The Development and Testing of a Forensic Interpretation Framework for use on Anthropometric and Morphological Data Collected During Stance and Gait

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

By

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Certificate of Original Authorship

I, Dilan Seckiner declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Centre for Forensic Science/Mathematical and Physical Sciences at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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Thesis by Compilation Declaration

The following publications will be included in the thesis titled ‘The Development and Testing of a Forensic Interpretation Framework for use on Anthropometric and Morphological Data Collected During Stance and Gait’ in the form of a thesis by compilation. PhD candidate Dilan Seckiner researched, wrote and edited the publications, while Dr Philip Maynard, Dr Xanthé Mallett, Prof Claude Roux and Prof Didier Meuwly all contributed their feedback, provided valuable guidance and their edits to the articles. Both of the following publications were accepted and published in Forensic Science International and will be included in chapter 1 of this thesis.

Forensic Image Analysis - CCTV Distortion and Artefacts (Accepted)

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Forensic Gait Analysis - Morphometric Assessment from Surveillance Footage (Accepted)

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List of Publications and Presentations

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1. Seckiner, D., Mallett, X., Meuwly, D., Maynard, P., Roux, C. (2019). Forensic Gait Analysis – Morphometric Assessment from Surveillance Footage. Forensic Science International. 296. 57 – 66.

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Conference Presentations

1. Forensic Gait Examination: Morphometric Body Assessment and associated CCTV Image Quantification. *Australasian Institute of Anatomical Sciences located in Sydney, Australia, 2019*

2. Forensic Gait Analysis: Morphometric Body Assessment and associated CCTV Image Quantification'. *Australian and New Zealand Forensic Science Society 24th International Symposium located in Perth, Australia, 2018*

3. Forensic Gait Analysis: Morphometric Body Assessment and Image Quantification. *21st Triennial Meeting of the International Association of Forensic Sciences Conference, Toronto Canada, 2017*

4. Forensic Gait Analysis: Morphometric Body Assessment and Image Quantification. *Australian and New Zealand Forensic Science Society International Symposium 24th International Symposium located in located in Auckland, New Zealand, 2016*

5. Forensic Body Mapping: Morphometric Gait Analysis and the Quantification of associated CCTV Distortion'. *New Horizon Conference Presentation located at Royal North Shore Hospital, Sydney, Australia, 2014*

Contents

List of Figures

List of Tables

Abstract

The ubiquitous nature of surveillance cameras allows continuous monitoring of an area where footage can be obtained for later use, if criminal or other activity of interest occurs, for investigative and evaluative purposes. In the process, gait is often important as facial analysis is not always possible due to obstruction of the face. Subsequently, a photo-comparative analysis of the footage and of a Person of Interest (POI) may be required. Such examination involves evaluation of the strength of evidence at both activity and source level, thus underlining its importance.

The aim of this PhD research is to assess and improve the scientific approaches applicable to forensic gait analysis through the investigation and development of an interpretation framework. The specific objectives include the development of an analytical model for morphometric body and gait analysis that shows distinctive features of gait in a forensic context, whilst determining features of the body during stance and gait (walk and run). The method includes a morphometric assessment of 25 anthropometric measurements (static and dynamic), 35 morphological features for stance and 51 morphological features for gait (male/female volunteers). Furthermore, the frequency, distinguishability and dependency of features within subpopulations were observed whilst viewing correlations of age/ethnicity/sex and examining the robustness of gait to different conditions (accessories, and environment) in forensic scenarios (speed and attire [hoodie] performing the best).

As a result, a standardised protocol was produced, and population databases established from which frequency statistics were attained. Moreover, features were observed as either common or distinct (most distinct observed as in-toeing of the feet and lateral placement of the hand) once compared to all age (85.39% predictive accuracy), ancestry (94.57% predictive accuracy) and sex (98.5% predictive accuracy) categories for correlation assessment. These components were then applied to assess the strength of evidence between the trace and the reference materials, resulting in a likelihood ratio score.

As a forensic tool, the forensic gait analysis method often lacks validation and its evaluation misses empirical substantiation. Nevertheless, the availability of trace material in numerous cases and the potential for development of the method suggests that research in this topic cannot be overlooked. The broader purpose of this study established a method of evaluating gait analysis

that offers valuable information to the criminal justice system whilst being scientifically robust and highlighting its limitations.

1. CHAPTER 1: Introduction

Surveillance[1] is universal in modern society (Wright *et al.*, 2010). The use of surveillance technology first proliferated in the United Kingdom in the 20th Century and soon after dispersed rapidly worldwide (*ibid*). Strategically placed ‘open-street’[2] surveillance systems, continuously monitor public places (crime ‘hot spots’), acting as a crime deterrent as well as a ‘silent witness’ to any activity of interest (Birch *et al.*, 2013; Wilson and Sutton, 2003). The presence of surveillance allows border security and authorities to capture footage of interest, to extract both source and activity information to track anti-social/criminal behaviour. If a criminal or other act of interest is captured on a CCTV camera, a forensic practitioner/expert, can be required to analyse the footage of the trace.

Gait is defined as the synchronised oscillation sequence of body segments that form a locomotive pattern (Uustal *et al.*, 2004). Forensic gait analysis incorporates a photographic comparison technique to assess the trace from surveillance footage, otherwise known as closed circuit television (CCTV). Currently, such techniques to assess gait may include biometric gait recognition, forensic gait analysis, tracking technology, and marker technology (Seckiner *et al.*, 2019). As highlighted by Mastrigt *et al.,* (2018), a valuable forensic feature involves measurability, consistency of the analysis and the differences between individuals.

This PhD research addresses the lack of standardisation in forensic evaluation protocols, and aims to scientifically improve and refine the existing technique of forensic gait analysis so that its full potential can be recognised, its strength of evidence assessed through probabilistic statistics, and the scientific validity and reliability upheld throughout this process. This chapter consists of two review papers that were published in Forensic Science International. The first paper is titled ‘Forensic Image Analysis – CCTV Distortion and Artefacts’, the second is titled ‘Forensic Gait Analysis - Morphometric Assessment from Surveillance Footage’. The aims, hypotheses, specific objectives, and research questions (that this research will endeavor to answer) will then be addressed, followed by the outline of this thesis.

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[1] Surveillance can be defined as ‘the practice of monitoring, recording, watching and processing the particular conduct of events, locations and persons for the purpose of governing activity’ (Wright *et al.*, 2010)

[2] ‘Open-street’ surveillance systems are defined by the placement of an array of cameras within the public to monitor and deter acts of crime (Birch *et al.*, 2013; Wilson and Sutton, 2003). Approximately, 45 of such systems have been installed within NSW alone (NSWCCL, 2011; Wilson and Sutton, 2003). One system for example, comprises of 10,070 cameras that are dispersed throughout NSW train services (NSWCCL, 2011; Berejiklian, 2014; Sydney City News, 2014).

1.1 Forensic Image Analysis - CCTV Distortion and Artefacts

1.1.1 Abstract

As a result of the worldwide deployment of surveillance cameras, authorities have gained a powerful tool that captures footage of activities of people in public areas. Surveillance cameras allow continuous monitoring of the area and allow footage to be obtained for later use, if a criminal or other act of interest occurs. Following this, a forensic practitioner, or expert witness can be required to analyse the footage of the Person of Interest. The examination ultimately aims at evaluating the strength of evidence at source and activity levels. In this paper, both source and activity levels are inferred from the trace, obtained in the form of CCTV footage. The source level alludes to features observed within the anatomy and gait of an individual, whilst the activity level relates to activity undertaken by the individual within the footage. The strength of evidence depends on the value of the information recorded, where the activity level is robust, yet source level requires further development. It is therefore suggested that the camera and the associated distortions should be assessed first and foremost and, where possible, quantified, to determine the level of each type of distortion present within the footage. The 'forensic image analysis' review is presented here. It will outline the image distortion types and detail the limitations of differing surveillance camera systems. The aim is to highlight various types of distortion present particularly from surveillance footage, as well as address gaps in current literature in relation to assessment of CCTV distortions in tandem with gait analysis. Future work will consider the anatomical assessment from surveillance footage.

1.1.2 Introduction

Surveillance is defined as 'the practice of monitoring, recording, watching and processing the particular conduct of events, locations and persons for the purpose of governing activity' (Wright *et al.*, 2010). The importance of surveillance as an intelligence- and investigative-gathering tool cannot be over-estimated, and the number of cameras installed across various types of locations (both public and private) are increasing, thus proving to be a strong avenue for activity level inference. The source level addresses the question of the identity of the person present on the CCTV footage, while the activity level focuses on the activity of this person (Meuwly *et al.,* 2012). However, the poor quality of the footage captured limits the amount of information recovered. The primary objective of installing surveillance cameras is to deter crime, as well as extracting both source and activity information following an effective detection, tracking, recognition, and identification of individuals. However, it has been determined that in some areas such as Newark, New Jersey, CCTV cameras are less effective at deterring crime than other areas such as Newcastle, England (Phillips *et al.,* 1999; Caplan *et al.*, 2011), thus questioning whether some places have lost their effect at deterring crime, possibly due to the recorded individual's awareness of limited source level analysis due to poor quality of footage (Petrossian *et al.,* 2011).

Cameras are placed across multiple sites at airports, car parks, shopping centres, train stations, motorways and stores (The CCTV Advisory Service, 2014; Wang, 2013), and other public places, as well as an increasing proliferation in the private sphere. The purpose of surveillance cameras is to monitor an area continuously, and collect information for later use. The public commonly believe that criminal or deviant acts will be brought to a premature close once the camera is noticed, although crime rates do not support this assertion (Isnard, 2001; Willis *et al.*, 2017). Although cameras are installed to deter the act of crime, or potentially reduce the amount of crimes committed, this does not appear to hold true based upon the increase of crime rates observed.

Between the years 2014 and 2015, an increase of 2% in varying types of crime was documented in Australia (i.e. theft and violent crimes) (Australian Bureau of Statistics, 2015). This equates to 411,686 offenders that were proceeded against by authorities (*ibid*). To combat this, strategically placed 'open-street'[3] surveillance systems act as a crime deterrent through the continual monitoring of public crime 'hot spots' (Birch *et al.*, 2013; Wilson and Sutton, 2003).

In NSW Australia alone, 45 open street camera systems have been strategically installed across crime hot-spots (Wilson and Sutton, 2003; NSWCCL, 2014). NSW Train Systems provide a good example of the large scale of some open street camera networks, as it includes 10,070 individual cameras within one system (NSWCCL, 2014; Berejiklian, 2014; Sydney City News, 2014). The purpose of such a network is to deter criminal activity and to capture the activity and identify individuals involved in this activity. Surveillance cameras have the capability to record continuously, however without a forensic image practitioner to examine the footage and infer the identity and the activities of the persons (victims or offenders), the footage remains of limited value, especially at the source level due to the limitations of the camera quality obstructing source level features. The determination of whether gait is able to be analysed from footage depends on whether the properties of the following can be satisfied, including: [1] feature set, [2] distinctiveness, [3] permanence, [4] universality, [5] collectability and [6] performance (Jain *et*

[3] 'Open-street' surveillance systems are defined by the placement of an array of cameras within the public to monitor and deter acts of crime (Birch *et al.*, 2013; Wilson and Sutton, 2003)

al., 2016). All these aforementioned properties are recommended by Jain *et al.*, (2016) contribute to the accurate assessment of various biometrics, including gait. The development of these factors can possibly allow the forensic evaluation of gait to be completed to produce an accurate probative value for operational purposes. For instance, determining which features can be extracted from the trace and assessing how distinct they are within the given population is imperative for the calculation of the strength of evidence, using Bayesian models. Further, the performance of the model (including proof of concept) are required for validation studies and accuracy. For more information, the gait analysis component will be further discussed in a future paper.

As aforementioned, the main limitations of CCTV cameras revolve around poor quality of the footage, thus limiting the availability for source level inference. Furthermore, camera distortion, aspect ratio distortion, high point of view of the camera, pan-tilt-zoom cameras, and time lapse recordings present obstacles commonly found in surveillance footage (HOSDB, 2007). This paper reviews the types of distortion present in particular those that are commonly observed within surveillance cameras, and highlights the elements that need to be considered prior to the suitable analysis of a trace within the images for identification characteristics.

Currently, forensic research revolves around the attempt to answer who the trace originally belongs to; through the inference of the source level by identification (investigation), individualisation (evaluation), and association (intelligence) (Meuwly *et al.,* 2012). These three processes are the results of the comparison of generally a trace, and a reference image. Although less attention has been provided for reconstruction at the activity level, the questions of 'how and when the traces are made' remain the primary focus (Meuwly *et al.,* 2012). CCTV technology was primarily designed for the activity level inference, which is effective for capturing information based on activity of individuals. However, when criminal activity is detected, the source level inference is then questioned. This paper focuses on distortions and artefacts that impact upon the trace material (CCTV footage) – which in turn may affect the analysis of the source level inference.

1.1.2.1 The Age of Surveillance Technology

Proliferation of surveillance technology began in the UK in the 20th Century, followed by rapid worldwide dispersion (Wright *et al.*, 2010). The number of camera systems have increased so significantly since that time that it is estimated that the average person in London will be captured by 300 different cameras in a single day (Porter, 2011). As a result of the terrorist attacks on the World Trade Center in New York in 2001, security requirements were reassessed worldwide (particularly USA) to combat similar threats (Kruegle, 2007). Thus, surveillance systems currently include video providing ‘remote eyes’ as a security measure (*ibid*). The recording feature of surveillance technology and its capability to record in various conditions (colour, monochrome, night vision, heat detection, and infrared) allows police and border security to capture footage of persons of interest (offender and/or victim) (*ibid*). Although still limited for source level inference, the presence of surveillance systems has been effective in reducing certain types of crimes (Gill and Spriggs, 2005). For example, incidents of theft and other property crimes in general have reduced following the installation of surveillance cameras, however the number of violent crimes have not gone down (*ibid*).

Following a crime occurring, police obtain relevant footage of criminal activity/ traces captured by CCTV, which are then passed to expert image analysts. The forensic practitioner is then required to assess the footage containing information about the presence of individuals, often being asked to provide an expert comparison between the Person of Interest and a suspect, followed by the ACE-V protocol of Analysis, Comparison, Evaluation and Verification. CCTV can be invaluable within investigation or intelligence for instance, in circumstances when tracking the last movements of a missing person or that committing a crime, which in turn may lead to further evidence - including fingerprints and/or DNA. The benefit of CCTV revolves around its availability and capability to record continuously even from a distance the footage generally is readily accessible, due to the vast amount of surveillance cameras present; albeit limited in quality. As a result of the proliferation of CCTV cameras, and how easy it is to capture footage of crime, once developed further and limitations addressed, this technique is thought to be very beneficial within modern society (Isnard, 2001; Raymond, 2006).

The accessibility to surveillance footage and its use have been demonstrated in a number of cases, however more importantly, scientific validation is not yet accomplished within the courtroom and is necessary. For example, in *Murdoch v The Queen ([2007] HCATrans 321* and *[2007]) NTCCA)*, an offender was convicted on the basis of ‘morphometric mapping’ of the body. The term ‘morphometric’ refers to the combination of both anthropometric and morphological analyses, whereas ‘body mapping’ is a comparison technique assessing the CCTV camera, followed by a comparison of the trace (person of interest) and reference (suspected person) (Edmond *et al.*, 2009). Therefore, this case is an example where surveillance footage was used as a powerful tool (Wright *et al.*, 2010; Keval and Sasse, 2006). However, it is hotly debated within the relevant forensic disciplines as to whether such evidence should be admissible in court without meeting the *Daubert* standards (as established in *Daubert v Merrell Dow Pharmaceuticals, 509. [1993], U.S. 579* and other relevant US cases) and without a significant population database, frequency statistics and standardised protocols. Australian case law does not have an equivalent to the *Daubert* standard, however reliability of the evidence is essential prior to admission in court and requires scientific validity (Meuwly, *et al.*, 2016; Robinson, 2011). To a degree, this is somewhat similar to admissibility of evidence in Europe where the practitioner, or expert must provide quantifiable evidence and report the strength of evidence to the judge (Domitrovich, 2016). Both *Daubert* and Frye standards (Hamilton, 1997) require the expert to demonstrate that they have attained an adequate level of study, training and experience in order for their evidence to be admissible in that case (Carrier, 2002). Demonstration of expertise is a necessary requirement, however, it doesn't reflect the performance of the method and its limitations. Therefore, the expert witness' claim must have been tested, error rates of the method in conditions similar to the case and standardised protocols established, peer reviewed and published, and finally, the relevant scientific community must generally accept the technique (Mallett and Evison, 2013; *Daubert v. Merrell Dow Pharmaceuticals, Inc,*, *509. 1993, U.S. 579*). An error rate or a strength of evidence does not characterise a method, but rather a method in a specific set of circumstances. Therefore, in the courtroom, the *Daubert* criteria should be met, scientific validity established, the performance of the method tested, and the limitations of such evidence should be highlighted (Porter, 2011; Edmond *et al.*, 2009; Carrier, 2002; Mallett and Evison, 2013). In Europe for instance, the approach is to validate and accredit a method via a validation report (ISO 17025) (NATA, 2015). Beside legal considerations, the strength of any forensic evidence depends on the intrinsic quantity of information present in the CCTV footage and how this information can be analysed compared and evaluated forensically. Therefore, it is suggested that surveillance footage should be assessed for distortion, prior to the assessment of the individual.

1.1.3. The Ultimate Goal: To Determine the Limitations Presented by Distortion and Artefacts

The type and extent of artefact or distortion affecting a CCTV camera can be determined if the correct information is provided about the camera. Certain characteristics of each type of distortion are present in the footage and may be used to identify the underlying distortion. Additionally, CCTV cameras generally contain not one, but a combination of multiple artefacts, distortions or a combination of the two. This presents further challenges to determining the types of distortion present within the footage/camera.

1.1.3.1 Artefact and Distortion Analysis

The examination of images as part of criminal investigations is known generally as 'forensic image analysis' (Forensic Image Analysis, 2014)**,** first stage of which often includes the evaluation of image quality and levels of artefacts (information and influences that impact upon and image) and distortion within CCTV footage. Once the distortion affecting the footage has been determined, morphometric analysis of any persons can proceed with the application of biometric technology (Meuwly and Veldhuis, 2012). Examples of features that contribute to distortion include: poor camera maintenance and placement (introduced before the camera is even turned on, due to the viewing angle the camera is placed at; for example, an extremely high or low angle), distortions due to the camera lens, perspective distortion, and external/environmental influences (e.g., direct sunlight, condensation) (Birch *et al.*, 2013; Keval and Sasse, 2006; Ng *et al.*, 2011). These factors combine and contribute to poor-quality surveillance footage.

Measurement of the height of known structures within the scene (HOSDB, 2007), such as trees, architecture details or non-removable objects, may be used to determine the corrected height and geometry of the individual from CCTV footage where the known structure can be measured with less than 2cm error; as shown by a study undertaken by (Andersen *et al.*, 2006). Furthermore, comparative measurements between the individual on the surveillance footage and a known person (a specific police officer for example) of a pre-recorded height placed in the same location as the individual from footage helps with the assessment of correct height and geometry (HOSDB, 2007). This analysis of the scene allows vital information to infer the approximate distance and sizes of subjects and objects, which increases the accuracy of height estimation (*ibid*). Another study by Neves (2015) however, showed the performance of the height estimation to vary in an individual (true height of 168cm) between 0.1cm 14.7cm. Therefore, strength of evidence of the height remains limited, except from extreme cases; for that reason, increasing the pool of features observed within the anatomy and gait provides further useful information. However, this analysis has the potential for subjective interpretation, highlighting the importance for standardised protocols to be established. This is one of the three requirements as highlighted in the Australian case of *Regina v Dastagir [2013] SASC 26*, (the other two being the development of population databases and publication of frequency statistics) (HOSDB, 2007). Once all three of these components are achieved and meet the *Daubert* standards, it is thought that a more accurate analysis can be achieved.

Various techniques have been applied to assess and/or correct geometric distortion, with one being photogrammetry. This method is defined as the attainment of dimensional information by application of perspective geometry to an image; a process that has an extended history, having been applied as early as the 15^{th} century by Leonardo De Vinci to allow accurate representation of objects in paintings (HOSDB, 2007). Today, in the analysis stage of CCTV footage, it is theorized that through accurate application of these techniques and assessment of distortion, relevant information can be extracted successfully from video evidence. However, problems are introduced when applying photogrammetry to CCTV video footage due to the distortions that are common amongst various cameras and subsequent footage (such as geometric distortion as a result of the high positioning of the camera and the downward angle tilting) (HOSDB, 2007).

1.1.3.1.1 Extrinsic Artefact and Distortion Analysis

Distortion can be divided into 'extrinsic' and 'intrinsic'. Extrinsic artefact refers to external factors that influence the camera – i.e. weather conditions and maintenance; and intrinsic artefact will be detailed in section 1.1.3.1.2. The various types of extrinsic artefact can be categorised to represent the different components of a CCTV camera that can be affected. Table 1.1 lists the specific types of extrinsic distortion and provides accompanying definitions, which can also be used as a checklist upon assessment of distortion.

Target Classification – Is referred to the target object or subject within the image that is being analysed, including the determination of the number of targets, their positions, their total speed (scalar), velocity (vector), and acceleration (Ristic *et al.*, 2003). Furthermore, the 'Field of View' is taken into consideration upon assessment of the target where the environment is monitored to detect the presence of crime or a particular person from footage. Human activity is observed through camera systems by the footage produced, however the purpose of the footage being viewed varies from crowd control to the recognition of a particular individual. Therefore, five categories have been developed by Cohen *et al.*, (2009), for the simplification of the purpose of monitoring. This is subcategorised into monitor and control, detection, observation, recognition, and identification (Cohen *et al.*, 2009) and activity and source level inference can be extracted based upon the aforementioned categories. For monitor and control the crowd is monitored so each target occupies 5% of screen height (Cohen *et al.*, 2009). For detection, the individual or target object occupies 10% of screen height, whilst observation is 25%, recognition is 50%, and identification is 100% (*ibid*). The purpose of target classifications was to develop a specification for monitoring and to meet the specific requirements for that purpose (Ristic *et al.*, 2003). It does not aim to set a minimum standard, nor does it suggest that identification can be achieved based purely on the accurate screen height of the person achieved – rather showing activity of the person and suggesting a categories for monitoring a person through CCTV. Factors including the resolution and other artefact and distortion types may alter each classification based on the clarity and condition of the footage.

Maintenance – Refers to the condition and upkeep of the camera and housing to determine whether any damage or dirt is obstructing the view of the camera (Chow *et al.*, 1999). For the purpose of this section within the table, the housing and the camera are separated into their own categories, since maintenance may only be undertaken for either camera, housing, or both.

Environment – Relates to the environmental conditions that may impact upon the camera (Jung, 2006). Weather conditions and light source are the two main components within this classification. Weather conditions (for instance rain) may cause water droplets on the camera housing, consequently obscuring parts of the footage. If the camera is not placed in an ideal location, sun damage can also occur over a span of time. Lighting on the other hand is essential to view the occurrences within the footage, the absence of which (unless the camera is night vision) would limit the camera of its use.

Camera Placement – Can be defined as the 'strategic' and 'non-strategic' placement of the CCTV camera (Caplan *et al.*, 2011). 'Strategic' camera placement refers to the camera being placed with forethought and consideration of the environment; whereas 'non-strategic' camera placement is more random placement with no further consideration or thought to the surrounding environment - whether the camera placement be high/low or angled facing upwards/downwards (Caplan *et al.*, 2011). When placing surveillance cameras, consideration of placement in relation to environment, and the subsequent target is required for the best gait examination outcome. These 'non-strategic' placements of the camera can more often than not, lead to geometric distortion as they are not aligned to the target (i.e. person).

Target Subject (and/or Object) – The target subject/object is as the name suggests, where a particular person/s or object of interest captured within the footage, is assessed (Cohen *et al.*, 2009). Motion blur was also examined as shown through a study by Jin *et al.*, (2005). Therefore, the table directly relates to the speed at which the subject is moving. If the subject is moving at a quick pace, for instance, this may lead to a motion blurring distortion, which tends to be more prominent within the appendicular anatomy (arms and legs) of the subject as they swing forward for advancement in gait.

Table 1.1 Extrinsic Factors/Distortion Affecting CCTV Footage

Property	Distortion Variance			Definition	Source
Functional Classification	Field of View	Monitor and Control		Monitoring the environment to determine the number, direction and speed of people within a wide area. Image of the subject is a very minor percentage of approximately 5% of the screen height	Cohen *et al.*, (2009)
		Detection		Monitoring the environment to detect presence of subject within a large field of view. Image of subject occupies small percentage 10% of the screen height.	
		Observation		Monitoring activities of moving subject(s) to detect specific action(s) &/or movement(s). Image of subject occupies approximately 25% of the screen height.	
		Activity level inference		To capture noticeable features for subject recognition. Image of subject occupies approximately 50% of the screen height.	
		Source level inference		To capture detailed images of high clarity for subject identification. Image of subject occupies more than 100% of the screen height.	
Maintenance	Physical condition of Camera Lens	Sun damage to Housing	Present	Damage to sensitive camera housing by direct exposure to intense sunlight	Jones and Arnold, (1997)
			Absent	No sun damage to lens surface	
			Indeterminable	Not evident	
		Dirty	Yes	Camera lens free of dust and/or pollutant	Canty (1990); Ho (2007)
			No	Dust and/or pollutant present on camera lens	
			Indeterminable	Not evident	
	Physical condition of Camera Housing	Damage	Present	Camera housing damaged (i.e. broken or cracked)	Chow *et al.*, (1999)
			Absent	No damage to camera housing	
			Indeterminable	Not evident	
		Dirty	Yes	Camera housing free of dust and/or pollutant	
			No	Dust and/or pollutant present on camera housing	
			Indeterminable	Not evident	
Environment	Environment (Time of day)	Day time		Sunrise to Sunset (i.e. daylight)	Nawrat and Kus (2013)
		Night time		Sunset to Sunrise (i.e. nightfall)	
		Indeterminable		Not evident	
	Weather Conditions	Dry		Dry weather conditions is visible in environment	Nawrat and Kus (2013)
		Wet		Wet weather conditions is visible in environment	
	Light Source	Natural lighting (sun)		Field of view is illuminated by sunlight	Nawrat and Kus (2013)
		Artificial lighting (lamp)		Field of view is illuminated by man-made light source (e.g. street lamps)	
		Both Natural and Artificial Lighting		Field of view is illuminated by sunlight and man-made light source	
		Absent lighting		Field of view is void of light (i.e. pitch-black)	
		Indeterminable		Not evident	

	Camera Placement	Height Camera Is placed	High Placement		Camera in elevated position relative to target object/subject	Cathey and Dailey (2005)
			Medium Placement		Camera in position relative to target object/subject	
			Low Placement		Camera positioned low, relative to target object/subject	
			Indeterminable		Not evident	
		Angle (Focal Plane) of Camera	Tilted Downwards		Focal plane tilted downwards for maximum coverage of target area (i.e. large field of view)	
			Neutral		Focal plane is at the same plane as the intended field of view of the subject(s)	
			Tilted Upwards		Focal plane tilted upwards to target area	
			Indeterminable		Not evident	
		Camera distance to Subject(s)	Large		Camera positioned far from subject(s), dependent on subject movement	Grgic *et al.*, (2011)
			Medium		Camera positioned moderate distance from subject(s) dependent on subject movement	
			Small		Camera positioned close to subject(s) dependent on subject movement	
			Indeterminable		Not evident	
	Target Subject (&/or Object)	Motion velocity of Target Subject (&/or Object)	Motion blur	Present	Image display apparent streaking of rapidly moving subject(s) (&/or objects). Motion Blur dependent on velocity of the subject(s) &/or objects (i.e. the faster the subject / object, the greater the distortion).	Jin *et al.*, (2005)
				Absent	Image free of *motion blur*	
				Indeterminable	Not evident	

1.1.3.1.2 Intrinsic Artefact and Distortion Analysis

Intrinsic distortion is a direct result of distortion caused by the camera itself and not from external factors that impact upon the camera, including the camera type, capture and recording for instance. The various types of intrinsic distortion can be categorised to represent the different components of a CCTV camera that can be affected. Table 1.2 lists the specific types of intrinsic distortion that have been compiled, and provides accompanying definitions, which can also be used as a checklist upon the preliminary assessment of distortion, prior to the examination.

CCTV Camera – Can be defined as a system that captures (relates to optics and sensor) and records (pre-process, encodes, compresses and records) its surrounding area for surveillance purposes (Doyle *et al.*, 2011). For the purpose of the table, the ‘CCTV camera’ category was subdivided into the camera type and specifications. Visibility of the camera to an individual captured on CCTV or members of the public is also considered, which assists to further determine its specifications. The first of these, camera types (monochrome, colour, infrared, night vision and thermal), can change the mode of footage produced. For instance an individual concealed within a bushland area may be concealed in footage from a monochrome camera, but easily observed with a thermal camera. The second factor, visibility of the camera, is important as if the individual can see the camera, this may affect their activity (they may keep their face averted, for instance).

Monitoring – Falls under video surveillance and, as the name suggests, refers to the direct visual monitoring of activities within any given premise (Government, 2000). Within the table, the operated or automatic movement of the camera is primarily highlighted, as upon said movement of camera, distortions may occur such as ‘rolling shutter’ (the distortion caused by the skewing of the image through movement of the camera while the shutter is open) (Meingast *et al.*, 2005). Operated movement occurs under the control of a person, whereas automatic movement is the programmed movement of the camera itself.

Capture and Recording – Can be defined as the recording and retention of footage captured by the camera, and the subsequent manner in which the footage is recorded (Cohen *et al.*, 1999). The mechanics of recording involves Modulation Transfer Function (MTF), which is the optical transfer function, indicating the resolution properties by determining the transfer of contrast at a certain resolution when recording from object to image (resolution and contrast integrated into a single parameter) (Fujita *et al.*, 1992). Electronic sensor of the camera supplies the digital image directly which can range between monochrome, colour, infrared, night vision and thermal

(Kraus, 2004). Other components to consider are the signal-to-noise ratio (level of information [signal] against the interference [noise] in a ratio form) (Hoult and Richards, 1976) and the dynamic range (ratio between minimum and maximum light intensities able to be measured at exposure) (Ginosaur *et al.*, 1993). Following from the mechanism of recording, now this category is further divided into three subcategories; recording mode, frame rate, and interlacing. Recording mode within this particular table relates to whether the camera records continuously or is triggered to record through motion or at a pre-set time. Frame rate refers to whether the recorded frames are high (images captured to show a high level of information from video as a result of the increased number of frames captured per second) or low (video appears 'jumpy' or 'lagged' as only some frames are obtained to complete the footage). Interlacing is the distortion whereby two line-by-line fields (odd and even that forms a full frame) shift as a result of timing differences.

Playback – Refers to footage that is played back after the capturing and recording has been completed (Isohuchi *et al.*, 1992). Time lapse is an example of this, where it is programmed to obtain a single image or a single still image at determined time gaps to capture a scene over the course of weeks or months – thus making it seem that the footage captured is 'fast forward' when it is played back.

System – Relates to the specifications that is held by the camera, including the manner in which data captured is stored; for instance, older systems are analogue and the contemporary systems are digital (Miki *et al.*, 2010). Analogue systems function by transmitting and recording video within analogue format and record to VHS, as opposed to digital cameras, which transmit and record digitally and are stored into hard drives (*ibid*).

Images – Can be defined as the resulting footage (frames) produced by the camera recording, which are stored on either a memory card, hard drive, or other storage system (Wantanabe, 1996; Taussig *et al.*, 2006). This section in the table however, specifically refers to the colour and quality of the image recorded. It can be further categorised into colour specification, image resolution, and image quality. Colour specification determines whether the camera is monochrome or colour, whilst image resolution determines the number of pixels present within the frame and the overall quality of the image (whether it is high or low).

Camera Lens – The camera lens works in tandem with the body of the camera to capture and recreate the surroundings recorded within the field of view of the CCTV camera and represents it on a 2D image depiction (Wang *et al.*, 2008). The camera lens can be fixed (distance of the field of view remains the same) or zoom (principle distance of zoom lens to changed so they 'zoom' in closer to an area of the camera field of view) (Shortis *et al.*, 2006). For the table, 'Camera Lens' specifically refers to the different types of camera lenses available and the subsequent image variations as a cause of the lens type. These variations in lens use can lead to six further types of distortion; wide angle barrel, narrow pincushion, moustache, rectilinear, lens blur, and rolling shutter. Wide angle or 'barrel' is the most common type of distortion seen within a CCTV camera, whereby the image becomes mapped around the shape of a barrel, thus making straight objects appear curved. Pincushion distortion is when the image bows inward, and moustache distortion is the combination of both barrel and pincushion distortions. Rectilinear is when straight objects appear curved. Lens blur occurs when the full/part of the image is not in focus and appears blurred. Rolling shutter distortion transpires when the movement of the camera (either automatic or through operator) leads to the skewing of objects/subjects within the image.

Transmission – Is when signals are sent and received to obtain an image file (Moghadam *et al.*, 1999). Distortion that manifests is a result of the interference of signals within the camera. Both speckle (black granules within screen) and Gaussian noise (white granules within screen) occur when one signal interferes with another, consequently leading to a grainy appearance of the footage.

Outer Frame – As the name suggests, the outer frame can be defined as the region comprising of some or all of the corner/edge of the image that is captured (Amemiya and Shimizu, 1999). For the purpose of the distortion table, this is subcategorised into particular distortions or features that occur within the outer edge/corner of the frame, including vignetting, chromatic aberration, digital watermark, and window framing. When the outer edge is darker in tone, this is known as vignetting, whereas chromatic aberration is the change in colour tone within the outer edges and corners. A digital watermark comprises details of the camera placed within the frame including date, time, place, and camera number. Window framing is the frame imprinting with a specific colour (traditionally black) or area of the edges of the frame.

Table 1.2 Intrinsic Factors/Distortion Affecting CCTV Footage

Property	Distortion Variance		Definition	Source
CCTV Camera	CCTV Camera Visibility	Visible (Overt)	Camera is noticeable	Doyle *et al.*, (2011)
		Hidden (Covert)	Camera is concealed (e.g. encased in dome or set behind panel in ATM)	
		Unknown	Camera visibility is indeterminate	
	CCTV Camera Type	Standard Colour	Colour image output under optimum lighting	Nawrat and Kus (2013)
		Standard Monochrome	Black and white image output under optimum lighting	
		Infra-red (Night Vision)	Utilises infra-red technology for low light level and pitch black condition (e.g. at night). (B&W output)	
		Day / Night Vision	Compensate for varying light conditions to allow the camera to capture images. Primarily used in outdoor applications where the security camera is positioned (e.g. for an outdoor parking lot). Units are capable of having a wide dynamic range to function in glare, direct sunlight, reflections and strong backlight 24/7. (B&W Output)	
		Heat Detection (Thermal)	Camouflaged subjects are visible through heat detection	
Monitoring	Automatic Monitoring	Stationary	Unmanned with constant directional view	Hong (1993)
		Moving	Unmanned with changing directional view	
	Manual Monitoring	Moving	Operator controlled changes of directional view	
		Moving & Zoom	Operator controlled changes of directional view and zoom in/out	
Capture and Recording	Recording Mode	Active	Continuous (independent of moving subject (or object)	Freeman (1995)
		Passive	Motion Detected	
		Time Pre-set	Time Scheduled	
	Frame Rate	High	High number of frames captured per second	Keval and Sasse (2008)
		Low	Low number of frames captured per second	
	Interlacing	Present	Shifting of two line-by-line fields (odd and even that form a full frame) due to difference in timing	Busko *et al.*, (1999)
		Absent	Image free of *interlacing* distortion	
Playback	Time Lapse	Present	Footage appears in *fast forward* (event captured at one frame rate per given time – subsequently making the appearance that time is passing quicker)	Reif and Tornberg (2006)
		Absent	Image free of *time lapse*	
System	Data Storage	Analogue (VCR)	Footage is recorded on videocassette by recorders (VCR) and to be viewed on TV screens	Keval and Sasse (2008)
		Digital	Footage recorded digitally and stored onto hard drives. Data can be compressed to conserve storage space, which can lead to pixilation, loss of details and/or colour chromes.	
Images	Colour Specification of Images	Colour	Image output of actual colour(s) recorded	Nawrat and Kus (2013)
		Monochrome	Image output in Black & White (and shades of Grey)	
		Other	Image output not of actual colour recorded And not in Black & White	
	Image Resolution	High	Image free of noticeable *pixels*	Cohen *et al.*, (2009)
		Medium	Image with slightly visible 'square shaped' *pixels*	
		Low	Noticeable individual 'square shaped' *pixel*	
	Image Quality	High	Maximum or full clarity of details	
		Medium	Intermediate clarity of details	
		Low	Minimal or no clarity of details	

	Camera Lens	Wide-angle barrel	Present	Image mapped into a barrel shape thus straight line/object appears curved	Johnston and Bailey (2003)
			Absent	Image free of *wide-angle barrel* distortion	
			Indeterminable	Not evident	
		Narrow-angle pincushion	Present	Centre of image appears bowing inward	Hugemann (2010)
			Absent	Image free of *narrow-angle pincushion* distortion	
			Indeterminable	Not evident	
		Moustache	Present	Combination of both *barrel* and *pincushion* distortions	Nawrat and Kus (2013)
			Absent	Image free of *moustache* distortion	
			Indeterminable	Not evident	
		Rectilinear	Present	Curved line/object appears straightened	Lucas *et al.*, (2014)
			Absent	Image free of *rectilinear* distortion	
			Indeterminable	Not evident	
		Lens blur	Present	Image appears blurred (whole or part of frame). Example is 'bokeh' blurring of distant object whilst close object appears in focus.	Reed (2008)
			Absent	Image free of *lens blur* distortion	
			Indeterminable	Not evident	
		Rolling shutter	Present	Image appears skewed resulting from camera movement whilst shutter is open.	Meingast *et al.*, (2005)
			Absent	Image free of *rolling shutter* distortion	
			Indeterminable	Not evident	
	Transmission	Speckle Noise	Present	Noise distortion occurs when one signal is interfered with by another signal, causing a distortion. Example is "speckling" on digital CCTV footage, which is determinable through black granules	Nawrat and Kus (2013)
			Absent	Image free of *noise* distortion	
			Indeterminable	Not evident	
		Gaussian Noise	Present	When white granular noise distortion is displayed on image	Ramirez-Mireles (2001)
			Absent	Image free of *Gaussian noise* distortion	
			Indeterminable	Not evident	
		Salt and Pepper Noise	Present	When black and white granular noise distortion is displayed on image	Yi *et al.*, (2008)
			Absent	Image free of *Salt and Pepper noise* distortion	
			Indeterminable	Not evident	
	Outer Frame	Vignetting	Present	Image display darker tones on edges of the frame	Kim and Pollefeys (2008)
			Absent	Image free of *vignetting* distortion	
			Indeterminable	Not evident	
		Chromatic Aberration	Present	Image displays change of colour on edges of the frame	Boult and Wolberg (1992)
			Absent	Image free of *chromatic aberration* distortion	
			Indeterminable	Not evident	
		Digital Watermark	Present	Image displays a watermark (e.g. time, date, place and camera number)	Reed(2008)
			Absent	Image free of *watermark*	
		Window Framing	Present	Frame imprinting or 'a frame watermark' of the camera (frame of the camera viewed in tandem with field of view)	Amemiya et al., (1999)
			Absent	Image free of *window framing*	

1.1.4 Artefacts and Distortion within Australian and International Courts of Law

The assessment of a CCTV footage trace has been questioned by many researchers and practitioners, based on what is 'real' or 'distorted', as emphasised by Porter, (2009). The District Court of NSW was the first Australian jurisdiction to declare facial mapping evidence currently inadmissible, and the first case that admitted face and body mapping evidence occurred in the Bidura Children's Court in NSW in 2005 (Edmond *et al.*, 2009). Following the admittance of such evidence, the landmark case of *Regina v Jung [Regina v Jung 658. 2006, NSWSC]* established that experts determining similarities and differences between a trace and a suspect from surveillance footage are also required to also have expertise in forensic imagery (Hall, 2014).

To provide an example, the case by *Regina v Jung*, *658 2006 NSWSC,* focused on evidence of CCTV images obtained from a Westpac Bank ATM that were compared to images obtained from NSW Police Force. The level of expertise displayed by the expert in forensic photography was scrutinised by Justice Hall (Porter, 2011; Hall, 2014). Hall (2006) suggested that the expert's skills were limited to the forensic imagery field, and did not cover extensive knowledge of distortion - as seen by errors made in court. To provide an example of the skills lacking by the expert in this case, one example includes the 'similar perspectives' reference within the expert's evidence, where rather than image perspectives, the expert meant similar camera angles (Porter, 2011). These are two separate concepts, as perspectives relate to perspective distortion in photography whereas camera angles refer to the angle of the camera in relation to the environment and trace. Without the extensive knowledge of forensic image analysis, assessment is prone to errors, thus making the photographic comparison questionable (Porter, 2011), as concluded by Justice Hall in this case.

Another case of *Honeysett v The Queen [2014] HCA 29*, a robbery, which initially accepted, that the expert had 'specialised knowledge' based on both anatomy and viewing of CCTV footage. Later however, the court accepted the expert's knowledge in anatomy during the appeal, but did not maintain his knowledge in viewing CCTV footage, thus allowing the appeal to be granted based on these grounds (*Honeysett v The Queen [2014] HCA 29*). Therefore, it is recommended that the expert have an appropriate mix of qualifications, such as anatomy and image analysis, to draw conclusions based on their training, skill, knowledge, and experience (as well as the awareness for limitations) (CSOFS, 2019).

Moreover, it is very important that the *Daubert* standards (*Daubert v. Merrell Dow Pharmaceuticals, Inc,*, *509. 1993, U.S. 579*) are met, the scientific validity achieved and any deficits acknowledged by the expert in court, to circumvent any potential miscarriage of justice (Porter, 2011). Additionally Porter, (2011) highlights the prerequisite to implement scientific methods that will allow for the presentation of consistent, reliable, transparent, and replicable evidence based on the analysis of CCTV images. It is suggested that identification evidence should not be presented in court until misunderstandings surrounding photographic evidence, methods of photointerpretation error rates, and subjectivity in examination methods are addressed through additional research (Porter, 2011).

To assist in the evaluation of the strength that should be afforded to expert evidence in a particular case, experts were recommended to begin using the 'Bromby Scale' within British criminal courts in 2003, developed for the purpose of standardising the presentation of evidence (Bromby, 2003). The scale indicates the level of support that the evidence would offer, the highest being 'lends powerful support' and the lowest being 'lends no support' (*ibid*). The Bromby scale however, was applied within the Australian courts in the matter of *R v Hien Puoc TANG [2006] NSWCCA 167*, where the expert produced a slightly different version of the Bromby scale. However, it was claimed that the evidence had 'no scientific basis' as quoted from *R v Hien Puoc TANG [2006] NSWCCA 167*, which led to the case being appealed and the forensic body mapping technique declared inadmissible. ENFSI (2010) states that the findings should be reported in an evaluative statement, with the probabilities of the findings. Evett (2009), stated that the four principles of balance, logic, transparency and robustness should be achieved, which should govern the decision of admissibility in the accusatorial system and inadmissibility in the inquisitorial system.

The cases aforementioned highlights the current development of the requirements of practitioners involving distortion analysis from body/gait assessment), within a legal setting and highlights the limitations and gaps that need to be addressed. Further development and research into the gait analysis is necessary, with the inclusion of implemented frameworks, reliable and reproducible results with the application of forensic statistics. Once the scientific requirements are achieved, cases can be admissible and processed within the court of law with minimal risk.

1.1.5 Conclusion

Surveillance cameras have become a powerful tool to capture footages of activities of people in public areas. While such footages have been increasingly used in investigations, their analysis and especially interpretation have been criticised for their lack of scientific validity in court. It is argued here that the forensic examination of such material ultimately aims at evaluating the strength of evidence at source and activity levels and that this strength is inferred from the trace, obtained in the form of CCTV footage. The strength of evidence therefore depends on the value of the information recorded which, itself, depends in part on the camera and the associated distortions. It is recognised that all artefacts and distortion cannot be eliminated and that they primarily and more critically affect the robustness of the inference at source level. However, their impact on the strength of evidence can and should be studied. For example, pre-assessment of cases can be completed as well as providing a preview of the degree of magnitude of the likelihood ratio both at source and activity level, according to the nature and magnitude of the artefacts present within the trace material. In other words - whilst taking artefacts into account from the trace material, the likelihood ratio, evaluates the strength of evidence at source and activity level; thus, assessing the likelihood of a ‘reference ‘image, to that of the trace evidence.

This review paper took a step towards highlighting the requirements and limitations revolving around artefacts and distortion by determining the types of distortion present and their degrees of impact on the resulting footage. To improve the analysis of source level information, further research is necessary to fully understand the varying types of artefacts and distortion and their levels of severity (and therefore the potential impact on the reliability of the evidence produced from any forensic evaluation). Currently, not enough research has been conducted to accurately state that an identification can be made of a trace from CCTV images, but that does not mean that such information is not of any value. For instance, evaluation of an individual from CCTV evidence can be used as an exclusionary tool and/or can be extremely valuable information in investigations and even in court proceedings. Ultimately, it should be pointed out that the value of any technology, including CCTV, is relative to the questions being asked. Knowing the relevant questions, how fit this technology is to answer them and the value and limitation of such technology for the intended purpose would go a long way to address criticisms and challenges about CCTV. With this in mind, forensic gait analysis from surveillance footage will be discussed in this thesis.

1.2 Forensic Gait Analysis - Morphometric Assessment from Surveillance Footage

1.2.1 Abstract

Following the technological rise of surveillance cameras and their subsequent proliferation in public places, the use of information gathered by such means for investigative and evaluative purposes sparked a large interest in the forensic community and within policing scenarios. In particular, it is suggested that analysis of the body, especially the assessment of gait characteristics, can provide useful information to aid the investigation. This paper discusses the influences upon gait to mitigate some of the limitations of surveillance footage, including those due to the varying anatomical differences between individuals. Furthermore, the differences between various techniques applied to assess gait are discussed, including biometric gait recognition, forensic gait analysis, tracking technology, and marker technology. This review article discusses the limitations of the current methods for assessment of gait; exposing gaps within the literature in regard to various influences impacting upon the gait cycle. Furthermore, it suggests a 'morphometric' technique to enhance the available procedures to potentially facilitate the development of standardised protocols with supporting statistics and database. This in turn will provide meaningful information to forensic investigation, intelligence-gathering processes, and potentially as an additional method of forensic evaluation of evidence.

1.2.2 Introduction

Surveillance is defined as 'the practice of monitoring, recording, watching and processing the particular conduct of events, locations and persons for the purpose of governing activity' by Wright *et al.*, (2010), pg. 2. The importance of surveillance as an investigative[4] and intelligence[5]-gathering tool cannot be over-estimated, and the number of cameras installed as part of this process is increasing (Cheng *et al.*, 2008). The primary objective of installing surveillance cameras (aside from deterring crime), is to detect, track and extract information to discriminate between 'normal' and 'problematic' activities of persons (activity level inference), followed by feature assessment of people (source level inference) (Meuwly *et al.*, 2012) through the trace left on screen and on recorded footages.

[4] For the purpose of this article, the definition is as follows - forensic investigation: produce lists of candidates from the comparison of a trace material to a database of references

[5] For the purpose of this article, the definition is as follows - Forensic intelligence: produce links between cases from the comparison of traces

As a result of increasing installation of surveillance cameras, the potential for increased analysis of surveillance footage has attracted more attention from researchers (Cheng *et al.*, 2008). One such feature that makes gait analysis more desirable for analysis and separates it from other methods, is the potential for unobtrusive monitoring of one or several individuals and/or a situation from a distance (without the knowledge of the subject(s)), as well as the availability of some features even on lower quality recordings (Cheng *et al.*, 2008; Veres *et al.*, 2004).

An important component of the assessment of gait involves the determination of the internal[6] and external[7] influences to an individual that may modify their gait. The process of targeting, isolating, and understanding these influences, followed by the observation of normal gait, attempts to distinguish which specific alterations affect gait the most. This review article follows on from Seckiner *et al.,* (2018), (Forensic Image Analysis - CCTV Distortion and Artefacts) with the purpose of addressing all these concerns, to discuss the research conducted within the gait analysis field, and to critically evaluate the limitations of the technique.

1.2.2.1 The Gait Cycle

Locomotion is defined as the method of moving from one place to another (Birch *et al.*, 2020). Therefore, gait, is known as the manner or style that a person undertakes a locomotor activity, which includes walking or running (*ibid*). The gait cycle is the time between two consecutive occurrences of one repetitive events involved in walking (*ibid*). The four stages within the stance phase includes: [1] Loading response, [2] Mid-stance, [3] Terminal stance, and [4] Pre-swing. The swing phase comprises three stages: [1] Initial swing, [2] Mid-swing and [3] Terminal swing *(ibid)*. Within gait, the time taken to complete a full gait cycle, is known as the cycle time (Birch *et al.*, 2020). In a complete gait cycle, two periods of double limb support are present and two periods of single limb support (*ibid*). Gait parameters, including foot contact timing, number of steps per minute, walking speed, stride length as well as the relative position of limbs and joint angulation, can all be examined through observational gait analysis (Birch *et al.*, 2020). These features can also be used to observe the symmetry or lack of symmetry of the body between left and right during gait (*ibid*). Gait parameters, including foot contact timing, number of steps per minute, walking speed, stride length as well as the relative position of limbs and joint angulation, can all be examined through observational gait analysis (Birch *et al.*, 2020). These features can also be used to observe the symmetry or lack of symmetry of the body between left and right during gait (*ibid*). Usually the body is asymmetrical, where variations can vary from minor to

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6 Physical influences relate to the pathology or physiology detected within the body.

7 External influences are not influences that occur from the body, but rather from objects (i.e. footwear) or environmental impacts (i.e. ground surfaces).

major, similar to the asymmetry of the face (Zaidel and Cohen, 2005; Fitz, 1981). This is further expressed during gait through upper trunk movement and lower leg rotation, where the legs swing and rotate for advancement (Kawabata *et al.*, 2013). The minor asymmetry relates to intrinsic characteristics of healthy subjects, but major asymmetry may be extrinsic characteristics consecutive with pathology or accidents. Major asymmetry may also be intrinsic due to the anatomy of the individual (e.g. an individual born with only one leg). The existence of asymmetry therefore, is thought to enhance the observation of features from the body or gait.

1.2.2.2 Development of Gait Assessment

Gait patterns have been studied for centuries, but the first forensic application of biometrics for identification purposes was in 1883, when Bertillon measured the face and body of many offenders in an attempt to improve the individualisation process through the accurate record of physical characteristics (Cole, 2001). While measurements of gait were not conducted on offenders, it was the beginning of a technique that aimed to achieve identification and is still applied within modern methods. A study by Stevenage et al., (1999), almost two decades ago, established the possibility of distinguishing between various gait patterns (i.e. scissoring gait), thus a degree of recognition of people by gait, by viewing gait from video footage.

The most common biometric applications for the purpose of identification focus on DNA, fingerprint, face, voice, hand signatures, gait, and iris (Cheng *et al.*, 2008). For gait specifically, each person's manner of walking is said to show some degree of distinctness *(ibid)*. Gait analysis is being continually developed through advances in the fields of physical medicine, psychology, and biomechanics (Veres *et al.*, 2004). Although studies in gait are developing continuously, in the forensic context, empirical substantiation from the evaluation is necessary – especially gait analysis from CCTV footage.

CCTV footages are often of poor quality (Seckiner *et al.,* 2018), particularly when the position of the camera, and camera settings are intended for determining the activity of persons by monitoring a large, public area. Additionally, camera resolution/quality are designed to continuously record its surroundings while footage accommodates a set storage space. Upon analysis, a POI (person of interest) is rarely observed to remain still, but rather seen to be in motion whilst committing a crime or fleeing from the scene of the crime. Therefore, the gait analysis is often important for assessing any gait patterns or behavioral traits.

1.2.2.3 Impacts upon Gait

To allow a holistic approach in gait analysis, influences that impact upon the manner in which a person walks need to be considered during analysis. This evaluation can be divided into two categories: [1] intrinsic features and [2] extrinsic features. Physical (intrinsic) influences relate to the features that are within the biology of the POI, whereas external (extrinsic) influences refer to environment or other influences that are introduced to the body to cause a change, for example alcohol consumption. Table 1.3 highlights the various physical influences that may cause change the body (physical), while Table 1.4 lists and describes the external influences which may cause change to gait (environmental) of a person.

Table 1.3 List of Possible Intrinsic Features Altering Gait. The following table details the potential features that may alter gait that could affect gait behaviours.

Features	**Description**	**References**
	Genetically Defined Features Influencing the Gait	
Sex	The sex of an individual, places them into the male and/or female category. For this article, the secondary sex characteristics will be considered. One such observed feature to distinguish between sexes, was seen in male subjects, who tend to increase their shoulder swing, whilst females increase the swing in their hips. Although studies have determined such correlations within sex, and separated features that belong to the two, deviations may arise and the features (shoulder or hip swing) may not strictly fall within the male or female groups – primarily as a result of differing skeletal features.	Ma *et al.*, 2012; Miller and Parker, 2014; Petersen *et al.*, 1988; Watson and Kimura, 1991; Yam *et al.*, 2004
Ethnic background	Infants with different genetic ancestry have shown a different capacity to acquire walking ability. In average, children with an African ethnical background been observed to first walk at the age of 11 months; Caucasian children at 12 months and Asian children at 13 months. Further research is required within this particular subcategory to determine its effects on gait.	Rushton, 2000
	Phenotypically Defined Features Influencing the Gait	
Somatotypes (genetic) and Body Mass Index (phenotypical)	Varying shapes and body sizes are thought to be contributing influences upon gait. To provide an example, the three fundamental physique types comprise of: [1] Mesomorphs – muscular and athletic, [2] Endomorphs – rounded, [3] Ectomorphs – tall and thin. Although the use of a Body Mass Index (BMI) was considered, it was however, was replaced in 2008 to somatotyping, primarily due to its limitations (provides value to determine fat content) of classifying the various body types from distribution of fat – which is possible through somatotyping.	Genovese, 2008; Maddan *et al.*, 2009; McLaughlin and Muncie, 2013; Sheldon *et al.*, 1940
Centre of Gravity	The assumed point in the body that differs between the somatotypes and shifts during gait is also known as Centre of Gravity (COG). To provide an example, endomorphs, have a low COG, while in ectomorphs it is positioned higher up.	Scott, 2002
Transient and Permanent Features	Transient features (relates to motion and physiology in this instance) are visible only upon certain actions for a partial amount of time, an example would be the changeover from stance to gait. Therefore, as soon as someone starts walking, transient features become visible. Permanent features (relate to anatomy) differ as they remain unchangeable within the body i.e. position of the umbilicus; which is expected to remain in the same position regardless of subject in stationary position or motion. Transient features also relate to temporary conditions, such as a pulled muscle or pregnancy, which is not permanent but rather alters gait for a period of time	Pogorzala *et al.*, 2013; van Mastrigt *et al.*, 2018
Speed	As the speed of walking increases, so does the stride and cadence. Increase in speed is demonstrated visibly by arm swing, where arms were seen to swing faster and higher to accommodate quicker and longer steps taken by the legs. Another study showed lateral	Collins *et al.*, 2009; Lynnerup and Larsen, 2009;

	instability of the knee of a POI during increased speeds, with this feature not seen during walking. Hence, it is suggested that in a reconstruction scenario, police officers accompanying suspects, should adapt the speed of the POI captured on CCTV footage to aid the comparative analysis, thus increasing accuracy upon examination between POI and suspect.	Tanawongsuwan and Bobick, 2003
Fatigue	Fatigued muscles, also known as the inability to keep an expected force output can be commonly seen by the affects upon foot stability, where supplementary eversion or inversion of the foot is present. Furthermore, upon comparison of fatigued and non-fatigued people, increased stride variability and instability when fatigued was observed.	Gefen *et al.*, 2002; Yoshino *et al.*, 2004
Standardisation	The unperturbed manner of walking is referred to as 'Normal' gait, thought to offer some distinctiveness between people. If 'normal' mannerisms of walking (correlating with normal anatomical structure) are not fulfilled, then this is considered as 'Pathological gait' or 'Directed gait' i.e. marching. Further research in this area can be completed in tandem with existing research to assess normal activity (unforced), degraded activity (pathology, age), and forced activity (marching, disguise).	Whittle, 1991
Directed	'Directed gait' is walking under specific instructions. One such example is marching, where it is observed to be a directed manner of synchronous walking in which pathological complications (i.e. the feet, lower limbs or pelvis) may arise as a consequence of 'directed' gait. Such pathological complications include stress fractures, blisters, sprains and strain.	Oumeish and Parish, 2002; Pope, 1999
Habitual Nature, Pathology or Otherwise Features Influencing the Gait		
Pathology and Accidents	Pathology in relation to gait relates to one or many body deformities. Gait that is free of pathology requires a sufficiently operational locomotor system, absent of body deformities and/or pathological conditions, including accidents (amputation). Such pathological gait includes multiple sclerosis for instance	Whittle, 1996
Age	Age relates to the lifespan of the particular person and how old they can be categorized into [1] a learning phase, [2] a stable phase and [3] a decay phase. For instance, children were seen to have differing gait to adults, including gait parameters surrounding stride length, cadence and velocity (i.e. stride length were shorter in children as a result of height. The body deteriorates with age - or so it is commonly thought. The way that studies have shown that speech and handwriting affects age, so does gait. Some studies contrariwise observed that abnormalities within the elderly subjects were based on pathology rather than age progression.	Whittle, 1991; Whittle, 1996; Cunha, 1988; Peel *et al.*, 2004; Schneider *et al.*, 2005; Slavin *et al.*, 1996; Sutherland *et al.*, 1988
Hand Preference	Hand preference relates to the preferred use of one, or both hands more than the other, also referred to as the dominant hand(s). Anatomically, the body is mainly symmetric, but physiologically as a lot of activities are asymmetric, this asymmetry is thought to be mirrored in gait. The body contains some asymmetries in nature, for instance, the left shoulder of a left-handed person is generally lower when compared to their right shoulder. This is thought to result from the positioning of the body (in particular the torso) while using the dominant hand. A lowered shoulder does not always indicate the dominant hand, it does however provide a possible reason for the morphological feature observed. Additionally, further research is required for population statistics	Corey *et al.*, 2001; Hennerberg, 2007; Sadeghi *et al.*, 2000
Habitual Mannerisms	Certain habits or 'mannerisms' may also alter the gait of an individual, whether they are behavioural/psychological and/or pathological/physiological. To provide an example, tics (i.e. Tourette's syndrome) are caused as a result of neurodevelopment disorders, arising from physiological circumstances.	Dutta and Cavanna, 2013; O'Connor, 2002
Emotional Mind State	As behavioral biometric trait, the gait modes is also a vector of expression of emotions. One study showed that depression and sadness influence gait at such a degree that walking speed, arm swing and head movements (vertically) were reduced, alongside a slumped posture and an increased lateral upper body sway. Furthermore, it was determined that while angry, gait contained longer stride length with increased heavy-footed step and happy gaits were detected to contain a faster pace.	Michalak *et al.*, 2009; Zhou and Zhang, 2008

Table 1.4 List of Possible Extrinsic Features Altering Gait. The following table details the potential features that may alter gait that could affect gait behaviours.

Features	Description	References
Ensemble Features Influencing the Gait		
Attire	Attire of the POI reveals or obstructs particulars of the body, thus potentially both altering the gait (depending on the textile and clothing type), and also the ability to observe it. Generally, the type of clothing worn, good fit and definition of the clothing is achieved visually from the upper back and shoulders as a result from the force of gravity acting upon it. It is commonly seen for a POI to wear shapeless, baggy clothes whilst committing a crime to deter analysis. Although some features of the body may be obscured, the gait of that particular person and distinctive features of gait can be still observable. It is thought that different attire may alter the way in which a person walks (tight or loose clothing, textiles etc.), however, further research is required.	Lynnerup and Larsen, 2009; Henneberg, 2007
Footwear	Footwear is available in various styles, shapes and sizes i.e. heels, sandals, sports shoes. Following the various short-term changes in gait that footwear has been seen to affect (i.e. flip-flops compared to well support sports shoes), the long-term alterations of gait caused are also questioned. Footwear has been seen to have long term alterations of gait, where high heels result in the instability of the foot (from fatigue) of muscles such as the gastrocnemius lateralis and peroneus longus.	Gefen *et al.*, 2002
Load Carriage	Load carriage refers to the carrying weight on parts of the body, such as bags and personal items during the time of analysis. Studies have shown that upon carrying a bag, stride length and single support time (when on one limb) is decreased; while an increase of double support time (on two limbs) and frequency of stride were observed. Another study assessed the influence of a single-strap bag during gait and results showed a decrease of stride length (contralateral leg) while carrying a bag on the forearm and minimal variances were seen with a bag over shoulder.	An *et al.*, 2010; Sumner, 2012
Environmental Features Influencing the Gait		
Environment and Culture	The cultural and surrounding environmental influences upon gait are yet to be determined. No research has been acknowledged in this particular area, but it is thought that it would be one of the lengthiest; this would require isolated groups of varying cultures (i.e. subpopulations, indigenous), and environments (city, country, village) as well as consideration for temperature, altitude, type of ground and declivity which may impact on gait.	No reported research found on this topic
Angular Momentum	Angular momentum is known as the rotational behaviour of the body, where stability and control during the gait cycle are provided by this mechanism. The effects of angular momentum on gait variability was observed through a study, where subjects walking on an incline showed greater forces applied to the ankle, knee and hip of the individuals with distinctly increased ankle motion observed.	Collins *et al.*, 2009; Herr and Popovic, 2008; McIntosh *et al.*, 2006
Treadmill	The use of treadmills to analyse gait has been heavily scrutinised and challenged across many studies; whereby some favour the benefits of a controlled ground surface, speed and environment, whilst other studies indicate variations caused in gait due to treadmills. Displacements in anatomy, such as the ankle and the head were seen in one particular study, whereas, another study states that a subject walking on an 'ideal' treadmill has no difference to walking on ground.	Kawabata *et al.*, 2013; Yam *et al.*, 2004
Other Features Influencing the Gait		
Music	Music is well known for its influential motivation for movement. Studies have been undertaken to determine the effects of music and the beat upon gait. On such study, observed subjects during gait, who listened to their own selected music containing metronomic rhythm, matched the tempo of the music, as well as increase their stride length, cadence and velocity. Another study however, assessed participants walking to music that did not contain metronomic rhythm and found that music did not significantly alter the gait dynamics.	Nutley, 2008; Sejdic *et al.*, 2013
Alcohol Influence	The influences on gait caused by alcohol consumption, drugs of abuse and medicine have not been extensively explored due to ethical reasons. One study however, indicated that high levels of alcohol consumption, increased the stride length during gait; which was the only significant variation detected in their gait. Ingesting lower levels of alcohol caused fewer variances from the original gait patterns observed within the same individual. Studies into speech have indicated that speech is progressively altered as a result of alcohol – further studies into gait will improve the understanding of the effect of drugs and alcohol.	Jansen *et al.*, 1985; Sigmund and Zelinka, 2011

1.2.3 Forensic Use

Biometric recognition is defined as a set of human-based and automated methods used for the recognition of people, which includes measuring and statistically analysing distinctive physical and behavioural traits (Meuwly and Veldhuis, 2012; Tistarelli *et al.*, 2014). Forensic biometrics are included within several forensic processes, such as: forensic investigation, forensic intelligence (Ribaux *et al.*, 2006), forensic evaluation, and in some instances, forensic identification and forensic identity verification (Meuwly and Veldhuis, 2012; Tistarelli *et al.*, 2014). The method of forensic biometrics involves the extraction and comparison of distinctive features of a pair of specimens (mainly a reference and a trace specimen) to determine their similarities and differences and, ultimately, assess the strength of this evidence for the inference of identity of source. The holistic treatment of this information across the three dimensions mentioned above (i.e. investigation, intelligence, and evaluation) fits the transversal model described in Morelato *et al.,* (2014) and Baechler *et al.*, (2015).

Gait assessment is currently thought to be mainly human based and computer assisted; where gait assessment is not restricted to only biometrics. Fully automated systems including Cartesian Optoelectronic Dynamic Anthropometer (CODA) would aid in a forensic investigative level, but not at the forensic evaluation level. Therefore, these evaluations are classed as human based, and computer assisted. Subtle differences exist between the current comparison techniques, but the automated process does not differ from one another where comparison applies. The assessment of gait based on memory recall is also known as ‘recognition’, where the observer recollects the manner in which a person walked through previous perception (Haist *et al.*, 1992). There is no comparative technique in memory recall (aside from comparing the memory of past encoded in the brain and present stimulus observed), but rather an example would be recognising someone the observer already knows (familiar human-based recognition). This term is not interchangeable with ‘biometric gait recognition’ or ‘gait biometrics’, where instead, gait is assessed through static and dynamic measurements, thus automated objectively (Goffredo *et al.*, 2008).

Forensic gait analysis involves the scientific application of [1] anthropometry (measurement), [2] morphology (features), and [3] superimposition (overlay) to objectively compare a person’s gait distinctiveness (i.e. a suspect) to that of a POI (Edmond *et al.*, 2009). To fully understand the differences between ‘gait recognition’ and ‘forensic gait examination’, developments and limitations within the current literature will be outlined.

While commonalities are present between gait recognition and forensic gait analysis, the conditions of camera recording differ significantly (Ng *et al.*, 2011; Lynnerup and Larsen, 2009;

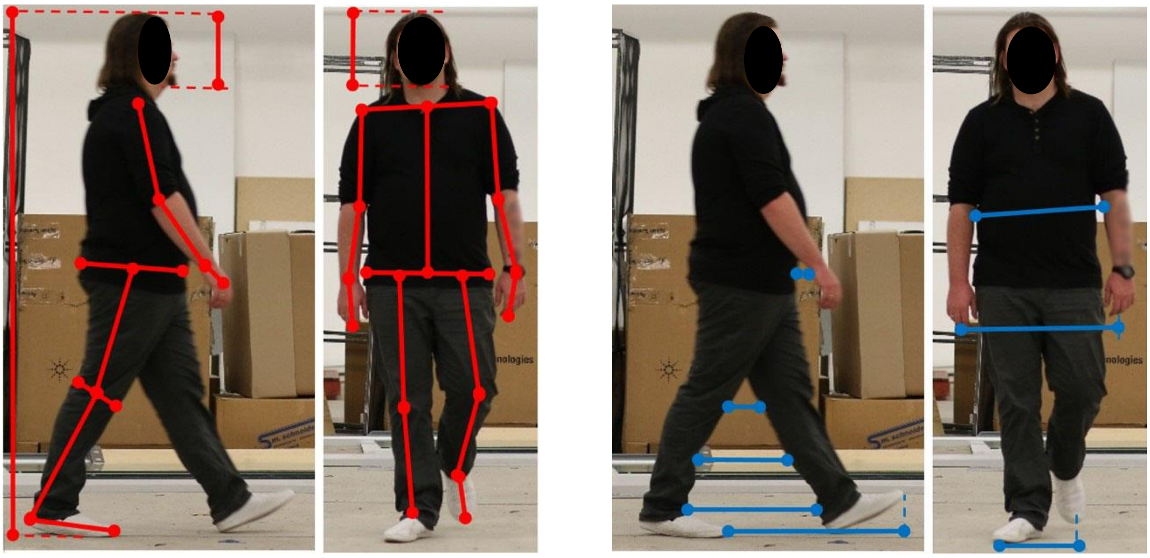
Nixon and Carter, 2006). To provide an example, gait biometrics/recognition includes the "model-free" 2-D method (extracted from gait databases), and the "model-based" approach (extracting features directly from a subject) (Lynnerup and Larsen, 2009). The 2-D model-free approach uses a representation (such as a silhouette) on a single camera and analyses the distinctions of gait patterns (Ng *et al.*, 2011; Zhao *et al.*, 2006). The 'model-based' approach extracts variables (features) from the human body whilst in motion and aims to match the features to corresponding model components (Ng *et al.*, 2011). In this way, the gait of a POI can be assessed from a distance. This differs significantly from facial analysis, where a POI is required to be closer to the camera (otherwise, a longer focal lens is required) - in other words, gait features are more available in forensic trace material than facial features (Ng *et al.*, 2011; Nixon and Carter, 2006). The following section will highlight the differences between human based approaches and computer based-human assisted approaches in gait analysis.

1.2.3.1 Forensic Gait Examination: Human Based

The combination of photographic comparison and forensic image analysis (Bramble *et al.*, 2001; Işcan and Helmer, 1993) results in forensic gait examination. Initially, photographic comparison was primarily used for frontal facial assessment from images, however, more recently its application for body assessment has been demonstrated. The concurrent application of photo comparison and forensic imagery results in a technique known as forensic gait examination.

1.2.3.1.1 Photo Comparison

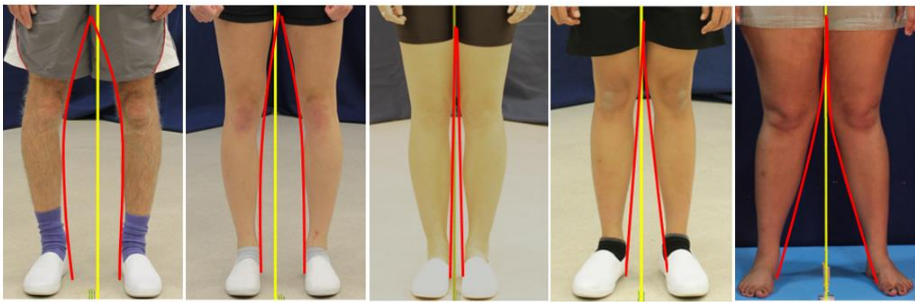
Analysis of gait was established to be useful for comparison of a POI and suspect as demonstrated through *Murdoch v The Queen, 2007 HCATrans 321*. Measurements are a component within anthropometry; defined as the quantification of measurements, proportions, angles, dimensions, and anthropometric landmarks of the face and body (Figure 1.1) (Edmond *et al.*, 2009). Thus, photo-anthropometry is the specific technique applied in forensic gait examination, which allows comparison of POI captured on CCTV to reference images (suspect or victim) (*ibid*). Set landmarks are then measured to ultimately attain proportional indices or produce ratio (*ibid*).



(a) Static (b) Dynamic

Figure 1.1 The Differing Types of Measurements/Proportions Analysed for Gait. The anthropometric measurements of the body (static and dynamic features) are applied for the assessment of gait. Static features (a) are defined as the geometrical measurements of the body, i.e. individual's length of whole leg, length of individual's knee to foot height etc. Examples of measurements taken are represented by lines. Dynamic features (b) are measurements related to gait. For instance, the distance between the left and the right toe during gait, distance between knees, stride length etc. The examples of such measurements are represented by the lines.

Morphology includes the qualitative analysis (feature by feature) of the shape, form and size, of the face and body (Figure 1.2) (Clagett, 1999; Zimbler and Ham, 2005). The amalgamation of anthropometric measurements with morphological classifications are defined as 'morphometric analysis' forming two of the three key components within photographic comparison (Edmond *et al.*, 2009).



(a) Moderate Bow legs (b) Slight Bow Legs (c) Straight (d) Slight knock Kneed (e) Moderate knock Kneed

Figure 1.2 The Morphology of the Lower Limbs. Morphology includes the qualitative (feature by feature) analysis of size, shape and form of human anatomy. The images indicate the differing orientation of the legs representing bow legs (a) and (b), straight (c) and knock kneed (d) and (e). Knock knees is when the angulation distal to the knees is away from the midline, whereas bow leggedness is the angulation of a bone (or within a bone) toward the midline (Sass and Hassan, 2003).

The third and final component of the photographic comparison technique is superimposition, which involves the overlay of features, enabling analysis of image comparison between POI and suspect, thus resulting in a visual representation (Figure 1.3) (Edmond *et al.*, 2009). Once again, superimposition was demonstrated in *Murdoch v The Queen, 2007 HCATrans 321*, however this third component within the photo-comparative technique must be treated as a support to the first and second components, rather than a standalone analytical method; as it is a visual representation to highlight any similarities and differences.

(a) Mock POI *(b) Slight* *(c) Moderate* *(d) Mock Suspect*

Figure 1.3 The Superimposition of the Mock 'POI' and 'Suspect'. Superimposition is defined as the overlay of images. As indicated in the above figure, the suspect (d)was superimposed on top of the POI (in pink) to determine similarities and differences. This technique is applied as more of a visual aid to determine similarities and differences. (a) is an image of the POI. Within (b) and (c), the suspect is gradually superimposed onto the suspect, and (d) is an image of the suspect.

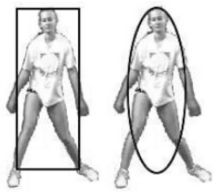
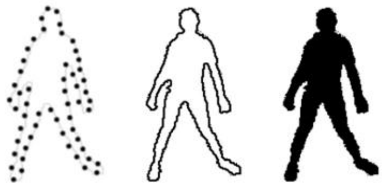
One study conducted by Home Office Science Development Branch (HOSDB) (2007), initially obtained footage of POI, then later introduced a 'dummy' subject – a known person whose height and morphological details are calibrated can attend the scene to be captured by the same camera. Like-to-like images should be compared and if, for instance, security manually 'followed' a POI with the camera to record their activity, the position and zoom of the camera need to be aligned to the original path of the POI when recording the 'dummy' as well (HOSDB, 2007). A measuring stick is used by the 'dummy' with the base of the stick placed at the approximate feet of the POI and measured with a spirit level to ensure it is parallel to the ground. Following this, superimposition can be conducted via software in a more accurate manner (HOSDB, 2007). Another study by Birch *et al.*, (2019), developed the Sheffield Features of Gait Tool, whereby 113 features of gait and its variances were tested for repeatability and reproducibility on 14 participants with prior experience in observational gait analysis, on six avatars; highlighting the importance of a standardised protocol for gait analysis.

Geradts *et al.*, (2002), determined that when assessed within the sagittal plane the hip, knee, and ankle joint angle were not suitable for identification separately, but they offer some distinctiveness that can contribute to the strength of evidence. Schollhorn *et al.*, (2002), resolved that single variables or parameters of such variables cannot establish an identification of individuality. Therefore, more variables extracted from the offender (captured on surveillance) increases the reliability of the evidence as well as the discriminatory potential (Larsen *et al.*, 2008). Both Larsen *et al.*, (2008), and Jokisch *et al.*, (2006), determined that the most significant features examined are of the frontal view of the subject. Jokisch *et al.*, (2006), explored the recording angles of individuals to determine the optimal view in which friends and colleagues were recognised most easily; with results leading to the frontal angle being superior to half-profile and profile view. Furthermore, the camera should be placed in profile and posterior views to determine any further joint, dynamic, or morphological related variables (*ibid*). Geradts *et al.*, (2002), proposed the camera placement to be above the head, to film in a transverse view, thus recording the step length and degree of outward rotation of the feet. It is believed that this transversal angle in tandem with other views would increase the number of variables developed to enhance the assessment of gait analysis. Lucas and Henneberg (2015), deduced eight facial and eight body measurements to determine which was more distinct within their database. This was conducted through the search for duplicates – where the duplicate measurement would mean that the numerical measurement of one individual was identical to another person's measurement of the same feature. A total of 3982 subjects were analysed and the body was determined to be more distinct than the face as less duplicates were seen in body measurements when compared to the face (Lucas and Henneberg, 2015). It is further questioned however, how this would perform with individuals captured on CCTV images rather than standardised images. Birch *et al.,* (2014), conducted a study which showed that varying frame rates affected the eight podiatrists' determinations of gait characteristics from the one participant. Thus, it was suggested that the CCTV cameras capture footage at as high of a frame rate as possible, as frame rates up to 25 frames per second indicated an increased positive effect on the analysis of gait by the podiatrists (*ibid*).

1.2.3.2 Gait Recognition: Computer Based – Human Assisted

Improvement of the specifications of the capture systems will enable further access to distinctive features for the source level inference as well as continue to maintain the activity level inference as it is now. However, they are not all applicable for forensic gait analysis. One such example includes 'body markers', which follow body movements through placement of 'markers' upon specific landmarks of the body (Simon, 2004). The markers can either be active (that may radiate sound, electrical waves, or light), or they can be passive (reflecting light, infrared, electromagnetic waves) (*ibid*). This method is unworkable when the source is unknown. Another technique applied for gait assessment includes tracking, where through estimation of body segment location, segments are separated from one another and 'tracked' (Wang *et al.*, 2004). Tracking commences once a person of interest is available for further assessment (Yilmaz *et al.*, 2006). Varying types of tracking are available and explained in detail (Yilmaz *et al.*, 2006) as seen on Table 1.5. This method may be applicable for forensic evaluation and possibly to forensic intelligence, but not for investigative work.

Table 1.5 Various Tracking methods (Yilmaz et al., 2006). Each represents the differing types of tracking methods that are applied to assess the gait of a subject. (a) Single centroid point, (b) multiple points, (c) rectangular patch (d) Elliptical patch (e) part

Types of tracking	Graphical representation
Points: The subject is characterized by a single central point (Figure 1.5a) or by multiple points assigned for tracking (Figure 1.5b)	 (a) (b)
Primitive Geometric Shapes: The subject is embodied by a ellipse or rectangle (Figure 1.5c) and (Figure 1.5d), used for tracking both rigid and non-rigid objects	 (c) (d)
Subject Silhouette and Contour: The boundary of a subject is outlined through contour representation (Figure 1.5g) and (Figure 1.5h). Inside this boundary, is the silhouette (Figure 1.5i)	 (g) (h) (i)
Articulated Shape Models: Ellipses and cylinder represent the parts of the body, particularly where the articulations within the body are present (Figure 1.5e), for instance the gleno-humeral (shoulder) joint to the torso	 (e)
Skeletal: Once the silhouette is obtained, a subject skeleton is applied through medial axis transform (Figure 1.5f)	 (f)

Tracking limits features available on the body and segments them into 'box-shapes' or 'elliptical shapes' (Yilmaz *et al.*, 2006), thus limiting variability that exists within the human form into said ‘box-like’ shapes. To provide an example, the bow-legged feature of an individual gait would be lost if segments of the body were to be tracked. Conversely, the use of anatomical landmarks of the body is ideal but use of the ‘tracking’ technology is not applicable to a POI captured by surveillance cameras as they are not in a controlled environment. This also applies to thermal CCTV cameras (sensors that detects heat signatures), which are used to visualise gait (Bisbee and Pritchard, 2004). Thermal CCTV cameras mimic silhouettes, which obstruct features of the body thus limiting feature analysis. Infrared provides benefits however, for allowing visualisation of an undetected POI (camouflaged within surrounding environment for example) (*ibid*).

One gait study conducted by Collins (2002), evaluated silhouettes to determine body measurements and gait patterns. It is debated in the study whether the use of silhouettes for analysis creates limitations, as morphological features of the body are overlooked, as technically the outline of the body and the subsequent features analysed. The use of various angles within Collins (2002) study however, provides analysis of anterior/posterior and both profile views, thus increasing the value of the information brought by this technique. The opposite approach was applied by Gabriel-Sans *et al.*, (2013), where the whole study was conducted by assessing from one camera view (sagittal plane) only, thus disregarding the asymmetrical nature of the body, limiting it to a single side, thus limiting the overall assessment. In another study, Cheng *et al.*, (2008), allowed nine subjects to walk such that all angles of the body (quarter views - midpoint between a frontal and profile view and posterior and profile view) were able to be seen, in which the subjects walked diagonal within the camera view rather than parallel or perpendicular to it. The assessment of diagonal walking is beneficial for gait analysis as all views of the body are viewed for assessment. Commonly, persons recorded from CCTV footage are not only walking perpendicular or directly parallel to the camera, but rather, in all directions, resulting in quarter views of the person being recorded. Therefore, it is essential for further research and development into quarter view studies, or as Birch *et al.,* (2015), refers to them: ‘oblique’ views. A total of 13 subjects were assessed in another study conducted by Birch *et al.*, (2013), where various clinical experts (podiatrists and physiotherapists) assessed the volunteers’ gait patterns. Although each feature from different body parts contain some distinctiveness associated to some strength of evidence, with no sufficiency threshold, this study determined that the analysis of the upper body is useful for analysis also, following the finding that the primary feature that aided in the analysis was the arm swing (Birch *et al.*, 2013). This reinforces that the assessment of the whole body rather than just the lower body can increase the feature set. Various techniques applied within experiments which were conducted previously, favoured analysis of the lower body, thus limiting the feature set assessment of the upper body. It was suggested by Veres *et al.*, (2004), that upon the assessment of silhouettes, the static component is focused upon as it is considered the essential component, whereas the dynamic component measuring the swing of the arms and legs are ignored as it is considered less important – which can reduce recognition rate. All features of the body are important, however it is thought that some features would be more distinct than others. Veres *et al.*, (2004), also utilised three separate databases to increase the pool of data so assessment on a larger pool of subjects can be analysed, which increases the robustness of the study.

One study disregarding the upper body for gait analysis was that of Zhao *et al.*, (2006), where the upper body was totally eliminated from the analysis as a result of measurements being deemed unreliable, following unsuccessful tracking of the upper limbs. Another study on the other hand by Birch *et al.*, (2013) provided standardised clothing, thus allowing consistency amongst the subjects, which was beneficial for the analysis process as it eliminated factors that may influence the analysis through attireAdditionally, shadows existing within the silhouette, limited the gait analysis, which was highlighted by Liu and Sarkar, (2004). Moreover, Liu and Sarkar, (2004), showed that the shadows and noise within the system generated too much distortion, therefore, extracting and treating the footage was necessary by removing artefacts. Therefore, it is highlighted that shadows existing within the silhouette limits may impact upon the study, compromising its reliability. A total of 71 subjects evaluated within the study contributed to the robustness of the experiment (Liu and Sarkar, 2004). Consequently, combinations of biometric and morphological techniques were thought to enhance analysis of gait. Features that were appearance-based were derived from a video sequence of subjects walking, which was captured in differing conditions (i.e. indoors and outdoors) (Kale *et al.*, 2003). The outer contour width of the binary silhouette was considered the basic feature *(ibid)*. Thus, to align temporally the gait sequences, various features were extracted (from width vector), followed by the application of dynamic time warping (DTW) *(ibid)*. Lee and Grimson (2002), were successfully able to eliminate some background noise within the silhouettes in their study, thus improving the reliability of the analysis.

1.2.4. Uses of Gait Analysis

As mentioned in section 1.2.3, 'Forensic Use', biometric technology can be applied to a variety of forensic processes, where in consequence, the value of gait analysis will be relative to its purpose:

Forensic investigation – Biometric technology can contribute by comparing traces (such as fingermarks and prints) to the database – where the persons whose data are most similar to the mark are shortlisted (Meuwly and Veldhuis, 2012). Results are then refined where reference specimens are excluded based on the data, leaving only those individuals whose data most closely related to the mark (*ibid*). The forensic investigation process is very valuable within gait analysis. For instance, generating a list of candidates and exclude unrelated persons within the database is possible from the gait, however, it is currently not scalable in the same way (from lack of standardised protocols) as an Automated Fingerprint Identification System (AFIS), whereby a gait database cannot be as large as a fingerprint database and requires further development (Meuwly and Veldhuis, 2012). Such improvements can be the incorporation of high quality surveillance cameras (such as the work of Neves - who determined that automatic height estimation is achievable within surveillance scenarios (Neves *et al.*, 2015)), as limitations of camera distortion and clothing are present within gait assessment and require further research before they can be overcome (Meuwly and Veldhuis, 2012).

Forensic intelligence – Biometric technology can be applied in forensic intelligence scenarios to detect patterns of interest (such as linking traces to a source), especially when they are linked to abnormal and potentially security-related situations and behaviours. When forensic science is applied within the forensic intelligence context, the aim is to develop efficient strategies and concrete operations to disrupt or prevent criminal activity, as well as to link traces related to the same source (Julian *et al.*, 2011), which complements the conventional use of forensic science to be used in court outcomes (*ibid*). In the case of gait analysis, forensic intelligence also depends on the main question being addressed, for example it is based on the activity (movements of POI in surveillance footage) or source (person related features observed on POI) level inference (Meuwly and Veldhuis, 2012). A typical example is linking cases involving someone who has a limp for instance, or is on crutches. It is recognized that gait analysis requires further development before this technique can be used to its full potential, with development of standardised intelligence databases (Julian *et al.*, 2011), to allow traces to be linked from various different cases.

Forensic evaluation – Forensic biometric evidence at source level comprises the application of biometric technology to exclude the POI or assess the strength of the evidence resulting fromthe comparison of the trace and reference specimens for reporting in court proceedings (Meuwly and Veldhuis, 2012). Development and application of a probabilistic approach within gait analysis will allow the examiner to provide a description of the strength of evidence to the trier of facts in court (*ibid*). Additionally, challenges also exist within the estimation of intravariability (within source variability for several persons), intervariability (feature variation between all persons of a population) within-source variability (feature variation of one person at different times) and between-source variability (feature variation of a person regarding a population) for gait, which will be further developed in future publications.

1.2.4.1 The Legal System

The Judicial Primer on Gait by the Royal Society (2017), highlighted the variances between different types of gait analysts, including the: [1] Forensic Gait Analyst; [2] Clinical Gait Analyst; [3] Running Gait Analyst; and [4] Biometric Gait Analyst. Forensic gait analysis has faced substantial obstacles and criticism within legal settings, where the problem lies not within gait analysis, but rather the lack of scientific validity and evaluation by the forensic examiner and poor understanding of the fundamental principles and of the forensic inference process. Internationally, not all legal systems rely on admissibility criteria to accept evidence in court; in the inquisitorial system it remains for example the province of the trier-of-fact. The two major legal systems are adversarial and inquisitorial (Powell and Mitchell, 2007). In short, the adversarial system is reliant on the courts role of an impartial referee between the prosecution and defense whereas an inquisitorial system relies on the court investigating the proof of facts of a case (Ambos, 2003).The adversarial law system is found predominantly in Australia, United Kingdom, America and Canada (Willke, 1986), whereas the inquisitorial law system is found in most of Europe, all of Latin America and parts of Africa and Asia (Merryman and Perez-Perdomo, 2007). However, rather than focusing on whether a rule is either adversarial or inquisitorial, importance of a fair trial, assisting tribunals to achieve tasks whilst abiding by fundamental fair trial standards (Ambos, 2003) and specifically for gait analysis, forensic evaluation of the evidence whilst upholding scientific validity and reliability as the result of forensic evaluation is not a decision of identification, but a description of the strength of evidence. Admissibility is not involved with the formulation of the forensic evaluation conclusion, but rather the legal rules in order to accept evidence. The result of the examination provides support to one of the alternative hypotheses; (H1) the trace and reference material originate from the same person, or (H2) the trace and reference material originate from different persons.

Experts in podiatry and medical practitioners are considered as qualified to present evidence of gait analysis within the United Kingdom courtroom – an example would be that of *R v Saunders [2000] VSCA 58*, where the expert was a podiatrist whose expertise was in gait analysis *(ibid)*. Although the podiatrist's knowledge was necessary for the examination, the forensic knowledge is also an imperative component which needs to be fulfilled not only in gait examination but also in other transdisciplinary forensic fields. The practitioner compared both suspect and POI images by vigorous frame by frame assessment where the same body planes for both image were analysed and compared (front, rear and side views) (*R v Saunders [2000] VSCA 58)*. This was the first time that gait analysis was deemed admissible in the Old Bailey Central Criminal Court in London – thus making legal history *(ibid)*. A Swedish case *Mijailo Mijailovic., Supreme Court of Sweden*

(2004) involved the assassination of Swedish Minister for Foreign Affairs. Facial comparison, as well as gait and body measurements, were measured and assessed between the accused and a person of interest (obtained from surveillance footage) – and contributed to the conviction of the accused (Brickley and Ferllini, 2007). Another example of this is the matter of *Regina v Aitken, 2008*, *1423*. *BCSC* a Canadian case where body analysis evidence was accepted as an identification, since the *Daubert*[8] test was satisfied, which requires the expert to demonstrate suitable levels of study, training, and experience (*Daubert v. Merrell Dow Pharmaceuticals, Inc,*, *509*. *1993, U.S. 579*). Additionally, the expert's theory must be tested, error rates determined, standardised protocols established, peer reviewed, publications to be available, and finally, the scientific community must generally accept the technique (*ibid*). In Europe however, rather than the Daubert standards, it is advocated that method is validated and accredited. Another case from the UK is that of *R v Otway [2011] EWCA Crim 3*, whereby identification evidence of the suspect's gait was compared to reference sequences. It was criticised by the defence, however, that there were no statistical database and no scientific basis of the method as support for its inclusion *(ibid)*. An appeal was raised on these grounds, but it was rejected and gait analysis was admissible *(ibid)*. Moreover, in 2003, the 'Bromby Scale' was recommended to experts and applied the same year for use in the British criminal courts (Table 1.6), for the purpose of standardisation of evidence presented (Bromby, 2003). The issue that lies within the ‚Bromby scale' however, is that the scale provides support to the hypothesis, and not to the evidence, given the hypothesis (defined as prosecution's fallacy).

Table 1.6 A Guide for an Expert Witness (Bromby, 2003). The level of support for identification evidence of image comparison, are provided within the table (ranging from 'Lends no support' to 'Lends powerful support').

Level	Description
1	Lends no Support
2	Lends limited Support
3	Lends moderate Support
4	Lends Support
5	Lends strong Support
6	Lends powerful Support

The Judicial Primer on Gait by the Royal Society (2017), also highlights that the trace, reference and comparison of the materials be assessed by one practitioner, however, to improve the

[8] *Daubert v Merrell Dow Pharmaceuticals, in 509. [1993], U.S. 579*

reliability and validity of the examination, it was recommended that the analyses are completed sequentially over a period of time. Further, the trace material should be examined first, thus ensuring that the analyst is not consciously or subconsciously looking for particular features extracted from the reference material to characterise the person assessed (The Royal Society, 2017). Finally, a likelihood of the trace and reference materials through forensic evaluation *(ibid*).

In Australia, forensic gait analysis, can only be presented as similarities and differences by '*Ad hoc*' experts (Edmond and San Roque, 2009). *Ad hoc* experts can only provide opinion-based evidence of the anatomical and forensic imagery experience obtained, and are limited to only providing evidence of similarities and differences, unlike experts who can provide evidence of identification (*ibid*). Using techniques of photo comparative analysis and morphological classification of the POI and suspect(s), evidence of this type in Australia is presented by experts within the forensic anatomy and imagery fields (Edmond *et al.*, 2009). This was established in the matter of *R v Hien Puoc TANG*, *167*. *2006, NSWCCA* whereby body examination evidence was not deemed admissible in court, as a result of the expert expressing the POI and suspect were 'one and the same'. This highlights that the issue lay within the poor understanding of the fundamental principles by the 'expert'; thus questioning the expertise of the appointed practitioner. This landmark case established that the requirements of section 79 of the Evidence Act were lacking due to lack of science supporting the 'opinion' evidence, but rather based on the judgement of the expert; thus differing significantly from evidence of 'fact' (Edmond *et al.*, 2009). Section 76 of the Evidence Act (1995) is also known as the 'Opinion Rule' where the lack of fact combined with the absence of expert experience/qualification results in inadmissibility of evidence (Government 2014). Subsection 79 of the Evidence Act (1995), is an exception to this rule, known as 'the expert opinion rule' (*ibid*). For this rule to be satisfied, the forensic practitioner must possess specialised knowledge obtained by training, experience or study, specifically an academic degree in a relevant field (such as forensic science with expertise in gait analysis) (*ibid*). Furthermore, the opinion presented must be based wholly or substantially on the area of said specialised knowledge (in combination with the disclosure of methods) (*ibid*).

Therefore, to be declared admissible in Australia, experts presenting evidence of forensic gait analysis must demonstrate they must exhibit appropriate training, experience, or study, whilst also understanding the forensic inference process. This was emphasised within the matter of *Smith v The Queen, HCA 50*, 2001 whereby police officers were not deemed appropriate to present evidence of identification due to lack of expertise. Likewise, within *Regina v Jung*, *658*, *NSWSC, 2006* it was determined that distortions must be considered upon analysis of a POI by experts when presenting evidence of facial comparison.

The admissibility for body analysis was established within the Australian High court as seen in the landmark homicide case of *Murdoch v The Queen, HCATrans 321, 2007* and *Murdoch v The Queen NTCCA, 2007*, where the appeal pursued by the defence was quashed with the original ruling sufficing. Nevertheless, scrutiny of forensic body examination continues to restrict opinions to similarities and differences, an issue once again raised in the case of *Regina v Dastagir, SASC 26, 2013*. This case highlighted the criticisms within the science including the lack of [1] standardised protocol, [2] population database, and [3] frequency statistics (including the probabilities of the presence of features in a population) (*ibid*). It is thought that the development and improvement of these aspects will allow forensic body examination evidence to be credible. Further credibility to a method is thought to be established through validation of an accepted protocol, compiled in a validation report that is peer-reviewed at the moment of the accreditation.

1.2.5 Conclusion

In the introduction it was stated that any type of observation, such as gait analysis from CCTV footage could potentially be used for investigative and forensic intelligence purposes, and as evidence in court proceedings if the most correct strength of evidence is provided (i.e. variations of dependance and independence of features, populations and other intrinsic/extrinsic factors).

Forensic investigation and forensic intelligence based on gait analysis is possible now, but more work is needed to further advance automated comparison systems for generating a list of candidates from their gait, and linking traces related to the same source. From this, not only will forensic examination be more efficient for narrowing the suspect pool, but through improvement of the forensic evaluation process, the strength of evidence can be assessed, and empirical substantiation attained. After the examination has been completed, if the Likelihood Ratio is 1, indicating the results are of no value, this may be indicative of the inability of the method or the lack of information in the observation.

In legal settings currently, assessment of gait material has been criticised for its lack of scientific validity through lack of ACE-V (Analysis, Comparison, Evaluation and Verification) protocols and inference models i.e. likelihood ratio. Specifically, courts have questioned the appropriateness of providing evidence of identification in court without the sufficient protocols, statistics and database available for the scientific community to determine the reliability of the method. As highlighted in ‘Forensic Image Analysis: CCTV Distortion and Artefacts‘ (Seckiner *et al.*, 2018), forensic examination of such material ultimately aims at evaluating the strength of evidence at source and activity levels and that this strength is inferred from the trace, obtained in the form of CCTV footage (Seckiner *et al.*, 2018). Therefore, forensic practitioners appointed as experts to present evidence of gait examination must understand the forensic inference process and also demonstrate their expertise within both forensic anatomy and forensic imagery; thus it makes clear the role given to them in the context of the case (Popejoy, 2010). The experts must also keep in mind the current limitations within the varying types of techniques, not only from influences that may alter the manner in which a person walks but also from CCTV distortion, however, the technique can be developed through further studies and research.

A possible way forward is firstly, determining the estimation intervariability and intravariability for gait, and establishment of a standardised CCTV gait database with accompanying controls in place with high quality DSLR cameras. Additionally, isolation and development of how varying influences impact upon the gait may determine certain patterns in each influence type. Furthermore, determining any trends or distinct features within various age, sex, and ancestry groups and the frequency of such features, may improve understanding of gait within each subpopulation. Finally, the development and application of a probabilistic approach within gait analysis, to provide a description of the strength of evidence whilst upholding scientific validity and reliability, is thought to contribute to unlocking the full potential of forensic gait examination.

When ascertaining the level of performance evaluation (and therefore of validation of a method), the developed system or method, must be tested. The testing of a biometric system, involve the calculation of scores for verification or identification purposes (ISO/IEC, 2006). One part of the process involves validation, in which is using the results of an evaluation (made according to defined protocol) and comparing them to a threshold to determine if the method meets the threshold or not. Within the testing of a biometric system, three types of evaluation are present: [1] technology evaluation; [2] scenario evaluation; and [3] operational evaluation (*ibid*).

Technology evaluation involves the standardised testing of all algorithms to view performance (for both environment and collected population) (ISO/IEC, 2006). This stage involves the development where the data is tuned and testing is completed on data not previously completed and the results should be repeatable (*ibid*). An example in relation to forensic gait analysis would be the assessment for the morphological and anthropometric examinations for forensic gait analysis.

Scenario evaluation requires the testing on a complete system in which the environment simulates that of a real-world target application of interest (ISO/IEC, 2006). Each tested system will involve a combination of various comparisons using the same population. Test results will be repeatable to the modelled scenario in controlled conditions (*ibid*). In regard to forensic gait analysis, it is about the development of an analytical method for forensic scenarios, such as using morphometric techniques for forensic evaluation. The interpretation method consists of assigning Likelihood Ratios as measure of the probative value.

Operational evaluation will not be repeatable as the unknown and undocumented differences between operational environments, in which ground truth can be difficult to determine, particularly within the unsupervised and uncontrolled environments (ISO/IEC, 2006).Within forensic gait analysis, this will be the implementation for cases.

Forensic gait analysis for this PhD research will be dedicated primarily to the scenario evaluation (developing the interpretation method), on basis of the results of the analytical method (morphometric assessment). The operational evaluation is not within the scope of this research. First the development of an interpretation framework is necessary in which once developed and tested, the validation and performance of the data and the technology can then be thoroughly examined.

From here, the foundation of the logical approach for forensic evaluation by the ISO standard in preparation, describe the following types of questions: [1] Question of source; [2] Classification and identification; [3] Quantification; and [4] Reconstruction (ISO/IEC, 2006). For the question of source, the current approach is to convey a probative value expressed in terms of LR. Within evaluative reporting, probabilities are applied to express the degree of certainty and uncertainty within each proposition, which may be based on empirically derived data (NIFS, 2017).
The logical framework as described by Evett (2015), contains two main phases known as the investigative phase, in which the scientist works closely with the investigator in search for the offender, and the evaluative phase, where the scientists assists the court (*ibid*). The probability theory, also known as Bayes Theorem, gives the following equation:

$$\frac{P(Hp|E,I)}{P(Hd|E,I)} = \frac{P(s|Hp,I)}{P(s|Hd,I)} \text{ x } \frac{P(Hp|I)}{P(Hd|I)}$$

Posterior odds = Likelihood Ratio x Prior odds

If new evidence is provided for the juror, this is known as the Prior odds (Evett, 2015). The scientist provides scientific observations which is indicative by *E*, in which the juror will have new information, this is known as the posterior odds (*ibid*). The likelihood Ratio (LR) can be described as the probability of the score (*P*) given the prosecution hypothesis is true, divided by the probability of the score given the defence hypothesis is true (Ali *et al.*, 2014). Furthermore, the prosecution hypothesis states the source of the trace material is the person of interest, or that the trace material originates from the reference material of the person of interest, whereas the defence hypothesis states that the reference material does not originate from the trace (*ibid*). These are viewed as Hp and Hd respectively and are 'two mutually exclusive and exhaustive source-level hypotheses' (Ali *et al.*, 2014, pg. 335). *I* describes background information, whereas *E* is the evidence by the scientist (Ali *et al.*, 2014; Evett, 2015).

Evett (2015), also established the following principles for the scientist in which the scientist: [1] should address a pair or propositions (prosecution and defence); [2] consider the probability of the scientific observations given that each in turn is true; [3] two probabilities that are conditioned by the two propositions are also conditioned by case circumstances (*I*); and [4] ratio of the two probabilities determines weight of evidence. Normally, *I* is neglected since the case circumstances at source level are not affected by whether Hp or Hd is true. This should also be implemented within an examiner comparing the trace from CCTV footage to reference materials.

In relation to surveillance footage, the European Network of Forensic Science Institutes (ENFSI) guidelines, state that following the examination from CCTV footage, the findings are usually evaluated against two propositions assumed to be true: [1] the first is by the authorities; [2] and the alternative by the defendant (ENFSI, 2010). Using Bayesian statistics, the Likelihood ratio of the two probabilities are then calculated and forms the value of the evidence through a graded conclusion – in turn, strengthening or weakening the prior opinions on the two propositions. The ENFSI guidelines also suggest the implementation of the *Guideline for evaluative reporting* as a two-fold step, which includes managing the change and the training involved. It is highlighted that the framework of circumstance, propositions, likelihood ratio per discipline should be provided with the relevant training, and competency testing.

To assess the LR approach in other biometric fields, it has been highlighted by Meuwly and Veldhuis, (2012), that biometric LR-based system combines the use of biometric databases, technologies and likelihood ratio approach to statistically examine the evidential value of a trace to a reference material. The quality of the inference is dependent on the quantity and properties of the data that is used to assess the within and between-source variability (*ibid*). As stated by Meuwly and Veldhuis (2012), the classic 'forensic identification' disciplines rely primarily on personal probabilities for assessment of the evidence and this in turn, is becoming increasingly challenged. Likelihood ratio approaches are seen to be promising within forensic biometrics and was firstly implemented within DNA modalities (Meuwly and Veldhuis, 2012). Other studies have since implemented Bayesian frameworks to various types of trace materials. For example, a study by Champod and Meuwly (2000), developed an interpretation framework (based on likelihood ratio) for speaker recognition, fingerprint recognition (Meuwly and Veldhuis, 2012), whereas a study by Es *et al.*, (2017) developed a Bayesian framework for forensic glass analysis. Therefore, it is imperative for the implementation of likelihood ratios within the forensic gait analysis discipline to potentially unlock the full potential of this discipline.

1.3 The Proposed Research

Research within Forensic gait analysis is ongoing, however, many gaps still remain within the literature, specifically in terms of forensic evaluation within gait analysis. The Bayesian interpretation framework has already been proposed and tested within various forensic disciplines and trace types (i.e. DNA, speaker recognition, glass, fingermarks etc.), but is currently not existing within forensic gait analysis. This research investigates whether a similar approach is applicable to the interpretation of gait examination. Therefore, the development of an interpretation framework, where the inference based on an evaluation of likelihood ratios for forensic gait examination and testing the proof of concept forms the foundation of this PhD research.

The aim of this exploratory PhD research is to assess and improve the scientific approaches applicable to forensic gait analysis through the investigation and development of an interpretation framework. This will be achieved using existing frameworks for other trace types, testing whether this framework can be adapted and applied to forensic gait examination. To accomplish this, a repeatable, standardised method for morphometric gait examination that includes CCTV image distortion will be developed, from which distinct features of the body can be extracted and examined during stance (standing still) and gait (walk). As such, a population database will be established from which frequency statistics will be conducted, thus, determining the occurrence of distinct identifiers. Subsequently, the inference of forensic gait analysis, derived from a probabilistic approach will be developed and proposed and based on an evaluation of likelihood ratios to the morphometric research; forming the interpretation framework in a real forensic context to assess the strength of evidence. Finally, the influences that affect the way a person walks will be explored in the form of case studies. The anticipated outcome is the development of a standardised protocol (guideline) that forms the interpretation framework from which forensic gait examination on an unstandardised trace using Bayes Statistics, can be completed, to contribute to the validity of expert's opinion as identification evidence in courts of law.

The working hypotheses of this research are:

1. An analytical model can be developed to extract distinctive features of gait useful for forensic evaluation
2. A likelihood ratio framework can be developed and tested to assess the weight of evidence of the gait for forensic evaluation

3. Some gait-dependent features captured with DSLR cameras can be retrieved from CCTV footages
4. The distortions/artefacts present of CCTV footages can affect the weight of the gait-recognition evidence
5. The distinctiveness and dependency of the features of gait can be determined through case studies, and the dependencies between age/ancestry/sex for both stance and gait can be seen and trends observed

These hypotheses focuses on the development and application of the forensic inference models to evaluate the strength of evidence of the trace, in the form of a Likelihood Ratio. As the activity level views the movement, activity and actions of the trace, rather than the gait itself, the activity level inference will not be assessed for this PhD research, but rather the source level.

1.3.1 Objectives

Many gaps are present in the current body of literature, primarily the lack of interpretation frameworks for forensic gait analysis from the trace extracted from CCTV footage. This PhD aims to begin to remedy some of these with the specific objectives being:

1. Technology Evaluation / step
    a. To develop an analytical model that shows distinctive features of gait in a forensic context, including a repeatable, standardised protocol from data collection through to data analysis and data entry. An Australian population database of individuals from all ages, ancestry and both sexes will be established
    b. To extract features of the body during stance and gait (walk and run)
    c. To determine the frequency, distinguishability and dependency of the extracted features of the body within subpopulations
    d. To view correlations of age/ancestry/sex for both stance and gait
2. Scenario Evaluation / step
    a. To develop and apply the likelihood ratio following data collection (univariate/multivariate and multimodal) to form likelihood ratios
    b. Examination of the robustness of gait to different conditions (person, accessories, environment) observed in forensic scenarios; including: [a] attire – hoodie; [b] load carriage – backpack; [c] load carriage – side bag; [d]

footwear – barefoot; [e] footwear – thongs; [f] speed – run; [g] treadmill; [h] incline.

   c. Quantification of the effect of CCTV distortion on the strength of evidence

3. Operational Evaluation / step
   a. To produce a manual, detailing step-by-step guidelines for stance and gait analysis, from which repeatability from a single-observer will be examined

1.3.2 Research Questions

This project will answer the following:

1. How can the results of an analytical model showing distinctive features of gait be exploited in a probabilistic framework for forensic evaluation?
2. From/through case studies, how can the distinctiveness and dependency of the features influencing the gait be determined?
   a. Can dependencies between age/ancestry/sex for both stance and gait be seen?
3. Which part of the features captured by DSLR cameras are still present on CCTV footage and how does it affect the weight of evidence?
4. How can the likelihood ratio framework be used to assess the value of the gait analysis for forensic evaluation?

This chapter presented an overall introduction to the research project, an extensively detailed background within forensic gait and image analysis, while highlighting the gaps within the literature. It also underlined the aims, hypotheses, specific objectives and research questions that will be addressed within this thesis.

Chapter 2 will investigate the photography process for optimal images for analysis and provide methods for morphometric gait analysis with the accompanying developed manual. Further, the demographic of the subjects recruited for this research project and the repeatability studies from a single-observer will be explored.

Chapter 3 will focus on the use of statistical analyses to observe the inter-relationship of the profiles to one another, determine which features are more or less variable between individuals, and which are observed regardless of attire, as well as to see correlations of sex, age and ancestry, whilst maintaining transparency with each stage of the data (raw, normalised, treated [outliers removed]) analysis.

Chapter 4 will present an analytical model for the development of statistical inference to show the strength of evidence in the form of a scientific case study; forming the interpretation framework. The components of the Likelihood Ratio statistic will be highlighted and applied to provide statistical inference for source material attained from CCTV, where the most correct strength of evidence will be presented.

Chapter 5 will observe the isolated influences and the variances they present to gait and its consequent analysis, in the form of case studies. The examination will include: [a] attire – hoodie; [b] load carriage – backpack; [c] load carriage – side bag; [d] footwear – barefoot; [e] footwear – thongs; [f] speed – run; [g] treadmill; and [h] incline.

Chapter 6 will provide final thoughts, conclusions, and future directions as a result of this PhD research.

2. CHAPTER 2: Standardised Photography, Manual, Demographic and Repeatability Studies

2.1 Introduction

The previous chapter outlined the methods currently applied in biometric studies, including various gait analysis techniques such as tracking and markers which are placed upon the body of a subject. Within this chapter, a manual (atlas and data collection sheets) detailing the methods to facilitate morphometric analysis and selection of significant morphometric variables was created and applied in a step-by-step analysis. This was then followed by a range of repeatability studies which were undertaken to determine the levels of intra-human error present within the assessment of features. This helps eliminate those features containing high levels of error to ensure the study is as robust as possible.

2.2 Aims

The aims of this chapter involved the development of an analytical model to form part of the interpretation framework, showing distinctive features of gait in a forensic context, including a standardised protocol from data collection through to data analysis and data entry. Whilst establishing this, an Australian population database of subjects from both sexes, all ages and ancestries was developed with the purpose of allowing morphometric assessment to assess features of the body during stance and gait. Finally, to enable consistent results, the development of a manual, which details a step-by-step guideline for stance and gait analysis and finally to provide police with a base standard for requirements.

2.3 Materials and Methods

2.3.1 Ethics Approval

Following the University of Technology Sydney (UTS) ethics approval (UTS HREC Ref No. 2015000451) by the Human Research Ethics Committee (HREC) subjects were recruited and photographed/filmed. All subjects were anonymised, and all personal information was stored separate to number coded images (in a PIN access room, on a password protected computer and in a locked safe). All CCTV footage obtained was also stored under the same conditions.

Once subjects were recruited via flyer advertisement (Appendix A.1), they were informed of the project details, the requirements for their participation, and were warned of any associated risks, as well as informed of the motives of the project. A questionnaire requesting details of sex, ancestry, age and pathology was presented to subjects to collect information that may assist the interpretation of the data (Appendix A.2). A total of 230 subjects for stance/walk assessment were recruited within this PhD research, notwithstanding prior subjects that were recruited for previous research Seckiner (2014) and in the years preceding. The total subjects assessed were 383 for stance and 268 for gait.

As subjects were instructed to wear their usual daily attire (to create a more realistic scenario to that of a trace recorded on CCTV footage), multiple features were concealed and therefore, some features were excluded from the feature pool as full body (varying from subject to subject) visibility was unavailable, inhibiting the analysis of those features. For instance, knee features, such as knee placement, cannot be observed if subjects are wearing baggy pants. Further, stance photography was repeated twice, and subjects were asked to walk through the designated filming areas four times.

2.3.2 Camera Standardisation and Method Development

This research aimed to imitate a trace captured on CCTV camera, and the reference data collected for forensic procedures to simulate a realistic scenario. Therefore, as the ground truth information cannot be retrieved from a trace, nor for them to be wearing tight fitting attire with tracking devices and/or motion capture suits, this technology was not used. Therefore, a morphometric technique was adopted whereby examination of the features using anthropometric and morphological assessments were completed. Further, as this is an exploratory study, components such as reproducibility, repeatability, reliability, accuracy and validity were all considered and although each of these factors are important, the validity and reproducibility components were unable to be completed due to time restrictions within this study. Additionally, after the development of an interpretation framework, it is standard for individual labs to complete full validation studies under their accreditations model and therefore, this component will be recommended as a future study.

For the most accurate analysis possible from both images and video assessment, standardisation to produce images of high quality was completed, together with the standardisation of camera specifications, camera height, distance and lighting. Furthermore, various equipment allowed for the optimisation of a set up so that data were collected in a consistent manner. Filming was conducted in various rooms and locations due to altered availability during the project. Some rooms had size complications, where the filming took place in smaller rooms. As a result of this, the limbs of taller subjects (longer step length) were off frame, thus not allowing the observation of a full gait cycle. As people have been shown in previous studies to possess habitual natures (Henneberg, 2007), which aligns with the findings in this research, whereby the same dominantly used foot was observed to begin the gait cycle. This is thought to be the reason why the same phase within the gait cycle (primarily leading or trailing limbs) was consistently off frame. To overcome this, multiple starting points were set (Figure 2.1). A total of 3 starting points (0.3m distance between each) were deemed to be sufficient to capture all gait phases. Furthermore, a backdrop was set up to eliminate any background disturbances (Figure 2.2). Once a larger room was available for filming, these 'stagger' points and the backdrop were no longer necessary for the process of data collection.

The majority of filming was completed in a store room (Figure 2.3). The area available for walking of participants was a minimum of 9.05m by 5.23m. There was a source of artificial lighting in the room with no windows to provide shifts in natural light – as the preferred conditions because over-lighting can cause loss of depth within the images. For other rooms, rods were placed to provide a consistent background during the filming process, however, due to the large size of the store room and high ceiling, the retractable rods that were used to construct the backdrop were no longer applicable as the rod did not reach the ceiling at full extension. An example of the photographic set-up is seen in Figure 2.4.

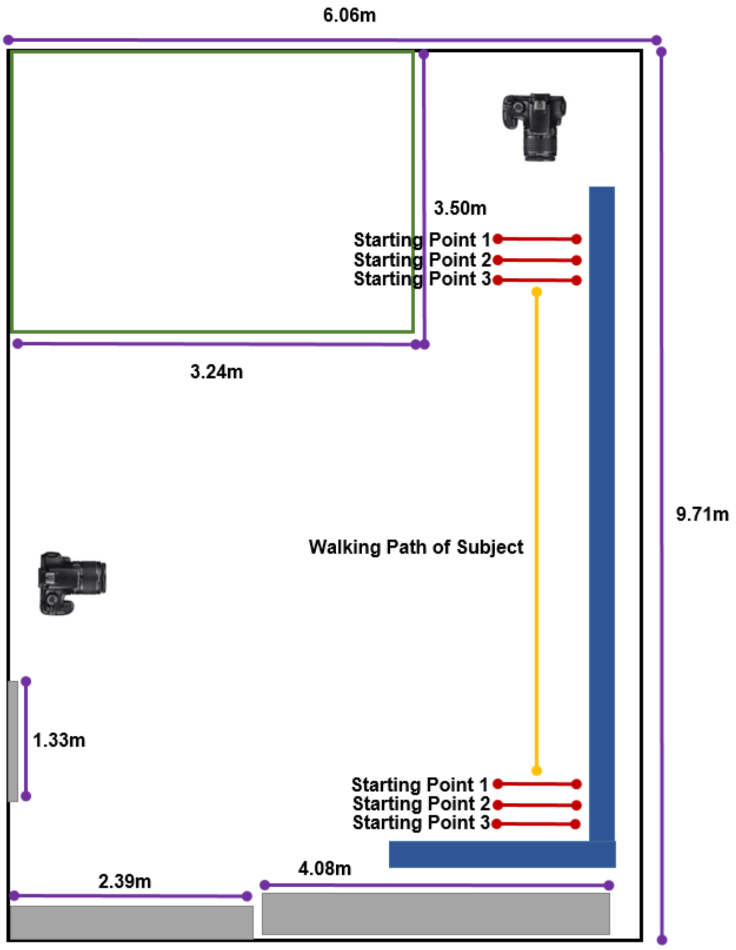


Figure 2.1 Photographic Room Measurements. The figure provides a representation of the position of the cameras and the distance of the relationship between objects. The starting points 1, 2 and 3 were created as a result of the limitation of successfully capturing the full gait cycle of a taller subject, therefore the staggered starting points (0.3m distance between each point) aim to obtain the full gait cycle. This figure is not to scale.

Figure 2.2 Retractable Rods within Backdrop Set up. The retractable rods required more than two individuals to set up to secure them in place. Even when secured the rods were observed to collapse, thus leading to the backdrop dropping. Once a larger room was sourced, the retractable rods were redundant.

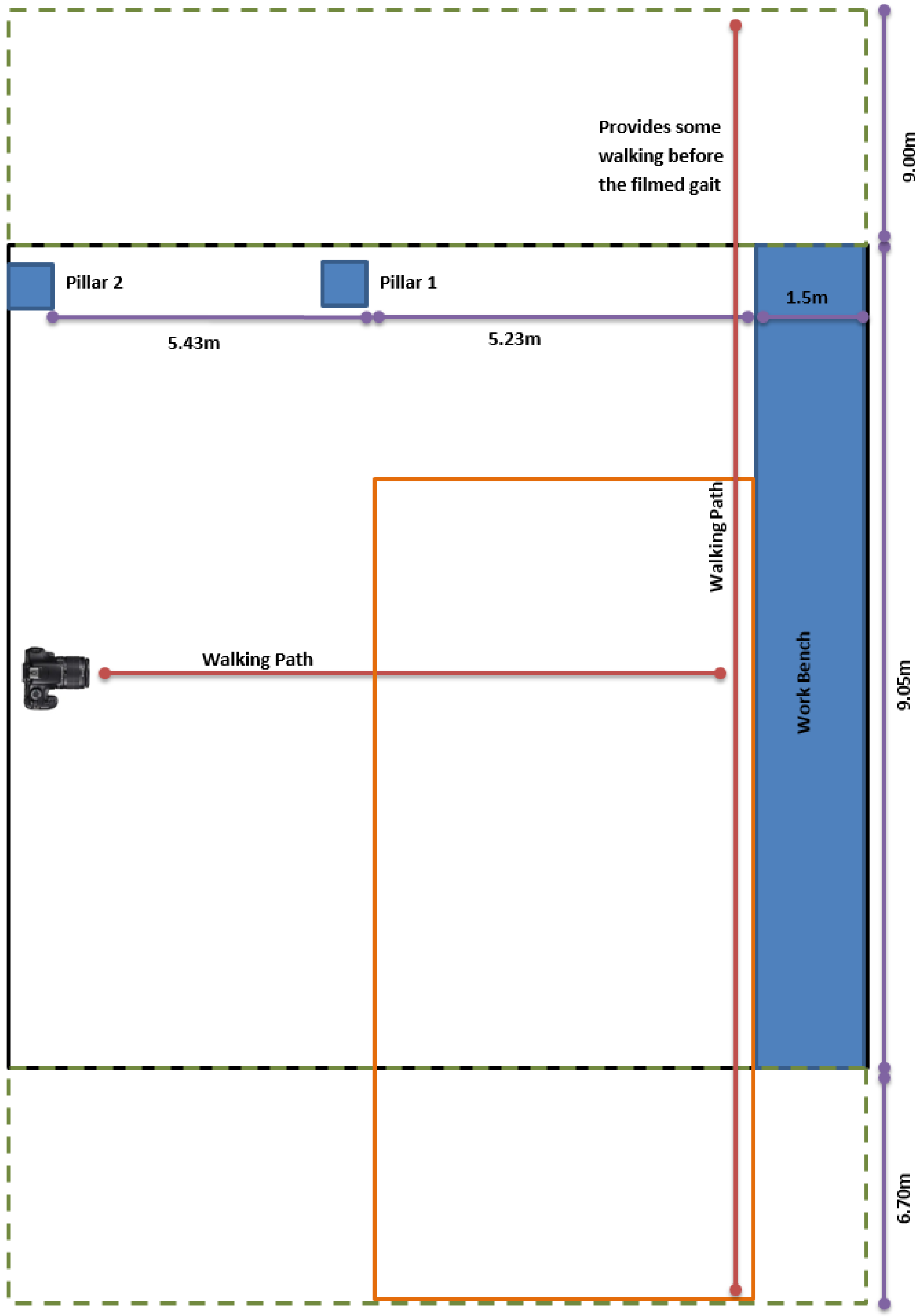


Figure 2.3 Final Photographic and Room Measurements. This figure shows the measurements of the area designated for filming within the store room. This figure is not to scale.

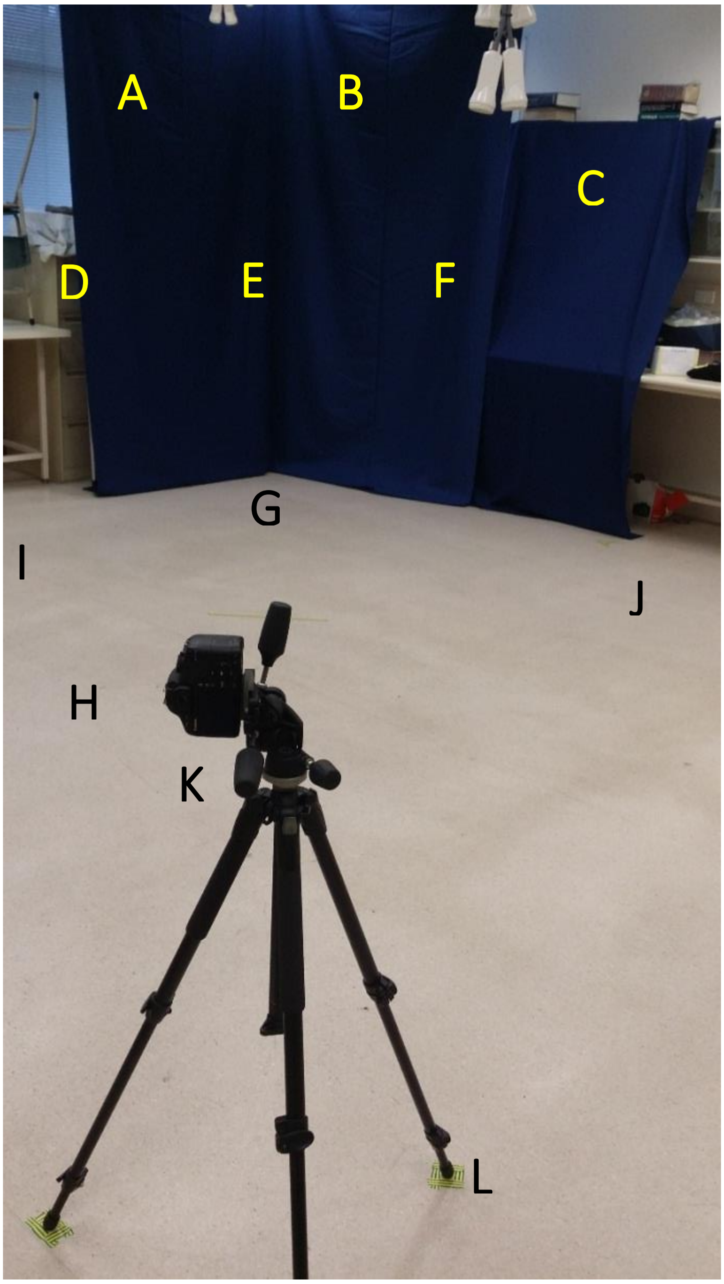


Figure 2.4 An Example of the Photographic Studio Set Up. Although multiple rooms were utilised, the premise of the photographic set-up remains the same: A) Navy Backdrop 1; B) Navy Backdrop 2; C) Navy Backdrop 3; D) Position of Retractable Rod 1 concealed by the by the backdrop; E) Position of Retractable Rod 2 concealed by the backdrop; F) Position of Retractable Rod 3 concealed by the backdrop; G) A marker to indicate the furthest point the subject walked till and the starting point of the gait cycle; H) Marker on ground to indicate the closest distance to the camera the subject walked to and the position that the stance images were photographed; I) A marker on the ground to indicate the furthest left the subject was instructed to walk till; J) A marker on the ground to indicate the furthest right a subject walked until; K) The Camera; L) The tripod.

2.3.2.1 Camera Settings, Offset and Geometric Studies

In a previous method development study (Seckiner, 2014), various distortion studies were conducted to determine offset distortion. These distortion studies indicated that vertical and horizontal offset should be eliminated where vertical should be at 90 degrees, whereas horizontal at 0 degrees. A distortion sheet analysis was utilised where the level of distortion within the captured image was measured. The distortion sheet (Figure 2.5) was levelled with a sprit level and then placed at varying distances from the camera, as well as placement offset to the camera. After the sheet was photographed, measurements within the sheet itself were undertaken (Figures 2.5 and 2.6) and converted to indices (Table 2.1) to avoid any changes in size of the true distortion sheet due to photography.

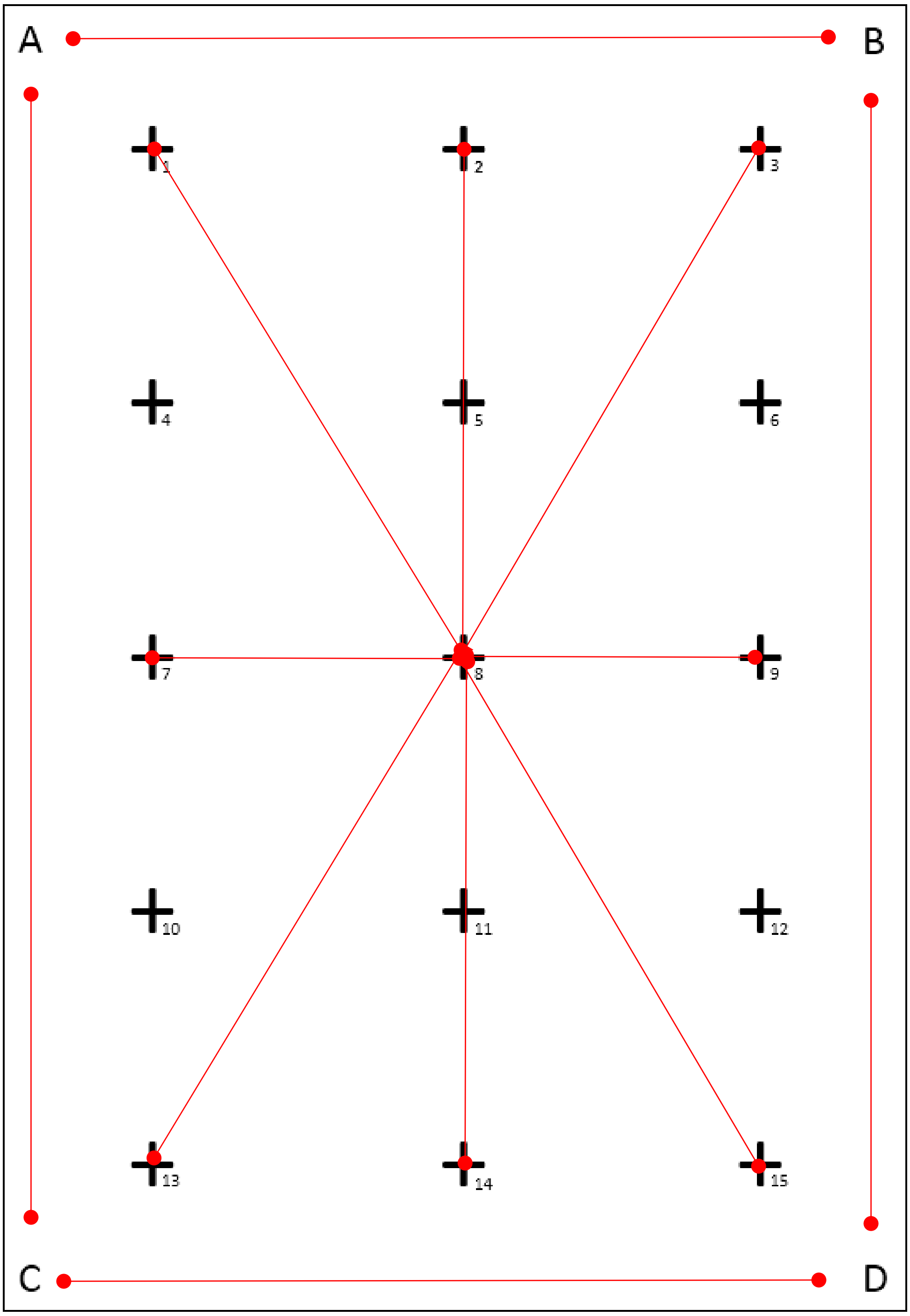


Figure 2.5 Distortion Sheet. The distortion sheet assessed distortion caused by intrinsic (within camera) or extrinsic factors (the subject/environment). An image distortions sheet was created to detect the presence of such distortions. The red lines indicate the measurements that were taken, whilst Table 2.1 details the order the measurements were taken in.

Table 2.1 Measurements Obtained from Distortion Sheet. The following table provides the indices and measurements obtained from the distortion sheet (Figure 2.3) at differing heights, distances and angles from the camera.

The Order Measurements were taken	Measurements	Indices
1	A to B	$\frac{AB}{CD}$
2	C to D	$\frac{CD}{AB}$
3	A to C	$\frac{AC}{BD}$
4	B to D	$\frac{BD}{AC}$
5	Centre of 1 to the centre of 8	$\frac{1/8}{3/8}$
6	Centre of 3 to centre of 8	$\frac{3/8}{1/8}$
7	Centre of 13 to centre of 8	$\frac{13/8}{15/8}$
8	Centre of 15 to centre of 8	$\frac{15/8}{13/8}$
9	Centre of 7 to centre of 8	$\frac{7/8}{9/8}$
10	Centre of 9 to centre of 8	$\frac{9/8}{7/8}$
11	Centre of 14 to centre of 8	$\frac{14/8}{2/8}$
12	Centre of 2 to centre of 8	$\frac{2/8}{14/8}$

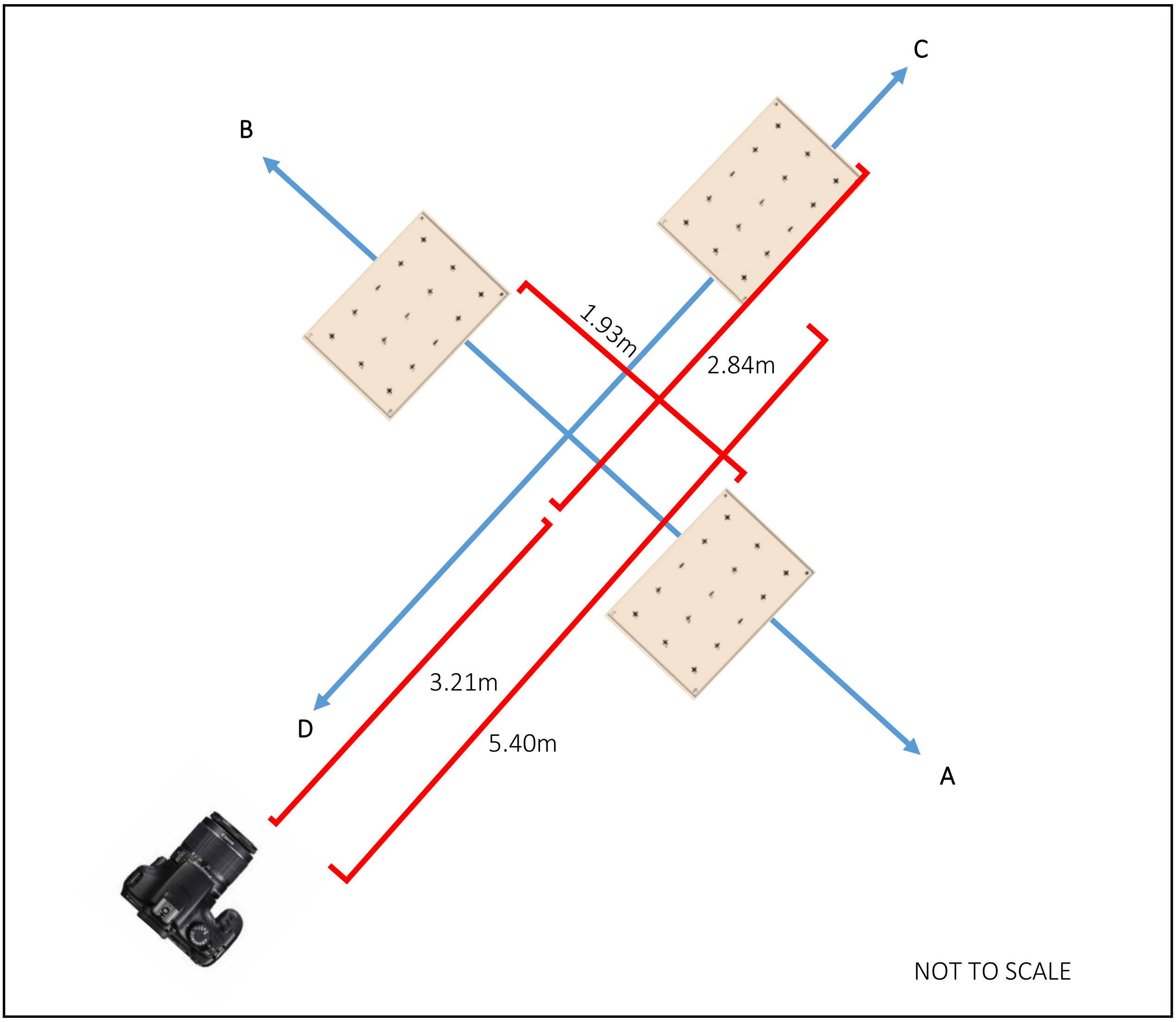


Figure 2.6 Camera Distances. The red brackets indicate the measurements that were taken for assessing distance between the offset distortion sheets (1.93m), camera distance to the offset distortion sheets (3.21m) and the distance between the offset distortion sheets with the direct distortion sheet (2.84m). The blue lines indicate the pathways that were walked by the subject (A – B for profile views, whilst C – D for Anterior/posterior views). The distortion sheet was measured at 5.4, as the subject started turning their bodies (to turn around and walk the other way) beyond this point. The subjects were asked to walk to the whole distance of C-D, followed by A-B.

2.3.2.2 Electronic Equipment, Hardware, and Software

Tables 2.2 to 2.5 show the final electronic equipment, hardware, software, and materials that were used to film, analyse, and measure the subjects in stance and gait.

Table 2.2 The Electronic Equipment Used. The hardware and electronic equipment used is listed in the following table. The specific descriptions and use of the equipment is provided.

Equipment	Specifics	Equipment Use
2 HD LED Monitors	Dell P2412H	To view the database images and conduct morphometric assessment on test subjects. One screen was to view persons and the other was to plug values into excel spreadsheets
Computer	Dell Optiplex 990	To conduct data analysis, statistics and to write thesis
CCTV Camera	MOBOTIX M12D-Sec-Dnight	To record volunteers (albeit in limited numbers) for the purpose of case studies
Tripod	Manfrotto 804RC2 190XB – Made in Italy	Allows the camera to be held immobile at umbilicus level (roughly mid-level to avoid perspective distortion) of the subject
Camera Lens	Canon Lens EF 50mm Ultrasonic	To allow photography and capturing videos of volunteers in frontal, profile and posterior views
2 SD Cards	SanDisk Extreme PRO 95 mb/s 64gb	To capture and store images as they were being recorded
QPIX Digital USB	Contains SD/MMC, USB (1,2,3), DC 5V, CF/MD, MS, XD, Mini SD, M2, T-Flash	To allow the contents of SD card to be uploaded onto the laptop and transferred to the hard drive
Digital Camera	Cannon EOS 70D	To allow photography and capturing videos of volunteers in frontal, profile and posterior views for assessment of gait
2 Camera Batteries	Canon LP-E6	To supply camera with power source
Battery Charger	Canon LC-E6 Model: DS510101	To charge battery of the camera, allowing filming
Battery Adapter/converter	Sansai World Adapter	To allow the conversion of the battery charger to the wall socket – thus allowing for charging of batteries for subsequent filming
Quick Release Plate	Grey in colour, details unspecified	To enable the attachment of the camera to the tripod

Table 2.3 Materials Used. Materials that to be used to achieve photographic studio set up.

Material	Specifics	Use of Material
Tape Measure	Assist Power tape 10M	To measure the distances relevant in the subject's walking during gait (walking points) and to measure the height and length of the camera from the ground and subject
Electric Tape	Yellow and white striped vinyl plastic electrical tape Temflex brand in 3M. The tape was 1.8cm in width	To indicate the location of each equipment including tripod on the ground
Spirit level Measurer	Yellow 1.25m measurer with 3 (one on each end and one in the centre) of the device	Placed upon the camera to ensure it is completely horizontal to the ground surface
Camera Charger	Cannon LC-E5E	To charge the camera

Table 2.4 Additional Materials Used to Complete Case Studies. Materials that to be used to allow the assessment of mock 'POI' and 'Suspect' with assessment of various influence upon gait.

Material	Specifics	Use of Material
Shoes	• White canvas male (sizes 6 – 12) and female shoes (sizes 6 – 11) • Black Y-shaped sandals male (sizes 6 – 12) and female shoes (sizes 6 – 11)	To allow standardised footwear among subjects whilst assessing various footwear types
Load Carriage - Backpack	Brown Rip curl Backpack	Backpack will contain 1kg to determine whether load carriage on back alters gait
Load Carriage – Side Bag	James Beam Black/Grey side bag	Backpack will contain 1kg to determine whether load carriage on one shoulder alters gait
Baggy Jumper	3 x Black Baggy Jumper	To determine whether attire alters gait

Table 2.5 Software Applied. The following table describes the software that will be used within the PhD research to conduct statistics and enable data collection.

Software	Specifics	Software Use
Adobe Photoshop	CS5 (64 bit)	Anthropometric and morphological assessment, resizing and compiling images to fit the template.
Microsoft Excel	Miscrosoft Excel 2010	To conduct statistics i.e. Technical Error of Measurement
XLSTAT	2014.4.06 Excel 14 7015 (6)	For conducting statistics including Discriminant analysis, Correspondence analysis, Principle component analysis
Minitab Statistical Software	MINITAB 15 Statistical Software	Kappa Coefficient Analysis
Paleontological Statistics (PAST)	Version 2.17c (4.1 MB)	Correspondence Analysis, Principle Component Analysis
VLC Media Player	Version 2.0.6	To allow the viewing of the videos that were captured via DSLR cameras
Free Studio	Version 6.5.4.805	To cut all the videos into individual frames such that frame-by-frame analysis can be conducted
R Studio	Version i386 3.5.0	To conduct Principal Component Analysis and Linear Discriminant Analysis

2.3.2.3 Camera to Subject Distance

It is well-known that subjects recorded offset to the camera result in geometric distortion (Mainprize, *et al.*, 2011). As a result of the subject's horizontal movement during gait, geometric distortion is unavoidable, particularly when a full gait cycle is captured of the subject. Therefore, slight geometric distortion will be considered during data analysis.

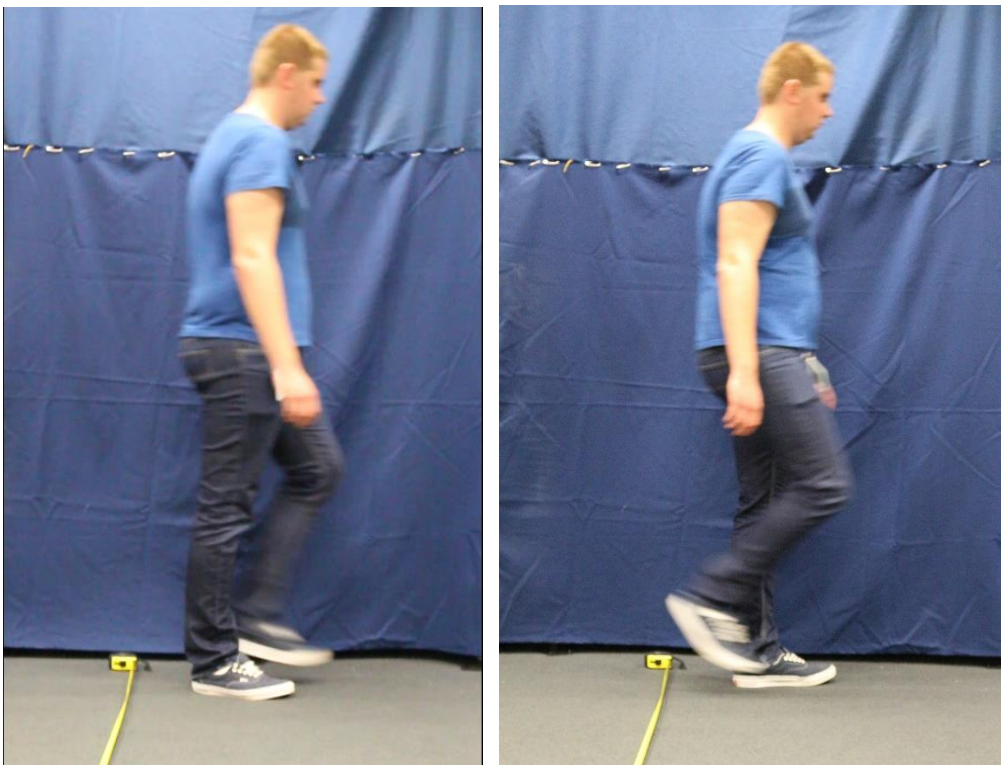
A study by Wright (2012), indicated that a minimum of 3.6m distance from subject to camera for analysis within stance is most accurate for analysis, however, this did not include gait and further developments to accommodate the subjects in motion was undertaken. Subjects were asked to walk at a comfortable pace along the designated walking path.

2.3.2.4 Lighting and Camera Height

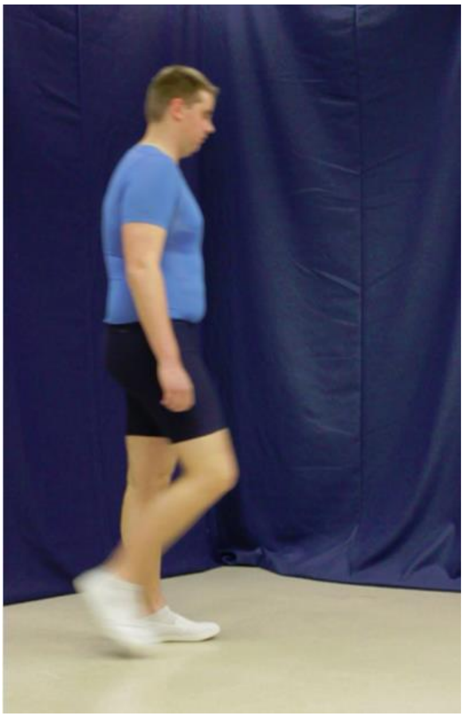
The effect of external lighting was assessed. Overhead lights within the room allowed adequate lighting during photography, however, the effects of further illumination via the use of three MAGGIE lamps was trialled to see whether features were enhanced. Though lighting can be adjusted whilst the subject is in stance, during motion consistent movement of the subject requires multiple external lights along the pathway designated for gait analysis. Following the trial, room lighting without the use of MAGGIE lamps was observed to be most appropriate, as subjects' features were clearly visualised and variables were determined without the use of extra lights. To eliminate perspective distortion, the camera height was adjusted to the umbilicus level of the subject (situated at approximately 1.1m from ground surface).

2.3.2.5 High Shutter Speed Photography

Stills were cut from the videos using the FreeStudio software. The stills were compared to the high shutter-speed photography to decide which type of footage had higher quality (Figure 2.7). Based on the results provided by using the Canon 70D, both were equally suitable for analysis as minor motion blurring (particularly in the hands and feet) could not be fully eliminated. The remainder of the body was clear. It was determined that the video cutting allowed each phase within the gait cycle to be analysed as the high shutter speed photography captured a fewer frames (Figures 2.7 – 2.11).

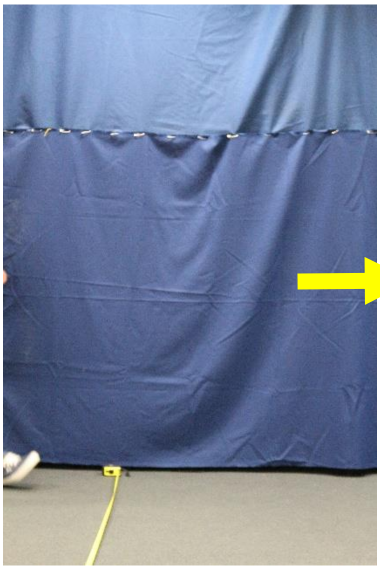


(a) Still from Video in PhD (2015) *(b) High shutter speed photography in PhD (2015)*

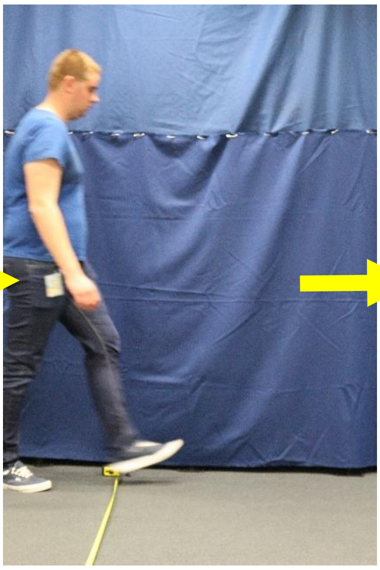


(c) Still from Video in Seckiner (2014)

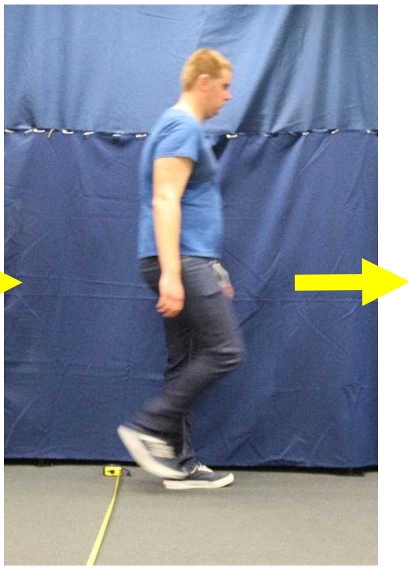
Figure 2.7 High Shutter Speed Photography Trial. (a) Represents a still cut from a video recording during PhD candidature, (b) Displays a photo as a result from high shutter speed photography, whereas (c) indicates a still cut from a video recording from Seckiner (2014)



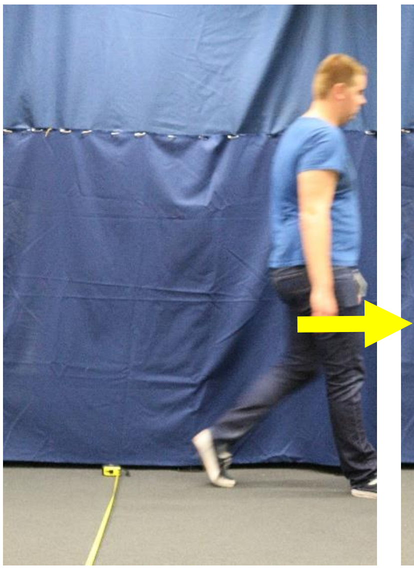
(a) Frame 1



(b) Frame 2



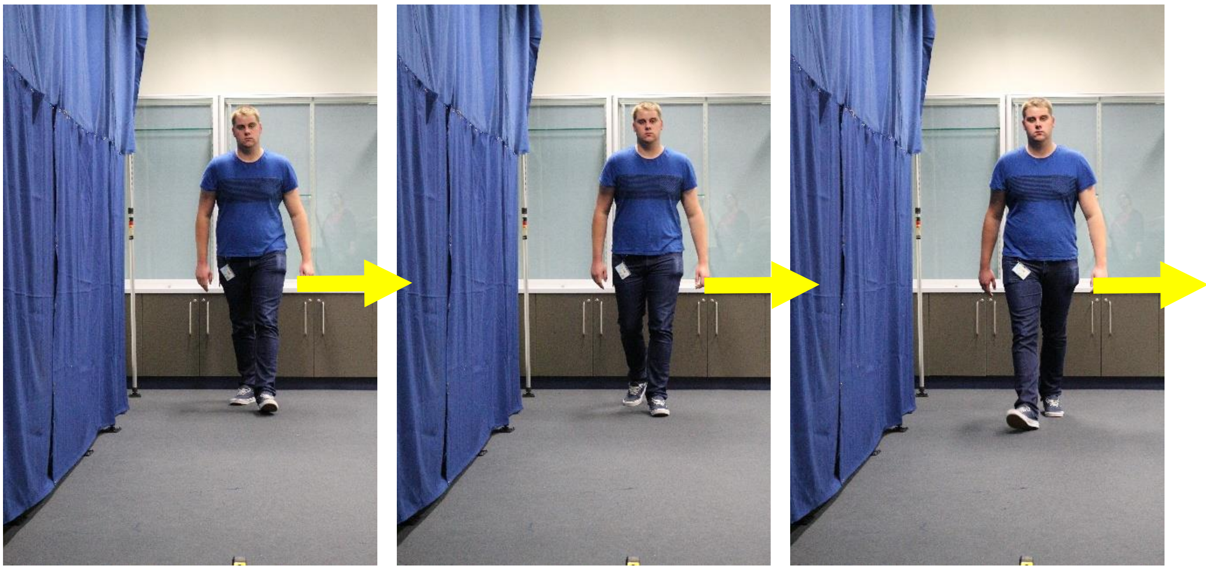
(c) Frame 3



(d) Frame 4

(e) Frame 5

Figure 2.8 High Shutter Speed Photography Frames in Profile View. The following frames (a) – (e) displayed within this figure presents all frames captured. Absence of multiple phases of gait has eliminated this as an option to obtain data.



(a) Frame 1 *(b) Frame 2* *(c) Frame 3*

(d) Frame 4

Figure 2.9 High Shutter Speed Photography Frames in Anterior View. The following frames (a) – (e) displayed within this figure presents all frames captured. Absence of multiple phases of gait has eliminated this as an option to obtain data.

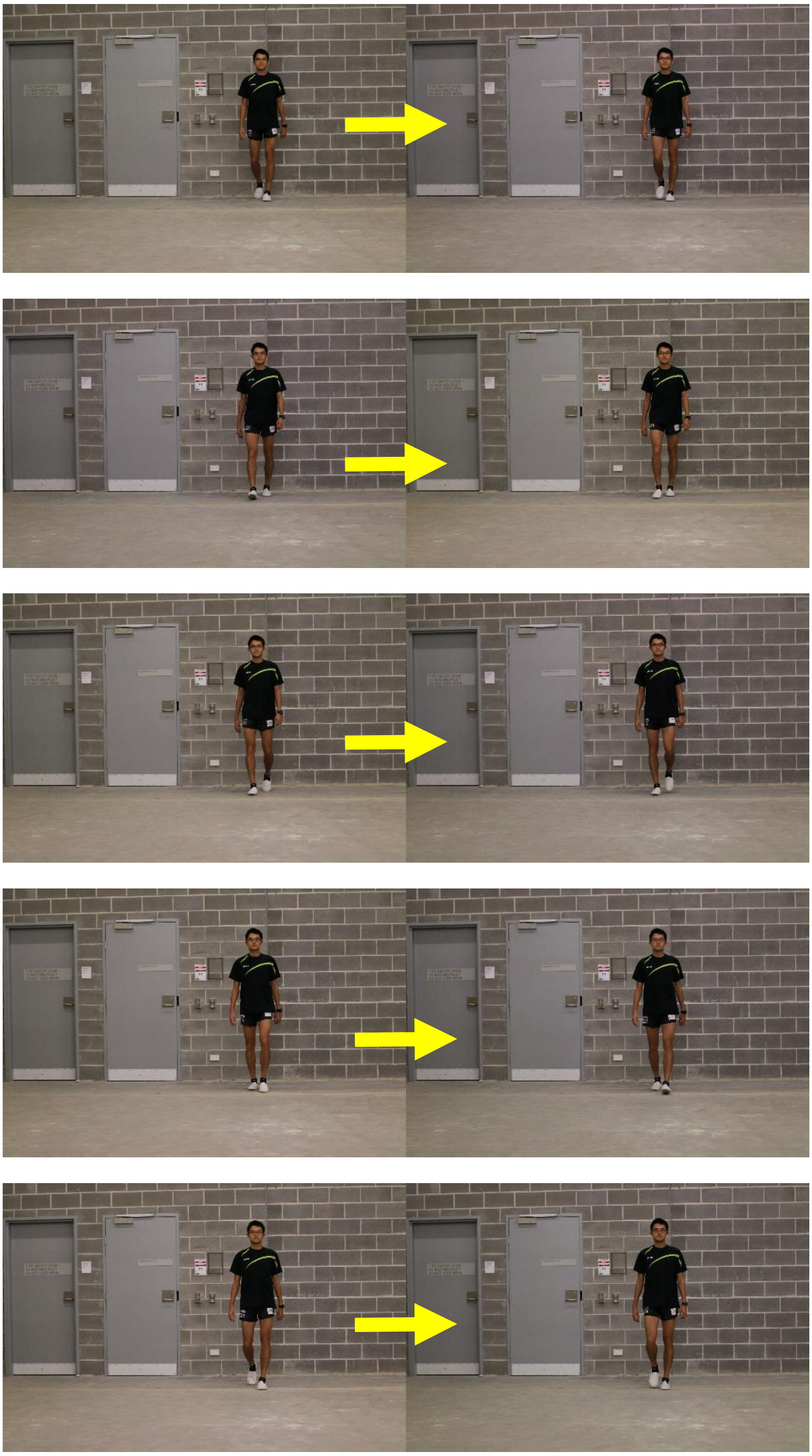


Figure 2.10 High Shutter Speed Photography Trial with Canon 70D in Anterior View. Images show each frame that was captured in anterior view.

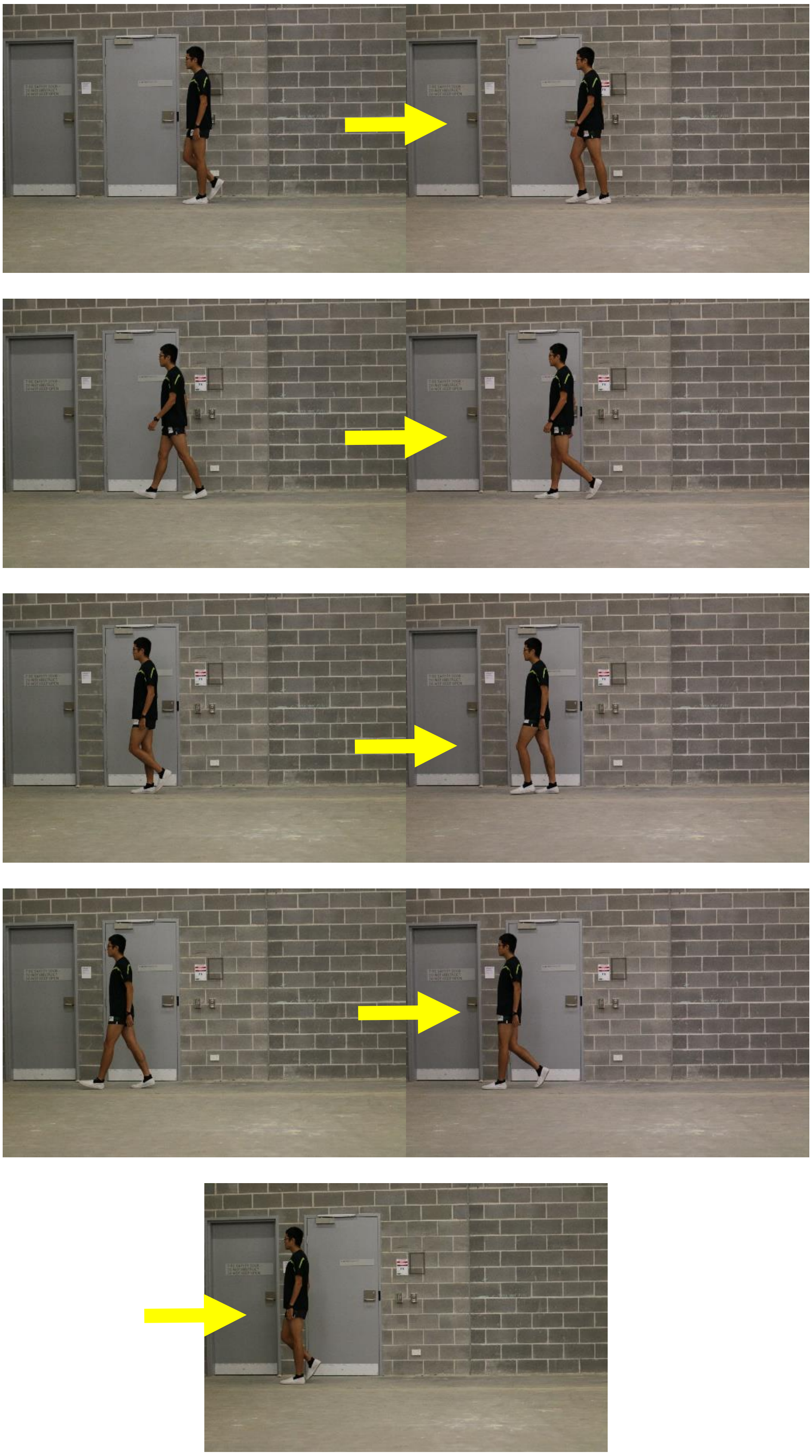


Figure 2.11 High Shutter Speed Photography Trial with Canon 70D in Profile View. Images show each frame that was captured in profile view.

2.3.2.6 Limitations

The main limitation arose with the changing of rooms due to unavailability of space. Scheduling conflicts with the room, reconstruction or unavailability were the main causes of these limitations. From this, multiple standardisation attempts were repeated for each new room allocated, thus limiting time for more subject recruitment. Furthermore, although a partitioned area was provided in the storage room for gait analysis filming, at multiple times there were furniture (chairs, wooden planks) that were immovable within the designated photographic set-up area. Thus, filming at times were cancelled or disturbed and not possible until those were moved, where filming could then resume. Another limitation was that the option to set a backdrop was not available in the store room. The backdrop provides a consistent background, that eliminates any potential background interference during the analysis.

Motion blurring was another limitation. This refers to where the distal ends (lower segments such as hands and feet) of the appendicular anatomy were blurred as a result of movement of the subject. Motion blurring severity ranged from mild to significant depending on the velocity of the subject. Further funding for equipment within this research project would have resolved this issue, and/or free access to the relevant facilities with the adequate technology would have allowed significant reduction of motion blurring.

2.3.3 Database and Subject Selection Criteria

To allow efficient observation of features, subjects were viewed in full body-height from four directions (anterior, posterior, right profile, and left profile). Assessing varying ages, ancestries and both sexes was important to view any possible correlations; therefore, subjects were recruited from as wide a demographic as possible. Shoes were consistent for subjects (unisex shoes) to reduce variances (high heels, joggers, boots, thongs etc.) that might be introduced as a result of footwear. Although this may lead to grouping of foot length when the feature is extracted, this was an important influence to include as shoes are commonly seen to be worn by the trace captured by surveillance cameras.

2.3.3.1 Footage

Following the recruitment and filming of volunteers, all footage was assessed, videos were cut into stills, cropped, resized and placed into templates within Photoshop. This allowed for the anthropometric assessment, where anatomical landmarks were determined, marked and then measured.

2.3.4 Templates and Plumb Line for Stance Assessment

A plumb line[9] determines correct and faulty alignments of a subject's body (Figure 2.12) (Kendall *et al.*, 2005). In stance, a subject's feet placement are equidistant to that of the line of reference (*ibid*). Any deviances from the plumb line observed were categorised into 'slight', 'moderate' and 'marked', depending on the amount of deviation detected.

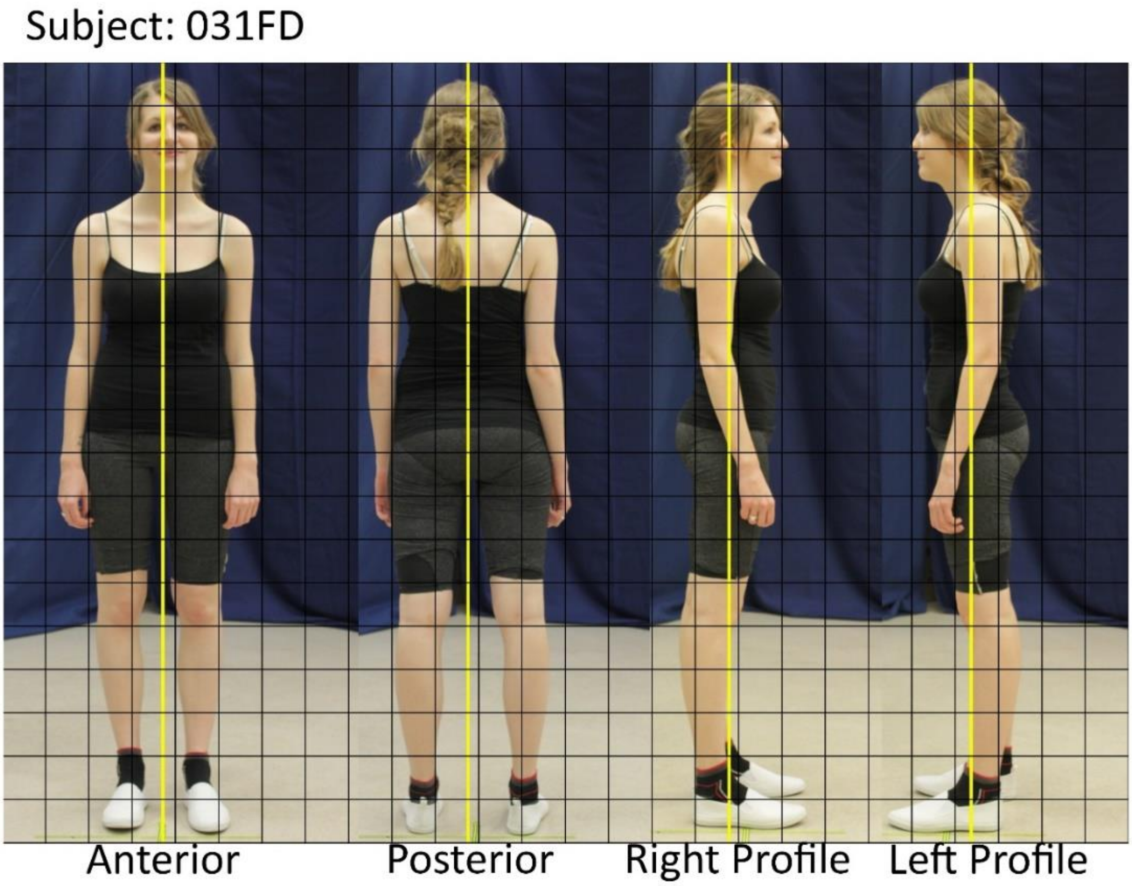


Figure 2.12 Plumb Line Alignment During Stance. The application of a plumb line allows further morphological variables to be assessed, an example being the shoulder placement of a subject and whether it falls anteriorly, posteriorly or on the centre of the plumb line

[9] A plumb line is a cord with a weighted plumb attached to provide a vertical line, dividing the body into two (coronal and/or sagittal) (Kendall *et al.*, 2005). A virtual plumb line was also added, which applied the same concepts to that with the weighted plumb, dividing the body into two.

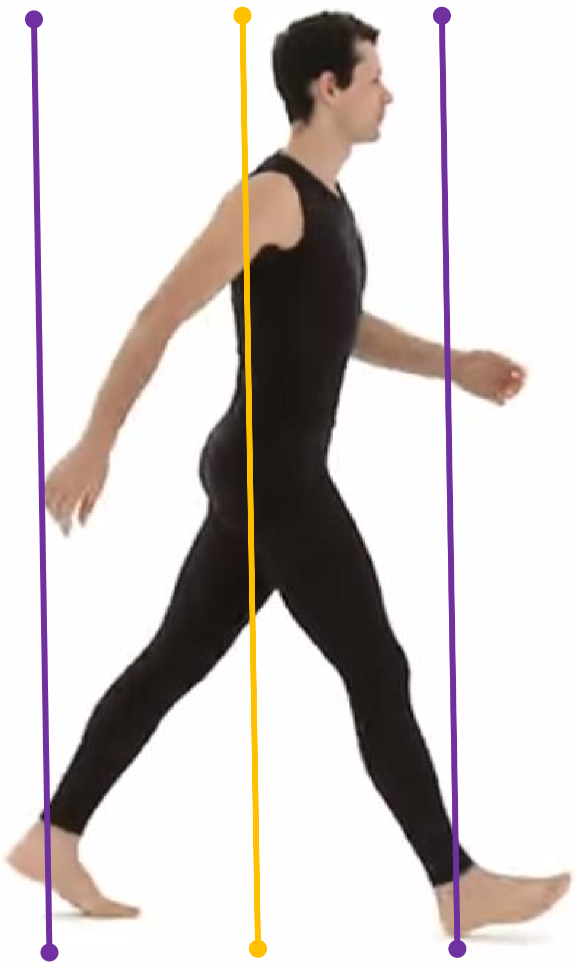
2.3.4.1 Development of a Plumb Line for Motion Assessment and Refinement of Plumb Line for Motion Assessment

The common plumb line for stance is not applicable for gait (Kendall *et al.*, 2005). Therefore, to assess morphological variables of gait, previous attempts for development of an appropriate plumb line was researched (Seckiner, 2014). Two lines on both left and right lateral malleolus (outermost points of ankles) of the feet were digitally applied to images in all views (Figure 2.13). Once these lines were established, the centremost point of the two lines was located and a third line was applied. This third line was identified as the plumb line for gait. The malleolus were selected as the lower limbs are responsible for forward advancement of the body and weight bearing, whilst arm movements are resultant of the movement of lower limbs (Herr and Popovic, 2008). As all subjects were recorded in their normal attire to assess the real-life applications of the study, hairstyle was also not standardised between subjects. Therefore, no 'ground truth' values were able to be determined for variances in hair, or if there were a hood or a hat – which may or may not provide some variations.

For the purpose of this study, it was assumed that the application of this plumb line was relatively stable and consistent for anterior and posterior assessment (Figure 2.13). The profile views however, posed a problem due to the 'leading' and 'trailing' limbs[10] (Vrieling *et al.*, 2008). In attempt to overcome this issue, the upper and lower body were separated in half (Figures 2.14 – 2.15).

It is known that reliability is used frequently to mean 'dependability', including both reliability and validity (Christensen *et al.*, 2013). Error is known as the variance between a measurement and the true value (or ground truth), which does not include practitioner error (human error) (*ibid*). Repeatability and reproducibility are both attributed to variations of precision. Repeatability, describes the variations within constant conditions within the same operator and/or instrument, whereas reproducibility, is demonstrated with different operators. To trial the observer accuracy of the new placement of the plumb line for motion, repeatability studies were completed to determine the level of error present when inserting the alignment line as illustrated in Figure 2.16 and Table 2.6.

[10] The lower appendage that initiates the gait sequence and moves forward first and foremost is referred to as the 'Leading limb' whereas the second appendage of the lower limbs is determined as the 'trailing limb' (Vrieling *et al.*, 2008).



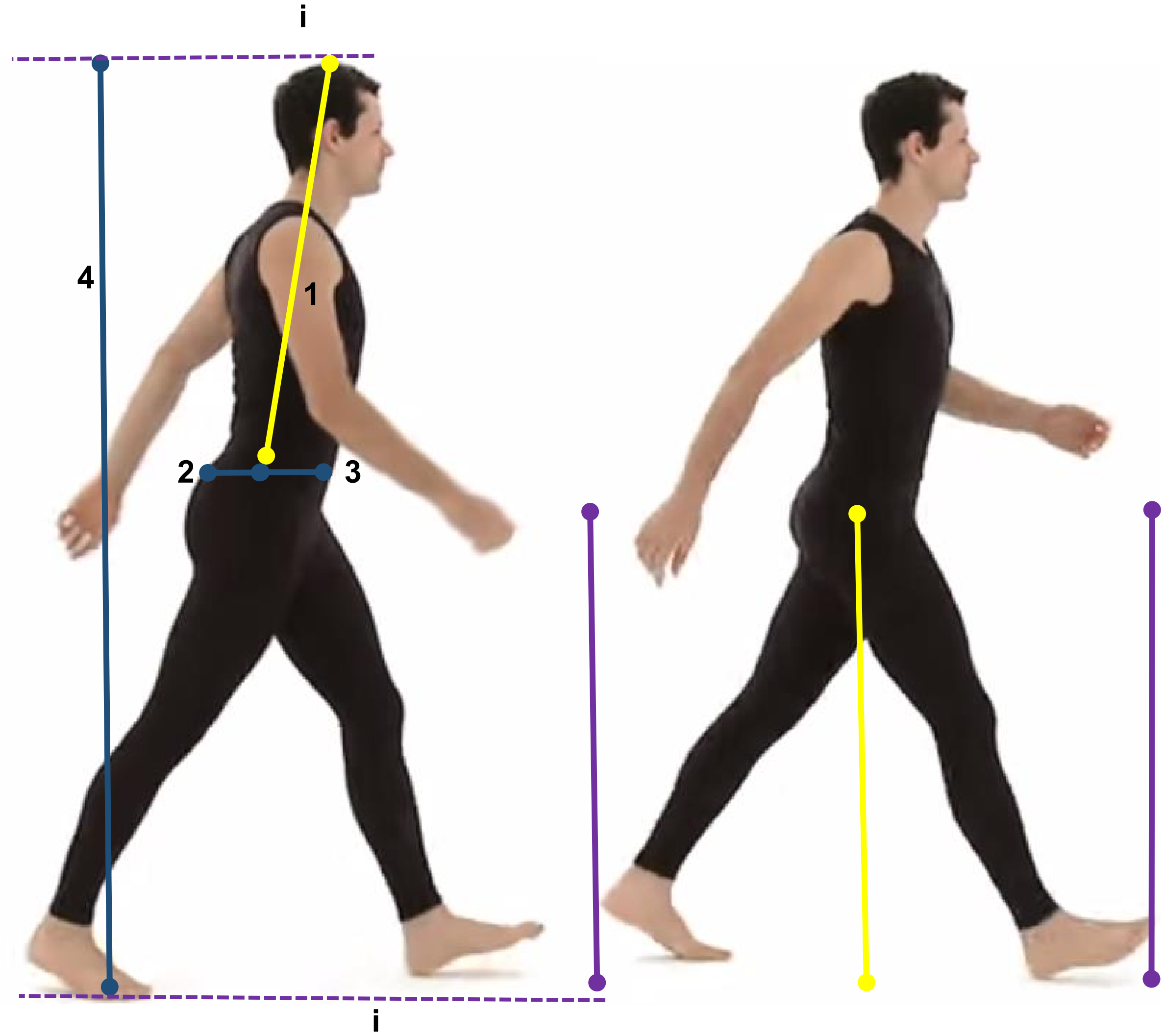
(a) Profile View

(b) Anterior View

Figure 2.13 The Original Alignment of the Plumb Line for Gait Developed in Seckiner (2014) (as adapted from YouTube, 2011). Two purple lines run through the (a) medial and lateral malleolus for the lateral view and (b) through both lateral malleolus for each foot. The centre of these two lines are then measured and the yellow line in both (a) and (b) is the reference (plumb) line. (a) applies to both left and right profiles whilst (b) applies to both anterior and posterior

(a) Profile View *(b) Anterior View*

Figure 2.14 Plumb Line for Gait Revisited (as adapted from YouTube, 2011; Herr and Popovic, 2008). (a) The lower body line is the Lower Body Plumb Line, whereas the upper body runs through the tragus of the ear, travelling coronally (plane) through the body to determine the displacement of the upper limbs. (b) The malleolus (outermost points of ankles) were selected in Seckiner (2014) for the anterior image, as the lower limbs are responsible for advancement of the body and weight bearing, whereas arm movements result from lower limb movement.



(a) Upper Body *(b) Lower Body*

Figure 2.15 Plumb Line Measurement for Gait Revised (as adapted from YouTube, 2011). The final and revised plumb line determination for error testing as seen by the (a) Upper and (b) Lower body. The measurements include: [1] Upper body plumb height, [2] From midpoint to posterior of body, [3] From midpoint to anterior of bod. From the concave dip above the gluteus maximus, prior to the lower back in the midsection of the body, a horizontal line was drawn in Photoshop and the mid-section determined, [4] Height. The lower body (b) was error tested for anthropometric purposes rather than plumb line to determine trailing and leading limbs.

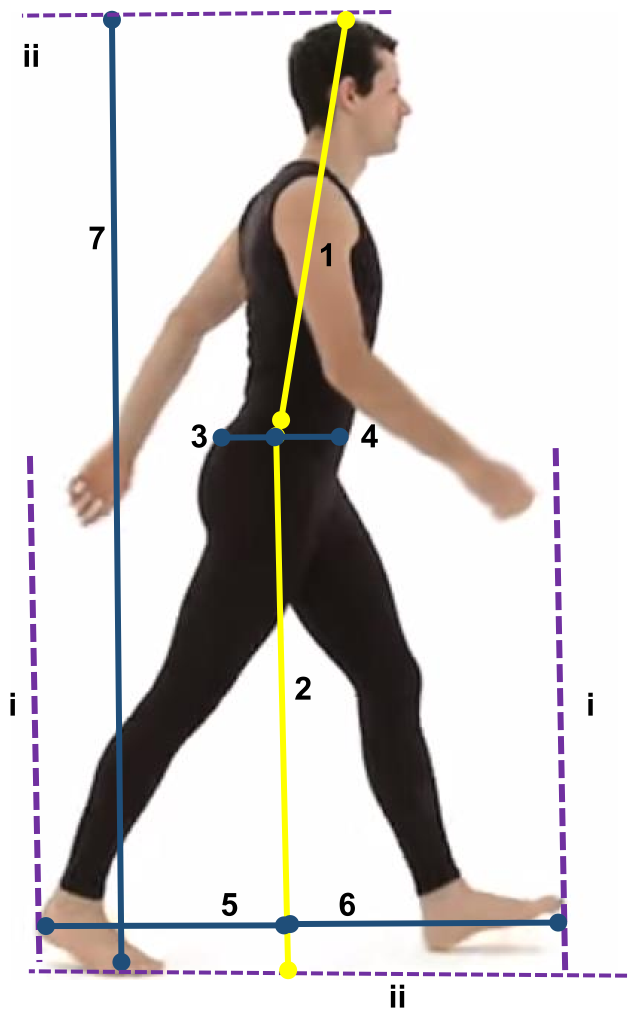


Figure 2.16 Plumb Line Measurement for Gait Plumb Line Repeatability Studies(as adapted from YouTube, 2011). Measurements: [1] Upper body plumb, [2] Lower body plumb, [3] From midpoint to posterior of body, [4] From midpoint to anterior of body, [5] From heel of trailing limb to midline of lower body plumb, [6] From toe of leading limb to lower body plumb, [7] Height.

Table 2.6 The Measurements within Plumb Line Error Studies. The table describes the segments of the body measured, as well as the purpose of the lines represented within the figures.

Measurements	Definition
Upper body Plumb	The vertex of the head to the concave dip above the gluteus maximus, prior to the lower back in the midsection of the body
Lower body Plumb	Above the Gluteus Maximus to the reference line on the bottommost section of feet
Reference line	[i] Refers to imaginary lines drawn to depict the outermost point of the heel of trailing limb, and the toe of the leading limb, whereas [ii] refers to the bottom of the feet and the vertex of the head

2.3.5 The 'Camera Skew' Issue

Upon analysis of the participants, a 'skew' within the camera was noticed where the camera was slightly tilted to one side rather than exactly horizontal. This may have been a result of human error when measuring the level with the 'spirit' scale; otherwise, it can be attributed to incidental 'bumping' of the camera resulting in the skew. A total of 21 subjects were affected within the database. This would not affect the anthropometric analysis, as the measurements were manually taken in photoshop with direct lines to anatomical landmarks, however some variables within the morphological analysis may have been affected as a result of the plumb line placement. As the plumb line is drawn using a straight line in Photoshop, to overcome this with the skewed images, the level of skew was measured and then applied to the line to counteract the skew from the camera (Figures 2.17 and 2.18). The differences between the original plumb line and the 'accommodating plumb line' are observed in yellow and green respectively in the Figures. The uneven surface can be observed through the pink line that draws out the background surface.

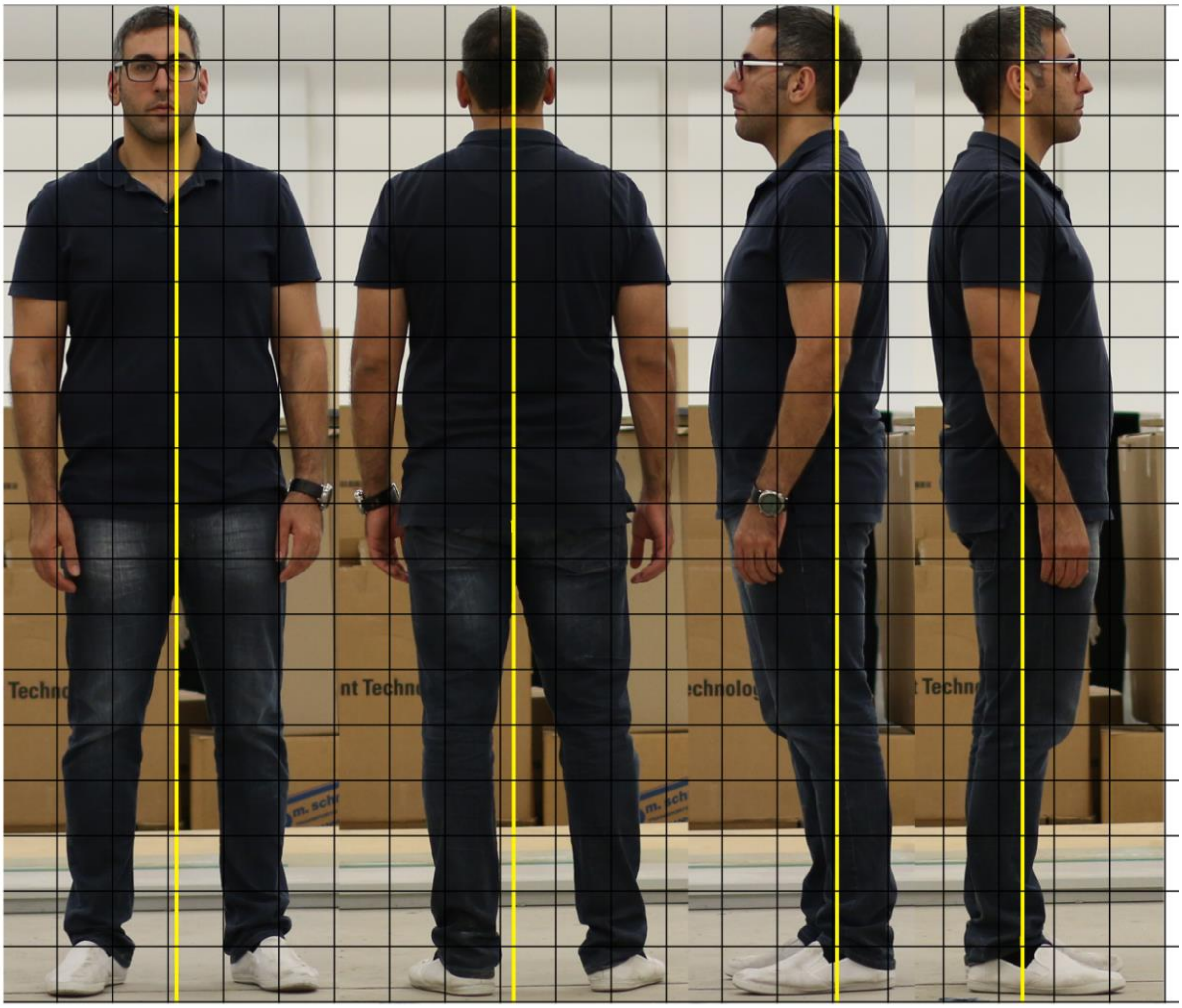


Figure 2.17 Image Captured with Skew. The original image capture on camera.

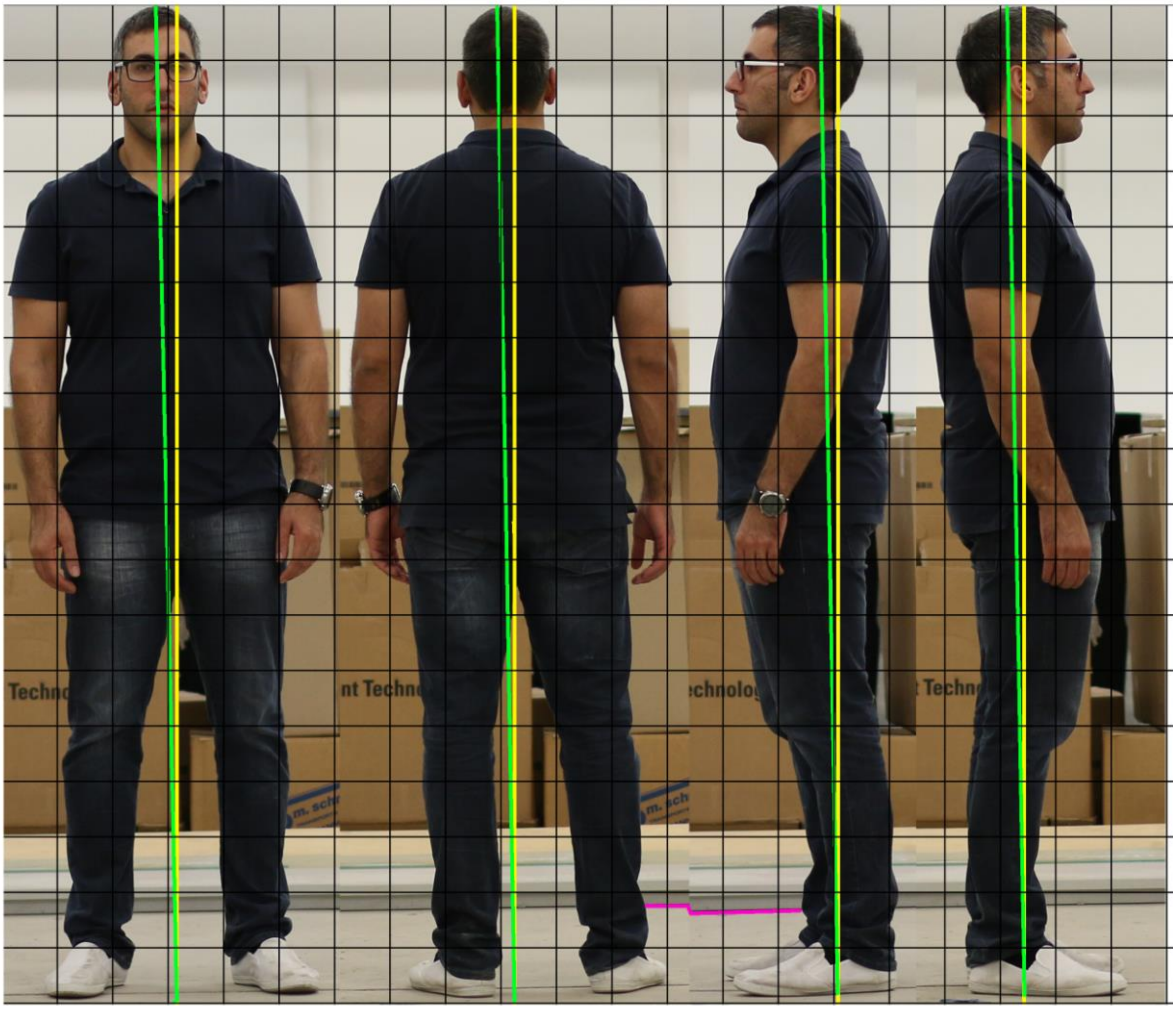


Figure 2.18 Image Alterations to Accommodate Skew. The yellow line indicates the original plumb line whereas the green line shows the altered plumb line. The pink line is showing the level of skew.

2.3.6 Repeatability Studies

The importance of repeatability is highlighted in this study as it determines the level of manual error for a single user. This then determines the outcome for the feature – whether the features are kept within the pool for assessment, whether the refinement of the classification of features for improvement is required, or the elimination of features as a result of high levels of error.

As previously mentioned, plumb lines for stance have been established as the subject is stationary. However, placement of plumb line had not yet been developed for those in gait. Therefore, prior to measuring the levels of repeatability within features of gait, the accurate placement of the plumb lines was necessary to ensure that the assessment of morphological features was accurate, and to also safeguard against incorrect assessment of features due to improper placement of the plumb line for gait. Position of stance has been well established in anatomical studies (Kendall *et al.*, 2005), therefore was disregarded for repeatability studies.

2.3.7 Assessment of Variables

Morphometric variables were established through extensive literature research, and observation of the footage and photographs acquired in this study.

2.3.7.1 Anthropometric Measurements

Most anthropometric landmarks applied within stance and walk were adopted from various anthropometric studies which involve *in situ* measurements. However, as footage is captured via surveillance cameras, assessing landmarks by palpation is not applicable, therefore development of appropriate macro-feature measurement (from joints) for assessment was established, then applied within this research. Measurements were either adopted from anthropometric studies or developed within this PhD research, as no literature was found for these particular measurements.

As the limbs are constantly flexing and extending during locomotion, the selection of anthropometric landmarks were primarily joint related, thus permitting application of measurements to all phases of gait. Measurements were obtained during the mid-stance phase (specifically at feet adjacent) of gait (4 frames at anterior, posterior, left and right sides) as it is the closest to stance, and to apply dynamic measurements, the heel strike phase were assessed to determine the distance between the limbs during locomotion (leading to a total of 8 frames for the anthropometric assessment). As no ground truth data can be collected from trace material, importance for this study was placed on consistency of measurements with low repeatability error.

A total of 32 anthropometric measurements and 24 anthropometric landmarks for stance were developed, then refined to 17 anthropometric measurements and 16 anthropometric landmarks developed for four views (anterior, posterior and both profiles) while subjects were in 'normal' position. The refinement or removal of features was due to the high level of repeatability error and also dependant on the visibility of the features. If either was not fulfilled, features were removed. Both biomechanical and anatomical sources were considered and incorporated, but adaptations made to facilitate forensic scenarios from surveillance footage. This was due to the lack of visibility of anatomical landmarks upon assessment, and/or too much repeatability error present within the single observer examination. For gait, 49 anthropometric measurements and 28 anthropometric landmarks developed, then further refined to 25 measurements with 20 anthropometric landmarks following error studies (Figures 2.19 – 2.24 and Tables 2.7 – 2.12).

'Normal' stance and gait refers to the relaxed, natural position of the body during rest and walk respectively. Therefore, subjects assumed a 'Normal' stance and gait to maintain a realistic approach when assessing a suspect to POI. This resulted from the unlikeliness of a POI posing on CCTV footage and providing ideal evidence to allow precise anthropometric measurements.

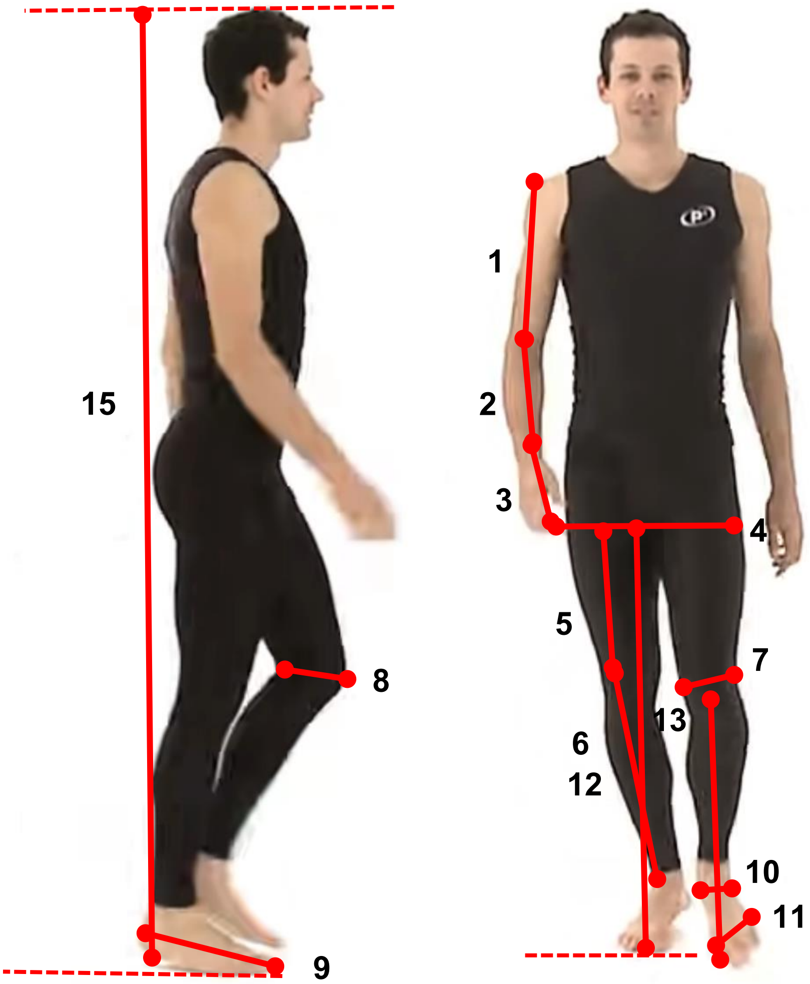


Figure 2.19 Static Measurements (as adapted from YouTube, 2011). The variables that were measured are detailed within Table 4.9 below.

Table 2.7 Anatomical Landmarks and Abbreviations for Static Measurements. The anatomical landmarks were first determined prior to measurement as listed within the table.

Anatomical Landmark (Walking) Static	Abbreviations	Source
1. Shoulder – Elbow Length	GHJ - AcF	Human Systems Information Analysis Centre, 1994.
2. Forearm (elbow-wrist) Length	AcF - StyP	Lohman *et al.*, 1988
3. Hand length	StyP - D	Lohman *et al.*, 1988
4. Maximum Hip Width	Gtr/R – Gtr/L	Snyder *et al.*, 1972
5. Thigh length	Cr - PCen	Author
6. Lower leg length	PI - CMal	Snyder *et al.*, 1972
7. Knee/Patellar width	KJ/R – KJ/L	Human Systems Information Analysis Centre, 1994.
8. Knee Breadth	PP - PopF	Author
9. Foot (or shoe) length	Ha - Ca	Snyder *et al.*, 1972
10. Bi Malleolar Width	Mal/R – Mal/L	Lohman *et al.*, 1988
11. Foot (or shoe) Width	M5 - Phx	Human Systems Information Analysis Centre, 1994.
12. Mid patellar Height	HaIn - PCen	Snyder *et al.*, 1972
13. Leg Length-Crotch	HaIn - Cr	Human Systems Information Analysis Centre, 1994.
14. Leg Length-Trochanter (Posterior)	CaIn - Gtr	Author
15. Total Height (stature)	V - CaIn	Human Systems Information Analysis Centre, 1994.

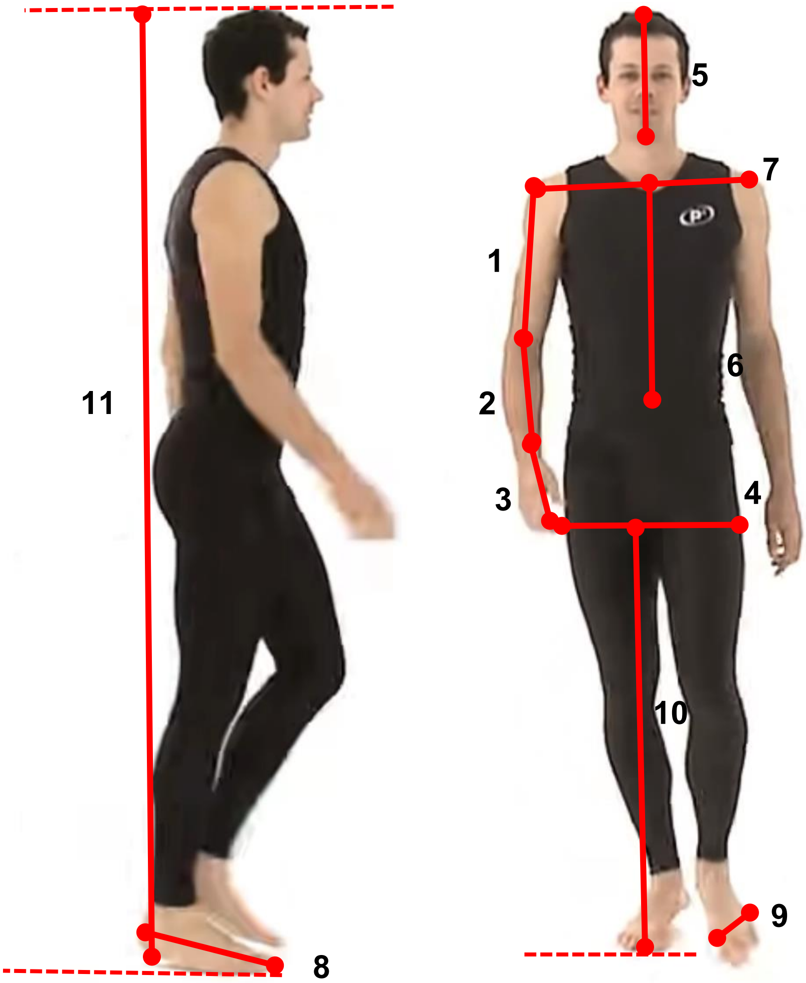


Figure 2.20 Refined Static Measurements (as adapted from YouTube, 2011). The variables that were measured are detailed within Table 4.9 below.

Table 2.8 Refined Anatomical Landmarks and Abbreviations for Static Measurements. The anatomical landmarks were first determined prior to measurement as listed within the table.

Anatomical Landmark (Walking) Static	Abbreviations	Source
1. Shoulder – Elbow Length	GHJ - AcF	Human Systems Information Analysis Centre, 1994
2. Forearm (elbow-wrist) Length	AcF - StyP	Lohman *et al.*, 1988
3. Hand length	StyP - D	Lohman *et al.*, 1988
4. Maximum Hip Width	Gtr/R – Gtr/L	Snyder *et al.*, 1972
5. Head Height	V - Ch	Fashionary, 2019
6. Torso Length	JugN - LoUmb	Fashionary, 2019
7. Shoulder Width	GHJ/R – GHJ/L	Fashionary, 2019
8. Foot (or shoe) length	Ha - Ca	Snyder *et al.*, 1972
9. Foot (or shoe) Width	M5 - Phx	Human Systems Information Analysis Centre, 1994
10. Leg Length-Crotch	HaIn - Cr	Human Systems Information Analysis Centre, 1994
11. Total Height (stature at mid-stance)	V - CaIn	Human Systems Information Analysis Centre, 1994

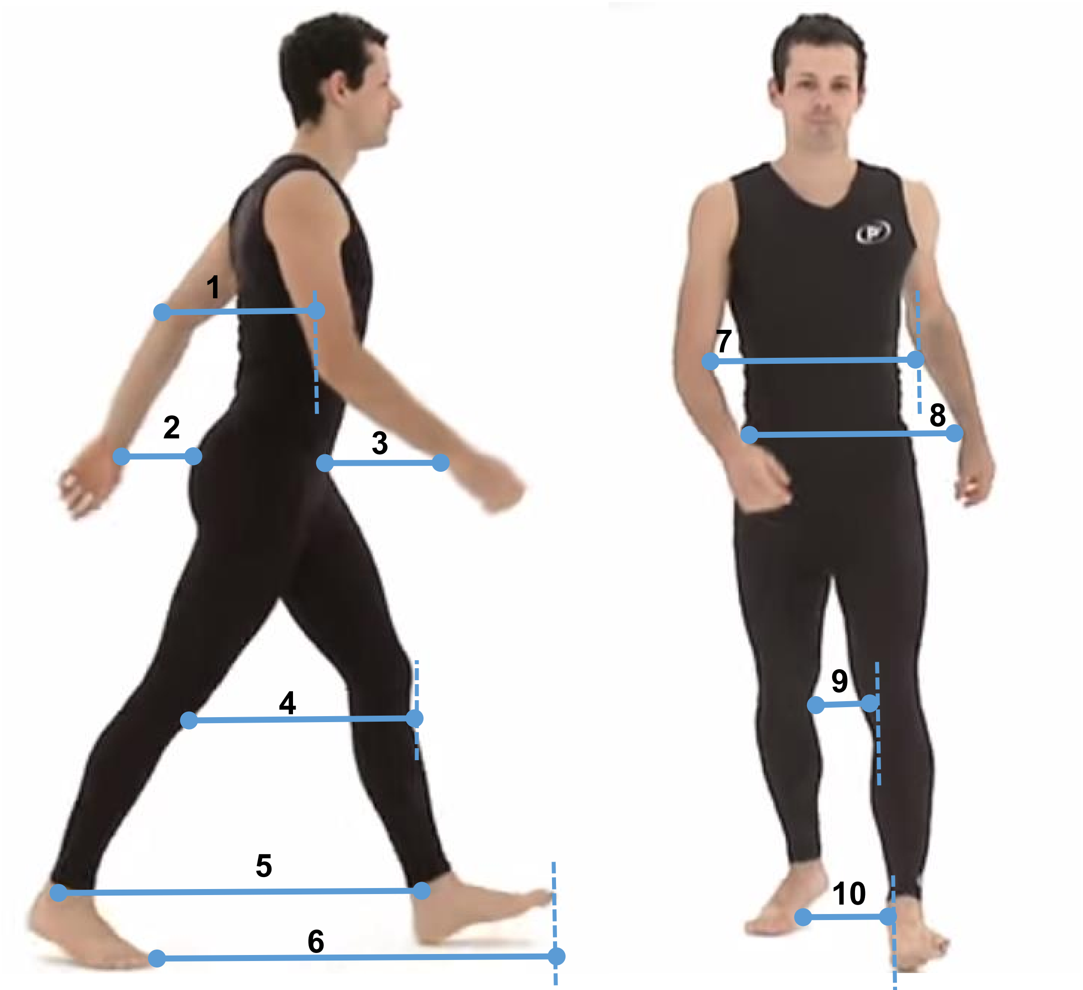


Figure 2.21 Dynamic Measurements (as adapted from YouTube, 2011). The variables that were measured are detailed within Table 4.10 below.

Table 2.9 Anatomical Landmarks and Abbreviations for Dynamic Measurements. The anatomical landmarks were first determined prior to measurement as listed within the table.

Anatomical Landmark (Walking) Dynamic	**Abbreviations**	**Source**
1. Elbow - Elbow	OleR – OleL	Gianaria *et al.*, 2014
2. Styloid process of Radius - Body	StyP/Ra - B	Author
3. Styloid process of Ulna - Body	StyP/Ul - B	Author
4. Knee Cap – Knee Cap (level)	PP/R – PP/L	Vaughan *et al.*, 1999
5. Lateral Malleolus – Medial Malleolus	LatMal/L – MedMal/R	Gianaria *et al.*, 2014
6. Hallux – Hallux (level)	Ha/R – Ha/L	Gianaria *et al.*, 2014
7. Antecubital Fossa – Antecubital fossa (level)	AcF/R – AcF/L	Author
8. Styloid process – Styloid Process	StyP/R – StyP/L	Author
9. Inner Knee – Inner Knee	MedKJ/R – LatKJ/L	Author
10. Medial Cuneiform – Medial Cuneiform	CuR - CuL	Author

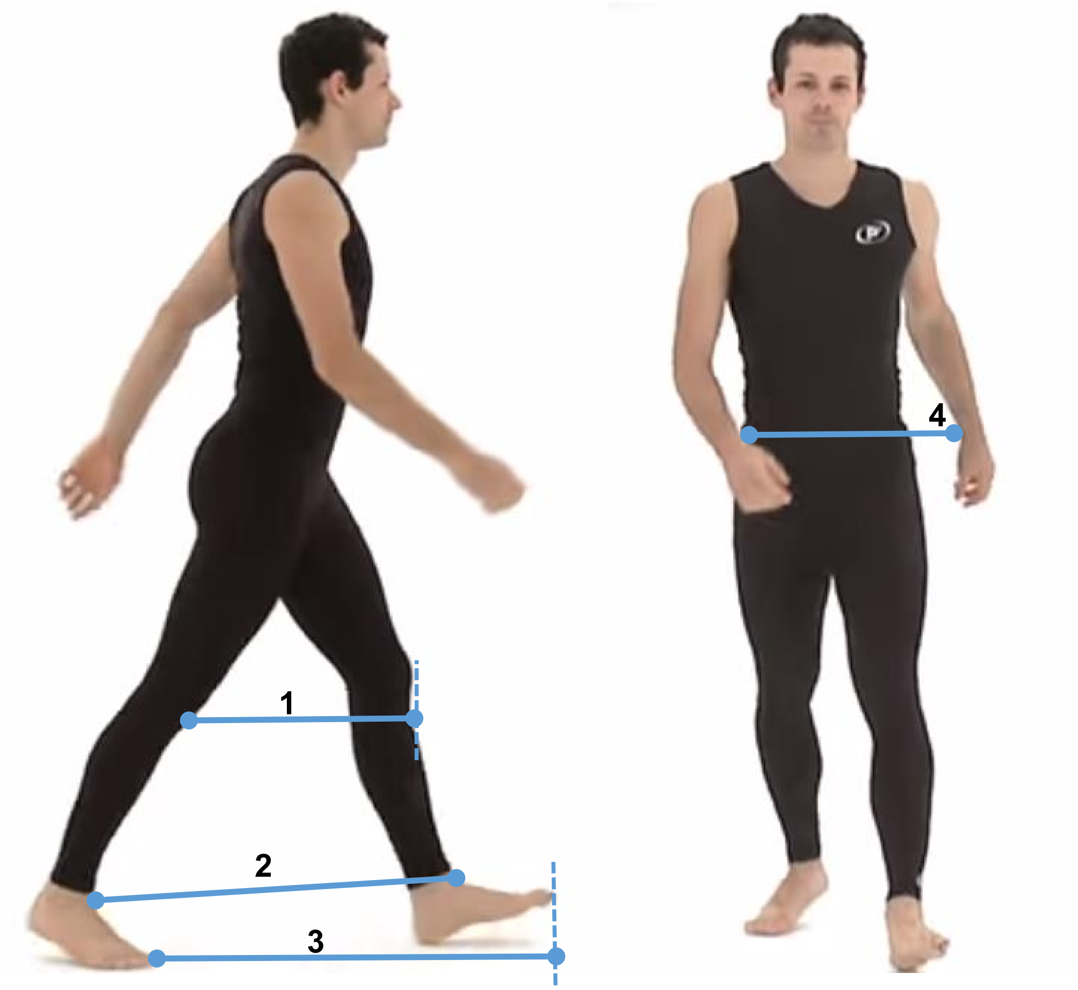


Figure 2.22 Dynamic Measurements Revised (as adapted from YouTube, 2011). The variables that were measured are detailed within Table 4.11 below.

Table 2.10 Anatomical Landmarks and Abbreviations for Dynamic Measurements Revised. The anatomical landmarks were revised prior to measurement as listed within the table.

Anatomical Landmark (Walking) Dynamic	Abbreviations	Source
1. Knee Cap – Knee Cap (level)	PP/R – PP/L	Vaughan *et al.*, 1999
2. Malleolus – Malleolus	AMal/L – AMal/R	Gianaria *et al.*, 2014
3. Hallux – Hallux (level)	Ha/R – Ha/L	Gianaria *et al.*, 2014
4. Styloid process – Styloid Process	StyP/R – StyP/L	Author

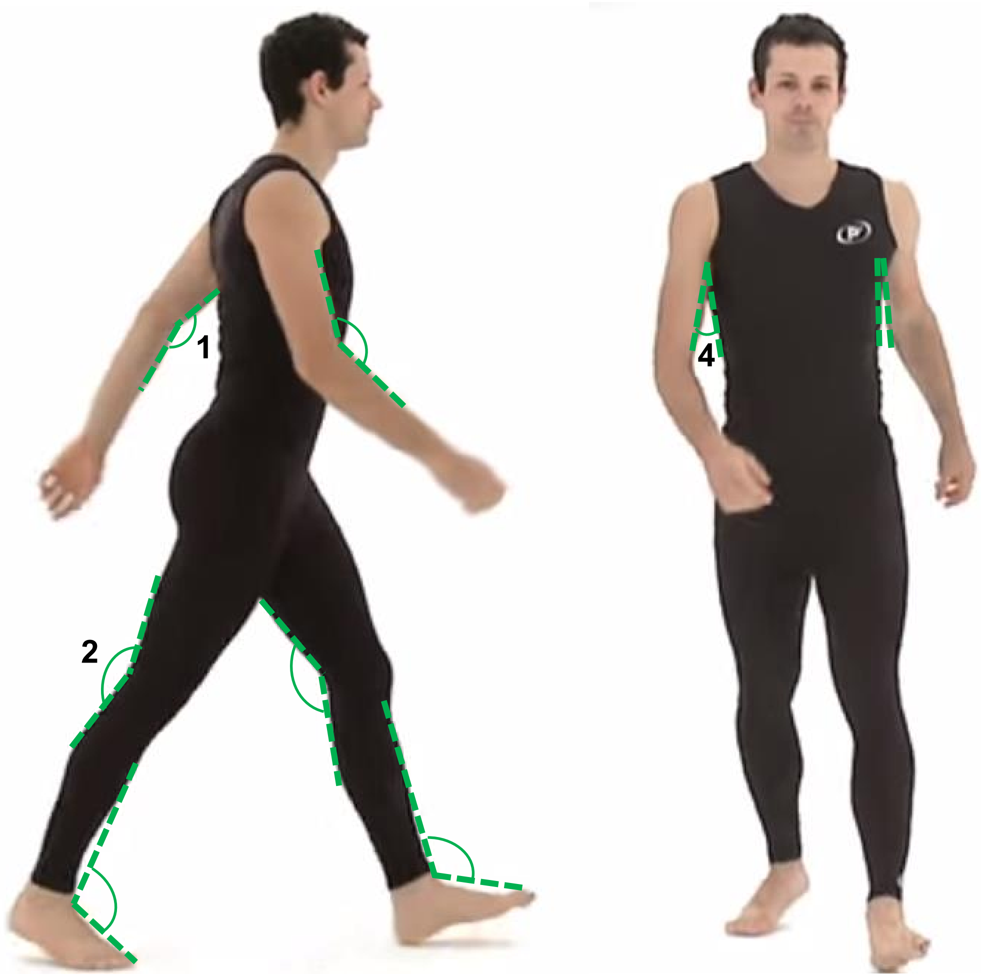


Figure 2.23 Angle Measurements (as adapted from YouTube, 2011). The variables that were measured are detailed within Table 4.12 below.

Table 2.11 Anatomical Landmarks and Abbreviations for Dynamic Measurements. The anatomical landmarks were first determined prior to angle measurement as listed within the table.

Anatomical Landmark (Walking) Angles	Abbreviations	Source
1. Elbow Flexion	From GHJ to antecubital fossa, from antecubital fossa to Styloid process	NASA, 2008
2. Knee Flexion	From mid posterior thigh to mid-calf	Anderson and Araujo, 2015
3. Ankle Flexion	From inferior of knee to talocrural joint, from talocrural joint to hallux	Anderson and Araujo, 2015
4. Shoulder – Body Distance Angle	From antecubital fossa to armpit, from armpit to inward curve of waist	Author

Table 2.12 Anthropometric Landmarks of the Limbs. The descriptive landmarks itemised below plainly describe the precise locations of the points for measurement, and the source the landmark was adapted from.

Abbreviation	Name	Description of Location	Source Adapted From
GHJ	Gleno-Humeral Joint	The projecting point within the curved area of the shoulder (between the acromion and greater tuberosity) before a small descending dip where the shoulder joint is visualised.	Virtual Medical Centre, 2014
AcF	Antecubital Fossa	A triangular depression located on the anterior surface of the elbow joint. The centre point of the horizontal skin fold that runs along this area.	The Free Dictionary, 2014
D	Dactylion	The most distal point of the third phalanx of the hand. The tip of the finger.	Kent, 2006
StyP	Styloid Process	Can be located on the distal end of the radius, specifically the side of the hand that contains the thumb. It is the most protruding point of the wrist and is visualised by a bump. A horizontal line is drawn from this styloid process (bump) and the middle point is the point of measurement.	Lippert, 2006
StyP/Ra	Styloid Process of Radius	Can be located on the distal end of the radius, specifically the side of the hand that contains the smallest finger (5th Phalanx). It is the most protruding point of the wrist and is visualised by a bump. A horizontal line is drawn from this styloid process (bump) and the middle point is the point of measurement.	Lippert, 2006
StyP/Ul	Styloid Process of Ulna	Can be located on the distal end of the radius, specifically the side of the hand that contains the smallest finger (5th Phalanx). It is the most protruding point of the wrist and is visualised by a bump. A horizontal line is drawn from this styloid process (bump) and the middle point is the point of measurement.	Lippert, 2006
PCen	Centre of Patella	In anterior view, the knee joint is located midway on the anterior side of the leg. The round protrusion containing the patella bone is embedded within the tendon of the muscles around the knee. The centremost point (from all directions) is located. A horizontal line is drawn from this point to the most medial and lateral points to measure the knee width.	Saladin, 2007
KJ	Outermost Point of Knee Joint	In anterior view, the most medial and lateral points that are the resultant of a horizontal line drawn from the Centre point of the patellar (Pcen).	Saladin, 2007
MedKJ	Medial Knee Joint	The outermost medial point of the leg (horizontal line drawn from the centremost point of knee)	Saladin, 2007
LatKJ	Lateral Knee Joint	The outermost lateral point of the leg (horizontal line drawn from the centremost point of knee)	Saladin, 2007
PI	Inferior Patellar	In anterior view, the centremost inferior point of the rounded knee cap.	Saladin, 2007
Cr	Crotch	The bottom of the pelvis (soft tissue or genitalia), inferior to the pubic tubercle, where the legs articulate with the pelvis of the body. A horizontal line is drawn across the bottom of the pelvis.	
HaIn	Inferior Hallux	In anterior view, the most inferior point of the big toe of the foot that is closest to the ground surface. The centre of this point is located for measurement.	Saladin, 2007
Mal	Malleolus	The most lateral and medial projections of the distal tibia and fibula of the lower leg. A small bump on either sides of the ankle joint are located and a line is drawn to connect these points horizontally. The centre of this line is the point used for measurement.	Simmons, 2001
LatMal	Lateral Malleolus	The most lateral projection of the distal tibia and fibula of the lower leg.	Simmons, 2001
MedMal	Medial Malleolus	The most medial projection of the distal tibia and fibula of the lower leg.	Simmons, 2001
CMal	Centre of Malleolus	The centermost point of the horizontal line drawn from the Malleolus (Mal) measurement.	Simmons, 2001
Phx	Phalanx	The bony projection of the first phalanx located on the outermost medial surface of the foot, visualised by a bump (also known as the metatarsophalangeal joint) of the hallux (toe).	Saladin, 2007
M5	Metatarsal 5	The outermost bony projection of the lateral surface of the foot, generally visualised with a small bump proximal to the (5th) metatarsal of the foot.	Saladin, 2007
Gtr	Greater Trochanter	The outermost projecting points located on either sides of the hips. A horizontal line is drawn between these points.	Saladin, 2007

PP	Protruding point of Patella	In Profile view, the most protruding surface point of the patellar is located.	Saladin, 2007
Ha	Hallux	In profile view, the most distal aspect of the hallux	Saladin, 2007
Ca	Calcaneus	In profile view, the outermost projection on the surface heel of the foot	Saladin, 2007
V	Vertex	The highest point on the apex of the head.	Garwin, 2006
PopF	Popliteal Fossa	The hollow area behind the knee located posteriorly to the patellar. The outermost point of the posterior surface where a skin crease/fold is present is the point for measurement.	Human Anatomy Online, 2014
CaIn	Inferior Calcaneus	In posterior view, the centremost inferior point within heel of the foot, closest to the ground surface	Saladin, 2007
UFT	Upper Fibres of Trapezius muscle	Upper fibres of the trapezius muscle, at the base of the neck, at the centre of where it dips before it follows along the trapezius muscle	Saladin, 2007
JugN	Jugular Notch	The centre of the jugular notch (superior border of the manubrium), located in between both left and right clavicle where a depression in the skin forms a 'V' shape	Saladin, 2007
SupIng	Superior Inguinal region	The centermost point of the superior inguinal region which lines up with the thigh (proximal femur). Where the skin of the upper leg folds from the pelvis region taking a step.	Saladin, 2007
LoUmb	Lower region of umbilicus	Below the umbilicus where the hips start flaring out to anatomically accommodate the pelvic bone. The blue dotted line is the umbilicus.	Saladin, 2007
Ch	Most inferior point of chin	The inferior most centre point of the mandible.	Saladin, 2007

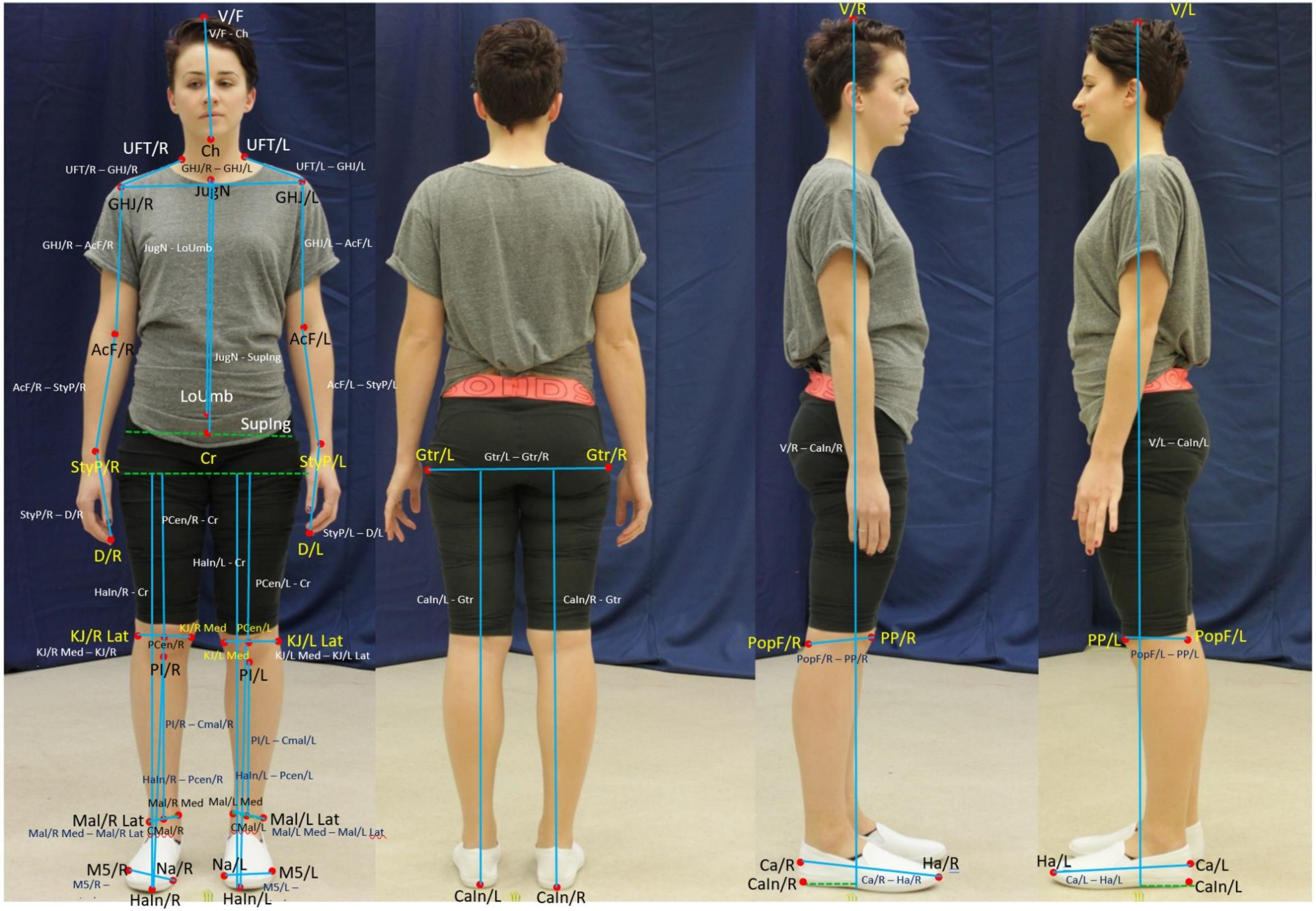


Figure 2.24 Anthropometric Measurements Taken from all Views. Further detail is provided within the Morphometric Manual (Supplementary 1).

Next, the comparison of whether 'normal' or 'anatomical' stance assessment of a participant was considered. The anatomical position of a person can be defined as an upright position with the palms of the hands facing anteriorly (forward) with feet together, facing forward with the supination of forearms (see Figure 2.25), where the forearm rotates externally and the thumbs are lateral to the midline (Croney, 1981; Kendall *et al.*, 2005). The "normal" position within this research is considered as a comfortable upright position with no exaggeration of posture, comfortable position of feet and limbs (*ibid*). Therefore, to view stance and gait patterns, subjects were asked to stand and walk as they do on a daily basis, with no instructions of hand and feet placement. Standing was also assessed within this study as although generally persons from CCTV footage are observed in motion, there are instances where they are seen to be standing, for instance if they are waiting for the right moment to accomplish any activity of interest. There are three types of stance observed by Wang and Newell (2012); [1] perpendicular standing posture[11], [2] asymmetrical stance[12], and [3] symmetrical stance[13]. These different stances are important to note, especially during a forensic procedures scenario when data is being collected from the suspected person to compare to the trace.

Due to photographing/recording subjects in normal stance, an 'altered' measurements section was added to the manual when subjects wore clothing that obstructed anthropometric landmarks, or curled their fingers when being photographed for instance, cutting the tip of the finger from view. Therefore, an altered landmark was applied to accommodate for these feature variants (Supplementary 1).

Due to the attire of some people within the database, and as palpations are not realistic as it is not achievable from a trace, anatomical landmarks were at times difficult to locate; therefore, some landmarks required educated estimations. These were then also tested through repeatability studies and if they contained little observer error (Technical Error of measurement %TEM or Cohens Kappa), they were incorporated into the examination, with transparency on the observer performance. It should be noted that further research on reproducibility studies are required. Also due to normal stance, a variety of reasons (ranging from visibility of the variables, to attire, to poor repeatability) resulted in the exclusion of features. The list in both sections 2.3.7.1 and

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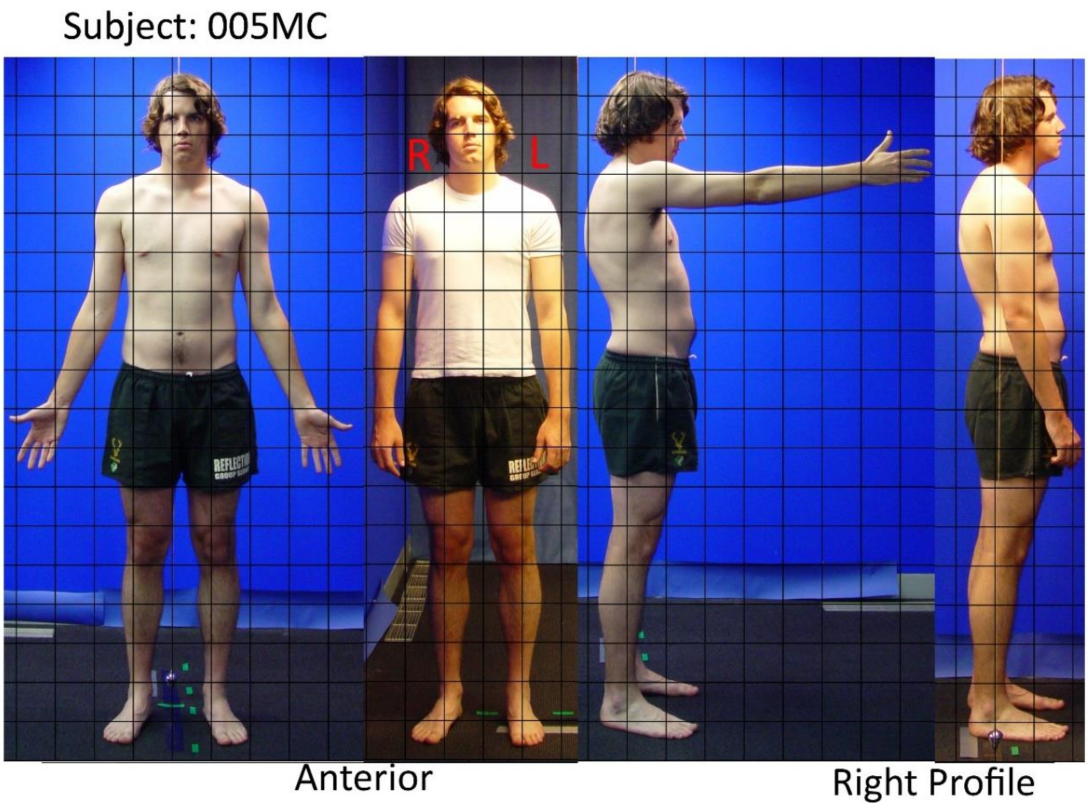
[11] Rigid position when asked to stand at attention (such as military) Wang and Newell (2012)
[12] When a person shifts from one leg to the other, leading to uneven weight distribution to the lower limbs Wang and Newell (2012)
[13] Equal weight distribution of the lower limbs Wang and Newell (2012)

2.3.7.2 indicates the final list used for analyses. A list including the excluded features can be found in the manual (Supplementary 1) as they may still be defined for future use.



(a) Anatomical *(b) Normal* *(c) Anatomical* *(d) Normal*

Figure 2.25 The "Anatomical" Position Compared to the "Normal" Position. This figure shows an example of the subject in both anatomical [(a) and (c)] and comfortable [(b) and (d)] stance positions.

2.3.7.2 Morphological Features

The combination of anthropometric measurements and morphological classifications allow a holistic assessment to ascertain variability among subjects. Since stance within this research is regarded as permanent and gait is transient, differing variables were developed for each. All phases and events within the gait cycle were assessed within the morphological features examination. Cases for gait analysis currently don't include measurements, but rather classifications, therefore, measurements outside of the 'norm' such as fashion sources were taken to adapt and implement within a forensic scenario.

Together with the features observed previously Seckiner (2014), 44 features were produced (72 for both limbs) with 142 subclassifications for stance, then further refined to 35 features for both limbs. From this, a total of 14 stance variables regarding the limbs were adopted, but further refined from Bradshaw, (2007), and Wright, (2012), to provide a full profile analysis. For gait, 39 classifications (63 for both limbs) and 118 subclassifications were produced then further refined to 51 features for both limbs. All features and their definitions are listed in Tables 2.13 and 2.14 for stance and gait respecively; features in blue were assessed in this research.

Table 2.13 Variables for Stance. The following table indicates morphometric variables produced within this research project.

Stance - Morphological Feature	Simple Definition
1. Head Level	The vertical movement and subsequent positioning of the head
2. Lateral Head Tilt	The ‘side-to-side’ tilting of the head
3. Projection of Head	The aligned or forward displacement of the head relative to plumb line (coronal plane)
4. Head Displacement	The aligned, left or right displacement of the head relative to the plumb line (sagittal plane)
5. Thoracic Projection	The levels of thoracic projection
6. Abdominal Projection	The levels of abdominal projection
7. Upper Torso Shape	The shape of the upper torso
8. Torso Musculature	The build of the muscles within the torso
9. Upper Thoracic Curvature	The curvature of the upper back within the upper thoracic region
10. Thoracic Curvature	The curvature of the back within the thoracic region
11. Lumbar Curvature	The curvature of the back within the lumbar region
12. Shoulder Level	The level of the shoulder in relation to the neck
13. Position of Shoulder	The alignment of the shoulder relative to the plumb line (coronal plane)
14. Rotational Position Shoulder	The rotational direction (medial/lateral) the shoulder assumes relative to the plumb line (sagittal plane)
15. Antero-Posterior Placement of Upper Arm	The placement of the upper arm antero-posteriorly relative to the plumb line (coronal plane)
16. Lateral Placement of Upper Arm	The abduction or adduction of the upper arm laterally relative to the plumb line (sagittal plane)
17. Upper Arm Muscle Definition	The build of the muscles within the upper arm
18. Antero-Posterior Placement of Forearm	The antero-posterior placement of the forearm relative to the position over thighs and further relative to the plumb line (coronal plane)
19. Lateral Placement of Forearm	The abduction or adduction of the lower arm laterally relative to the plumb line (sagittal plane)
20. Lateral Rotation of the Forearm	The rotational direction (medial/lateral), otherwise known as pronation and supination, that the forearm assumes relative to the plumb line (sagittal plane)
21. Lower Arm Muscle Definition	The build of the muscles within the lower arm
22. Antero-Posterior Placement of Hand	The antero-posterior placement of the hand relative to the position over thighs and further relative to the plumb line (coronal plane)
23. Lateral Rotation of the Hand	The rotational direction (medial/lateral), otherwise known as pronation and supination, that the hand assumes relative to the plumb line (sagittal plane)
24. Finger Flexion	The flexion or extension of the fingers
25. Antero-Posterior Pelvic Tilt	The antero-posterior tilting of the pelvis
26. Lateral Pelvic (Surface Anatomy) Asymmetry	The asymmetry of the surface anatomy of the pelvis, where the pelvis appears higher on the left or right side
27. Gluteal Projection	The levels of gluteal projection
28. Gluteal Shape	The shape of the gluteal region
29. Antero-Posterior Hip Deviation	The hips in relation to the abdomen are either flexed or extended
30. Lateral Hip Deviation	The deviation of the hips laterally (abduction) or medially (adduction)
31. Orientation of Lower Extremities	The levels of genu varum and genu valgum as a result of knee rotation
32. Lateral Placement of Upper Leg	The abduction or adduction of the upper leg laterally relative to the plumb line (sagittal plane)
33. Upper Leg Muscle Definition	The build of the muscles within the upper leg
34. Antero-Posterior Knee Joint Position	The extension or flexion of the knee relative to the plumb line (coronal plane)
35. Position/Orientation of the Knee Joint	The direction (medial/lateral) the knee assumes relative to the plumb line (sagittal plane)
36. Patellar Level	The elevated or depressed position the patella assumes, resultant of tendon and adipose distribution
37. Level of Infrapatellar Folds	The number of folds and level of adipose tissue distribution (considering the position of the tendon) within the distal (inferior) end of the knee

38. Lateral Placement of Lower Leg	The abduction or adduction of the lower leg laterally relative to the plumb line (sagittal plane)
39. Lower Leg Muscle Definition	The build of the muscles within the lower leg
40. Antero-Posterior Ankle Deviation	The plantarflexion or dorsiflexion of the ankle (giving the appearance of the lower limb of the leg leaning either backward or forward)
41. Lateral Ankle Deviation	The angling of the calcaneus towards (pronation - eversion) or away (supination - inversion) from the sagittal plumb line
42. Placement of Feet	The placement of feet laterally relative to the plumb line (sagittal plane)
43. Lateral Position of the foot	The positioning of the lateral area of the feet
44. Somatotype	The general body shape

Table 2.14 Variables for Gait. The following table indicates morphometric variables produced within this research project.

Phase	Gait - Morphological Feature	Definition
Backward Arm Swing	1. Lateral Placement of Upper Arm	The abduction or adduction of the upper arm laterally during backward arm swing
	2. Lateral Placement of Forearm	The abduction or adduction of the lower arm laterally during backward arm swing
	3. Rotation of the Forearm	The rotational direction (medial/lateral), otherwise known as pronation and supination, that the forearm assumes during backward arm swing
	4. Level of Elbow Flexion	The varying degrees of flexion observed within the elbow during backward arm swing
	5. Rotation of Hand	The rotational direction (medial/lateral), otherwise known as pronation and supination, that the hand assumes during backward arm swing
	6. Finger Flexion	The flexion or extension of the fingers during backward arm swing
Forward Arm Swing	7. Lateral Placement of Upper Arm	The abduction or adduction of the upper arm laterally during forward arm swing
	8. Lateral Placement of Forearm	The abduction or adduction of the lower arm laterally during forward arm swing
	9. Rotation of the Forearm	The rotational direction (medial/lateral), otherwise known as pronation and supination, that the forearm assumes during forward arm swing
	10. Level of Elbow Flexion	The varying degrees of flexion observed within the elbow during forward arm swing
	11. Rotation of Hand	The rotational direction (medial/lateral), otherwise known as pronation and supination, that the hand assumes during forward arm swing
	12. Finger Flexion	The flexion or extension of the fingers during forward arm swing
Complete Cycle	13. Lateral Trunk Sway	The lateral sway of the body (from side to side) observed during multiple gait cycles
	14. Orientation of Lower Extremities	The levels of genu varum and genu valgum as a result of knee rotation
Midstance	15. Head Level	The vertical movement and subsequent positioning of the head during midstance
	16. Lateral Head Tilt	The 'side-to-side' tilting of the head during midstance
	17. Shoulder Level	The level of the shoulder in relation to the neck during midstance
	18. Lateral Placement of Upper Arm	The abduction or adduction of the upper arm laterally during midstance
	19. Lateral Placement of Forearm	The abduction or adduction of the lower arm laterally during midstance
	20. Level of Elbow Flexion	The varying degrees of flexion observed within the elbow during midstance
	21. Rotation of Hand	The rotational direction (medial/lateral), otherwise known as pronation and supination, that the hand assumes during midstance
	22. Finger Flexion	The flexion or extension of the fingers during midstance
	23. Thoracic Projection	The levels of thoracic projection during midstance
	24. Abdominal Projection	The levels of abdominal projection during midstance
	25. Upper Thoracic Curvature	The curvature of the upper back within the upper thoracic region during midstance
	26. Thoracic Curvature	The curvature of the back within the thoracic region during midstance
	27. Lumbar Curvature	The curvature of the back within the lumbar region during midstance
	28. Gluteal Shape	The shape of the gluteal region
	32. Lateral Placement of Upper Leg	The abduction or adduction of the upper leg laterally during midstance
	32. Lateral Placement of Lower Leg	The abduction or adduction of the lower leg laterally during midstance
	33. Knee Flexion	The varying degrees of flexion observed within the knee during midstance
	34. Placement of Feet	The placement of feet laterally during midstance
	35. Lateral Position of the Foot	The positioning of the lateral area of the feet
Swing	36. Lateral Placement of Upper Leg	The abduction or adduction of the upper leg laterally during swing
	37. Lateral Placement of Lower Leg	The abduction or adduction of the lower leg laterally during swing
	38. Placement of Feet	The placement of feet laterally during swing
Full Body	39. Somatotype	The general body shape

2.3.8 Data Processing of Images and Footage

Preceding the analysis, footage was reviewed, cut into stills and then compiled into standardised templates. Images were resized and compiled into separate templates, with a grid overlaid. Following this, variables were measured and classified by referring to templates developed.

Before the morphometric assessment was conducted, the gait footage was observed multiple times using VLC Media Player, then cut into still frames via Free Studio software. This process was repeated for all subjects recruited and recorded. Still frames were then resized and compiled into standardised templates (Figure 2.26).

Normalisation of subjects, where the whole body fits into the image (Figure 2.17), allows analysis via proportional indices. The purpose of the proportional indices allowed the proportions of an individual to be examined rather than the measurements related to ground truth – thus allowing a more accurate technique to facilitate photo-comparative analysis of trace and reference materials. Subjects were photographed, images were proportionally resized via the 'transform to scale' tool on Photoshop. Depending on the height of the subject, images were increased approximately 30–40% of their original height. The image was then overlaid with a removable 1cm x 1cm grid. Size was reduced manually to avoid image compression. Images were anthropometrically measured within Photoshop whereas the raw cut still and footage was used for morphological analysis. The template for gait mimics the format and the number of steps varied per subject due to the differences in step length, however, participants were asked to walk back and forth along predetermined paths a total of four times each pathway so that features from anterior, posterior and profile views could be developed and extracted. procedure applied for stance templates. A total of four images per volunteer were cut for stance and eight per volunteer for gait, resized and placed into templates and a plumb line was then added via Photoshop. The eight frames that were selected for anthropometric measurements allowed the anatomical landmarks to be marked, so measurements could be taken.

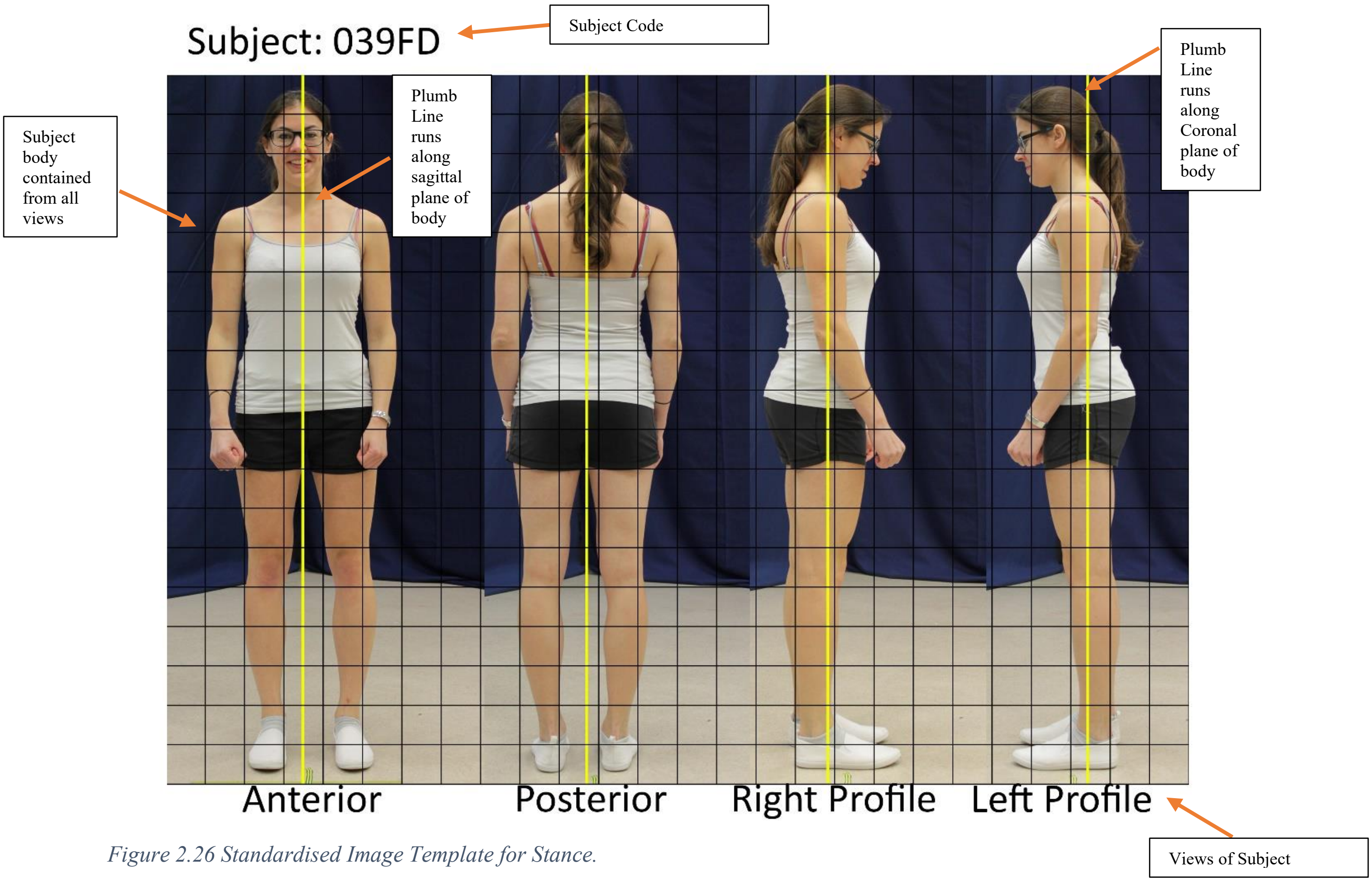


Figure 2.26 Standardised Image Template for Stance.

2.3.9 The User Manual

A user manual and datasheets were developed to produce a standardised protocol, which can be referred to during analysis (so anthropometric landmarks and morphometric descriptors can be followed with precision by trained personnel) (Appendix B). For anthropometric assessments, the measuring tool in Photoshop was applied and values obtained, transferred onto Excel spreadsheets and converted into indices to eliminate the issue of scale between measurements. The usage of indices[14] disregards image size, therefore allowing comparison of proportions. Furthermore, features that were eliminated due to visual obstruction (i.e. as the result of clothing), were included within the manual for future assessment that might be available as visible features differ on a case-by-case basis as some features are observed, while others might not be seen.

[14] By dividing the anthropometric measurement by the total sum of all measurements, indices are attained, subsequently proportions will be compared instead of sizes: Indices = $\frac{Anthropometric\ Measurement}{Total\ sum\ of\ all\ the\ Measurements}$

Categorical values obtained from morphological features (ordinal data) was recorded on separate datasheets for stance and gait, then later converted into dichotomous (nominal data).

2.3.9.1 Manual for Stance and Gait

The manual is comprised of two main components; 'Part 1: Stance' and 'Part 2: Gait'. Within these components, directions to locate anthropometric landmarks are explained in detail through points placed upon cropped images (Table 2.15 and Figure 2.27). For Table 2.15, the datasheet is filled out for both nominal and ordinal data, where the bold font within the ordinal category, depicts what category the subject's feature was classified from the options provided (posterior, neutral, anterior). The nominal shows a 'presence-absence' analysis where if a '2' was classified in the ordinal value, the nominal value would show a '0' in the first and third category, but it would display a '1' in the second category. Anthropometric measurements taken and classification of morphological variables are defined and described. Planes of the body, any adjustments applied, and datasheets are also provided for a holistic approach (Supplementary 1).

Table 2.15 Datasheet Example for Stance showing Nominal and Ordinal data. Ordinal and nominal data is filled out within the datasheets, where statistics are then applied.

Variable	View	Left/Right	Classification	Ordinal	Nominal
1. Position of the Upper Arm – Profile	Profile	Right	Posterior	1	0
			Neutral	**2**	1
			Anterior	3	0
		Left	Posterior	1	0
			Neutral	**2**	1
			Anterior	3	0

26 Lateral positioning of the feet

The positioning of the lateral area of the feet

Classification	Number	Description
Inner foot	1	The position appears distributed to the inner sides of the feet
Neutral	2	The position appears evenly distributed on the whole foot
Outer foot	3	The position appears distributed to the outer sides of the feet

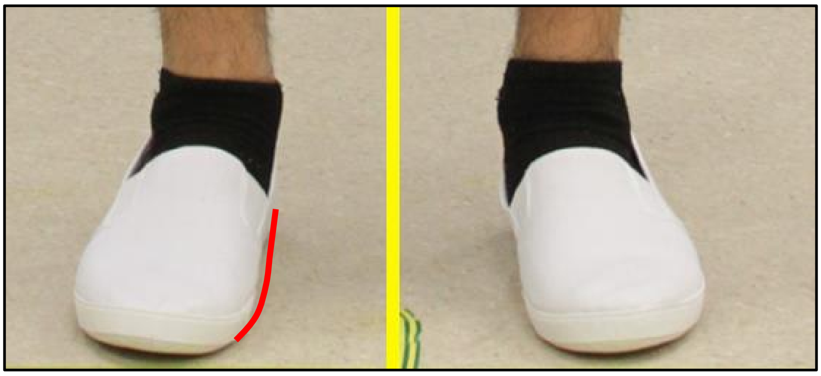


Figure 190 – Inner Foot

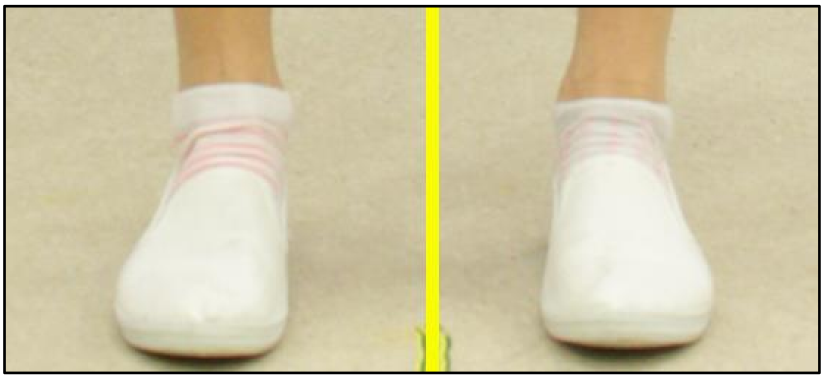


Figure 191 – Whole Foot

Figure 192 – Outer Foot

Figure 2.27 Sample of the Atlas. The Figure provides an example of one variable produced within this research project (Supplementary 1).

2.3.10 Data Collection Procedure

The classification and measurement of subjects was completed, then information tabulated into an Excel Spreadsheet, so statistical analyses were able to be conducted.

The number of steps varied per subject due to the differences in step length, however, participants were asked to walk back and forth along predetermined paths a total of four times each pathway so that features from anterior, posterior and profile views could be developed and extracted. Subjects were asked to stand facing the camera, and were directed to turn while their stance data was collected. This procedure was repeated twice for each subject. The gait cycle(s) was extracted when the subject was directly in line with the camera (each cycle extracted for four views of the body – total of four extracted gait cycles), which allowed room for acceleration and deceleration at the beginning and end of the walking pathways and also reduced potential geometric distortion. All data of the subjects was viewed repetitively where features that could be examined were extracted.

2.3.10.1 Anthropometry

Anthropometric landmarks were physically plotted into Photoshop, then measurements and angles were obtained through the measuring tool. For the anthropometric analysis, measurements were recorded (following repeatability studies of data collected from stance and gait [anthropometry and morphology]), tabulated within an Excel spreadsheet and converted to indices. Following this, statistical analyses were completed including Principle Component Analysis and Linear Discriminant Analysis.

2.3.10.2 Morphology

Morphological assessments were conducted on the footage and cut stills and recorded onto Excel spreadsheets, followed by statistical analyses including Correspondence Analysis and Linear Discriminant Analysis.

2.3.11 Statistics for Error Analyses: Anthropometry and Morphology

For anthropometry, Technical Error of Measurement[15] (TEM%) was used to determine the standard deviation amongst repeated measures, thus concluding the precision of the observer (Arroyo *et al.*, 2010; Goto and Mascie-Taylor, 2007).

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[15] Technical error of measurement (TEM%) is used to measure precision between observers, thus determining the standard deviation amongst repeated measures (Arroyo *et al.*, 2010; Goto and Mascie-Taylor, 2007). The International Society for Advancement of Kinanthropometry (ISAK) determined that an error value above 1.5%

For morphology, measuring the inter-observer presence of true agreement and comparing to the amount of agreement based on chance is known as Cohen's Kappa statistic[16] (Table 2.16) (Viera and Garrett, 2005). If values are above 0.5, they are considered reliable, whereas variables that fall below the 0.5 threshold are considered as unreliable as a result of lacking reproducibility and reliability. If such results are obtained where they are considered unreliable, further refinement of such variables are recommended. To assess the agreement of values, Minitab Statistical software was used.

Table 2.16 The Interpretation of the Kappa Values (Kurande et al., 2013). The above figure indicates the kappa values and the corresponding level of agreement of the results that are produced from the error study.

Kappa Value	**Strength of Reliability**
<0.0	Poor
0.01- 0.20	Slight
0.21 – 0.40	Fair
0.41 – 0.60	Moderate
0.61 – 0.80	Substantial
0.81 – 1.00	Almost Perfect

2.3.11.1 Repeatability Studies

To determine repeatability of the analysis an intra-observer error study was performed, thus permitting interpretation of features over a period of time. Repeatability studies, using the guidance of the atlas were conducted multiple times (by a single observer) for anthropometry (static/dynamic/angles) by assessment of 5 male and 5 female subjects (total of 10) randomly selected from the database. By using Adobe Photoshop, morphometric analysis was conducted and data was recorded on Microsoft Excel spreadsheets and Minitab.

Following the repeatability studies for the plumb line placement, repeatability studies were completed for both morphology and anthropometry variables. These were conducted more than three times to allow refinement/training as well as determine the most recent error rates. This was carried out to monitor repeatability to determine whether levels of error increase or decrease over time.

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for intra-observer was too excessive and further training to minimise the variability is required (Perini *et al.*, 2005).

[16] A Kappa value of 1 shows a perfect agreement, whereas a kappa value of 0 indicates an agreement dependent on chance (Viera and Garrett, 2005). Furthermore, a value below 0 demonstrates a less than chance agreement (*ibid*). The significant difference of the results are determined by the p-value (95% confidence interval) (*ibid*).

2.4 Results

This section highlights the results attained following the photography trials, development of the manual and recruitment of participants. The final camera settings, demographic, repeatability studies are tabulated.

2.4.1 Final Camera Settings

Following various trials with two types of cameras and in different rooms using video and transition shots, the Cannon 70D produced the highest quality images from observational analyses. All images and videos were captured as detailed in Table 2.17.

Table 2.17 Final Camera Settings. The subsequent table outlines the final camera settings that will be applied within the PhD research as a result of photographic standardisation.

	Setting	Details	Justification
Photography	Mode and mode dial	Mode: Photography Mode Dial: Tv	To enable the photos captured to be consistent with those captured during gait. The Video mode photograph provided ideal photographs easily analysed
	F-Stop	1.4	Automatic video mode adjusts the f-stop (field of view) depending on the object/person photographed to provide optimum images
	Focal Length	50mm	To avoid any possible perspective distortions, a zoom matched closely with that of the human eyes were adopted to eliminate such distortions
	Flash	Off	Was avoided to prevent any over exposure of light that may inhibit any features on the body from visibility
	Extensions	None	Tripod was used to keep camera in consistent height and position
	Offset	None	To eliminate any possible geometric distortion
	Height	Umbilicus level of subject (1.1m)	To avoid any angling of the camera which may cause a distortion
	ISO	400	The camera adjusts the ISO (sensitivity of the camera to light) automatically to provide the optimum settings
	Distance	Between 10.66m to 5.43m	Distance of camera to subject to eliminate any perspective distortion or blur
	Attachment	Canon RS-60E3	To enable high shutter photography by holding down the image
	Exposure time	1/250 sec	The time the shutter is open, allowing light into the digital sensor is known as the exposure time. Too long leads to overexposed images and vice versa
Video	Mode and mode dial	Mode: Video Mode Dial: Tv	Video mode was the only option available to capture subjects in motion
	F-Stop	5.6	Automatic video mode adjusts the f-stop (field of view) depending on the object/person recorded to provide optimum images
	Focal Length	50mm	To avoid any possible perspective distortions, a zoom matched closely with that of the human eyes were adopted to eliminate such distortions
	Flash	Off	Was avoided to prevent any over exposure of light that may inhibit any features on the body from visibility
	Extensions	None	Tripod was used to keep camera in consistent height and position
	Offset	From furthest Left to the Furthest Right of the camera view	Presence of geometric distortion whilst subjects are walking is unavoidable due to constraints within the room. However, as subjects walked backwards and forwards multiple times, the gait phase analysed were captured directly from the same horizontal plane, hence eliminating distortion from those images
	Height	Umbilicus level of subject (1.1m)	To avoid any angling of the camera which may cause a distortion

	ISO	1000 - 1600	The camera adjusts the ISO (sensitivity of the camera to light) automatically to provide the optimum settings
	Shutter Speed	25 fps	The video mode was set at automatic and optimum images were obtained at film standard
	Distance	Between 10.66m to 5.43m	Distance of camera to subject to eliminate any perspective distortion or blur

2.4.2 Demographic

Tables 2.18 and 2.19 highlight the demographic of the participants that were recruited (age, sex, ancestry), including the data available in previous years leading up to this study.

Table 2.18 Tabulated Population Database. Indicating the quantity of images within the standardised database collected from 2007 to 2017.

Type of footage	**Year**	**Total subjects within database**	**Total subjects for analysis**
Stance	2006	30	386
	2012	84	
	2014	42	
	2017	230	
Gait	2014	41	271
	2017	230	

Table 2.19 Subject Demographic. The following table indicates the Sex, Age and Ancestry of the volunteers analysed.

Stance		**Gait**	
Sex	**Total for M/F**	**Sex**	**Total for M/F**
Male	182	Male	130
Female	201	Female	138
Age	**Total for Age**	**Age**	**Total for Age**
18-29 (Group 1)	217	18-29	129
30-49 (Group 2)	53	29-49	40
50+ (Group 3)	113	50+	99
Ancestry	**Total for Ancestry**	**Ancestry**	**Total for Ancestry**
Caucasian	311	Caucasian	229
Asian	54	Asian	30
Other	18	Other	9
Total subjects	**383**	**Total subjects**	**268**

2.4.2.1 Stance Demographic

Pie charts were completed for the demographic to show the percentage of each group and sub-group, to highlight whether adequate numbers are available within each group for statistical analyses. Within stance, males (182) and females (201) were relatively even in numbers. In age, the 18 – 29 group (217) was the highest, followed by 50+ (113) and the smallest group was 30 – 49 (53). For ancestry, Caucasians (311) were the largest group, followed by Asian (54) and 'Other' (18). These are all highlighted in Figures 2.28 and 2.29.

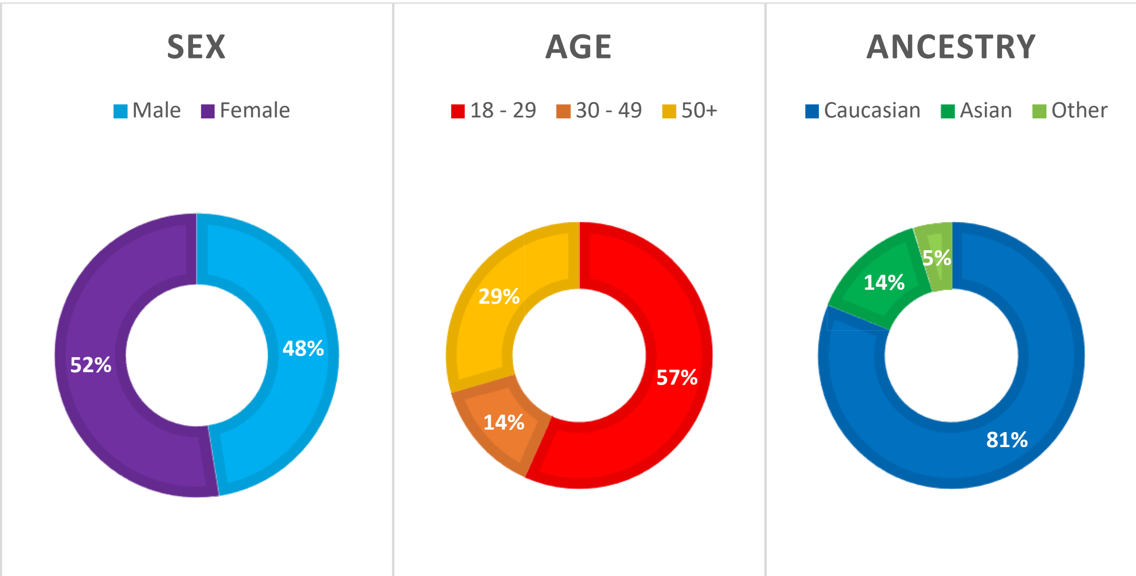


Figure 2.28 Demographic for Stance. Pie graphs for sex, age and ancestry for stance indicate the percentage of each group relative to one another.

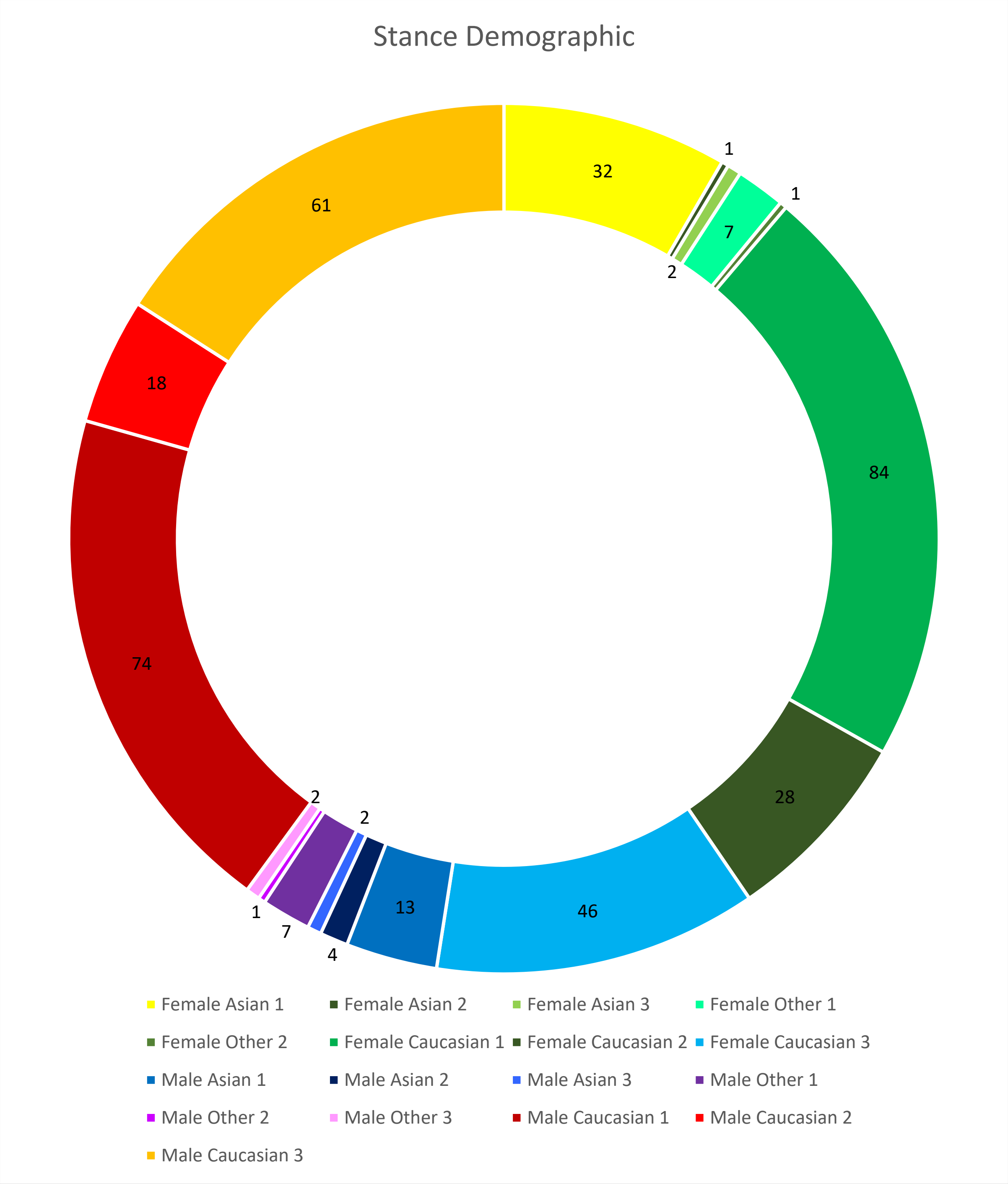


Figure 2.29 Full Demographic for Stance. Further pie graphs were generated for stance to look at all three age (categorised as numbers 1, 2 and 3 – please refer to Table 2.19), sex and ancestry groups combined, showing that the largest groups were 'Female Caucasian 1' and 'Male Caucasian 1'.

2.4.2.2 Gait Demographic

Pie charts were compiled to show the percentage of each group and sub-group to highlight whether adequate numbers within the demographic were available for statistical analyses. Within gait, males (130) and females (138) were relatively even in numbers; whereas for ancestry, Caucasians (229) were the largest group, followed by Asian (30) and finally 'Other' (9). In age, group 18 – 29 (129) was the highest, followed by 50+ (99) and the smallest group was 30 – 49 (40). These are all highlighted within Figure 2.30 and Figure 2.31.

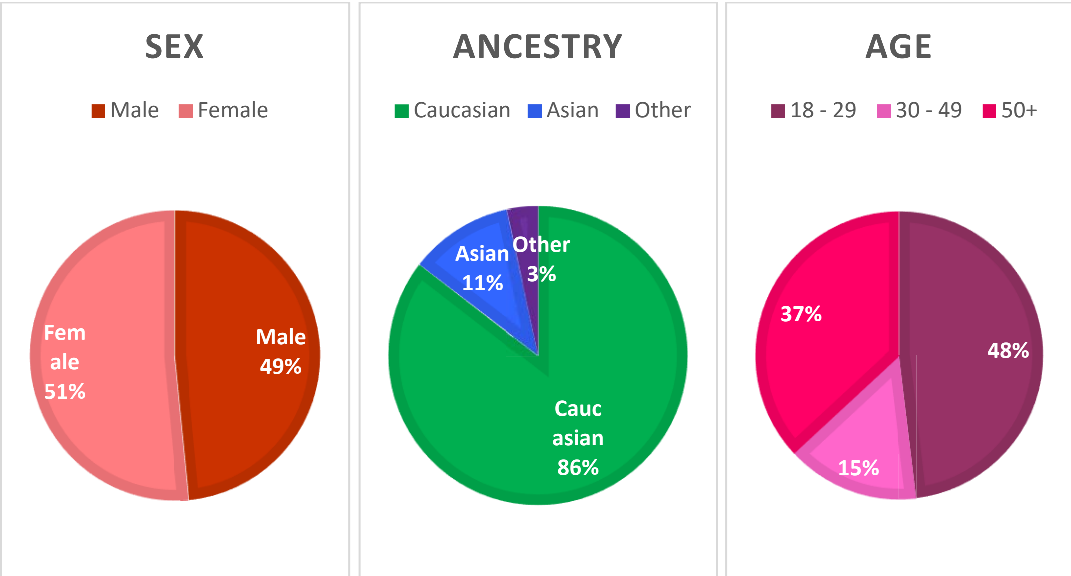


Figure 2.30 Demographic for Gait. Pie graphs for sex, age and ancestry for gait indicate the percentage of each group relative to one another.

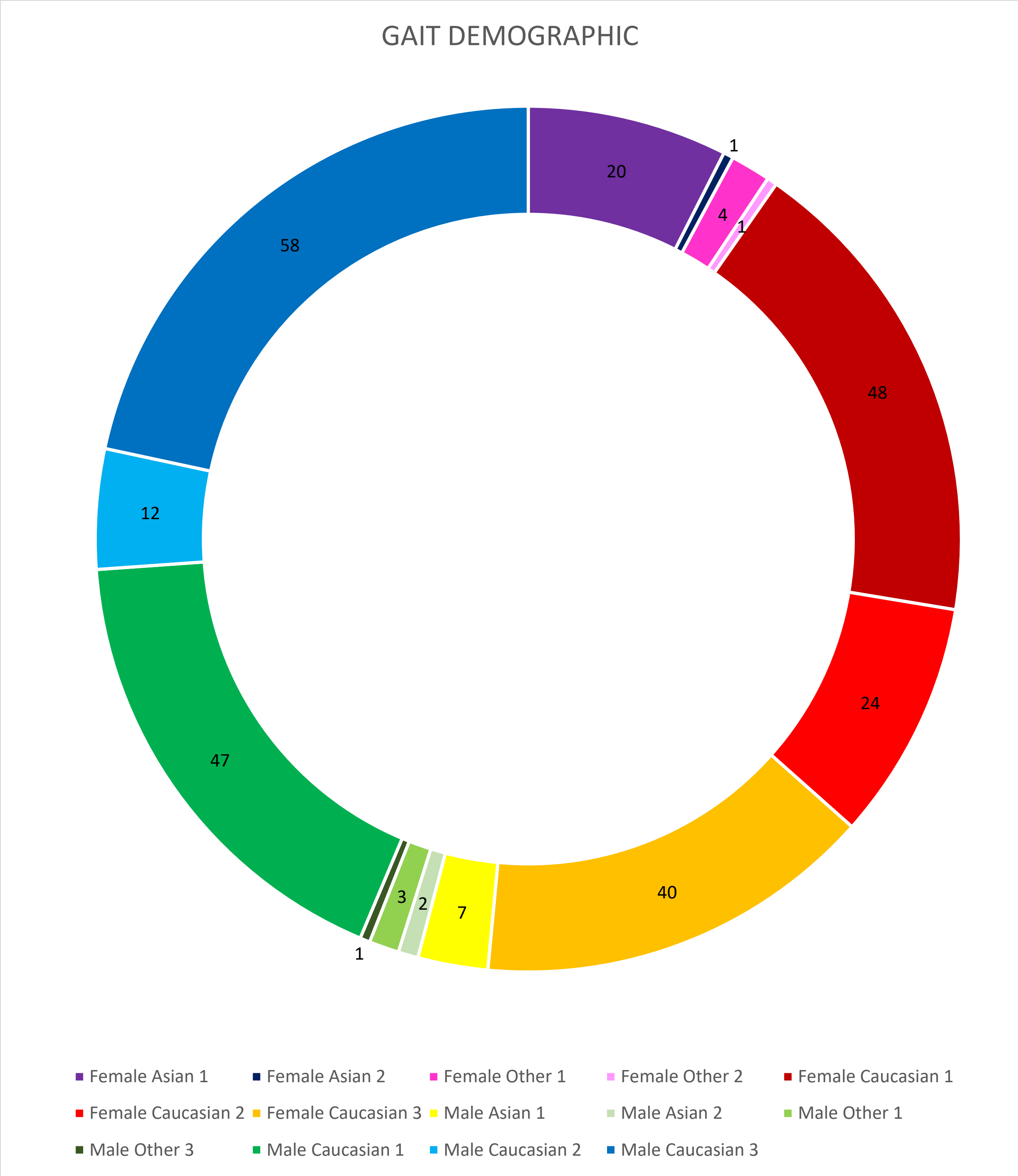


Figure 2.31 Full Demographic for Gait. Further pie graphs were generated for gait to look at all three age, sex and ancestry groups combined, showing that the largest groups were 'Female Caucasian 1' and 'Male Caucasian 3'.

2.4.3 Repeatability Assessment

Repeatability studies were completed and then calculated via either Technical Error of Measurement (%TEM) or Cohen's Kappa statistics. Following this, they were tabulated and graphed.

2.4.3.1 Plumb Line Repeatability Assessment

Plumb line repeatability studies were not completed for stance, as the placement has been established in previous studies by Kendall *et al.*, (2005). Repeatability study results from the plumb line assessment for gait, however, produced high levels of error in the position of the plumb line, rather than the length of it (Figure 2.32). The distance between the furthermost anterior/posterior points of the body to the midline, did not fall under the threshold, indicating that further refinement is necessary before it is repeated to determine accurate placement of plumb line for morphological assessment.

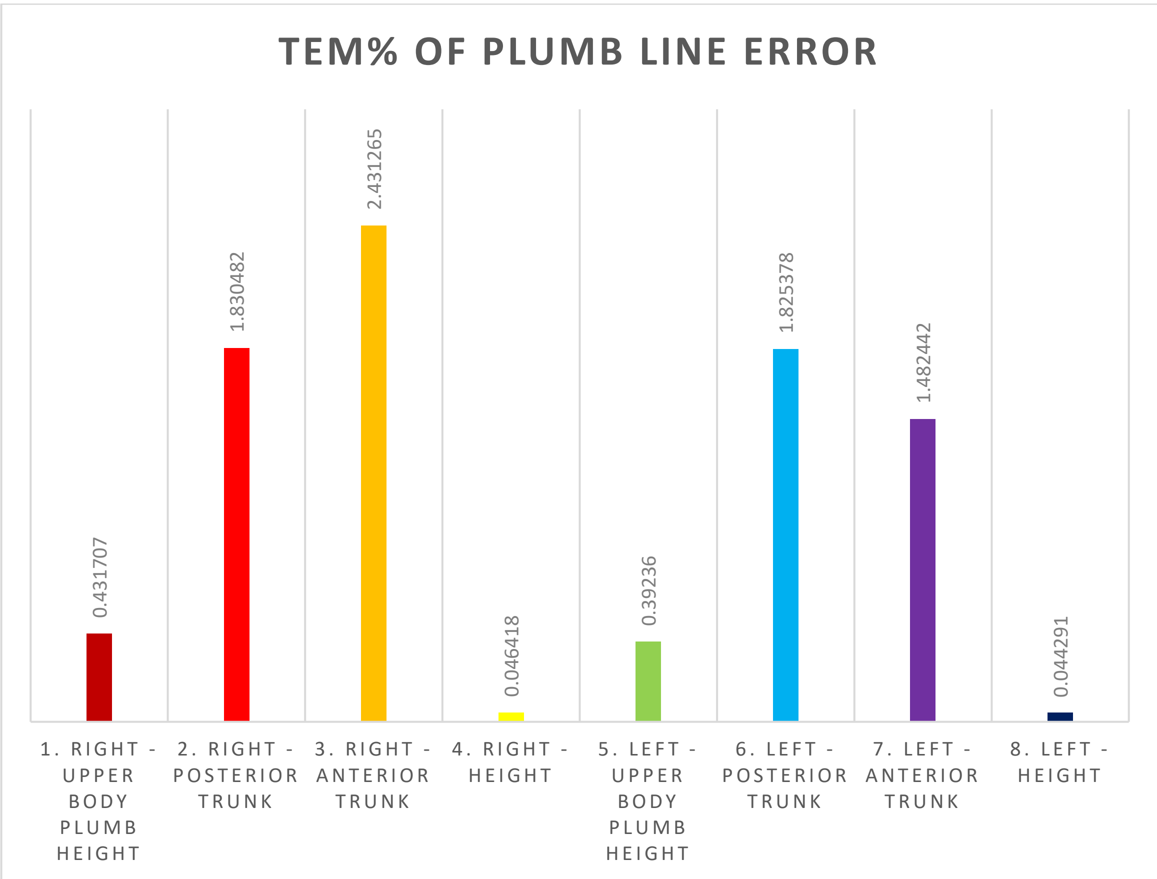


Figure 2.32 Plumb Line Error Study Results for Gait. The assessment of TEM% indicated the plumb line heights and the heights of the subjects fell well under the threshold. The remaining variables however exceeded the 1.5 value deemed acceptable by ISAK (Perini et al.*, 2005).*

2.4.3.2 Morphology Repeatability Assessment

Repeatability for both stance and gait were completed via Cohen's Kappa Statistics separately and the following results indicate that levels for both were acceptable; values that were under 0.5 were considered to have too much error within the repeatability studies. An unacceptably high error was observed in four features in gait and one in stance. For gait, 'backward arm swing: rotation of left hand', 'forward arm swing: level of elbow flexion of left arm', 'midstance: placement of right foot' and 'swing: lateral placement of lower right leg' (see Figure 2.33) and for stance, 'antero-posterior placement of right hand' contained higher levels of error compared to the remainder of features (see Figure 2.34).

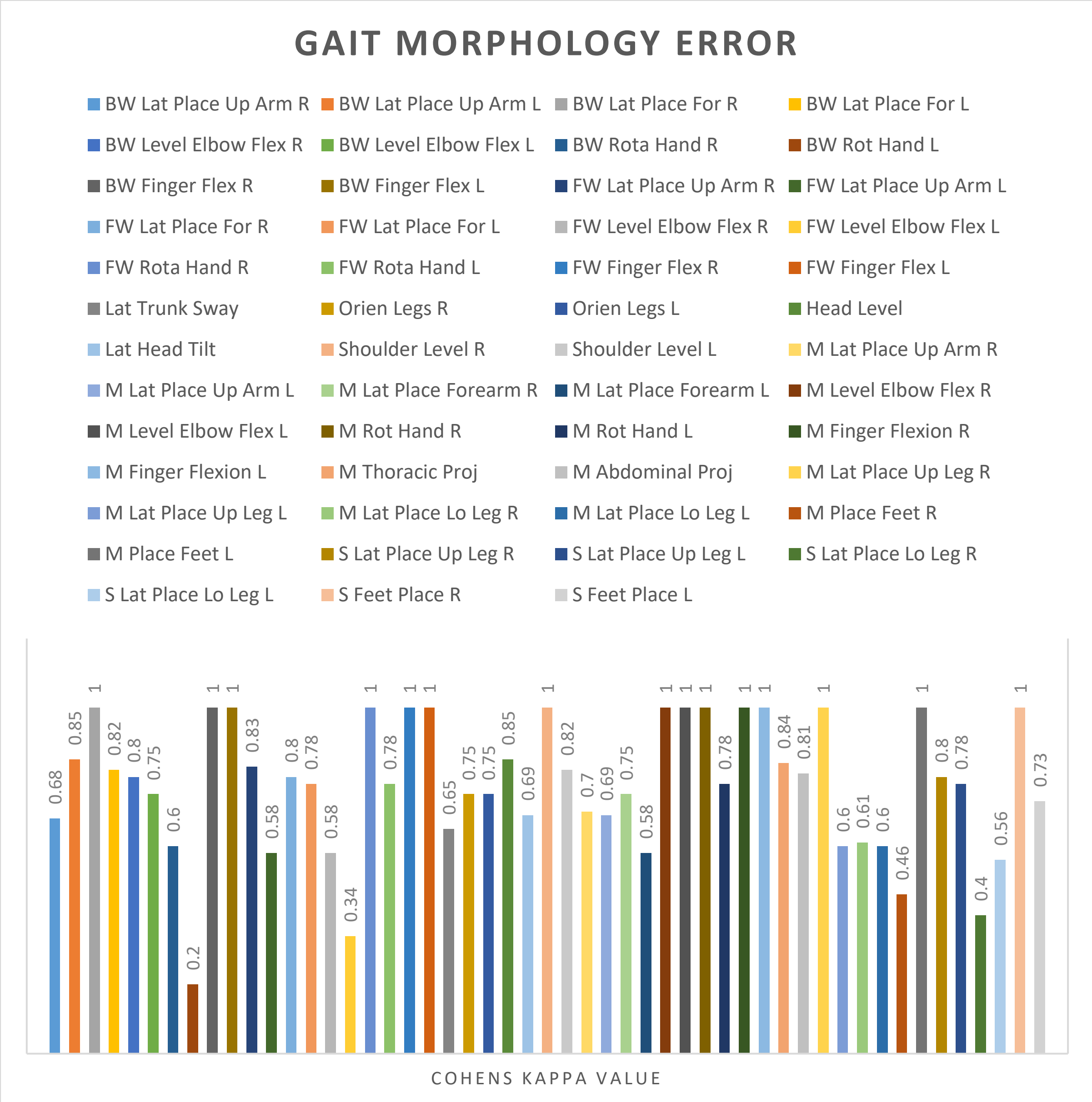


Figure 2.33 Repeatability Studies for Gait Using Cohen's Kappa Statistics. Cohen's Kappa results show that all variables show a true agreement above the 0.5 value, aside from 'backward arm swing: rotation of left hand', 'forward arm swing: level of elbow flexion of left arm', 'midstance: placement of right foot' and 'swing: lateral placement of lower right leg.

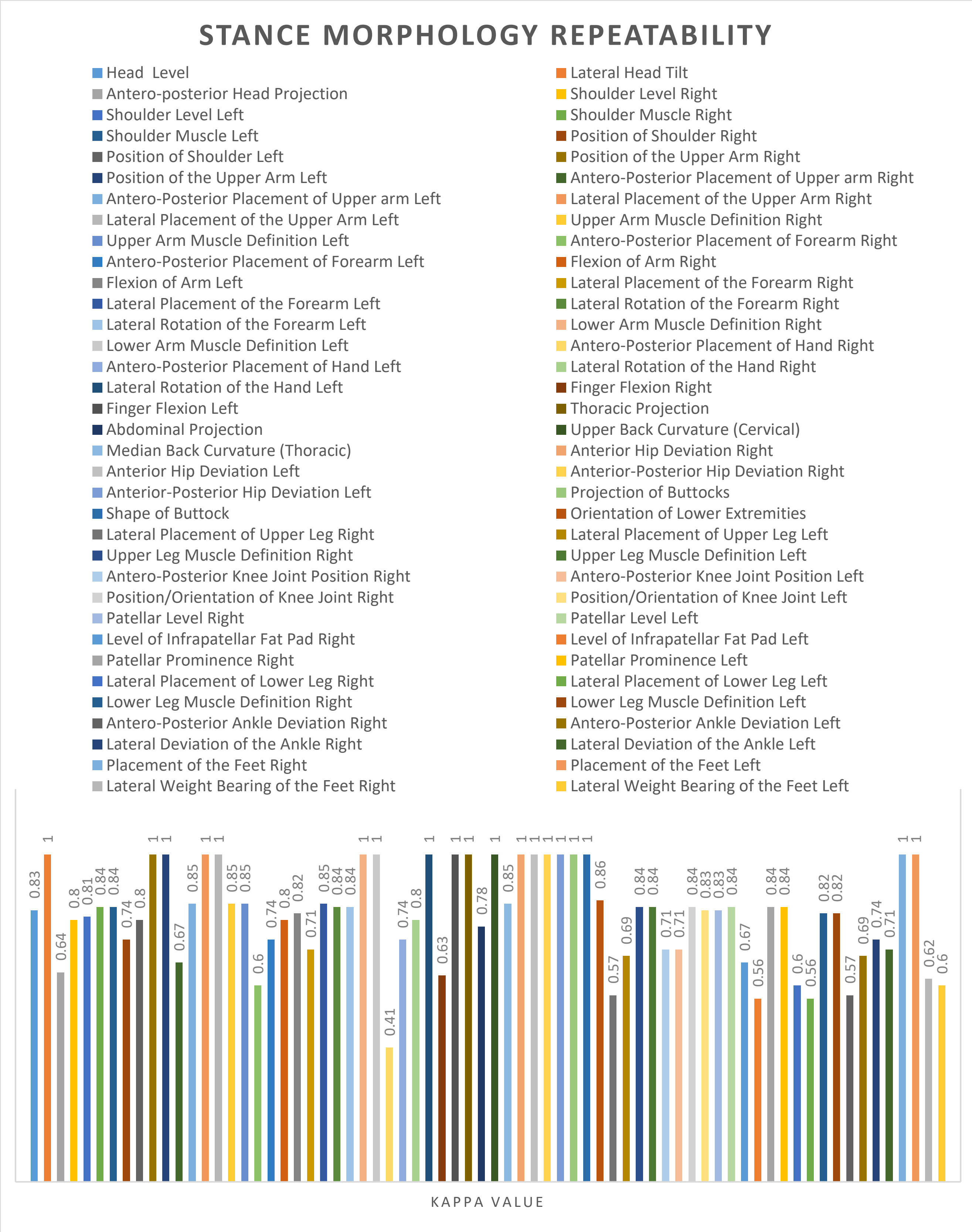


Figure 2.34 Repeatability Studies for Stance Using Cohen's Kappa Statistics. Cohen's Kappa results show that all variables show a true agreement above the 0.5 value, aside from 'antero-posterior placement of right hand'.

2.4.3.2 Anthropometry Repeatability Assessment

Anthropometric variables were developed for the purpose of accommodating static, dynamic, and angle measurements. All measurements for stance, gait static and gait dynamic error studies (aside from 'gait: Right Foot Width') fell beneath the threshold, indicating that there was minimal error and these variables were carried forward to the analysis phase (Figures 2.35 to 2.37). Some variables were eliminated for the dynamic measurements as there were limitations observing features due to the natural walking pattern of subjects. For angles however, significant error was obtained within all angle measurements (Figure 2.38). The measurements were eliminated from analysis as they were unfit for assessment due to the process being repeated (redefined) with unsuccessful results.

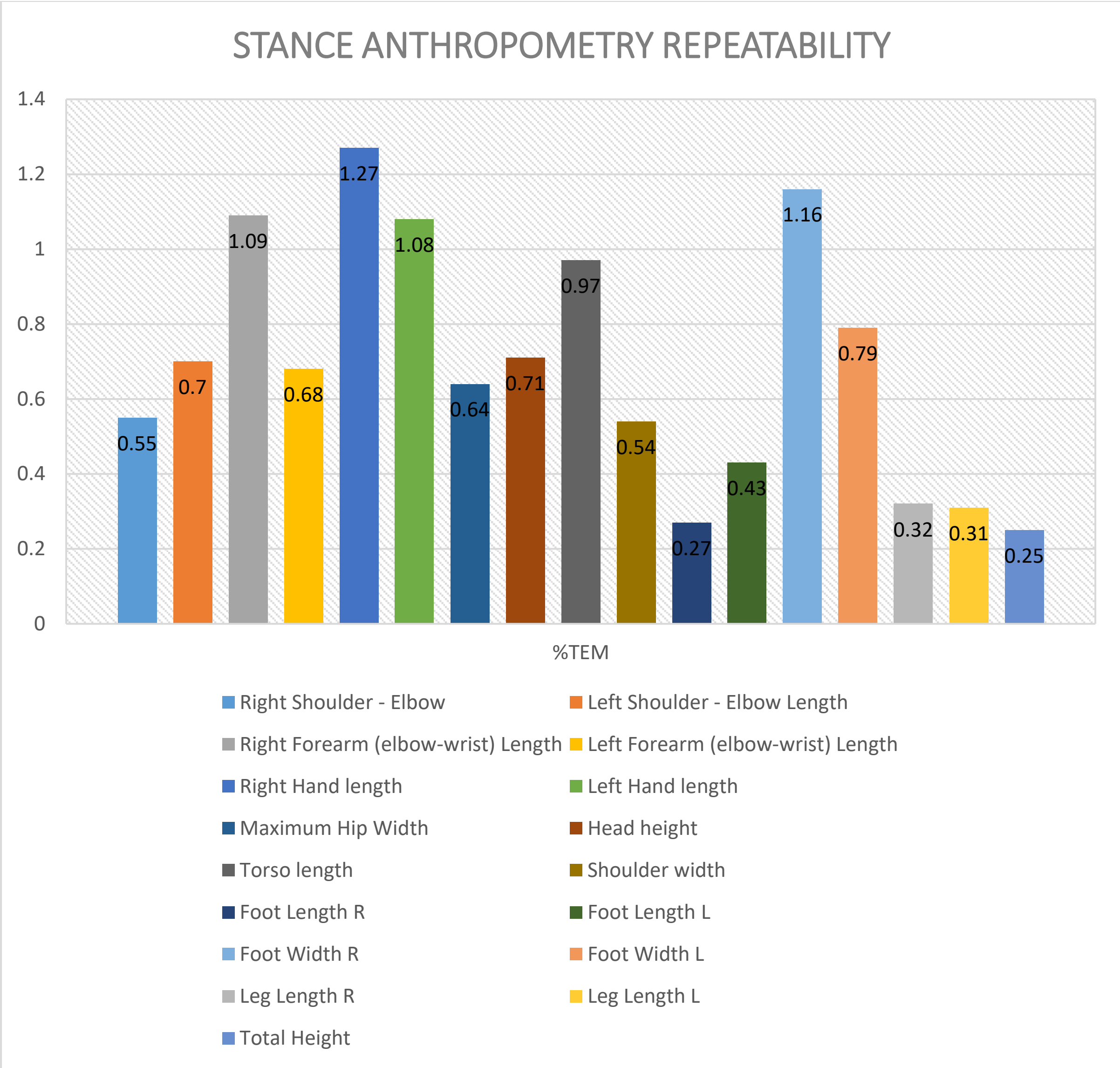


Figure 2.35 Stance Anthropometry Repeatability Study Results. The assessment of TEM% indicated that all variables fell well under the threshold, thus displaying that the operator displayed minimal error.

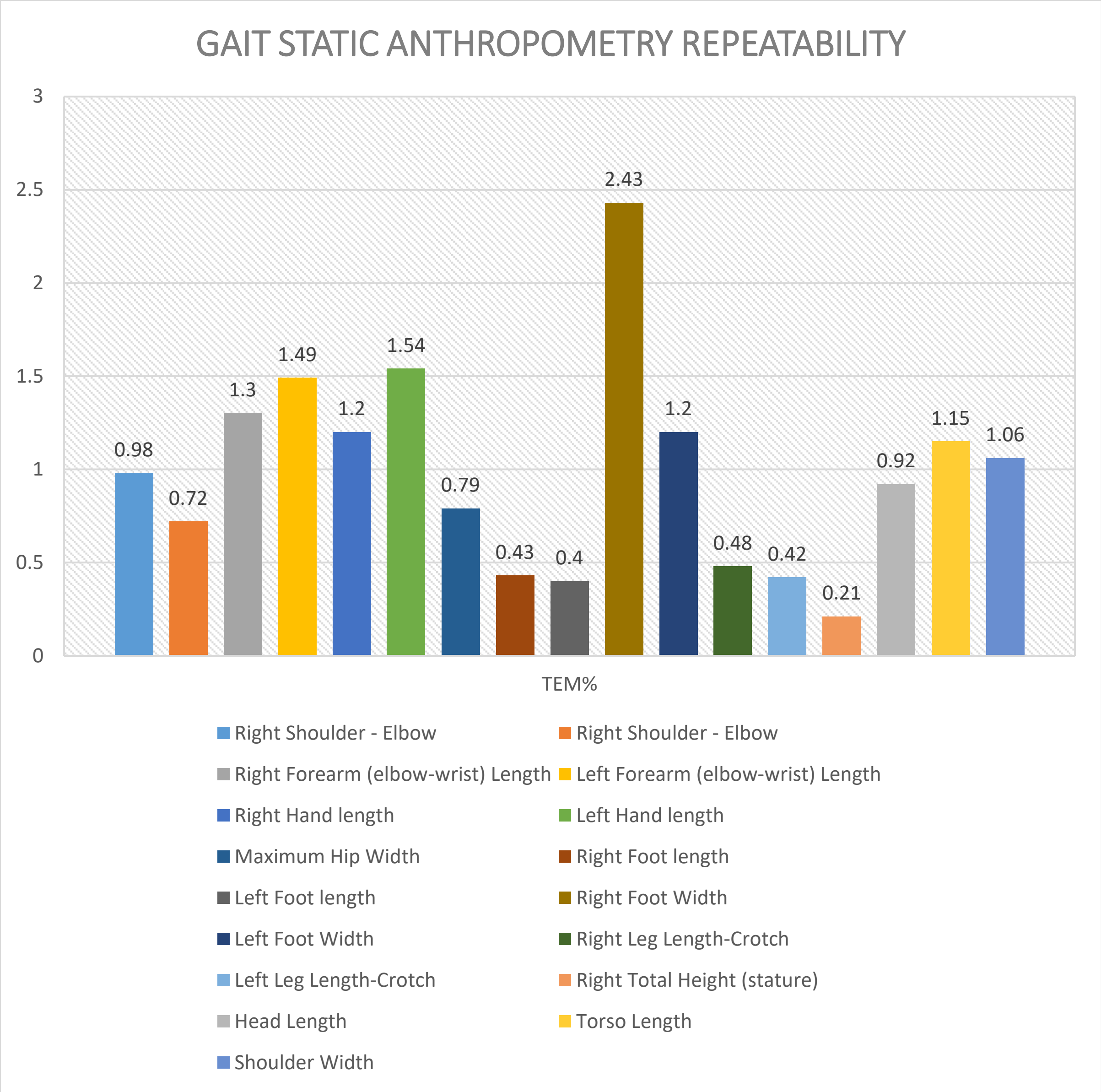


Figure 2.36 Static Anthropometry Repeatability Study Results. The assessment of TEM% indicated that all variables aside from 'Right Foot Width' fell well under the threshold, thus displaying that the operator displayed minimal error.

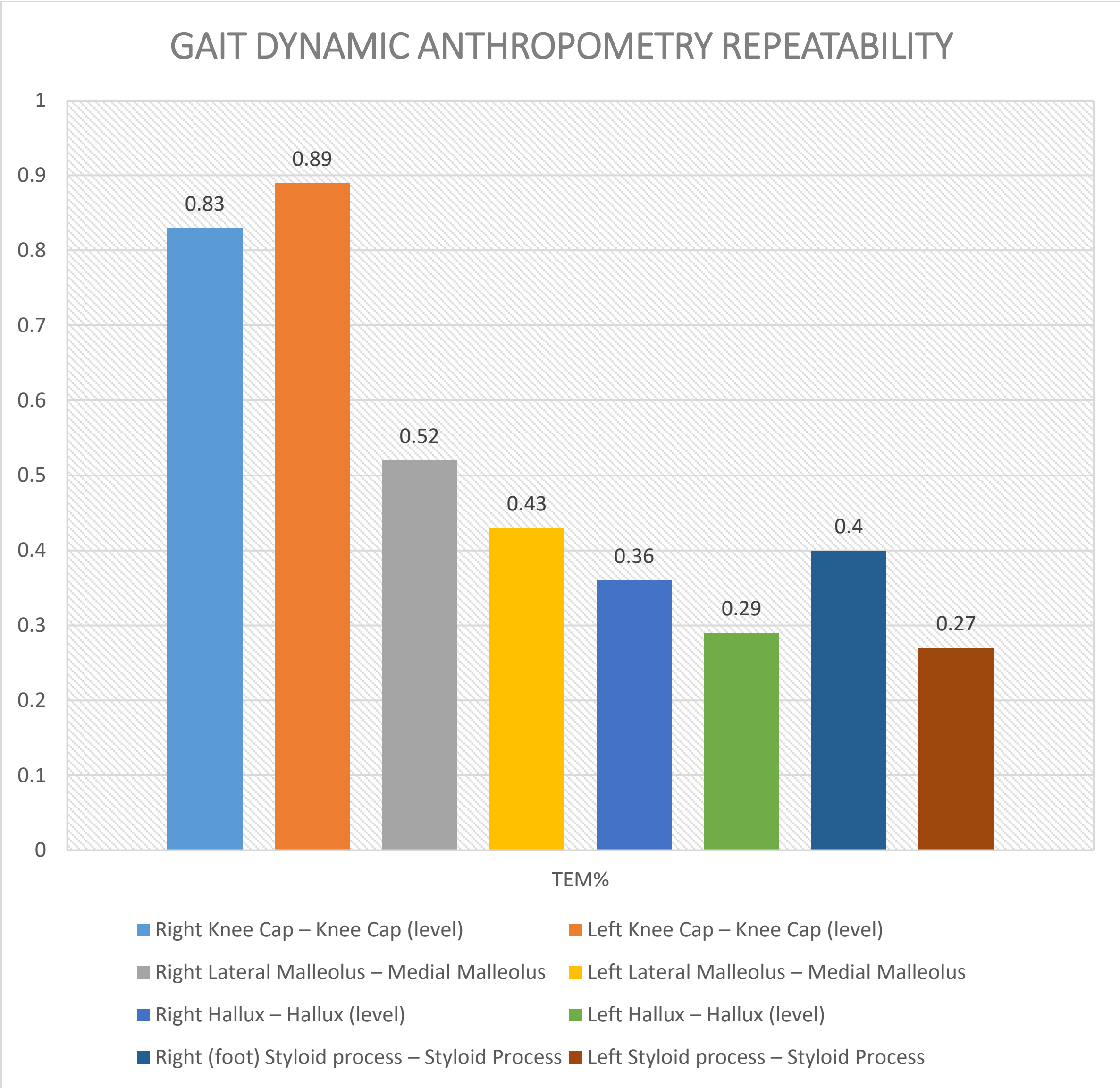


Figure 2.37 Dynamic Anthropometry Repeatability Study Results. The assessment of TEM% indicated that all variables fell well under the threshold, thus displaying that the operator displayed minimal error.

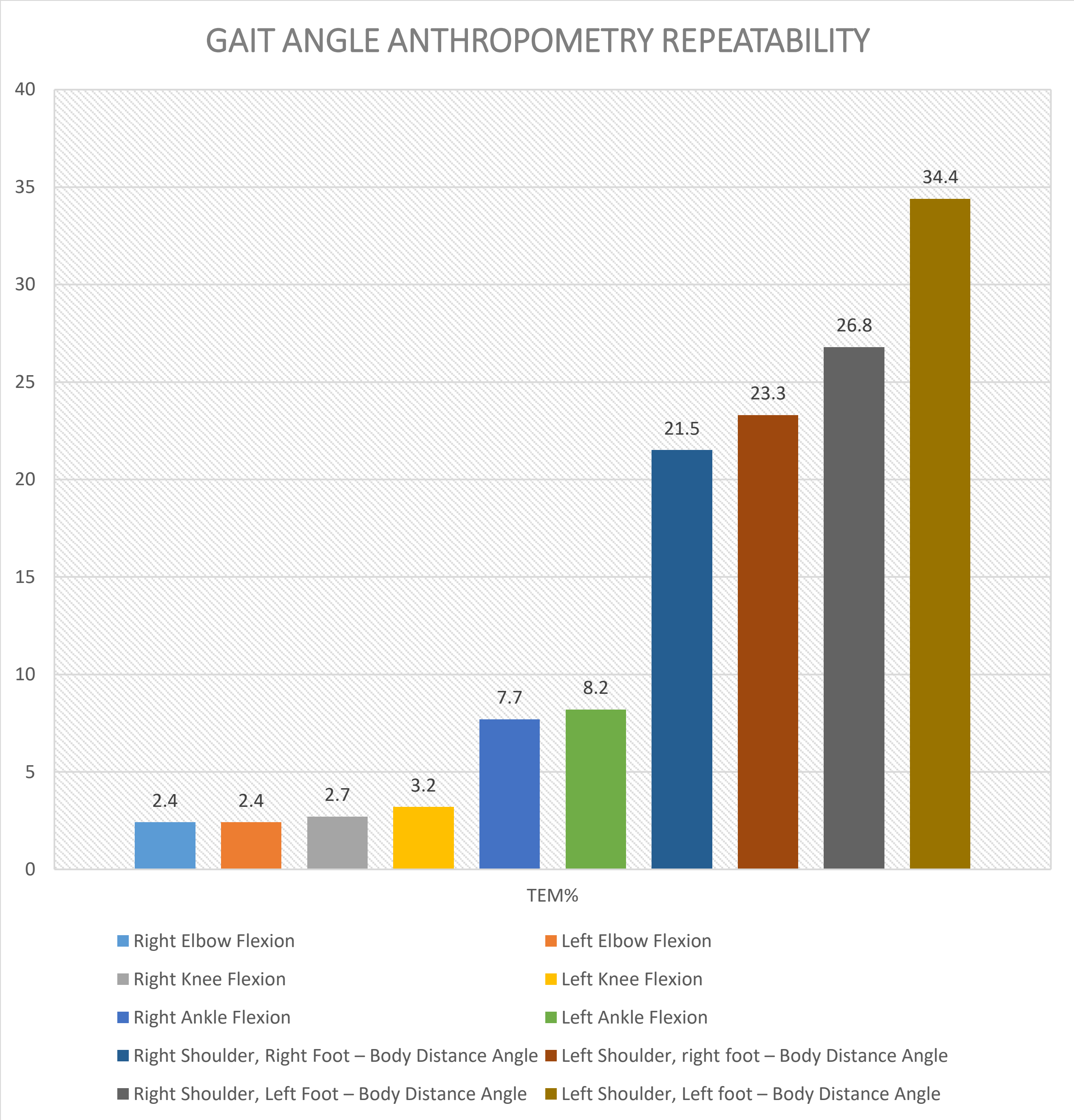


Figure 2.38 Angle Anthropometry Repeatability Study Results. The assessment of TEM% indicated that all variables displayed a high level of error, indicating that it should be eliminated from this feature pool.

2.4.4 Additional Features Not Included within the Data Sheet

Any features that were observed as individual mannerisms were noted. An example of this can be observed within one subject that joined both index finger and thumb to form a circle (Figure 2.39). This was observed during stance and gait.

Figure 2.39 An Example of the Mannerisms Observed in Both Stance and Gait. The circle shape formed by the fingers was consistent throughout stance and gait.

2.5 Discussion

2.5.1 Photographic Conditions

Consistent camera settings allowed morphometric variables to be developed and assessed from participants. Furthermore, statistical analyses were conducted to visualise trends within the results obtained for sexual dimorphism, age, and ancestry. Photography of volunteers in stance contributed to the database, now comprising 386 subjects ready for analysis.

2.5.1.1 Motion Blurring: Gait

Motion blurring was present within all subjects from the standardised footage collected and predominantly seen with those subjects that habitually have a faster gait. The feet and hands during anterior/posterior views of subjects were visualised to contain minimal distortion, while profile views displayed slight blurring of whole body for a few subjects. Although blurring was present, this did not obstruct the main anatomical landmarks of the subject and still fit the criteria for analysis. Variables were excluded if it was not a visible feature in all subjects, thus providing consistency. Therefore, finer details were slightly blurred and inhibited assessment of appendages, which when considering the analysis platform (CCTV footage) is not a significant limitation due to the poor quality of the footage. In the applicability stage, very slight blurring of the reference material will not impact the analysis when comparing to a trace CCTV footage.

2.5.2 Development of a Protocol for Morphometric Analysis

The surveillance footage of a POI varies case by case. Therefore, the aim of this research project was to develop a protocol that ensures applicability of the morphometric technique to trace footage. Thus, development of a manual defining specific anatomical landmarks and morphological classifications to ensure consistency is indispensable. Since analysis of 'normal' gait was the primary focus within this research, further adjustments were defined to accommodate deviations, such as clenched hands (see Figure 2.40). This may potentially add some variation to the database, however, the purpose is to develop a interpretation framework that would compare a reference in their normal mannerism to the trace material captured on CCTV footage. Refinement of features was based on visibility from both CCTV and attire.

3. Dactylion (D)

Location

The most distal point of the third phalanx of the hand. The tip of the finger.

Figure 13: The Dactylion

Adjustment

When the fingers are curled inwards, the most proximal point of the proximal finger (phalanx) is used as a point of measurement.

Figure 14: The Proximal Point of Proximal Phalanx

Figure 2.40 An Example of the Adjustments Applied to Subjects in Normal Stance within the Manual (Supplementary 1). The tip of the fingers within some subjects were not visible, therefore an adjustment was made.

2.5.3 Demographic

After subjects were recruited, questionnaires filled out, they were grouped and classified into their relevant categories for both stance and gait. This was completed to determine that the results would be statistically relevant when trying to determine any correlations between age, ancestry and sex. It was observed that primarily, males and females were relatively even in numbers, thus correlations were consistent when statistical analyses were conducted. For age and ancestry however, the primary age groups were 18-29 and 50+, and the majority were Caucasian (311 out of 383). This may potentially have affected the statistical outcomes, however statistical studies were carried out to determine any trends or whether any effects were observed, and whether smaller groups needed to be removed to avoid skew of correlations, reported in 3.4.3 Stance Anthropometry.

2.5.4 Importance of Standardisation and Repeatability Studies

Standardised photographic conditions are not available within CCTV cameras. Identifying the various intrinsic and extrinsic factors influencing footage combined with anatomical knowledge are required when comparing the trace and reference. Development of a manual, templates, and datasheets allows for more consistent assessment of anatomical landmarks and accompanying variations of such features.

Reproducibility is essential to observe presence of operator error during analysis of subjects. Although reproducibility will be completed in future studies, the rigorous repeatability testing by the single observer, by following the manual developed for this project, determines the consistency of data for statistical analyses.

The use of the plumb line was previously eliminated from use in gait analysis as it did not meet the required standards for correct alignment. The plumb line was placed based on user observation instead of instructed placement. Further research is required within this area. Removing the plumb will improve the accuracy for the full profile analyses for the subjects. It is not recommended to apply a plumb line when not representing true alignment. This is more an anatomical rather than a forensic study for research which may potentially be applied later for forensic use.

For morphological and anthropometric repeatability studies, repetition throughout the study and repetition of the study itself was necessary for reliability for repetition purposes. The angle levels were very high and further refinement and repeatability is necessary in future research. Throughout the initial research project (Seckiner, 2014) and this PhD research, repeatability studies were carried out a total of eight times by a single observer. Validation of the anthropometric measurements has not been completed as part of this study and will be undertaken in future studies.

2.6 Conclusions

Within this chapter, through visual observations and measurements for geometric distortion, optimal conditions for filming (camera, lighting, distance to camera etc.) were determined for the highest quality images that were able to be recorded and/or photographed given the technology available. Following this, recruitment of participants for analysis was completed and a demographic obtained to view correlations within statistical analyses. A manual (atlas and datasheets) was developed for the purpose of standardisation and to allow repeatability of the morphometric and anthropometric analyses. Using the manual, repeatability studies and levels of error were determined for plumb line placement, stance (morphology and anthropometry) and gait (morphology and anthropometry [static, dynamic, angle]).

The next chapter will focus on the use of statistical analyses to observe the inter-relationship of the profiles to one another, determine which features are more or less variable between individuals, and which are observed regardless of attire, as well as to see correlations of sex, age and ancestry.

3. CHAPTER 3: Distinctiveness of Features

3.1 Introduction

Chapter 2 detailed the methods to facilitate morphometric analysis, and highlighted the selection of significant morphometric variables, as well as a range of repeatability studies and categories for demographics. Chapter 3 includes the data analysis and assessment for subjects in stance and gait, where both morphological and anthropometric examination were completed. Furthermore, statistical analyses to observe the inter-relationship of the profiles to one another was completed, features that were distinct or less variable between individuals were determined. Also, observing which features were visually seen and able to be extracted regardless of attire was accomplished, as well viewing correlations of sex, age and ancestry.

3.2 Aims

The objective of this chapter involved determining the frequency, distinguishability and dependency of the features (and its variables) within subpopulations of both males and females, including various age groups, with Caucasoid and Asian ancestries. Furthermore, to view correlations of [1] Age [2] Sex, and [3] Ancestry for both stance and gait will also be undertaken within this chapter as well as the relationship between features. Finally, the predictive accuracy of the model will be tested for both anthropometry and morphology.

3.3 Materials and Methods

3.3.1 Analysis of Primary Database

Following the methods and materials outlined in Chapter 2, Section 2.3, and through the use of the manual that has been developed as an accompanying guide, a full analysis for [1] stance anthropometry, [2] stance morphology, [3] gait anthropometry, and [4] gait morphology of those recruited for the Australian population database that was developed in this research was conducted through the use of a morphometric technique. Each image was analysed through Photoshop (anthropometric measurements), or from the raw footage/images (to view gait sequences), then the measurements/classifications were plugged into an excel worksheet. From this, heat maps and frequency values within each feature, and the variances from each of those features, were tallied and recorded (Appendix C). Consequently, Principle Component Analyses (PCA) were completed for anthropometric and morphological studies followed by Linear Discriminant Analysis (LDA) for both.

3.3.1.1 Exclusion of Features

Features were excluded based on their visibility during the assessment and if features were not observed in over 20 participants, then the feature was removed from the overall analysis, but kept within the feature pool for analysis in future studies. The reasoning from this stems from the unpredictable nature of CCTV footage, where those features may be of use in future scenarios as features will be extracted on a case by case scenario.

3.3.1.2 Exclusion of Participants

Participants were excluded if there were major obstructions that did not allow the analysis of multiple features that were otherwise observed in the majority of participants. Examples of these can be seen in Figure 3.1 (participants 092SF, 116SF, and 158SF) where upper body and limbs can be analysed but lower body was obscured as a result of attire.

Figure 3.1 Participants 092SF, 116SF, and 158SF Removed from the Final Dataset, but Retained for Later Use as Upper Body was still Assessable.

3.3.1.3 Limitations of Assessment

As there was a limited time for collecting data due to room constraints, subjects 113SM, 142SF, 151SF, and 179SF were inadvertently not photographed as a result of human error. However, those same subjects still had their gait recordings available, which were included in the analysis.

It is imperative that 'like-to-like' images are compared for analysis to eliminate any artefact or distortion that may be introduced. One example of this is to not mix analyses of transient and permanent assessments. For instance, gait is regarded as transient as gait patterns can only be observed during gait and not during stance. Therefore, conducting an analysis during stance and comparing it to gait is not recommended as the images are in two different 'activities', but rather compare a stance trace to a stance reference and gait to gait.

When collecting data, thoracic and abdominal projection changed between stance and gait. Due to the subject's consciousness of being filmed, when subjects were being recorded for stance, the possibility of them pulling their abdomen in to 'lessen' their abdominal projection was observed, compared to when they were walking. Figure 3.2 shows a subject going from a 2 'slightly projecting thoracic' and 3 'moderately projecting abdomen' category to a 2 'slightly projecting thoracic' and 2 'slightly projecting abdomen' category.

Additionally, loose clothing was a limitation that at times during stance appearing like the abdomen was more projecting when compared to movement as the clothes moved and adhered to the person, showing the true projection of the abdomen. Once again reiterating the necessity of comparing 'like-to-like' images. The existing body mapping literature has little to report on this subject.

Figure 3.2 Example of Abdominal Projection.

3.3.2 Statistical Methods for Analyses

To assess the subpopulation data within ancestry, age and sex, various statistical methods were applied to view distinctiveness of the features observed, alongside its relationship to one another. First, heat maps were generated from the raw data as a screening process to view any 'extremes' within the data, to determine any human error (any potential mistakes during examination detected and remedied), detect any anomalies, or view highly variant features between all subjects. This was to ensure that the error was reduced as much as possible. The data was viewed with outliers and then removed to closely view the clustered data and to combat any potential major errors. Once the heat maps were completed, other analyses, such as Hierarchical Cluster Analysis (HCA) and PCA for anthropometry through the use of R studio, which is an R programming language for statistical computing (Hui, 2019) for both stance and gait. Additionally, Correspondence Analysis (CA) for morphology will be assessed from R studio statistical software, and XLSTAT for both stance and gait. For assessment of correlations between sex, age and ancestry, LDA will be applied through both R studio and XLSTAT.

3.3.2.1 Principle Component Analysis

Principle Component Analysis is a broadly used statistical method in which a large set of continuous data is reduced into minimum components possible through visual representation of a scatter graph (Abdi and Williams, 2010; Zolman, 1993). Within this graph, individual points demonstrate the separation of a person's anthropometric indices (*ibid*). From this data, eigenvalues are produced, further represented in a scree plot, which are suggestive of the greatest variance expressed within each principle component (Zolman, 1993). Furthermore, from these eigenvalues, the degree of separation among the individuals are observed the within x and y values of the graph (*ibid*).

Loadings of the PCA were assessed in both raw and normalised form, including the loadings distribution, loadings line graph, correlation matrix and Hierarchical Clustering Analysis. The data was normalised (changing the degree of magnitude) by determination of the lowest and the highest measurements per feature within the dataset, and the difference between them determined by a simple subtraction. From here, the following equation was applied to all the values to normalise the data:

$$\frac{Sample\ Number\ (raw\ proportional\ indices) - Minimum\ Value\ in\ Dataset}{Maximum\ Value\ in\ dataset - Minimum\ Value\ in\ Dataset} = Normalised\ Value$$

Finally, the PCA was completed in both treated (removal of outliers) and untreated data. R Studio, was used to complete the PCA analysis and codes were written by Natasha Benson to view the raw, normalised, and treated versions of the data, which will be outlined in subsequent sections.

3.3.2.2 Hierarchical Cluster Analysis

Hierarchical Clusters, which are a tree-based representation of the observations (also known as a dendrogram), were also completed within the normalised dataset to identify any groups within the features evaluated. Hierarchical clustering applies pairwise distance matrix among observations as a criteria for clustering (Nassif and Hruschka, 2012; DataNovia, 2018). Varying Hierarchical Cluster agglomeration method (also known as linkage methods) were applied to view correlations or linkages between sex, age, and ancestry. These types of linkage methods involved: [1] Complete; [2] Single; [3] Average (Moyen); and [4] Ward (DataNovia, 2018). For the first three (complete, single, and average), all pairwise dissimilarities between the features in cluster 1 and cluster 2 were computed. The differences between these linkage methods is that complete linkage considers the largest value of these variations as the distance amid both clusters, single linkage is the smallest variation, average considers the average of the variations (DataNovia, 2018). The Ward linkage method, however, differs in that it minimises the total within-cluster variance, where minimum between-cluster distance were merged between a pair of clusters (*ibid*).

3.3.2.3 Correspondence Analysis

Correspondence Analysis (CA), illustrates the dependence between the columns and rows of a contingency table through a graphical representation (Greenacre, 2007). Analogous to PCA, this assessment reduces high-dimensional data into components, which consist of features of higher variability (*ibid*). A scatter plot, eigenvalues, and scree plot are produced from the results of the data. Within the scatter plot, each point represents a person's profile (collection of data extracted from each subject) and the eigenvalues then consequently signify the components that are highly variable within the categorical data. The categorical data was initially converted into dichotomous data as explained within Chapter 2, Section 2.3, allowing frequency values to be obtained and Discriminant Analysis (DA) performed. The XLSTAT and Paleontological statistics (PAST) programs were both used to obtain results. Examples for PCA and CA can be observed in Figures 3.3 and 3.4.

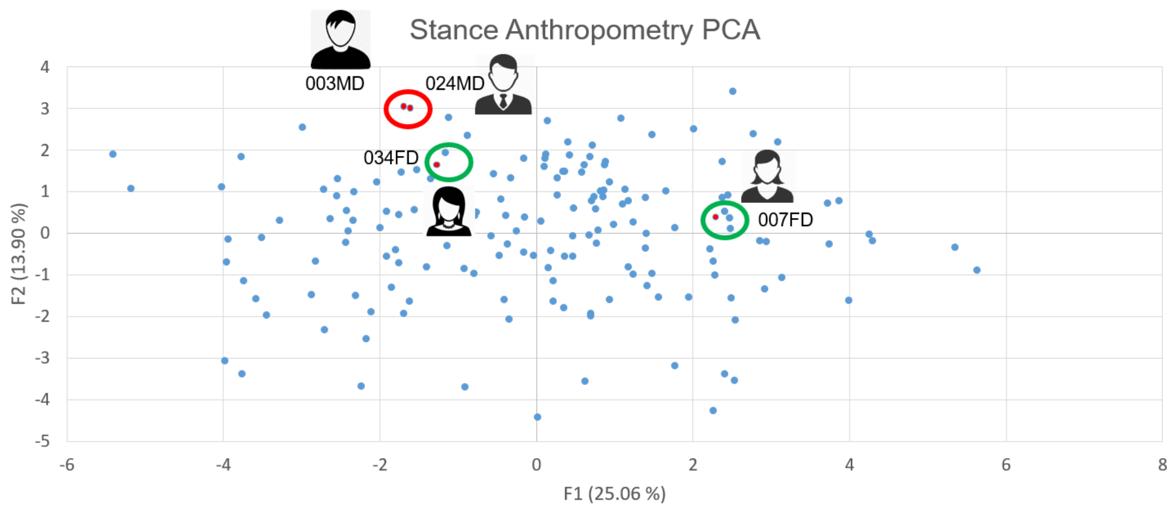


Figure 3.3 Graphical Representation of Principal Component Analysis. Principle Component Analysis was conducted to statistically view the interrelationship of the stance anthropometric profiles of subjects (indicated by blue dots). Dispersion of the subjects indicate that for the given population within the database, no two individuals appeared to have the same profile. Subjects 003MD and 024MD (red circle) specify similar anthropometric profiles as observed by the closeness of the two points, whereas subjects 034FD and 007FD are seen to be separate from one another (green circles).

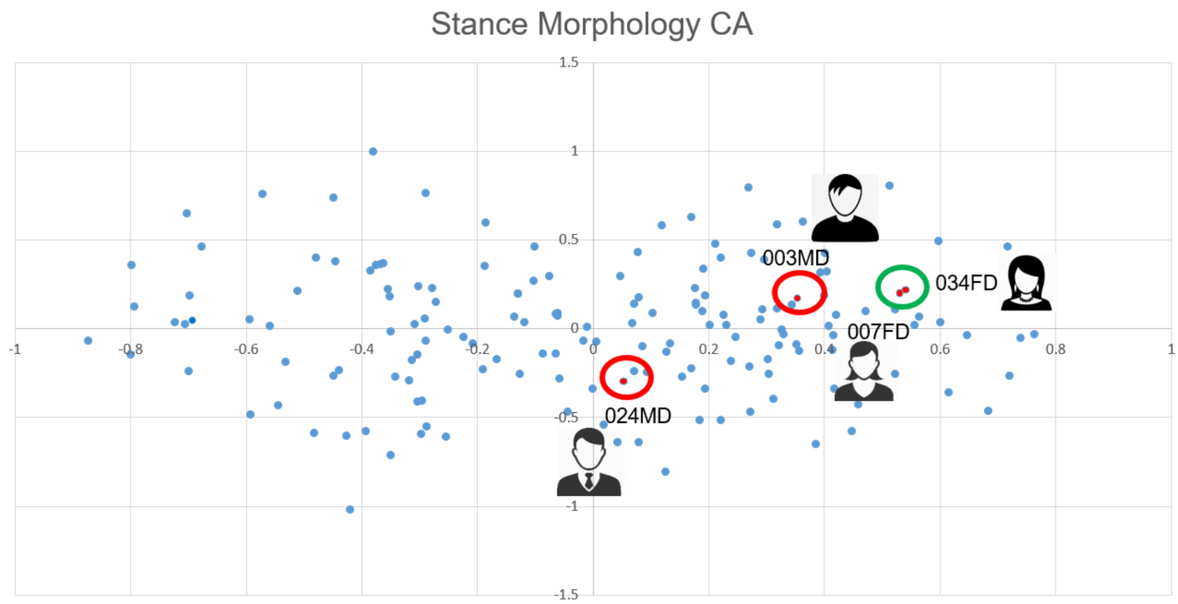


Figure 3.4 Graphical Representation of Correspondence Analysis. Correspondence Analysis was conducted to statistically view the interrelationship between morphological profiles of subjects during gait. Dispersion of the subjects (blue dots) indicate that for the given population within the database, no two individuals appeared to have the same profile. Subjects 003MD and 024MD (red circles) were seen within Figure 3.3 as grouped, however when compared to their morphology, they were observed to be segregated to one another in this graph. Likewise, with the green circle containing subjects 034FD and 007FD shows their morphological profiles are clustered within this figure, indicating similarity between morphological profiles, but difference in anthropometric profiles.

3.3.2.4 Linear Discriminant Analysis

Discriminant analysis (DA) statistics comprise of interval variables that are predicted in the form of a linear representation (Oravec *et al.*, 2019; Raschka, 2014). Features and their variants are grouped together to categorise relationships among one dependant variable to the remainder of the features (*ibid*). From the DA results, the Wilk's Lambda statistic results are also generated, which show the significance of difference between the means (that are resultant by the combination of dependant variables) and used for hypothesis testing (*ibid*). Furthermore, a confusion matrix was produced from the results of the DA, which determines prediction of the feature and the accuracy of such predictions (*ibid*). This statistical analysis was conducted on XLSTAT for morphology and R Studio for anthropometry and correlations between males/females to analyse sexual dimorphism, varying age groups, and different ancestries.

3.4 Results

To determine the distinctiveness of the features developed and analysed, a systematic sequence of statistics and analyses were conducted. Starting first with heat maps that allowed any visual discrepancy to be revealed as well as highlighting very distinctive features. Then frequency values that presented how frequent each feature was observed within the given population was detected, and finally, PCA for anthropometry, CA for morphology and LDA to view any correlations between the subgroups of the population recruited for this research was assessed.

3.4.1 Heat Maps

Heat maps were generated from the original (raw data) as a screening process; to determine any human error that may have been present, to detect any anomalies, or view highly variant features between all subjects. The raw values were used as the proportional indices values were too low to represent the data to view any anomalies, or highly variant features. Therefore, the heat maps served as a screening tool where is an anomaly was detected, the feature was checked and if an error present, it was remedied, or if the feature was accurate, it showed distinctiveness. Figures 3.5 – 3.8 are short data extracts from both anthropometric and morphological assessments for stance in both row (subject) and column (feature) variations. The green represents the higher values, the red is low, and yellow is the mid-range. These values are a good indicator for distinct features, for instance, if the column (for a single feature) was primarily green and yellow, and a few red visible, then those individuals highlighted in red are suggestive of distinct features. These will be noted and then further assessed in detail within PCA and CA analyses. The full excel heat maps for both stance and gait in both anthropometry and morphology can be observed in Appendix C, and the conversion to proportional indices of the anthropometry data can be found in Appendix D.

1	Subject	Sex	Ancestry	Age	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
2	003Fc	Female	Cauc	1	2.96	3.11	2.32	2.25	1.68	1.59	3.75	2.32	5.26	3.89	2.33	2.33	0.87	0.89	7.84	7.99	15.67
3	015F	Female	Cauc	1	3.06	3.07	2.17	2.19	1.48	1.48	3.76	2.3	5.02	3.53	2.35	2.32	0.77	0.78	7.26	7.26	16.36
4	016Fc	Female	Cauc	1	3.06	3.14	2.41	2.33	1.36	1.31	3.53	2.36	4.96	3.88	2.48	2.38	0.86	0.84	7.81	7.81	16.93
5	017F	Female	Cauc	1	2.94	2.86	2.12	2.01	1.31	1.23	4.19	2.23	5.58	3.68	2.4	2.36	0.79	0.81	7.54	7.55	16.87
6	019F	Female	Asian	1	2.64	2.8	1.81	1.75	1.43	1.49	4.13	2.02	4.34	3.19	2	2.11	0.7	0.65	6.75	6.71	14.31
7	004F	Female	Cauc	2	2.91	2.87	2.02	1.95	1.68	1.76	3.7	1.97	3.93	3.07	2.18	2.17	0.88	0.9	7.22	7.25	14.95
8	006F	Female	Cauc	1	2.52	2.52	1.89	1.91	1.28	1.3	3.32	1.8	4.16	3	1.98	1.96	0.64	0.64	6.72	6.67	14.06
9	009F	Female	Cauc	3	2.95	2.95	2.06	1.98	1.84	1.9	4.37	2.11	4.65	3.21	2.27	2.32	0.81	0.86	7.55	7.56	15.9
10	021F	Female	Cauc	1	2.81	2.88	2.07	1.98	1.65	1.65	3.86	2.01	4.5	3.51	2.36	2.35	0.85	0.81	7.75	7.74	15.85
11	024Fc	Female	Cauc	1	3.26	3.33	2.35	2.32	1.62	1.54	3.63	2.25	4.47	3.27	2.61	2.6	0.79	0.73	7.87	7.83	17.24
12	025Fc	Female	Cauc	1	3.23	3.22	2.17	2.12	1.55	1.6	3.85	2.17	4.64	3.29	2.27	2.26	0.8	0.77	7.61	7.56	16.53
13	032F	Female	Cauc	1	3.12	3.14	2.16	2.14	1.53	1.55	3.63	2.23	4.75	3.62	2.34	2.35	0.75	0.74	7.69	7.65	16.61
14	033F	Female	Cauc	1	2.98	3.1	2.02	2.05	1.6	1.44	3.83	2.17	4.54	3.43	2.28	2.29	0.85	0.84	7.48	7.46	16.19
15	042F	Female	Cauc	3	3.14	3.13	2.09	2.17	1.49	1.43	3.3	2.02	4.63	3.17	2.14	2.1	0.74	0.71	7.56	7.55	15.89

Figure 3.5 Heat Map Extract of Stance Anthropometry Row. A heat map was generated through Excel.

1	Subject	Sex	Ancestry	Age	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
2	003Fc	Female	Cauc	1	2.96	3.11	2.32	2.25	1.68	1.59	3.75	2.32	5.26	3.89	2.33	2.33	0.87	0.89	7.84	7.99	15.67
3	015F	Female	Cauc	1	3.06	3.07	2.17	2.19	1.48	1.48	3.76	2.3	5.02	3.53	2.35	2.32	0.77	0.78	7.26	7.26	16.36
4	016Fc	Female	Cauc	1	3.06	3.14	2.41	2.33	1.36	1.31	3.53	2.36	4.96	3.88	2.48	2.38	0.86	0.84	7.81	7.81	16.93
5	017F	Female	Cauc	1	2.94	2.86	2.12	2.01	1.31	1.23	4.19	2.23	5.58	3.68	2.4	2.36	0.79	0.81	7.54	7.55	16.87
6	019F	Female	Asian	1	2.64	2.8	1.81	1.75	1.43	1.49	4.13	2.02	4.34	3.19	2	2.11	0.7	0.65	6.75	6.71	14.31
7	004F	Female	Cauc	2	2.91	2.87	2.02	1.95	1.68	1.76	3.7	1.97	3.93	3.07	2.18	2.17	0.88	0.9	7.22	7.25	14.95
8	006F	Female	Cauc	1	2.52	2.52	1.89	1.91	1.28	1.3	3.32	1.8	4.16	3	1.98	1.96	0.64	0.64	6.72	6.67	14.06
9	009F	Female	Cauc	3	2.95	2.95	2.06	1.98	1.84	1.9	4.37	2.11	4.65	3.21	2.27	2.32	0.81	0.86	7.55	7.56	15.9
10	021F	Female	Cauc	1	2.81	2.88	2.07	1.98	1.65	1.65	3.86	2.01	4.5	3.51	2.36	2.35	0.85	0.81	7.75	7.74	15.85
11	024Fc	Female	Cauc	1	3.26	3.33	2.35	2.32	1.62	1.54	3.63	2.25	4.47	3.27	2.61	2.6	0.79	0.73	7.87	7.83	17.24
12	025Fc	Female	Cauc	1	3.23	3.22	2.17	2.12	1.55	1.6	3.85	2.17	4.64	3.29	2.27	2.26	0.8	0.77	7.61	7.56	16.53
13	032F	Female	Cauc	1	3.12	3.14	2.16	2.14	1.53	1.55	3.63	2.23	4.75	3.62	2.34	2.35	0.75	0.74	7.69	7.65	16.61
14	033F	Female	Cauc	1	2.98	3.1	2.02	2.05	1.6	1.44	3.83	2.17	4.54	3.43	2.28	2.29	0.85	0.84	7.48	7.46	16.19
15	042F	Female	Cauc	3	3.14	3.13	2.09	2.17	1.49	1.43	3.3	2.02	4.63	3.17	2.14	2.1	0.74	0.71	7.56	7.55	15.89

Figure 3.6 Heat Map Extract of Stance Anthropometry Column. A heat map was generated through Excel.

1	Subject	Sex	1. Head Level R	3. Lateral head tilt	4. Shoulder level R	5. Shoulder level L	6. Position of Shoulder R	7. Position of Shoulder L	10. Position of Upper Arm (Frontal) Right	11. Position of Upper Arm (Frontal) Left	12. Antero-Posterior Placement of Upper Arm Right	13. Antero-Posterior Placement of Upper Arm Left	14. Lateral Placement of Upper Arm Right	15. Lateral Placement of Upper Arm Left	16. Antero-posterior Placement of Forearm Right	17. Antero-posterior Placement of Forearm Left	20. Flexion of arm R	21. Flexion of arm L	22. Lateral placement of forearm R	23. Lateral placement of Forearm L	19. Antero-posterior Placement of Hand Right	20. Antero-posterior Placement of Hand Left	21. Finger Flexion Right	22. Finger Flexion Left	23. Lateral Rotation of the Hand Right	24. Lateral Rotation of the hand Left	25. Thoracic Projection	26. Abdominal projection	21. Shape of Gluteus	25. Orientation of Lower Extremities Right Anterior	26. Orientation of Lower Extremities Left Anterior	29. Lateral Placement of Upper leg Right	30. Lateral Placement of Upper leg Left	41. Lateral Placement of Lower Leg Right	42. Lateral Placement of Lower leg Left	49. Placement of the Feet Right	50. Placement of the Feet Left
2	003Fc	Female	1	3	1	1	3	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	1	2	1	1	3	1	3	4	4	2	2	1	1	2	2
3	015F	Female	1	2	3	3	2	2	2	2	1	2	3	3	4	4	2	2	3	3	4	4	2	2	2	2	2	1	3	3	3	1	1	1	1	2	1
4	016Fc	Female	1	2	1	1	1	2	3	3	1	2	2	3	1	1	1	2	3	3	1	2	2	1	2	2	2	1	4	2	3	1	1	1	1	2	2
5	017F	Female	2	3	3	3	1	1	3	3	1	1	3	3	2	1	2	2	3	2	2	2	1	1	1	1	2	1	2	3	4	2	2	3	3	2	2
6	019F	Female	1	2	3	3	1	2	2	2	1	2	2	2	3	4	2	2	3	3	3	4	3	3	1	1	3	2	4	5	5	2	2	1	1	1	1
7	004F	Female	2	2	3	3	3	3	2	2	3	3	2	2	3	3	3	3	3	3	3	3	3	3	1	1	2	2	3	4	4	3	3	1	1	2	2
8	006F	Female	2	2	1	1	2	1	2	2	2	1	2	2	3	3	2	2	3	3	4	4	3	1	2	2	2	2	4	4	4	1	1	1	1	2	2
9	009F	Female	2	2	3	2	2	2	2	2	2	1	3	3	4	2	2	3	1	1	4	3	3	3	2	2	3	2	3	5	5	3	3	1	1	2	2
10	021F	Female	2	3	2	2	2	2	2	2	1	2	2	2	3	4	2	2	3	3	3	3	3	3	2	2	3	1	4	4	5	2	2	1	1	2	2
11	024Fc	Female	1	2	1	1	3	2	1	1	4	3	2	2	4	4	1	2	3	3	4	4	2	2	2	2	2	2	1	3	3	1	1	1	1	2	1
12	025Fc	Female	1	3	3	3	2	2	2	2	1	1	3	3	3	3	2	2	3	3	3	4	3	3	1	1	2	3	2	2	2	2	2	1	1	2	2
13	032F	Female	1	1	1	1	2	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	2	2	2	2	3	1	4	4	4	2	2	1	1	1	1
14	033F	Female	2	2	2	2	2	2	1	1	2	2	2	1	4	4	1	2	3	3	3	4	2	2	2	2	2	2	3	3	3	1	1	1	1	2	2
15	042F	Female	2	3	2	2	2	2	3	3	1	1	3	3	2	2	2	2	3	3	2	2	3	3	2	2	2	1	4	2	2	1	1	1	1	2	1

Figure 3.7 Heat Map Extract of Stance Morphology Row. A heat map was generated through Excel.

1	Subject	Sex	1. Head Level R	3. Lateral head tilt	4. Shoulder level R	5. Shoulder level L	6. Position of Shoulder R	7. Position of Shoulder L	10. Position of Upper Arm (Frontal) Right	11. Position of Upper Arm (Frontal) Left	12. Antero-Posterior Placement of Upper Arm Right	13. Antero-Posterior Placement of Upper Arm Left	14. Lateral Placement of Upper Arm Right	15. Lateral Placement of Upper Arm Left	16. Antero-posterior Placement of Forearm Right	17. Antero-posterior Placement of Forearm Left	20. Flexion of arm R	21. Flexion of arm L	22. Lateral placement of forearm R	23. Lateral placement of Forearm L	19. Antero-posterior Placement of Hand Right	20. Antero-posterior Placement of Hand Left	21. Finger Flexion Right	22. Finger Flexion Left	23. Lateral Rotation of the Hand Right	24. Lateral Rotation of the hand Left	25. Thoracic Projection	26. Abdominal projection	21. Shape of Gluteus	25. Orientation of Lower Extremities Right Anterior	26. Orientation of Lower Extremities Left Anterior	29. Lateral Placement of Upper leg Right	30. Lateral Placement of Upper leg Left	41. Lateral Placement of Lower Leg Right	42. Lateral Placement of Lower leg Left	49. Placement of the Feet Right	50. Placement of the Feet Left
2	003Fc	Female	1	3	1	1	3	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	1	2	1	1	3	1	3	4	4	2	2	1	1	2	2
3	015F	Female	1	2	3	3	2	2	2	2	1	2	3	3	4	4	2	2	3	3	4	4	2	2	2	2	2	1	3	3	3	1	1	1	1	2	1
4	016Fc	Female	1	2	1	1	1	2	3	3	1	2	2	3	1	1	1	2	3	3	1	2	2	1	2	2	2	1	4	2	3	1	1	1	1	2	2
5	017F	Female	2	3	3	3	1	1	3	3	1	1	3	3	2	1	2	2	3	2	2	2	1	1	1	1	2	1	2	3	4	2	2	3	3	2	2
6	019F	Female	1	2	3	3	1	2	2	2	1	2	2	2	3	4	2	2	3	3	3	4	3	3	1	1	3	2	4	5	5	2	2	1	1	1	1
7	004F	Female	2	2	3	3	3	3	2	2	3	3	2	2	3	3	3	3	3	3	3	3	3	3	1	1	2	2	3	4	4	3	3	1	1	2	2
8	006F	Female	2	2	1	1	2	1	2	2	2	1	2	2	3	3	2	2	3	3	4	4	3	1	2	2	2	2	4	4	4	1	1	1	1	2	2
9	009F	Female	2	2	3	2	2	2	2	2	2	1	3	3	4	2	2	3	1	1	4	3	3	3	2	2	3	2	3	5	5	3	3	1	1	2	2
10	021F	Female	2	3	2	2	2	2	2	2	1	2	2	2	3	4	2	2	3	3	3	3	3	3	2	2	3	1	4	4	5	2	2	1	1	2	2
11	024Fc	Female	1	2	1	1	3	2	1	1	4	3	2	2	4	4	1	2	3	3	4	4	2	2	2	2	2	2	1	3	3	1	1	1	1	2	1
12	025Fc	Female	1	3	3	3	2	2	2	2	1	1	3	3	3	3	2	2	3	3	3	4	3	3	1	1	2	3	2	2	2	2	2	1	1	2	2
13	032F	Female	1	1	1	1	2	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	2	2	2	2	3	1	4	4	4	2	2	1	1	1	1
14	033F	Female	2	2	2	2	2	2	1	1	2	2	2	1	4	4	1	2	3	3	3	4	2	2	2	2	2	2	3	3	3	1	1	1	1	2	2
15	042F	Female	2	3	2	2	2	2	3	3	1	1	3	3	2	2	2	2	3	3	2	2	3	3	2	2	2	1	4	2	2	1	1	1	1	2	1

Figure 3.8 Heat Map Extract of Stance Morphology Column. A heat map was generated through Excel.

3.4.2 Frequency Values within the Given Population

Following the heat maps, the categorical data was converted to dichotomous, where the frequency values were obtained and tabulated. This provides valuable information on whether features are more distinct within the population or more common (Tables 3.1 – 3.4). The features that were observed in less than 50 people were highlighted in yellow, indicating a more distinct feature compared to the remainder of the feature dataset. Tables 3.1 – 3.4 shows the features listed on the left, where the names of each feature are listed, then on the right, V1 indicates the first variable to the feature i.e. posterior, V2 the second, i.e. anterior etc., that are correlated with the manual to that specific feature listed on the left side of the column. The numbers displayed within the column show the number of people seen to exhibit the feature, and the 'X' indicates that there is no further categories or variants available for that particular listed feature. In Tables 3.1 and 3.2 stance anthropometry and gait anthropometry (frequency statistics conversions can be seen in Appendix E), features including forearm length and leg length were observed to be distinct for category one. In Tables 3.3 and 3.4 (stance morphology and gait morphology repsectively) features including medial placement of the feet, moderate bow leggedness, or moderate knock kneed were observed to be distinct.

Table 3.1 Frequency Values of Stance Anthropometry. Values were tallied in Excel and tabulated. Yellow indicates the features that were observed in less than 50 people.

Feature	V1	V2	V3
1. Shoulder – Elbow Length R	132	226	25
2. Shoulder – Elbow Length L	111	235	37
3. Forearm Length R	11	198	174
4. Forearm Length L	20	229	134
5. Maximum Hip Width	20	140	223
6. Head Height	43	242	98
7. Torso Length	68	137	178
8. Shoulder Width	143	179	61
9. Foot Length R	79	185	119
10. Foot Length L	77	167	139
11. Leg Length – Crotch R	16	197	170
12. Leg Length – Crotch L	22	195	166
13. Total Height (Stature)	65	89	229

Table 3.2 Frequency Values of Gait Anthropometry. Values were tallied in Excel and tabulated. Yellow indicates the features that were observed in less than 50 people.

Feature	V1	V2	V3
1. Shoulder – Elbow Length R	71	120	77
2. Shoulder – Elbow Length L	64	121	83
3. Forearm Length R	39	91	138
4. Forearm Length L	65	85	118
5. Maximum Hip Width	82	116	70
6. Head Height	38	207	23
7. Torso Length	67	151	50
8. Shoulder Width	38	165	65
9. Foot Length R	61	146	61
10. Foot Length L	65	142	61
11. Leg Length – Crotch R	41	126	101
12. Leg Length – Crotch L	42	130	96
13. Total Height (Stature)	58	178	32
14. Lat Mal – Med Mal R	65	171	32
15. Lat Mal – Med Mal L	74	161	33
16. Hallux – Hallux R	22	160	86
17. Hallux – Hallux L	24	159	85
18. Styloid Pro – Styloid Pro R	71	141	56
19. Styloid Pro – Styloid Pro L	76	133	59

Table 3.3 Frequency Values of Stance Morphology. Values were tallied in Excel and tabulated. Yellow indicates the features that were observed in less than 50 people. 'X' denotes a blank value with no variant to feature expressed within the 4th and 5th categories.

Feature	V1	V2	V3	V4	V5
1. Head Level R	73	194	116	X	X
2. Lateral head tilt	39	211	133	X	X
3. Shoulder level R	149	119	115	X	X
4. Shoulder level L	137	126	120	X	X
5. Position of Shoulder R	136	151	96	X	X
6. Position of Shoulder L	100	142	141	X	X
7. Position of Upper Arm (Frontal) Right	188	151	44	X	X
8. Position of Upper Arm (Frontal) Left	189	154	40	X	X
9. Antero-Posterior Placement of Upper Arm Right	172	136	49	26	X
10. Antero-Posterior Placement of Upper Arm Left	135	125	68	55	X
11. Lateral Placement of Upper Arm Right	71	163	149	X	X
12. Lateral Placement of Upper Arm Left	90	147	145	X	X
13. Antero-posterior Placement of Forearm Right	56	58	140	129	X
14. Antero-posterior Placement of Forearm Left	34	46	117	186	X
15. Flexion of arm R	17	297	65	X	X
16. Flexion of arm L	18	297	68	X	X
17. Lateral placement of forearm R	113	95	175	X	X
18. Lateral placement of Forearm L	133	105	145	X	X
19. Antero-posterior Placement of Hand Right	3	16	98	266	X
20. Antero-posterior Placement of Hand Left	X	14	66	303	X
21. Finger Flexion Right	256	91	36	X	X
22. Finger Flexion Left	249	100	34	X	X
23. Lateral Rotation of the Hand Right	194	188	1	X	X
24. Lateral Rotation of the hand Left	208	175	X	X	X
25. Thoracic Projection	168	134	81	X	X
26. Abdominal projection	138	179	66	X	X
27. Shape of Gluteus	33	178	155	17	X
28. Orientation of Lower Extremities Right Anterior	14	139	89	122	19
29. Orientation of Lower Extremities Left Anterior	14	140	88	120	21
30. Lateral Placement of Upper leg Right	114	125	144	X	X
31. Lateral Placement of Upper leg Left	124	131	128	X	X
32. Lateral Placement of Lower Leg Right	202	119	62	X	X
33. Lateral Placement of Lower leg Left	216	133	34	X	X
34. Placement of the Feet Right	220	159	4	X	X
35. Placement of the Feet Left	256	123	4	X	X

Table 3.4 Frequency Values of Gait Morphology. Values were tallied in Excel and tabulated. Yellow indicates the features that were observed in less than 50 people. The colour in the feature column represent as follows: red - backward arm swing features; orange – forward arm swing features; green – complete gait features; blue – mid stance features; and purple swing phase features. 'X' denotes a blank value with no variant to feature expressed within the 4th and 5th categories.

Feature	V1	V2	V3	V4	V5
3. Lat Placement of Upper Arm Backward Swing Right	57	74	139	X	X
4. Lat Placement of Upper Arm Backward Swing Left	52	82	134	X	X
5. Lat Placement of Forearm Backward Arm Swing Right	153	73	42	X	X
6. Lat Placement of Forearm Backward Arm Swing Left	161	57	50	X	X
9. Level of elbow Flexion backward Arm Swing Right	81	162	23	2	X
10. Level of elbow Flexion Backward Arm Swing Left	92	149	26	1	X
13. Lateral Rotation of the Hand Backwards swing Right	71	193	4	X	X
14. Lateral Rotation of the hand Backwards swing Left	75	183	10	X	X
15. Finger flexion upon backward arm swing Right	224	44	X	X	X
16. Finger flexion upon backward arm swing Right	222	46	X	X	X
3. Lat Placement of Upper Arm Forward Swing Right	114	89	65	X	X
4. Lat Placement of Upper Arm Forward Swing Left	117	85	66	X	X
5. Lat Placement of Forearm Forward Arm Swing Right	115	74	79	X	X
6. Lat Placement of Forearm Forward Arm Swing Left	121	62	85	X	X
9. Level of elbow Flexion Forward Arm Swing Right	3	103	140	22	X
10. Level of elbow Flexion Forward Arm Swing Left	X	86	159	23	X
13. Lateral Rotation of the Hand Forward swing Right	155	113	X	X	X
14. Lateral Rotation of the hand Forward swing Left	159	108	1	X	X
15. Finger flexion upon Forward arm swing Right	222	45	1	X	X
16. Finger flexion upon forward arm swing Right	217	50	1	X	X
2. Lateral trunk sway	36	134	98	X	X
3. Orientation of Lower Extremities Right Anterior	11	123	61	67	6
4. Orientation of Lower Extremities Left Anterior	11	123	61	67	6
1. Head Level	110	108	50	X	X
2. Lateral head tilt	75	102	91	X	X
3. Shoulder level Right	89	83	96	X	X
4. Shoulder level Left	92	80	96	X	X
7. Lateral Placement of Upper Arm Right	79	84	105	X	X
8. Lateral Placement of Upper Arm Left	76	81	111	X	X
9. Lateral Placement of Forearm Right	145	97	26	X	X
10. Lateral Placement of Forearm Left	143	99	26	X	X
11. Level of elbow Flexion Mid stance Right	8	210	48	2	X
12. Level of elbow Flexion Mid stance Left	11	211	43	3	X
14. Lateral Rotation of the Hand Mid stance Right	108	160	X	X	X
15. Lateral Rotation of the hand Mid Stance Left	119	149	X	X	X
16. Finger Flexion Right	223	44	1	X	X
17. Finger Flexion Left	213	54	1	X	X
18. Thoracic Projection	113	88	67	X	X
19. Abdominal projection	99	120	49	X	X
22. Lateral Placement of Upper leg Mid Stance Right	13	64	191	X	X
23. Lateral Placement of Upper leg Mid Stance Left	14	82	172	X	X
24. Lateral Placement of Lower Leg Mid Stance Right	11	93	164	X	X

25. Lateral Placement of Lower leg Mid Stance Left	16	108	144	X	X
28. Placement of the Feet Mid Stance Right	185	72	11	X	X
29. Placement of the Feet Mid Stance Left	158	96	14	X	X
1. Lat placement of Upper Leg Swing Right	53	112	103	X	X
2. Lat placement of Upper Leg Swing Left	57	90	121	X	X
5. Lateral Placement of Lower Leg Swing Right	30	193	45	X	X
6. Lateral Placement of Lower leg Swing Left	33	189	46	X	X
11. Placement of the Feet Swing Right	234	29	5	X	X
12. Placement of the Feet Swing Left	214	43	11	X	X

3.4.3 Stance Anthropometry

A total of 386 subjects for stance were recorded, where 3 were removed due to obstructions, leaving a final total of 383 subjects analysed within the anthropometry component. Through the R Studio programming software, a series of codes were written to run statistical analyses on the data in its raw form initially, then the normalised values for the data. Upon direct comparison of both raw and normalised data, the normalised data produced more consistent results and, therefore, when data was treated, the normalised dataset was used to view the statistical results. For stance anthropometry, all graphs generated from R Studio will be displayed and explained. The subsequent 'Gait Anthropometry' section to follow will only contain the most significant graphs within the body of the thesis, with remaining graphs displayed in Appendices.

3.4.3.1 Raw Data for Stance Anthropometry Analyses

Firstly, for PCA, the data in its raw form was analysed, where eigenvalues in scree plots were generated. Figure 3.9 shows the scree plot produced from the raw anthropometric data for stance, showing the five highest significant features and components.

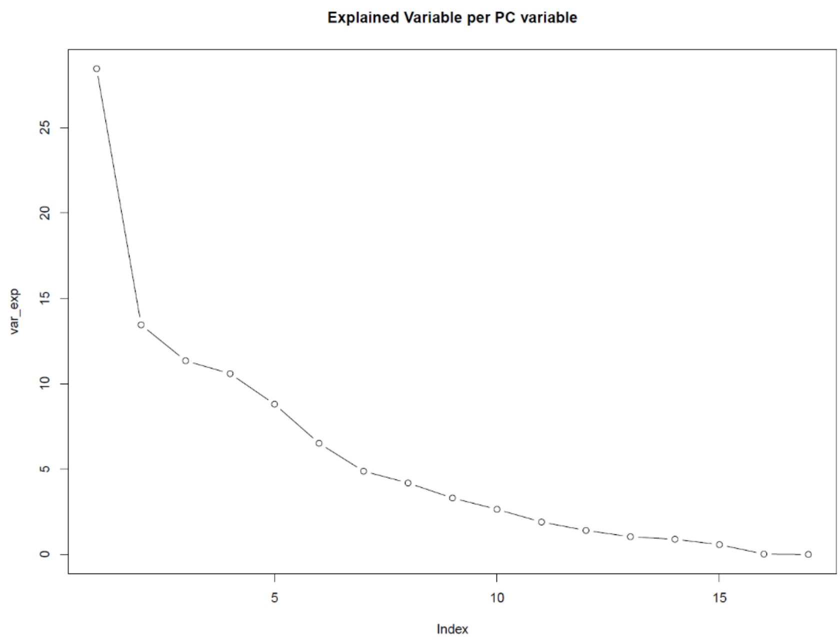


Figure 3.9 Scree Plot for Raw Stance Anthropometry from Principal Component Analysis.

Following the scree plot and associated eigenvalues, a loadings distribution was attained where a projection of the features/variables was observed within the factors space. If the features are further away from the centre of the square (0,0 vector), but closer to one another as observed by the green circle (leg length L and R) in Figure 3.10, these features are considered to be 'significantly negatively correlated' (Benaglia *et al.*, 2017). Similar to the green circle, but on the opposite side of the loadings distribution, is features that are 'significantly positively correlated' as observed by the orange circle (forearm length L and R). Finally, the blue circles (shoulder width and foot length L and R) are far from the centre but orthogonal to one another, indicating that they are not correlated to one another (Benaglia *et al.*, 2017). The grey boxes are included for clarification where features are overlapping. The features are seen to not be variant between left and right sides of the body features as we are symmetrical overall, but contain minor asymmetries. However, feature types show that they are variant to one another; potentially grouping them into feature families such as the axial and appendicular anatomy. For instance, the feature of the leg length (appendicular anatomy) varied from the torso length (axial anatomy).

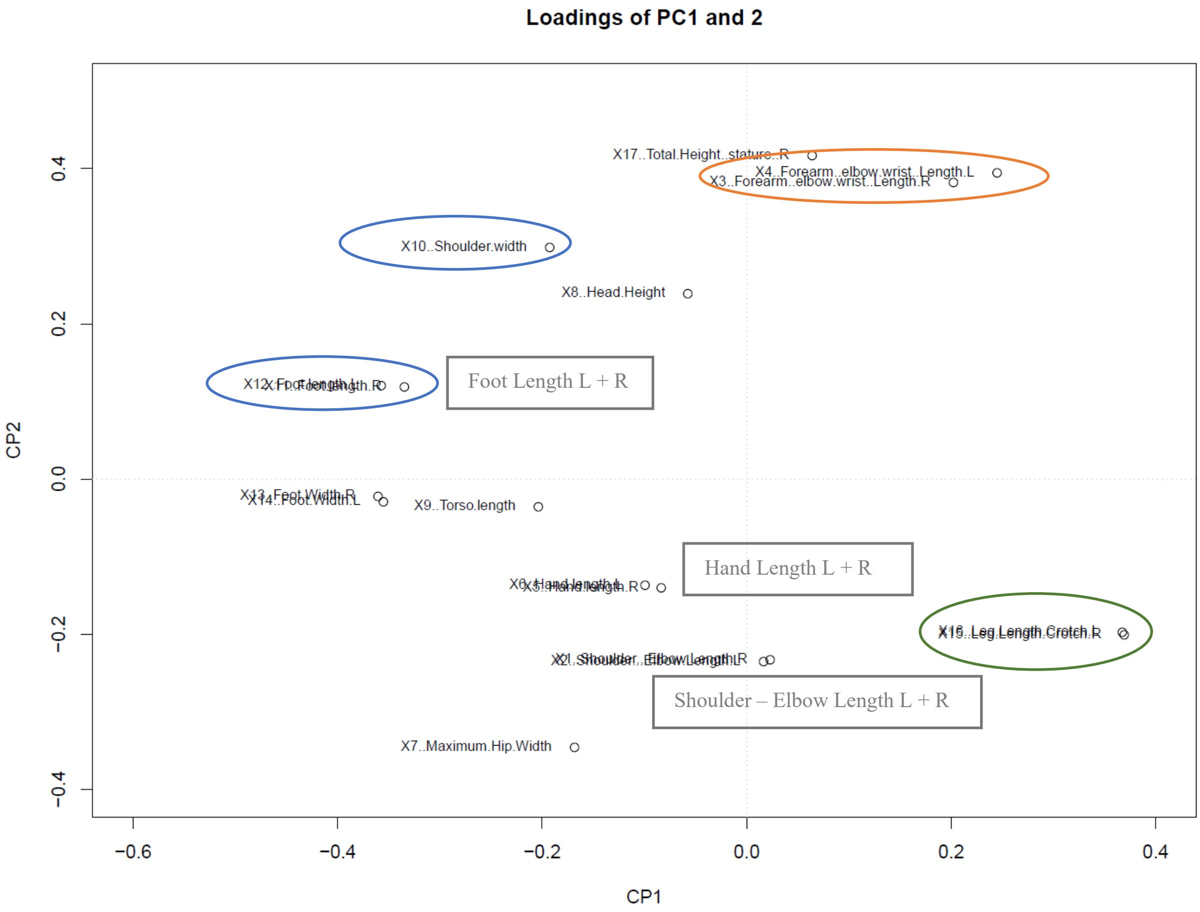


Figure 3.10 Loadings Distribution for Raw Stance Anthropometry from Principal Component Analysis.

Resultant to the loadings distribution, a loadings line graph was produced (Figure 3.11). Within this graph, the data set involves 17 features/variables (x axis), where 17 components have been generated in a linear combination. A weak influence of the particular variable on the specific component is indicated by smaller values that are closer to zero, while the larger values are indicative of a great influence. The five principle components with the highest variability were observed as: [PC1] Leg Length R; [PC2] Height; [PC3] Hand Length L; [PC4] Humeral Length (Shoulder –Elbow) L; and [PC5] Torso Length.

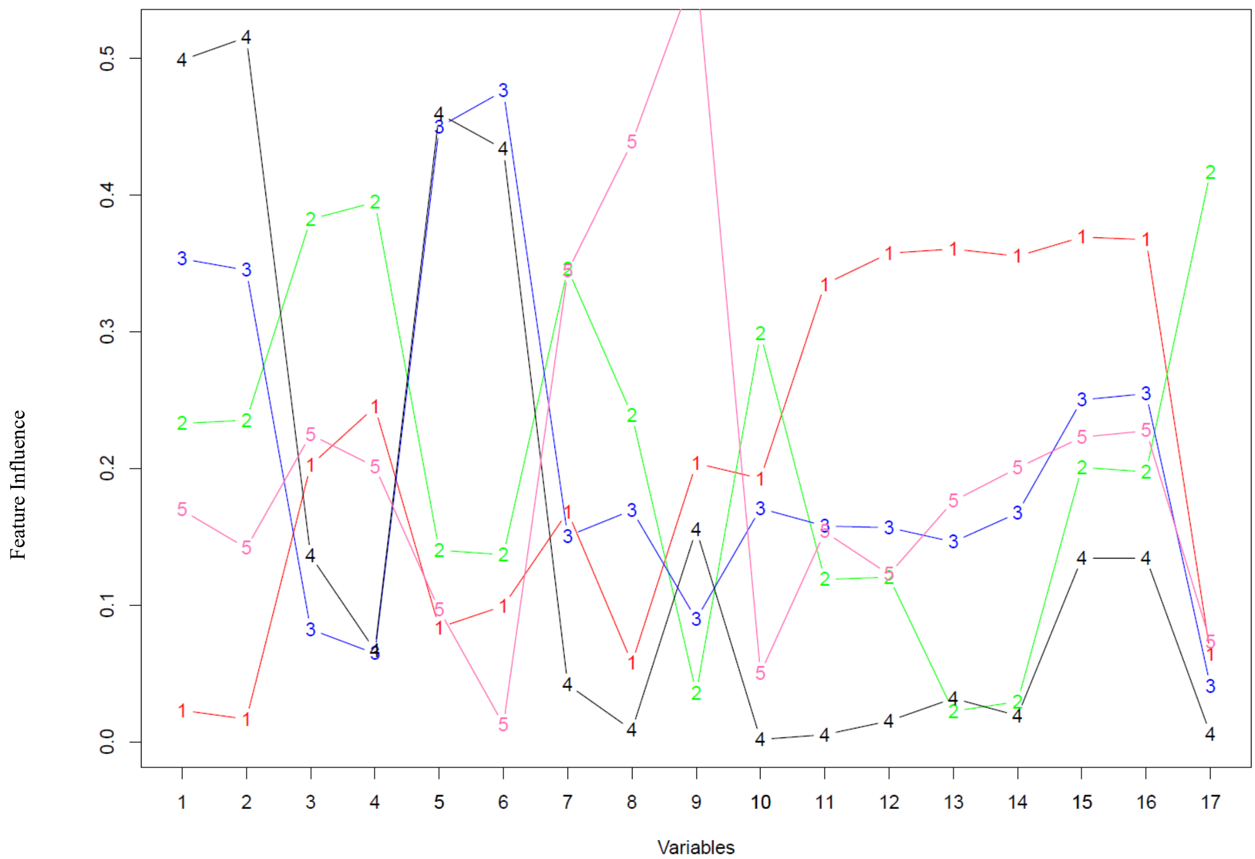


Figure 3.11 Loadings Line Graph for Raw Stance Anthropometry from Principal Component Analysis. The five principle components with the highest variability were observed as: [PC1] Leg Length R; [PC2] Height; [PC3] Hand Length L; [PC4] Humeral Length (Shoulder –Elbow) L; and [PC5] Torso Length.

3.4.3.2 Normalised Data for Stance Anthropometry Analyses

Following the analysis of the raw data graphs, the data was normalised as observed in Appendix E. From this, PCA was conducted as previous. Results for the scree plot, were seen to be similar to the raw data as observed in Figure 3.12.

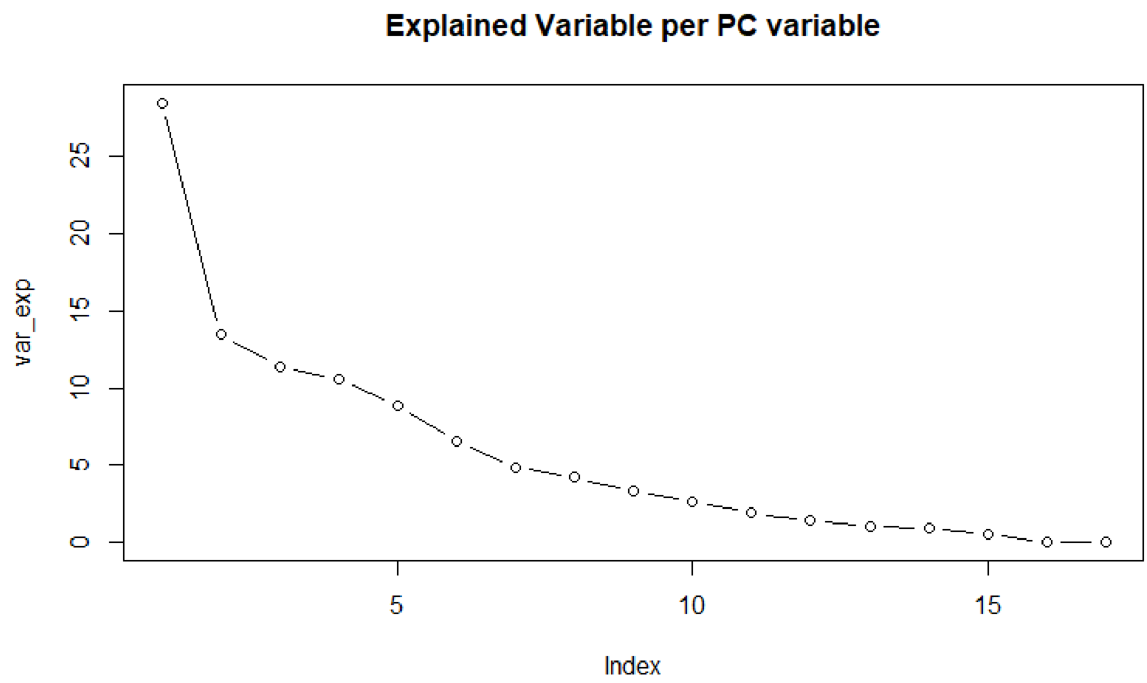


Figure 3.12 Scree Plot for Normalised Stance Anthropometry from Principal Component Analysis.

Next, the Hierarchical Clusters were generated, where a visual representation is depicted for normalised sex (Figure 3.13), age (Figure 3.14) and ancestry (Figure 3.15), Ward was the only linkage method that operated and produced clusters where sex functioned the best out of all categories (Table 3.5). Within this table, the sex and age categorised correctly into their groups, as seen by the (1,2) for sex, in the class system column. This class system signifies the categories within the subgroups, for instance in sex, class 1 is male whereas class 2 is female. This is also observed for age, classing correctly into subcategories 1, 2, 3, segregating and distinguishing between subpopulations. This was not the case for ancestry however, where it was classed as 1, 3, 1, intermixing between classes. This may be the result of uneven numbers within the data-pool.

As an example; in Figure 3.13 the red boxes signify that the HCA is separating the data into male and female categories. Whereas in Figures 3.14 and 3.15, the data is separating into three categories for the three age groups and also three categories for the ancestry groups based on the system separating the data.

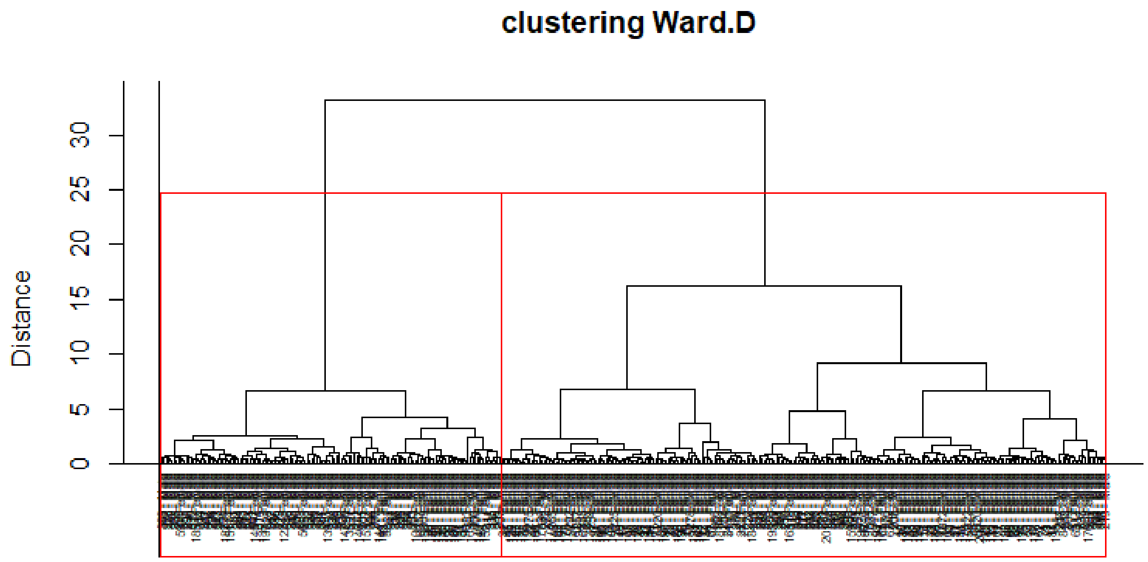


Figure 3.13 Hierarchical Cluster Ward for Normalised Sex Stance Anthropometry.

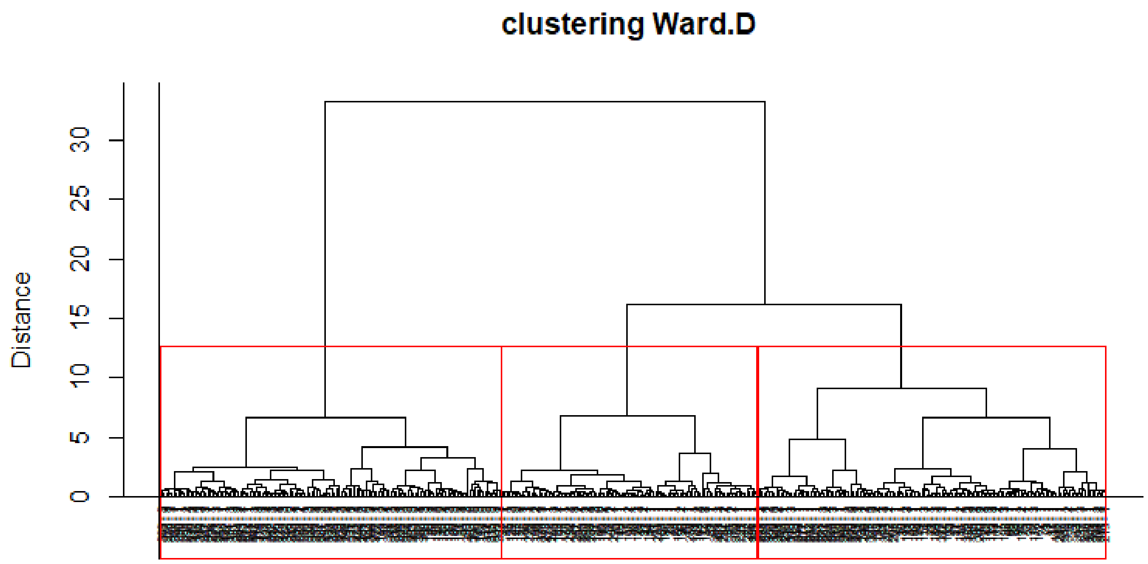


Figure 3.14 Hierarchical Cluster Ward for Normalised Age Stance Anthropometry

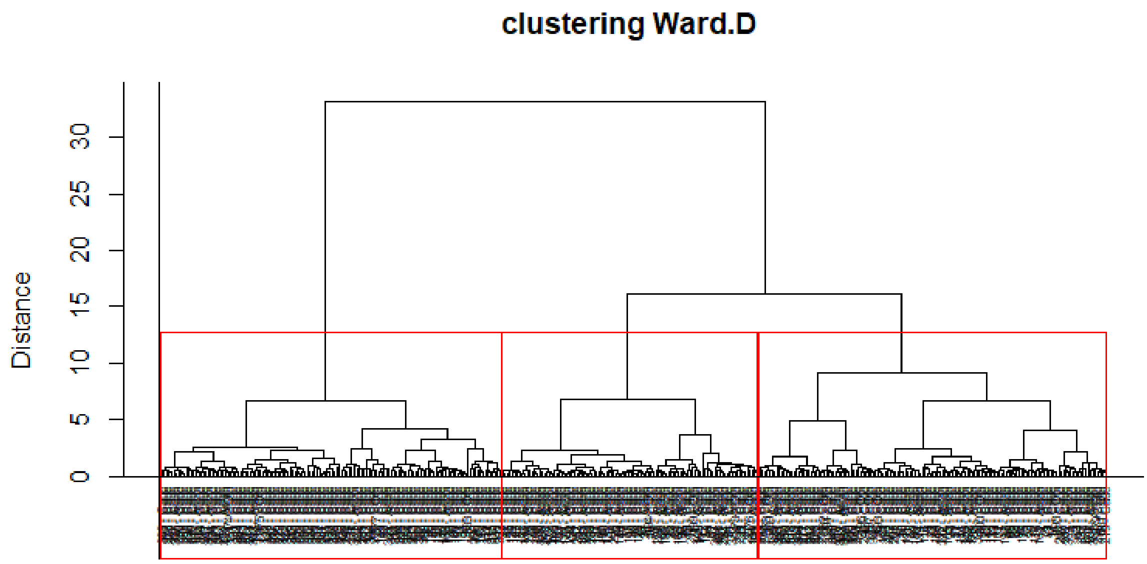


Figure 3.15 Hierarchical Cluster Ward for Normalised Ancestry Stance Anthropometry.

Table 3.5 Master Table for both Raw and Normalised Stance Anthropometry HCA.

		simple		complete		Moyen (Average)		ward	
		%	CLASS SYSTEM	%	CLASS SYSTEM	%	CLASS SYSTEM	%	CLASS SYSTEM
RAW	SEX (2)	99.74	1,1	99.74	1,1	99.74	1,1	71.8	1,1
	Age(3)	99.48	1,1,1	65.01	2,2,2	99.48	1,1,1	44.65	3,3,3
	Ancestry(3)	99.48	1,1,1	66.01	1,2,2	99.48	1,1,1	44.91	2,3,3
	SEX (2)	99.74	1,1	99.74	1,1	99.74	1,1	66.58	1,2
	Age(3)	99.48	1,1,1	76.5	1,1,2	99.48	1,1,1	50.39	1,2,3
	Ancestry(3)	99.48	1,1,1	70.23	1,1,1	99.48	1,1,1	40.99	1,3,1

Similar to the raw distribution graph (Figure 3.10) the green features in Figure 3.16 are significantly negatively correlated, the orange circle is significantly positively correlated, and the blue circles are not correlated to one another. The grey boxes are included for clarification where features are overlapping.

Identical to the raw stance anthropometry (Figure 3.10 and 3.11), the five principle components with the highest variability in the loadings distribution (Figure 3.16) and loadings line graph (Figure 3.17) for normalised stance anthropometry were observed. These were: [PC1] Leg Length R; [PC2] Height; [PC3] Hand Length L; [PC4] Humeral Length (Shoulder –Elbow) L; and [PC5] Torso Length.

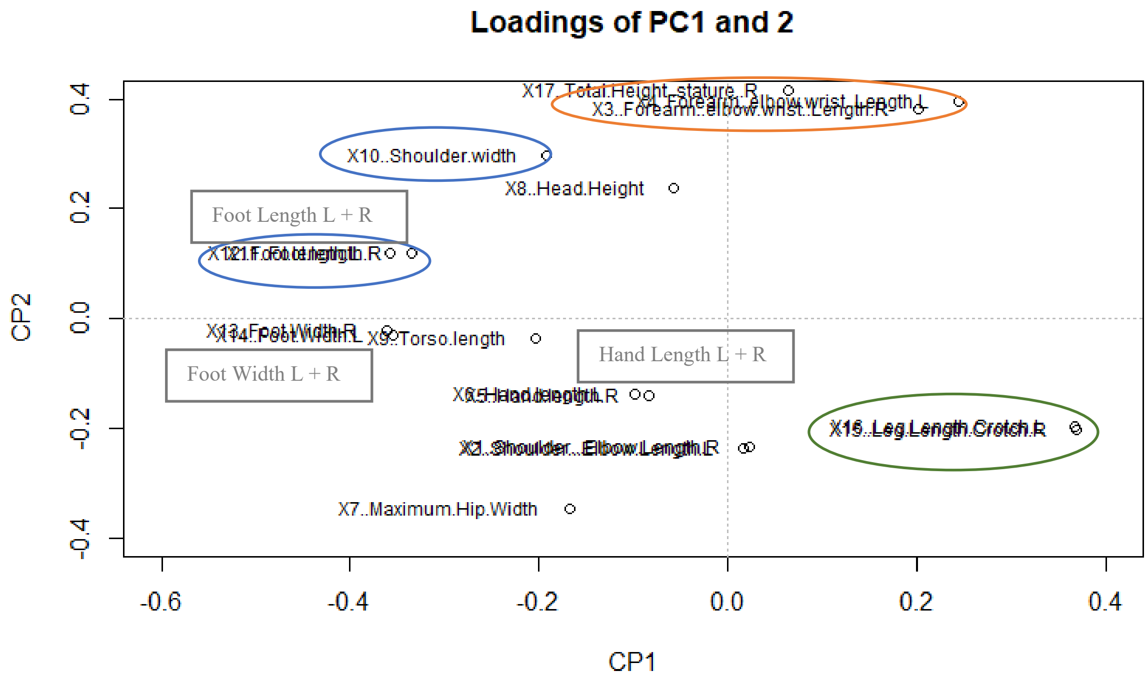


Figure 3.16 Loadings Distribution for Normalised Stance Anthropometry from Principal Component Analysis.

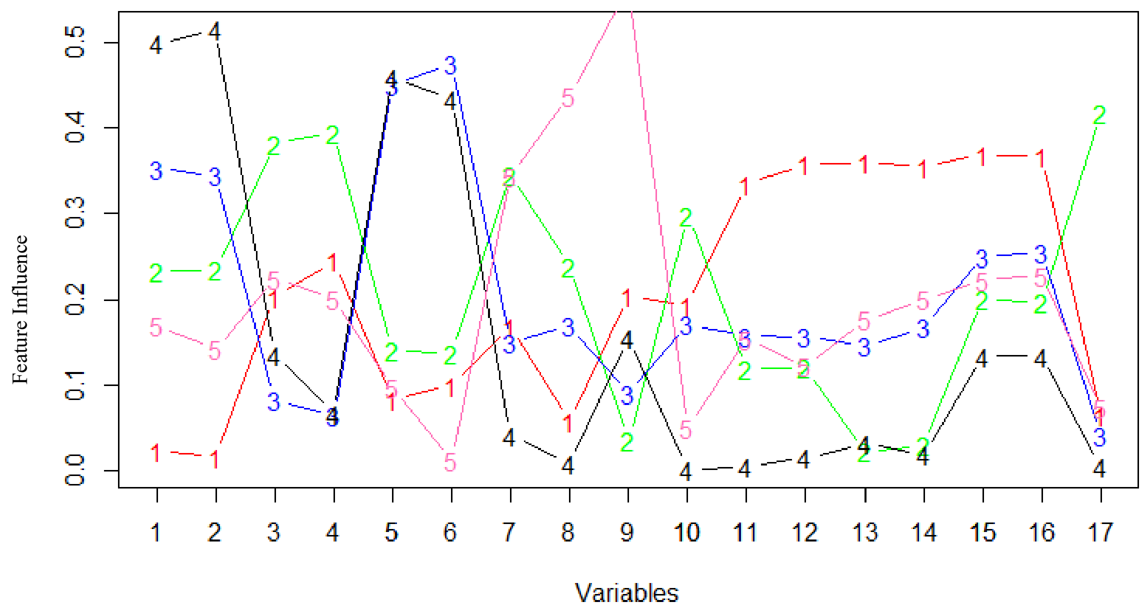


Figure 3.17 Loadings Line Graph for Normalised Stance Anthropometry from Principal Component Analysis.

Consequently, the correlation between the variables were observed in a correlation matrix, with the red boxes highlighting the top five most correlated features. The branches of the lines are representative of the level of variance. If the 'branches' are longer, this indicates higher variability to those that are shorter, representing a lower variance (Benaglia *et al.*, 2017). For example, in Figure 3.18, leg length – crotch was seen to be more variable between individuals than the foot length. This may or may not be attributed to the magnitude of the variable, in which further research will need to be completed. Also, leg length was separated into its own box, along with elbow width, but a grouping is observed within variables of the feet and head length etc. If the box had further separated, the next two that would be grouped would be X8 Head Height and X10 Shoulder Width.

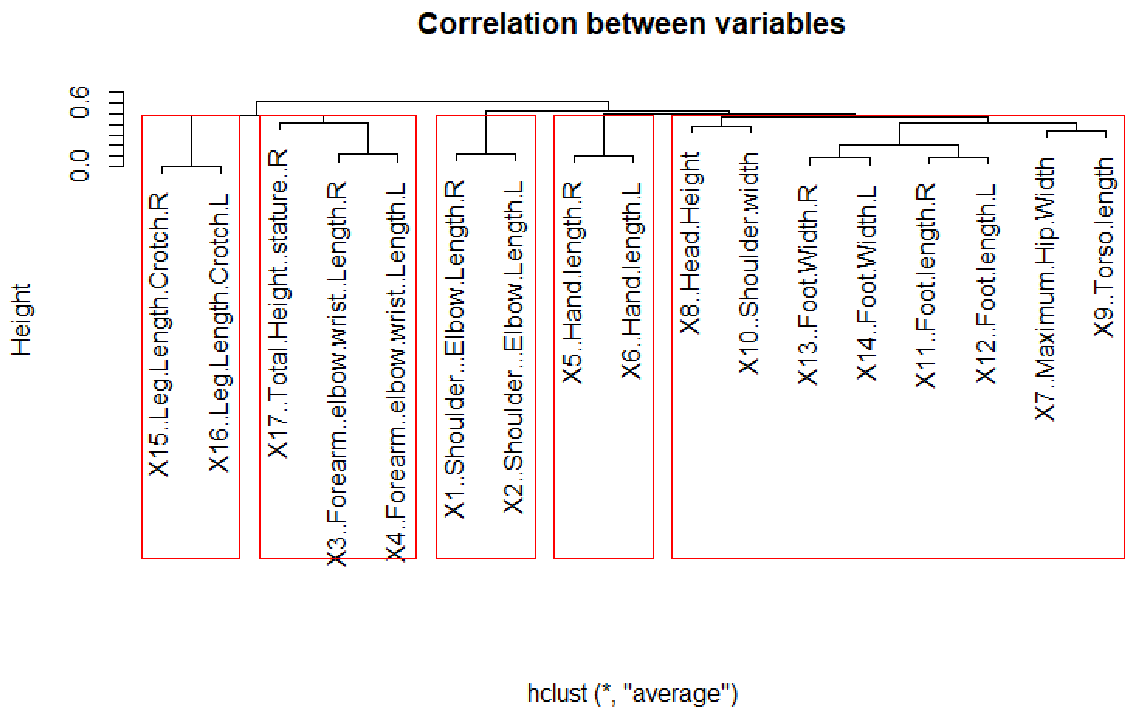


Figure 3.18 Correlation Matrix for Normalised Stance Anthropometry from Principal Component Analysis.

Within the Principle Component Analysis graph for normalised stance anthropometry data, no two anthropometric profiles were seen to be identical to one another, as observed within the scatterplot in Figure 3.19. Some points (or profiles) were seen to be clustered together, which indicates a high degree of similarity within their stance anthropometric proportions. Furthermore, males are represented by the grey colour whilst females are blue. A degree of separation between both sexes are clearly observed within this scatterplot.

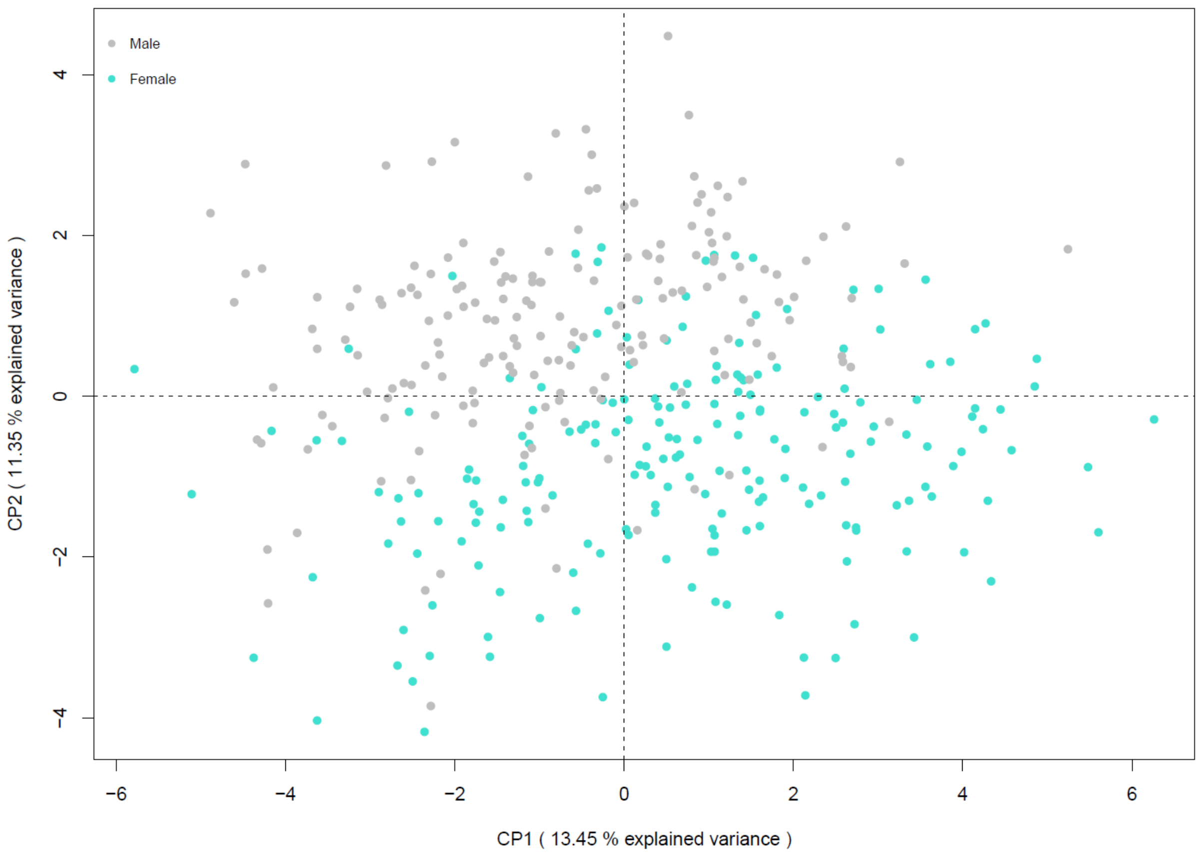


Figure 3.19 Principle Component Analysis for Raw Normalised Stance Anthropometry, Showing Correlations of Sex.

The point placement within the scatterplot remained the same for the ancestry and age components (Figure 3.20 and 3.21), but what can be observed from these graphs is the correlation of the subgroups. For Figure 3.20, the purple points represent the Caucasian group, whereas yellow indicates Asian, and green points denote the 'Other' category. Within the scatterplot, no clear degree of separation was observed between each of the ancestry groups. In Figure 3.21, the green points are age group 18 – 29, the orange are 30 – 49, and the red are 50 and above. Again, the points are similar in placement to the sex and ancestry graphs, but differ in colour to indicate the correlations of the subgroups. Some clustering of the points can be observed, where green is grouping to the right and red to the left of the scatterplot, but mixture between the groups are observed.

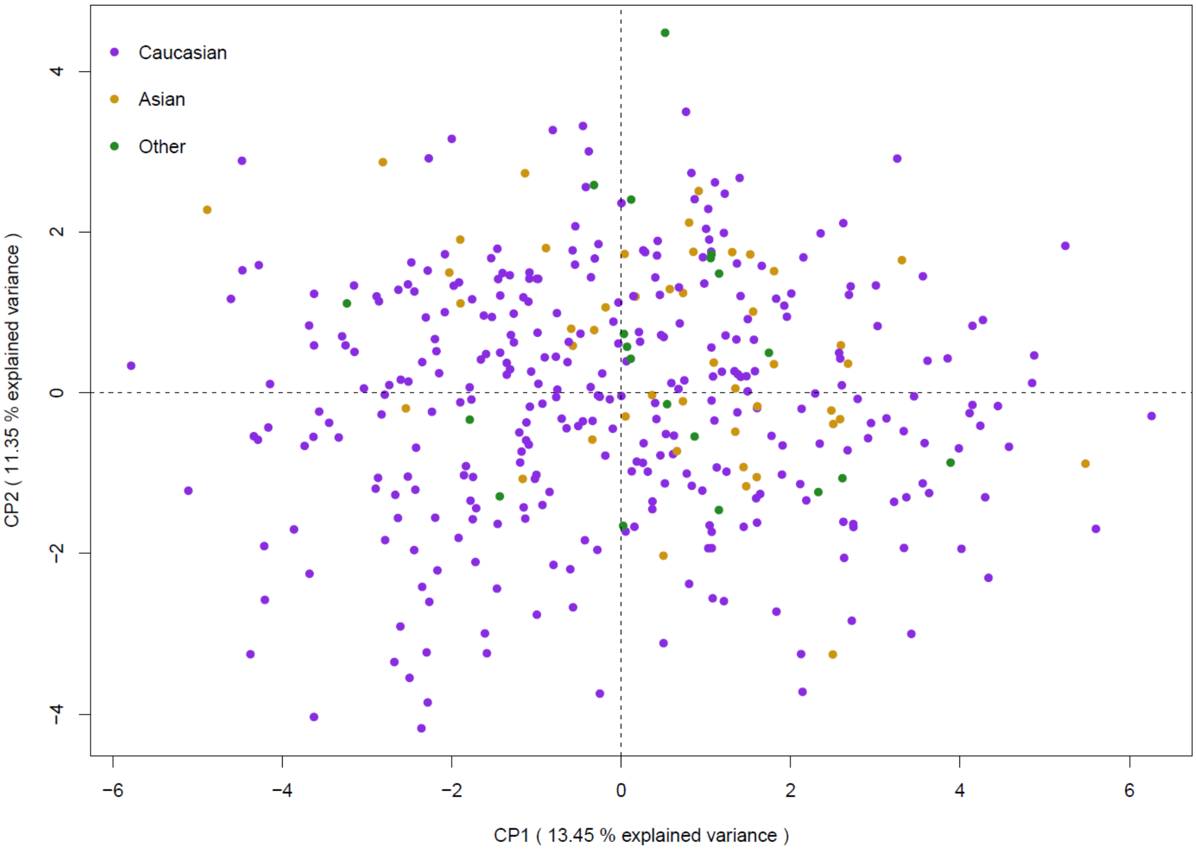


Figure 3.20 Principle Component Analysis for Raw Normalised Stance Anthropometry, Showing Correlations of Ancestry.

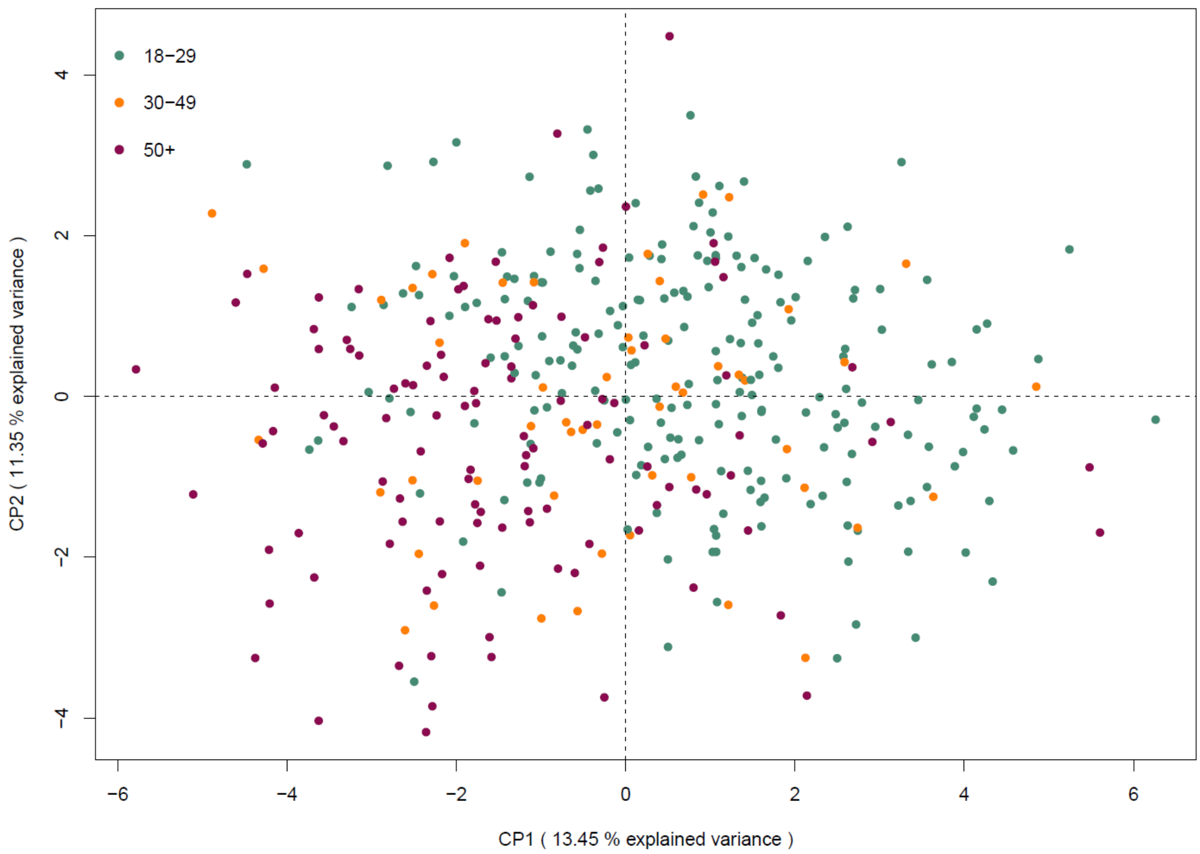


Figure 3.21 Principle Component Analysis for Raw Normalised Stance Anthropometry, Showing Correlations of Age.

3.4.3.3 Sex Data Treatment on Normalised Data for Stance Anthropometry Analyses

To make use of the data in the correct form, data treatment is imperative. Raw data collection is the primary component of all research, however, organising the data is a vital step to ensure that the appropriate conclusions can be drawn. Therefore, based on the results that were obtained, the data was treated by suppressing the outliers within the normalised dataset based on their sex, as that was the factor producing the strongest results. All outliers that were not predicted accurately by the system (males were predicted as females and vice versa), were removed to view the results that would be produced. Therefore, we will call this 'sex treatment of the dataset'. Once the data was treated, the scatterplot graphs were repeated. There was a more refined and clear degree of separation between the male (grey) and female (blue) groups (Figure 3.22). No clear degree of separation was observed within the ancestry groups (Figure 3.23), but a degree of separation was perceived in the age groups (Figure 3.24), where the older age group clustered to the right, whereas the younger group clustered to the left.

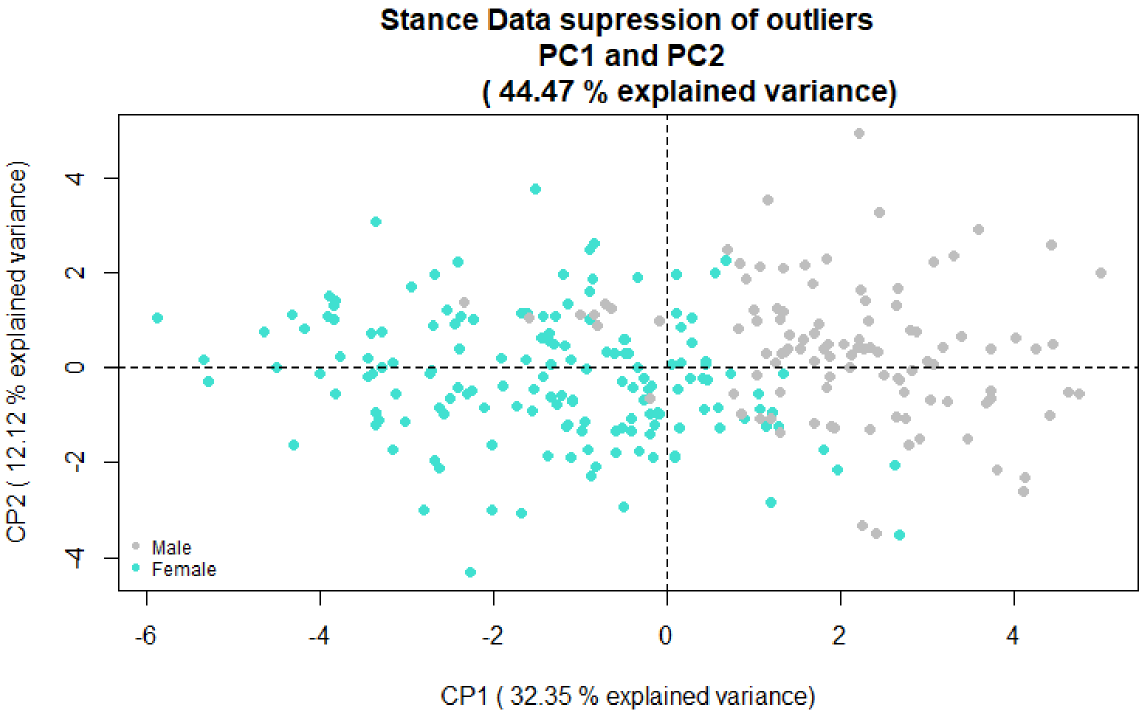


Figure 3.22 Principle Component Analysis for Sex Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Sex.

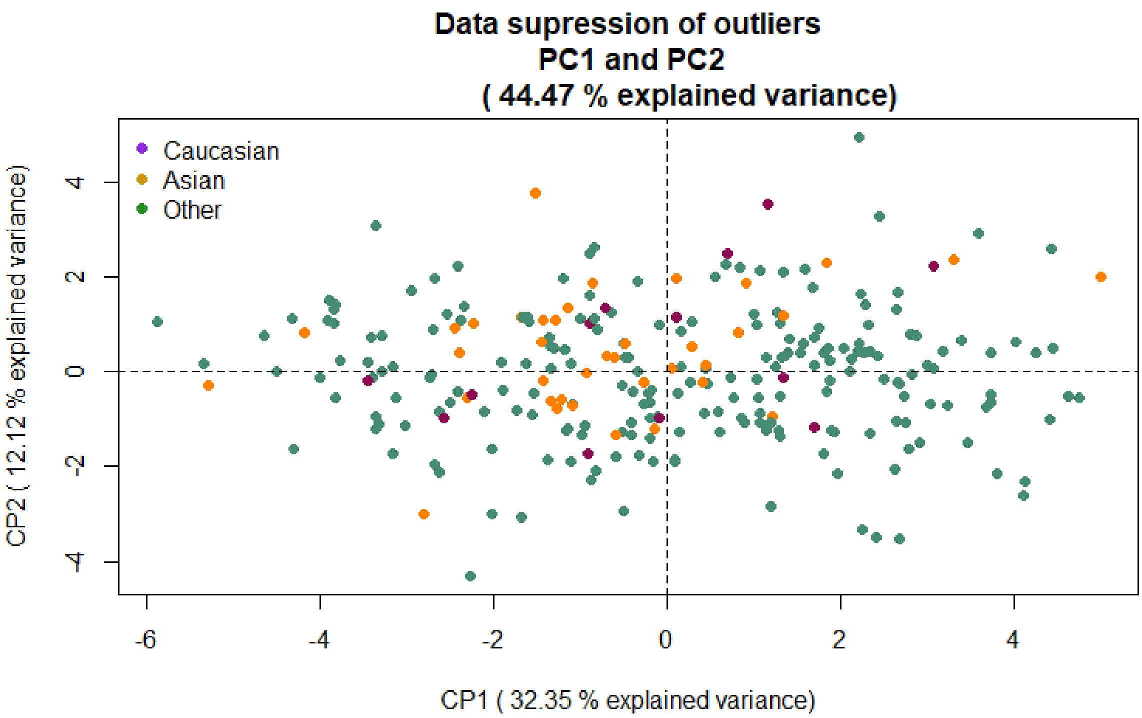


Figure 3.23 Principle Component Analysis for Sex Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Ancestry.

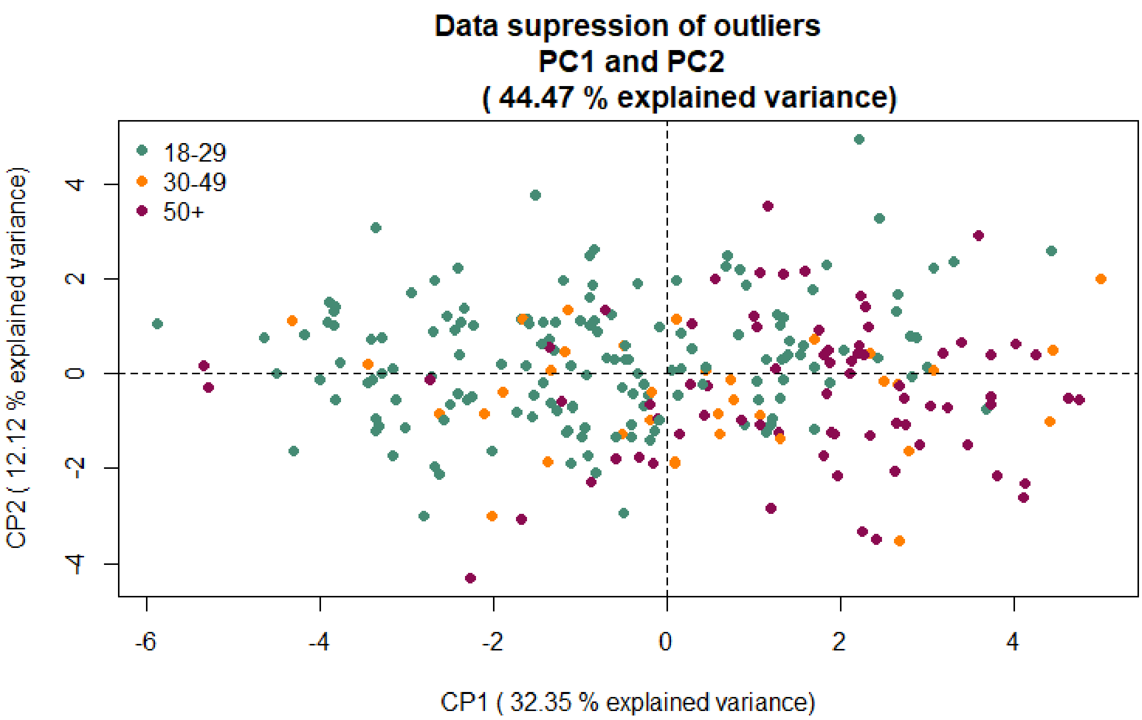


Figure 3.24 Principle Component Analysis for Sex Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Age.

Next, the cumulative percentage of variance expressed by the principle components were evaluated. Three features were selected at random, including: [13] Foot Width R, [14] Foot Width L, and [15] Leg Length R. After this was reduced to only two features [13] Foot Width R, [14] Foot Width L, the cumulative percentage of explained variance for the data (after it was treated) was seen to be at 100%, meaning that 100% of the variance was able to describe the total variance of the dataset, as seen in Figure 3.25. The red line shows that expressing 80% of variance is sufficient to describe the total variance of the dataset as expressed by Pareto's Law (Benaglia *et al.*, 2017).

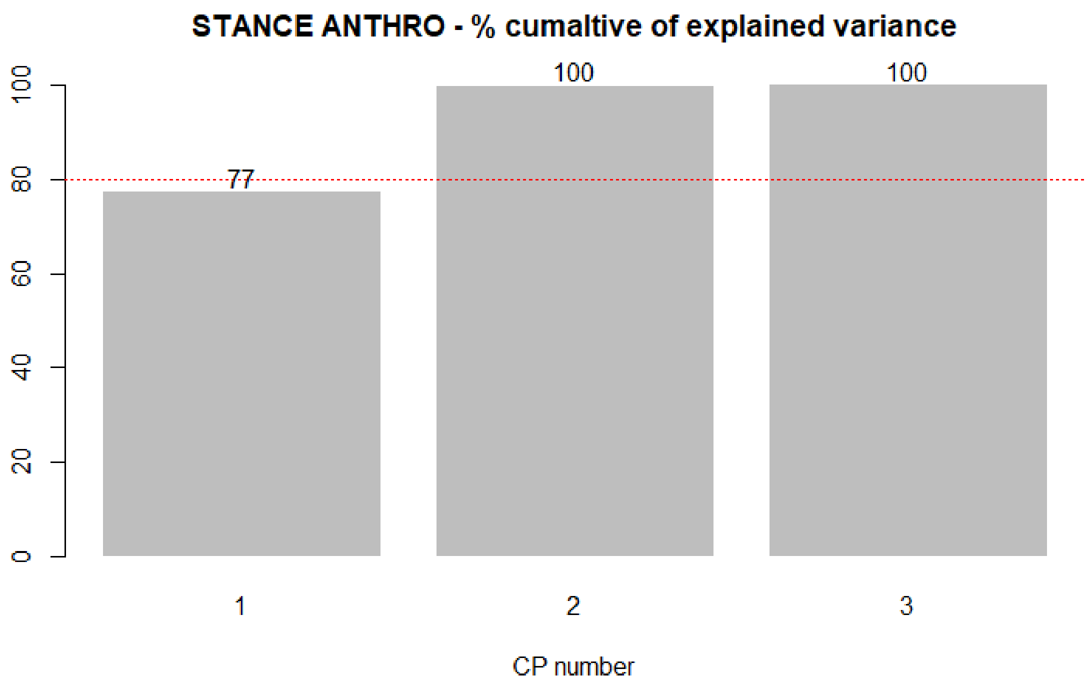


Figure 3.25 Cumulative Percentage of Explained Variance in Treated Data for Three Features in Normalised Stance Anthropometry.

Following the determination of the cumulative percentage of variance, using these three aforementioned variables, scatterplots were again generated to view any clustering of subgroups. Figure 3.26 shows the male and female groups clustering on either side of the ‘0’, as observed from the x axis, and a clear degree of separation can be observed between them. Figure 3.27, demonstrates the subgroups of ancestry have no significant degree of separation, however, in Figure 3.28 we can see that there is clustering of the older and younger age groups, as observed by the red and green clustering respectively, showing a degree of separation.

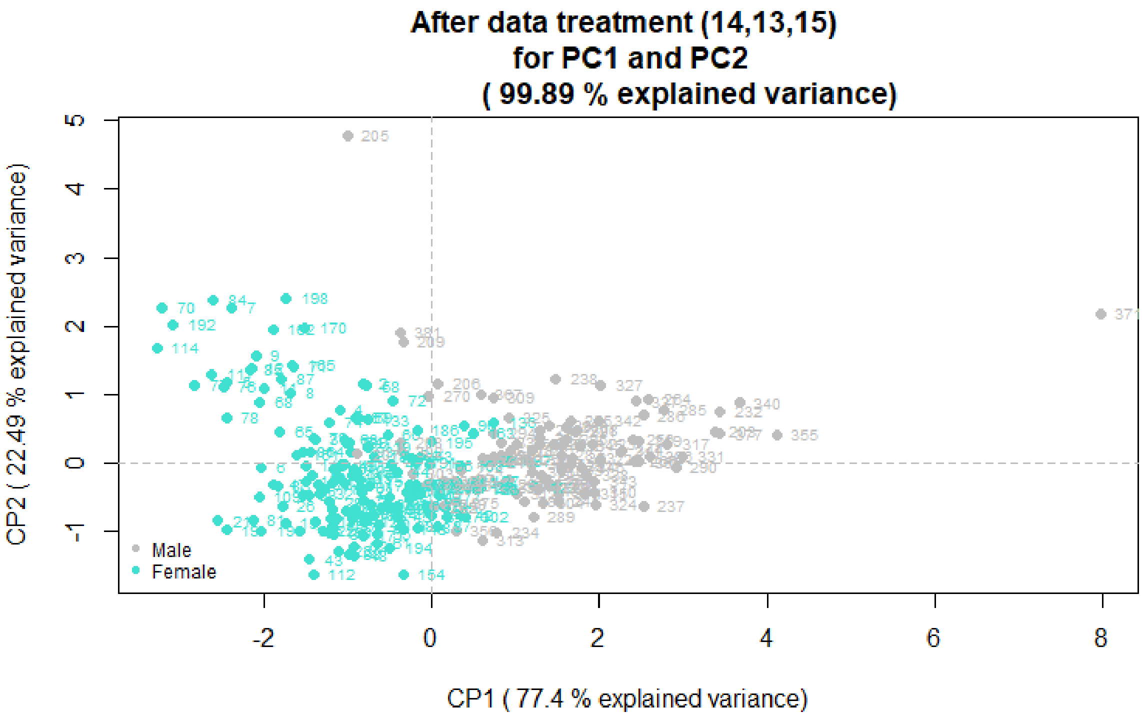


Figure 3.26 Normalised Stance Anthropometry for Sex Treated Data to view Sex Correlations for Three Features.

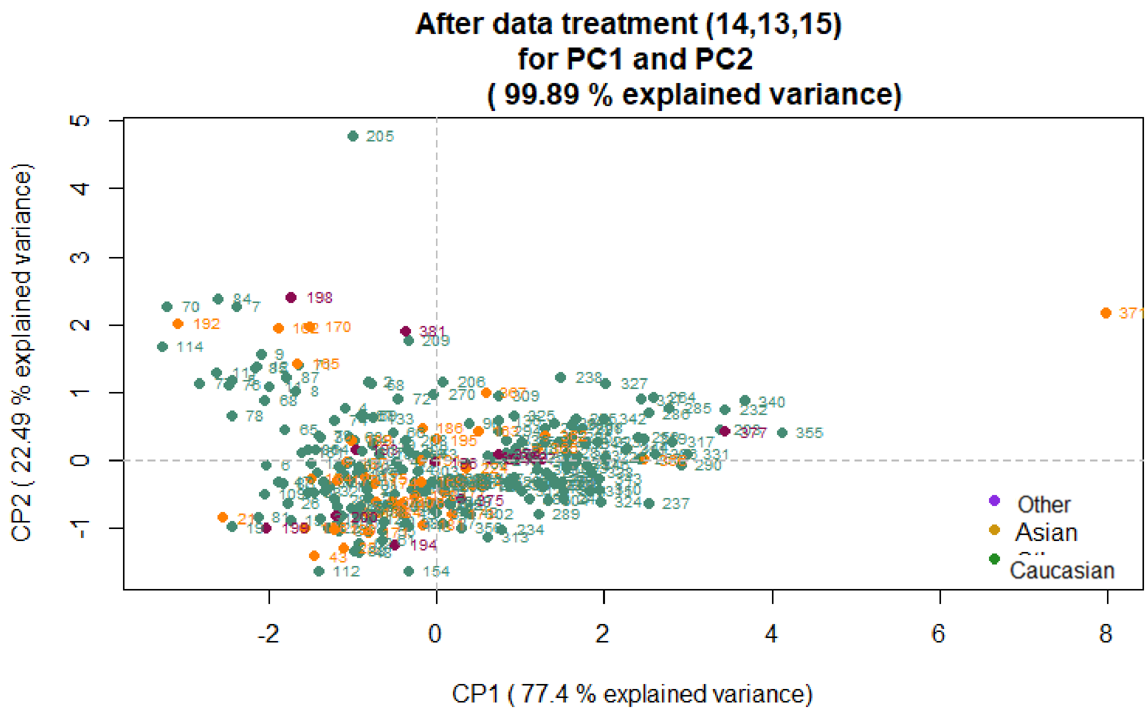


Figure 3.27 Normalised Stance Anthropometry for Sex treated Data to view Ancestry Correlations for Three Features.

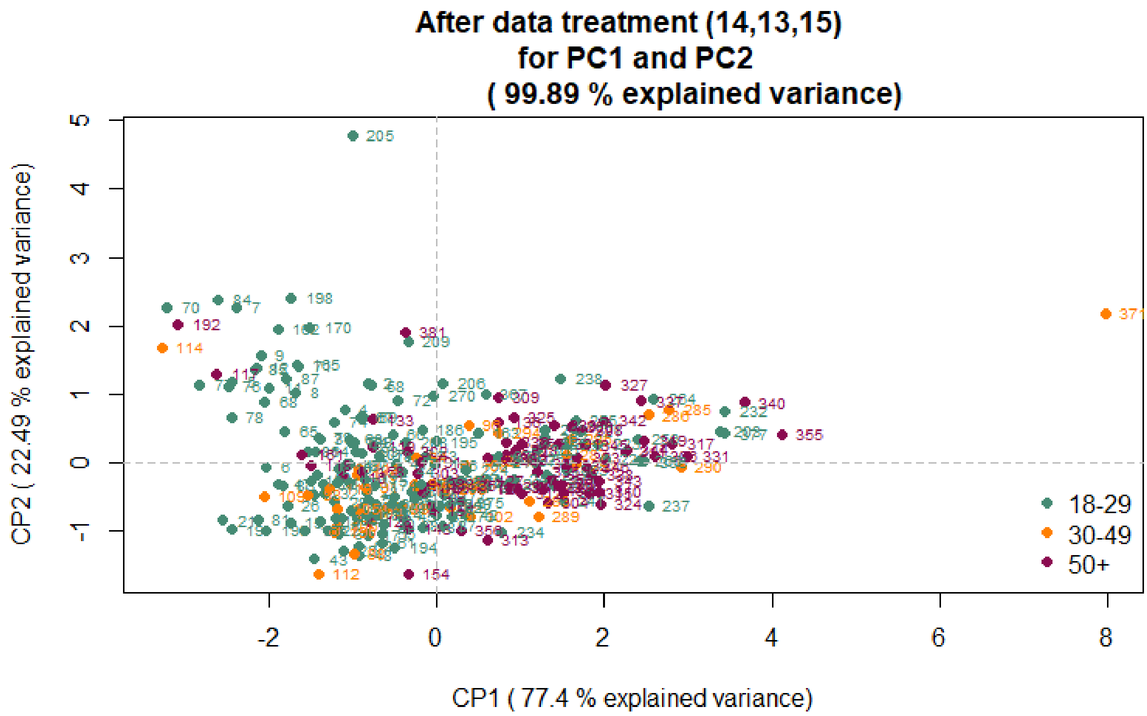


Figure 3.28 Normalised Stance Anthropometry for Sex treated Data to view Age Correlations for Three Features.

Similar to the three features seen previously, two features were randomly selected based on the sex data treated results: [13] Foot Width R, and [14] Foot Width L, and the test was repeated again to see if there were any variances in results, as observed in Figure 3.29. From the scatterplots generated, for sex, ancestry, and age (Figures 3.30, 3.31, and 3.32 respectively) a degree of separation was observed in sex and age, but not for ancestry.

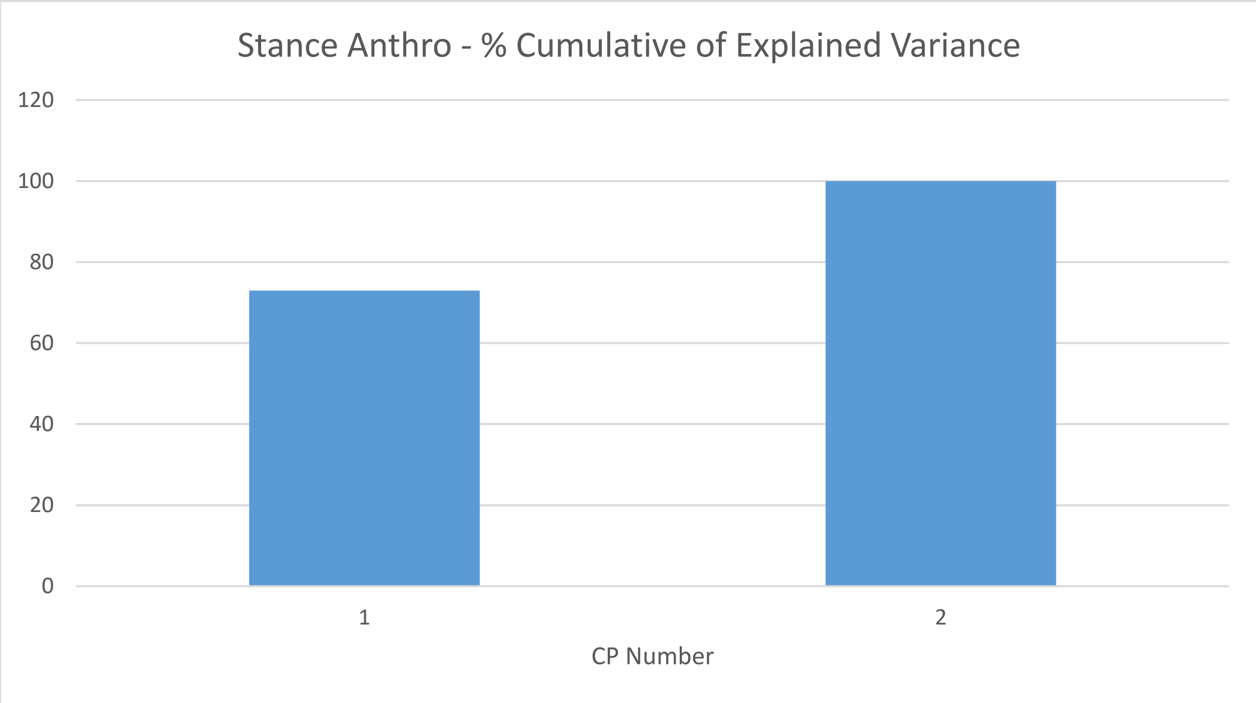


Figure 3.29 Cumulative Percentage of Explained Variance in Treated Data for Two Features in Normalised Stance Anthropometry.

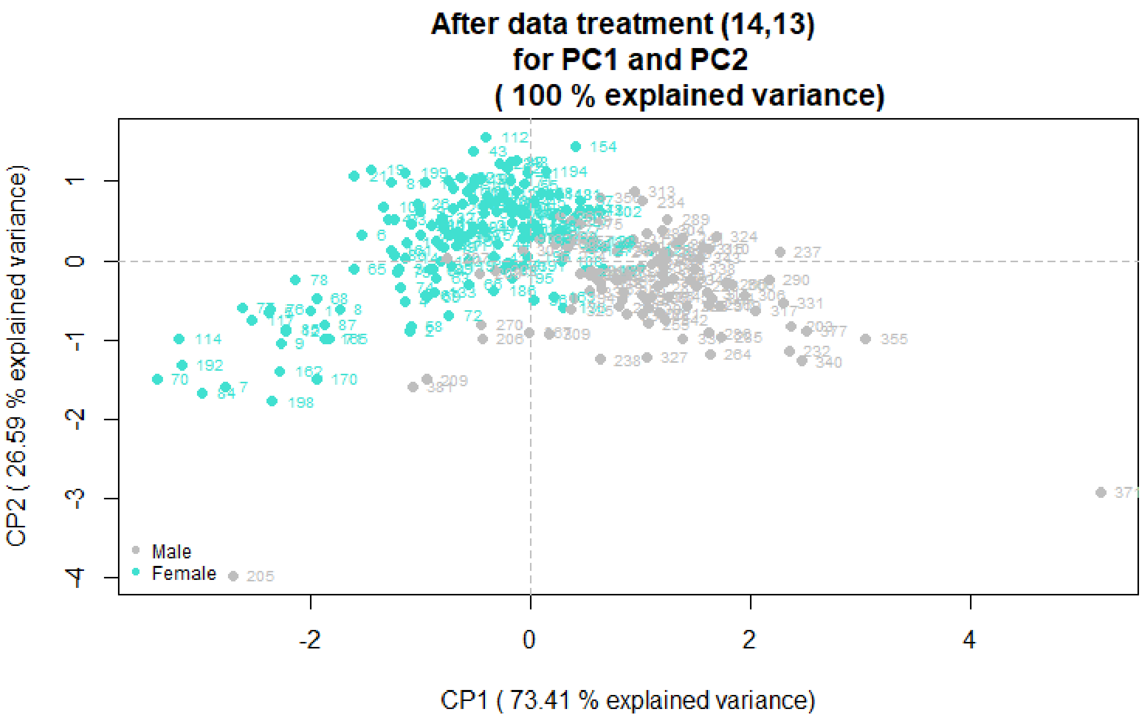


Figure 3.30 Normalised Stance Anthropometry for Sex Treated Data to view Sex Correlations for Two Features.

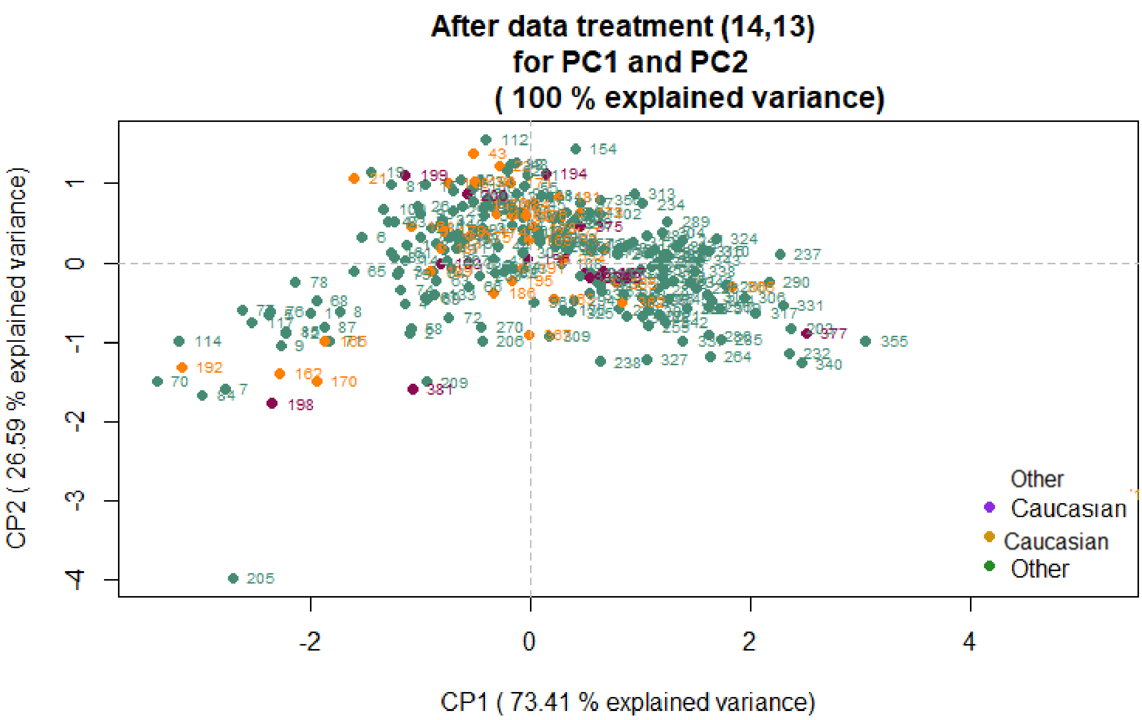


Figure 3.31 Normalised Stance Anthropometry for Sex Treated Data to view Ancestry Correlations for Two Features.

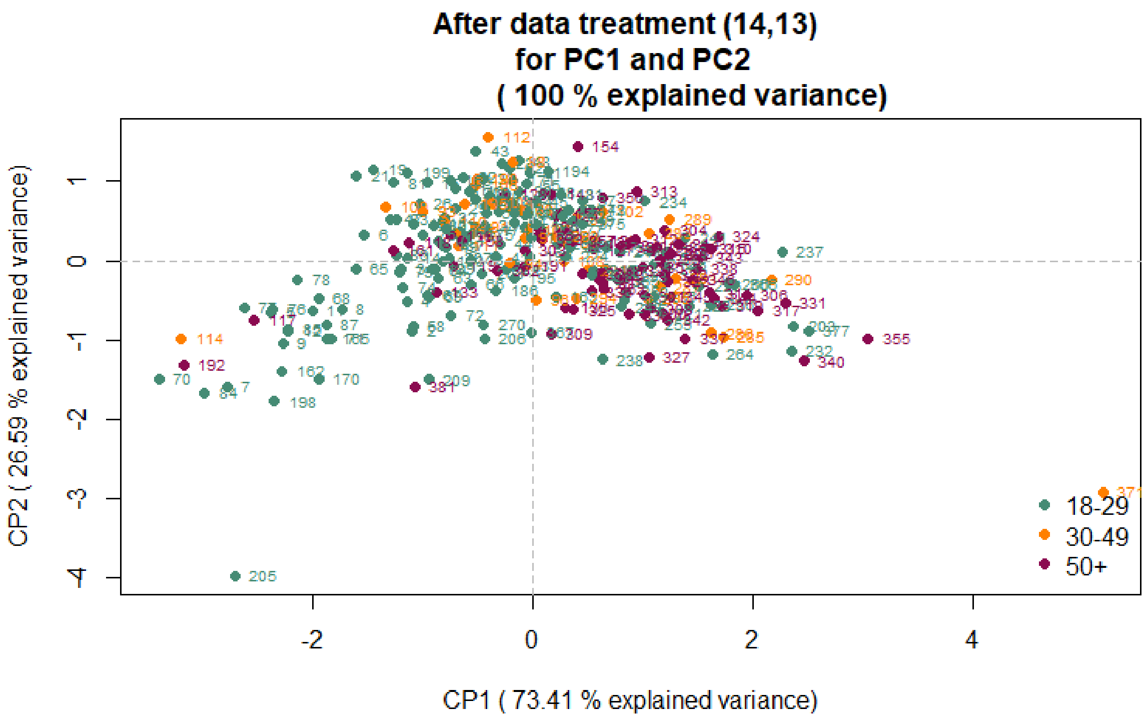


Figure 3.32 Normalised Stance Anthropometry for Sex Treated Data to view Age Correlations for Two Features.

The scores from the cumulative percentage explained for ‘Foot Width R’ and ‘Foot Width L’, were then represented in a biplot where the relationships between the subpopulations were then visually observed (Nonlinear, 2019) (plotting first eigenvector to a second), where results were observed for both sex and ancestry (Figures 3.33 and 3.34). For sex, the females gravitate to the bottom left of the graph, indicating a high negative score, and appear to be separated from the male subjects, which gravitate towards the right of the graph. Ancestry on the other hand appeared to be mixed with no degree of separation between the subcategories. This may be a direct result from the uneven numbers within each category. It was not possible to generate a plot in R studio for age, due to the lack of degree of separation for this test and the subsequent poor results attained.

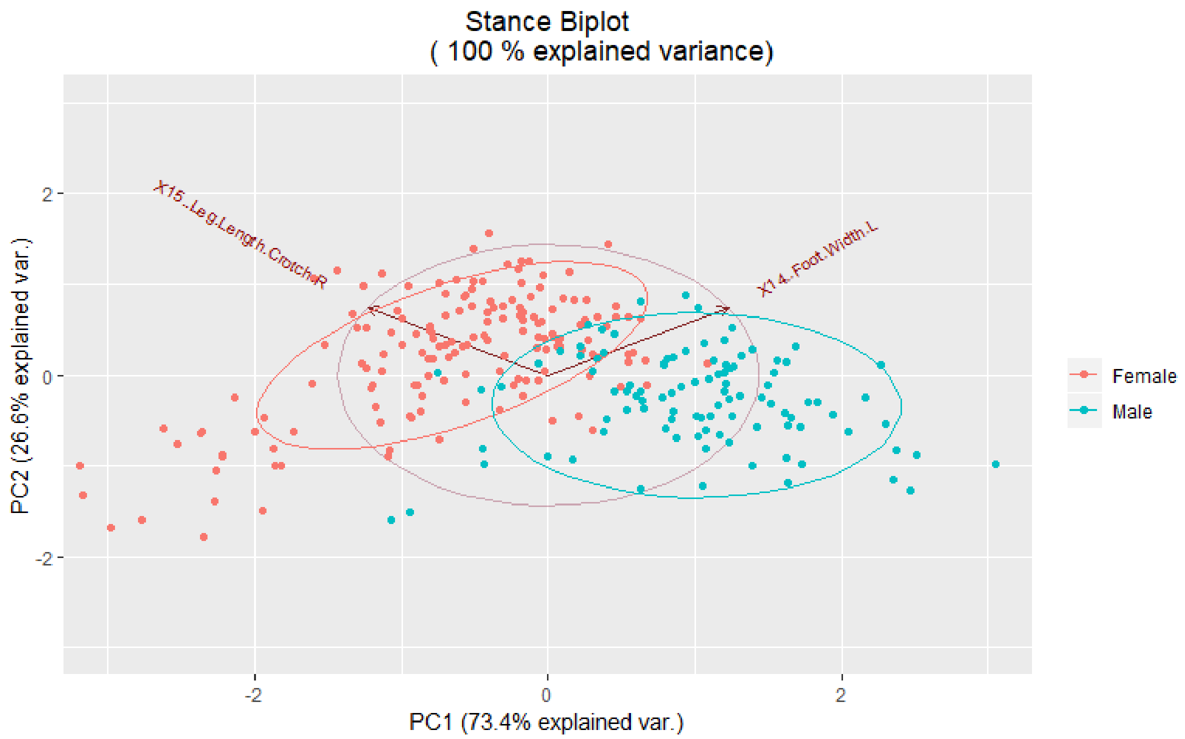


Figure 3.33 Biplot for Sex. The females are observed in orange and the males in blue. A high degree of separation based on the two features (Leg Length R and Foot Width L) is observed.

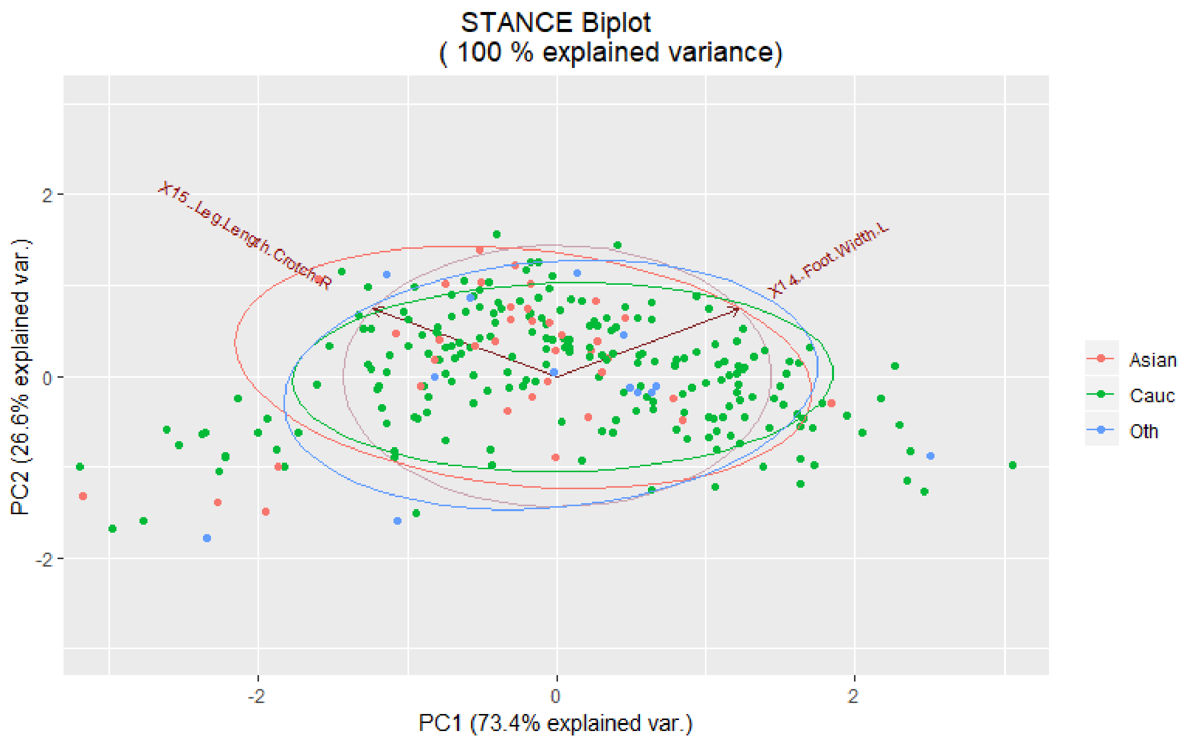


Figure 3.34 Biplot for Ancestry. Asian population is represented by orange, Caucasian by green, and 'Other' by blue.

3.4.3.4 Linear Discriminant Analysis for Stance Anthropometry Analyses

Following PCA, Linear Discriminant Analysis (LDA) was conducted to firstly determine whether variation within the subgroups exist, and secondly, if so, the degree of variation present. LDA tries to apply the greatest linear combination that provides maximum separation between the centres of each of the classes, while at the same time minimising variation between the groups; in essence, seeking the direction for the biggest variance between classes. LDA was conducted for sex, age, and ancestry. Results were obtained for both sex and age, however a graph and LDA results were not provided for ancestry, as data sizes between the groups were too uneven.

Within the LDA graph, where sex was the independent variable, a clear degree of separation was observed with male and female groups (Figure 3.35). Some overlap between the sexes was observed. As observed within the Master Table (Table 3.6), the confusion matrix for the results without pre-data treatment showed a high 94.9% predictive accuracy. When the data was pre-processed, this increased to 98.4% predictive accuracy. Furthermore, false positives and negatives of variables that are classified correctly and misclassified were observed. For ‘no treatment’, females were classified correctly at 94.6% and incorrectly 5.4%, and males were classified correctly at 95.2% and incorrectly 4.8%, indicating that males performed slightly better for the ‘non-treated’ data. When the data was treated (outliers removed), results were much better for females, with a 99.4% accuracy and 0.6% misclassification. Males were 96.7% correctly classified and 3.3% incorrectly classified. This shows that treated data yielded a higher predictive accuracy and performance in general, and females within the treated data performed better than males.

The LDA graph where age was the independent variable showed no significant degree of separation (Figure 3.36), with an abundance of overlap observed. Within the Master Table (Table 3.6), age did not perform well overall (75.3% performance for untreated and 76.1% for treated), however, when we observe the subcategories for treated data, age group one had a 91.3% correct (high) classification, group two had a 31.2% correct (poor) classification, and group three had a 64.9% correct (moderate) classification. When age and sex are compared, sex performed considerably better.

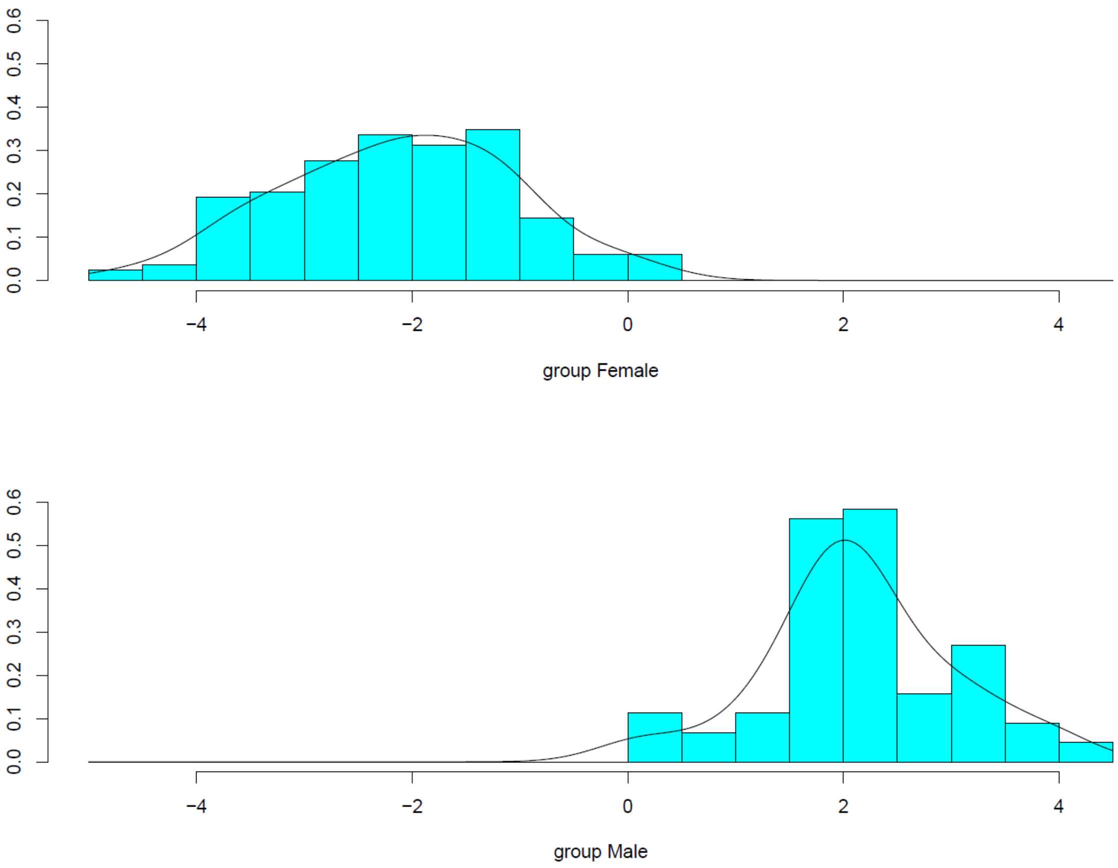


Figure 3.35 Linear Discriminant Analysis for Sex Stance Anthropometry

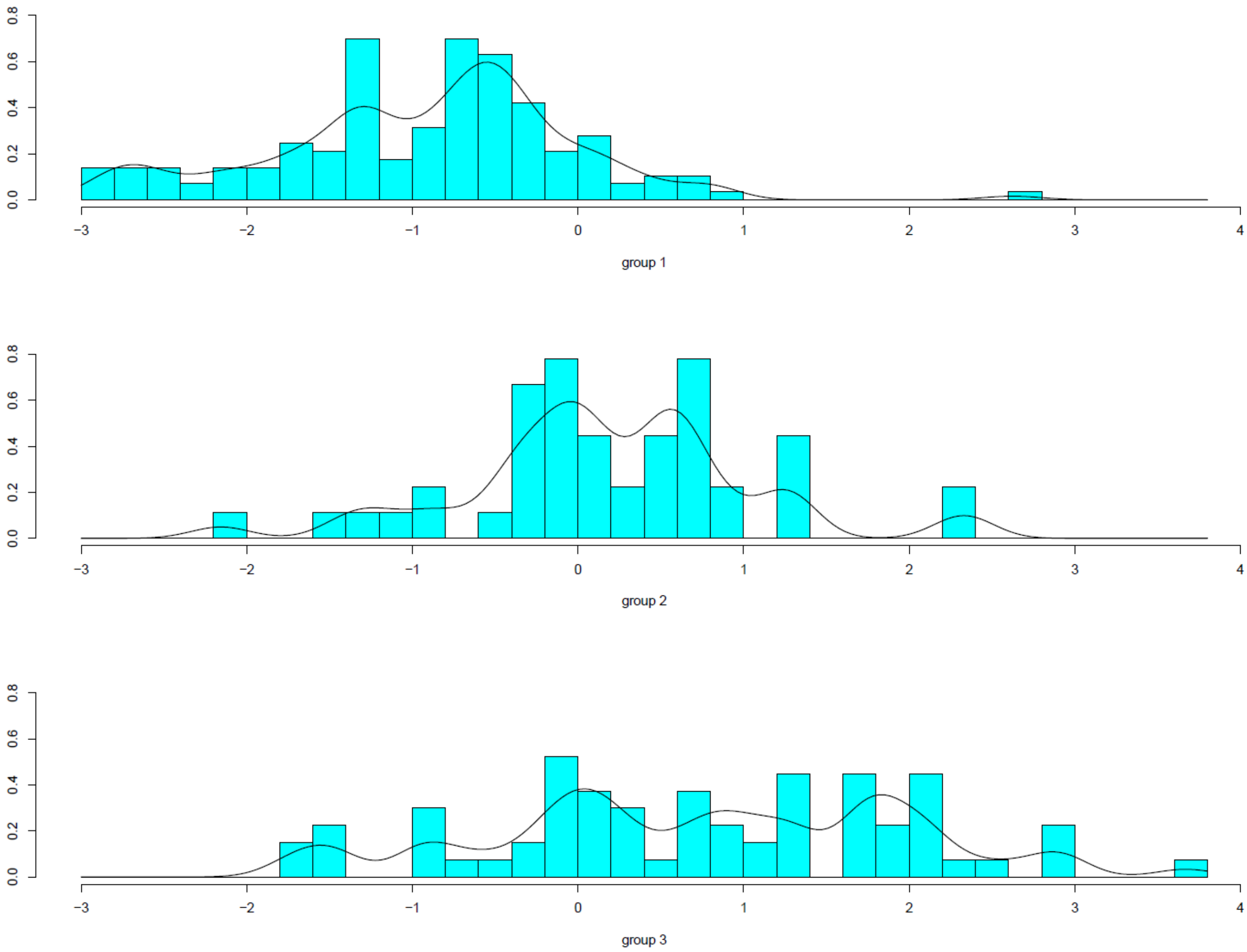


Figure 3.36 Linear Discriminant Analysis for Age Stance Anthropometry

Table 3.6 Master Table for Own Data Linear Discriminant Analysis for Sex Stance Anthropometry

Model	**1**		**2**		**3**		**4**	
Pre-treatment	no		no		YES- WARD SEX		YES- WARD SEX	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=replicate/samples	SAMPLE SIZE		SAMPLE SIZE		SAMPLE SIZE		SAMPLE SIZE	
Performance %	**94.9**		**75.3**		**98.4**		**76.1**	
Variable 1 classified%	FEMALE	94.6	1	93.3	FEMALE	99.4	1	91.3
Variable 1 misclassified		5.4		6.7		0.6		8.7
Variable 2 classified%	MALE	95.2	2	3.2	MALE	96.7	2	31.2
Variable 2 misclassified		4.8		96.8		3.3		68.8
Variable 3 classified%			3	63.9			3	64.9
Variable 3 misclassified				36.1				35.1

Following the performance assessment of the data, an LDA 2/3rds prediction test was completed, whereby two-thirds of the original data as well as one-third randomised or 'resampled' data was tested (Table 3.7). For sex, the one-third randomised data selection performed better within the treated data, which produced a 94.6% predictive accuracy (high performance), whereas the untreated data was 87.3%. Therefore, when narrowing on the treated data, females were classified 96.9% correctly and males at 91.5%, both displaying high levels of performance.

Age, in the same table, performed better in the untreated dataset at 62.2% (moderate performance) and worse with the treated data at 58.8% performance. For the treated data, age group one contained a 77.6% classification (moderate performance), age group two was 15.4% (poor performance) and age group three at 38.5% classification (poor performance). Overall, sex performed better than age, and more specifically, females once again performed better than males and age group one better than groups two and three.

Table 3.7 Master Table for 2/3rds of Data – Prediction Test Linear Discriminant Analysis for Sex Stance Anthropometry

Model	**1**		**2**		**3**		**4**	
Pre-treatment	no		no		YES - WARD SEX		YES - WARD SEX	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=samples	1/3 RESAMPLED		1/3 RESAMPLED		1/3 RESAMPLED		1/3 RESAMPLED	
Performance %	**87.3**		**62.2**		**94.6**		**58.8**	
Variable 1 classified%	FEMALE	88.7	1	89.2	FEMALE	96.9	1	77.6
Variable 1 misclassified		11.3		10.8		3.1		22.4
Variable 2 classified%	MALE	85.7	2	0	MALE	91.5	2	15.4
Variable 2 misclassified		14.3		100		8.5		84.6
Variable 3 classified%			3	50			3	38.5
Variable 3 misclassified				50				61.5

Finally, within LDA, based on all the results from the 'original data' and the 2/3rds resampling, a 'blind' LDA performance of 100 resampling was undertaken (Master Table 3.8). A hundred randomly selected people were tested and correctly ranked. Similar to artificial neural networking where the system tries to model the capabilities of the human brain (Paliwal and Kumar, 2009). Continuing with the trend, the treated data for sex performed better, at 95.6% predictive accuracy, and untreated was 90.54%. Furthermore, the false positives for females were 5.7% and 3.5% for males, for the treated data, overall indicating that it performed well and was classified correctly. Age did not perform as well, with a 66% for treated data and a 66.2% for untreated data. The false positive and negative rates can be observed within the 100 resampling Master Table (Table 3.8).

Table 3.8 Master Table 100 Resampling Linear Discriminant Analysis for Sex Stance Anthropometry.

Model	**1**		**2**		**3**		**4**	
Pre-treatment	no		no		YES - WARD SEX		YES - WARD SEX	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=replicate/samples	100		100		100		100	
Performance %	**90.543**		**66.189**		**95.625**		**66.023**	
Variable 1 false positives %	FEMALE	10.95	18-29	47.477	FEMALE	5.712	1	47.271
Variable 1 false negatives %				12.426				13.097
Variable 2 false positives %	MALE	8.039	30-49	2.3726	MALE	3.458	2	4.1665
Variable 2 false negatives %				96.788				98.15
Variable 3 false positives %			50+	15.569			3	15.056
Variable 3 false negatives %				44.792				47.481

3.4.3.5 Ancestry Data Treatment on Normalised Data for Stance Anthropometry Analyses

Section 3.4.3.3 highlighted the 'sex treatment of the dataset', and the subsequent results that were treated by suppressing the outliers within the normalised dataset based on their sex, where outliers that were incorrectly predicted were removed. The following section applied the same principles, however instead of 'sex treatment' the data was treated based on ancestry.

Once the data was treated, scatterplot graphs were generated for PCA assessment and to also view the subgroups. Figure 3.37 shows that, in general, there is more clustering of the overall data, indicating sex shows a lesser degree of separation where the male (grey) and female (blue) groups are clustering together, showing significantly more overlap observed than the sex treated data. Additionally, Figure 3.38 shows a higher degree of separation between Caucasian (green), Asian (orange), and 'Other' (red) groups, as observed by the clear clustering. The 'Other' groups includes the African ancestry as well as any admixtures. Meanwhile, no degree of separation was observed between the age groups (Figure 3.39).

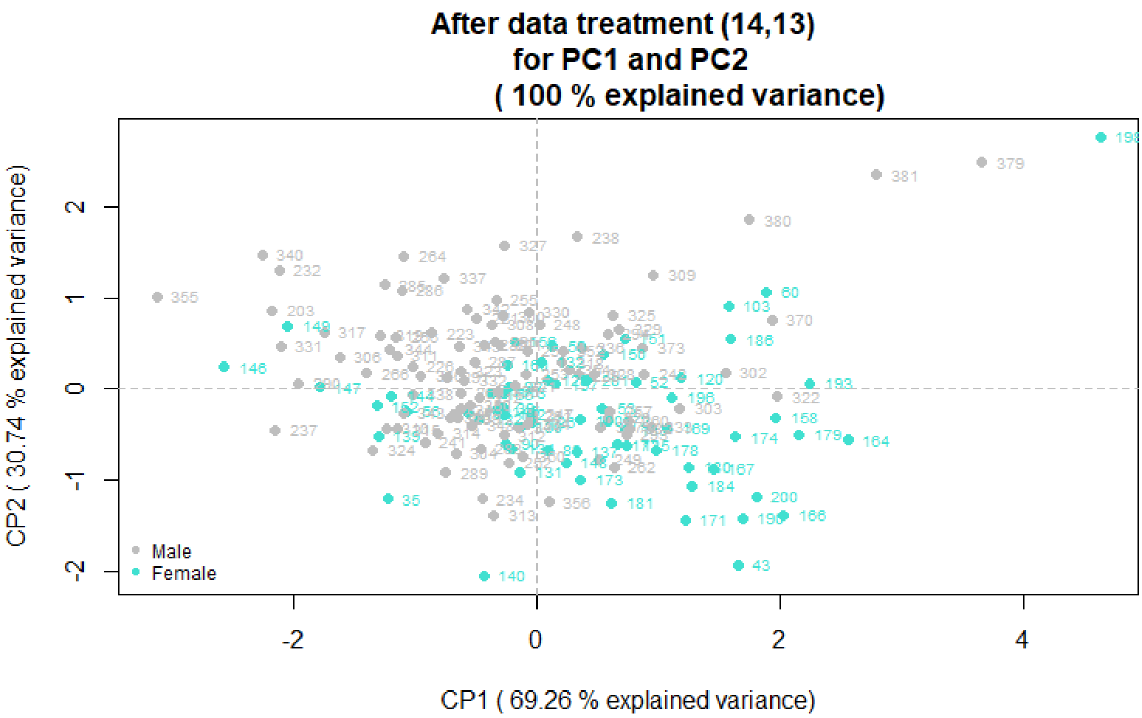


Figure 3.37 Principle Component Analysis for Ancestry Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Sex.

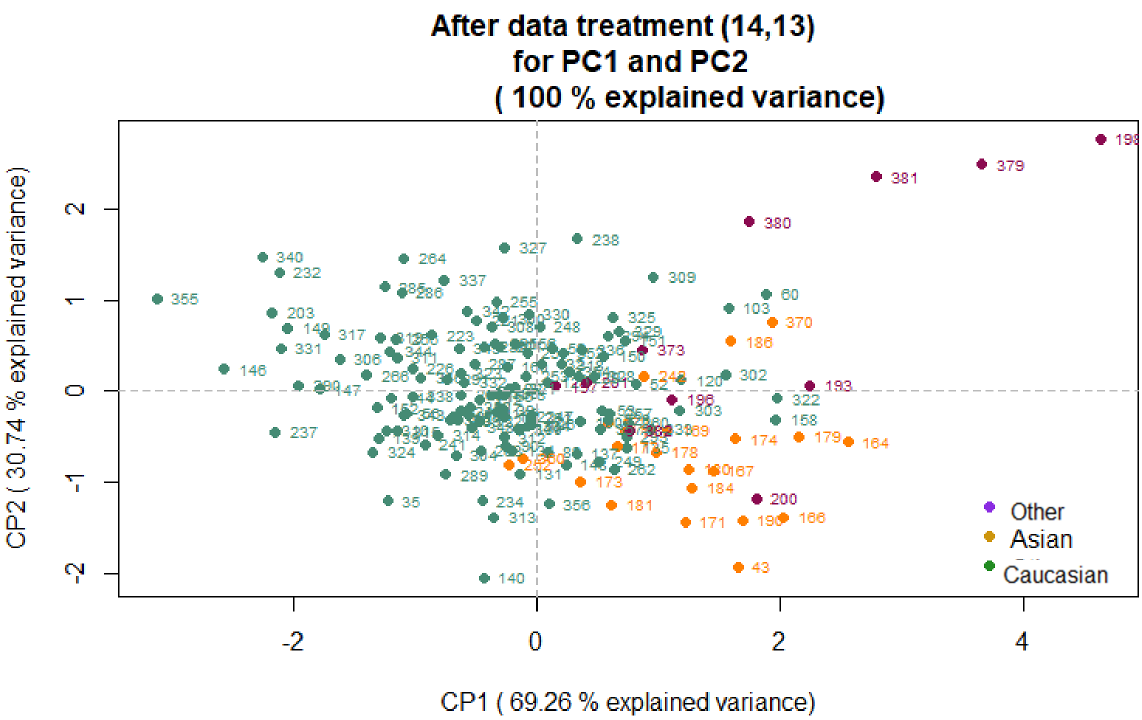


Figure 3.38 Principle Component Analysis for Ancestry Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Ancestry.

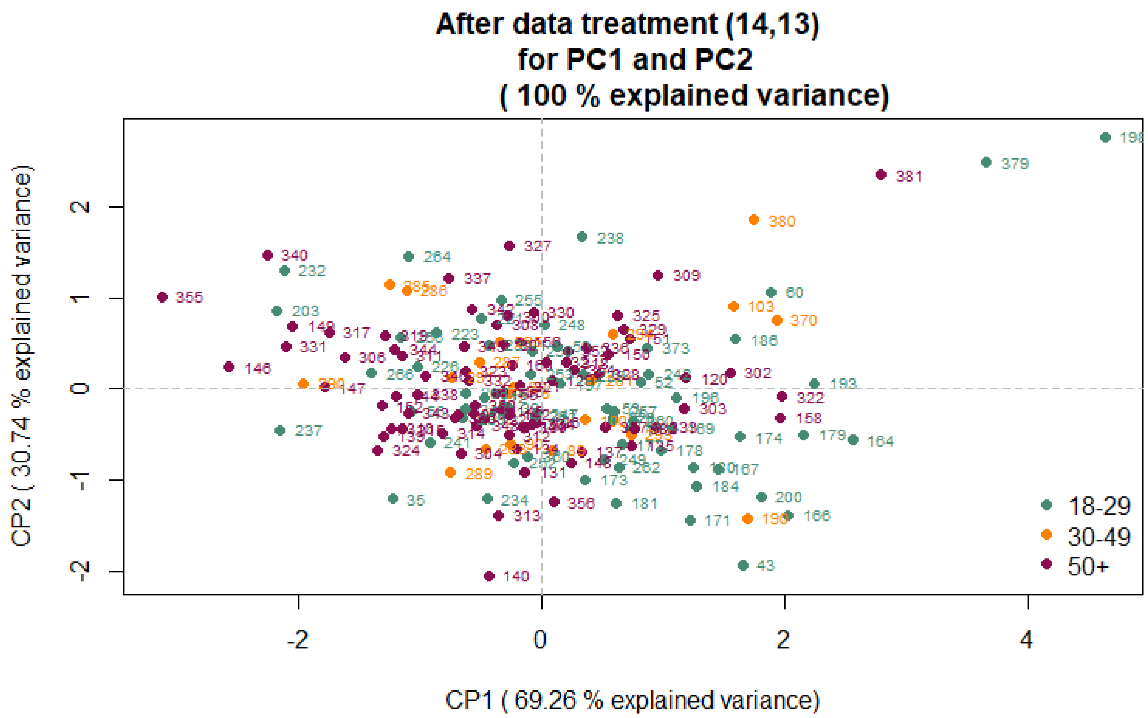


Figure 3.39 Principle Component Analysis for Ancestry Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Age.

Next, the cumulative percentage of variance expressed by the principle components were evaluated. Two features were selected: [14] Foot Width L, and [15] Leg Length R. Similar to the data treated with sex earlier in Section 3.3.3.3, after only two features, the cumulative percentage of explained variance for the data (after it was treated with ancestry) was seen to be at 100%, indicating that 100% of the total variance could be described in the dataset. The scores were then represented in a biplot, where the results can be observed for both sex (Figures 3.40) and ancestry (Figure 3.41). A plot was not able to be generated for age, due to the poor results attained.

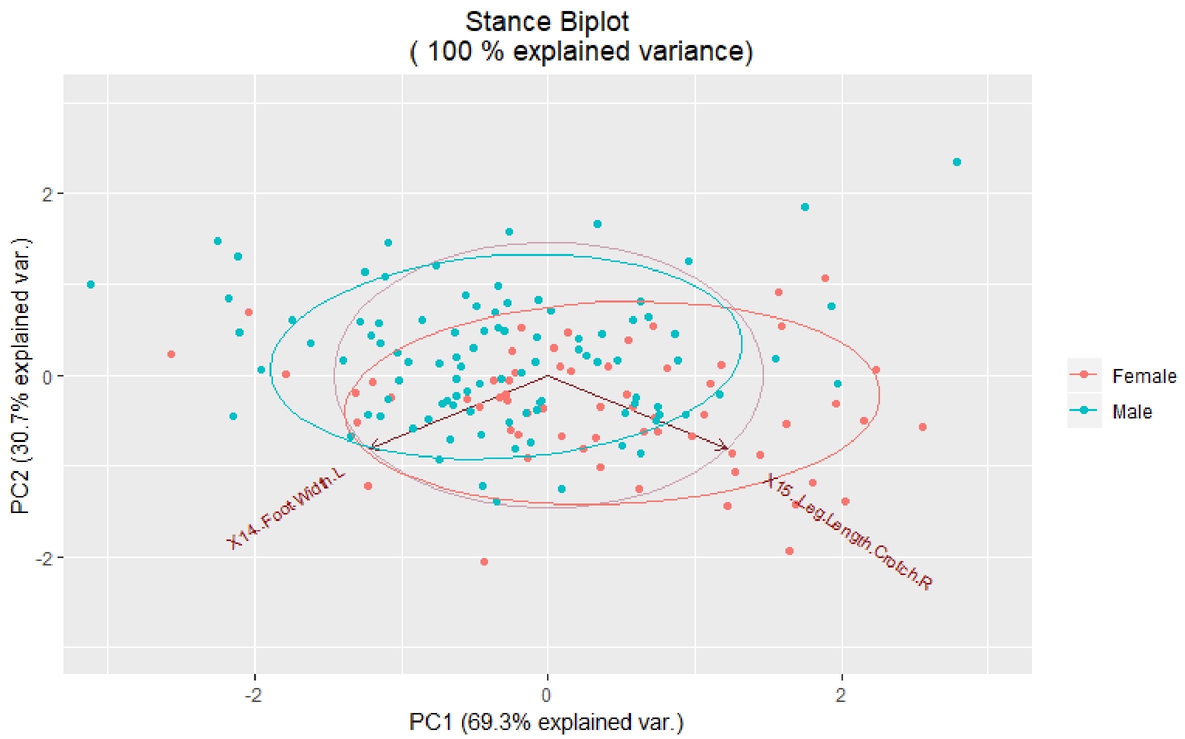


Figure 3.40 Biplot for Sex. Females are indicated by the orange points and male by the blue.

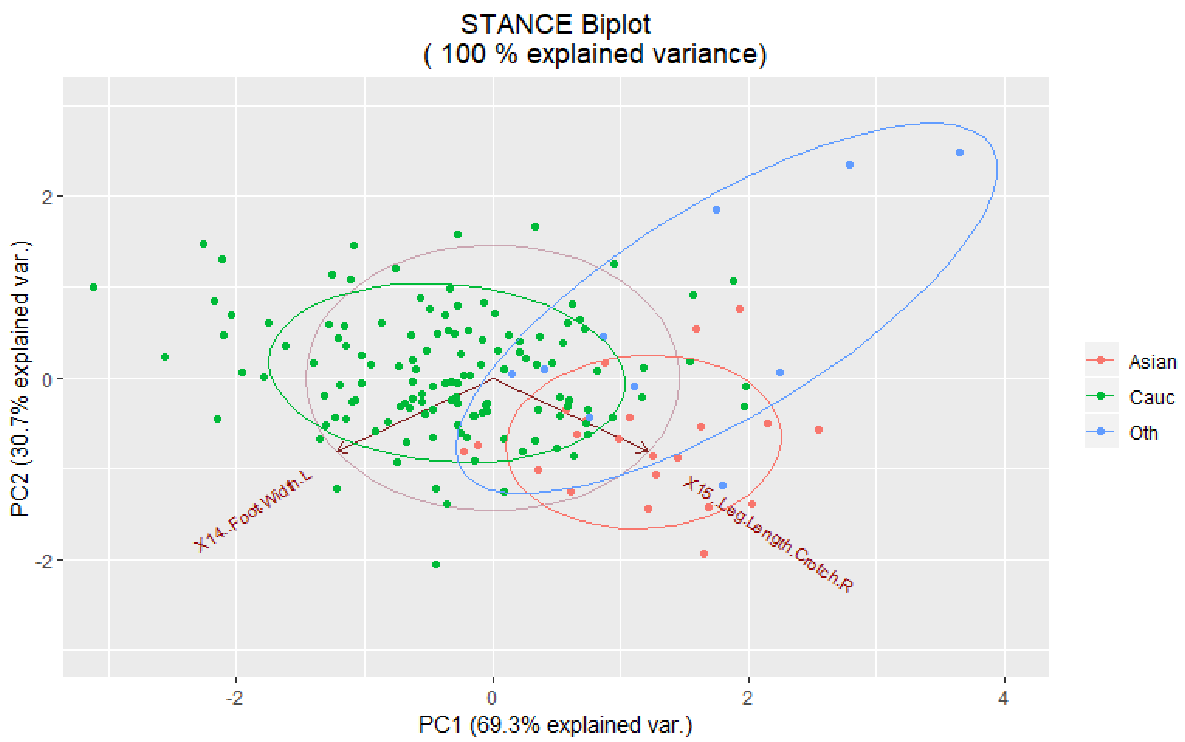


Figure 3.41 Biplot for Ancestry. Asian population are indicated by the orange, Caucasian by green and 'Other' by blue.

3.4.3.6 Age Data Treatment on Normalised Data for Stance Anthropometry Analyses

The two previous sections 3.3.3.3 and 3.3.3.5, emphasised the sex and ancestry treatment of the dataset, and to provide robustness an ‘age treatment of the dataset’ was completed, where outliers that were incorrectly predicted within the age groups were removed.

After the data was treated with the age-related outliers removed, scatterplots were generated for PCAs. In general, points are dispersed, but clustered in some areas. Figure 3.42, representing sex, shows a lesser degree of separation where the male (grey) and female (blue) groups are clustering together, with a significant level of overlap. Figure 3.43, shows no degree of separation between ancestry groups, as observed by the mixed green, red, and orange points. Finally, a clear degree of separation was observed within Figure 3.44, where age group 18 – 29 (green) was observed to be clustered on them left side of the scatterplot, age group 30 – 49 (orange) was observed to be clustered above and centre, while the final age group 50 and above (red), was clustered on the right of the graph.

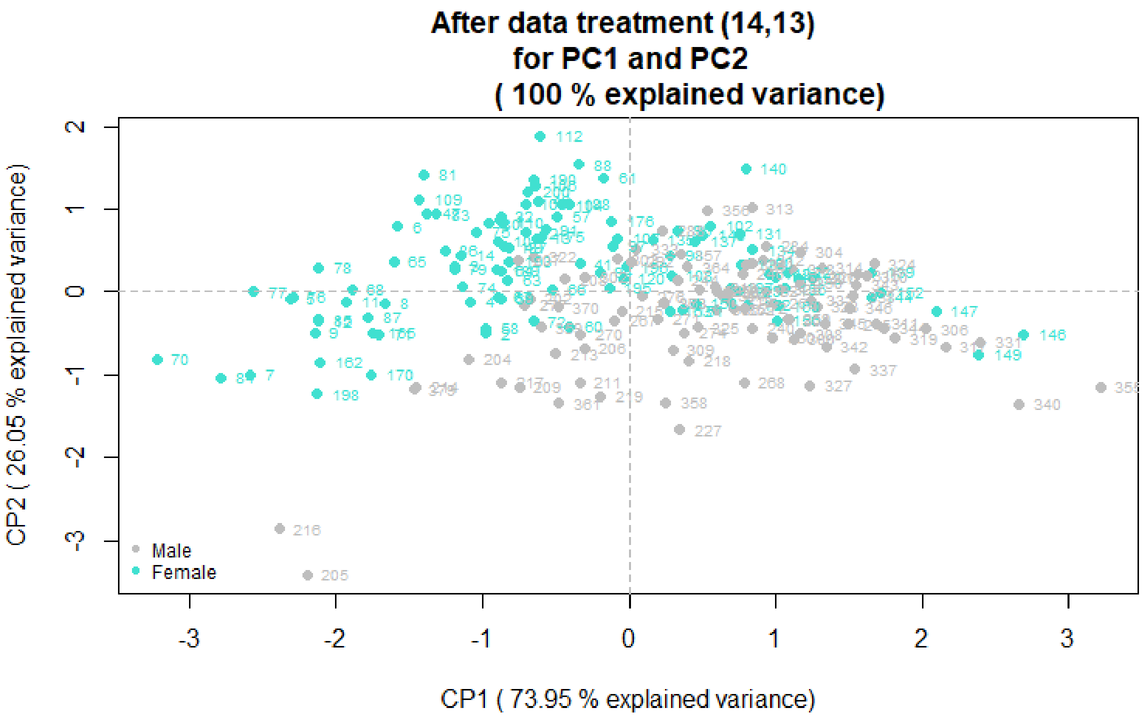


Figure 3.42 Principle Component Analysis for Age Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Sex.

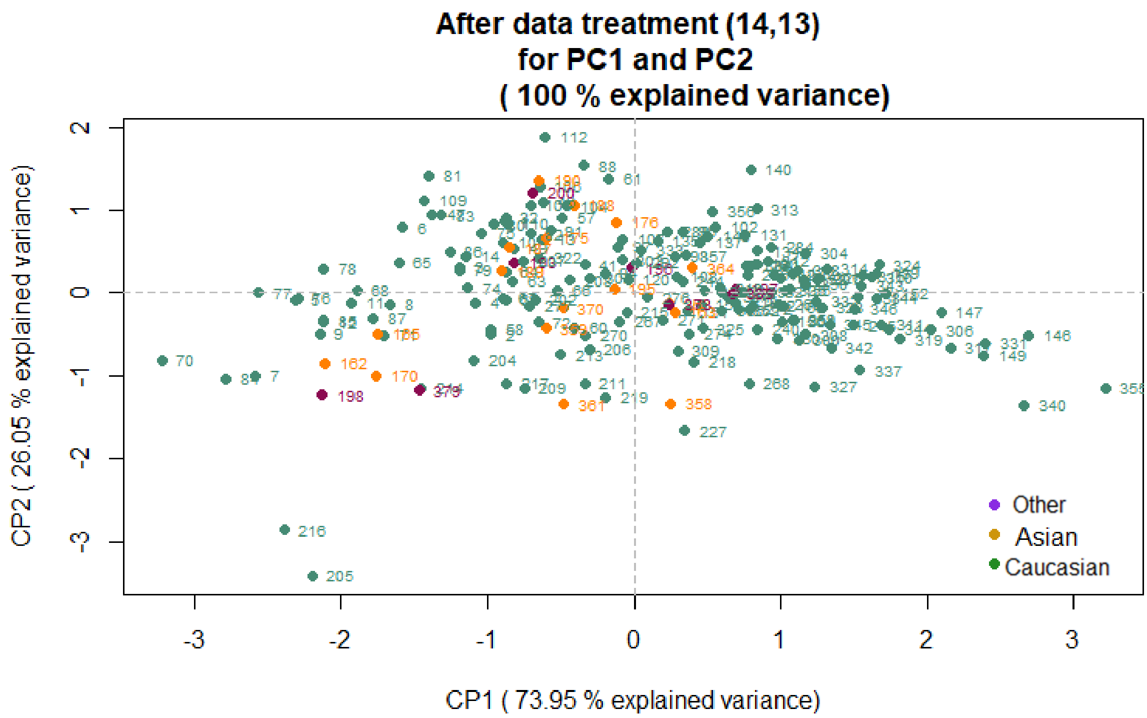


Figure 3.43 Principle Component Analysis for Age Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Ancestry.

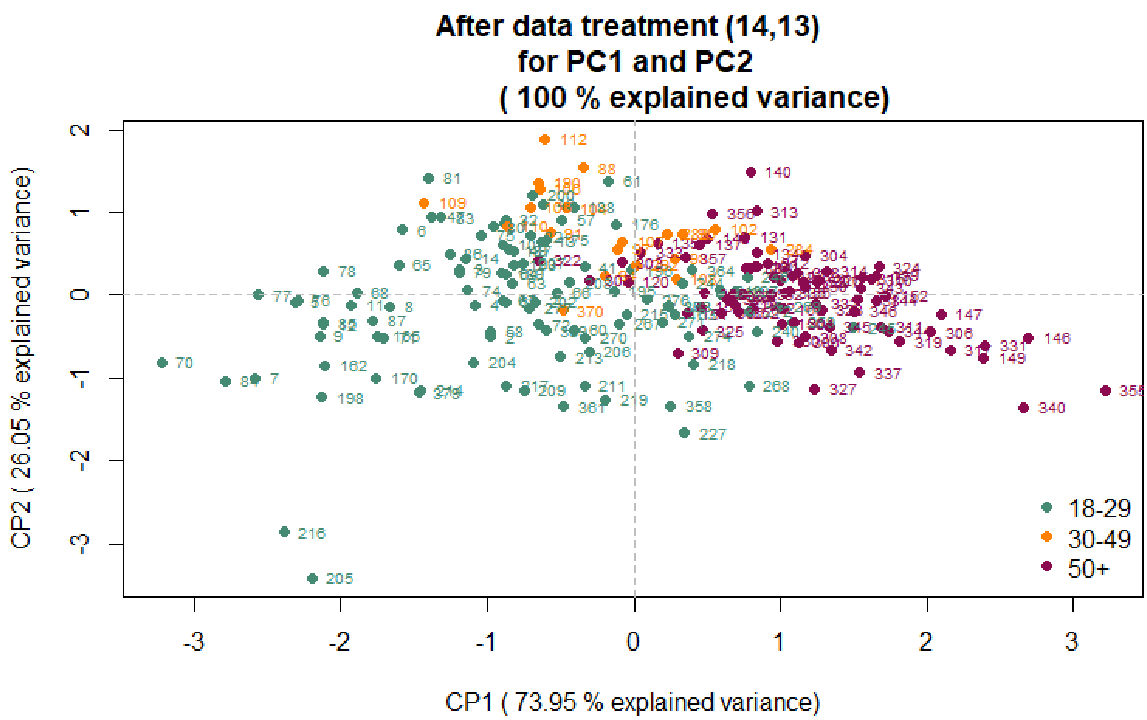


Figure 3.44 Principle Component Analysis for Age Suppressed Data (Outliers Removed) Normalised Stance Anthropometry, Showing Correlations of Age.

Afterward, the cumulative percentage of variance expressed by the principle components were evaluated. Two features were once again selected: [14] Foot Width L, and [15] Leg Length R. Similar to the data treated with sex and ancestry, after only two features, the cumulative percentage of explained variance for the data (after it was treated with age) was 100%, indicating that 100% of the variance was described by the dataset. The scores were then represented in a biplot, where the results can be observed for both sex and ancestry in Figures 3.45 and 3.46. A plot was not able to be generated for age, due to the poor results attained. This highlights that the model is performing well based on the features that are extracted from the subjects, highlighted by the high prediction percentages attained by the model, and the subsequent separation of data into their categories.

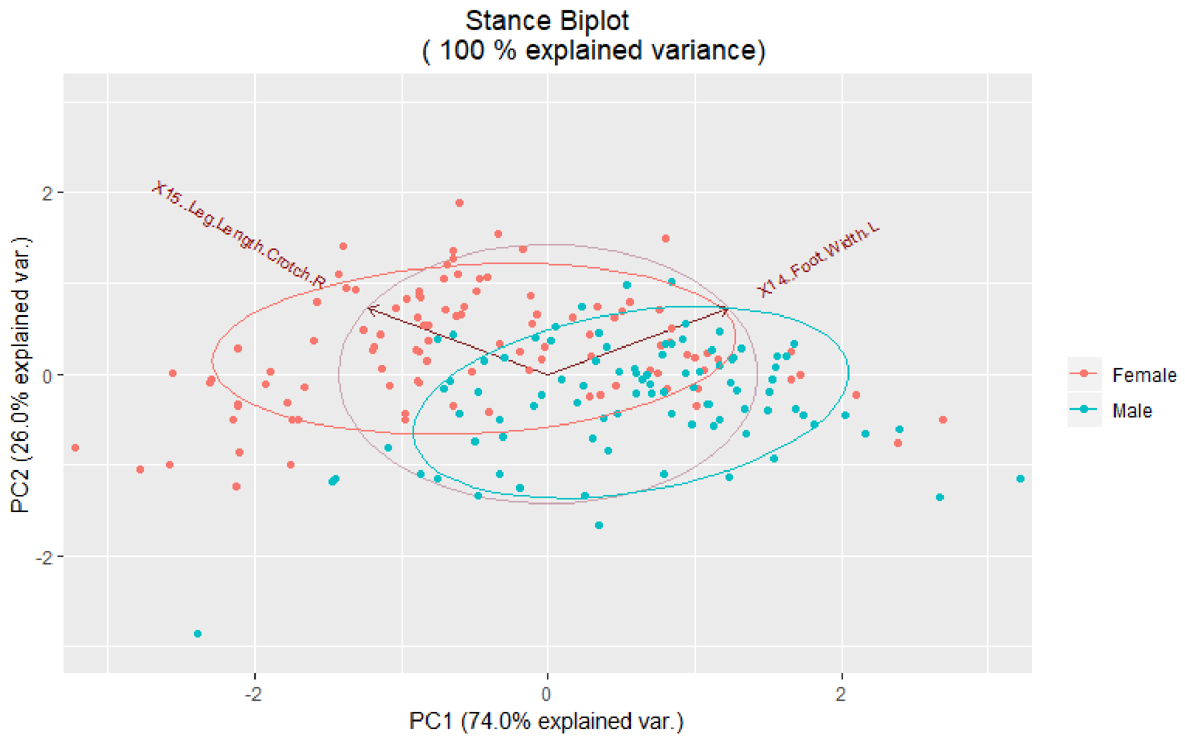


Figure 3.45 Biplot for Sex. Females are indicated by the orange points and male by the blue.

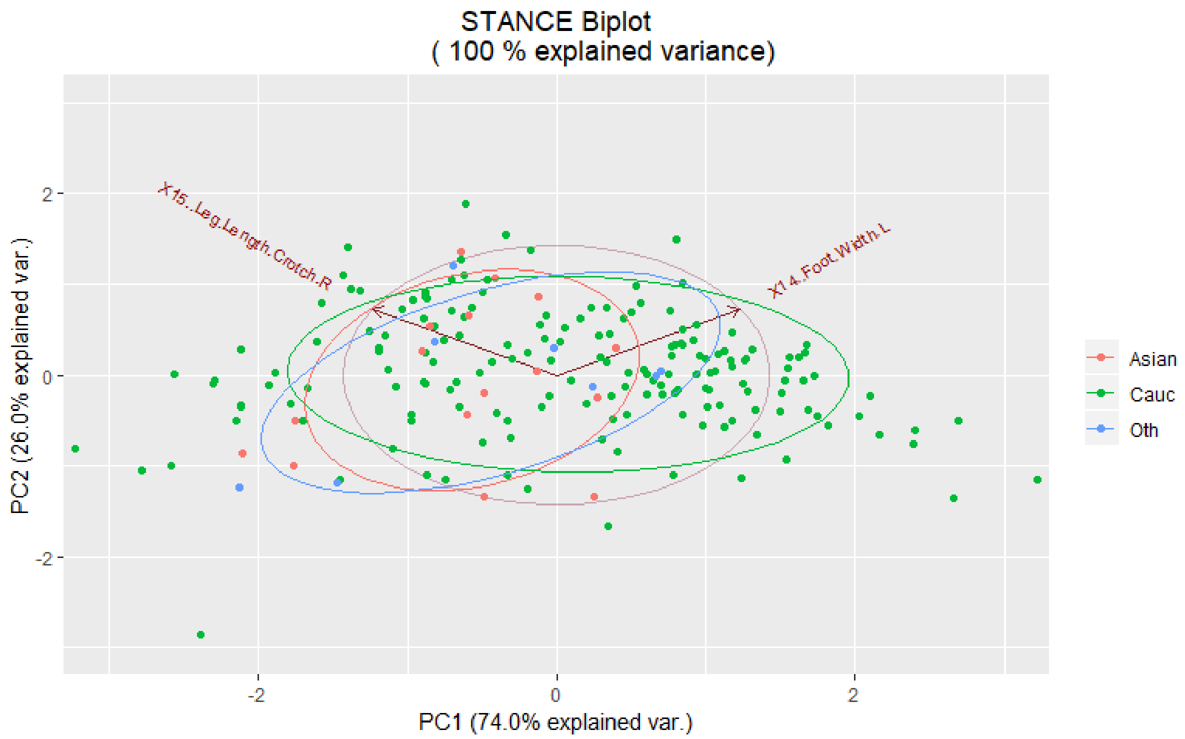


Figure 3.46 Biplot for Ancestry. Asian population are indicated by the orange, Caucasian by green and 'Other' by blue.

3.4.4 Gait Anthropometry

A total of 269 subjects for gait analysis was assessed through the use of R studio. As the measurements for gait are divided into 'static' and 'dynamic', three versions of this data will be analysed, which are: [1] Combined; [2] Static, and [3] Dynamic. This is to observe if major variations are present within the whole analysis of gait, or if one provides more distinctness when compared to the other two categories. Similar to section 3.3.3, 'Stance Anthropometry', the raw data was evaluated first, followed by normalised data, and finally, the treated data. As a step-by-step explanation was provided in the previous section, this section will highlight the results most imperative.

3.4.4.1 Combined Gait Anthropometry

Prior to breaking down the components of gait analysis into static and dynamic features, the combined gait features were evaluated to observe a 'complete' profile. Subsequently, the analysis was repeated for static gait features and dynamic gait features respectively.

Observing the raw data for combined gait anthropometry analyses, all scatterplots for sex, age and ancestry remained identical to the normalised scatterplots. These results can be found in Appendix F. The correlation for sex presented the highest degree of separation, as observed by the clustering of the male and female groups, but a high level of overlap between the groups was also observed. Therefore, normalising the data followed by data treatment was necessary to determine any further trends that may be observed.

Similar to stance anthropometry, the Normalised Data for Combined Gait Anthropometry Analyses was assessed, where a scree plot was attained (Appendix F.1) as well as the hierarchical clustering results for sex. Within the hierarchical clustering (Appendix F.1), Ward, and possibly complete, was the linkage method that operated for sex as highlighted by the green boxes (Table 3.9). This was seen by the correct classifications of the class systems into males and females (observed through class system 1 and 2). As Complete performed slightly worse than Ward at 61.94%, the analysis with Ward as the linkage method was assessed.

Table 3.9 Master Table for both Normalised Gait Combined Anthropometry HCA.

	Simple		Complete		Moyen (Average)		Ward	
	%	CLASS SYSTEM	%	CLASS SYSTEM	%	CLASS SYSTEM	%	CLASS SYSTEM
SEX (2)	99.63	1,1	61.94	1,2	98.51	1,1	66.42	1,2
Age(3)	99.25	1,1,1	76.5	3,3,3	98.13	1,1,1	55.22	1,1,2
Ancestry(3)	99.25	1,1,1	57.09	1,3,3	99.13	1,1,1	44.4	1,1,1

The loadings that were produced from the data include the loadings distribution graph (Figure 3.47), which show pairing within the features. This does signify a higher level of variance between them, as observed by the separation of left and right variables of the features as seen by the red circle. There is also an increased overall clustering of the features as they appear to not segregate as well as stance anthropometry.

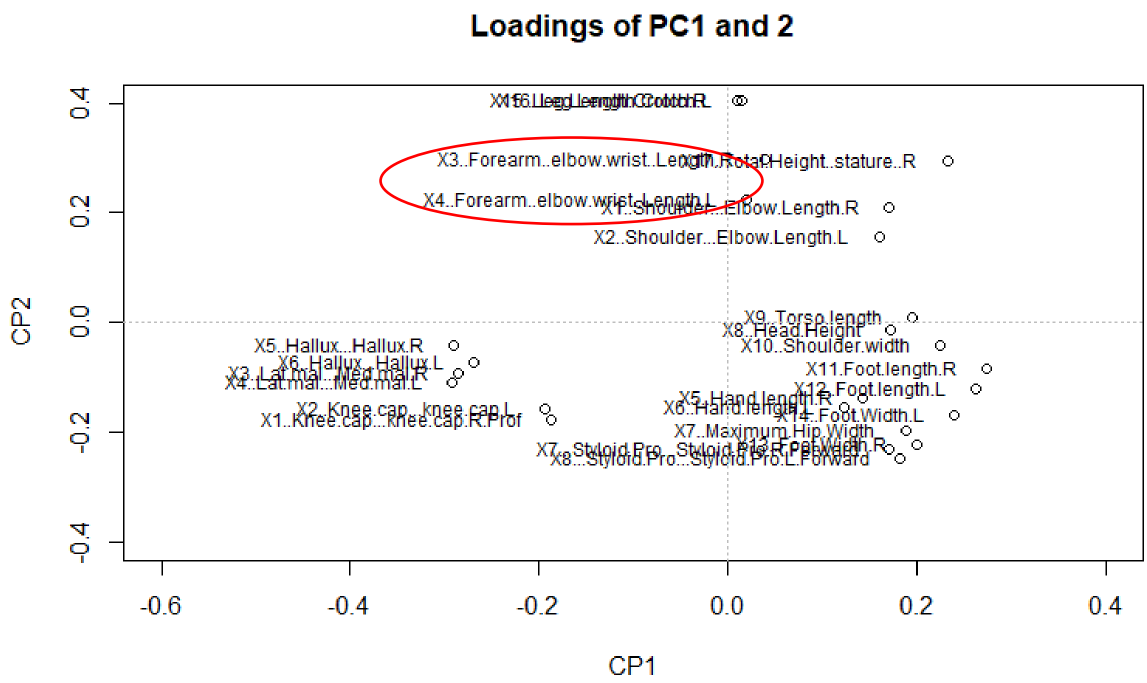


Figure 3.47 Loadings Distribution for Normalised Gait Combined Anthropometry from Principal Component Analysis.

A loadings line graph was also produced from the data (Figure 3.48), and the variables that were observed to contain the largest amount of variability were: [PC1] Lateral Malleolus – Medial Malleolus L; [PC2] Leg Length R; [PC3] Styloid Process - Styloid Process R; [PC4] Hand Length R; [PC5] Shoulder – Elbow Length L.

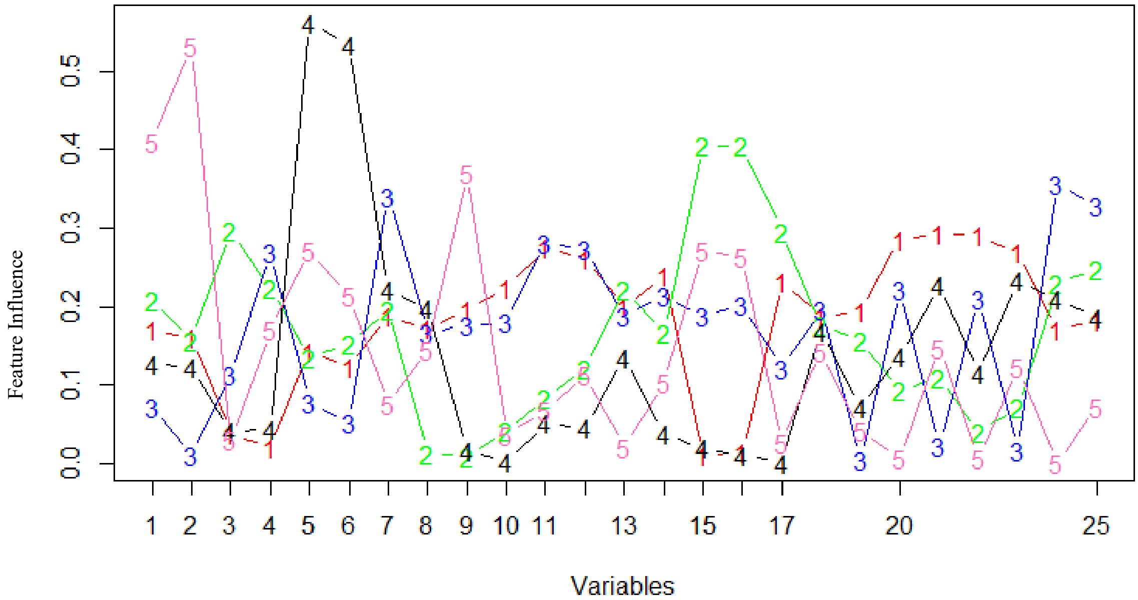


Figure 3.48 Loadings Line Graph for Normalised Gait Combined Anthropometry from Principal Component Analysis.

Following the loadings line graph, the correlation matrix (Figure 3.49) was derived from the data, highlighting if there were any correlations between the features that were observed. The ‘branches’ were shorter in comparison to the stance anthropometry data, indicating that there was a lower variance between individuals, this was also combined with the clustering of major groups of features. For instance, it was expected for the hand length to group together in isolation, but the clustering of the maximum hip width with the styloid process lengths was not expected. This may be a result of combining both the static and dynamic features for assessment, as these features within both the static and dynamic features were similar in proportionality.

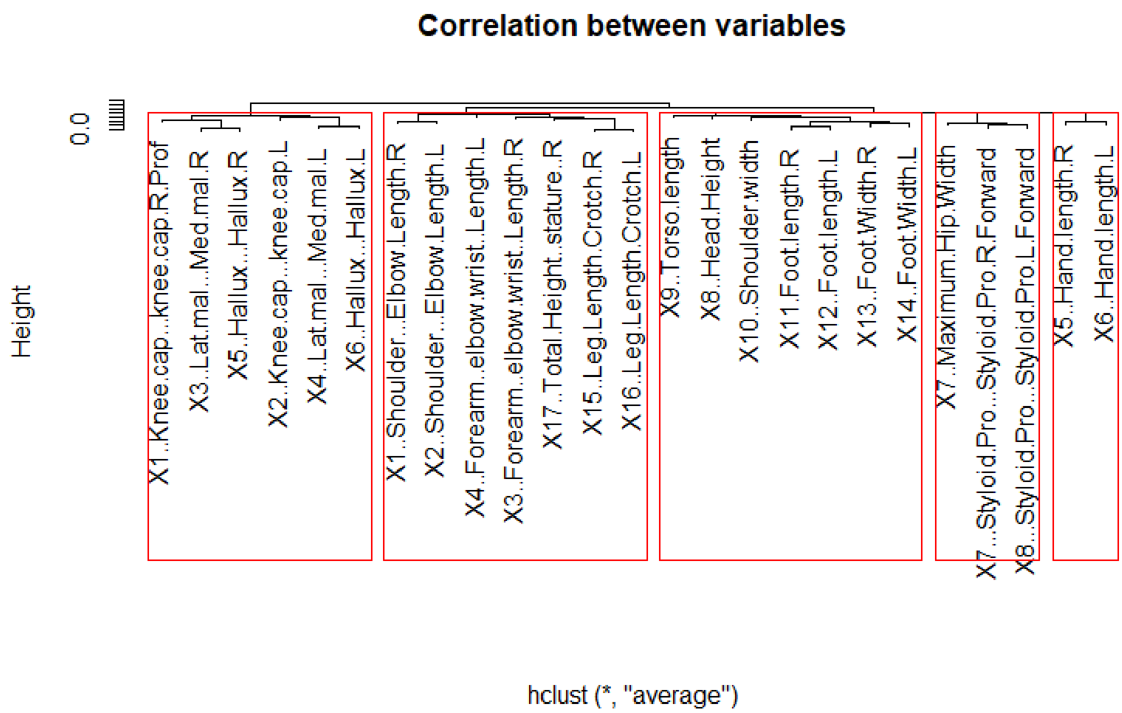


Figure 3.49 Correlation Matrix for Normalised Gait Combined Anthropometry from Principal Component Analysis.

For Sex Data Treatment on Normalised Data for Gait Combined Anthropometry Analyses, the data was treated by suppressing and removing the outliers for a ‘sex treatment of the data’, as sex was the only correlation that performed adequately. Following the treatment, scatterplots were produced and, as seen in Figure 3.50, males (grey) and females (blue) were largely clustered within their groups. No significant clustering was observed in either age and ancestry, but rather an overlap of the subgroups, as seen in Figures 3.51 and 3.52.

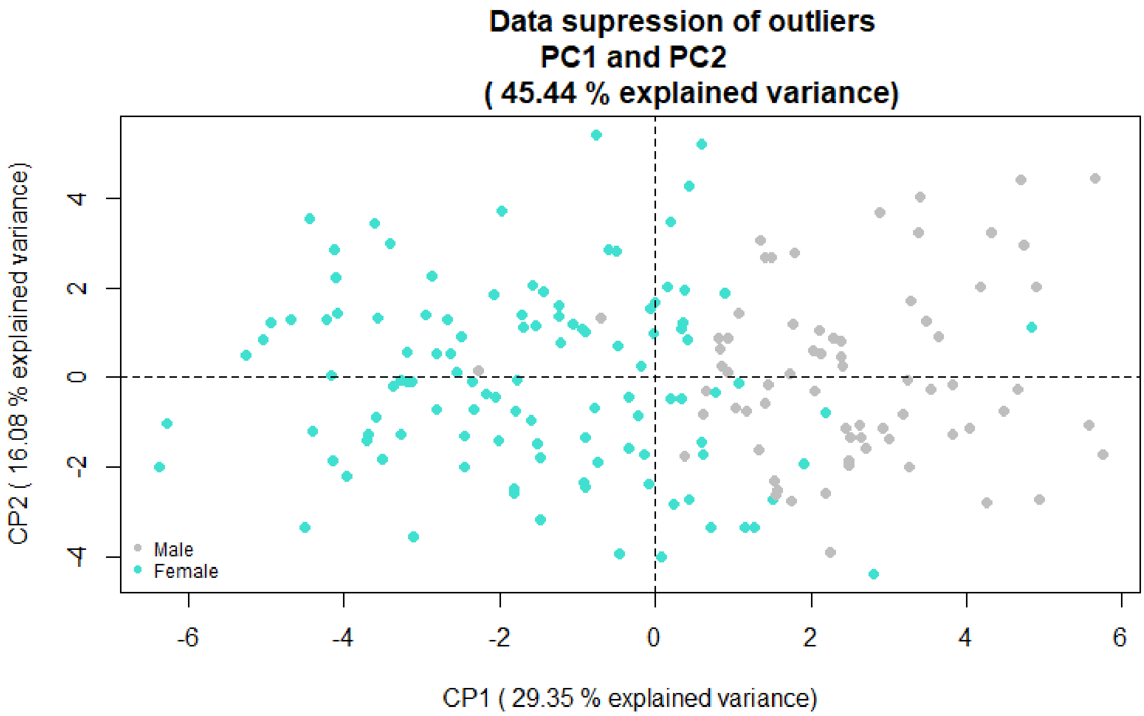


Figure 3.50 Principle Component Analysis for Sex Suppressed Data (Outliers Removed) Normalised Gait Combined Anthropometry, Showing Correlations of Sex.

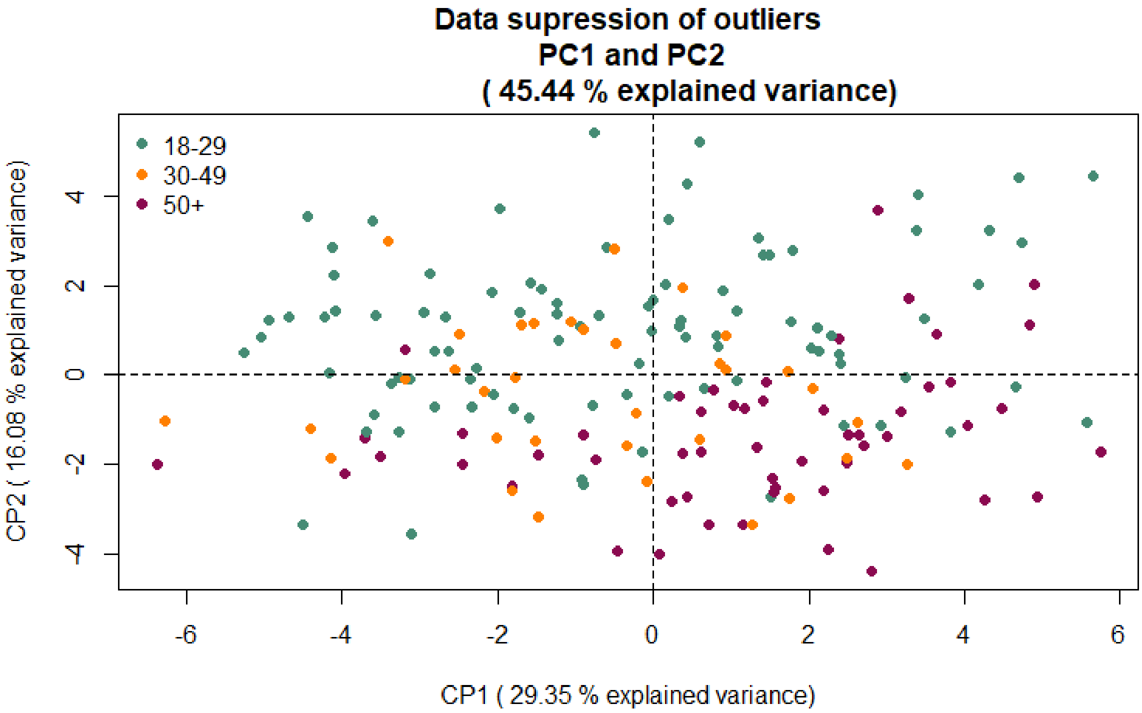


Figure 3.51 Principle Component Analysis for Sex Suppressed Data (Outliers Removed) Normalised Gait Combined Anthropometry, Showing Correlations of Age.

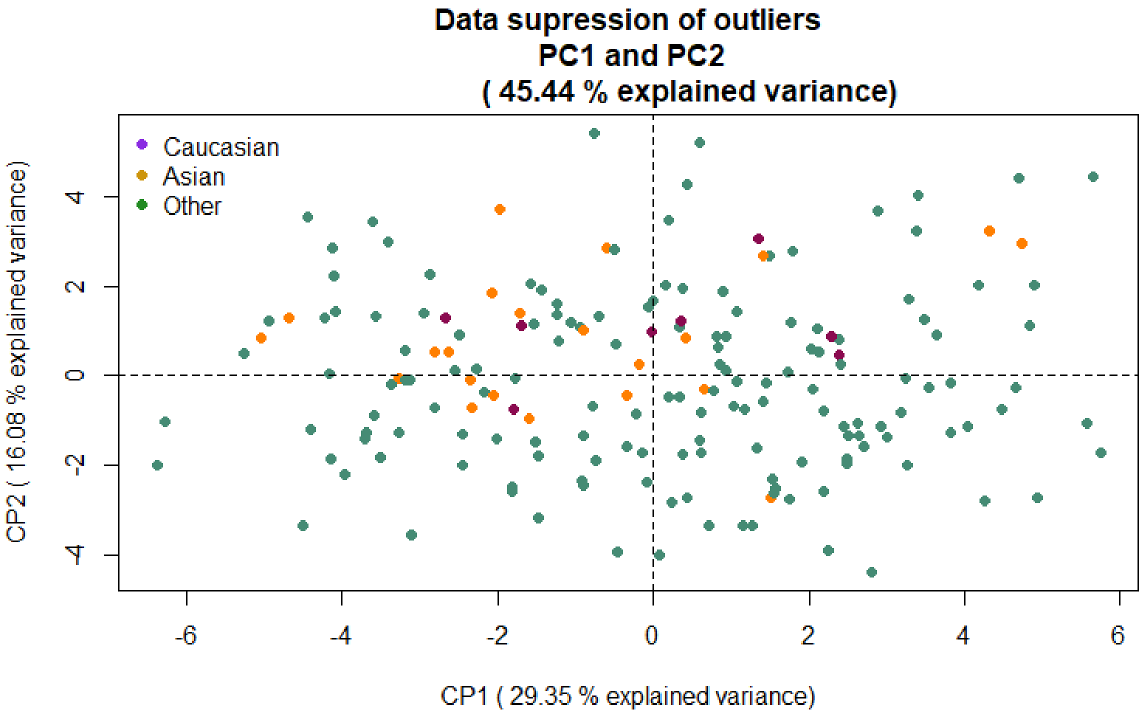


Figure 3.52 Principle Component Analysis for Sex Suppressed Data (Outliers Removed) Normalised Gait Combined Anthropometry, Showing Correlations of Ancestry.

The cumulative percentage of variance expressed by the principle components show that through two features (Foot Width R and Foot Width L), was seen to be at 100%, meaning that 100% of the variance was able to describe the total variance of the dataset (Figure 3.53).

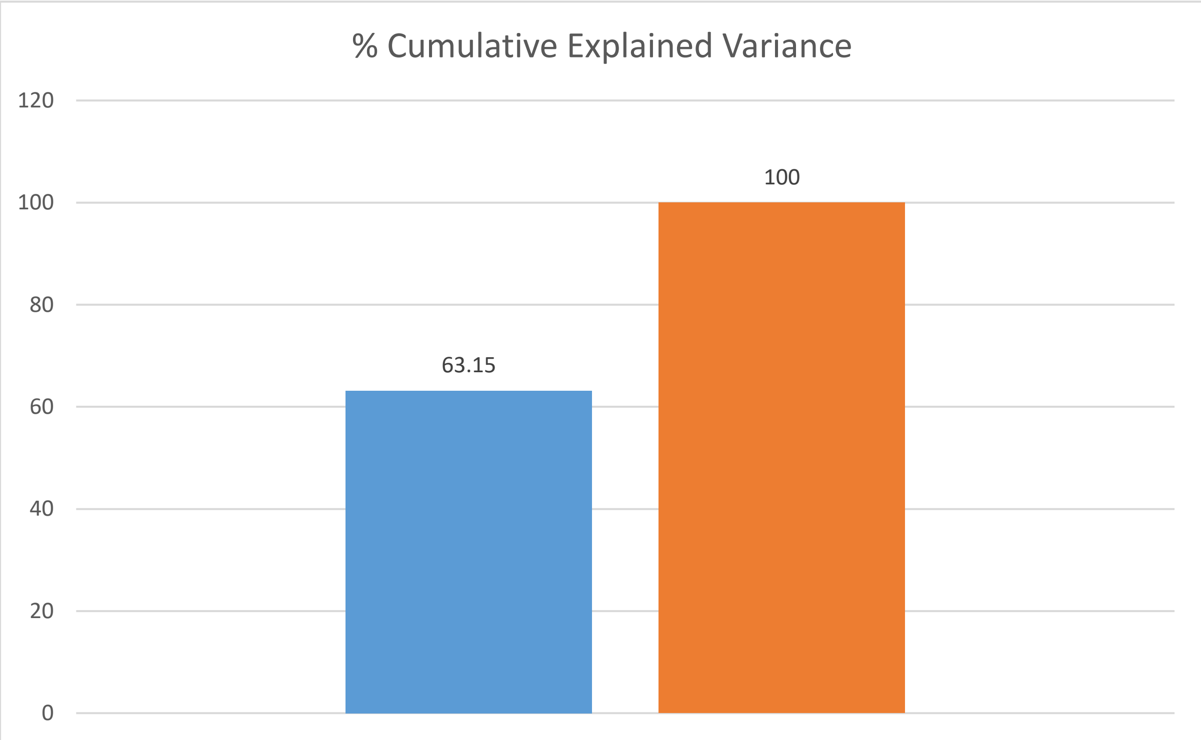


Figure 3.53 Cumulative Percentage of Explained Variance in Treated Data for Three Features in Normalised Gait Anthropometry Combined.

Using the aforementioned features (Foot Width L and Foot Width R) scatterplots were once again produced (Figures 3.54 – 3.56) and show a degree of separation between the sexes, whereby the females are grouping to the left in blue and the males are grouping to the right in grey. No separation was observed in either ancestry or age in gait anthropometry.

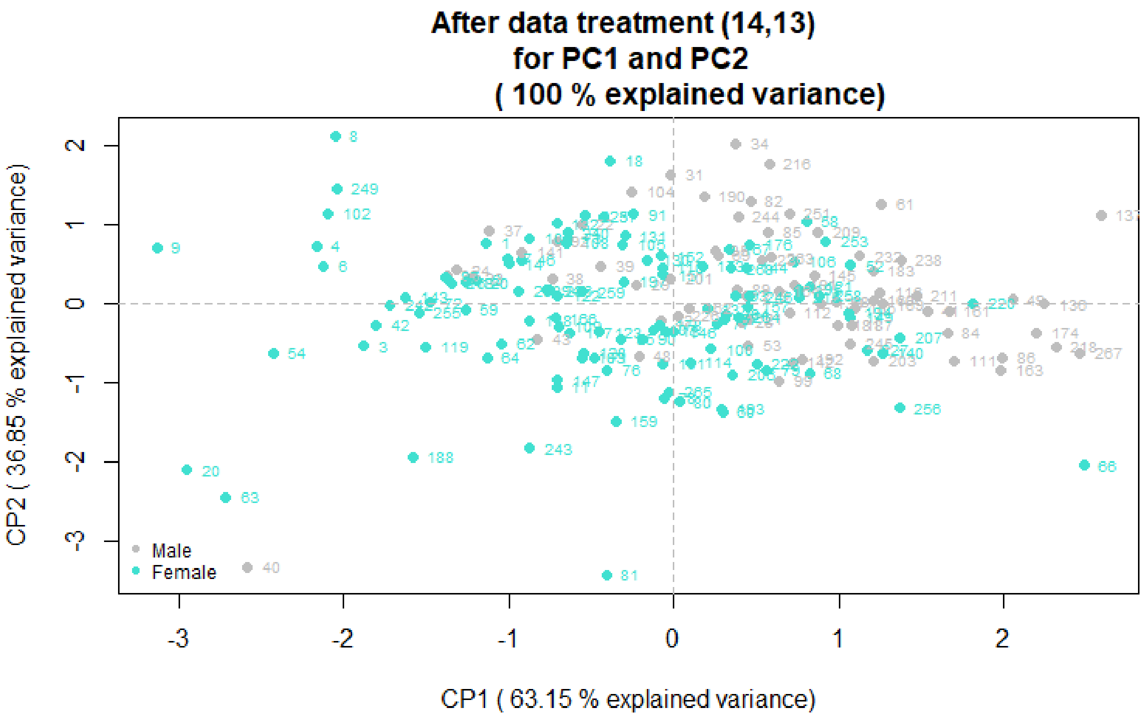


Figure 3.54 Normalised Gait Combined Anthropometry for Sex Treated Data to view Sex Correlations for Two Features.

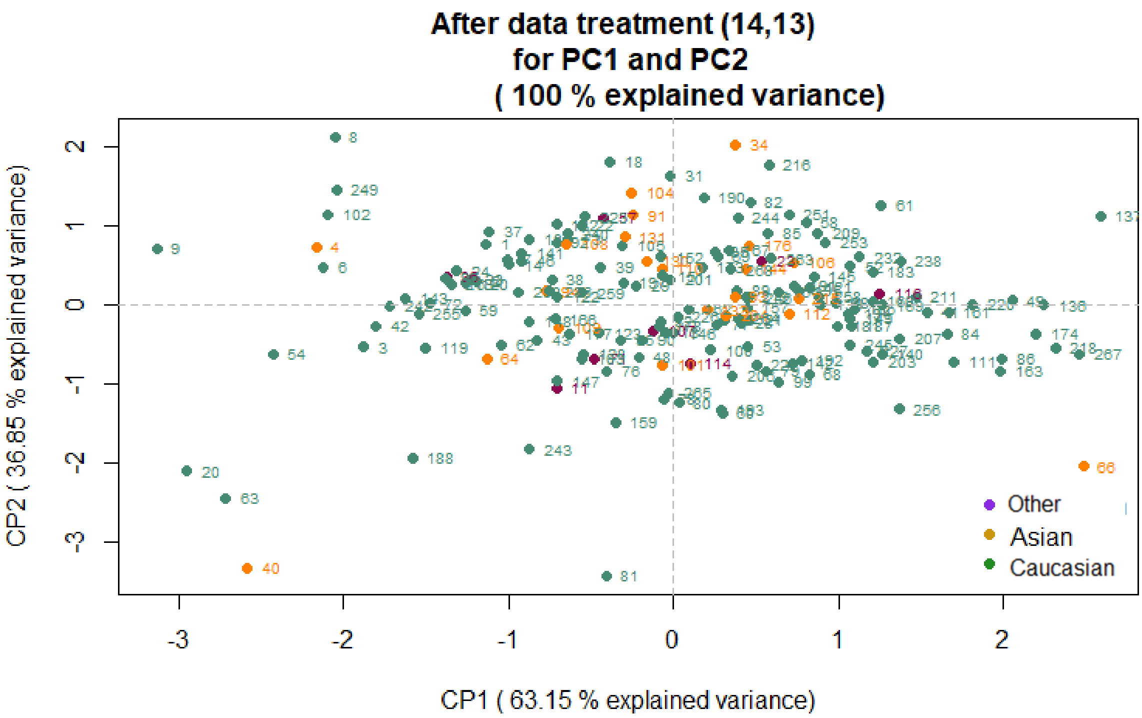


Figure 3.55 Normalised Gait Combined Anthropometry for Sex Treated Data to view Ancestry Correlations for Two Features.

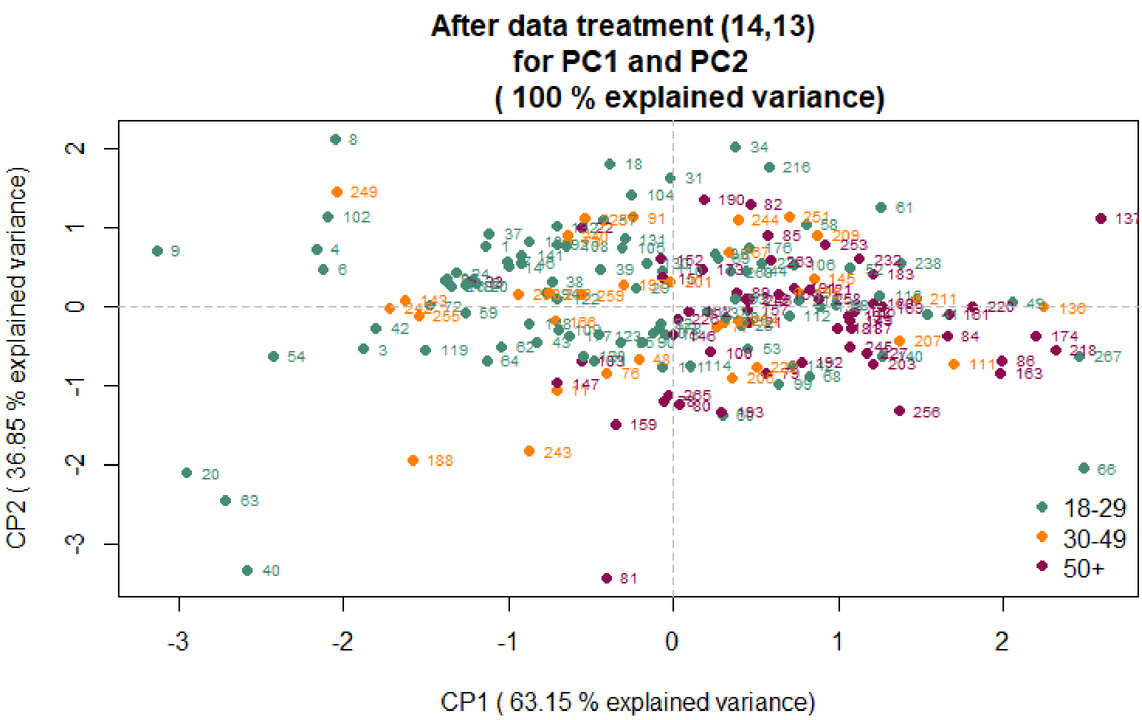


Figure 3.56 Normalised Gait Combined Anthropometry for Sex Treated Data to view Age Correlations for Two Features.

The scores were then observed in a biplot, where for sex (Figure 3.57) a degree of separation is visible between males and females, and for ancestry (Figure 3.58) no degree of separation is observed. A plot was not able to be generated for age in R Studio as there was no useful degree of separation for ancestry (even if it were generated) since it did not perform well.

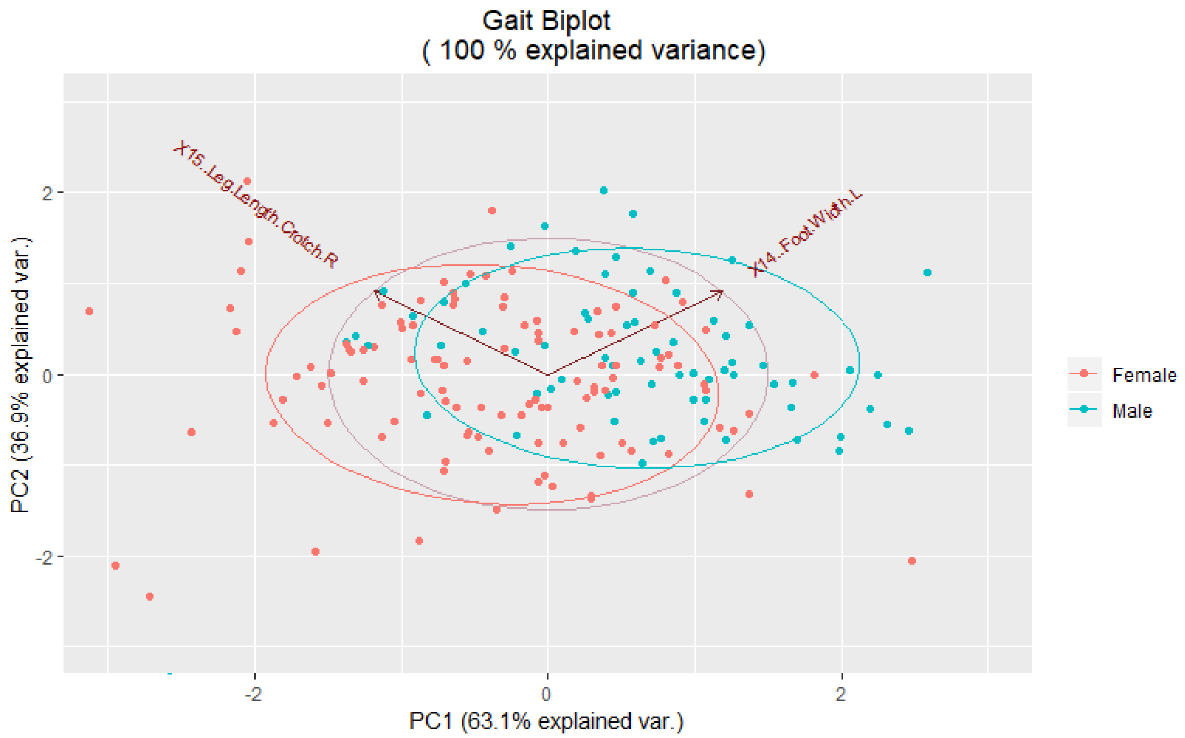


Figure 3.57 Biplot for Sex Gait Combined. Females are indicated by the orange points and male by the blue.

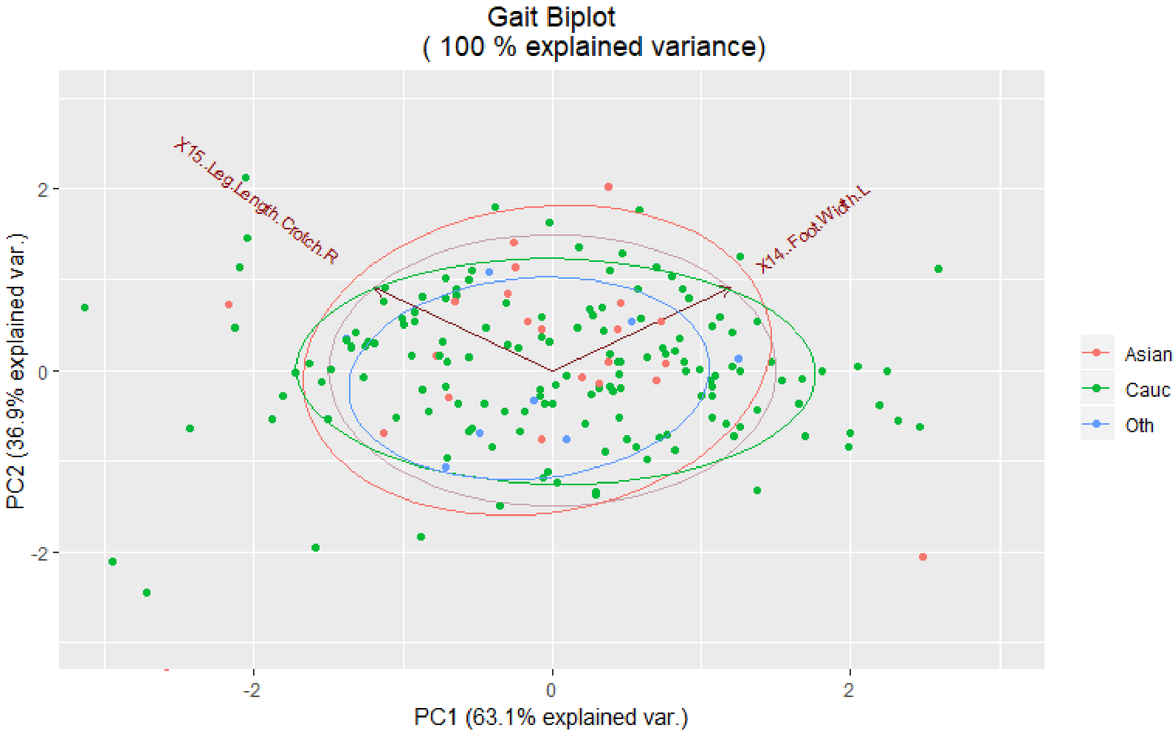


Figure 3.58 Biplot for Ancestry Gait Combined. Asian population are indicated by the orange, Caucasian by green and 'Other' by blue.

When assessing Linear Discriminant Analysis for Gait Combined Anthropometry, the master Table 3.10, shows the confusion matrix without pre-data treatment, showing a 94.4% predictive accuracy. When the data was treated, this increased to 98.3%. Furthermore, false positives and negatives of variables were assessed for correct or incorrect classification. For no pre-treatment, females were classified correctly at 95.7% and incorrectly 4.3% of the time, whereas males were classified correctly at 92.9% and incorrectly at 7.1%. This indicates that females performed slightly better (higher prediction) with the non-treated data. When the data was treated, results were better for females, with a 97.4% accuracy, whereas males were 100% correctly classified, showing that the treated data yielded a higher predictive accuracy and performance in general, and males within the treated data performed better than females.

Within the same Master Table, age discrimination did not perform as well as sex, however, before pre-treatment, performance was 82%, and after treatment discrimination dropped to 80.3%. Furthermore, when we observe the treated data, age group one had a 92.6% correct (high) classification, group two had a 44.4% correct (poor) classification and group three had a 83% correct (moderate-high) classification. When age and sex discrimination are compared in gait anthropometry, sex discrimination performed considerably better.

Table 3.10 Master Table for Own Data Linear Discriminant Analysis for Sex Gait Combined Anthropometry.

Model	**1**		**2**		**3**		**4**	
Pre-treatment	no		no		YES- WARD SEX		yes- reactivity	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=replicate/samples	SAMPLE SIZE		SAMPLE SIZE		SAMPLE SIZE		SAMPLE SIZE	
Performance %	**94.4**		**82**		**98.3**		**80.3**	
Variable 1 classified%	FEMALE	95.7	1	88.4	FEMALE	97.4	1	92.6
Variable 1 misclassified		4.3		11.6		2.6		7.4
Variable 2 classified%	MALE	92.9	2	40	MALE	100	2	44.4
Variable 2 misclassified		7.1		60		0		55.6
Variable 3 classified%			3	85.7			3	83
Variable 3 misclassified				14.3				17

Within the LDA graphs with sex as the independent variable, a clear degree of separation was observed between males and females (Figure 3.59) with some overlap observed. For Age LDA (Figure 3.60), no significant separation was observed.

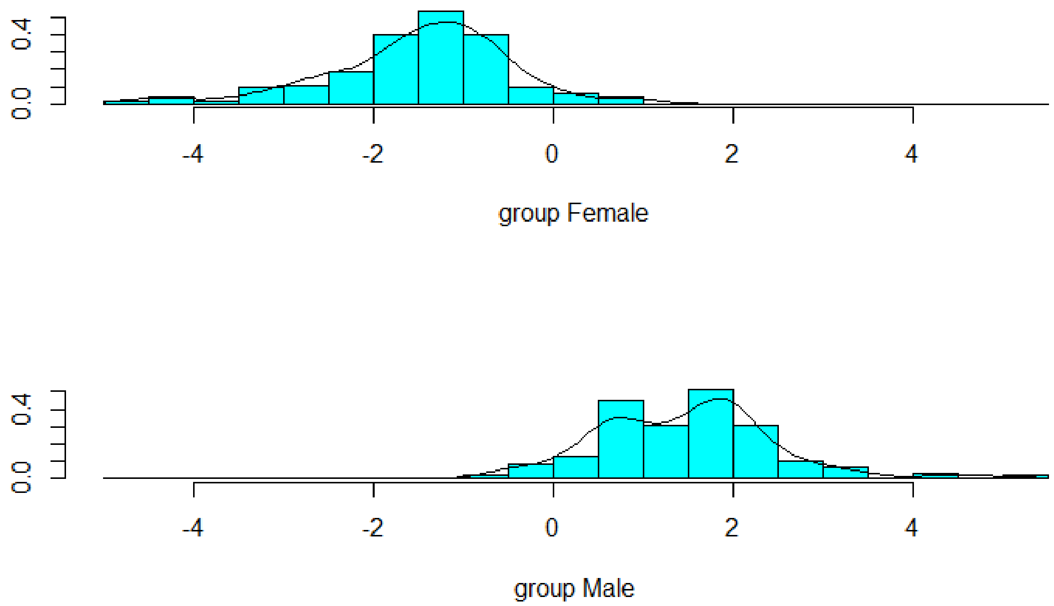


Figure 3.59 Linear Discriminant Analysis for Sex Gait Combined Anthropometry

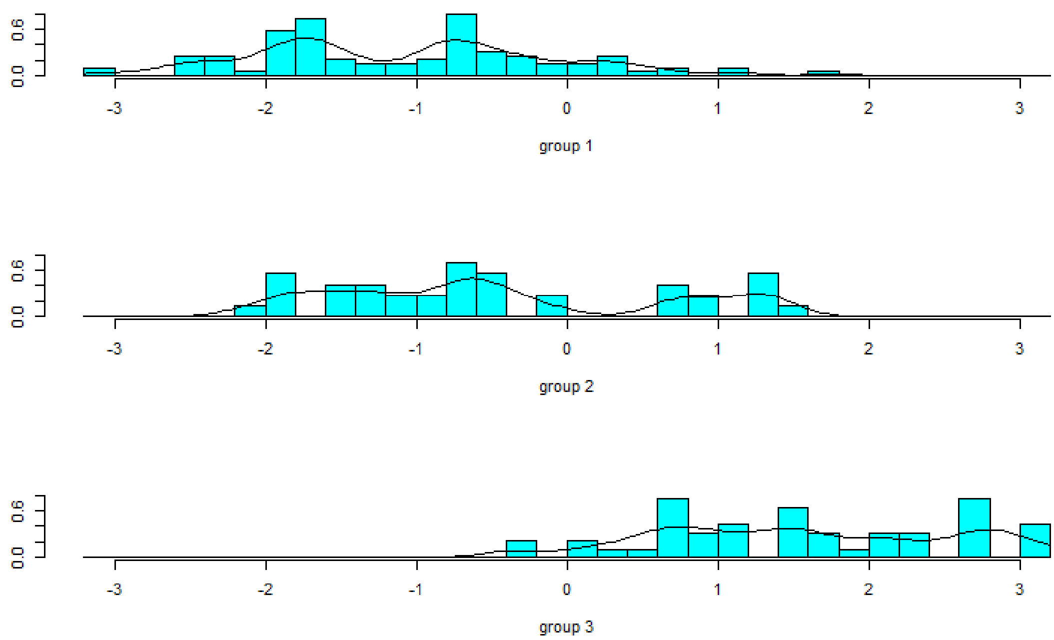


Figure 3.60 Linear Discriminant Analysis for Age Gait Combined Anthropometry.

Within the 2/3rds Master Table (Table 3.11) for sex the one-third randomised data selection performed moderately well for treated data, producing an 85.7% predictive accuracy, whereas the untreated data was 86.9%. Therefore, when viewing the untreated data, females were classified 90.4% correctly and males were classified correctly at 82.8% of the time, both displaying high levels of performance.

In the same table, age discrimination performed worse in the untreated dataset at 57.4% (poor performance) and worse again with the treated data at 47.1%. Overall, sex discrimination performed better than age, and more specifically, females once again performed better than males and age group one better than groups two and three.

Table 3.11 Master Table for 2/3rds of Data – Prediction Test Linear Discriminant Analysis for Sex Gait Combined Anthropometry

Model	**1**		**2**		**3**		**4**	
Pre-treatment	no		no		YES - WARD SEX		YES - WARD SEX	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=samples	1/3 RESAMPLED		1/3 RESAMPLED		1/3 RESAMPLED		1/3 RESAMPLED	
Performance %	**86.9**		**57.4**		**85.7**		**47.1**	
Variable 1 classified%	FEMALE	90.4	1	78.7	FEMALE	88.9	1	61.3
Variable 1 misclassified		9.6		21.3		11.1		38.7
Variable 2 classified%	MALE	82.8	2	8.7	MALE	80	2	21.4
Variable 2 misclassified		17.2		91.3		20		78.6
Variable 3 classified%			3	53.8			3	43.5
Variable 3 misclassified				46.2				56.5

Finally, a 100 resampling was conducted, and in master Table 3.12 the treated data for sex performed better at 91.7% predictive accuracy and untreated was 84.7%. Furthermore, the false positives for females were 6.8% and 9% for males for the treated data, overall indicating that it performed well and was classified correctly. Age did not perform as well, with 60% for treated data and 65% for untreated data. The false positive and false negative rates can be observed within the 100 resampling Master Table (Table 3.12).

Table 3.12 Master Table 100 Resampling Linear Discriminant Analysis for Sex Gait Combined Anthropometry

Model	**1**		**2**		**3**		**4**	
Pre-treatment	no		no		YES - WARD SEX		YES - WARD SEX	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=replicate/samples	100		100		100		100	
Performance %	**84.708**		**64.933**		**91.733**		**60.033**	
Variable 1 false positives %	FEMALE	15.701	1	29.729	FEMALE	6.7816	1	34.163
Variable 1 false negatives %				21.161				25.419
Variable 2 false positives %	MALE	14.873	2	8.6294	MALE	9.0503	2	14.003
Variable 2 false negatives %				86.235				76.153
Variable 3 false positives %			3	19.28			3	16.58
Variable 3 false negatives %				32.588				40.574

3.4.4.2 Static Gait Anthropometry

After the combined (of both static and dynamic features) were analysed, the features were separated into body measurements (static) and gait measurements (dynamic). From there, the same analyses were repeated to view any further correlations or distinctions. Static features were looked at first. The Scree plot, HCA, loadings, raw PCA and treated PCA with data suppression results can be found in Appendix F.2, with similar results to gait combined.

Through two features (Leg Length – Crotch R and Foot Width L) a degree of separation between males and females can be observed in Figure 3.61, where the blue circle shows males (those that are outside these circles can be classified as outliers). Those in the red circles are females and the overlap between the two show those subjects overlap of traits. Linear Discriminant analysis was also conducted for static gait features and can be seen in Appendix F.2.

Figure 3.62 shows an ancestry biplot where no real degree of separation can be observed within the subgroups of 'Caucasian', 'Asian' and 'Other'.

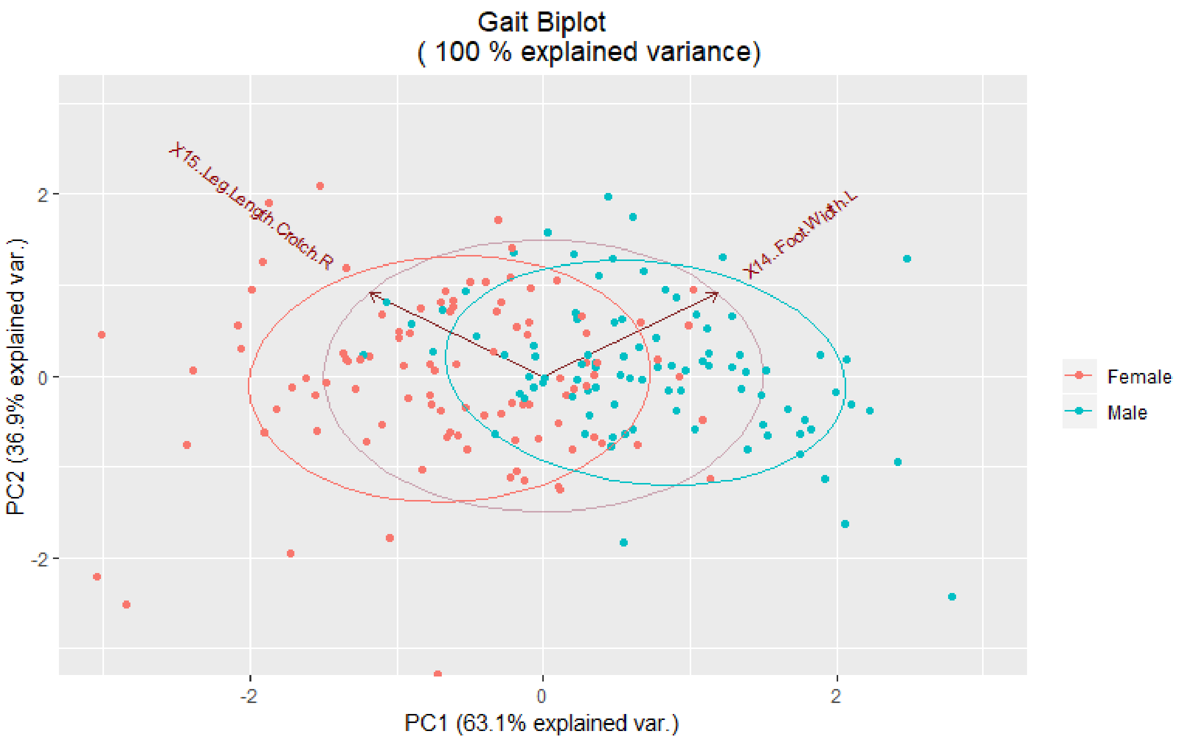


Figure 3.61 Biplot for Sex Gait Static. Females are indicated by the orange points and male by the blue.

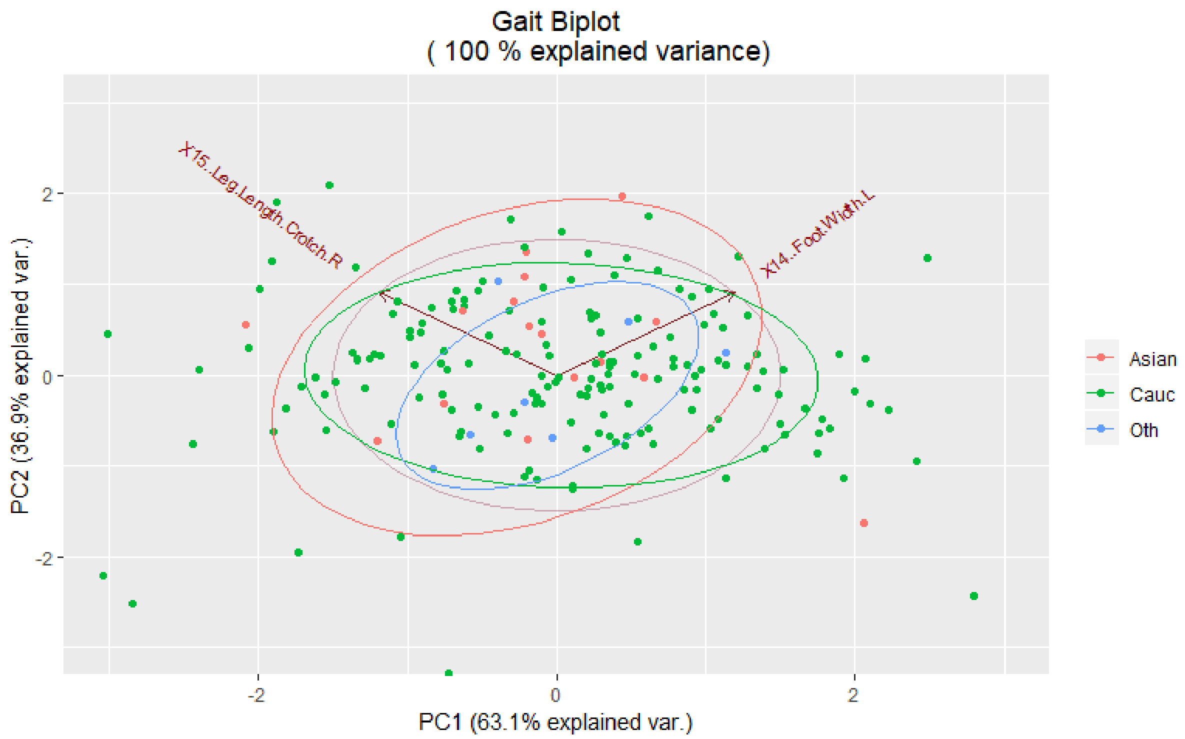


Figure 3.62 Biplot for Ancestry Gait Static. Asian population are indicated by the orange, Caucasian by green and 'Other' by blue.

3.4.4.3 Dynamic Gait Anthropometry

The same analyses were repeated for dynamic gait variables to view any further correlations or distinctions. The Scree plot, loadings, raw PCA results can be found in Appendix F.3. Upon analysing the LDA as seen in Appendix F.3, it was observed for dynamic gait that no degree of separation was available between males and females, or for the various age groups.

3.4.5 Stance Morphology

Following the completion of the anthropometric components, the morphological analyses were conducted. The morphological assessment was analysed through both R Studio and XLSTAT. Similar to the anthropometry of both stance and gait, analysis of the raw stance morphology was followed by analysis of the normalised data. Following this, CA statistical analyses were completed, followed by Linear Discriminant Analysis through XLSTAT to view correlations.

3.4.5.1 Raw Data Stance Morphology – R Studio

The raw data was firstly generated and observed where a scree plot, loadings and PCA results were produced as seen in Appendix F.4. Since the normalised data are produced results that are more significant, those graphs will be assessed in further detail.

3.4.5.2 Normalised Data Stance Morphology –R Studio

The scree plot and the HCA cluster produced from R studio can be found in Appendix F.4. The loadings distribution (Figure 3.63) showed that the features were clustering together into two groups. As you can see by the green circle, the features are pairing up (left and right sides of the same feature) together, but further features are also within the clustering also. Additionally, the loadings line graph (Figure 3.64), show that the five principle components with the highest variability are: [PC1] Lateral Placement of Upper Leg R; [PC2] Lateral Placement of Upper Leg L; [PC3] Lateral Placement of Forearm R; [PC4] Orientation of Lower Extremities L; and [PC5] Finger Flexion L.

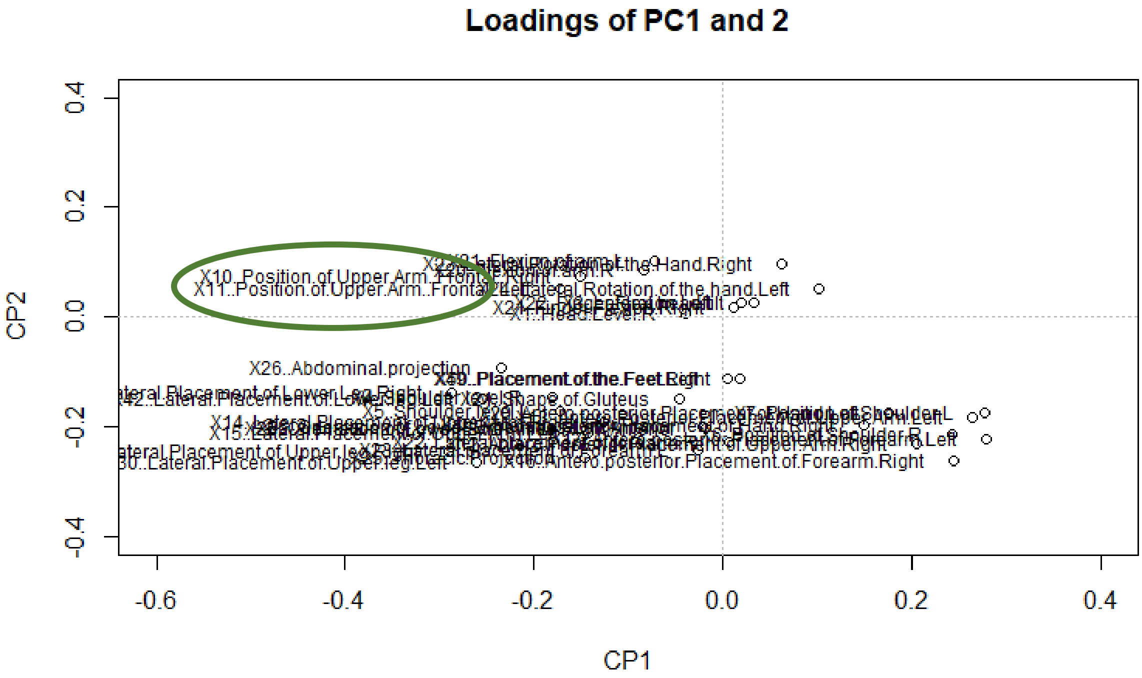


Figure 3.63 Loadings Distribution for Normalised Stance Morphology from Principal Component Analysis.

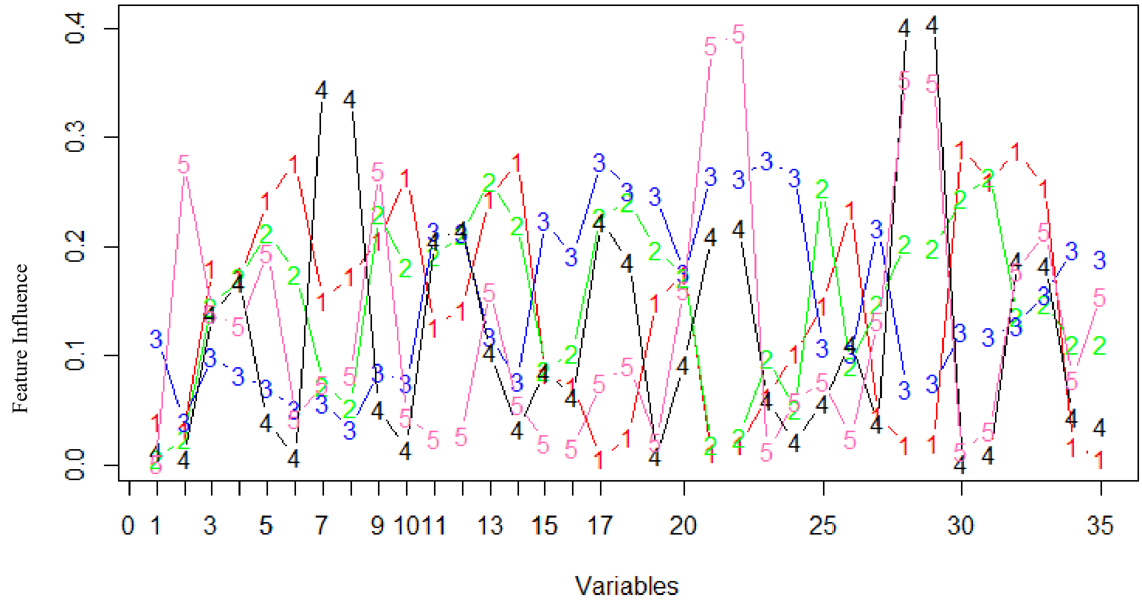


Figure 3.64 Loadings Line Graph for Normalised Stance Morphology from Principal Component Analysis.

The normalised PCA plots were produced, and a clear degree of separation was observed for sex (Figure 3.65), where males grouped towards the top of the graph and females towards the bottom. Some overlap was also observed. No separation was observed in age (Figure 3.66) nor ancestry (Figure 3.67).

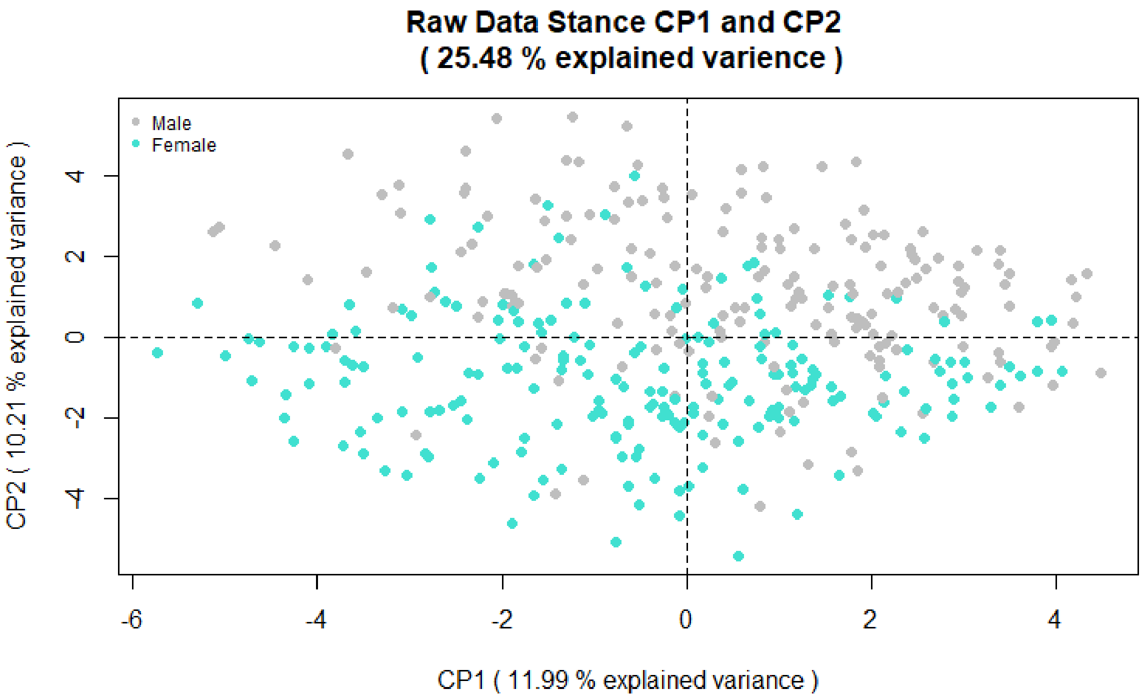


Figure 3.65 Principle Component Analysis for Raw Normalised Stance Morphology, Showing Correlations of Sex.

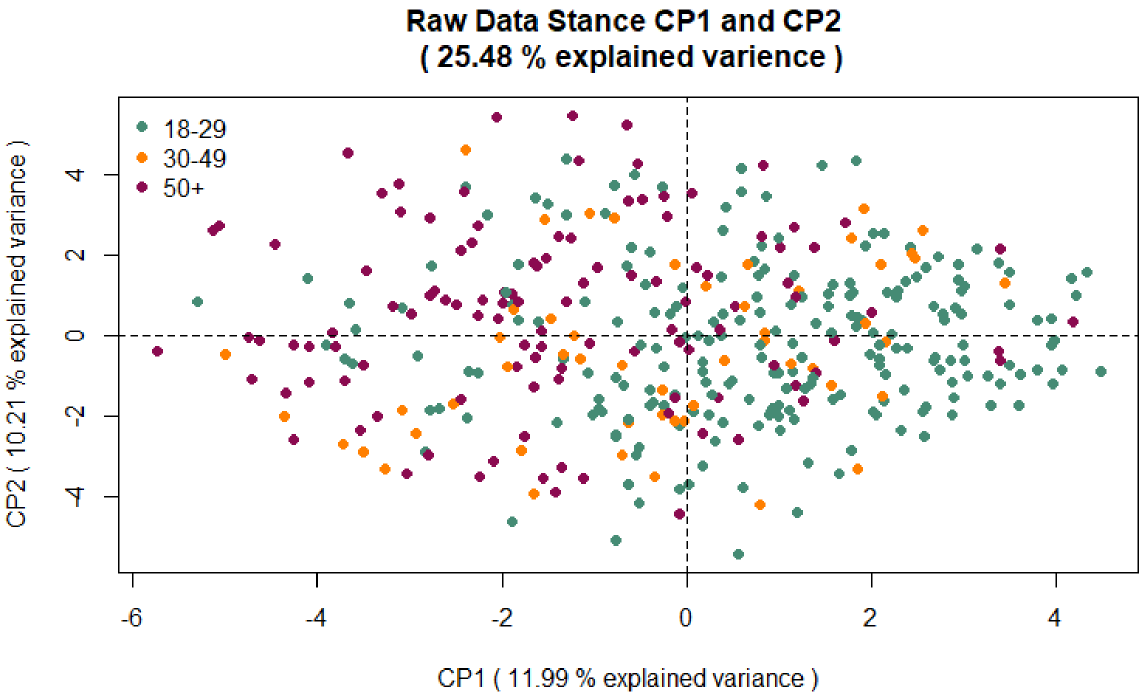


Figure 3.66 Principle Component Analysis for Raw Normalised Stance Morphology, Showing Correlations of Age.

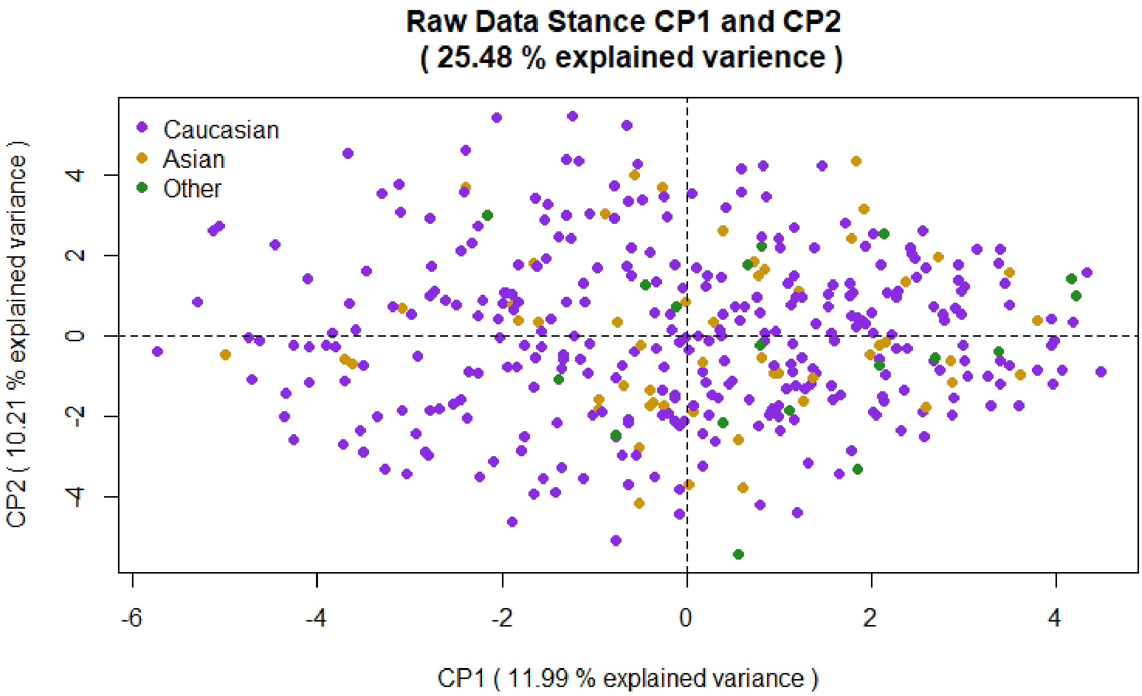


Figure 3.67 Principle Component Analysis for Raw Normalised Stance Morphology, Showing Correlations of Ancestry.

3.4.5.3 Correspondence Analysis for Stance Morphology

Following PCA analyses on the stance morphology dataset, the evaluation was continued through correspondence analysis using XLSTAT. A scatterplot was generated, and clustering was observed linearly. Some of the points were grouped together in twos and threes, indicating similar stance profiles between them, as observed in Figure 3.68.

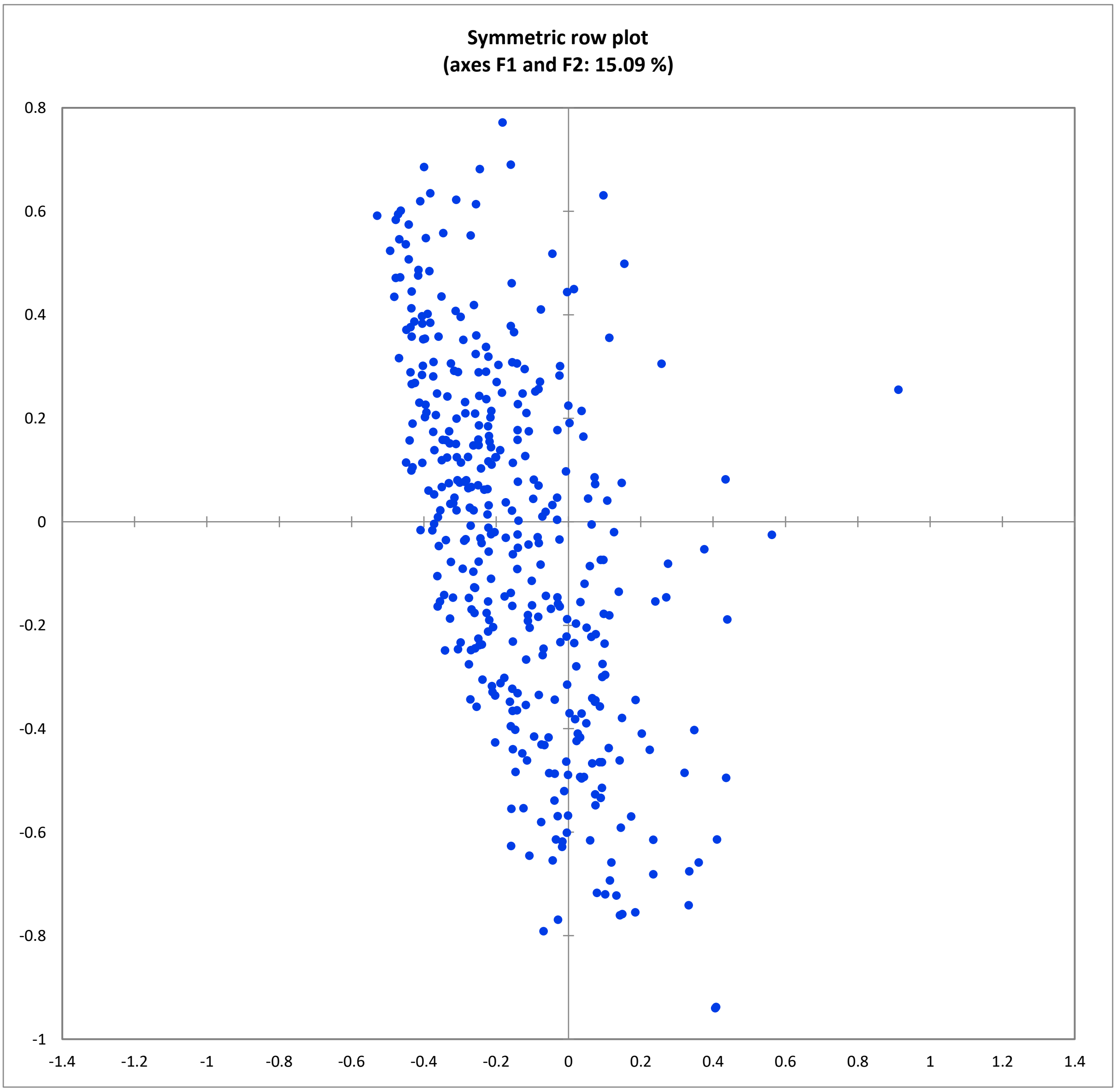


Figure 3.68 Correspondence Analysis for Stance Morphology.

3.4.5.4 Linear Discriminant Analysis for Stance Morphology

Nominal and ordinal datasets were examined for stance morphology and linear discriminant analysis were applied to sex, age, and ancestry groups. Linear and scatter graphs were generated, and confusion matrix obtained (for both data [training sample] and cross validation results) as well as the Wilk's Lambda values. Cross validation is a useful tool when estimating the accuracy of a prediction model when in practice on new observations (prediction ability) (Rencher, 2002). For instance, when the program runs through each individual to be classified, it leaves out from the database one actually being classified and instead, recalculates the classificatory formulae without the individual, thus leaving out any bias. It is expected therefore, that the classificatory percentage success rate for the cross-validation method will be less than that of the re-substitution method, thus mimicking what will happen when a new individual is classified.

To begin with, sex was assessed for the ordinal dataset (Figure 3.69), where LDA was observed in a linear fashion. A degree of separation was observed between males (orange) and females (blue), with some overlap between them. Furthermore, Wilk's Lambda test provided a p-value of < 0.0001 indicating a significant difference in the male and female profiles. Finally, a confusion matrix (Table 3.13), showed a high predictive accuracy for both the data at 97.12%, and the cross-validation, at 95.29%. Additionally, the distinct features are summarised in Table 3.14, where it was observed that features such as lateral head tilt etc. was seen to be distinct for sex determination. For the full list, see Appendix G.

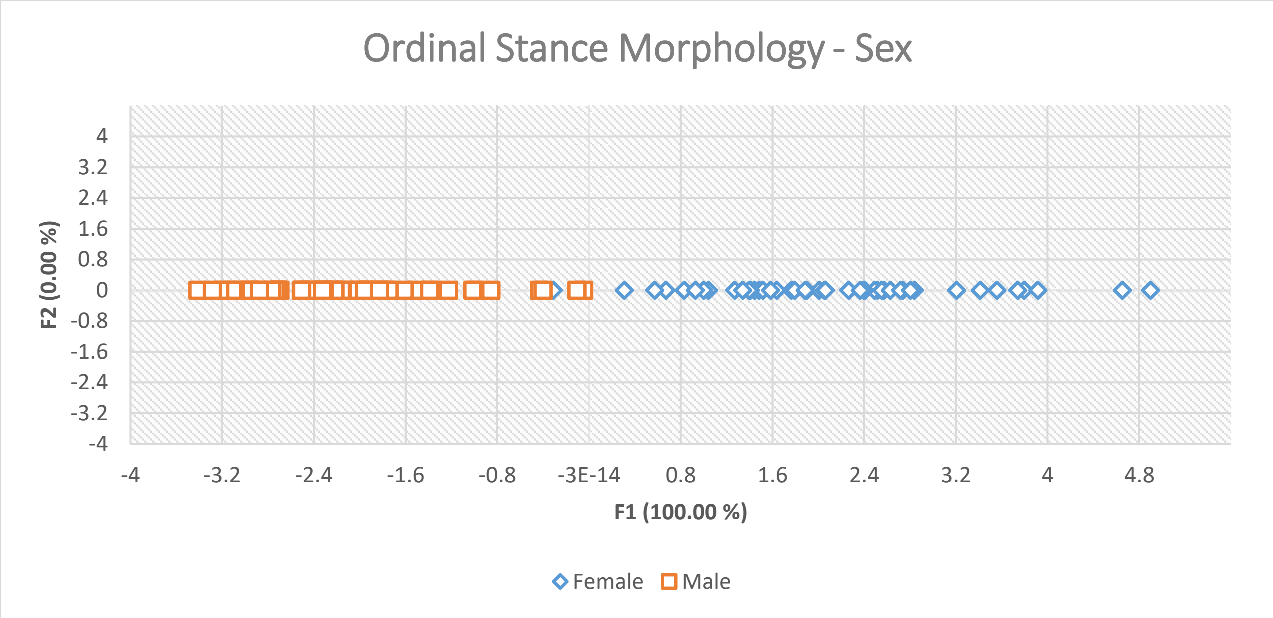


Figure 3.69 Linear Discriminant Analysis for Ordinal Stance Morphology - Sex

Table 3.13 Confusion Matrix for Data and Cross Validation Ordinal Stance Morphology - Sex

Confusion Matrix - Data				
from \ to	Female	Male	Total	% correct
Female	196	4	200	98.00%
Male	7	175	182	96.15%
Total	203	179	382	97.12%
Confusion Matrix - Cross Validation				
from \ to	Female	Male	Total	% correct
Female	191	9	200	95.50%
Male	9	173	182	95.05%
Total	200	182	382	95.29%

Table 3.14 Distinct Features Observed for Ordinal Stance Morphology for Sex Determination

Distinct Features for Stance Morphology Ordinal Data - Sex	
Head Level	Lateral head tilt
Position of Shoulder	Antero-Posterior Placement of Upper Arm
Flexion of arm	Finger Flexion

The same tests were repeated for the nominal data for stance morphology. The LDA for sex showed a higher degree of separation for nominal (Figure 3.70) than ordinal data (Figure 3.69), with a Wilk's Lambda p-value of < 0.0001, again, demonstrating a significant difference in the male (blue) and female (green) profiles. Furthermore, the confusion matrix (Table 3.15), showed a high predictive accuracy for both the data (96.34%) and the cross-validation (95.29%).

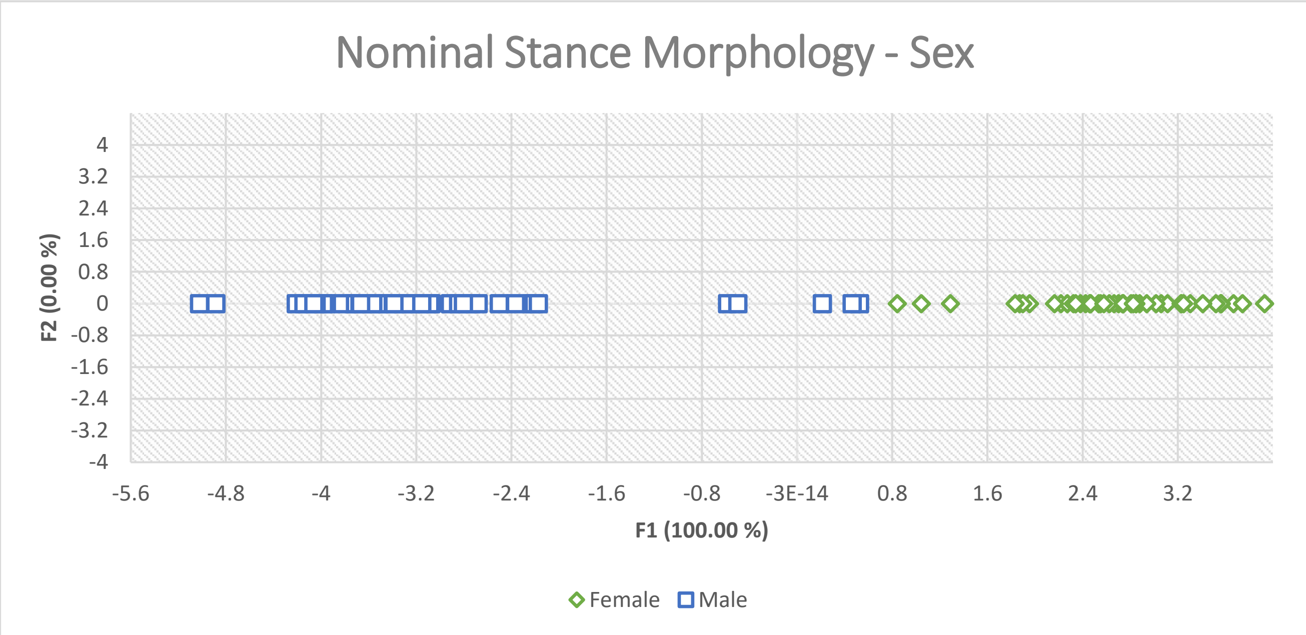


Figure 3.70 Linear Discriminant Analysis for Nominal Stance Morphology - Sex

Table 3.15 Confusion Matrix for Data and Cross Validation Nominal Stance Morphology – Sex

Confusion Matrix - Data				
from \ to	Female	Male	Total	% correct
Female	199	1	200	99.50%
Male	13	169	182	92.86%
Total	212	170	382	96.34%
Confusion Matrix - Cross Validation				
from \ to	Female	Male	Total	% correct
Female	197	3	200	98.50%
Male	15	167	182	91.76%
Total	212	170	382	95.29%

Next, the LDA for ancestry ordinal was assessed, where no true clustering of data was observed (Figure 3.71). Therefore, the 'other' (yellow) ancestry category was removed and reassessed (Figure 3.72), still showing overlap between the Caucasian (orange) and Asian (blue) groups, but moderately separated. A Wilk's Lambda p-value of 0.0002, represented a significant difference between the Caucasian and Asian profiles. Furthermore, the confusion matrix (Table 3.16), showed a high predictive accuracy for both the data, at 86.54%, and the cross-validation, at 82.42%. Additionally, the distinct features are summarised in Table 3.17, where it was observed that features such as shoulder level etc. was seen to be distinct for ancestry determination. For the full list, see Appendix G.

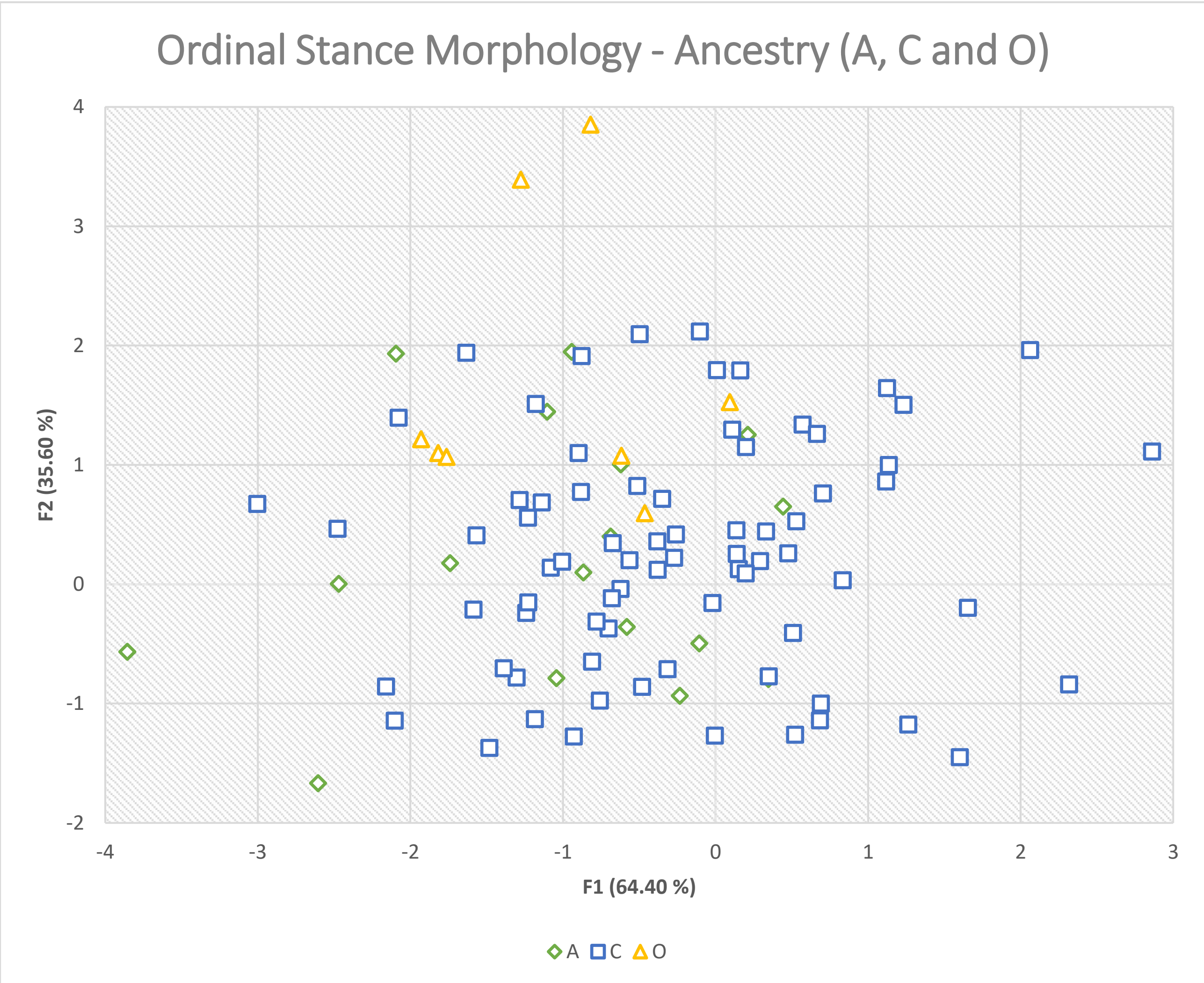


Figure 3.71 Linear Discriminant Analysis for Ordinal Stance Morphology – Ancestry for Caucasian, Asian and 'Other' categories.

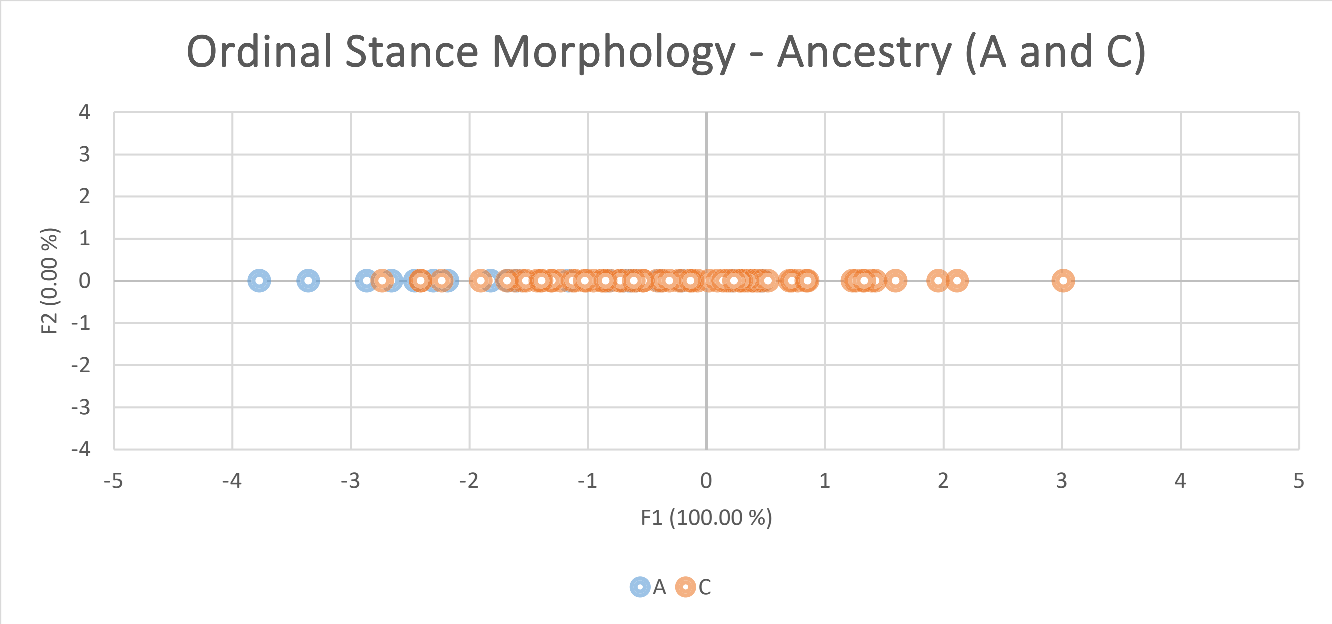


Figure 3.72 Linear Discriminant Analysis for Ordinal Stance Morphology – Ancestry for Caucasian and Asian categories

Table 3.16 Confusion Matrix for Data and Cross Validation Ordinal Stance Morphology – Ancestry

Confusion Matrix - Data				
from \ to	A	C	Total	% correct
A	11	43	54	20.37%
C	6	304	310	98.06%
Total	17	347	364	86.54%
Confusion Matrix - Cross Validation				
from \ to	A	C	Total	% correct
A	6	48	54	11.11%
C	16	294	310	94.84%
Total	22	342	364	82.42%

Table 3.17 Distinct Features Observed for Ordinal Stance Morphology for Ancestry Determination

Distinct Features for Stance Morphology Ordinal Data - Ancestry	
Shoulder level	Lateral Placement of Upper Arm
Antero-posterior Placement of Forearm	Lateral placement of forearm
Finger Flexion	Lateral Rotation of the Hand
Thoracic Projection	Shape of Gluteus
Placement of the Feet	

The nominal data for ancestry showed the same overlap as observed within the ordinal data (Figure 3.73), with the same Wilk's Lambda p-value of 0.0002, representative of a significant difference in the Caucasian (blue) and Asian (green) profiles. Furthermore, the confusion matrix (Table 3.18) showed a high predictive accuracy for both the data (90.93%) and the cross-validation (80.77%).

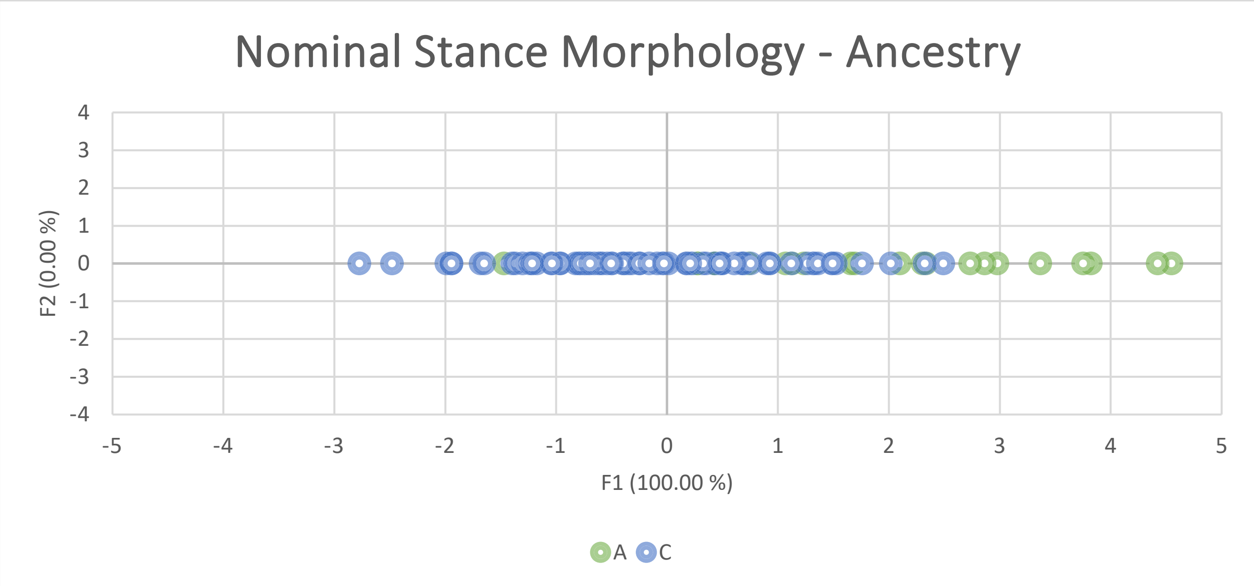


Figure 3.73 Linear Discriminant Analysis for Nominal Stance Morphology – Ancestry for Caucasian and Asian categories

Table 3.18 Confusion Matrix for Data and Cross Validation Nominal Stance Morphology – Ancestry

Confusion Matrix - Data				
from \ to	A	C	Total	% correct
A	29	25	54	53.70%
C	8	302	310	97.42%
Total	37	327	364	90.93%
Confusion Matrix - Cross Validation				
from \ to	A	C	Total	% correct
A	13	41	54	24.07%
C	29	281	310	90.65%
Total	42	322	364	80.77%

Finally, the LDA for age ordinal was assessed and a moderate level of separation was observed (Figure 3.74). A Wilk's Lambda p-value of < 0.0001 was found, representing a significant difference in age groups profiles one (green), two (blue), and three (yellow). The confusion matrix (Table 3.19) showed a moderate predictive accuracy for both the data at 76.7% and the cross-validation at 69.63%. The distinct features are summarised in Table 3.20, where it was observed that features such as finger flexion etc. are distinct for age determination. For the full list, see Appendix G.

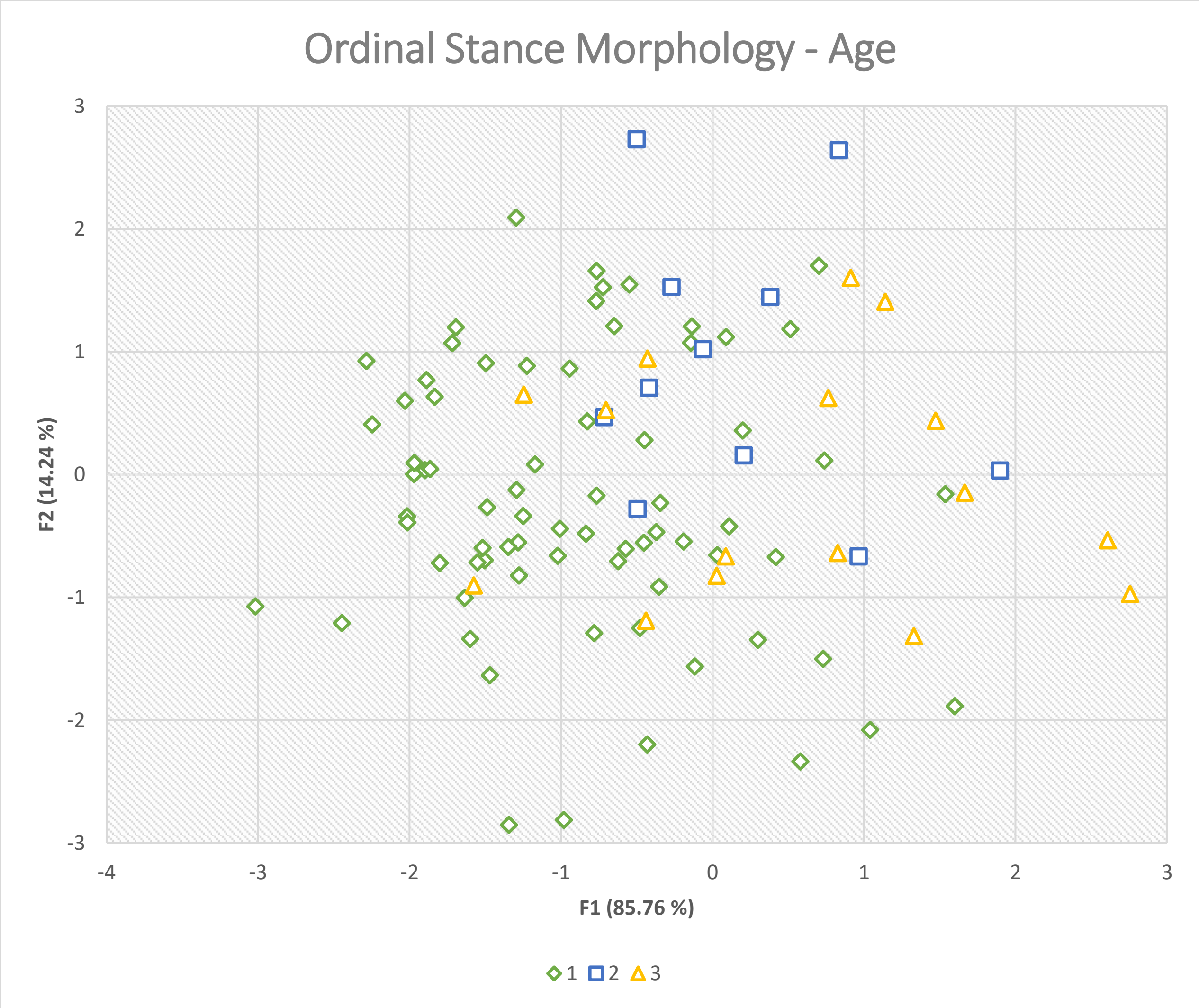


Figure 3.74 Linear Discriminant Analysis for Ordinal Stance Morphology – Age

Table 3.19 Confusion Matrix for Data and Cross Validation Ordinal Stance Morphology – Age

Confusion Matrix - Data					
from \ to	1	2	3	Total	% correct
1	196	5	15	216	90.74%
2	25	15	13	53	28.30%
3	26	5	82	113	72.57%
Total	247	25	110	382	76.70%
Confusion Matrix - Cross Validation					
from \ to	1	2	3	Total	% correct
1	185	11	20	216	85.65%
2	27	8	18	53	15.09%
3	33	7	73	113	64.60%
Total	245	26	111	382	69.63%

Table 3.20 Distinct Features Observed for Ordinal Stance Morphology for Age Determination

Distinct Features for Stance Morphology Ordinal Data - Age	
Position of Shoulder	Antero-Posterior Placement of Upper Arm
Lateral placement of Forearm	Finger Flexion
Lateral Rotation of the Hand	Placement of the Feet

The nominal data for age displayed further separation between the groups when compared to the ordinal data (Figure 3.75), and contained the same Wilk's Lambda p-value of < 0.0001, representative of a significant difference between the age profiles. Furthermore, the confusion matrix (Table 3.21) showed a moderate predictive accuracy for both the data, at 72.57%, and the cross-validation, at 64.60%.

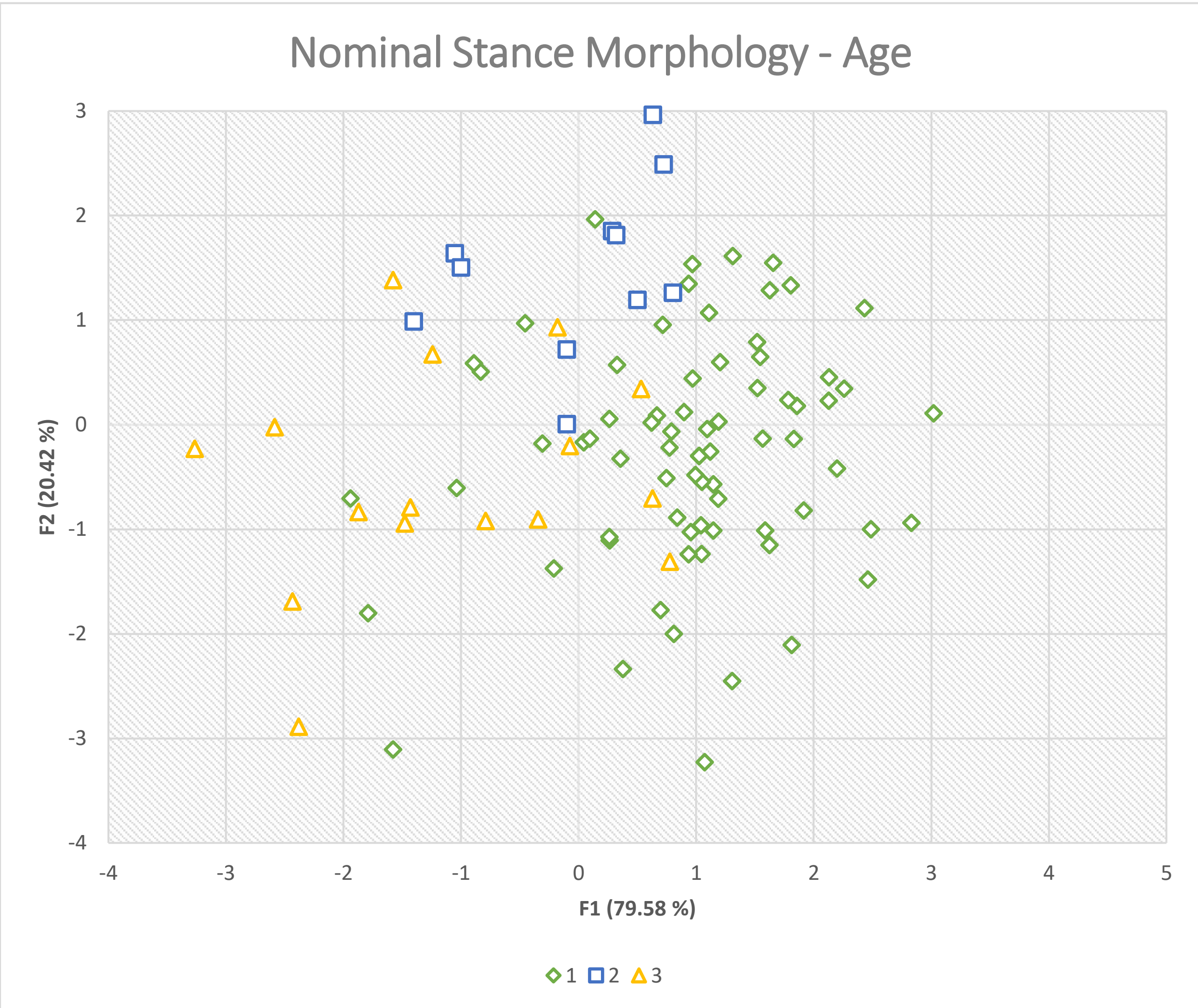


Figure 3.75 Linear Discriminant Analysis for Nominal Stance Morphology – Age

Table 3.21 Confusion Matrix for Data and Cross Validation Nominal Stance Morphology – Age

Confusion Matrix - Data					
from \ to	1	2	3	Total	% correct
1	193	8	15	216	89.35%
2	19	26	8	53	49.06%
3	15	6	92	113	81.42%
Total	227	40	115	382	81.41%
Confusion Matrix - Cross Validation					
from \ to	1	2	3	Total	% correct
1	174	19	23	216	80.56%
2	27	7	19	53	13.21%
3	28	13	72	113	63.72%
Total	229	39	114	382	66.23%

3.4.6 Gait Morphology

Similar to stance morphology, morphological assessment of gait was carried out in R Studio and XLSTAT. The raw gait morphology was assessed first, followed by the normalised data and, and finally CA statistical analyses were completed as well as Linear Discriminant Analysis through XLSTAT to view correlations.

3.4.6.1 Raw Data Gait Morphology – R Studio

The raw data was firstly generated and observed where a scree plot, loadings and PCA results were produced as seen in Appendix F.5.

3.4.6.2 Normalised Data Gait Morphology –R Studio

The scree plot and the HCA cluster produced from R studio can be found in Appendix F.5. The loadings line graph (Figure 3.76), show that the five principle components with the highest variability are: [PC1] Lateral Placement of Upper Leg Midstance R; [PC2] Finger Flexion L; [PC3] Lateral Rotation of the Hand Forward Swing R; [PC4] Level of Elbow Flexion Backward Arm Swing R; and [PC5] Lateral Placement of upper Leg Swing L.

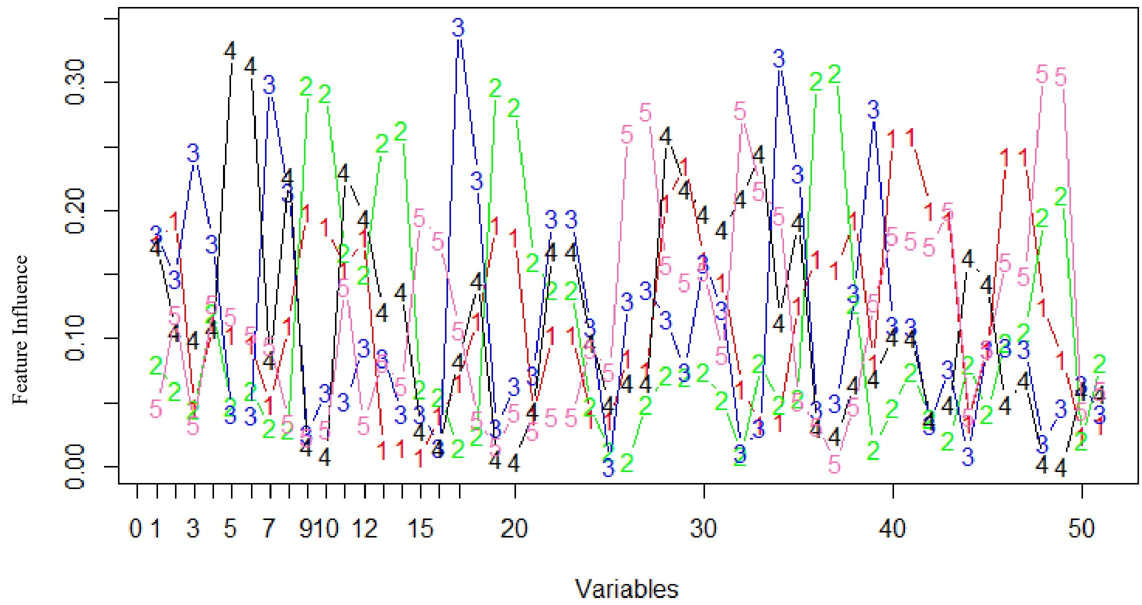


Figure 3.76 Loadings Line Graph for Normalised Gait Morphology from Principal Component Analysis.

The normalised PCA plots were produced, and a degree of separation was observed for sex (Figure 3.77) where males grouped towards the left and females towards the right. Some overlap was also observed. No separation was observed in age (Figure 3.78) or ancestry (Figure 3.79).

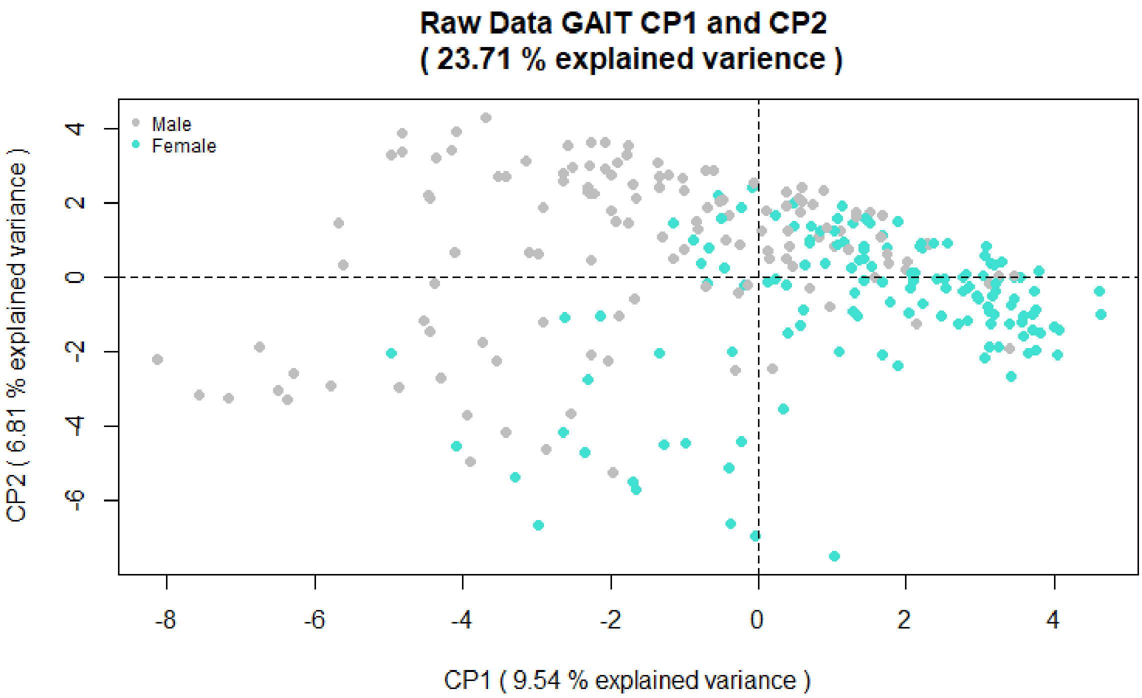


Figure 3.77 Principle Component Analysis for Raw Normalised Gait Morphology, Showing Correlations of Sex.

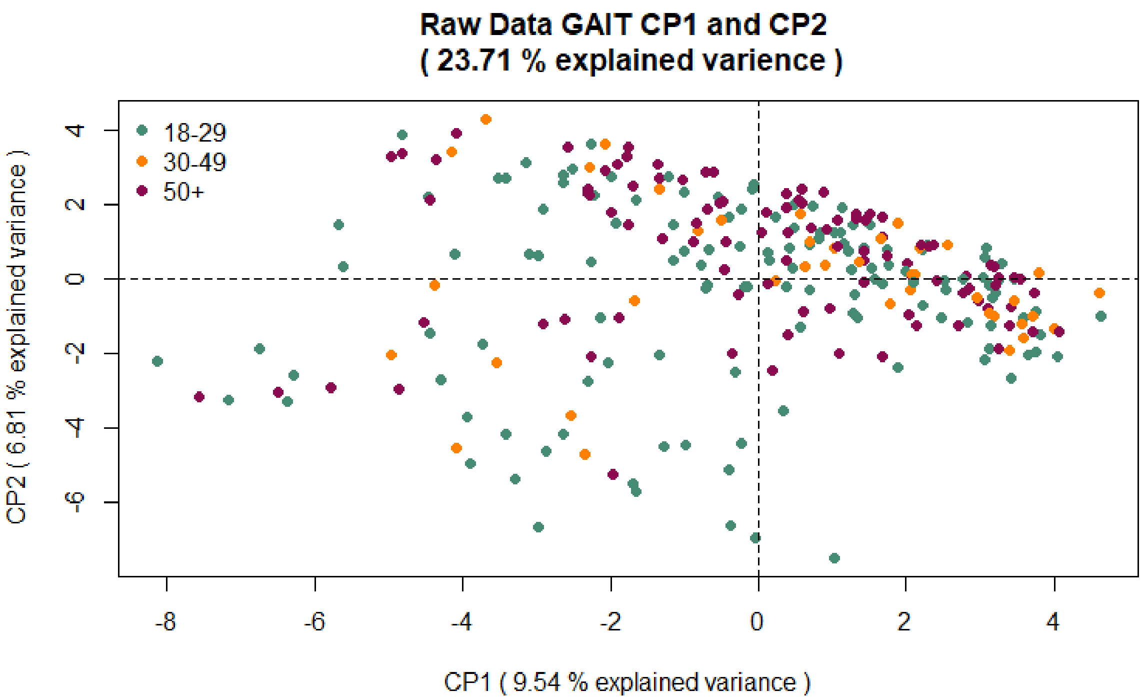


Figure 3.78 Principle Component Analysis for Raw Normalised Gait Morphology, Showing Correlations of Age.

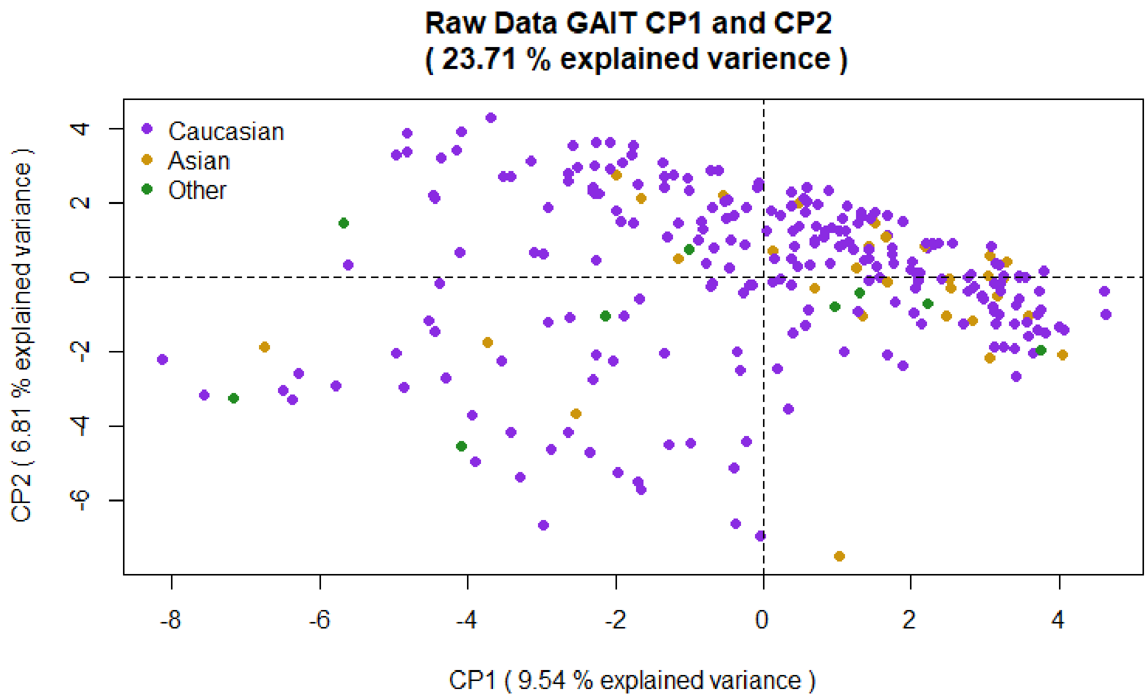


Figure 3.79 Principle Component Analysis for Raw Normalised Gait Morphology, Showing Correlations of Ancestry.

3.4.6.3 Linear Discriminant Analysis for Gait Morphology

To begin with, sex was assessed for the ordinal dataset (Figure 3.80) where LDA was observed in a linear fashion. A degree of separation was observed between males (orange) and females (blue), with some overlap between them. Furthermore, Wilk's Lambda test provided a p-value of < 0.0001, indicating a significant difference in the male and female profiles. Finally, a confusion matrix (Table 3.22) showed a high predictive accuracy for both the data, at 98.50%, and the cross-validation at 95.51%. The distinct features are summarised in Table 3.23, where it was observed that features such as finger flexion, elbow flexion etc. was seen to be distinct for sex determination. For the full list, see Appendix G.

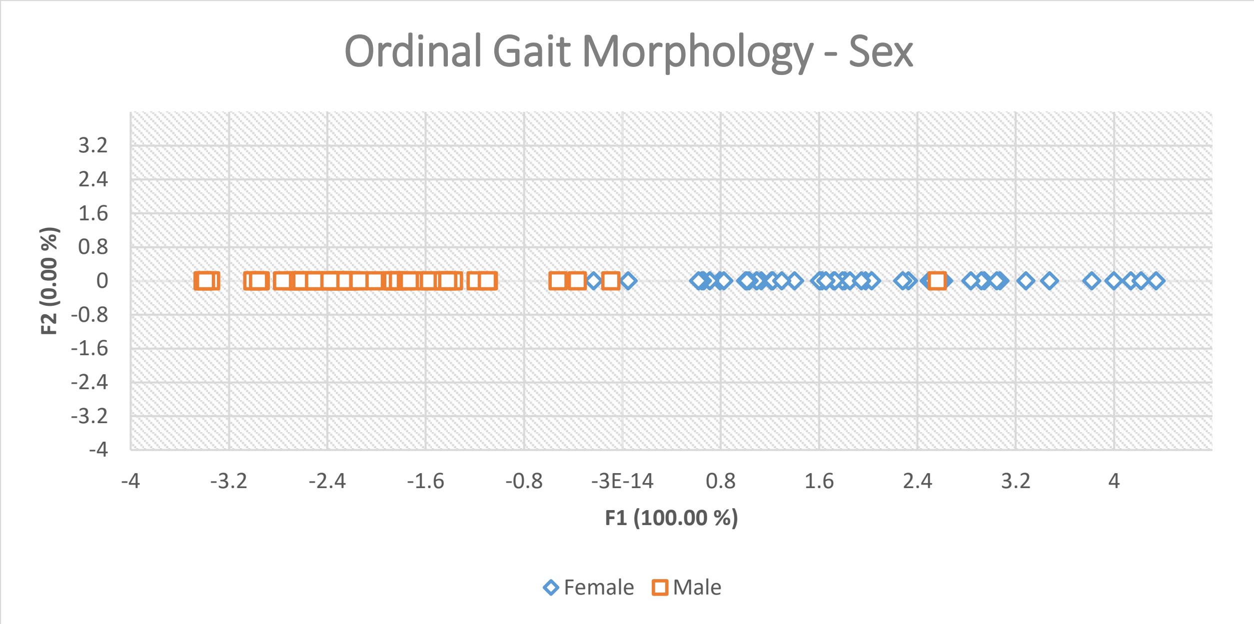


Figure 3.80 Linear Discriminant Analysis for Ordinal Gait Morphology – Sex

Table 3.22 Confusion Matrix for Data and Cross Validation Ordinal Gait Morphology - Sex

Confusion Matrix - Data				
from \ to	Female	Male	Total	% correct
Female	134	2	136	98.53%
Male	2	129	131	98.47%
Total	136	131	267	98.50%
Confusion Matrix - Cross Validation				
from \ to	Female	Male	Total	% correct
Female	132	4	136	97.06%
Male	8	123	131	93.89%
Total	140	127	267	95.51%

Table 3.23 Distinct Features Observed for Ordinal Gait Morphology for Sex Determination

Distinct Features for Gait Morphology Ordinal Data - Sex	
Lateral Placement of Forearm Backward Arm Swing	Level of elbow Flexion Backward Arm Swing
Finger flexion upon backward arm swing	Level of elbow Flexion Forward Arm Swing
Finger flexion upon forward arm swing	Lateral trunk sway
Lateral head tilt	Level of elbow Flexion Mid stance
Finger Flexion Mid Stance	Placement of the Feet Swing

The same tests were repeated for the nominal data for gait. The LDA for sex showed a high degree of separation for nominal data (Figure 3.81), with a Wilk's Lambda p-value of < 0.0001, again, demonstrating a significant difference in the male (blue) and female (green) profiles. Furthermore, the confusion matrix (Table 3.24) showed a high predictive accuracy for both the data (98.50%) and the cross-validation (95.51%).

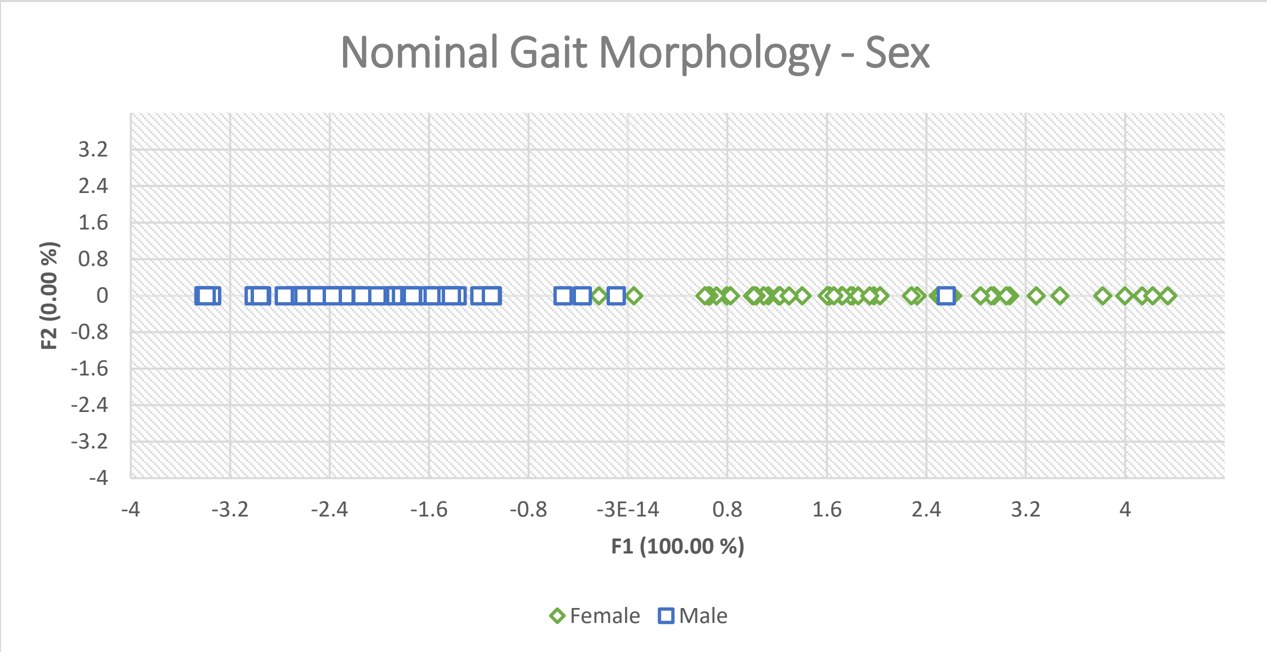


Figure 3.81 Linear Discriminant Analysis for Nominal Gait Morphology – Sex

Table 3.24 Confusion Matrix for Data and Cross Validation Nominal Gait Morphology - Sex

Confusion Matrix - Data				
from \ to	Female	Male	Total	% correct
Female	134	2	136	98.53%
Male	2	129	131	98.47%
Total	136	131	267	98.50%
Confusion Matrix - Cross Validation				
from \ to	Female	Male	Total	% correct
Female	132	4	136	97.06%
Male	8	123	131	93.89%
Total	140	127	267	95.51%

Next, the LDA for ancestry ordinal was assessed, where some degree of separation in the data was observed between the Caucasian (orange) and Asian (blue) populations (Figure 3.82). A Wilk's Lambda p-value of 0.015 was produced, representing a significant difference in both Caucasian and Asian profiles. Furthermore, the confusion matrix (Table 3.25) showed a high predictive accuracy for both the data, at 93.02%, and the cross-validation at 86.82%. The distinct features are summarised in Table 3.26, where it was observed that features such as lateral placement of the upper arm in backward arm swing etc. was seen to be distinct for ancestry determination. For the full list, see Appendix G.

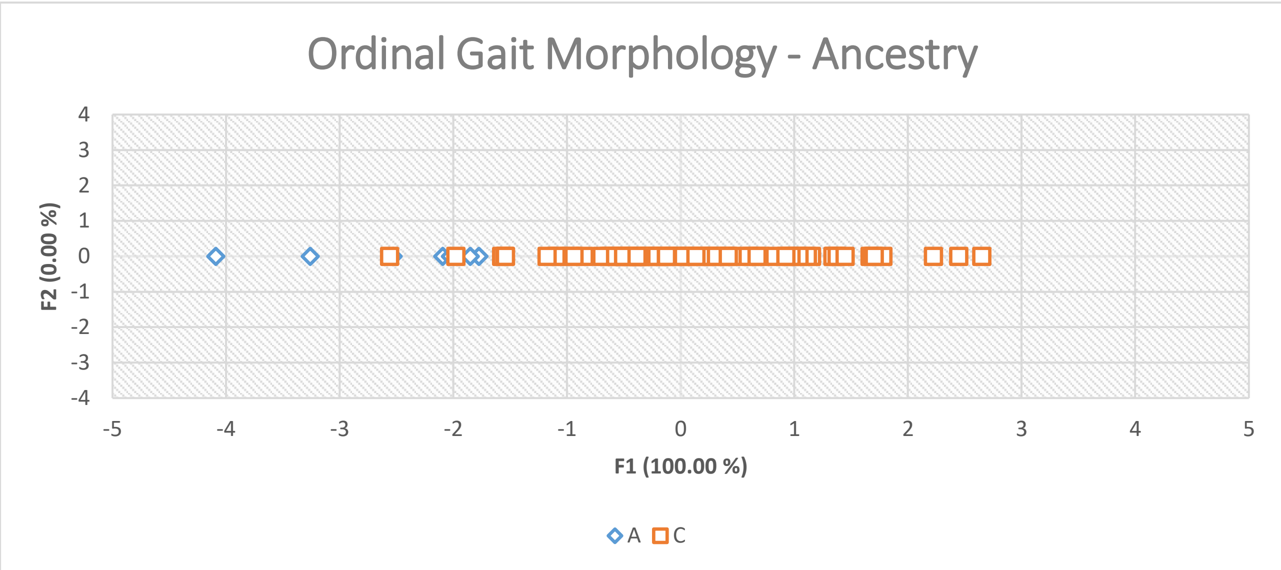


Figure 3.82 Linear Discriminant Analysis for Ordinal Gait Morphology – Ancestry

Table 3.25 Confusion Matrix for Data and Cross Validation Ordinal Gait Morphology - Ancestry

Confusion Matrix - Data				
from \ to	A	C	Total	% correct
A	16	14	30	53.33%
C	4	224	228	98.25%
Total	20	238	258	93.02%
Confusion Matrix - Cross Validation				
from \ to	A	C	Total	% correct
A	6	24	30	20.00%
C	10	218	228	95.61%
Total	16	242	258	86.82%

Table 3.26 Distinct Features Observed for Ordinal Gait Morphology for Ancestry Determination

Distinct Features for Gait Morphology Ordinal Data - Ancestry	
Lateral Placement of Forearm Backward Arm Swing	Lat Placement of Upper Arm Backward Swing
Lateral Rotation of the Hand Backwards swing	Lat Placement of Upper Arm Forward Swing
Lat Placement of Forearm Forward Arm Swing	Lateral Rotation of the Hand Forward swing
Shoulder level	Lateral Placement of Upper Arm Mid Stance
Lateral Placement of Forearm Mid Stance	Lateral Placement of Forearm Mid Stance
Lateral Rotation of the Hand Mid stance	Lateral Placement of Upper leg Mid Stance
Lateral Placement of Lower Leg Mid Stance	Placement of the Feet Mid Stance
Lat placement of Upper Leg Swing	Lateral Placement of Lower Leg Swing

The nominal data for ancestry showed no degree of separation, as observed by the Asian population (green) and Caucasians (blue) with the same Wilk's Lambda p-value of 0.286, representative of no significant difference in the Caucasian and Asian profiles (Figure 3.83). However, the confusion matrix (Table 3.27), showed a high predictive accuracy for both the data (94.57%) and a lower predictive accuracy for the cross-validation (77.91%).

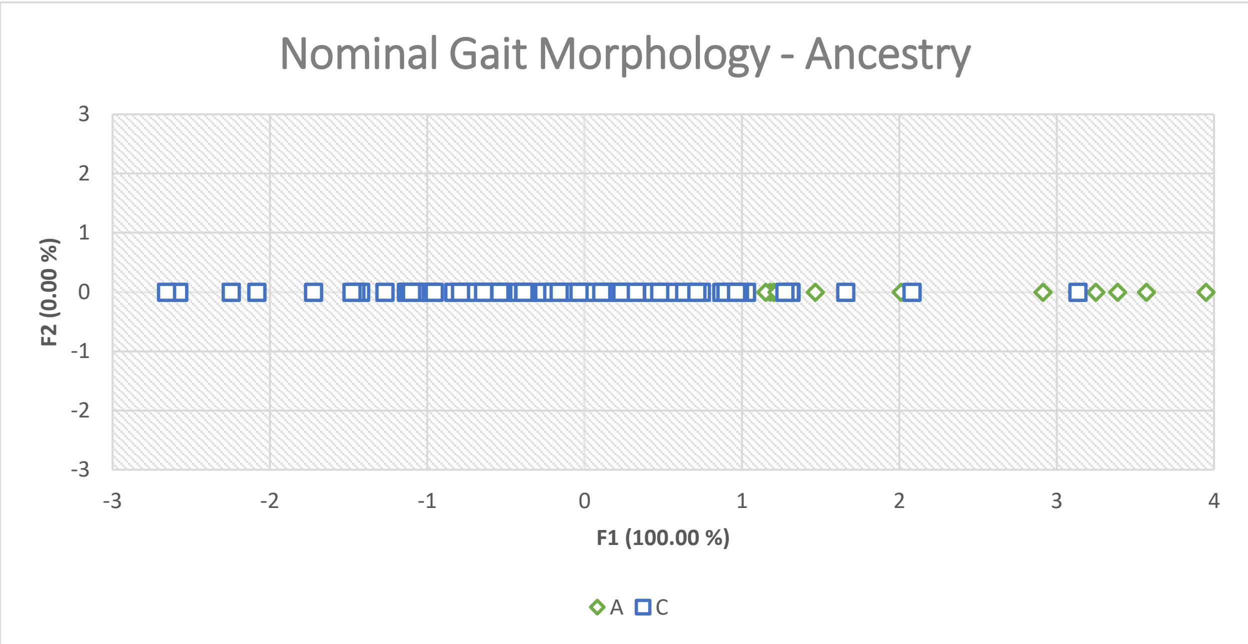


Figure 3.83 Linear Discriminant Analysis for Nominal Gait Morphology – Ancestry

Table 3.27 Confusion Matrix for Data and Cross Validation Nominal Gait Morphology - Ancestry

Confusion Matrix - Data				
from \ to	A	C	Total	% correct
A	21	9	30	70.00%
C	5	223	228	97.81%
Total	26	232	258	94.57%
Confusion Matrix - Cross Validation				
from \ to	A	C	Total	% correct
A	6	24	30	20.00%
C	33	195	228	85.53%
Total	39	219	258	77.91%

Finally, the LDA for age ordinal was assessed and a higher level of separation was observed (Figure 3.84) between age groups one (green), two (blue), and three (yellow), as observed through the clustering of data. A Wilk's Lambda p-value of < 0.0001, represented a significant difference in age group profiles. Furthermore, the confusion matrix (Table 3.28) showed a moderate predictive accuracy for both the data at 79.40%, and the cross-validation at 62.17%. The distinct features are summarised in Table 3.29, where it was observed that features such as lateral placement of the lower leg in swing phase etc. was seen to be distinct for age determination. For the full list, see Appendix G.

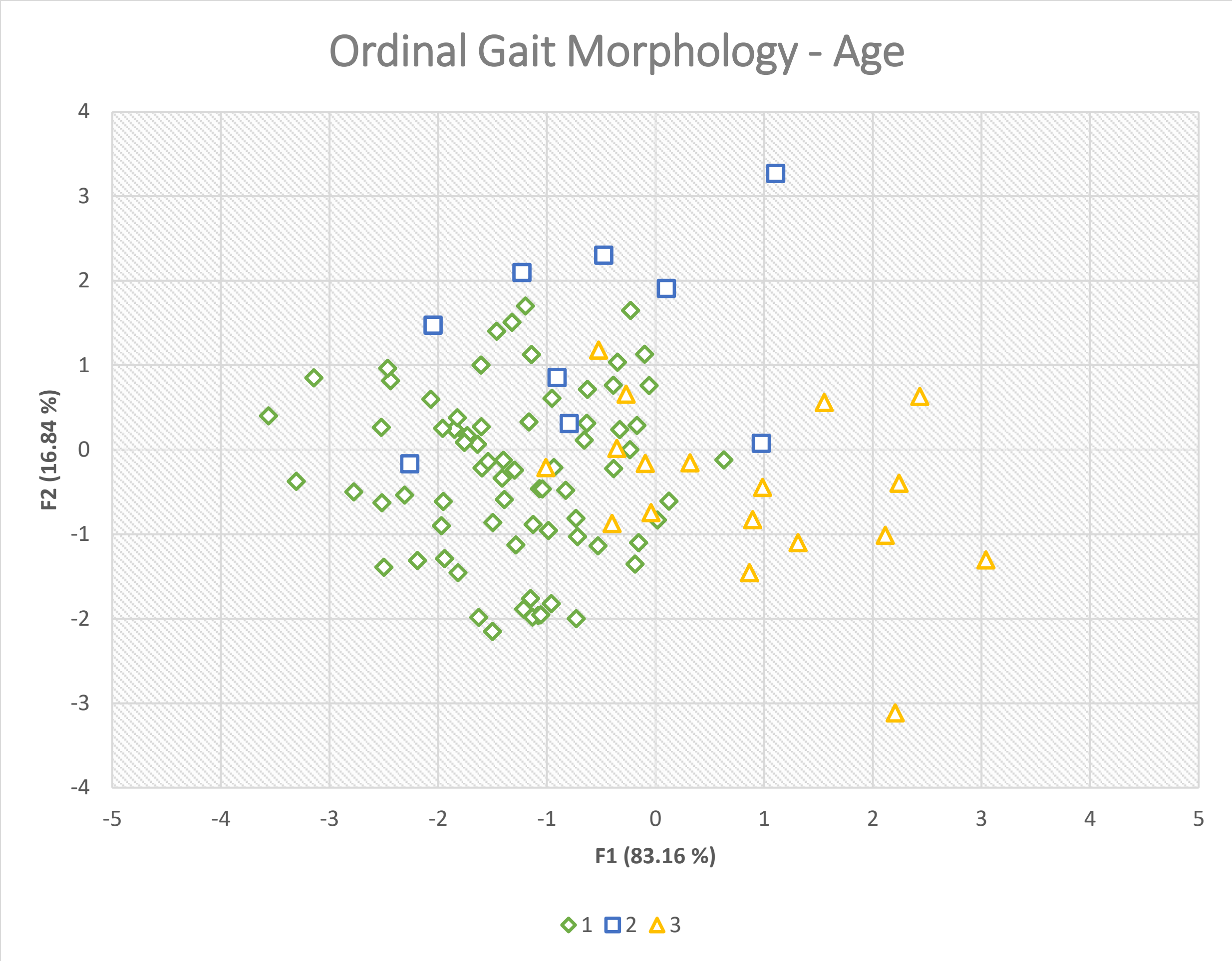


Figure 3.84 Linear Discriminant Analysis for Ordinal Gait Morphology – Age

Table 3.28 Confusion Matrix for Data and Cross Validation Ordinal Gait Morphology - Age

Confusion Matrix - Data					
from \ to	1	2	3	Total	% correct
1	114	6	8	128	89.06%
2	15	14	11	40	35.00%
3	13	2	84	99	84.85%
Total	142	22	103	267	79.40%
Confusion Matrix - Cross Validation					
from \ to	1	2	3	Total	% correct
1	98	14	16	128	76.56%
2	20	3	17	40	7.50%
3	25	9	65	99	65.66%
Total	143	26	98	267	62.17%

Table 3.29 Distinct Features Observed for Ordinal Gait Morphology for Age Determination

Distinct Features for Gait Morphology Ordinal Data - Age	
Lat Placement of Forearm Backward Arm Swing	Lat Placement of Forearm Forward Arm Swing
Lateral Rotation of the Hand Forward swing	Finger flexion upon Forward arm swing
Lateral head tilt	Lateral Placement of Forearm Mid Stance
Finger Flexion Mid Stance	Lateral Placement of Lower Leg Swing

The nominal data for age again displayed separation between age groups one (green), two (blue), and three (yellow) (Figure 3.84), and contained the same Wilk's Lambda p-value of < 0.0001, representative of a significant difference between the age profiles. Furthermore, the confusion matrix (Table 3.30) showed a high predictive accuracy for both the data (85.39%) and the poor predictive accuracy for cross-validation (55.06%).

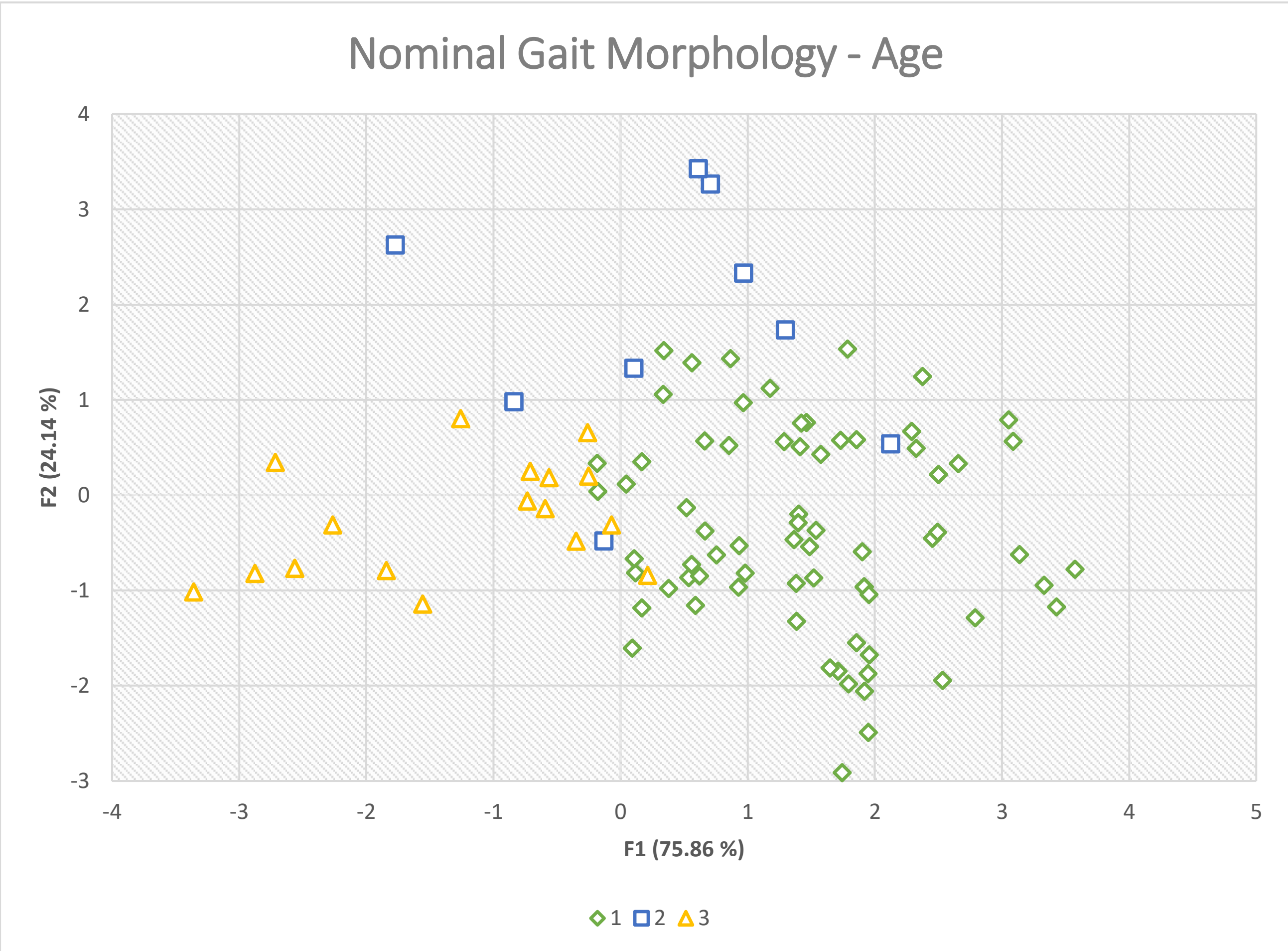


Figure 3.85 Linear Discriminant Analysis for Nominal Gait Morphology – Age

Table 3.30 Confusion Matrix for Data and Cross Validation Nominal Gait Morphology - Age

Confusion Matrix - Data					
from \ to	1	2	3	Total	% correct
1	115	6	7	128	89.84%
2	8	27	5	40	67.50%
3	10	3	86	99	86.87%
Total	133	36	98	267	85.39%
Confusion Matrix - Cross Validation					
from \ to	1	2	3	Total	% correct
1	77	25	26	128	60.16%
2	19	7	14	40	17.50%
3	21	15	63	99	63.64%
Total	117	47	103	267	55.06%

3.5 Discussion

3.5.1 Screening of the Data and Frequency Values

The importance of surveillance as an investigative and intelligence-gathering tool cannot be under-estimated, and the number of cameras installed as part of this process is increasing (Seckiner *et al.*, 2018). From this, assessing both the activity level and source level inference from the trace is imperative. As the activity level is predetermined in the form of cases studies, as explained in Chapter 1, only the source level assessment was evaluated. Therefore, the first step to view and assess the source level inference, the data produced in this study was through heat maps, which were generated using both rows and columns to determine if there were distinct people and/or features respectively. The frequency values for each feature within the given population were then assessed to observe whether features were more distinct or common. Those that were determined to be distinct were the features that contained a low frequency of their portrayal within the subject pool. The highlighted features were those values under 50, equating to 13.05% of the given population for stance and 18.6% of the given population for gait. It appears that the features that were seen less frequently within the given population were those that were more marked, such as the moderate knock knees and moderate bow leggedness observed for stance morphology. Additionally, the 'V' shape gluteus and heart shaped gluteus were more distinct in the population compared to the quite common round or square gluteus. Within gait, lateral rotation of the hand during backwards or forward arm swing were very distinct, and extended fingers were only observed in one person during forward arm swing, indicating a high distinction, which may be attributed to increased speed. This is reinforced by Birch *et al.*, (2013), which highlighted that the primary feature that aided in the analysis of the study was the arm swing. However, various studies such as Veres *et al.*, (2004), and Zhao *et al.*, (2006) to name a couple, favour the analysis of the lower body due to the high variability of the upper limbs, as a result of measurements being deemed unreliable, following unsuccessful tracking of the upper limbs.

As the ground truth of the measurements were not established (since you cannot obtain *in situ* measurements from a trace recorded on CCTV footage), it is possible that measurements of features did not fully correspond to that of the 'ground truth' of the participant measurements. However, it is important to note that all measurements were completed by a single observer, thus allowing consistent measurements across all subjects, thus allowing precision of the measurements (reinforced by the repeatability studies) taken by the single observer and potentially reducing the error.

3.5.2 Stance Anthropometry and Morphology

In scenarios where the face is obstructed preventing assessment, the analysis of the body, especially the assessment of gait characteristics, can provide useful information to aid the investigation (Seckiner *et al.*, 2019). Stance assessment is particularly useful when the trace halts their actions to view their surroundings or while they are speaking to another person. Therefore, following the assessment of heat maps and frequency values, PCA and LDA were undertaken for anthropometry to understand the data and to view any correlations. From this, the loadings line graph (Figure 3.17) indicates which features were the most distinct for stance anthropometry. Hand length variability is assumed, as different flexion states (extended, slightly flexed and moderately flexed) would alter the measurements, causing a variance between and within individuals. Furthermore, torso length and leg length would also be variable, dependant on whether a person has a longer torso or longer legs, with the other subsequently shorter to accommodate; i.e. an individual with long legs and a shorter torso or vice versa. Additionally, the loadings distribution graph (Figure 3.16) shows the features grouping together, indicating a high level of similarity. Although some features such as Foot Length L and R are grouped together, slight variance between the two is observed due to the minor displacement on the graph, which may be attributed to either minor asymmetry due to possible positioning of the foot (i.e. one foot was facing the camera, the other was out-toeing, thus causing slight alteration of measurements from 2D materials as it causes the illusion the foot is shorter) or human error. Finally, the 'correlations between the variables' graph (Figure 3.18) aimed to group the features into 5 groups and was successfully able to group the pairs together from both the left and right sides of the body. For instance, in the farthest box on the left, both left and right 'Leg Length – Crotch' were grouped together, and reiterates the distinctiveness displayed in these features due to the 'longer' branches, indicating a higher variability.

With principle component analysis, observing the closeness of the profiles between subjects is able to be visually understood. Within the PCA plot (Figure 3.19), the points were dispersed, and even though individuals appeared to have a similar profile to one another, no two points were observed to be identical to one another in the normalised data and the treated data suppressed from outliers (Figure 3.22).

For morphology, the normalised data for PCA showed a dispersion of data, highlighting that the profiles were different from one another. However, clustering of data was also observed, indicating that those points clustering had people with similar profiles to one another. Further, the CA plot was observed on the dichotomous data (Figure 3.68), whereby the points were closer together, with less dispersion and formed a linear displacement.

3.5.2.1 Sex

Studies have shown that delinquents are primarily young males (Ma *et al.*, 2012). However, as females also are known to be involved in criminal activity, it is still important to analyse and understand features that are attributed to sex from the trace material. Therefore, from the PCA scatterplot using sex as the independent variable, a degree of separation was observed with the males grouping to one end and the females to the other end of the graph. However, some overlap is observed, which is common, as our anatomy has variances to accommodate both male and female traits.

Once the data was treated with sex and the outliers suppressed for anthropometry, the PCA graph (Figure 3.22) shows a further degree of separation. This will be useful in instances where the sex of the trace is unknown, where the unknown can be inserted into the graph to visually observe in which category the unknown gravitates towards. Furthermore, the cumulative percentage of variance (Figure 3.29) showed that 100% of the total variance of the dataset was able to be described after only two features; showing a clear degree of separation. Also, for the LDA results for anthropometry, the male and female groups separated well, possibly due to the even numbers of the sample size and produced a predictive accuracy of 98.4% indicating significant differences between groups and alluding to the presence of sexual dimorphism in anthropometry.

The morphological results on the other hand, were separated into ordinal (Figure 3.69) and nominal data (Figure 3.70). For LDA, sexual dimorphism was observed in both the ordinal and nominal data where a high predictive accuracy at 97.12% and 96.34% respectively and a high degree of separation were observed between both sexes.

3.5.2.2 Ancestry

Studies have shown that people from different ancestral groups develop at different rates to one another (Rushton, 2000). Correlations of ancestry were assessed to view any variances between populations. Upon PCA assessment, no degree of separation was observed from the ancestry results (Figure 3.20). This could potentially be resulting directly from the uneven subpopulation categories; specifically, a large number of Caucasian individuals (311), a moderate number in the Asian population (54), but a low number of 'Other' category (18) present. Furthermore, the presence of admixture within the populations, as observed by the 'Other' group, was visualised by the scattering of these points throughout the entire graph; while the Asian population, apart from outliers, gravitated towards the right side of the graph. This is further supported, as R Studio was not able to generate LDA graphs, nor provide a confusion matrix for the ancestry data for stance, possibly as a result of uneven numbers within each subgroup. However, once the data was treated with ancestry, the outliers suppressed, the graph (Figure 3.38) shows a degree of separation, with only slight overlap. Further research and selective data collection of all ancestries needs to be completed to fully and accurately observe the correlations between ancestries.

The morphological results on the other hand, were separated into ordinal (Figure 3.72) and nominal data (Figure 3.73). For LDA, initially, the data included all the ancestry groups, but was then later reduced to two (Caucasian and Asian), due to the small number in the 'Other' group. From here, a high predictive accuracy in both the ordinal and nominal data, at 86.54% and 90.93% respectively, and a moderate degree of separation was observed. Greater separation between the groups may be achieved through further data collection and increasing the subgroups of the data pool, such that all ancestry groups are relatively even in number.

3.5.2.3 Age

The human body deteriorates with age (Westendorp, 2015). As the human body ages, various pathologies develop such as osteoporosis in the spine of older individuals. Therefore, as every living individual goes through an age progression, age was a correlation that was viewed in this dataset. Some degree of separation was initially observed for the age PCA results (Figure 3.21); the 18-29 age group was seen grouping to the right and the 50+ age group gravitating to the left of the graph. The 30-49 age group was scattered throughout the graph. This is of no concern, as lifestyle conditions play a vast role in the body features. Further research is required to analyse the direct correlations between the age of the individual and the individuals relative growth within their time period. Those that were more active had features similar to the younger age group while the younger individuals with poorer physical conditions, may have appeared older, body-wise, than their true age.

Once the data was treated with age (Figure 3.44), and the outliers removed, a clear degree of separation was observed within the age groups. This comes as no surprise, as the sex, ancestry and age data treatment is tailored to remove outliers within those specific correlations, in turn, observe any trends. Finally, for the LDA results, the male and female groups separated moderately, and produced a predictive accuracy of 66%, indicating some differences between groups. Further research with selective data collection will be able to provide even numbers within the data, thus allowing a more accurate analysis in future.

The morphological results for age, were separated into ordinal (Figure 3.74) and nominal data (Figure 3.75). For LDA, all three age groups were observed in both the ordinal and nominal data where a low predictive accuracy, at 69.63% and 72.57% respectively, and a moderate degree of separation were observed. Greater separation between the groups may be achieved through further data collection and increasing the subgroups of the data pool, such that all age groups are even in number.

3.5.3 Gait Anthropometry and Morphology

As a result of increasing installation of surveillance cameras, the potential for increased analysis of surveillance footage has attracted more attention from researchers, particularly in relation to gait analysis. Therefore, to understand the data and to view any correlations, PCA and LDA were undertaken for anthropometry for: [1] Combined gait, [2] Static and [3] Dynamic gait analyses. The initial analysis was completed for the combined gait, including both the static and dynamic features. From the loadings line graph (Figure 3.48), the features most distinct for gait anthropometry showed two static features and three gait features. Further reinforcing that features of gait are more variable due to the changeable distances between feet (during heel strike) and arm swing that varies with speed of gait. Moreover, the loadings distribution graph (Figure 3.47) show the features grouping together in pairs, indicating a high level of similarity. However, a larger distance between these pairs are observed in gait than what was seen for stance, which can be attributed to the variances in gait. When an image from the footage is analysed, the arm is swinging; if the arm is slightly positioned forward or backward at mid-stance (which varies from person to person) this can alter the length of the arm making it appear slightly longer or shorter. Furthermore, slight error and asymmetry also contribute.

The principle component results showed the dispersion of the data, indicating that the profiles differed to one another. The PCA plot (Appendix F), for both the normalised data and the treated data suppressed from outliers (Figure 3.50), showed some clustering between profiles, but overall the points were dispersed along the graph. For morphology, the normalised data for PCA (Figure 3.77) showed a clustering for most of the data on the top right of the graph with some dispersion between some individuals gravitating away from the cluster, highlighting that some individuals contained a more distinct profile.

3.5.3.1 Sex

For the normalised data for gait, the scatterplot shows a poor degree of separation for sex as the independent variable.

Once the data was treated with sex and the outliers suppressed for anthropometry, the graph (Figure 3.50 shows a clear degree of separation with males on the right and females on the left of the graph. Furthermore, the cumulative percentage of variance (Figure 3.53), showed that 100% of the total variance of the dataset was able to be described after only two features; describing a clear degree of separation.

Moreover, for the LDA results for anthropometry the male and female groups separated well, possibly due to the even numbers of the sample size, and produced a predictive accuracy of 98.3%. This performed equally as well as stance anthropometry, indicating significant differences between groups and alluding to the presence of sexual dimorphism in anthropometry.

The morphological results on the other hand, were separated into ordinal (Figure 3.80) and nominal data (Figure 3.81). For LDA, sexual dimorphism was observed in both the ordinal and nominal data with a high predictive accuracy, at 98.50% and 98.50% respectively, which performed better than stance morphology and showed a high degree of separation between both sexes.

3.5.3.2 Ancestry

No true degree of separation was observed from the ancestry results from PCA (Appendix F). This could potentially be a direct result of the uneven subpopulation categories, as observed for the stance data, which is further observed through R Studio not being able to generate LDA graphs nor provide a confusion matrix for the ancestry data for gait. When the data was treated with sex, and the outliers suppressed, the results remained consistent such that the graph (Figure 3.52) showed no degree of separation. Further research and selective data collection of all ancestries needs to be completed to fully and accurately observe the above correlations.

The morphological results were separated into ordinal (Figure 3.82) and nominal data (Figure 3.83). For LDA, it was observed in both the ordinal and nominal data contained a high predictive accuracy, at 93.02% and 94.57%, thus performing better than stance ancestry. Greater separation between the groups may be achieved through further data collection and increasing the subgroups of the data pool, such that all ancestry groups are relatively even in number.

3.5.3.3 Age

For age, some degree of separation was initially observed for the age PCA results (Appendix F), whereby the 18-29 age group was seen grouping to the top of the graph and the 50+ age group gravitating to the bottom of the graph. The 30-49 age group was scattered throughout the graph. As lifestyle conditions plays a vast role in the body features, these results are expected, similar to the stance results. Following the data treatment (Figure 3.51), similar degree of separation was observed within the age groups.

Finally, for the LDA results, the male and female groups separated moderately and produced a predictive accuracy of 80.3%, indicating moderate to high differences between groups, thus performing better than stance anthropometry. Further research with selective data collection can will be able to provide even numbers within the data, thus allowing a more accurate analysis in future.

The morphological results for age, were separated into ordinal (Figure 3.84) and nominal data (Figure 3.85). For LDA, all three age groups were observed in both the ordinal and nominal data where a moderate predictive accuracy, at 79.40% and 85.39% respectively, and a degree of separation were observed. Greater separation between the groups may be achieved through further data collection and increasing the subgroups of the data pool, such that all age groups are even in number.

3.6 Conclusion

The objective of this chapter involved determining the frequency, distinguishability and dependency of the features (and its variables) within subpopulations. This chapter presented the full PCA, CA, and LDA results for the full database, showing the dispersion of the data, any trends and correlations observed between anthropometry and morphology for both stance and gait datasets. The data showing the highest performance and correlations was sex, which could be attributed to the even numbers within the data pool. The discrimination of anthropometry and morphology measurements were seen to be distinct, where anthropometry results discriminated on sex and showed little discrimination for ancestry and age. Morphology results showed significant discrimination for both sex and ancestry, and demonstrated moderate discrimination for age. The combination of the two, increases the discriminative power of the technique.

To potentially view the most accurate representation of the age and ancestry data, even numbers in all subcategories would be essential, paving the way for further (selective) data collection and studies.

The next chapter will present a model for the development of statistical inference to show the strength of evidence in the form of a case study; viewing the applicability of the research.

4. CHAPTER 4: Case Studies: Development and Application of Bayesian Statistics to Gait Analysis

4.1 Introduction

Chapter 3 involved the assessment of the data, initially through a screening process using heat maps and determined the frequency values of the given population, followed by in depth Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA) to view any trends and correlations within the dataset and subsequent subpopulations. Chapter 4 follows on from the feature distinctiveness, where a model was presented for the purpose of statistical inference development, showing the strength of evidence in the form of a case study; viewing the applicability of the research. The components of the Likelihood Ratio statistic were highlighted and applied, providing statistical inference for source material attained from CCTV.

4.1.1 Bayesian Frameworks: Likelihood Ratio

Previous studies have implemented Bayesian frameworks to various types of trace materials. For example, a study by Champod and Meuwly (2000), developed an interpretation framework (based on likelihood ratio) for speaker recognition, whereas a study by Es *et al.*, (2017) developed a Bayesian framework for forensic glass analysis. To facilitate the development and application of the likelihood ratio to trace and reference material from footage, the fundamental Bayesian frameworks were applied. When ascertaining the inference of the source, the LR is a useful and informative output to evaluate the strength of evidence for a trace (POI from CCTV footage) and a reference (suspect from forensic procedures) (Haraksim *et al.*, 2015). Presently, a logical inference model is applied for evaluating and reporting forensic evidence, through the use of a likelihood ratio (LR) approach - based on the Bayes inference model (*ibid*). The likelihood Ratio (LR) can be described as the probability of the score given the prosecution hypothesis is true, divided by the probability of the score given the defence hypothesis is true (Ali *et al.*, 2014). Furthermore, the prosecution hypothesis states that the reference material has originated from the trace (suspect), whereas the defence hypothesis states that the reference material does not originate from the trace (*ibid*). These are viewed as Hp and Hd respectively and are ‘two mutually exclusive and exhaustive source-level hypotheses’ (Ali *et al.*, 2014, pg. 335) as shown in the following equation:

$$LR(s) = \frac{P(s|Hp, I)}{P(s|Hd, I)}$$

In the equation, 's' is regarded as the evidence, where the LR value (score) is produced through the comparison of features from the reference with that captured on footage (trace) at (or near) the crime scene (Ali *et al.*, 2014). While *I*, describes the background information.

A LR provides useful information that forms an important component within forensic evaluation which can be applied in forensic criminal cases (Ali *et al.*, 2014). Following the forensic evaluation provided by the forensic practitioner/expert, it is then the duty of the judge or jury (based on the adversarial or inquisitorial legal systems in place) to hear the proceedings of the case along with other sources of information and other evidence put forth (*ibid*). This is where the Bayesian probabilistic framework is applied. The forensic practitioner is tasked with the scientific analyses of the footage (and quantification of evidential value) whereas the judge/jury is responsible for the quantification of prior odds (Ali *et al.*, 2014).

$$\frac{P(Hp|s, I)}{P(Hd|s, I)} = \frac{P(s|Hp, I)}{P(s|Hd, I)} \text{ x } \frac{P(Hp|I)}{P(Hd|I)}$$

Posterior odds = Likelihood Ratio x Prior odds

4.2 Aim

As stated in the thesis overview (Chapter 1), the aim of this PhD research, and particularly this chapter, was to assess and improve the scientific approaches applicable to forensic gait analysis through the investigation and development of an interpretation framework. Subsequently, the inference of forensic gait analysis, derived from a probabilistic approach (using Bayes theorem) will be developed and proposed and based on an evaluation of likelihood ratios to the morphometric research; forming the interpretation framework in a real forensic context to assess the strength of evidence. This relates directly to the working hypotheses of this research H0: The developed interpretation framework for forensic gait analysis will address the source level using Bayes theorem [P (E|Same source) = P (E|SS)]. H1: The developed interpretation framework for forensic gait analysis will not will address the source level using Bayes theorem [H1: P (E|Different source) = P (E|DS)]. This hypothesis focuses on the development and application of the forensic inference models to evaluate the strength of evidence of the trace, in the form of a Likelihood Ratio.

4.3 Methods and Materials

4.3.1 CCTV Camera and Filming Location

Following the standardised filming process, each participant was asked if they consented to being filmed by CCTV cameras. The CCTV footage of the participants and the examination from the SLR cameras of the same subjects were compared (to demonstrate a trace and reference) testing the applicability of the research with a surveillance camera containing distortion. A total of 24 participants were recruited for CCTV gait analysis and 31 participants for stance from previous studies, where subjects were taken to UTS CB02.01 that allowed filming from CCTV cameras.

The primary surveillance camera used to record footage and assess a trace (MOBOTIC M12D-Sec- Dnight CCTV camera) is situated 4.1m from the ground. The area used to film subjects walking measures 6.2m in length and 4.5m in width. This provided the analysis of both trace and reference for comparative studies to view the applicability of the developed research. Furthermore, the development of the likelihood ratios within this chapter was completed to assess the strength of evidence. Various distortions and artefacts are thought to impact the assessment of gait, but this will be discussed within Chapter 6, Section 6.2, Future Directions.

To avoid confusion for subjects while recording all views of the body for feature extraction, and to also provide efficiency in recording time, walking pathways were marked on the ground for subjects (Figure 4.1). Furthermore, UTS staff and students are protected by the Workplace Surveillance Act 2005, which prohibits any invasion of privacy, thus ensuring the protection of subjects recorded in open spaces (UTS, 2015).

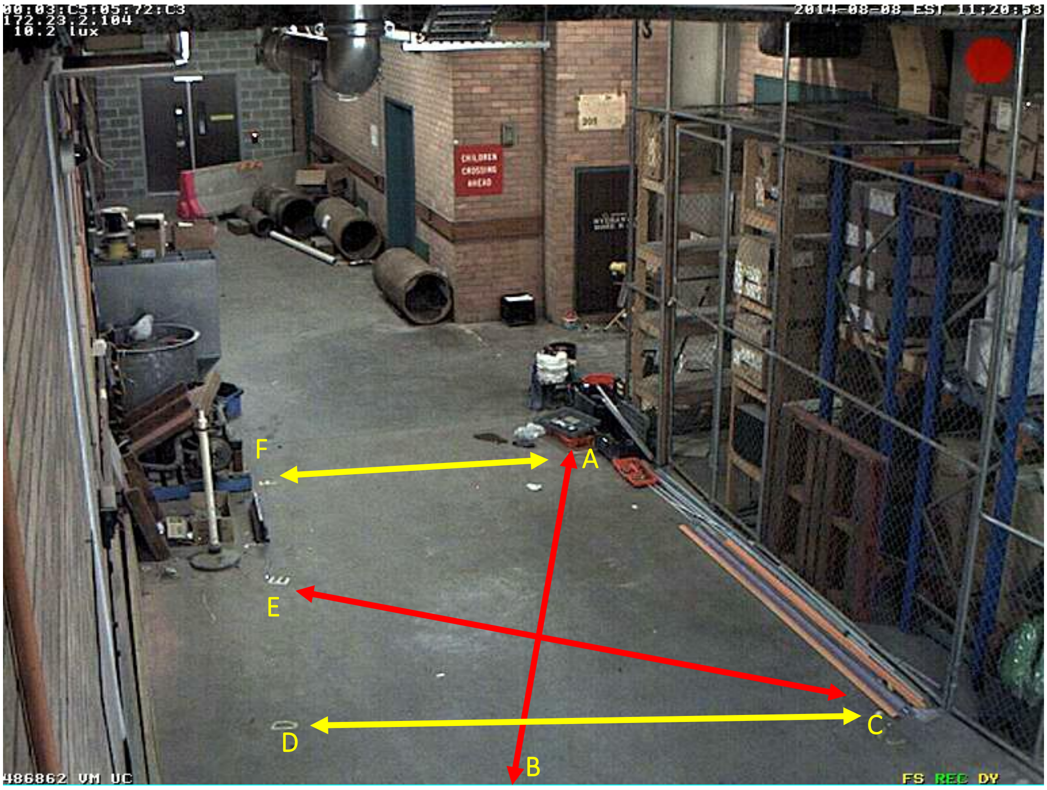


Figure 4.1 CCTV Footage with Indicated Pathways. The figure demonstrates the pathways that set for walking of subjects, which capture anterior, posterior, right profile and left profile views. Letters from A to F were indicated upon the ground, thus allowing easier directions for the subjects during gait analysis (red arrows A-B [Anterior] and yellow arrows C-E [profile]). These pathway's measured 4.4m in length (anterior) and 5.5m in width (profile).

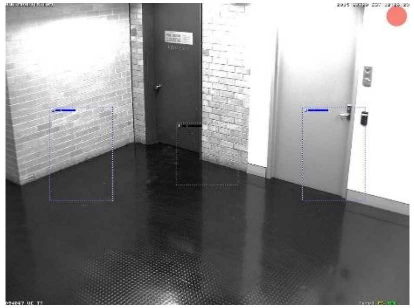
Initially, this PhD project aimed to record subjects with differing distortions to assess the quantification of CCTV distortion/artefacts and whether analysis changed based on the quality of the camera or the artefacts present. However, some ethical limitations (uninterrupted filming of only the consenting individual was required, but this was not possible within the CCTV locations as permissions were not given) and renovations prevented this from proceeding. Areas were selected, and footage frames and short snippets (brief camera extract) without persons were obtained to view various distortion types, in cameras that would be desirable for filming the case studies (Figure 4.2). However, one major limitation for filming subjects within these areas was the ethics requirements to only record those that had consented, therefore any individuals that happened to appear on the surveillance camera (which were all situated in public places) rendered the footage unusable. Most cameras that contained a large enough field of view to record persons in gait are placed in high traffic areas and preventing persons walking by who have not consented was not possible. Moreover, requesting to film persons from surveillance cameras purchased for this research was not permitted by security. Therefore, after careful consideration, it was concluded that this research would be more valuable as a robust large-scale study for future, rather than case studies, and that one surveillance camera will be used for development and assessment of the strength of evidence.

Another limitation that arose for the single selected CCTV surveillance location was the presence on various occasions of hazardous equipment and parked vehicles obstructing the walking pathway (Figure 4.3). Therefore, to abide by OH&S, gait pathways were shortened to ensure safety of subjects and, at times, filming was halted to prevent any risks. Moreover, as the area was not secured, members of the public disrupted the filming process multiple times and, due to ethics, these recordings were not used.

(a) CCTV Camera 1

(b) CCTV Camera 2

(c) CCTV Camera 3



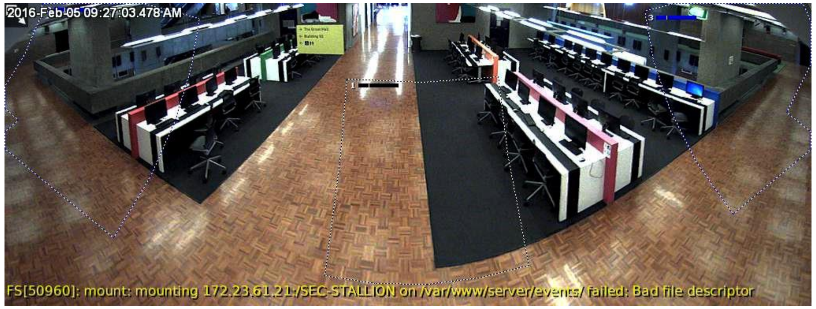
(d) CCTV Camera 4

(e) CCTV Camera 5

(f) CCTV Camera 6

(g) CCTV Camera 7

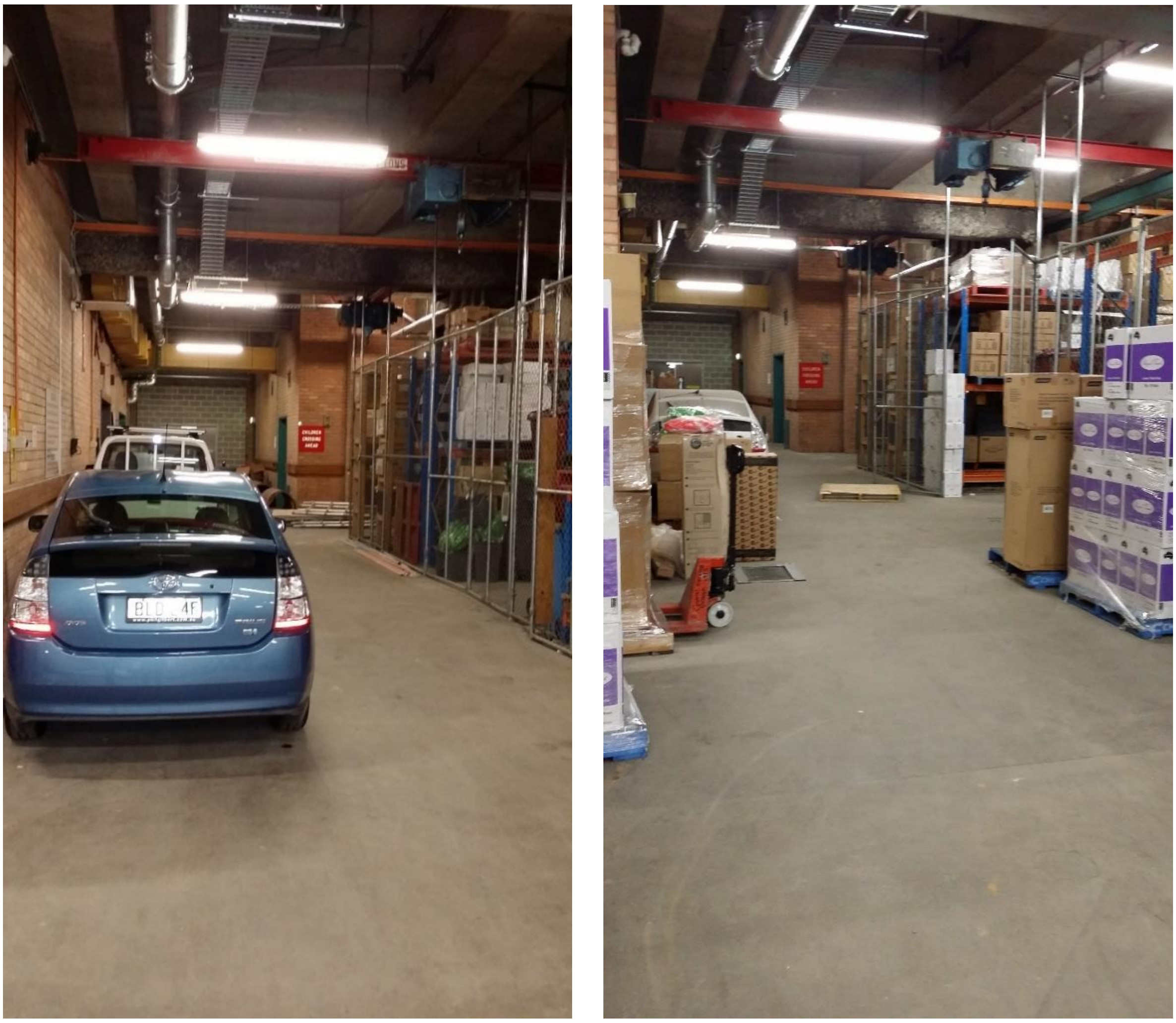
(h) CCTV Camera 8



(i) CCTV Camera 9

(j) CCTV Camera 10

Figure 4.2 Varying types of CCTV Cameras with Associated Distortions and Artefacts in Buildings One and Two of UTS.

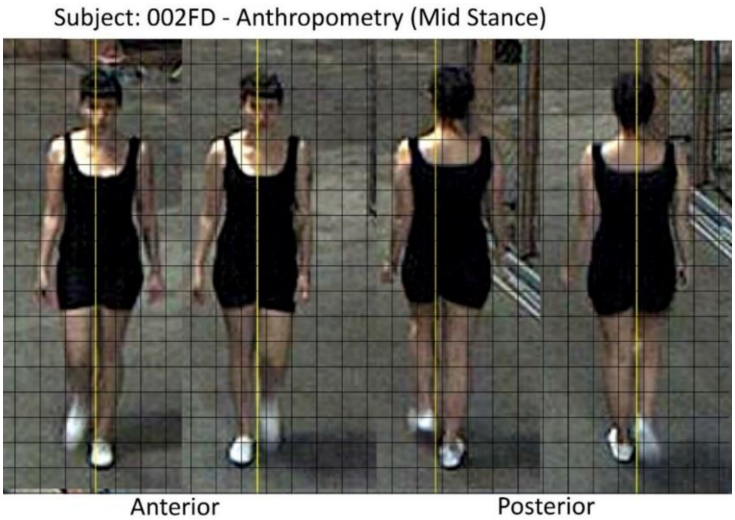


(a) Car Obstruction *(b) Car obstruction & OH&S Issues*

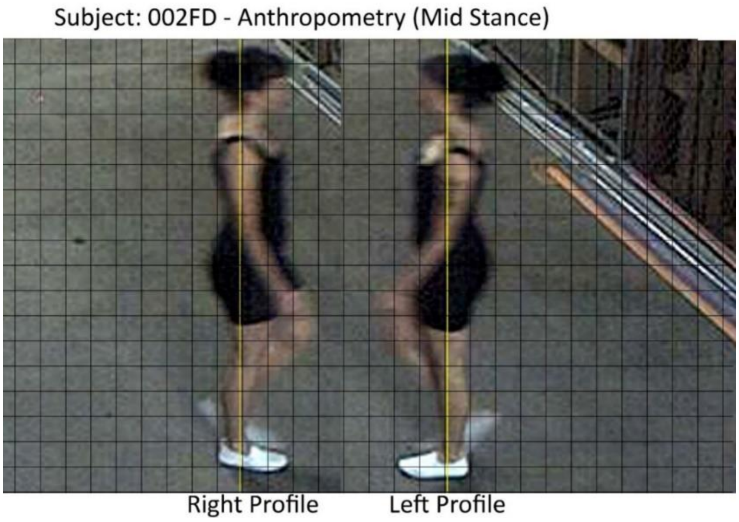
Figure 4.3 Limitations of the CCTV Area. Image displays the obstruction of the CCTV pathways (produced to film subjects) during two separate times (a) and (b). The pathway was obstructed regularly, therefore several volunteers were unable to be filmed within the CCTV area.

4.3.2 Analysis of Surveillance Footage

Similar to Section 4.3.1, surveillance images were obtained through security and provided to the author on DVD, then cut and compiled into templates for analysis (Figure 4.4). Anthropometric analyses were measured through Photoshop as well as GIMP (a free software that provides all features similar to Photoshop). Morphological features were assessed on JPEG images and the footage from the DVDs, then plugged into Excel using the manuals and the associated datasheets.



(a) Example of a Template for Anthropometric analysis in Anterior/Posterior View



(b) Example of a Template for Anthropometric analysis in Profile View

Figure 4.4 Templates from Surveillance footage. The footage for gait assessment was analysed using VLC media player.

4.3.3 Evaluation of Strength of Evidence

The forensic examination of trace material (CCTV footage) ultimately aims to evaluate the strength of evidence, at source and activity levels, where the strength is inferred from the trace.

Therefore, the strength of evidence is contingent on the value of the material recorded, which itself depends on the camera and the associated distortions (Seckiner *et al.*, 2018). As all artefacts and distortion cannot be removed, and are usually of poor quality (Petrossian, 2011), it is accepted that they primarily, and more critically, affect the robustness of the inference at source level (Seckiner *et al.*, 2018; Haraksim *et al.*, 2015). As the review paper by Seckiner *et al.*, (2018) states, the impact on the strength of evidence can and should be studied. Whilst taking artefacts from the trace material into account, the likelihood ratio evaluates the strength of evidence at source and activity levels; thus, assessing the likelihood of a 'reference' image, to that of the trace evidence (Seckiner *et al.*, 2018; Haraksim *et al.*, 2015; Ali *et al.*, 2014). Development and application of a probabilistic approach within gait analysis will allow the examiner to provide a description of the strength of evidence to the trier of facts in court (Seckiner *et al.*, 2019).

4.3.3.1 Calculation of Likelihood Ratio for Morphology

A single observer carried out the repeatability studies a total of eight times as detailed in Chapter 2, (Section 2.4.3). These values provide an indication of the error present within each features assessment, thus taking this observer error into consideration for the LR result generated. Then, frequency values were acquired from the dichotomous data values as expressed in Chapter 3 (Section 3.4.2). This is an imperative component of the LR calculation that shows how distinct a feature is within the given population.

After the repeatability and feature frequency results were obtained, each feature was assessed for dependency and independency. To ensure that only the independent features likelihood ratios were multiplied to form a final LR value, distribution graphs were generated. Features that are found to be independent were identified and then multiplied with all independent features (Aitken, 2018). This was completed through selection and generation of a distribution graph between two features (such as Orientation of Leg L and Orientation of Leg R). A distribution graph for each variant of the feature were compared and if the distribution graph curve appearance changed from the full feature graph curve then the features were deemed dependant, whereas if there was no change, then they were classified as independent. For instance, if the curve was higher on the right for the first graph and then higher on the left for the next, they were deemed dependant (as they changed), whereas if both graphs remained high on the right, they were deemed independent.

When calculating the LR, Cohen's kappa calculations for morphology (repeatability scores) allowed the values to be plugged into the numerator without any modifications. These calculations were completed for two subjects (two different subjects for each stance and gait were selected) who were recorded on CCTV footage (treated as 'trace' and then compared to their 'reference' material) (Figure 4.5). Both anthropometric and morphological analyses were completed for each subject. The calculations for the trace material was completed for each independent feature where a LR value was produced. The likelihood ratio for the morphological component was calculated by plugging in the following values for each feature that were the same for both trace and reference materials:

$$\frac{Repeatability\ test\ results}{Frequency\ value\ for\ case\ \div\ Total\ given\ population}$$

Subsequently, all the LRs for each independent feature was multiplied for the final LR value. However, if the trace and the reference had different results, the equation numerator changed to (1 - repeatability test results). The calculations were then completed as previously described. It is thought that the magnitude of the variable is not impacted within this stage, however, further studies need to be completed as part of the validation process.

CCTV Stance 1 *CCTV Stance 2* *CCTV Gait 1* *CCTV Gait 2*

025M *028F* *003MD* *007FD*

Figure 4.5 CCTV Footage of Subjects for both Stance and Gait. The CCTV Stance and Gait images for both 1 and 2 were treated as the 'trace' whereas the images below were those considered the 'reference'.

4.3.3.3 Calculation of Likelihood Ratio for Anthropometry (Model One)

The anthropometry component was completed analogous to the morphological component. The first model contained proportional indices and these values were then grouped into categories to divide measurements into 'groups', similar to morphology. For instance, measurements that were between 0.05 – 0.08 were classed as group one, 0.081 – 1.2 were group two, and so on. Following this, frequency values were obtained from the dichotomous data, and dependant/independent features observed using the same method as detailed for morphology. The calculations were the same for the denominator as expressed in the morphology component, but varied slightly for the numerator; where, if the trace and the reference had the same feature variant, the TEM% (repeatability statistic value) was adjusted such that:

$$100 - \text{TEM\%} = x \text{ value}$$

Then:

$$x \text{ value} \div 100 = \text{numerator.}$$

If the trace and reference had a different variant of feature, then the same steps would be repeated (if they were the same) and the only change occurs at the end of the numerator calculation where (1 - numerator value). Following the results that were obtained from the anthropology (model one) component, a variant to the existing model was applied on a trial basis to observe whether the LR values (which were low for the first model) could be improved. Therefore, a second anthropometry model was assessed for stance as a trial.

4.3.3.4 Calculation of Likelihood Ratio for Anthropometry (Model Two)

The full R codes for the calculation of LR model two were written by Dr Simone Gittelson, where the features were divided by the height to form a feature-height ratio. The height was selected as it contained the least amount of error within the repeatability studies and furthermore, this model has been applied to previous studies such as Radu *et al.*, (2014). This model was applied as a smaller study to trial the model and its performance. The raw data was normalised (through calculating the mean and standard deviation of the feature-to-height ratio data), followed by the generation of intra-variability and inter-variability distribution graphs from the data for each feature. As seen in Figure 4.6, a (red) line was drawn at a randomly selected point (0.13) where the intra- and inter-variability curves overlap with one another (Baechler *et al.*, 2013). From here the points wherethe lines intersect with the inter-variability (blue line) and intra-variability (green line) curves, were the values that were recorded. The value from the inter-variability curve intersection was placed in the denominator whereas the intra-variability was placed in the numerator. The graphs demonstrating the lack of an intra-variability curve showed features unable to be assessed from the CCTV footage, therefore this curve was absent. In this instance (Figure 4.6), the green line is 249, whereas the blue line is 40. Therefore:

$$\text{LR} = \frac{Intra-variability}{Inter-variability} = \frac{249}{40} = 6.225$$

The histogram LR values were generated in R Studio by drawing a line at the point where the feature is divided by the height. For instance, a histogram was generated for the 'head height' feature, as seen in Figure 4.6, then the feature from the 'trace' value from Table 4.1, (which is 2.91) is divided by the height (17.32). This final value, 0.168, (which can be seen in orange) is where a supposed red line is drawn on the histogram on R studio, producing the final value for the LR.

$$\text{LR} = \frac{2.91}{17.32} = 0.168$$

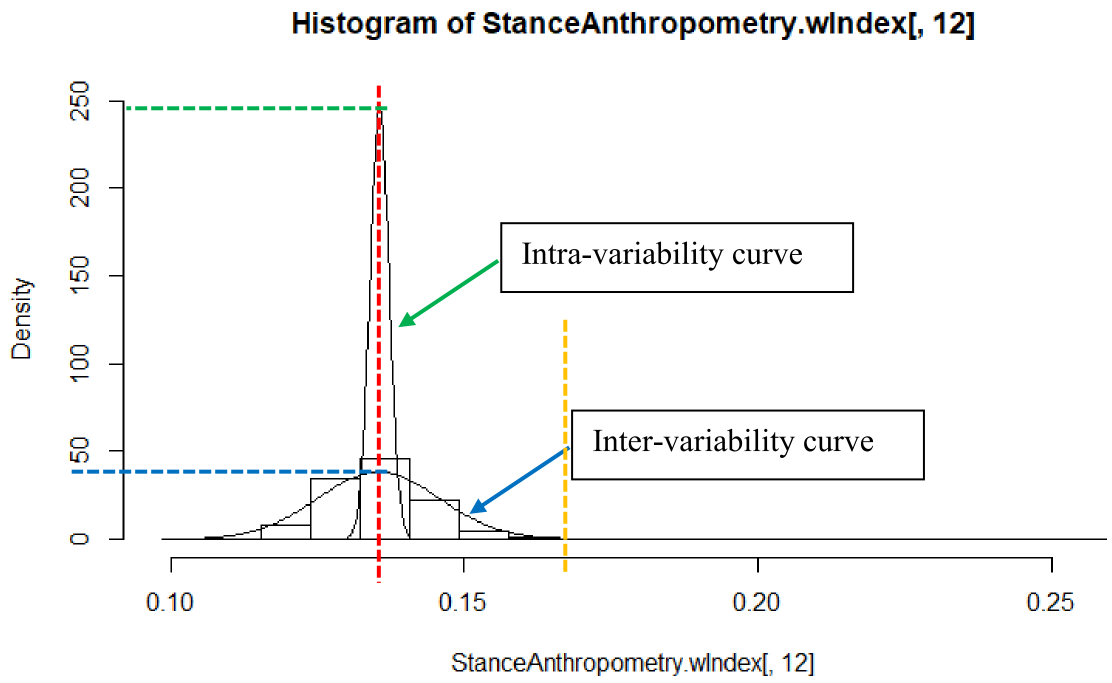


Figure 4.6 Deducing the Likelihood Ratio Value from the Inter-variability and Intra-variability Curves. The feature presented in this graph was for 'Head Height'. The red line indicates the line drawn at the first intersecting points of the curves, and then a value is obtained from each curve from which it intersects with the red line as seen through the inter-variability (blue line) and intra-variability (green line) curves.

Table 4.1 The Stance Values for the Trace and Reference Data.

Subject	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand Length R	6. Hand Length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot width R	14. Foot width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
Stance CCTV 1	3.32	3.2	2.66	2.64			3.64	2.91	4.72	4.12	3	2.87			7.42	7.75	17.32
025M Reference	3.23	3.15	2.28	2.22			3.82	2.29	4.48	3.57	2.76	2.79			7.22	7.26	16.89

On the other hand, those features, such as 'Left Foot Width' which were not able to be analysed from the CCTV footage did not procure a result for source assessment from the trace. This can be observed in Figure 4.7 as seen by the lack of an intra-variability curve.

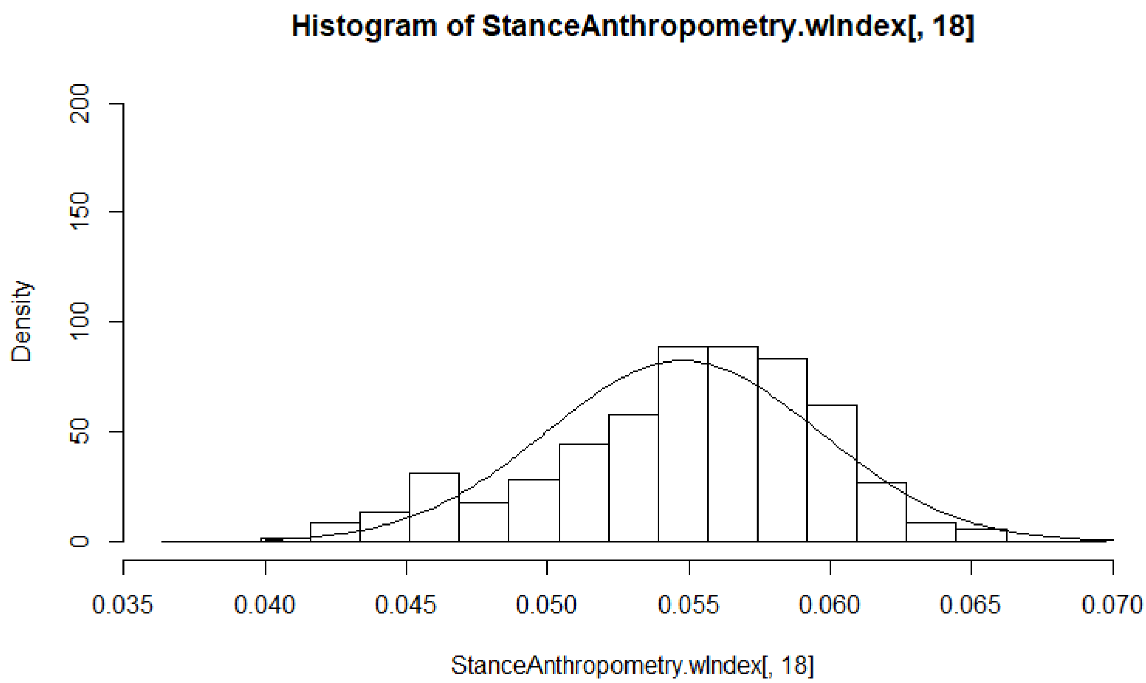


Figure 4.7 Absence of a Likelihood Ratio Value. The inter-variability curve is available, however, the intra-variability curve is not. The 'Left Foot Width' feature was not observable and therefore, no result obtained.

A different platform (GIMP) was used instead of Photoshop for model two. To confirm that the interchanging platforms is not an issue since the measurements are divided by the height, further tests were completed to trial this. The assessments and measurements were repeated across Photoshop and GIMP on the same subject and template to view if the varying platforms altered the results. Furthermore, a different measurement index was used for GIMP (centimetres, pixel and inches), again to view any changes present.

Once the LR score was available, the Hd true and Hp true tests were generated. A method for evaluating the performance of a model for an interpretation system, can be through Hd true testing (Taylor *et al.*, 2017). These tests include the simulation of gait profiles from 'other' people (non-donors) that are not the person recorded on CCTV footage and calculating the LR with one hypothesising their contribution and the other alternative hypothesising their non-contribution (*ibid*).

For the Hd true tests, the trace data was compared to the whole given population with the approach of 'if correspondence is found, what is the probability that it is not them'. The Hp tests on the other hand, were completed through assessing 17 'non-donors' with the approach of 'if correspondence is found, what is the probability that it is them' with misleading profiles. These tests aimed to test the performance of the model. The LRs were generated for the full given population for Hd true tests, where the proportions 'greater than one' for each feature were tested to get an indication of misleading LRs. For the Hp true tests, the misleading profile LRs were scored and the proportions 'less than one' for each feature were assessed to view errors.

4.4 Results

To view the applicability of the developed model and its statistical inference of the source material, feature frequency studies, repeatability studies, and dependency studies were applied/completed, and the Likelihood Ratio score was calculated for evaluation of the strength of evidence. Additionally, Hp true and Hd true studies were completed as proof of concept and to view the performance of the model.

4.4.1 Morphology Assessment of Case study

Firstly, the morphological assessment was completed from the CCTV footage. The frequency values that are imperative for the calculations can be found in Chapter 3, Section 3.3.

4.4.1.1 Stance

Subjects that mimicked a trace were labelled 'Stance CCTV 1' and 'Stance CCTV 2' and the photo-comparative technique was applied whereby the trace was assessed first, followed by the comparison to the reference material. Those features that differed between the trace and reference values were highlighted in yellow as seen in Figure 4.8.

Subject	1. Head Level R	3. Lateral head tilt	4. Shoulder level R	5. Shoulder level L	6. Position of Shoulder R	7. Position of Shoulder L	10. Position of Upper Arm (Frontal) Right	11. Position of Upper Arm (Frontal) Left	12. Antero-Posterior Placement of Upper Ar	13. Antero-Posterior Placement of Upper Ar	14. Lateral Placement of Upper Arm Right	15. Lateral Placement of Upper Arm Left	16. Antero-posterior Placement of Forearm	17. Antero-posterior Placement of Forearm	20. Flexion of arm R
Stance CCTV 1	2	2	2	3	1	2	3	3	2	1	3	2	2	2	2
Stance CCTV 2	2	2	1	2	3	2	1	1	2	2	2	2	4	4	2

Subject	21. Flexion of arm L	22. Lateral placement of forearm R	23. Lateral placement of Forearm L	19. Antero-posterior Placement of Hand Rig	20. Antero-posterior Placement of Hand Lef	25. Thoracic Projection	26. Abdominal projection	21. Shape of Gluteus	25. Orientation of Lower Extremities Right A	26. Orientation of Lower Extremities Left An	29. Lateral Placement of Upper leg Right	30. Lateral Placement of Upper leg Left	41. Lateral Placement of Lower Leg Right	42. Lateral Placement of Lower leg Left	49. Placement of the Feet Right	50. Placement of the Feet Left
Stance CCTV 1	2	2	1	3	3	1	2	2	2	2	1	1	1	1	1	1
Stance CCTV 2	2	3	3	4	4	3	1	3	2	2	1	1	1	1	1	2

Figure 4.8 Stance Analysis of 'Trace' Material from CCTV Footage. The features that varied from the reference were highlighted in yellow for both subjects 'Stance CCTV 1' and 'Stance CCTV 2'.

4.4.1.2 Gait

Similar to section 4.4.1.1 Stance, subjects that represented a trace were labelled 'Gait CCTV 1' and 'Gait CCTV 2'. From here, photo-comparative analyses were completed, and the trace was evaluated first, tailed by the reference material comparison. Features that contrasted between the trace and reference values were highlighted in yellow as seen in Figure 4.9.

Subject	Backward Arm Swing					
	3. Lat Placement of Upper Arm Backward Swing Righ	4. Lat Placement of Upper Arm Backward Swing Left	5. Lat Placement of Forearm Backward Arm Swing Ri	6. Lat Placement of Forearm Backward Arm Swing Le	9. Level of elbow Flexion backward Arm Swing Right	10. Level of elbow Flexion Backward Arm Swing Left
Gait CCTV 1	2	2	2	1	2	2
Gait CCTV 2	3	3	2	3	1	2

Subject	Forward Arm Swing					
	3. Lat Placement of Upper Arm Forward Swing Right	4. Lat Placement of Upper Arm Forward Swing Left	5. Lat? Placement of Forearm Forward Arm Swing Rig	6. Lat? Placement of Forearm Forward Arm Swing Le	9. Level of elbow Flexion Forward Arm Swing Right	10. Level of elbow Flexion Forward Arm Swing Left
Gait CCTV 1	1	2	1	3	3	2
Gait CCTV 2	3	3	3	2	2	3

Subject	Overall		
	2. lateral trunk sway	3. Orientation of Lower Extremities Right Anterior	4. Orientation of Lower Extremities Left Anterior
Gait CCTV 1	2	2	2
Gait CCTV 2	2	4	4

Subject	Midstance															
	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of Upper Arm Right	8. Lateral Placement of Upper Arm Left	9. Lateral Placement of Forearm Right	10. Lateral Placement of Forearm Left	18. Thoracic Projection	19. Abdominal projection	22. Lateral Placement of Upper leg Mid Stance Right	23. Lateral Placement of Upper leg Mid Stance Left	24. Lateral Placement of Lower Leg Mid Stance Right	25. Lateral Placement of Lower leg Mid Stance Left	28. Placement of the Feet Mid Stance Right	29. Placement of the Feet Mid Stance Left
Gait CCTV 1	1	3	1	1	1	1	1	2	2	2	1	1	1	1	2	1
Gait CCTV 2	2	1	3	2	3	2	2	2	2	1	3	3	2	2	1	2

Subject	Swing (lower legs)					
	1. lat placement of Upper Leg Swing Right	2. lat placement of Upper Leg Swing Left	5. Lateral Placement of Lower Leg Swing Right	6. Lateral Placement of Lower leg Swing Left	11. Placement of the Feet Swing Right	12. Placement of the Feet Swing Left
Gait CCTV 1	1	1	1	1	1	1
Gait CCTV 2	3	3	3	3	1	1

Figure 4.9 Gait Analysis of 'Trace' Material from CCTV Footage. The features that varied from the reference were highlighted in yellow for both subjects 'Gait CCTV 1' and 'Gait CCTV 2'.

4.4.2 Anthropometry Assessment of Case study

Next, the anthropometry assessments were completed from the CCTV footage. The values for the converted categories can be found within Appendix 3B, and the frequency values that are vital for the calculations can be found in Chapter 3, Section 3.4.2.

4.4.2.1 Stance Model One

Similar to the morphological components, subjects that simulated a trace, which were already labelled 'Stance CCTV 1' and 'Stance CCTV 2', were once again assessed for the anthropometry components through photo-comparative analyses. The trace was assessed first, followed by the comparison to the reference material. In Figure 4.10, the measurements for both subjects can be viewed within the first two rows following the feature names. The last two rows of the same subjects were the subsequent categories they were placed in. The converted categories can be seen in Appendix 3B. The purpose of categorising the values, then further converting them to dichotomous values (Figure 4.11), was to view the frequency of each variant within the feature in the given population. These categories are already set for morphological analyses (i.e. category one indicated bow legged orientation) but were generated for anthropometry (for instance, values from 0.02 – 0.03 indicated category one). These were essential for both observation of distinct features as well as for completion of the LR calculations. Within Figure 4.11, a direct comparison between the simulated trace and the reference can be viewed subsequent to one another. Those features that are similar to one another can be viewed by the '1' or '0' values aligning to each (trace/reference) pair, such as 2.2 for 'S CCTV 1' and '025M'. Those that differed can be observed through the non-aligning values, such as 1.2 and 1.3 for both 'S CCTV 1' and '025M'.

		1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Lengt	4. Forearm (elbow-wrist) Lengt	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
Stance CCTV 1		0.050632911	0.048802806	0.040567333	0.040262315	0.055513192	0.044380052	0.071984139	0.062833613	0.045752631	0.043770017	0.113161507	0.118194296	0.264145188
Stance CCTV 2		0.04920492	0.04980498	0.041254125	0.036453645	0.063456346	0.04050405	0.080408041	0.063156316	0.04230423	0.041554155	0.112811281	0.114311431	0.264776478
Stance CCTV 1		2	2	3	3	2	3	1	2	3	3	2	2	1
Stance CCTV 2		2	2	3	3	3	3	3	2	2	2	2	2	1

Figure 4.10 The Proportional Indices Values and the Consequent Categories for Each Measurement. The dimensions for both subjects 'Stance CCTV 1' and 'Stance CCTV 2' can be viewed within the first two rows following the feature names. The last two rows of the same subjects were the subsequent categories they were placed in.

	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	7.1	7.2	7.3	8.1	8.2	8.3	9.1	9.2	9.3	10.1	10.2	10.3	11.1	11.2	11.3	12.1	12.2	12.3	15.1	15.2	15.3	16.1	16.2	16.3	17.1	17.2	17.3
S CCTV 1	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0
025M	0	0	1	0	1	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	1

	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	7.1	7.2	7.3	8.1	8.2	8.3	9.1	9.2	9.3	10.1	10.2	10.3	11.1	11.2	11.3	12.1	12.2	12.3	15.1	15.2	15.3	16.1	16.2	16.3	17.1	17.2	17.3
S CCTV 2	0	1	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0
028F	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	1	0	0	1	0	1	0

Figure 4.11 Comparison of both Simulated 'Trace' and 'Reference' Materials with the Categorised Dichotomous Values. Two trace subjects are observed as 'S CCTV 1' and 'S CCTV 2' whereas the reference materials followed directly after the trace rows for each trace, labelled as '025M' and '028F' respectively. Those features that are similar to one another can be viewed by the '1' or '0' values aligning to each (trace/reference) pair, such as 2.2 for 'S CCTV 1' and '025M'. Those that differed can be observed through the non-aligning values, such as 1.2 and 1.3 for both 'S CCTV 1' and '025M'.

4.4.2.2 Gait

Parallel to the morphological components, subjects that mimicked a trace already labelled 'Gait CCTV 1' and 'Gait CCTV 2' were assessed again for gait anthropometry through photo-comparative analyses. The trace was assessed first, followed by the comparison to the reference material. In Figure 4.12, the measurements for both subjects can be viewed within the first two rows following the feature names. The last two rows of the same subjects were the respective categories they were placed in based on the converted categories (Appendix 3B). These categories were then further converted to dichotomous values (Figure 4.12), allowing examination into the frequency of each variant within the features in the given population. Figure 4.13 shows a direct comparison between the trace and the reference assessments, which can be viewed successive to one another. Those features that are similar to one another can be viewed by the '1' or '0' values aligning to each (trace/reference) pair, such as 1.1 for 'Gait CCTV 1' and '003MD'. Those that differed can be observed through the non-aligning values, such as 2.1 and 2.2 for both 'Gait CCTV 1' and '003MD'.

Subject	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11 Foot length R	12. Foot length L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R	3. Lat mal - Med mal R	4. Lat mal - Med mal L	5. Hallux - Hallux R	6. Hallux - Hallux L	7. Styloid Pro - Styloid Pro R Forward	8. Styloid Pro - Styloid Pro L Forward
Gait CCTV 1	0.027062	0.031111	0.024	0.023802	0.039901	0.026469	0.050173	0.05037	0.032	0.032099	0.070914	0.069827	0.174321	0.056691	0.066469	0.061531	0.069037	0.047901	0.046321
Gait CCTV 2	0.032296	0.032981	0.026718	0.023488	0.034449	0.028479	0.046291	0.042768	0.029262	0.02936	0.077412	0.078587	0.172539	0.063613	0.069975	0.070366	0.062732	0.037972	0.040712
Gait CCTV 1	1	2	3	3	2	2	2	3	3	3	1	1	2	1	2	2	2	2	2
Gait CCTV 2	3	3	3	3	1	3	1	3	3	3	2	3	2	2	3	3	2	1	1

Figure 4.12 The Proportional Indices Values and the Consequent Categories for each Measurement. The dimensions for both subjects 'Gait CCTV 1' and 'Gait CCTV 2' can be viewed within the first two rows following the feature names. The last two rows of the same subjects were the subsequent categories they were placed in.

	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	7.1	7.2	7.3	8.1	8.2	8.3	9.1	9.2	9.3	10	10	10	11	11	11	12	12	12	15	15	15	16	16	16	17	17	17	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	7.1	7.2	7.3	8.1	8.2	8.3
Gait CCTV 1	1	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0	1	1	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0
003MD	1	0	0	1	0	0	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0

	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	7.1	7.2	7.3	8.1	8.2	8.3	9.1	9.2	9.3	10	10	10	11	11	11	12	12	12	15	15	15	16	16	16	17	17	17	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	7.1	7.2	7.3	8.1	8.2	8.3
Gait CCTV 2	0	0	1	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	1	0	0	1	0	0
007FD	0	1	0	0	1	0	0	0	1	0	0	1	1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0

Figure 4.13 Comparison of both Simulated 'Trace' and 'Reference' Materials with the Categorised Dichotomous Values. Two trace subjects are observed as 'Gait CCTV 1' and 'Gait CCTV 2' whereas the reference materials followed directly after the trace rows for each trace, labelled as '003MD' and '007FD' respectively. Those features that are similar to one another can be viewed by the '1' or '0' values aligning to each (trace/reference) pair, such as 1.1 for 'Gait CCTV 1' and '003MD'. Those that differed can be observed through the non-aligning values, such as 2.1 and 2.2 for both 'Gait CCTV 1' and '003MD'.

4.4.3 Distribution graphs to View Dependant and Independent Features

Following the photo-comparative analyses completed for both anthropometry and morphology, distribution graphs to view whether features were dependent or independent were assessed. Two features were selected, such as the head level and the feet placement and compared. The features and the variations subsequent to them were placed side by side, with the rows remaining identical to one another, such that the features for both head level and feet placement both come from the same person per row. One feature was selected (as seen on Table 4.2), for example, head level, and the first variant from that one feature was all copied over along with all remaining columns (named Trait 1 = A) as seen on the top of the table in blue with all '1' in the first column (1.1). The same was repeated for Trait 1 = B as observed in the purple, where column 1.2 contains '1' and finally for Trait 1 = C (observed in green) contains '1' in column 1.3. Once separate tables were completed for the full data, the values were tallied for each columns and consequent distribution column graphs were completed to represent these tallies.

Table 4.2 Snippets of the Comparative Feature Traits. Blue signifies Trait 1 = A, purple represents Trait 1 = B and green shows Trait 1 = C. Two features and its variants were compared to one another, where the presence of first variant for feature 1, was compared to all three variants for feature 2. Then the presence of the second variant for feature 1, compared to all three variants of feature two. Finally, the presence of the third variant for the first feature, is compared to all three variants for feature two.

Trait 1 = A	1.1	1.2	1.3	35.1	35.2	35.3
	1	0	0	0	1	0
	1	0	0	1	0	0
	1	0	0	0	1	0
	1	0	0	1	0	0
	1	0	0	1	0	0
Trait 1 = B	1.1	1.2	1.3	35.1	35.2	35.3
	0	1	0	0	1	0
	0	1	0	0	1	0
	0	1	0	0	1	0
	0	1	0	0	1	0
	0	1	0	0	1	0
Trait 1 = C	1.1	1.2	1.3	35.1	35.2	35.3
	0	0	1	0	1	0
	0	0	1	0	1	0
	0	0	1	1	0	0
	0	0	1	0	1	0
	0	0	1	0	1	0

4.4.3.1 The Distribution Graphs

Distribution graphs were completed following the comparative feature traits through tallying the values from each trait. Following consultation from an anatomist, Dr Ghaith Al Badri, it was postulated that the features that were more symmetrical, such as upper arm length of both left and right sides, and leg length for both left and right sides of the body etc. would be dependent on one another. On the other hand, it was suggested that those features asymmetrical to one another, such as the head level to the feet placement, would be independent to one another. These theories were tested and examples of dependency and independency for both anthropometry and morphology were observed. The two features were observed in four graphs (Full, Trait 1 = A, Trait 1 = B, Trait 1 = C), where for anthropometry dependent (Figure 4.14), leg length for left and right sides were compared. The dependency can be observed from the changing graphs, where for instance Trait 1 = A shows higher numbers in column one, Trait 1 = B, shows higher numbers in column two and Trait 1 = C shows higher numbers in column three. This differs to anthropometry independent (Figure 4.15), where the two features compared (leg length – crotch right and shoulder – elbow right) show relatively low numbers for column one, and higher numbers for columns two and three, thus indicating independency.

Similar trends can be observed in the morphological component for dependent (Figure 4.16), where for placement of foot left and right sides, the graph bars differ in ratios to one another. While for morphology independent (Figure 4.17), when assessing head level and placement of feet (left side), high values within the first column are seen, moderate numbers for the second column and low numbers for the third column.

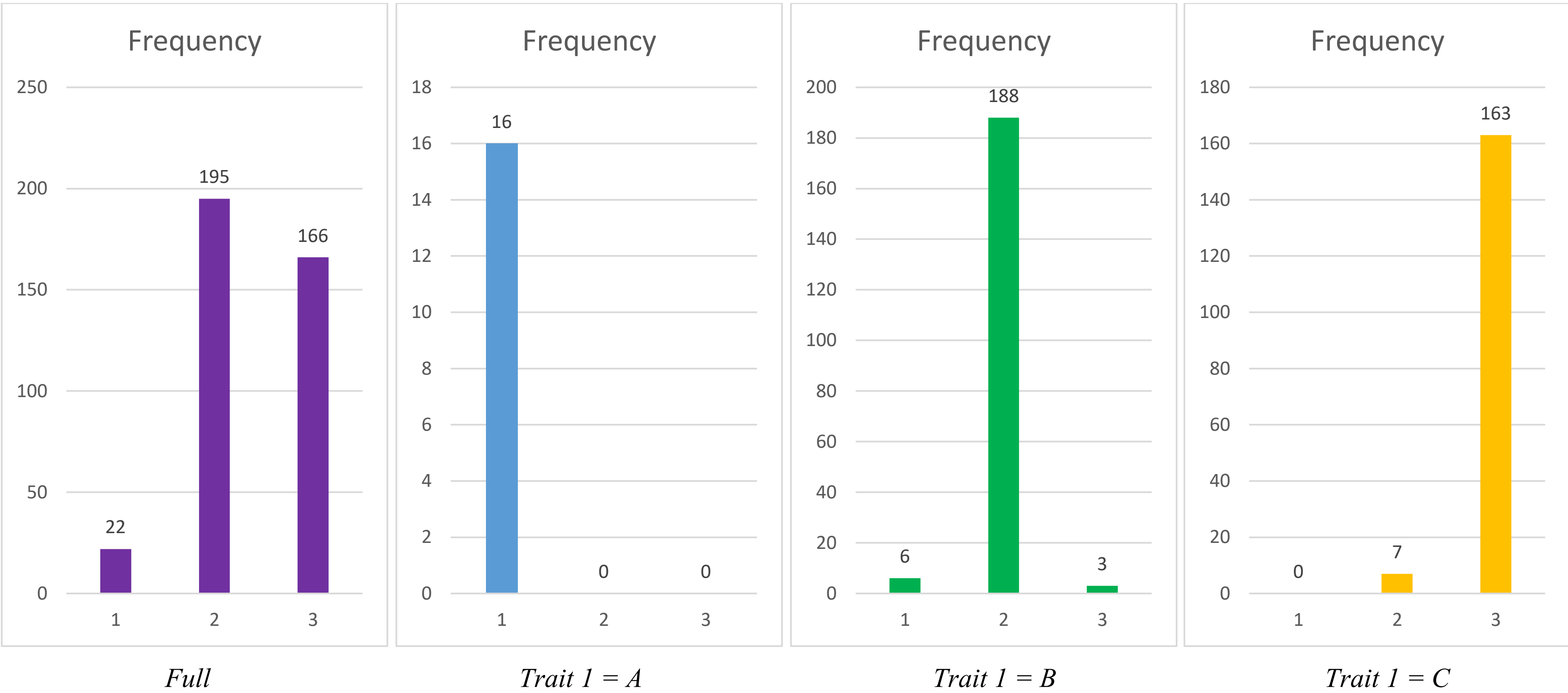


Figure 4.14 Anthropometry Dependent. Distribution graphs showing dependency between features for stance anthropometry. Features were a direct comparison between leg length – crotch for left and right sides.

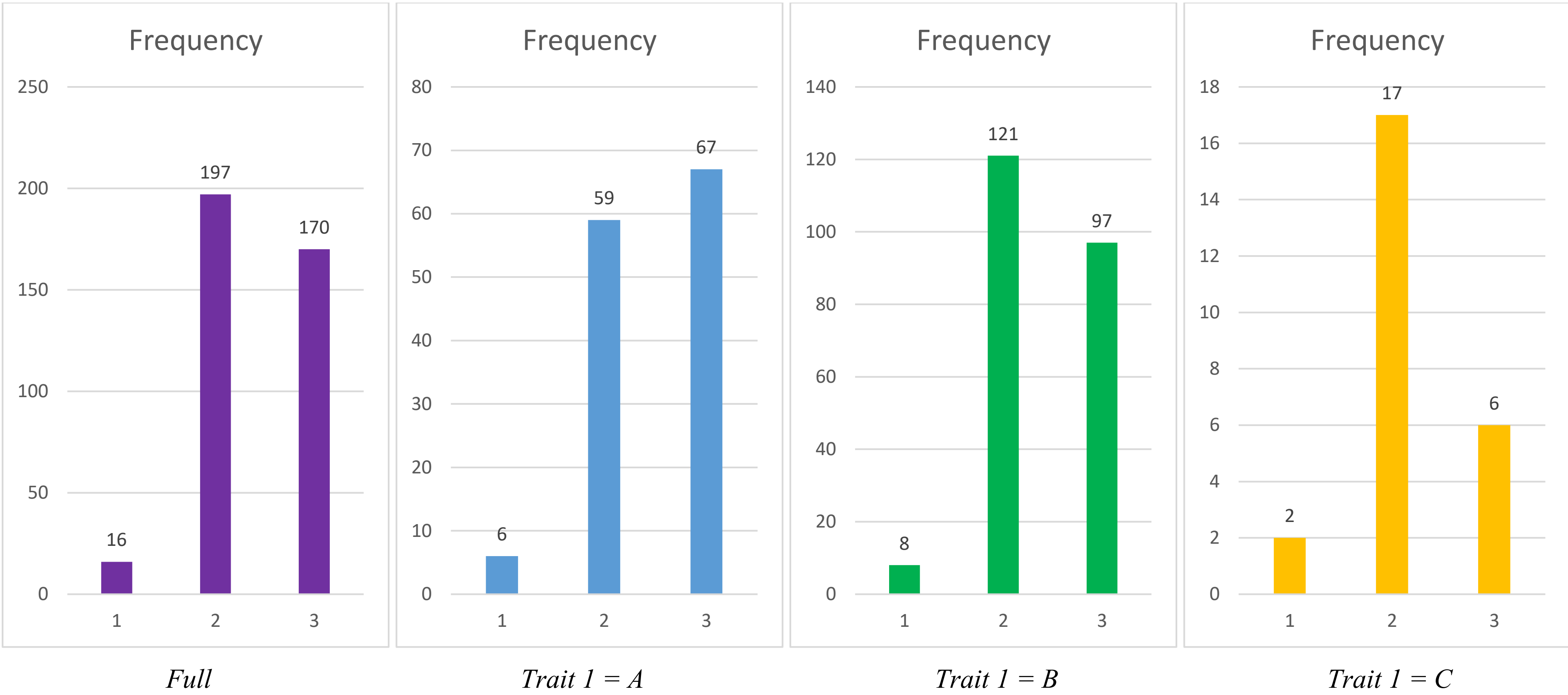


Figure 4.15 Anthropometry Independent. Distribution graphs showing independency between features for stance anthropometry. Features were a direct comparison between leg length – crotch (right side), and shoulder – elbow length (right side).

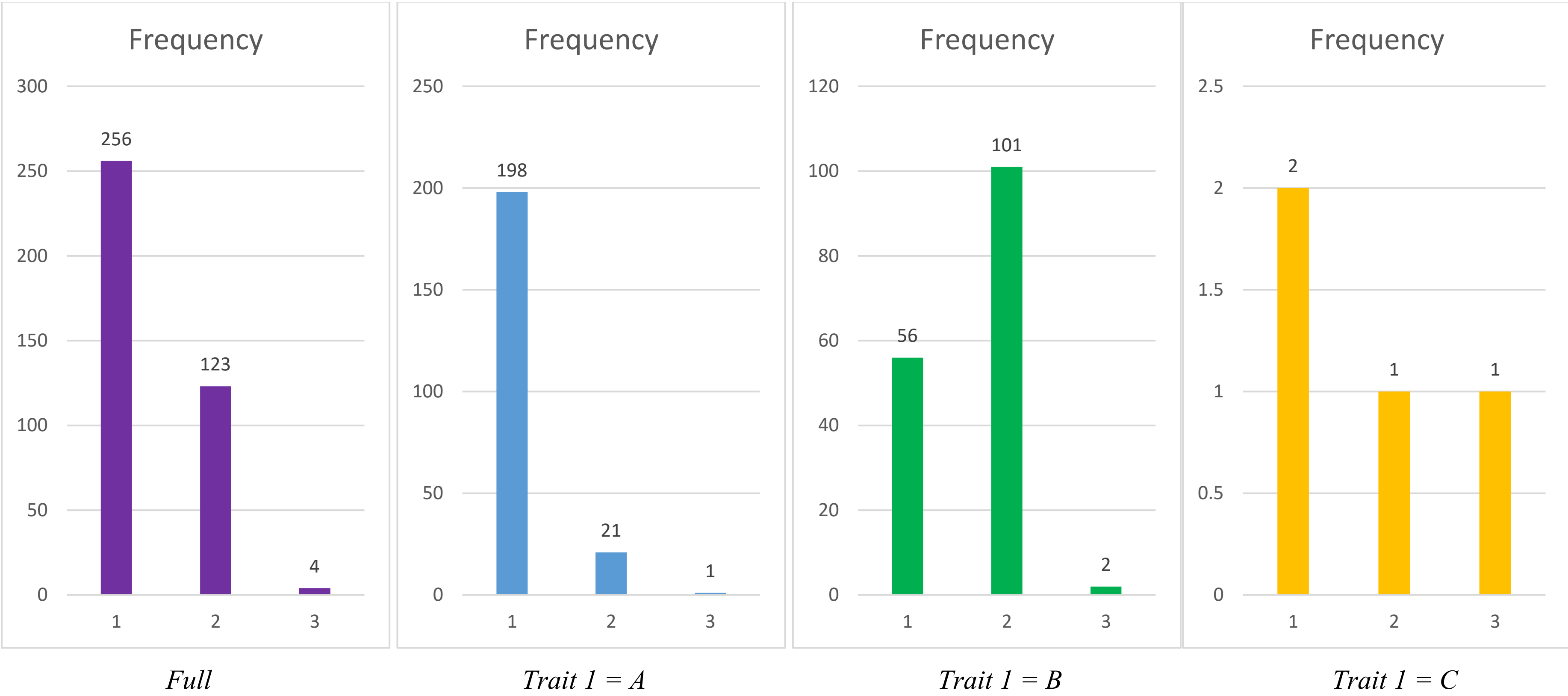


Figure 4.16 Morphology Dependent. Distribution graphs showing dependency between features for stance morphology. Features were a direct comparison between Placement of the feet (both left and right sides).

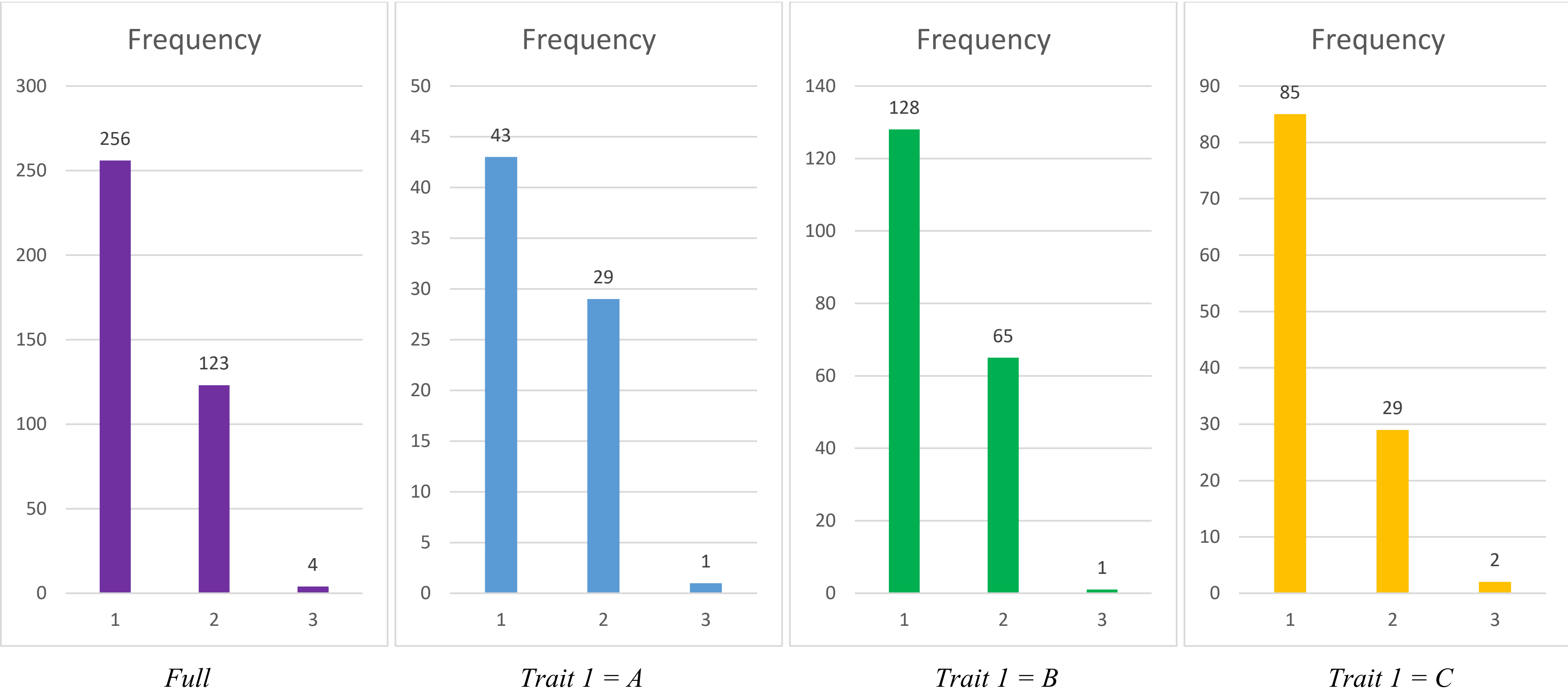


Figure 4.17 Morphology Independent. Distribution graphs showing independency between features for stance morphology. Features were a direct comparison between head level, and placement of the feet (left side).

4.4.3.2 Family of Features

It is also postulated that features can be grouped into 'families' and features can be extracted, where LR values can be calculated through one feature per family. Therefore, a preliminary 'family of features' were defined for stance anthropometry and morphology for this purpose as observed in Figures 4.18 and 4.19. These were separated into head (green box), upper limbs (blue), torso (purple) and lower limbs (red) and height was a standalone feature within anthropometry, therefore did not contain its own coloured segment. Both figures show the feature separation based on the anthropometry (Figure 4.18) and morphological features (Figure 4.19) that were developed in this research and separated into their relevant families. Although a preliminary model is suggested, further studies are imperative for progression of 'feature families'.

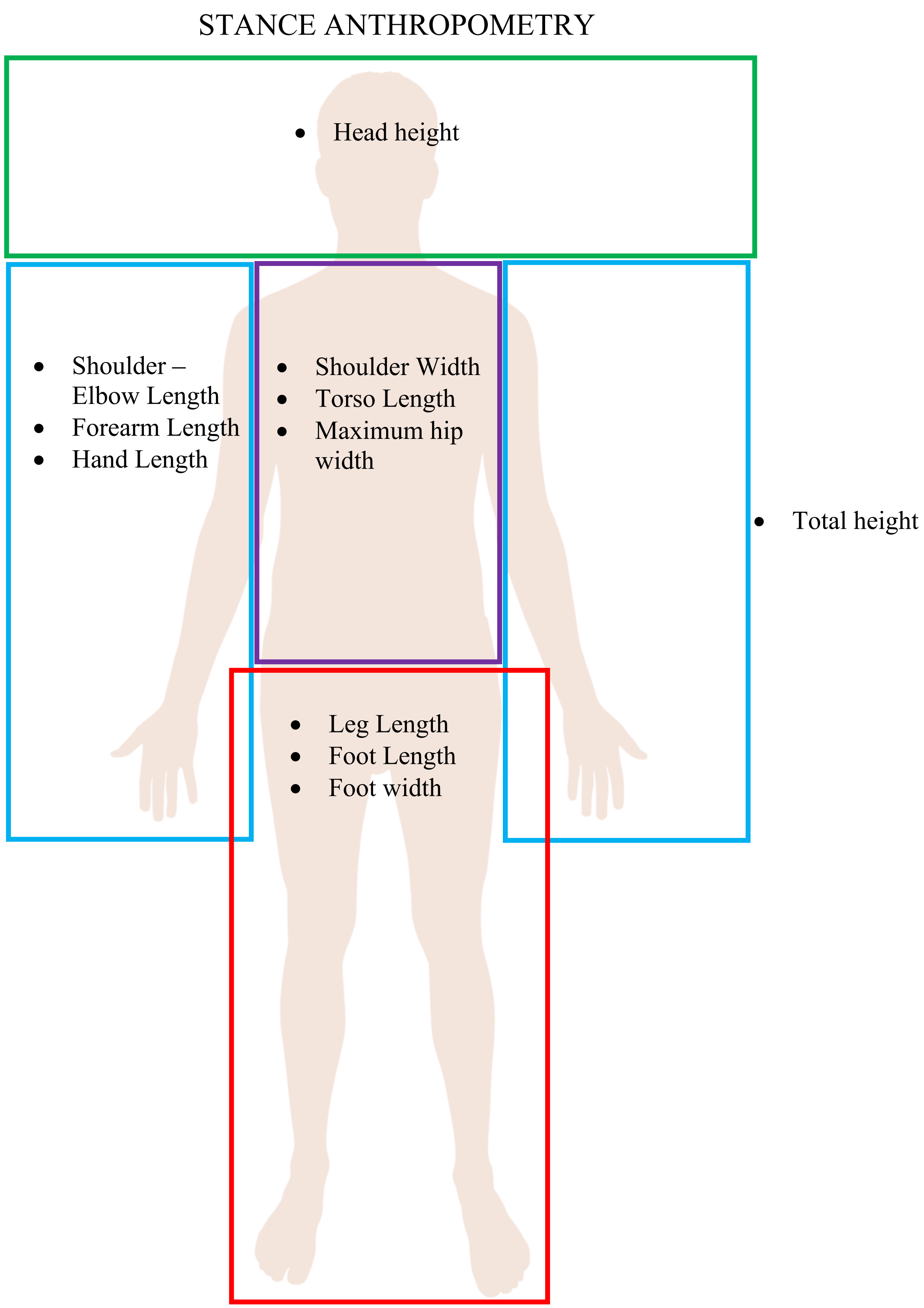


Figure 4.18 Feature Family for Stance Anthropometry. Features are separated: head (green box), upper limbs (blue), torso (purple) and lower limbs (red). Height was a standalone feature within anthropometry, therefore did not contain its own coloured segment.

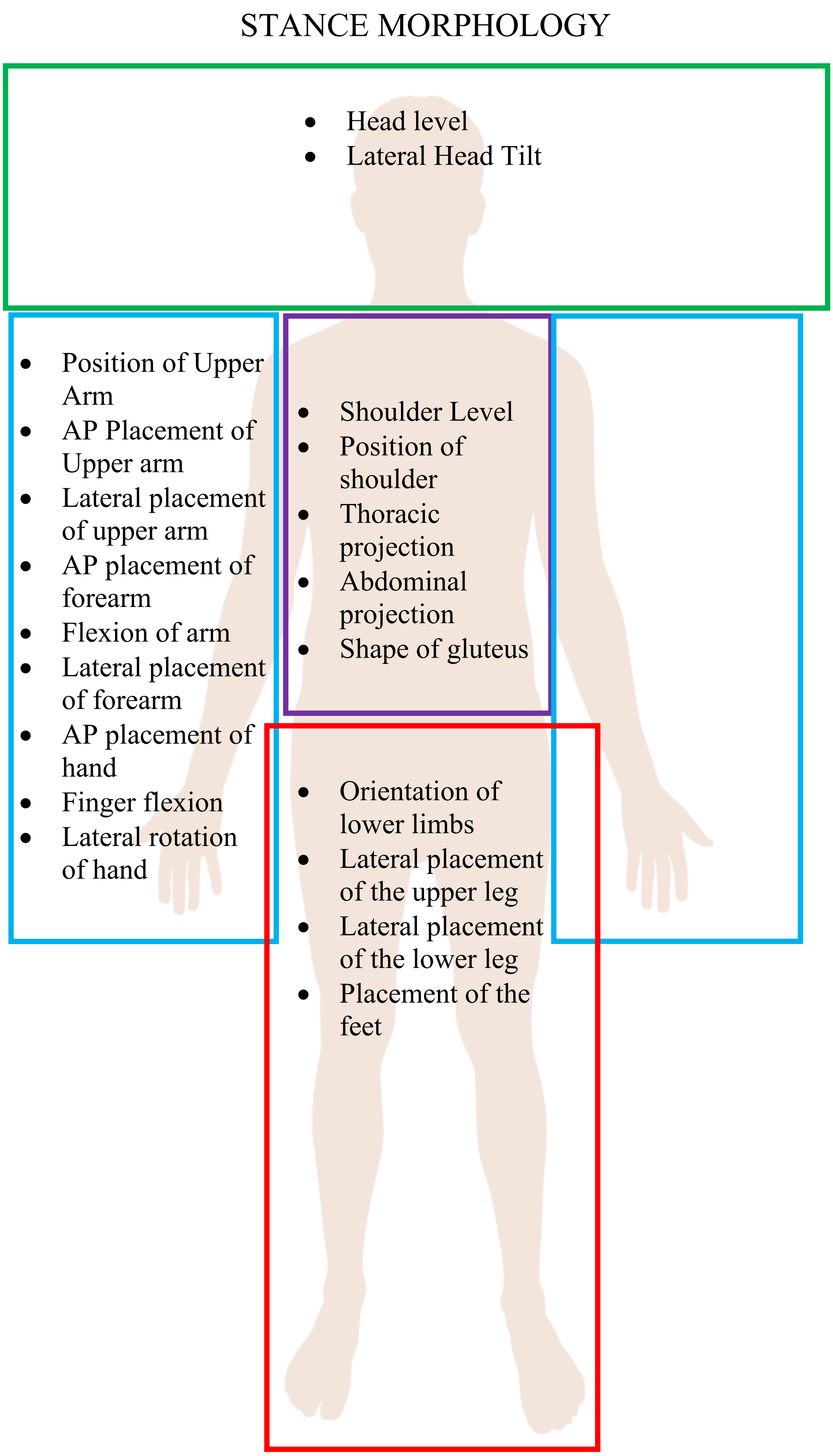


Figure 4.19 Feature Family for Stance Morphology. Features are separated: head (green box), upper limbs (blue), torso (purple) and lower limbs (red).4.4.4 Evaluating the Strength of Evidence through Likelihood Ratio Calculations

The calculations for the trace material was completed for each independent feature where a LR value was produced. From this, each LR was multiplied, resulting in a final likelihood ratio value. These calculations were completed for two subjects for both stance and gait, who were recorded on CCTV footage and then compared to their reference material. Both anthropometric and morphological analyses were completed for each subject. Table 4.2 shows the full calculation for each feature for subject Stance CCTV 1 anthropometry and the steps undertaken for both numerator (error value) and denominator (feature frequency multiplied by the population number), followed by the final LR calculation. The individual LR values (as observed per feature) are dependent on how distinct the feature was within the population. The more frequently a feature is observed, the lower the LR value is and vice versa. As an example, shoulder – elbow length L produced an LR value of 1.63 (due to a feature frequency of 235) whereas torso length was 5.5 (due to a feature frequency of 68). Those features that differed between the trace and the reference, were rectified with a (1 – error value), which can be observed through the lower values such as shoulder width producing an LR of 0.01. This final multiplied value is presented with the following statement for each LR calculation:

'Observations are 0.0000096 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population'.

These steps are repeated for both stance and gait in anthropometry and morphology as observed by Tables 4.3 – 4.10. Furthermore, Table 4.11 shows the final LR values for both anthropometry and morphology.

It was observed that values for anthropometry were low whereas values for morphology were higher, at *6,071,082 times more probable* as seen in Table 4.11.

Table 4.3 Likelihood Ratio Calculations for Subject 'Stance CCTV 1' Anthropometry

<u>Variable: Shoulder – Elbow length L</u> Error: 0.7 100 - 0.7 = 99.3 99.3 ÷ 100 = 0.993 $\frac{0.993}{235 \div 383} = \frac{0.993}{0.61} = \mathbf{1.63}$	<u>Variable: Forearm Length L</u> Error: 0.68 100 - 0.68 = 99.32 99.32 ÷ 100 = 0.9932 $\frac{0.9932}{134 \div 383} = \frac{0.9932}{0.35} = \mathbf{2.84}$
<u>Variable: Maximum Hip Width</u> Error: 0.64 100 - 0.64 = 99.36 99.36 ÷ 100 = 0.9936 $\frac{(1-0.9936)}{140 \div 383} = \frac{0.0064}{0.37} = \mathbf{0.02}$	<u>Variable: Head Height</u> Error: 0.71 100 - 0.71 = 99.29 99.29 ÷ 100 = 0.9929 $\frac{(1-0.9929)}{98 \div 383} = \frac{0.0071}{0.26} = \mathbf{0.03}$
<u>Variable: Torso Length</u> Error: 0.97 100 - 0.97 = 99.03 99.03 ÷ 100 = 0.9903 $\frac{0.9903}{68 \div 383} = \frac{0.9903}{0.18} = \mathbf{5.5}$	<u>Variable: Shoulder Width</u> Error: 0.54 100 - 0.54 = 99.46 99.46 ÷ 100 = 0.9946 $\frac{(1-0.9946)}{179 \div 383} = \frac{0.0054}{0.47} = \mathbf{0.01}$
<u>Variable: Foot Length R</u> Error: 0.27 100 - 0.27 = 99.73 99.73 ÷ 100 = 0.9973 $\frac{0.9973}{119 \div 383} = \frac{0.9973}{0.31} = \mathbf{3.22}$	<u>Variable: Leg Length L</u> Error: 0.31 100 - 0.31 = 99.69 99.69 ÷ 100 = 0.9969 $\frac{0.9969}{195 \div 383} = \frac{0.9969}{0.51} = \mathbf{1.96}$
<u>Variable: Total Height</u> Error: 0.25 100 - 0.25 = 99.75 99.75 ÷ 100 = 0.9975 $\frac{(1-0.9975)}{65 \div 383} = \frac{0.0025}{0.17} = \mathbf{0.01}$	

Therefore:

1.63 x 2.84 x 0.02 x 0.03 x 5.5 x 0.01 x 3.22 x 1.96 x 0.01 = 0.0000096

<u>Observations are 0.0000096 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.</u>

Table 4.4 Likelihood Ratio Calculations for Subject 'Stance CCTV 2' Anthropometry

Variable: Shoulder – Elbow length L Error: 0.7 100 - 0.7 = 99.3 99.3 ÷ 100 = 0.993 $\frac{0.993}{235 \div 383} = \frac{0.993}{0.61} = \mathbf{1.63}$	Variable: Forearm Length L Error: 0.68 100 - 0.68 = 99.32 99.32 ÷ 100 = 0.9932 $\frac{0.9932}{134 \div 383} = \frac{0.9932}{0.35} = \mathbf{2.84}$
Variable: Maximum Hip Width Error: 0.64 100 - 0.64 = 99.36 99.36 ÷ 100 = 0.9936 $\frac{(1-0.9936)}{223 \div 383} = \frac{0.0064}{0.58} = \mathbf{0.01}$	Variable: Head Height Error: 0.71 100 - 0.71 = 99.29 99.29 ÷ 100 = 0.9929 $\frac{(1-0.9929)}{98 \div 383} = \frac{0.0071}{0.26} = \mathbf{0.03}$
Variable: Torso Length Error: 0.97 100 - 0.97 = 99.03 99.03 ÷ 100 = 0.9903 $\frac{(1-0.9903)}{178 \div 383} = \frac{0.097}{0.47} = \mathbf{0.21}$	Variable: Shoulder Width Error: 0.54 100 - 0.54 = 99.46 99.46 ÷ 100 = 0.9946 $\frac{(1-0.9946)}{179 \div 383} = \frac{0.0054}{0.47} = \mathbf{0.01}$
Variable: Foot Length R Error: 0.27 100 - 0.27 = 99.73 99.73 ÷ 100 = 0.9973 $\frac{0.9973}{185 \div 383} = \frac{0.9973}{0.48} = \mathbf{2.08}$	Variable: Leg Length L Error: 0.31 100 - 0.31 = 99.69 99.69 ÷ 100 = 0.9969 $\frac{(1-0.9969)}{195 \div 383} = \frac{0.0031}{0.51} = \mathbf{0.01}$
Variable: Total Height Error: 0.25 100 - 0.25 = 99.75 99.75 ÷ 100 = 0.9975 $\frac{(1-0.9975)}{65 \div 383} = \frac{0.0025}{0.17} = \mathbf{0.01}$	

Therefore:

1.63 x 2.84 x 0.01 x 0.03 x 0.21 x 0.01 x 2.08 x 0.01 x 0.01 = 0.00000000066

Observations are 0.00000000066 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.

Table 4.5 Likelihood Ratio Calculations for Subject 'Gait CCTV 1' Anthropometry

<u>Variable: Shoulder – Elbow length R</u> Error: 0.98 100 - 0.98 = 99.02 99.02 ÷ 100 = 0.99 $\frac{0.99}{71\div269}=\frac{0.99}{0.26} = \mathbf{3.81}$	<u>Variable: Forearm Length L</u> Error: 1.49 100 – 1.49 = 98.51 98.51 ÷ 100 = 0.98 $\frac{0.98}{118\div269}=\frac{0.98}{0.44} = \mathbf{2.23}$
<u>Variable: Maximum Hip Width</u> Error: 0.79 100 - 0.79 = 99.21 99.21 ÷ 100 = 0.9921 $\frac{0.9921}{116\div269}=\frac{0.9921}{0.43} = \mathbf{2.31}$	<u>Variable: Head Height</u> Error: 0.92 100 - 0.92 = 99.08 99.08 ÷ 100 = 0.9908 $\frac{0.9908}{207\div269}=\frac{0.9908}{0.77} = \mathbf{1.28}$
<u>Variable: Torso Length</u> Error: 1.15 100 – 1.15 = 98.85 98.85 ÷ 100 = 0.9885 $\frac{(1-0.9885)}{151\div269}=\frac{0.012}{0.56} = \mathbf{0.02}$	<u>Variable: Shoulder Width</u> Error: 1.06 100 – 1.06 = 98.94 98.94 ÷ 100 = 0.9894 $\frac{0.9894}{65\div269}=\frac{0.9894}{0.24} = \mathbf{4.12}$
<u>Variable: Foot Length L</u> Error: 0.4 100 - 0.4 = 99.6 99.6 ÷ 100 = 0.996 $\frac{0.996}{61\div269}=\frac{0.996}{0.27} = \mathbf{3.69}$	<u>Variable: Leg Length L</u> Error: 0.42 100 - 0.42 = 99.658 99.58 ÷ 100 = 0.9958 $\frac{(1-0.9958)}{42\div269}=\frac{0.0042}{0.16} = \mathbf{0.03}$
<u>Variable: Total Height</u> Error: 0.21 100 - 0.21 = 99.79 99.79 ÷ 100 = 0.9979 $\frac{0.9979}{178\div269}=\frac{0.9979}{0.66} = \mathbf{1.51}$	<u>Variable: Lat Mal – Med Mal R</u> Error: 0.52 100 - 0.52 = 99.48 99.48 ÷ 100 = 0.9948 $\frac{(1-0.9948)}{65\div269}=\frac{0.0052}{0.24} = \mathbf{0.02}$
<u>Variable: Hallux – Hallux L</u> Error: 0.29 100 - 0.29 = 99.71 99.71 ÷ 100 = 0.9971 $\frac{0.9971}{159\div269}=\frac{0.9971}{0.59} = \mathbf{1.69}$	<u>Variable: Styloid Pro L</u> Error: 0.27 100 - 0.27 = 99.73 99.73 ÷ 100 = 0.9973 $\frac{0.9973}{133\div269}=\frac{0.9973}{0.49} = \mathbf{2.04}$

Therefore: 3.81 x 2.23 x 2.31 x 1.28 x 0.02 x 4.12 x 3.69 x 0.03 x 0.51 x 0.02 x 1.69 x 2.04 = 0.008

<u>Observations are 0.008 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.</u>

Table 4.6 Likelihood Ratio Calculations for Subject 'Gait CCTV 2' Anthropometry

<u>Variable: Shoulder – Elbow length R</u> Error: 0.98 100 - 0.98 = 99.02 99.02 ÷ 100 = 0.99 $\frac{(1-0.99)}{77 \div 269} = \frac{0.01}{0.29} = \mathbf{0.03}$	<u>Variable: Forearm Length L</u> Error: 1.49 100 – 1.49 = 98.51 98.51 ÷ 100 = 0.98 $\frac{0.98}{118 \div 269} = \frac{0.98}{0.44} = \mathbf{2.23}$
<u>Variable: Maximum Hip Width</u> Error: 0.79 100 - 0.79 = 99.21 99.21 ÷ 100 = 0.9921 $\frac{0.9921}{83 \div 269} = \frac{0.9921}{0.31} = \mathbf{3.2}$	<u>Variable: Head Height</u> Error: 0.92 100 - 0.92 = 99.08 99.08 ÷ 100 = 0.9908 $\frac{(1-0.9908)}{23 \div 269} = \frac{0.0092}{0.09} = \mathbf{0.1}$
<u>Variable: Torso Length</u> Error: 1.15 100 – 1.15 = 98.85 98.85 ÷ 100 = 0.9885 $\frac{(1-0.9885)}{67 \div 269} = \frac{0.012}{0.25} = \mathbf{0.05}$	<u>Variable: Shoulder Width</u> Error: 1.06 100 – 1.06 = 98.94 98.94 ÷ 100 = 0.9894 $\frac{(1-0.9894)}{65 \div 269} = \frac{0.011}{0.24} = \mathbf{0.04}$
<u>Variable: Foot Length L</u> Error: 0.4 100 - 0.4 = 99.6 99.6 ÷ 100 = 0.996 $\frac{(1-0.996)}{61 \div 269} = \frac{0.004}{0.27} = \mathbf{0.01}$	<u>Variable: Leg Length L</u> Error: 0.42 100 - 0.42 = 99.658 99.58 ÷ 100 = 0.9958 $\frac{0.9958}{96 \div 269} = \frac{0.9958}{0.36} = \mathbf{2.77}$
<u>Variable: Total Height</u> Error: 0.21 100 - 0.21 = 99.79 99.79 ÷ 100 = 0.9979 $\frac{0.9979}{178 \div 269} = \frac{0.9979}{0.66} = \mathbf{1.51}$	<u>Variable: Lat Mal – Med Mal R</u> Error: 0.52 100 - 0.52 = 99.48 99.48 ÷ 100 = 0.9948 $\frac{0.9948}{171 \div 269} = \frac{0.9948}{0.64} = \mathbf{1.55}$
<u>Variable: Hallux – Hallux L</u> Error: 0.29 100 - 0.29 = 99.71 99.71 ÷ 100 = 0.9971 $\frac{0.9971}{159 \div 269} = \frac{0.9971}{0.59} = \mathbf{1.69}$	<u>Variable: Styloid Pro L</u> Error: 0.27 100 - 0.27 = 99.73 99.73 ÷ 100 = 0.9973 $\frac{0.9973}{76 \div 269} = \frac{0.9973}{0.28} = \mathbf{3.56}$

Therefore: 0.03 x 2.23 x 3.2 x 0.1 x 0.05 x 0.04 x 0.01 x 2.77 x 1.51 x 1.55 x 1.69 x 3.56 = 0.0000167

Observations are 0.0000167 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.

Table 4.7 Likelihood Ratio Calculations for Subject 'Stance CCTV 1' Morphology

Feature: Head Level Error: 0.83 $\frac{0.83}{194 \div 383} = \frac{0.83}{0.506} = \mathbf{1.64}$	Feature: Lateral Head Tilt Error: 1 $\frac{1}{133 \div 383} = \frac{1}{0.35} = \mathbf{2.86}$
Feature: Shoulder Level Left Error: 0.81 $\frac{0.81}{120 \div 383} = \frac{0.81}{0.31} = \mathbf{2.61}$	Feature: Position Shoulder Left Error: 0.80 $\frac{0.8}{142 \div 383} = \frac{0.8}{0.37} = \mathbf{2.16}$
Feature: Position Upper Arm Left Error: 1 $\frac{1}{40 \div 383} = \frac{1}{0.1} = \mathbf{10}$	Feature: AP Placement Upper Arm Left Error: 0.85 $\frac{0.85}{135 \div 383} = \frac{0.85}{0.35} = \mathbf{2.42}$
Feature: Lateral Placement Upper Arm Right Error: 1 $\frac{1}{149 \div 383} = \frac{1}{0.39} = \mathbf{2.56}$	Feature: AP Placement Forearm Right Error: 0.6 $\frac{0.6}{58 \div 383} = \frac{0.6}{0.15} = \mathbf{4}$
Feature: Flexion Arm Left Error: 0.82 $\frac{0.82}{297 \div 383} = \frac{0.82}{0.78} = \mathbf{1.05}$	Feature: Lateral Placement Forearm Left Error: 0.85 $\frac{0.85}{133 \div 383} = \frac{0.85}{0.35} = \mathbf{2.43}$
Feature: AP Placement Hand Left Error: 0.74 $\frac{0.74}{66 \div 383} = \frac{0.74}{0.17} = \mathbf{4.35}$	Feature: Thoracic Projection Error: 1 $\frac{1}{168 \div 383} = \frac{1}{0.44} = \mathbf{2.27}$
Feature: Abdominal Projection Error: 0.78 $\frac{0.78}{179 \div 383} = \frac{0.78}{0.47} = \mathbf{1.66}$	Feature: Shape of Gluteus Error: 1 $\frac{1}{178 \div 383} = \frac{1}{0.46} = \mathbf{2.17}$
Feature: Orientation of Limbs Error: 0.86 $\frac{0.86}{139 \div 383} = \frac{0.86}{0.36} = \mathbf{2.39}$	Feature: Lateral Placement Upper Leg Left Error: 0.69 $\frac{0.69}{124 \div 383} = \frac{0.69}{0.32} = \mathbf{2.16}$
Feature: Lateral Placement Lower Leg Right Error: 0.6 $\frac{0.6}{202 \div 383} = \frac{0.6}{0.53} = \mathbf{1.13}$	Feature: Feet Placement Right Error: 1 $\frac{1}{220 \div 383} = \frac{1}{0.57} = \mathbf{1.75}$

Therefore:

1.64 x 2.86 x 2.61 x 2.16 x 10 x 2.42 x 2.56 x 4 x 1.05 x 2.43 x 4.35 x 2.27 x 1.66 x 2.17 x 2.39 x 2.16 x 1.13 x 1.75 = 6,071,082.23

Observations are 6,071,082 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.

Table 4.8 Likelihood Ratio Calculations for Subject 'Stance CCTV 2' Morphology

Feature: Head Level Error: 0.83 $\frac{0.83}{194 \div 383} = \frac{0.83}{0.506} = \mathbf{1.64}$	Feature: Lateral Head Tilt Error: 1 $\frac{1}{211 \div 383} = \frac{1}{0.55} = \mathbf{1.82}$
Feature: Shoulder Level Left Error: 0.81 $\frac{(1-0.81)}{126 \div 383} = \frac{0.19}{0.33} = \mathbf{0.58}$	Feature: Position Shoulder Right Error: 0.74 $\frac{0.74}{96 \div 383} = \frac{0.74}{0.25} = \mathbf{2.96}$
Feature: Position Upper Arm Left Error: 1 $\frac{1}{189 \div 383} = \frac{1}{0.49} = \mathbf{2.04}$	Feature: AP Placement Upper Arm Left Error: 0.85 $\frac{0.85}{125 \div 383} = \frac{0.85}{0.33} = \mathbf{2.58}$
Feature: Lateral Placement Upper Arm Right Error: 1 $\frac{1}{163 \div 383} = \frac{1}{0.43} = \mathbf{2.33}$	Feature: AP Placement Forearm Left Error: 0.74 $\frac{0.74}{186 \div 383} = \frac{0.74}{0.49} = \mathbf{1.51}$
Feature: Flexion Arm Left Error: 0.82 $\frac{0.82}{297 \div 383} = \frac{0.82}{0.78} = \mathbf{1.05}$	Feature: Lateral Placement Forearm Left Error: 0.85 $\frac{0.85}{145 \div 383} = \frac{0.85}{0.38} = \mathbf{2.24}$
Feature: AP Placement Hand Left Error: 0.74 $\frac{0.74}{303 \div 383} = \frac{0.74}{0.79} = \mathbf{0.94}$	Feature: Thoracic Projection Error: 1 $\frac{1}{81 \div 383} = \frac{1}{0.44} = \mathbf{4.76}$
Feature: Abdominal Projection Error: 0.78 $\frac{0.78}{138 \div 383} = \frac{0.78}{0.36} = \mathbf{2.17}$	Feature: Shape of Gluteus Error: 1 $\frac{1}{155 \div 383} = \frac{1}{0.41} = \mathbf{2.44}$
Feature: Orientation of Limbs Error: 0.86 $\frac{0.86}{139 \div 383} = \frac{0.86}{0.36} = \mathbf{2.39}$	Feature: Lateral Placement Upper Leg Left Error: 0.69 $\frac{0.69}{124 \div 383} = \frac{0.69}{0.32} = \mathbf{2.16}$
Feature: Lateral Placement Lower Leg Right Error: 0.6 $\frac{0.6}{202 \div 383} = \frac{0.6}{0.53} = \mathbf{1.13}$	Feature: Feet Placement Left Error: 1 $\frac{1}{123 \div 383} = \frac{1}{0.32} = \mathbf{3.13}$

Therefore:1.64 x 1.82 x 0.58 x 2.96 x 2.04 x 2.58 x 2.33 x 1.51 x 1.05 x 2.24 x 0.94 x 4.76 x 2.17 x 2.44 x 2.39 x 2.16 x 1.13 x 3.13 = 96,541.45

Observations are 96,541 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.

Table 4.9 Likelihood Ratio Calculations for Subject 'Gait CCTV 1' Morphology

<u>Feature: BW Lat Placement UA Left</u> Error: 0.85 $\frac{0.85}{82 \div 269} = \frac{0.85}{0.30} = \mathbf{2.83}$	<u>Feature: BW Lat Place Forearm Left</u> Error: 0.82 $\frac{0.82}{161 \div 269} = \frac{0.82}{0.60} = \mathbf{1.37}$
<u>Feature: BW Elbow Flexion Left</u> Error: 0.75 $\frac{0.75}{149 \div 269} = \frac{0.75}{0.55} = \mathbf{1.36}$	<u>Feature: FW Lat Placement UA Right</u> Error: 0.83 $\frac{0.83}{114 \div 269} = \frac{0.83}{0.42} = \mathbf{1.98}$
<u>Feature: FW Lat Place Forearm Left</u> Error: 0.78 $\frac{0.78}{85 \div 269} = \frac{0.78}{0.32} = \mathbf{2.44}$	<u>Feature: FW Elbow Flexion Right</u> Error: 0.58 $\frac{0.58}{140 \div 269} = \frac{0.58}{0.52} = \mathbf{1.12}$
<u>Feature: Lateral Trunk Sway</u> Error: 0.65 $\frac{0.65}{134 \div 269} = \frac{0.65}{0.50} = \mathbf{1.30}$	<u>Feature: Orientation Limbs</u> Error: 0.75 $\frac{(1-0.75)}{123 \div 269} = \frac{0.25}{0.46} = \mathbf{0.54}$
<u>Feature: Head Level</u> Error: 0.85 $\frac{0.85}{110 \div 269} = \frac{0.85}{0.41} = \mathbf{2.07}$	<u>Feature: Lateral Head Tilt</u> Error: 0.69 $\frac{0.69}{91 \div 269} = \frac{0.69}{0.34} = \mathbf{2.03}$
<u>Feature: Shoulder Level Right</u> Error: 1 $\frac{1}{89 \div 269} = \frac{1}{0.33} = \mathbf{3.03}$	<u>Feature: Lateral Placement UA Right</u> Error: 0.70 $\frac{0.70}{79 \div 269} = \frac{0.70}{0.29} = \mathbf{2.41}$
<u>Feature: Lateral Placement Forearm Right</u> Error: 0.75 $\frac{0.75}{145 \div 269} = \frac{0.75}{0.54} = \mathbf{1.39}$	<u>Feature: Thoracic Projection</u> Error: 0.84 $\frac{0.84}{88 \div 269} = \frac{0.84}{0.33} = \mathbf{2.55}$
<u>Feature: Abdominal Projection</u> Error: 0.81 $\frac{0.81}{120 \div 269} = \frac{0.81}{0.45} = \mathbf{1.80}$	<u>Feature: Lat Placement UL Right</u> Error: 1 $\frac{1}{13 \div 269} = \frac{1}{0.05} = \mathbf{20}$
<u>Feature: Lat Placement LL Right</u> Error: 0.61 $\frac{0.61}{11 \div 269} = \frac{0.61}{0.04} = \mathbf{15.25}$	<u>Feature: Placement Feet Right</u> Error: 1 $\frac{1}{158 \div 269} = \frac{1}{0.59} = \mathbf{1.69}$
<u>Feature: Swing Lat Placement UL Right</u> Error: 0.8 $\frac{0.8}{53 \div 269} = \frac{0.8}{0.20} = \mathbf{4}$	<u>Feature: Swing Lat Placement LL Left</u> Error: 0.56 $\frac{(1-0.56)}{33 \div 269} = \frac{0.44}{0.12} = \mathbf{3.67}$

Feature: Swing Placement Feet Right Error: 1 $\frac{1}{234 \div 269} = \frac{1}{0.87} =$ **1.15**	

Therefore:

2.83 x 1.37 x 1.36 x 1.98 x 2.44 x 1.12 x 1.30 x 0.54 x 2.07 x 2.03 x 3.03 x 2.41 x 1.39 x 2.55 x 1.8 x 20 x 15.25 x 1.69 x 4 x 3.67 x 1.15 = 34,120,865.80

Observations are 34,120,865 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.

Table 4.10 Likelihood Ratio Calculations for Subject 'Gait CCTV 2' Morphology

Feature: BW Lat Placement UA Left Error: 0.85 $\frac{0.85}{134 \div 269} = \frac{0.85}{0.50} = \mathbf{1.7}$	Feature: BW Lat Place Forearm Left Error: 0.82 $\frac{(1-0.82)}{50 \div 269} = \frac{0.18}{0.19} = \mathbf{0.95}$
Feature: Elbow Flexion Left Error: 0.75 $\frac{0.75}{149 \div 269} = \frac{0.75}{0.55} = \mathbf{1.36}$	Feature: FW Lat Placement UA Right Error: 0.83 $\frac{0.83}{65 \div 269} = \frac{0.83}{0.24} = \mathbf{3.46}$
Feature: FW Lat Place Forearm Left Error: 0.78 $\frac{(1-0.78)}{62 \div 269} = \frac{0.22}{0.23} = \mathbf{0.96}$	Feature: FW Elbow Flexion Right Error: 0.58 $\frac{0.58}{103 \div 269} = \frac{0.58}{0.38} = \mathbf{1.53}$
Feature: Lateral Trunk Sway Error: 0.65 $\frac{0.65}{134 \div 269} = \frac{0.65}{0.50} = \mathbf{1.3}$	Feature: Orientation Limbs Error: 0.75 $\frac{0.75}{67 \div 269} = \frac{0.75}{0.25} = \mathbf{3}$
Feature: Head Level Error: 0.85 $\frac{(1-0.85)}{108 \div 269} = \frac{0.15}{0.40} = \mathbf{0.38}$	Feature: Lateral Head Tilt Error: 0.69 $\frac{0.69}{75 \div 269} = \frac{0.69}{0.28} = \mathbf{2.46}$
Feature: Shoulder Level Right Error: 1 $\frac{1}{96 \div 269} = \frac{1}{0.36} = \mathbf{2.78}$	Feature: Lateral Placement UA Right Error: 0.70 $\frac{0.70}{105 \div 269} = \frac{0.70}{0.39} = \mathbf{1.79}$
Feature: Lateral Placement Forearm Right Error: 0.75 $\frac{0.75}{97 \div 269} = \frac{0.75}{0.36} = \mathbf{2.08}$	Feature: Thoracic Projection Error: 0.84 $\frac{0.84}{88 \div 269} = \frac{0.84}{0.33} = \mathbf{2.55}$
Feature: Abdominal Projection Error: 0.81 $\frac{0.81}{99 \div 269} = \frac{0.81}{0.37} = \mathbf{2.19}$	Feature: Lat Placement UL Right Error: 1 $\frac{1}{191 \div 269} = \frac{1}{0.71} = \mathbf{1.41}$
Feature: Lat Placement LL Right Error: 0.61 $\frac{0.61}{93 \div 269} = \frac{0.61}{0.35} = \mathbf{1.74}$	Feature: Placement Feet Right Error: 1 $\frac{1}{96 \div 269} = \frac{1}{0.36} = \mathbf{2.78}$
Feature: Swing Lat Placement UL Right Error: 0.8 $\frac{0.8}{103 \div 269} = \frac{0.8}{0.38} = \mathbf{2.1}$	Feature: Swing Lat Placement LL Left Error: 0.56 $\frac{0.56}{46 \div 269} = \frac{0.56}{0.17} = \mathbf{3.29}$

Feature: Swing Placement Feet Right Error: 1 $\frac{1}{234 \div 269} = \frac{1}{0.87} = \mathbf{1.15}$	

Therefore:

1.7 x 0.95 x 1.36 x 3.46 x 0.96 x 1.53 x 1.3 x 3 x 0.38 x 2.46 x 2.78 x 1.79 x 2.08 x 2.55 x 2.19 x 1.41 x 1.74 x 2.78 x 2.1 x 3.29 x 1.15 = 127,469.169

Observations are 127,469 times more probable if this person is the source from the trace than if someone else is the source of the trace within the population.

Table 4.11 Final Likelihood Ratio Values for both Anthropometry and Morphology

CCTV Subject Name	Anthro/Morpho	Final LR Value
Stance CCTV 1	Anthropometry	0.0000096
Stance CCTV 2	Anthropometry	0.00000000066
Gait CCTV 1	Anthropometry	0.008
Gait CCTV 2	Anthropometry	0.0000167
Stance CCTV 1	Morphology	6,071,082.23
Stance CCTV 2	Morphology	96,541.45
Gait CCTV 1	Morphology	34,120,865.80
Gait CCTV 2	Morphology	127,469.169

4.4.5 Anthropometry Model Two

The first anthropometry model converted the data into proportional indices and following the poor results attained from the LR, a secondary model was trialled for stance to view results. This model compared the feature to the total height of the subject, producing a feature-to-height ratio. The height was selected as it contained the least amount of observer error within the repeatability studies (in which the repeatability error may or may not be attributed to size) and furthermore, this model has been applied to previous studies such as Radu *et al.*, (2014). Therefore, this model was selected, converted (Appendix H) and trialled, starting with the PCA results.

4.4.5.1 Principle Component Analysis: Model Two for Stance

Using a method similar to that introduced in Chapter 3, the PCA was produced in R Studio and the loadings distribution plot showed the left and the right-side features clustering together, as seen by the green circle (leg length crotch for both left and right sides), as well as the Foot Width, Foot Length etc. (Figure 4.20).

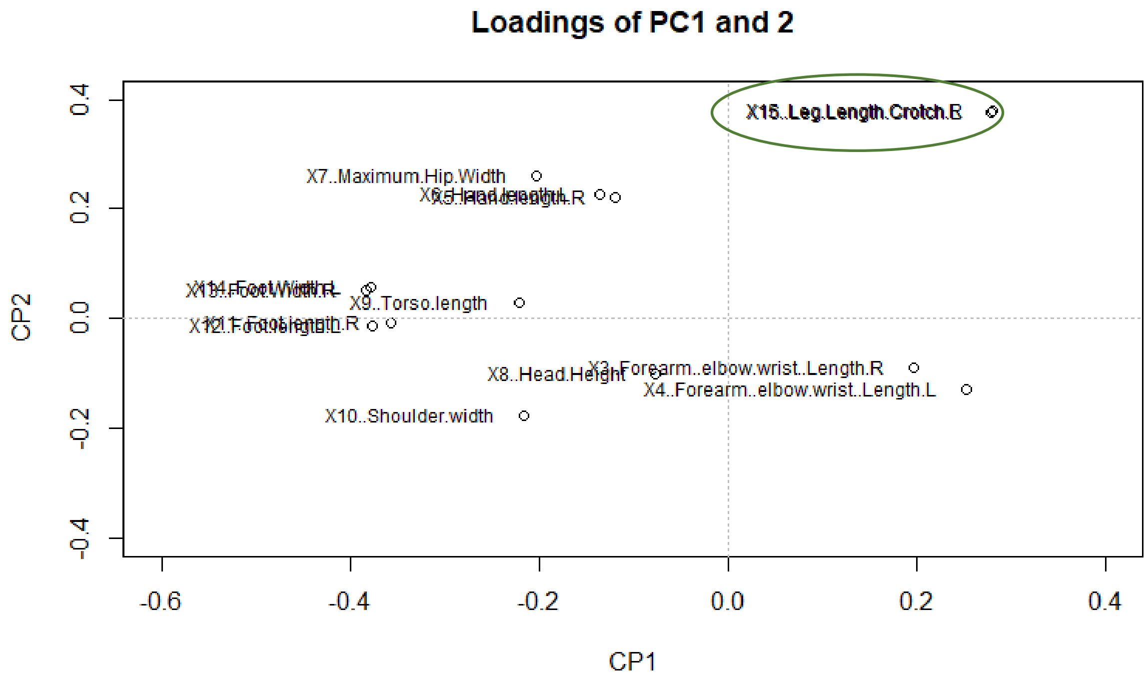


Figure 4.20 Loadings Distribution for Stance Anthropometry Model Two from Principal Component Analysis.

Next the loadings line graph (Figure 4.21) shows that within the 16 features developed (height not included as it is used to complete the ratio conversions), the top five variable features were determined. These features are: [PC1] Foot Width L; [PC2] (Shoulder –Elbow) R; [PC3] Hand Length L; [PC4] Forearm Length R; and [PC5] Torso Length.

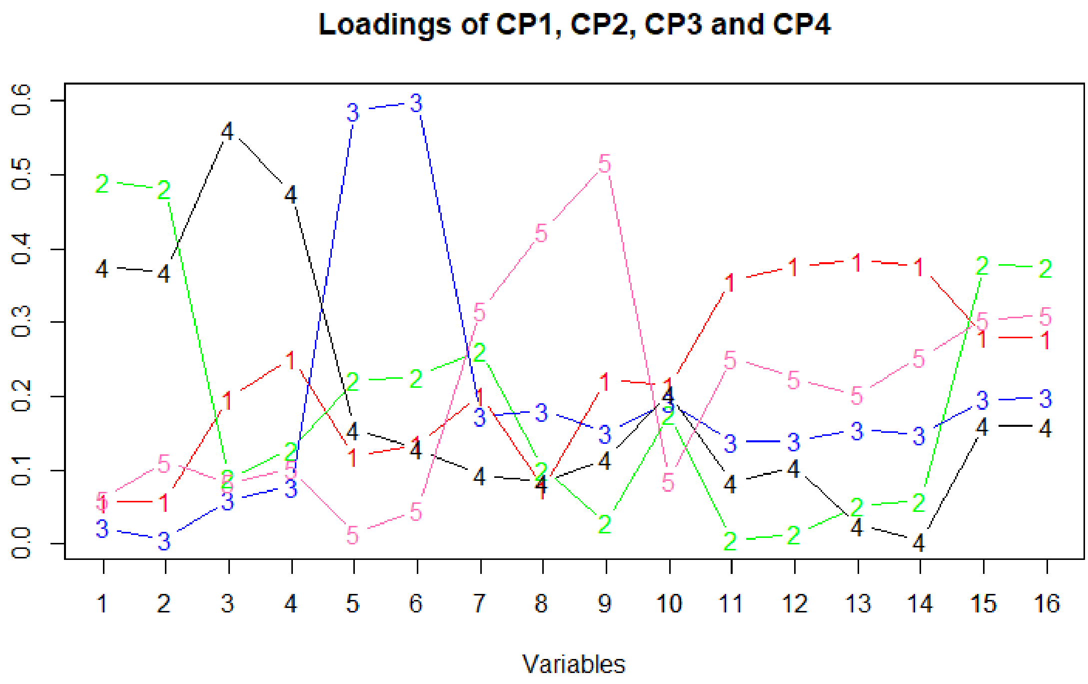


Figure 4.21 Loadings Line Graph for Stance Anthropometry from Principal Component Analysis.

Finally, for the PCA for sex (Figure 4.22), the profiles are dispersed and the points (representing the subjects) for both males (grey) and females (blue) appear to have no degree of separation, but rather mixed together. The same is observed for both Ancestry (Figure 4.23) and Age (Figure 4.24), where the subpopulation have no degree of separation from one another. For Figure 4.23, the purple points represent the Caucasian group, whereas yellow indicates Asian and green points denote the 'Other' category. Whereas, in Figure 4.24, the green points are age group 18 – 29, the orange are 30 – 49 and the red are 50 and above in the scatterplot.

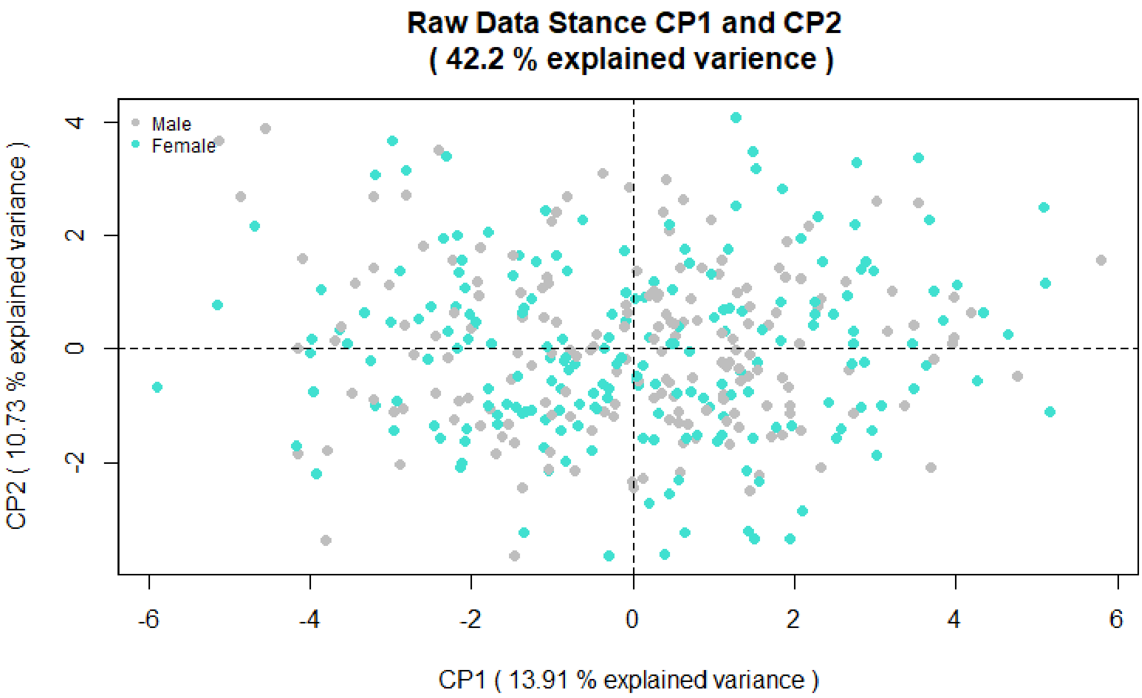


Figure 4.22 Principle Component Analysis for Stance Anthropometry, Showing Correlations of Sex.

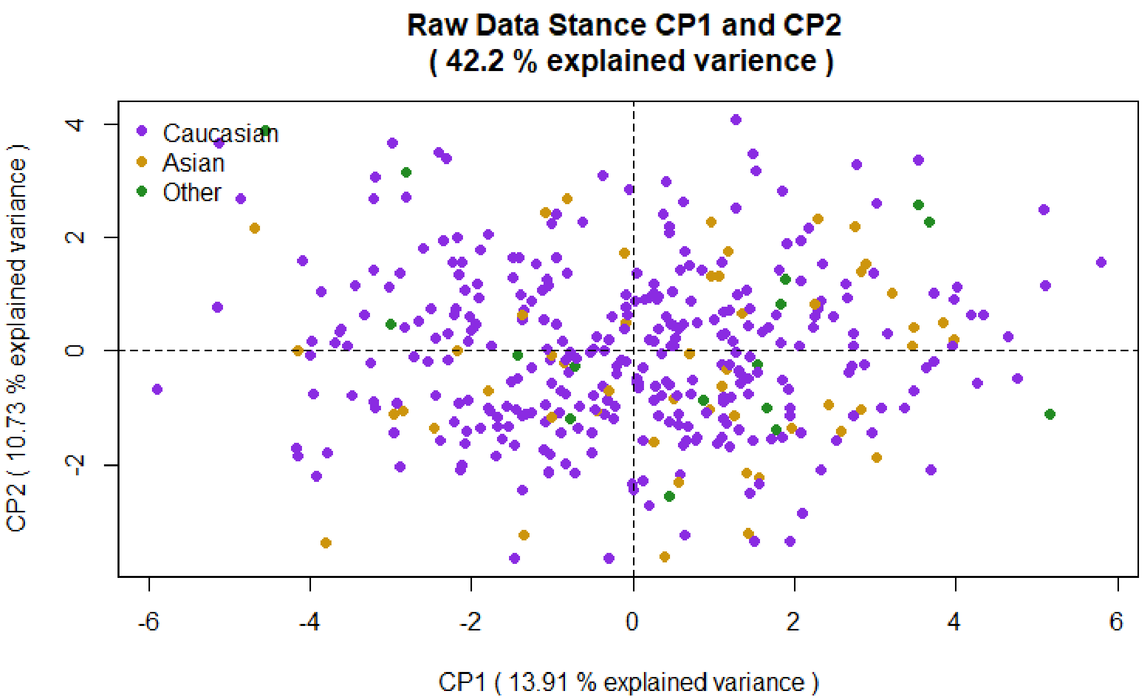


Figure 4.23 Principle Component Analysis for Stance Anthropometry, Showing Correlations of Ancestry.

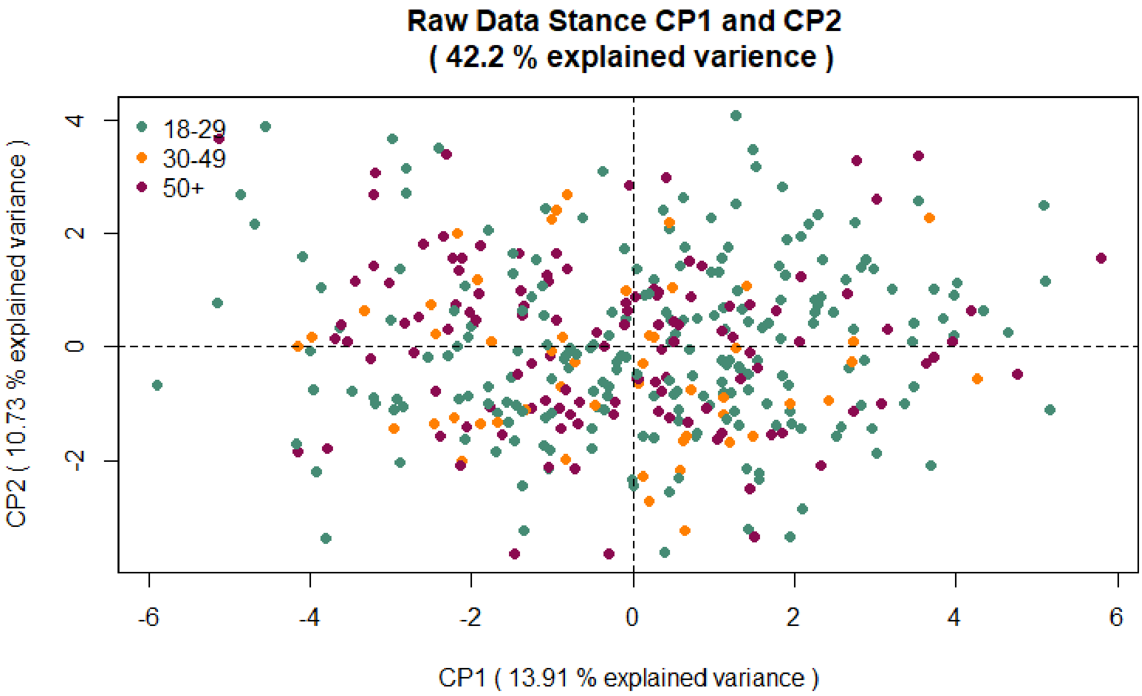


Figure 4.24 Principle Component Analysis for Stance Anthropometry, Showing Correlations of Age.

4.4.5.2 Variances between Photoshop and GIMP

Measurements were completed for the same subject on DSLR footage across two different platforms: Photoshop and GIMP. Following the measurements from Photoshop (centimetres), measurements on GIMP (centimetres, pixels, inches) were completed and documented in raw measurements (Figure 4.25), and then converted to a measurement to height ratio (Figure 4.26). The hand length and foot width were left empty as they were not assessable from the CCTV footage, and for consistency, left blank. From this, both platforms and measurements index were observed to have identical results, or minor variances between them, which can be attributed to human error between measurements. Therefore, the platform and the index are irrelevant when completing the measurements as they are later converted to the ratio.

Subject	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand Length R	6. Hand Length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot width R	14. Foot width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
021F Reference Photoshop	2.81	2.88	2.07	1.98			3.86	2.01	4.5	3.51	2.36	2.35			7.75	7.74	15.85
021F Reference GIMP cm	2.81	2.879	2.07	1.98			3.83	2.01	4.54	3.51	2.35	2.34			7.75	7.75	15.858
021F Reference GIMP pxl	332	340.1	243.6	232.8			454	237	537	416	276	278			915	913	1873
021F Reference GIMP inches	1.107	1.133	0.816	0.776			1.517	0.793	1.79	1.38	0.933	0.927			3.047	3.047	6.253

Figure 4.25 Raw Measurements for Subject 021F on Photoshop (centimetre) and GIMP (Centimetre, Pixel, Inches).

Subject	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand Length R	6. Hand Length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot width R	14. Foot width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
021F Reference Photoshop	0.177287	0.181703	0.130599	0.130599			0.243533	0.126814	0.283912	0.221451	0.148896	0.148265			0.488959	0.488328	1
021F Reference GIMP cm	0.177198	0.181549	0.130533	0.130533			0.241518	0.12675	0.286291	0.221339	0.14819	0.14756			0.488712	0.488712	1
021F Reference GIMP pxl	0.177256	0.18158	0.130059	0.130059			0.242392	0.126535	0.286706	0.222104	0.147357	0.148425			0.488521	0.487453	1
021F Reference GIMP inches	0.177035	0.181193	0.130497	0.130497			0.242604	0.126819	0.286263	0.220694	0.149208	0.148249			0.487286	0.487286	1

Figure 4.26 Measurement to Height Ratio Conversions for Subject 021F on Photoshop (centimetre) and GIMP (Centimetre, Pixel, Inches).

4.4.5.3 Likelihood Ratio for Stance Anthropometry

The evaluation of the strength of evidence for model two stance anthropometry was completed, where histograms were generated with the intra-variability and inter-variability curves from the height-ratio data. Firstly, it can be observed that the inter-variability curves were consistently very close to the bars of the histograms (Appendix H.2), whereas the intra-variability were peaked significantly higher. A total of four graphs (Hand Length [Left and Right], and Foot Width [Left and Right]) did not contain intra-variability curves due to the inability to extract that information from the CCTV trace.

A final LR table was completed through the R software which contained all data including intra-variability, inter-variability, repeatability tests, and feature-to-height ratio profiles for all individuals. This can be observed in Table 4.12. The highest values were for 'Shoulder – Elbow Length R', 'Foot Length L' and 'Leg Length – Crotch R', while the lowest was 'Head Height'.

Table 4.12 Likelihood Ratio Scores from R Studio.

Feature	LR
1. Shoulder – Elbow Length R	10
2. Shoulder – Elbow Length L	3.34
3. Forearm (elbow-wrist) Length R	1.59E-20
4. Forearm (elbow-wrist) Length L	2.88E-20
5. Hand Length R	*NA*
6. Hand Length L	*NA*
7. Maximum Hip Width	1.08E-07
8. Head Height	1.82E-85
9. Torso length	1.88
10. Shoulder width	5.62E-21
11. Foot length R	1.64E-18
12. Foot length L	13.8
13. Foot width R	*NA*
14. Foot width L	*NA*
15. Leg Length-Crotch R	9.52
16. Leg Length-Crotch L	7.44E-12

4.4.5.3.1 Hd True Tests

For proof of concept of the model and to test the performance, Hd true tests were completed. The true donor (025M) was identified within the codes and then the trace was compared to the whole given data population. Likelihood Ratio values were produced and can be found in Appendix H.3. A snippet from this table was extracted (Figure 4.27), showing very low values within each feature. Some features within some individuals contained a higher LR value and this is expected and is consequential to chance. Overall, aside from the 'one-off' features containing a high LR value, this Hd true test expresses a good performance of the model.

	Subject	Sex	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand Length R	6. Hand Length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot width R	14. Foot width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L
new.HdTest	003Fc	Female	3.6782937	2.28E-14	3.90383	0.041001	NA	NA	2.59E-26	5.27E-31	1.67E-47	0.0040282	8.08E-122	1.92E-53	NA	NA	4.96E-157	2.41E-152
new.HdTest	015F	Female	0.5931606	1.3034082	1.54E-26	1.84E-15	NA	NA	8.64E-12	1.68E-60	6.59E-14	1.48E-14	1.15E-177	7.01E-106	NA	NA	6.76E-07	3.1249828
new.HdTest	016Fc	Female	1.35E-06	5.2281596	2.55E-06	3.57E-09	NA	NA	9.711983	4.68E-66	8.05E-05	0.0365095	6.10E-145	4.09E-117	NA	NA	1.17E-32	3.27E-07
new.HdTest	017F	Female	3.85E-17	1.00E-17	1.36E-48	1.09E-53	NA	NA	1.85E-45	8.64E-105	2.23E-40	1.39E-11	9.94E-195	1.28E-123	NA	NA	3.54E-10	10.692583
new.HdTest	019F	Female	0.0108029	4.37E-09	1.12E-45	1.08E-43	NA	NA	9.41E-193	6.61E-58	3.89E-11	1.32E-06	1.11E-227	1.33E-61	NA	NA	9.89E-57	1.05E-17
new.HdTest	004F	Female	3.2243486	0.0005874	3.19E-20	1.99E-22	NA	NA	2.23E-43	2.79E-107	0.6247128	1.24E-31	2.59E-152	3.21E-78	NA	NA	3.40E-90	9.67E-55
new.HdTest	006F	Female	1.25E-08	0.0262081	6.54E-22	5.70E-12	NA	NA	8.17E-21	4.13E-131	2.43E-06	6.55E-18	2.26E-213	2.21E-128	NA	NA	2.16E-74	4.12E-28
new.HdTest	009F	Female	0.0688643	5.1396467	1.67E-35	3.43E-37	NA	NA	6.31E-131	1.01E-101	0.0001432	9.37E-39	2.05E-188	1.69E-72	NA	NA	2.58E-65	1.99E-30
new.HdTest	021F	Female	1.25E-11	1.1034327	2.42E-32	4.22E-36	NA	NA	1.35E-34	2.71E-139	0.2263508	5.47E-08	8.83E-120	3.51E-56	NA	NA	2.96E-111	4.15E-65
new.HdTest	024Fc	Female	4.238799	2.26E-05	1.84E-17	3.59E-14	NA	NA	11.70742	4.85E-115	0.0649131	1.34E-69	3.15E-96	7.65E-41	NA	NA	1.01E-23	0.1830287
new.HdTest	025Fc	Female	1.6563427	1.09E-07	2.34E-30	1.77E-27	NA	NA	6.86E-16	2.67E-110	1.2766866	3.65E-45	3.16E-262	5.42E-156	NA	NA	8.27E-31	0.0015784
new.HdTest	032F	Female	1.452943	0.224178	5.09E-34	4.49E-26	NA	NA	0.073987	8.69E-93	0.0552894	8.11E-12	1.17E-212	8.01E-109	NA	NA	4.54E-36	2.00E-06
new.HdTest	033F	Female	0.0047195	0.0019928	6.85E-52	1.47E-31	NA	NA	1.58E-21	4.78E-94	1.4463306	3.34E-20	2.45E-213	3.81E-109	NA	NA	4.46E-34	1.21E-06

Figure 4.27 Snippet of Hd True Test Likelihood Ratio Results.

Additionally, the proportion (greater than one) tests were completed, which are descriptive statistics and act as error studies. These tests ideally are expected to be closer to zero. As seen from Table 4.13, all these values are closer to zero, which is indicative of minimal error. The maximum provides an idea of the misleading LRs and provides the maximum value from the data available. Finally, the average provides an average of all the data, and it is expected that these values are closer to one. The only 'average' value from this table that is not closer to one, is 'forearm length L', which indicates high levels of error. These values allow observation into the performance of the model and indicate that the model worked well overall.

Table 4.13 Hd True Test Proportion Tests, Maximum Misleading Values and Average of Data.

Hd Test	**Value**
Proportion Greater than 1 (Shoulder – Elbow Length R)	0.1465969
Maximum (Shoulder – Elbow Length R)	10.27566
Average (Shoulder – Elbow Length R)	0.8438875
Proportion Greater than 1 (Shoulder – Elbow Length L)	0.2513089
Maximum (Shoulder – Elbow Length L)	5.717122
Average (Shoulder – Elbow Length L)	0.956771
Proportion Greater than 1 (Forearm Length R)	0.0104712
Maximum (Forearm Length R)	187.278
Average (Forearm Length R)	0.8716879
Proportion Greater than 1 (Forearm Length L)	0.002617801
Maximum (Forearm Length L)	29.62493
Average (Forearm Length L)	0.07955268
Proportion Greater than 1 (Hand Length R)	NA
Maximum (Hand Length R)	NA
Average (Hand Length R)	NA
Proportion Greater than 1 (Hand Length L)	NA
Maximum (Hand Length L)	NA
Average (Hand Length L)	NA
Proportion Greater than 1 (Maximum Hip Width)	0.1989529
Maximum (Maximum Hip Width)	11.84015
Average (Maximum Hip Width)	1.491412
Proportion Greater than 1 (Head Height)	0.002617801
Maximum (Head Height)	606.7399
Average (Head Height)	1.590626
Proportion Greater than 1 (Torso Length)	0.1753927
Maximum (Torso Length)	8.067696
Average (Torso Length)	0.9680796
Proportion Greater than 1 (Shoulder Width)	0.1858639
Maximum (Shoulder Width)	6.78034
Average (Shoulder Width)	0.7288974
Proportion Greater than 1 (Foot Length R)	0.02879581
Maximum (Foot Length R)	71.74055
Average (Foot Length R)	0.767787
Proportion Greater than 1 (Foot Length L)	0.1073298
Maximum (Foot Length L)	15.43577
Average (Foot Length L)	0.8679633
Proportion Greater than 1 (Foot width R)	NA
Maximum (Foot width R)	NA
Average (Foot width R)	NA
Proportion Greater than 1 (Foot width L)	NA
Maximum (Foot width L)	NA
Average (Foot width L)	NA
Proportion Greater than 1 (Leg Length-Crotch R)	0.1701571
Maximum (Leg Length-Crotch R)	10.11992

Average (Leg Length-Crotch R)	0.9541848
Proportion Greater than 1 (Leg Length-Crotch L)	0.1518325
Maximum (Leg Length-Crotch L)	10.69258
Average (Leg Length-Crotch L)	0.8806002

4.4.5.3.2 Hp True Tests

Next, the Hp tests were completed through assessing 17 'non-donors' where the performance of the model was once again evaluated with misleading profiles. The LR scores were produced for each feature, per 'non-donor' which can be observed in Table 4.14. Although some features within the 'non-donors' contained a high LR values, primarily very low LR values were observed, which was expected.

Next, the Hp proportions (less than 1) tests were completed and can be observed in Table 4.15, where the values for all 17 'non-donors' are scored with a '0' or '1'. The '1' indicates a 100% error, whereas the '0' shows a 0% error. As the values are all relatively seen as '1', this shows errors within the 'non-donors' comparison, which was not the expected outcome of the test. A 0% error was expected to be seen more frequently, and this could be a result of the camera angles. Finally, the min (as numeric) (Table 4.16) provides an idea of the misleading LRs and provides the minimum value from the data available. However, Maximum Hip Width performed relatively well, indicating that the width measurements perform better in higher situated cameras. These tests provide insight into the performance of the model.

Table 4.14 Hp True Tests that Produced Likelihood Ratio Scores for all 17 'Non-donors'.

Hp True Test	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand Length R	6. Hand Length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot width R	14. Foot width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L
Case 1	5.379033969	1.406024691	4.37E-21	8.179928059	NA	NA	3.05E-14	8.06E-52	8.21E-09	2.43E-10	5.92E-14	1.14E-12	NA	NA	1.09E-45	7.11E-46
Case 2	0.012793644	0.001832649	3.49E-19	0.001917388	NA	NA	1.73E-05	1.89E-27	1.14E-07	1.65E-19	4.51E-20	0.0827403	NA	NA	7.45E-42	3.25E-44
Case 3	0.013171681	1.21E-14	0.004134175	0.006148141	NA	NA	10.47724416	1.49E-48	0.035004611	9.65E-09	0.0752535	11.22098	NA	NA	1.21E-09	0.00026
Case 4	1.017201923	7.258438387	1.801273444	3.07572688	NA	NA	0.002238935	4.48E-29	0.023393548	3.15E-17	1.85E-44	26.075068	NA	NA	3.34E-19	4.09E-08
Case 5	8.80E-07	0.000100069	1.44E-07	4.11971869	NA	NA	8.560434828	4.37E-56	5.60E-09	2.20E-19	6.82E-86	6.26E-19	NA	NA	7.82E-48	8.17E-34
Case 6	0.000619279	0.389914826	0.000713395	9.03E-20	NA	NA	6.010037645	6.09E-57	0.289398114	1.52E-15	3.05E-115	2.53E-29	NA	NA	3.75E-05	0.000174
Case 7	3.34123606	9.95E-10	0.007450889	5.735679183	NA	NA	0.000160766	5.16E-60	0.829134307	0.151584	5.71E-32	8.8531353	NA	NA	0.88486	0.01489
Case 8	0.004836221	25.08313911	5.240445847	0.00583076	NA	NA	10.23106509	1.32E-35	1.01E-20	1.73E-14	1.64E-24	62.261229	NA	NA	3.15E-15	0.002416
Case 9	2.49E-25	3.52E-15	2.76E-06	4.177138118	NA	NA	0.000524397	7.04E-71	8.03E-05	1.31E-09	2.52E-13	4.6574279	NA	NA	6.084086	7.419681
Case 10	4.45351134	9.31E-22	0.007634896	3.188778385	NA	NA	2.41E-08	4.52E-101	0.006789985	7.68E-24	5.54E-71	6.49E-27	NA	NA	1.22E-10	0.413802
Case 11	1.766633079	1.743319661	0.04492323	22.02691902	NA	NA	7.179845227	1.52E-105	0.301376757	4.03E-12	7.88E-31	8.90E-07	NA	NA	9.18E-07	5.32E-08
Case 12	0.008714058	3.83E-25	0.112954282	1.06E-07	NA	NA	5.50777059	1.53E-166	3.04E-13	4.642879	2.16E-99	6.61E-22	NA	NA	4.76E-74	1.15E-44
Case 13	1.03E-34	5.32E-44	3.813077947	0.073067002	NA	NA	10.25489889	1.31E-60	8.24E-12	3.90E-13	4.37E-41	3.60E-43	NA	NA	1.87E-16	8.83E-17
Case 14	0.000159962	1.86E-05	2.738691312	0.440852968	NA	NA	0.144166685	2.05E-80	2.20E-18	2.40E-49	8.72E-96	1.22E-137	NA	NA	7.538824	2.207084
Case 15	7.83E-14	6.70E-56	0.001890765	0.027202448	NA	NA	0.017560875	1.87E-31	0.011363318	2.21E-11	1.02E-210	8.96E-07	NA	NA	0.000105	3.20E-14
Case 16	3.61E-05	1.68E-07	3.02E-05	0.004624009	NA	NA	2.05E-05	8.06E-105	5.857366751	3.66E-29	2.93E-87	4.55E-35	NA	NA	4.03E-77	1.65E-104
Case 17	0.000430598	11.08083931	1.56E-29	0.006582616	NA	NA	8.475524485	6.71E-75	1.41E-39	4.16E-24	1.23E-81	1.21E-78	NA	NA	3.97E-147	7.95E-140

Table 4.15 Hp True Proportion Tests

	Proportion Less than 1 (Shoulder – Elbow Length R)	Proportion Less than 1 (Shoulder – Elbow Length L)	Proportion Less than 1 (Forearm Length R)	Proportion Less than 1 (Forearm Length L)	Proportion Less than 1 (Hand Length R)	Proportion Less than 1 (Hand Length L)	Proportion Less than 1 (Maximum Hip Width)	Proportion Less than 1 (Head Height)	Proportion Less than 1 (Torso Length)	Proportion Less than 1 (Shoulder Width)	Proportion Less than 1 (Foot Length R)	Proportion Less than 1 (Foot Length L)	Proportion Less than 1 (Foot Width R)	Proportion Less than 1 (Foot Width L)	Proportion Less than 1 (Leg Length- Crotch R)	Proportion Less than 1 (Leg Length- Crotch L)
Hp1	0	0	1	0	NA	NA	1	1	1	1	1	1	NA	NA	1	1
Hp2	1	1	1	1	NA	NA	1	1	1	1	1	1	NA	NA	1	1
Hp3	1	1	1	1	NA	NA	0	1	1	1	1	0	NA	NA	1	1
Hp4	0	0	0	0	NA	NA	1	1	1	1	1	0	NA	NA	1	1
Hp5	1	1	1	0	NA	NA	0	1	1	1	1	1	NA	NA	1	1
Hp6	1	1	1	1	NA	NA	0	1	1	1	1	1	NA	NA	1	1
Hp7	0	1	1	0	NA	NA	1	1	1	1	1	0	NA	NA	1	1
Hp8	1	0	0	1	NA	NA	0	1	1	1	1	0	NA	NA	1	1
Hp9	1	1	1	0	NA	NA	1	1	1	1	1	0	NA	NA	0	0
Hp10	0	1	1	0	NA	NA	1	1	1	1	1	1	NA	NA	1	1
Hp11	0	0	1	0	NA	NA	0	1	1	1	1	1	NA	NA	1	1
Hp12	1	1	1	1	NA	NA	0	1	1	0	1	1	NA	NA	1	1
Hp13	1	1	0	1	NA	NA	0	1	1	1	1	1	NA	NA	1	1
Hp14	1	1	0	1	NA	NA	1	1	1	1	1	1	NA	NA	0	0
Hp15	1	1	1	1	NA	NA	1	1	1	1	1	1	NA	NA	1	1
Hp16	1	1	1	1	NA	NA	1	1	0	1	1	1	NA	NA	1	1
Hp17	1	0	1	1	NA	NA	0	1	1	1	1	1	NA	NA	1	1

Table 4.16 Hp True Minimum Tests Showing Misleading Values.

	Minimum (Shoulder – Elbow Length R)	Minimum (Shoulder – Elbow Length L)	Minimum (Forearm Length R)	Minimum (Forearm Length L)	Minimum (Hand Length R)	Minimum (Hand Length L)	Minimum (Maximum Hip Width)	Minimum (Head Height)	Minimum (Torso Length)	Minimum (Shoulder Width)	Minimum (Foot Length R)	Minimum (Foot Length L)	Minimum (Foot Width R)	Minimum (Foot Width L)	Minimum (Leg Length- Crotch R)	Minimum (Leg Length- Crotch L)
Hp1	5.379034	1.406025	4.37E-21	8.179928	NA	NA	3.05E-14	8.06E-52	8.21E-09	2.43E-10	5.92E-14	1.14E-12	NA	NA	1.09E-45	7.11E-46
Hp2	0.012794	0.001833	3.49E-19	0.001917	NA	NA	1.73E-05	1.89E-27	1.14E-07	1.65E-19	4.51E-20	0.0827403	NA	NA	7.45E-42	3.25E-44
Hp3	0.013172	1.21E-14	0.0041342	0.006148	NA	NA	10.47724	1.49E-48	0.035005	9.65E-09	0.0752535	11.22098	NA	NA	1.21E-09	0.00026
Hp4	1.017202	7.258438	1.801273	3.075727	NA	NA	0.002239	4.48E-29	0.023394	3.15E-17	1.85E-44	26.07507	NA	NA	3.34E-19	4.09E-08
Hp5	8.80E-07	0.0001	1.44E-07	4.119719	NA	NA	8.560435	4.37E-56	5.60E-09	2.20E-19	6.82E-86	6.26E-19	NA	NA	7.82E-48	8.17E-34
Hp6	0.000619	0.389915	0.0007134	9.03E-20	NA	NA	6.010038	6.09E-57	0.289398	1.52E-15	3.05E-115	2.53E-29	NA	NA	3.75E-05	0.000174
Hp7	3.341236	9.95E-10	0.0074509	5.735679	NA	NA	0.000161	5.16E-60	0.829134	0.151584	5.71E-32	8.853135	NA	NA	0.88486	0.01489
Hp8	0.004836	25.08314	5.240446	0.005831	NA	NA	10.23107	1.32E-35	1.01E-20	1.73E-14	1.64E-24	62.26123	NA	NA	3.15E-15	0.002416
Hp9	2.49E-25	3.52E-15	2.76E-06	4.177138	NA	NA	0.000524	7.04E-71	8.03E-05	1.31E-09	2.52E-13	4.657428	NA	NA	6.084086	7.419681
Hp10	4.453511	9.31E-22	0.0076349	3.188778	NA	NA	2.41E-08	4.52E-101	0.00679	7.68E-24	5.54E-71	6.49E-27	NA	NA	1.22E-10	0.413802
Hp11	1.766633	1.74332	0.0449232	22.02692	NA	NA	7.179845	1.52E-105	0.301377	4.03E-12	7.88E-31	8.90E-07	NA	NA	9.18E-07	5.32E-08
Hp12	0.008714	3.83E-25	0.1129543	1.06E-07	NA	NA	5.507771	1.53E-166	3.04E-13	4.642879	2.16E-99	6.61E-22	NA	NA	4.76E-74	1.15E-44
Hp13	1.03E-34	5.32E-44	3.813078	0.073067	NA	NA	10.2549	1.31E-60	8.24E-12	3.90E-13	4.37E-41	3.60E-43	NA	NA	1.87E-16	8.83E-17
Hp14	0.00016	1.86E-05	2.738691	0.440853	NA	NA	0.144167	2.05E-80	2.20E-18	2.40E-49	8.72E-96	1.22E-137	NA	NA	7.538824	2.207084
Hp15	7.83E-14	6.70E-56	0.0018908	0.027202	NA	NA	0.017561	1.87E-31	0.011363	2.21E-11	1.02E-210	8.96E-07	NA	NA	0.000105	3.20E-14
Hp16	3.61E-05	1.68E-07	3.02E-05	0.004624	NA	NA	2.05E-05	8.06E-105	5.857367	3.66E-29	2.93E-87	4.55E-35	NA	NA	4.03E-77	1.65E-104
Hp17	0.000431	11.08084	1.56E-29	0.006583	NA	NA	8.475524	6.71E-75	1.41E-39	4.16E-24	1.23E-81	1.21E-78	NA	NA	3.97E-147	7.95E-140

4.5 Discussion

4.5.1 Likelihood Ratios: Morphology and Anthropometry (Model One)

The development of LR methods involves a combination of roles, where the first role spotlights the development of forensic methodology, where forensic practitioners devise solutions (Meuwly *et al.*, 2016). Following this, the second role concentrates on further development, and successive validation of the new methods/solutions devised (*ibid*). A group of experts including forensic practitioners, statisticians and engineers establish new (or adapt existing) technologies for forensic evidence evaluation (*ibid*). And finally, the third role is the evaluation of forensic evidence in practice (*ibid*). Therefore, the development, and the consequent application of the developed methods were imperative for the furtherance of forensic gait analysis, so that the strength of evidence could be evaluated.

The likelihood ratio results for the morphological component showed higher scores than those compared to anthropometry model one. However, these scores need to be further researched and tested in future studies for validity. The final LR scores for morphology were in the millions (the highest being 34 million), whereas the highest score for anthropometry was 0.008. As the trace and reference compared were known to be from the same source, producing a low score may have been the result of multiple factors. This includes the distortions and artefacts involved within the CCTV camera and the differences between the trace and reference footage quality (CCTV and DSLR). Another factor may have been the threshold for the dichotomous conversion categories for anthropometry. These categories are already set for morphological analyses but were generated for anthropometry. To overcome this, possible distribution graphs to trial the most correct threshold can be completed. As the trace and reference material were known to be from the same source, the anthropometry results indicated that the model could be reassessed and further trialled, which led to the development of anthropometry model two. A few points have come to light from these results:

1. The dependent and independent models need to have extensive trialling over a large-scale study. This should include a few thousand volunteers initially, increasing over time. Although one method (distribution graphs) was assessed within this study to separate those features into dependent and independent features, further studies into feature 'families' and using a various combination of features for dependency with various methods need to be trialled for efficiency. A total of 9 independent, and 4 dependent features for stance anthropometry were observed within the first model,

whereas, for gait anthropometry, 12 independent, and 7 dependent features were observed. For stance morphology, 18 independent features were seen, and 13 dependent features, while for gait morphology, 21 independent, and 16 dependent features were observed. Given that the numerical values within the LR score were very high for the morphological component, and very low for the anthropometric, the method requires further calibration, and testing of independence between the features selected to compute the probative value.

2. The variances in features observed between the reference and the trace (such as outward placement of the feet rather than inward placement of the feet) are resultant from natural gait, a result of anatomy and physiology. As an example of this, cues such as direction of stance, other noises outside the camera frame etc. can alter the directional head level or tilt. Therefore, as a suggestion, the measurements for the trace and reference materials should be repeated three times for each footage and, potentially, the average kept as the final value for analysis. Furthermore, repeating the analysis for different frames in another study can view the variances within a single frame.
3. The category placement of the proportional indices also requires further analyses in a large-scale study. This should include a few thousand volunteers initially, increasing over time, where possibly the results for each feature could possibly be placed in a distribution graph and the categories selected and trialled through this process, to improve the reliability and validity of the results.
4. The CCTV camera placement when compared to the standardised DSLR cameras provided skewed results, and in turn, they altered the proportional indices measured within each individual analysed. This led to stunted lower limbs, and longer upper body proportions. One way to combat this is through future research, particularly aiming to mimic trace footage with a subsequent reference footage. This reference camera will be placed at the same height of the CCTV camera, tilting down at the same angle. This can be used to assess and trial a magnitude of different cameras. Further, it is recognised that all distortion and artefacts are most probably not of equal significance, however, the detailed analysis of these are beyond the scope of this research project and should be undertaken in future work.

Ultimately, the methods applied to develop a statistical inference framework for gait analysis and assess the strength of evidence from the footage were successfully applied to the data. Given that the trace and reference material was known to come from the same source, the morphological component produced high LR scores, whereas, the anthropometry component produced low LR scores. To observe whether it was an issue with the current anthropometry model, a second model was proposed and was trialled. Further, to view whether the anthropometry results were valid, Hd/Hp true tests were completed for proof of concept and to view the performance of the model. The dependency/independency of features need to be further trialled to provide the most accurate strength of evidence.

4.5.2 Likelihood Ratios: Anthropometry (Model Two) and Hd/Hp True Tests

The second anthropometry model looked at the feature-to-height ratio, where the statistical analyses were generated through R Studio. Additionally, PCA analyses were completed in tandem with the LR results, where no significant correlations were made for sex, age or ancestry from the height ratios. Therefore, it is suggested that the proportional indices are valuable for correlation analyses.

The LR values were extracted from the histograms (intra-variability and inter-variability), where a line can be drawn manually to produce an LR score. The line can be drawn over any overlap of the intra-variability and inter-variability curves, therefore, additional research should be conducted at various and/or multiple points of the histogram. Moreover, the LR values (per feature) were obtained through R Studio with a combination of both high (13.8 for foot length L) and low (1.82E-85 for head height) LR scores. These values were also obtained through the histogram as shown by the *x* axis intersection of the orange line in Figure 4.6. A reason for the lower LR scores can be a resultant of the camera placement between the trace and the reference materials as above-mentioned.

For proof of concept and to test the performance of the model, both Hd true and Hp true tests were completed. The true donor for (025M) Hd tests was identified within the codes and then the trace was compared to the whole given data population. In contrast, for Hp true tests, 17 'non-donors' were assessed where the performance of the model was once again evaluated with misleading profiles (Table 4.14). Both tests performed well and the errors for the misleading profiles were made prominent within the results attained. The LRs were scored within the Hp/Hd true tests and low LR scores were acquired as expected. As Hp/Hd are conflicting hypotheses, the Hp/Hd True tests were completed, where the Hp true tests looked at proportions less than 1, in lieu of the Hp hypotheses, and Hd true tests looked at proportions greater than 1; viewing error rates of both Hp/Hd. The Hp test for proportions greater than 1, did not perform as expected, as majority of values were 100%, which can be attributed to the high placement of the CCTV camera. Another reason may be the movement of the head, which goes up and down during gait, as well as the limb motion, which may have altered the results even further. There are varying distortions that are present between different types of cameras and it was observed that the anthropometric component was affected, however the morphological component was seemingly unaffected as shown by the results. Thus, the effectiveness of the methodology is not dependant on the height on the camera.

The results obtained for the morphological and anthropometry component reinforce that the models developed to calculate the statistical inference performed well, specifically for the morphological LRs and the Hd true tests for anthropometry model two. These are observed by the high LR scores seen in morphology (approximately 34 million), and Hd true tests as observed from the proportion (greater than 1) values that were closer to 0.

4.6 Conclusion

This chapter developed calculations for evaluation of the strength of evidence for forensic gait analysis and subsequently showed its applicability in the form of a case study. The purpose of this research was to develop and test the applicability of an evaluative framework for forensic gait analysis. The components of the LR statistic was highlighted and applied to provide statistical inference for source material attained from CCTV footage. From this, features were observed to be either dependant or independent, which is of utmost importance within Bayesian statistics, as the most correct strength of evidence needs to be presented. A total of 9 and 4 independent and dependent features respectively for stance anthropometry were observed within the first model, whereas, for gait anthropometry, 12 independent, and 7 dependent features were observed. For stance morphology, 18 and 13 independent and dependent features were seen respectively, while for gait morphology, 21 independent, and 16 dependent features were observed. Features that are misclassified as dependent or independent can change the final LR score. Morphology LR calculations provided a high result, and anthropometry model one produced a low LR score. Finally, Hp/Hd true studies were completed as proof of concept and to view the performance of the model. Hd true tests performed well, as observed from the proportion (greater than 1) values that were closer to 0, indicating a low error rate. Hp true tests produced a higher error rate, and further research is imperative so that the most correct strength of evidence can be provided.

The next chapter will observe the isolated influences and the variances they present to gait and its consequent analysis, in the form of case studies.

5. CHAPTER 5: Case Studies: Assessment of Isolated Influences

5.1 Introduction

Chapter 4 involved the development of a statistical framework, and subsequent data analysis and application of the Likelihood Ratio (LR) to the given population, collected for both anthropometric and morphological data. This was applied to a ‘mock’ trace, and the associated reference to produce a final LR value. This chapter assesses features that may impact on the manner in which a person walks, including, attire, load carriage, footwear, run, and inclined surface. Each feature introduced was isolated and compared to a ‘control’ where no influences were applied. As this chapter focuses of the influences that impact gait, the stance component was not assessed. Furthermore, due to the high quality DSLR cameras the footage was assessed from, the morphological study was completed to view variations within influences from all phases and events in gait. Anthropometry was not analysed within this case study as all footage was consistent and standardised with a high quality camera.

5.2 Aims

The aim for this chapter was the examination of the robusticity of forensic gait analysis within different conditions (person, accessories, and environment), observed in forensically relevant scenarios. The examination included: [a] attire – hoodie; [b] load carriage – backpack; [c] load carriage – side bag; [d] footwear – barefoot; [e] footwear – thongs; [f] speed – run; [g] treadmill; and [h] incline.

5.3 Methods and Materials

5.3.1 Room and Equipment

A total of 32 Subjects were recruited for the ‘influences case studies’, where subjects were filmed at the UTS gymnasium in CB04. For the case studies, varying influences were introduced to view whether different conditions affected the manner in which a person walked from the morphological developed features. Each influence that was introduced to the subject was isolated and the subject was asked to walk the same designated path multiple times with a different influence each time. The underlying materials and methods were identical to those in Chapter 2, Section 2.3 and Chapter 3, Section 3.3. Each subject was asked to walk in a pre-determined path that allowed clear visibility of four views of the body (anterior, posterior, left profile and right profile).

The room layout and the walking paths can be seen in Figure 5.1. The blue arrow in Figure 5.1 shows the path walked by the subjects towards and away from the camera, recording both anterior and posterior views. The green arrow shows the left and right profile views that were recorded by the camera. This arrow was indicative of path but not the set points of the room as the ‘start/stop’ points extended past the frame of the image. Finally, the orange line indicates where the subjects stood for stance photography as well as the ‘stop’ point for anterior/posterior walk.

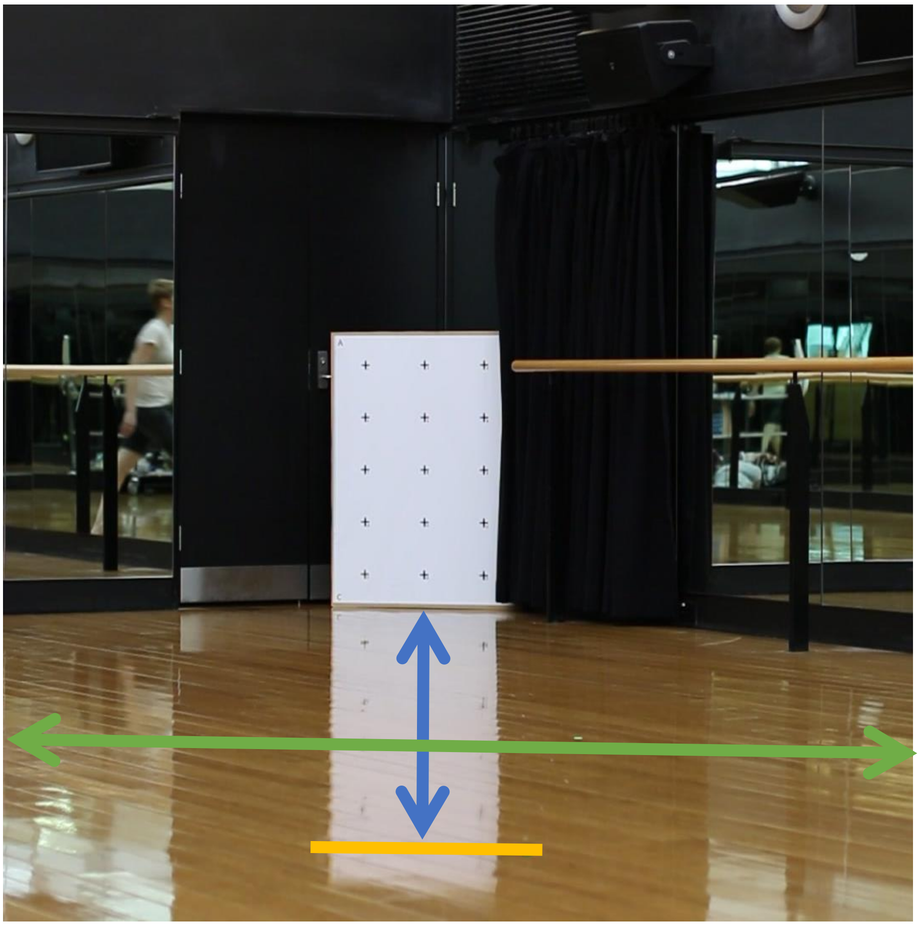


Figure 5.1 Walking Path for Case Studies: Influences. The blue arrow shows the path recording anterior/posterior, the green arrow was left and right profile views, and the orange line shows where subjects stood for stance photography.

Table 5.1 lists the attire, footwear and load carriage equipment, as well as the method undertaken for both stance and gait, however, only gait footage was used for this case study and assessed in further detail in this chapter. The steps undertaken to measure each influence and the materials associated with them are also outlined. Standardised footwear was provided to subjects for consistency (identical canvas shoes in various sizes between all subjects), however, additional footwear - thongs and barefoot, were also observed, as thongs (and the lack of shoes) can be consistently observed between both males and females. A hoodie was provided as attire, to assess any variance in analysis with 'baggy' clothing, as this is frequently observed to be worn on a trace from CCTV footage. Load carriage was assessed by the use of a backpack and side bag, each containing a 1kg weight to mimic someone carrying their personal items. Upwards incline walking was observed using a treadmill (as an outdoor surface is not always flat), where the treadmill (with no incline) was used as the 'control', followed by changing the settings on the treadmill to incline. Run was assessed by instructing participants to run, as a trace can be seen to flee the area (where the criminal activity occurred). Also, ‘standardised’ stance (where subjects in anatomical position with supinated forearms) photography was completed to simulate a possible ‘forensic procedure’, if police or other personnel were to instruct the accused to stand in a certain manner for photography.

The subject was filmed from four sides, (front, back, left and right profile views). In a crime scene, the varying capture conditions would include quarter views, but these were not tested in the project due to time restrictions, projects aims, and scope. The evaluative framework was the priority of this project. Section 6.2 future studies contains suggestions for extensions to the project aims.

Table 5.1 Case Study Equipment. The following table lists the equipment and requirements that for assessment of influences upon gait.

Influence	**Stance**	**Gait**	**Equipment**
Normal	Subjects were photographed from 4 views (anterior, posterior, left profile and right profile) in their normal attire with standardised shoes provided for them – this footage acts as the control	Subjects walked (at their comfortable pace) on designated path to capture their gait from all four views in standardised footwear while they were recorded – this footage acts as the control	White canvas male (sizes 6 – 12) and female (sizes 6 – 11)
Attire	Subjects were recorded in hoodie and repeated the photography	Subjects walked on their set path whilst wearing baggy attire (hoodie)	3 x Black Baggy Jumper
Footwear	Aside from the standardised footwear provided for subjects, they were instructed to stand barefoot and in thongs, repeating the photography process	Subjects were asked to walk barefoot, then repeated the process whilst wearing thongs	Black thongs male (sizes 6 – 12) and female (sizes 6 – 11)
Load Carriage	Subjects were instructed to stand with both backpack and side bag (containing 1kg weight) where photography was repeated	Subjects walked without any load, then the again whilst carrying a shoulder bag on their preferred side and backpack (with a 1 kg weight)	Brown Rip curl Backpack and James Beam Black/Grey side bag
Treadmill		Subjects walked on a treadmill at a pace they were most comfortable	Precor USA treadmill
Incline		Subjects walked at an incline of 3.5 percent	Precor USA treadmill
Run		Subjects were asked to run	
Standardised	Subjects were photographed in anatomical position for all four views		

5.3.2 Treadmill Speed and Load Carriage Preference

The speed of the treadmill was adjusted by the participants themselves to match a speed that they were most comfortable walking at. The aim was to capture their natural gait pattern. Once the speed was adjusted based on subject preference, it was recorded and tabulated in Table 5.2 to highlight the varying speeds most comfortable for each subject. Incline was set at 3.5% for all participants, to mimic walking up a hill for instance. Further, load carriage was tested on ground surface and the side preference of the subject indicated within Table 5.2.

Table 5.2 Subject Gait Details. The following table lists the speed set on the treadmill as well as the side preference for load carriage.

Subject	**Treadmill Speed**	**Load carriage (L/R)**
001CSF	5.0 m/s	Right
002CSM	3.5 m/s	Right
003CSM	3.5 m/s	Right
004CSM	3.5 m/s	Right
005CSF	3.5 m/s	Left
006CSM	4.0 m/s	Right
007CSM	3.5 m/s	Right
008CSM	3.5 m/s	Right
009CSM	4.0 m/s	Left
010CSM	3.5 m/s	Left
011CSF	3.1 m/s	Left
012CSM	3.5 m/s	Right
013CSF	3.0 m/s	Right
014CSM	4.0 m/s	Left
015CSM	4.0 m/s	Right
016CSF	3.5 m/s	Right
017CSM	3.5 m/s	Right
018CSF	3.7 m/s	Right
019CSF	4.0 m/s	Right
020CSM	4.2 m/s	Right
021CSF	4.0 m/s	Right
022CSF	4.3 m/s	Right
023CSF	3.5 m/s	Right
024CSM	3.7 m/s	Left
025CSF	4.0 m/s	Right
026CSF	3.0 m/s	Right
027CSF	3.5 m/s	Right
028CSM	3.0 m/s	Right
029CSM	4.0 m/s	Right
030CSF	3.0 m/s	Right
031CSF	2.5 m/s	Right
032CSF	4.5 m/s	Right

5.3.3 Data Analysis

The gait pattern without any external influences applied (referred to as the 'normal' or 'control' dataset for the purpose for this chapter) was analysed first, followed by each of the influences per participant (Figure 5.2 and 5.3). Each external influence (aside from the treadmill and incline) were filmed on the ground surface. The treadmill influences were filmed in a gymnasium and the remaining features were filmed in a dance studio. These were then placed into an Excel spreadsheet and the changes from the normal to the influences were highlighted and colour coordinated based on each influence. The features that were not seen due to obstructions were 'blanked out' in a darker colour. The colours applied are as follows [1] normal – no colour; [2] backpack – green; [3] hoodie – blue; [4] side bag – purple; [5] thongs – pink; [6] barefoot – red; [7] run – orange; [8] treadmill – yellow; and [9] incline – brown. Once the results were tabulated, Linear Discriminant Analysis was applied to the groups to view any correlations. These 'groups' were a compared with 'normal' gait, where statistical analyses were carried out on each group to observe any degree of separation between the groups. The normal gait was assessed alongside: attire (hoodie), load carriage (backpack and side bag), footwear (thongs and barefoot), speed (run) and treadmill (flat and incline).

(a) Normal *(b) Standardised* *(c) Attire* *(d) Load Carriage* *(e) Footwear*

Figure 5.2 The Application of Various Influences (a) – (e) for the Same Individual for Stance in the Dance Studio.

(a) Treadmill *(b) Incline*

Figure 5.3 The Application of Various Influences for the Same Individual for (a) Treadmill and (b) Incline Respectively in the Gymnasium.

5.3.4 Limitations

The first limitation was a result of the timetable conflicts with the gym. As the dance studio (where participants were filmed) was a shared space, booking was limited as students also required time for their rehearsals. Furthermore, no stickers were allowed to be placed on the ground to mark out the walking pathway, therefore improvised materials were placed to guide subjects to their 'start' and 'stop' points, as well as placement of the camera tripod. This may potentially have led to some non-quantifiable variation.

Another limitation was the ongoing renovations of the gym within the timeframe permitted for filming. The results for treadmill and treadmill incline are incomplete as the left profile and posterior views were not filmed due to restrictions of the room, equipment obstacles (Figure 5.4), and the renovations. Therefore, it is recommended that once data is collected for both posterior and incline, that a full analysis be conducted.

Another limitation encountered was the loud music playing from time to time in adjoining rooms. Studies by Nutley (2008) have found that music impacts the manner in which a person walks. Therefore, further studies to observe any changes between walks would be necessary.

The final limitation was faced during data analysis where, as a result of the application of the various influences, it was not always possible to observe all anatomical elements. To highlight this, these boxes were left empty in the spreadsheet, with a darker shade of the allocated colour for that particular category used to highlight data gaps.

(a) No obstruction *(b) Obstruction*

Figure 5.4 Obstruction by Gym Equipment. The legs of subject 013CSF was seen with (a) no obstruction; whereas subject 026CSF was seen with (obstruction).

5.4 Results

This section outlines the results obtained for the ‘influences upon gait’ case studies whereby following the recruitment of subjects, development of the morphometric manual, and repeatability studies outlined in Chapter 2, the influences were evaluated through observational analyses initially, followed by LDA.

5.4.1 Observational Analyses

As the analyses were being completed, comparison between the normal assessment and influence image were made such that the changes could be closely monitored and highlighted (colour). Those that were not visible were blanked out and coloured darker. The following sections provide an observational analysis for each of the influences applied to a subject.

5.4.1.1 Normal

Individuals are observed to posses minor or major variances to one another for the same features that are not necessarily pathological. This relaxed manner of walking is known as ‘normal’ gait, which was considered to be the ‘control’ for this comparison.

Firstly, the analysis of the ‘control’ was completed as observed in Figure 5.5, where no alterations were applied. This Excel sheet represents the foundation for the subsequent sections.

Subject	Sex	Influence	3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat? Placement of Fo	6. Lat? Placement of Fo	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement o	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16. Finger Flexion Right	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement o	23. Lateral Placement o	24. Lateral Placement o	25. Lateral Placement o	26. Level of knee Flexio	27. Level of knee Flexio	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Upp	2. lat placement of Upp	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexion	10. Level of knee Flexio	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	NORM	3	3	2	3	4	4	2	1	1	1	1	1	1	1	4	4	2	1	1	1	3	3	3	3	2	3	3	2	2	1	1	2	3	2	1	1	1	3	1	3	3	2	2	2	2	1	2	3	2	2	2	3	3	1	1
002CSM	Male	NORM	1	2	1	2	3	3	2	1	1	1	1	1	1	1	3	3	2	1	1	1	3	4	4	2	2	2	1	1	1	1	1	2	2	1	1	1	1	1	1	2	3	2	2	2	2	1	1	2	2	2	2	3	3	1	1
003CSM	Male	NORM	2	1	1	1	4	3	2	1	1	1	2	1	1	1	3	4	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	3	2	1	1	1	1	1	1	2	2	2	2	3	2	1	1	1	1	1	1	3	3	1	1
004CSM	Male	NORM	3	3	3	3	2	2	2	2	1	1	2	1	1	1	4	4	2	2	1	1	1	2	2	1	3	2	1	3	3	3	3	3	3	2	2	1	1	1	1	2	2	2	2	2	2	1	2	2	2	2	2	3	3	2	2
005CSF	Female	NORM	3	3	3	3	1	1	2	3	1	1	1	2	1	2	3	3	1	2	1	1	2	4	4	1	2	1	1	3	2	2	1	2	2	2	2	1	1	2	1	3	3	3	3	1	2	2	2	3	3	3	2	3	3	1	2
006CSM	Male	NORM	1	1	1	1	1	2	2	2	1	1	3	1	3	1	2	3	2	1	1	1	2	2	2	2	3	2	2	3	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1	3	3	1	1
007CSM	Male	NORM	2	2	1	1	1	1	2	2	2	2	1	1	1	1	3	3	1	1	2	1	2	3	3	1	3	3	3	2	3	1	2	2	2	1	1	2	2	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	1	1
008CSM	Male	NORM	1	1	1	1	2	3	2	2	1	1	1	1	1	1	2	3	1	1	1	1	2	2	2	1	3	2	2	1	1	1	1	3	3	2	2	1	1	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	2	1
009CSM	Male	NORM	2	2	2	2	2	2	1	1	1	2	1	1	1	1	2	2	1	1	1	2	2	2	2	3	3	1	1	2	2	1	1	3	3	1	1	1	2	1	1	2	2	2	2	3	3	1	1	2	2	2	2	3	3	1	1
010CSM	Male	NORM	2	2	2	2	3	2	1	2	1	1	1	1	1	1	3	3	1	2	1	1	1	3	3	2	1	2	2	3	2	2	2	4	4	1	2	1	1	1	1	3	3	2	2	3	2	2	2	3	3	2	2	3	3	2	2
011CSF	Female	NORM	3	3	3	3	1	1	3	3	1	1	1	1	1	1	2	3	2	2	1	1	2	2	2	2	2	2	2	1	2	1	1	2	2	2	2	1	1	2	1	2	2	2	2	2	1	2	3	2	2	2	2	3	3	1	1
012CSM	Male	NORM	2	1	2	1	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	2	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	3
013CSF	Female	NORM	3	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	3	3	2	3	3	3	2	2	2	2	2	2	1	1	1	1	2	1	3	3	3	3	2	2	2	2	2	3	2	2	3	3	1	1
014CSM	Male	NORM	3	1	3	1	1	1	2	2	1	1	1	1	1	1	3	3	2	1	1	1	3	2	2	2	2	1	1	1	1	1	1	3	4	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	1	2
015CSM	Male	NORM	2	2	2	1	1	1	2	2	1	1	2	2	2	2	3	3	2	2	1	1	2	2	2	1	2	1	1	1	2	1	2	2	2	2	1	1	1	1	1	3	3	2	2	3	3	1	1	3	3	2	2	3	3	1	1
016CSF	Female	NORM	3	2	1	1	2	1	2	1	1	1	2	3	2	3	2	3	1	1	1	1	2	4	4	1	3	3	3	3	3	1	2	4	3	2	1	1	1	2	1	3	3	3	3	3	2	2	2	3	3	2	2	3	3	2	2
017CSF	Female	NORM	1	2	1	1	2	2	2	2	1	1	1	1	2	1	3	3	1	2	1	1	2	4	4	2	3	3	3	3	2	2	3	2	2	2	1	1	1	3	2	3	3	2	2	2	2	1	2	3	3	2	2	3	3	1	1
018CSF	Female	NORM	2	3	1	3	1	1	2	3	1	1	1	1	1	1	4	4	1	1	1	1	1	2	2	2	3	2	2	1	2	1	2	2	2	2	2	1	1	2	1	3	3	2	3	2	2	3	1	3	3	2	2	4	4	2	2
019CSF	Female	NORM	3	3	1	3	1	1	1	1	1	1	3	3	3	3	3	3	1	1	1	1	2	5	5	3	2	3	3	3	3	3	2	2	2	1	1	1	2	2	3	3	3	2	2	2	2	3	3	3	3	2	2	4	4	1	1
020CSM	Male	NORM	2	2	1	1	2	2	2	2	1	1	3	3	2	3	4	4	2	2	1	1	1	2	2	2	1	2	2	3	3	1	1	3	2	2	2	1	1	1	1	3	3	2	2	2	2	2	2	3	3	2	2	4	4	3	3
021CSF	Female	NORM	3	2	3	2	1	1	2	1	1	1	1	1	1	2	3	3	2	1	1	1	2	3	3	2	3	1	1	2	3	2	3	2	2	2	1	1	1	3	2	3	3	3	3	2	2	2	2	2	2	2	2	3	3	1	1
022CSF	Female	NORM	2	3	2	2	1	1	1	2	1	1	1	1	1	1	3	2	1	1	1	1	2	4	4	2	3	3	3	3	3	1	3	1	1	1	1	1	1	2	2	3	3	3	2	2	2	2	3	2	2	2	2	3	3	2	2
023CSF	Female	NORM	3	3	1	1	1	1	2	2	1	1	3	3	3	3	4	3	2	1	1	1	1	4	4	3	1	1	1	3	3	3	2	1	1	2	2	1	1	2	1	3	3	2	2	2	2	2	3	2	2	2	2	3	3	1	1
024CSM	Male	NORM	1	1	1	1	1	1	2	2	1	1	2	2	3	3	4	4	1	1	1	1	2	4	4	2	3	1	1	2	1	2	1	2	2	2	1	1	1	1	1	2	2	2	2	1	1	1	1	2	1	2	2	3	3	1	1
025CSF	Female	NORM	2	2	1	2	1	2	2	2	1	1	2	1	3	1	2	2	1	2	1	1	2	4	4	2	3	2	2	3	3	3	2	2	2	1	2	1	1	3	2	3	3	3	3	2	2	1	1	2	2	2	2	4	4	1	1
026CSF	Female	NORM	1	1	1	1	2	1	2	2	2	2	1	1	1	1	3	3	1	1	2	2	2	4	4	2	3	2	2	1	2	1	1	3	2	1	1	2	2	3	2	3	3	2	2	3	3	1	1	1	1	1	1	4	4	1	1
027CSF	Female	NORM	3	2	1	1	1	1	2	2	1	1	2	2	3	3	4	4	1	1	1	1	1	2	2	2	1	2	2	3	3	2	3	2	2	1	1	2	2	3	2	3	3	3	3	3	4	2	3	2	3	2	2	4	4	1	1
028CSM	Male	NORM	2	3	2	3	2	2	1	1	1	1	2	2	3	2	3	3	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	2	2	1	1	2	2	1	1	3	3	3	3	2	2	1	1	3	3	2	2	3	3	1	1
029CSM	Male	NORM	3	3	1	3	1	1	2	1	1	1	3	3	3	2	2	2	1	1	1	1	2	3	3	1	1	1	1	3	3	2	2	2	2	1	2	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
030CSF	Female	NORM	3	2	1	1	1	1	2	2	2	1	1	1	1	1	3	3	2	2	1	1	1	2	2	1	3	1	1	1	1	1	1	3	2	2	2	2	2	2	1	3	2	2	2	3	3	2	2	2	3	2	2	3	3	1	1
031CSF	Female	NORM	3	3	3	2	2	2	2	2	1	1	3	3	3	3	3	3	2	2	1	1	2	4	4	1	3	2	2	3	3	2	2	2	2	2	2	1	1	3	1	3	3	3	3	3	3	2	2	3	2	2	2	3	3	1	1
032CSF	Female	NORM	3	3	3	3	1	1	2	2	1	1	2	1	1	1	4	4	2	2	1	1	2	3	3	3	1	2	2	2	1	1	1	3	2	2	2	1	1	2	1	3	3	3	3	2	2	2	2	3	2	2	2	3	3	1	1

Figure 5.5 Normal Gait of the Participants were Analysed for Morphology and Recorded in Excel.

5.4.1.2 Backpack

Load carriage refers to the carrying various weight on parts of the body, including bags and personal items upon the time of analysis. A study by Sumner (2012), showed that while a subject was carrying a bag, stride length, and single support time (while subject is on one leg) is decreased; with a concurrent increase of double support time (on two limbs) and the frequency of stride were observed. Another study by Attwells *et al.*, (2007) showed that heavy backpacks up to 24 kgs in 20 military males, demonstrated posture changes within the subjects and significant forward flexion of the trunk. This was reinforced by as study by Majumdar *et al.*, (2010), who showed that ten military male subjects carrying up to 17.5kg, showed forward flexion of the trunk. Other studies such as Smith *et al.*, (2006), and Castro *et al.*, (2015), assessed the pelvic tilt and ground reaction forces respectively from load carriage, however, these features were not assessed as part of this research project, and thus could not be compared. Therefore, the next influence analysed was the presence of a backpack (Figure 5.6). The main changes observed in arm placement, particularly within the backward and forward swing phases. This may be ascribed to the straps of the bag limiting the movement of the arm back and forth, or potentially in some people, the exaggeration of the arm movement to accommodate the placement of the bag on one side (their preferred side). No changes to trunk flexion was observed in this PhD research, unlike the study by Attwells *et al.*, (2007), and Majumdar *et al.*, (2010), which is most likely resultant from the lightness of the bag from this PhD study, compared to 24kg and 17.5kg from both previous studies respectively. Minor changes between some people were seen for the feet features but could be attributed to natural changes during gait. This is also true for the features related to head where subjects may have turned their head or tilted it based on visual or sound cues. Furthermore, some changes may be a result of repeatability error.

Subject	Sex		3. Lat Placement of Upi	4. Lat Placement of Upi	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upi	4. Lat Placement of Upi	5. Lat? Placement of Fc	6. Lat? Placement of Fc	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement c	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16. Finger Flexion Righ	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement c	23. Lateral Placement c	24. Lateral Placement c	25. Lateral Placement c	26. Level of knee Flexic	27. Level of knee Flexic	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Upp	2. lat placement of Upp	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexior	10. Level of knee Flexic	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	BACKP	1	1	1	1	4	3	2	1	1	1	1	1	1	1	4	4	1	1	1	1	3	3	3	3	2	3	3	2	2	1	1	2	3	2	1	1	1	3	1	3	3	2	2	2	2	1	2	3	2	2	2	3	3	1	1
002CSM	Male	BACKP	2	2	2	2	3	2	2	1	1	1	1	1	1	1	3	3	1	1	1	1	3	4	4	2	2	2	1	1	1	1	1	2	2	1	1	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
003CSM	Male	BACKP	1	1	1	1	2	2	2	1	1	1	2	1	1	1	3	3	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	3	3	1	1	1	1	1	1	2	2	2	2	3	2	1	1	1	1	1	1	3	3	1	1
004CSM	Male	BACKP	3	3	3	2	2	2	2	2	1	1	2	3	2	2	4	4	2	2	1	1	1	2	2	2	3	2	1	3	3	3	2	4	3	2	2	1	1	1	1	2	2	2	2	2	2	1	2	2	2	2	2	3	3	2	2
005CSF	Female	BACKP	3	3	2	3	1	1	1	3	1	1	1	2	1	2	3	3	1	2	1	1	2	4	4	1	2	1	1	3	3	2	2	2	2	2	2	1	1	2	1	3	3	3	3	1	2	2	2	3	3	3	2	3	3	1	2
006CSM	Male	BACKP	1	1	1	1	1	2	2	2	1	1	3	1	3	1	2	3	1	2	1	1	2	2	2	2	2	2	2	1	1	1	1	2	2	1	2	1	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1	3	3	1	1
007CSM	Male	BACKP	2	2	1	1	1	1	2	1	2	1	1	1	1	1	2	3	1	1	2	1	2	3	3	1	3	3	3	2	2	1	2	2	2	1	1	2	1	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	1	1
008CSM	Male	BACKP	1	1	1	1	2	2	2	2	1	1	1	1	3	3	2	4	1	1	1	1	2	2	2	1	3	2	2	1	1	1	1	3	3	2	2	1	1	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	2	1
009CSM	Male	BACKP	1	1	1	1	2	2	1	1	1	2	1	1	1	1	2	3	1	1	1	2	2	2	2	3	3	1	1	1	1	1	1	3	3	1	1	1	2	1	1	2	2	2	2	3	3	1	1	2	2	2	2	3	3	1	1
010CSM	Male	BACKP	2	2	2	1	3	2	1	2	1	1	1	1	1	1	3	3	1	2	1	1	1	3	3	2	1	2	2	3	3	2	2	4	4	1	2	1	1	1	1	3	3	2	2	3	2	2	2	3	3	2	2	3	3	2	2
011CSF	Female	BACKP	3	3	3	3	4	4	1	2	3	2	3	3	3	3	4	4	1	2	3	2	2	2	2	2	2	2	2	3	3	3	2	4	4	1	2	3	1	2	1	2	2	2	2	2	1	2	3	2	2	2	1	3	3	1	1
012CSM	Male	BACKP	1	2	1	2	2	1	2	1	1	1	1	1	1	2	3	3	2	1	1	1	2	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
013CSF	Female	BACKP	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	3	3	2	3	3	3	2	2	2	2	2	2	1	1	1	1	2	1	3	3	3	3	2	2	2	2	3	3	2	2	3	3	1	1
014CSM	Male	BACKP	3	1	3	1	2	2	2	2	1	1	1	1	1	1	3	3	1	1	1	1	3	2	2	2	2	1	1	1	1	1	1	3	4	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	1	2
015CSM	Male	BACKP	2	1	1	1	1	1	2	2	1	1	2	3	3	3	3	3	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	3	3	2	2	3	3	1	1	3	3	2	2	3	3	1	1
016CSF	Female	BACKP	3	2	1	1	2	1	2	1	1	1	2	3	2	3	3	3	1	1	1	1	2	4	4	1	3	3	3	3	2	1	1	4	4	1	1	1	1	2	1	3	3	3	3	3	2	2	2	3	3	2	2	3	3	2	2
017CSF	Female	BACKP	1	1	2	1	2	2	2	2	1	1	1	1	1	1	3	3	1	2	1	1	2	4	4	2	3	3	3	3	2	1	1	3	2	2	1	1	1	3	2	3	3	2	2	2	2	1	2	3	3	2	2	3	3	1	1
018CSF	Female	BACKP	2	2	1	2	1	1	2	2	1	1	1	1	1	1	4	4	1	1	1	1	1	2	2	2	3	2	2	1	2	1	2	3	2	2	2	1	1	2	1	3	3	2	3	2	2	3	1	3	3	2	2	4	4	2	2
019CSF	Female	BACKP	3	3	1	1	1	1	2	1	1	1	3	3	3	3	4	4	1	1	1	1	2	5	5	3	2	3	3	3	3	2	2	2	2	1	1	1	2	2	3	3	3	2	2	2	2	3	3	3	3	2	2	4	4	1	1
020CSM	Male	BACKP	3	2	1	1	2	2	2	2	1	1	3	3	3	3	4	4	2	2	1	1	1	2	2	2	1	2	2	3	3	1	1	3	2	2	2	1	1	1	1	3	3	2	2	2	2	2	2	3	3	2	2	4	4	3	3
021CSF	Female	BACKP	3	2	3	2	1	1	2	1	1	1	1	1	1	2	3	3	2	1	1	1	2	3	3	2	3	1	1	2	3	2	3	2	2	2	1	1	2	3	2	3	3	3	3	2	2	2	2	2	2	2	2	3	3	1	1
022CSF	Female	BACKP	3	2	2	1	1	2	1	2	2	1	1	1	1	1	2	2	1	1	1	1	2	4	4	2	3	3	3	3	3	1	2	1	2	1	1	1	1	2	2	3	3	3	2	2	2	2	3	2	2	2	2	3	3	2	2
023CSF	Female	BACKP	3	3	1	1	1	1	2	2	1	1	3	3	3	2	4	4	2	1	1	1	1	4	4	3	1	1	1	3	3	1	3	2	1	2	1	1	1	2	1	3	3	2	2	2	2	2	3	2	3	2	2	3	3	1	1
024CSM	Male	BACKP	1	1	1	1	1	1	2	2	1	1	2	1	3	3	4	4	1	1	1	1	1	4	4	2	3	1	1	1	1	1	1	3	2	2	1	1	1	1	1	2	2	2	2	1	1	1	1	2	1	2	2	3	3	1	1
025CSF	Female	BACKP	1	2	1	2	1	2	2	2	1	1	2	1	2	1	3	2	1	2	1	1	2	4	4	2	3	2	2	3	3	3	2	2	2	1	2	1	1	3	2	3	3	3	3	2	2	1	1	2	2	2	2	4	4	1	1
026CSF	Female	BACKP	1	1	1	1	2	1	2	2	2	1	1	1	1	1	3	3	1	1	1	2	2	4	4	1	3	2	2	1	3	1	1	2	2	1	1	2	2	3	2	3	3	2	2	3	3	1	1	2	2	2	2	4	4	1	1
027CSF	Female	BACKP	3	3	1	2	1	1	2	1	1	2	2	2	2	1	4	3	1	1	1	1	1	2	2	2	2	2	2	2	3	2	2	3	2	1	1	2	2	3	2	3	3	3	3	3	3	2	3	2	3	2	2	4	4	1	1
028CSM	Male	BACKP	1	3	1	3	1	2	1	1	1	1	2	2	3	2	3	3	1	1	1	1	2	2	2	2	3	3	2	1	2	1	2	2	3	1	1	1	2	1	1	3	3	3	3	2	2	1	1	1	2	2	2	3	3	1	1
029CSM	Male	BACKP	2	3	1	3	1	1	2	2	1	1	2	3	3	2	2	2	1	1	1	1	2	3	3	1	1	1	1	3	3	2	3	2	2	2	2	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
030CSF	Female	BACKP	2	2	1	1	2	1	2	2	2	1	1	1	1	1	3	3	2	2	1	1	1	2	2	1	3	1	1	1	1	1	1	3	2	2	2	2	2	2	1	3	2	2	2	4	3	2	2	2	3	2	2	4	4	1	1
031CSF	Female	BACKP	3	3	3	2	2	2	2	2	1	1	3	3	3	2	2	2	2	2	1	1	2	4	4	1	3	2	2	3	3	3	2	3	3	2	2	1	1	3	1	3	3	3	3	3	3	2	2	3	2	2	2	3	3	1	1
032CSF	Female	BACKP	3	3	3	2	1	1	2	2	1	1	2	1	1	1	4	4	2	2	1	1	2	3	3	3	3	2	2	2	3	1	1	3	2	2	2	1	1	2	1	3	3	3	3	2	2	2	2	3	2	2	2	3	3	1	1

Figure 5.6 Gait with Load Carriage (Backpack) of the Participants were Analysed for Morphology and Recorded in Excel. The green represents the changes observed between normal and gait with load carriage (backpack).

5.4.1.3 Hoodie

The attire of people are known to reveal or obstruct particulars of the body, both potentially modifying the manner in which a person walks, and the observer's ability to extract obstructed features. Generally, depending on the type of clothing worn, good fit and definition is achieved visually from the upper back and shoulders as a result of the force of gravity acting upon it. It is commonly seen for a trace from CCTV footage to wear shapeless, baggy clothes whilst committing a crime to deter analysis. Although some features of the body may be obscured, the gait of that particular person and distinctive features of gait can be still observable. It is thought that different attire may alter the way in which a person walks (tight or loose clothing, textiles etc.) (Lynnerup and Larson 2009). Further, a study by DiMaggio and Vernon, (2010), have concluded that loose or flowing types of clothing can affect the ability to perform forensic gait analysis. Consequently, the attire change of the subjects was assessed (Figure 5.7). The main feature altered in this section was seen to be the abdominal projection. This is expected as the hoodie is baggy attire. From the 32 subjects, 28 had this alteration. Furthermore, it was not possible to observe features of the hand in 10 subjects due to the length of the hoodie's arms, as they were not form fitting. Similar to the backpack analysis, the backward and forward arm swing was observed to be different, once again this may be a result of the change in upper body attire. Changes that were sporadic within the lower limbs and the head were observed, but may be the result of normal gait variation.

Subject	Sex		3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat? Placement of Fo	6. Lat? Placement of Fo	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement o	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16. Finger Flexion Right	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement o	23. Lateral Placement o	24. Lateral Placement o	25. Lateral Placement o	26. Level of knee Flexio	27. Level of knee Flexio	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Uppe	2. lat placement of Uppe	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexion	10. Level of knee Flexio	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	HOOD	3	3	3	3	1	1					3	3	1	2	4	4					3	3	3	1	1	3	3	3	3	2	3	2	3					3	3	3	3	2	2	2	2	1	2	3	2	2	2	3	3	1	1
002CSM	Male	HOOD	3	3	3	2	3	3	2	1	1	1	1	3	1	2	3	3	2	1	1	1	3	4	4	2	2	2	1	3	3	2	3	2	2	1	1	1	1	2	2	2	3	2	2	2	2	1	1	2	3	2	2	3	3	1	1
003CSM	Male	HOOD	3	3	3	1	4	3	2	1	1	1	3	3	1	2	3	4	1	1	1	1	2	2	2	2	3	3	2	3	1	1	1	3	2	2	1	1	1	2	2	2	2	2	2	3	2	1	1	1	1	1	1	3	3	1	1
004CSM	Male	HOOD	3	3	3	3	1	1	2	2	1	1	3	3	2	2	4	4	2	2	1	1	1	2	2	1	3	2	1	3	3	3	3	3	3	2	2	1	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	3	3	2	2
005CSF	Female	HOOD	3	3	3	3	1	1					1	3	1	2	3	3					2	4	4	1	2	1	1	3	3	2	3	2	2					2	3	3	3	3	3	1	2	2	2	3	3	3	2	3	3	1	2
006CSM	Male	HOOD	1	1	1	1	1	2	2	2	1	1	3	2	3	1	2	3	2	1	1	1	2	2	2	3	3	2	2	3	3	2	1	2	2	1	1	1	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1	3	3	1	1
007CSM	Male	HOOD	3	3	3	3	1	1	2	1	2	2	3	1	2	1	3	3	1	1	2	1	2	3	3	1	3	3	3	2	3	1	2	2	2	1	1	2	2	1	2	2	2	2	2	3	2	1	1	2	2	2	2	3	3	1	1
008CSM	Male	HOOD	1	1	1	1	2	3	2	2	1	1	1	3	1	3	3	3	1	1	1	1	2	2	2	1	3	2	2	3	2	1	1	3	3	2	2	1	1	1	2	2	2	2	2	3	2	1	1	2	2	2	2	3	3	2	1
009CSM	Male	HOOD	2	3	2	2	2	2	1	1	1	2	2	1	1	1	3	2	1	1	1	2	2	2	2	1	3	1	1	3	3	2	2	3	3	2	1	1	2	1	2	2	2	2	2	3	3	1	1	2	2	2	2	3	3	1	1
010CSM	Male	HOOD	3	3	2	1	2	2	1	2	1	1	3	3	2	1	3	3	1	2	1	1	1	3	3	2	1	2	2	3	3	2	2	4	4	1	2	1	1	1	2	3	3	2	2	3	3	2	2	3	3	2	2	3	3	2	2
011CSF	Female	HOOD	3	3	3	3	1	1	2	2	1	1	3	3	1	1	2	3	2	2	1	1	2	2	2	2	2	2	2	3	3	3	3	2	2	2	2	1	1	2	2	2	2	2	2	2	1	2	3	2	2	2	2	3	3	1	1
012CSM	Male	HOOD	2	2	1	1	2	2	2	2	1	1	2	1	2	1	3	3	2	1	1	1	2	2	2	2	2	1	1	1	2	1	1	3	3	2	1	1	1	1	2	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
013CSF	Female	HOOD	3	2	2	1	1	1					3	2	2	2	2	3					2	3	3	2	1	3	3	3	3	3	3	2	2					2	2	3	3	3	3	2	2	2	1	3	3	2	2	3	3	1	1
014CSM	Male	HOOD	3	1	3	1	1	1	2	2	1	1	3	3	2	2	3	3	1	1	1	1	3	2	2	1	2	1	1	3	3	2	2	3	4	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	1	2
015CSM	Male	HOOD	3	3	2	1	1	1	2	2	1	1	3	3	2	3	3	3	2	2	1	1	2	2	2	1	2	1	1	3	3	1	2	2	2	2	2	1	1	1	1	3	3	2	2	3	3	1	1	3	3	2	2	3	3	1	1
016CSF	Female	HOOD	3	2	1	1	2	2					2	3	2	3	2	3					2	4	4	1	3	3	3	3	3	3	3	2	2					2	2	3	3	3	3	3	2	2	2	3	3	2	2	3	3	2	2
017CSF	Female	HOOD	1	2	1	1	2	2	2	2	1	1	2	2	3	2	3	3	1	2	1	1	2	4	4	2	3	3	3	3	2	2	2	2	2	2	1	1	1	3	3	3	3	2	2	2	2	1	2	1	3	2	2	3	3	1	1
018CSF	Female	HOOD	3	3	3	3	1	1					1	2	1	2	4	4					1	2	2	3	3	2	2	3	2	1	2	2	2					2	2	3	3	2	2	2	2	3	1	3	3	2	2	4	4	1	1
019CSF	Female	HOOD	3	3	1	1	1	1	1	1	1	1	3	3	3	3	3	3	1	1	1	1	2	5	5	3	2	3	3	2	1	1	1	2	2	1	1	1	2	2	3	3	3	2	2	2	2	3	3	3	3	3	3	4	4	1	1
020CSM	Male	HOOD	2	2	1	1	2	2	2	2	1	1	3	3	3	3	4	4	2	2	1	1	1	2	2	1	1	2	2	3	3	1	1	2	2	2	2	1	1	1	2	3	3	2	2	2	2	2	2	3	3	2	2	4	4	3	3
021CSF	Female	HOOD	3	3	3	1	1	1	2	2	1	1	1	2	1	3	3	3	2	1	1	1	2	3	3	2	3	1	1	3	3	3	3	2	2	2	1	1	1	3	3	3	3	3	3	2	2	2	2	2	3	2	3	3	3	1	1
022CSF	Female	HOOD	3	3	3	2	1	1					3	2	1	1	3	3					2	4	4	2	3	3	3	3	3	2	2	2	1					2	3	3	3	2	2	2	2	2	3	2	2	2	2	3	3	1	1
023CSF	Female	HOOD	3	3	1	3	1	1					2	3	2	2	4	4					1	4	4	3	1	1	1	3	3	1	3	1	1					2	2	3	3	2	2	2	2	2	3	2	3	2	2	3	3	1	1
024CSM	Male	HOOD	1	1	1	1	1	1	2	2	1	1	3	3	3	3	4	4	1	1	1	1	2	4	4	2	3	1	1	3	3	2	2	2	2	2	1	1	1	2	2	3	3	2	2	1	1	1	1	2	1	2	2	3	3	1	1
025CSF	Female	HOOD	2	3	1	3	1	2					2	1	2	1	3	2					2	4	4	2	3	2	2	3	3	3	2	2	2					3	3	3	3	3	3	2	2	1	1	3	2	2	2	4	4	1	1
026CSF	Female	HOOD	3	1	2	1	2	1	1	2	2	2	1	1	1	1	3	3	1	1	2	2	2	4	4	1	3	2	2	1	3	1	1	3	2	1	1	2	2	3	3	3	3	2	2	3	3	1	1	2	1	1	1	4	4	1	1
027CSF	Female	HOOD	3	3	1	3	1	1	2	2	1	1	2	2	2	1	4	4	1	1	1	1	1	2	2	2	1	2	2	3	3	2	3	2	2	1	1	2	2	3	2	3	3	3	3	3	3	2	1	2	3	2	2	4	4	2	1
028CSM	Male	HOOD	3	3	1	3	2	2	1	1	1	1	3	3	3	3	3	3	1	2	1	1	2	2	2	2	3	3	2	2	3	1	2	2	2	1	1	2	2	1	2	3	3	3	3	2	2	1	1	3	3	2	2	3	3	1	1
029CSM	Male	HOOD	3	3	2	3	1	2					3	3	3	3	2	2					2	3	3	1	1	1	1	3	3	2	3	2	2					1	2	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
030CSF	Female	HOOD	3	2	1	1	1	1	2	2	2	1	1	3	1	2	3	3	2	2	1	1	1	2	2	1	3	1	1	3	3	1	1	3	2	2	2	2	1	2	2	3	2	3	2	3	3	2	2	2	3	2	2	3	3	1	1
031CSF	Female	HOOD	3	3	2	2	2	2					3	3	3	3	3	2					2	4	4	1	3	2	2	3	3	3	3	2	2					3	3	3	3	3	3	3	3	2	1	3	3	2	2	3	3	1	1
032CSF	Female	HOOD	3	3	1	3	1	1	2	2	1	1	2	2	1	1	4	4	2	2	1	1	2	3	3	3	1	2	2	3	2	1	1	3	2	2	2	1	1	2	2	3	3	3	3	1	1	2	2	2	3	2	2	3	3	1	1

Figure 5.7 Gait with Different Attire (Hoodie) of the Participants were Analysed for Morphology and Recorded in Excel. The light blue represents the changes between normal and attire change, and the darker blue is indicative of features that it was not possible to

5.4.1.4 Side bag

As section 5.4.1.2 Backpack addressed load carriage on the back, the side bag influence was also assessed. A study by An *et al.*, (2010), assessed the influence of a single-strap bag during gait, and results showed a reduction of stride length (contralateral leg) while carrying a bag on the forearm and minimal variances were seen with a bag over shoulder. Side bag influence was seen to vary based on the preference of the side the bag was carried on (left or right) in Figure 5.8. The lateral placement of the arm was obstructed from the bag strap and varied from both left and right side. Moreover, arm swing was reduced within the arm carrying the bag as subjects held the bag in place to keep it stable as they walked. This contradicts the study by An *et al.*, (2010), however before conclusions can be drawn, further studies are required across different conditions for repeatable and valid results. Similar to the previous sections, a trend of varying arm movements was observed, which can possibly be due to the compensation of the alternate side of the body trying to accommodation for the added weight to one side, possibly changing the centre of gravity. Unlike the previous sections, no changes within the head tilt were observed, however five subjects altered their head level.

Subject	Sex		3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat Placement of Fore	6. Lat Placement of Fore	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of th	14. Lateral Rotation of th	15. Finger flexion upon l	16. Finger flexion upon	3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat? Placement of Fo	6. Lat? Placement of Fo	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of th	14. Lateral Rotation of th	15. Finger flexion upon l	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower l	4. Orientation of Lower l	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement o	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of th	15. Lateral Rotation of th	16. Finger Flexion Right	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projection	22. Lateral Placement o	23. Lateral Placement o	24. Lateral Placement o	25 Lateral Placement o	26. Level of knee Flexio	27. Level of knee Flexio	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Uppe	2. lat placement of Uppe	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexion	10. Level of knee Flexio	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	SIDEB		1	2	1	4	4	1	1	3	1	1	1	1	1	4	4	1	1	3	1	3	3	3	1	2	3	3		2	1	1	4	3	1	1	3	1	3	1	3	3	2	2	2	2	1	2	3	2	2	2	3	3	1	1
002CSM	Male	SIDEB		1	1	1	4	3	2	2	1	1		1	1	1	3	3	1	1	1	1	3	4	4	2	2	2	1		1	1	1	3	2	2	1	1	1	1	1	2	3	2	2	2	2	1	1	2	2	2	2	3	3	1	1
003CSM	Male	SIDEB		1	1	1	4	2	1	1	3	1		1	1	1	4	4	1	1	2	1	2	2	2	2	3	3	2	1	1	1	1	4	2	1	1	1	1	1	1	2	2	2	2	3	2	1	1	1	1	1	1	3	3	1	1
004CSM	Male	SIDEB		3		3	4	2	1		1			1		1	4	4	1	2	1	1	1	2	2	2	3	2	1	3	3	3	1	4	3	1	2	1	1	1	1	2	2	2	2	2	2	1	2	2	2	2	2	3	3	2	2
005CSF	Female	SIDEB	3	3	2	3	1	2	2	2	1	1	1		1	2	3	2	2	2	1	1	2	4	4	1	2	1	1	3	3	1	3	2	2	2	2	1	1	2	1	3	3	3	3	1	2	1	2	3	3	3	2	3	3	1	2
006CSM	Male	SIDEB		1	1	1	2	2	1	2	3	1	1	1	1	1	2	3	1	2	3	1	2	2	2	2	3	2	2	1	1	1	1	2	2	1	2	3	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1	3	3	1	1
007CSM	Male	SIDEB		3	2	3	2	1	1		3			1	2	1	2	3	1	1	3	1	2	3	3	1	3	3	3		2	2	3	2	2	1	1	3	2	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	1	1
008CSM	Male	SIDEB	1	1	1	1	3	3	1	2	3	1	1	1	1	1	3	4	1	1	3	1	2	2	2	1	3	2	2	1	1	1	1	3	3	1	2	3	1	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	2	1
009CSM	Male	SIDEB	2		1	1	2	3	1	2	1	2	1	2	1	1	2	3	1	2	1	3	2	2	2	3	3	1	1	1		1	1	3	3	1	2	1	2	1	1	2	2	2	2	3	3	1	1	2	2	2	2	3	3	1	1
010CSM	Male	SIDEB	2		1	2	3	2	1	2	1	2	1		1	1	3	2	1	2	1	2	1	3	3	2	1	2	2	3		1		3	2	1	1	1	1	1	1	3	3	2	2	3	2	2	2	3	2	2	2	3	3	1	1
011CSF	Female	SIDEB	3		3	1	1	2		3		2	1		1	1	1	2	2	2	1	1	2	2	2	2	2	2	2	1		1	1	2	2	2	2	1	1	2	1	2	2	2	2	2	1	2	2	2	2	2	2	3	3	1	1
012CSM	Male	SIDEB		1	2	1	3	2	2	1	1	1	1	1	1	1	3	3	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	2	3	1	1	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
013CSF	Female	SIDEB		2	2	1	2	1	1	1	1	1		1	2	1	1	2	1	1	1	1	2	3	3	2	3	3	3		2	2	2	2	2	1	1	1	1	2	1	3	3	3	3	3	2	2	1	3	3	2	2	3	3	1	1
014CSM	Male	SIDEB	3		2	2	1	3	2	2	1	1	1		1	2	4	3	2	2	1	1	3	2	2	2	2	1	1	1		1	2	3	3	2	1	1	1	1	1	2	2	2	2	2	2	2	3	2	2	2	2	3	3	1	1
015CSM	Male	SIDEB	2	1	3	1	4	1	2	2	1	1	2	2	3	3	4	3	1	2	1	1	2	2	2	1	2	1	1	1	2	3	2	4	2	1	2	1	1	1	1	3	3	2	2	3	3	1	1	3	3	2	2	3	3	1	1
016CSF	Female	SIDEB		1		1	1	1	2	1	1	1		3	2	3	1	3	2	1	1	1	2	4	4	1	3	3	3		2	2	2	1	3	1	1	1	1	2	1	3	3	3	2	3	2	2	2	3	3	2	2	3	3	2	1
017CSF	Female	SIDEB		2		1	3	3	2	2	1	1		1	2	1	3	3	1	1	1	1	2	4	4	3	3	3	3		1	2	1	3	2	1	2	1	1	3	2	3	3	2	2	2	2	1	2	3	3	2	2	3	3	1	1
018CSF	Female	SIDEB	3	3	3	2	4	1	2	3	1	1	1	1	3	1	4	4	2	1	1	1	1	2	2	2	3	2	2	3	2	3	2	4	2	2	2	1	1	2	1	3	3	2	2	2	2	3	1	3	3	2	2	4	4	1	1
019CSF	Female	SIDEB	3	3	3	1	2	1	1	1	1	1	3	3	3	3	2	2	1	1	1	1	2	5	5	3	2	3	3	3	3	3	1	2	2	1	1	1	2	2	3	3	3	2	2	2	2	3	3	3	3	2	2	4	4	1	1
020CSM	Male	SIDEB		2	1	1	2	2	2	2	1	1		3	1	2	4	4	2	2	1	1	1	2	2	2	1	2	2		2	1	1	3	2	2	2	1	1	1	1	3	3	2	2	2	2	2	2	3	3	2	2	4	4	2	3
021CSF	Female	SIDEB		1		1	3	1	2	1	3	1	1	3	1	2	3	2	1	1	3	1	2	3	3	2	3	1	1		2	2	2	3	2	1	1	3	1	3	2	3	3	3	3	2	2	2	2	2	2	2	2	3	3	1	1
022CSF	Female	SIDEB		3	1	1	2	1	2	1	1	1		2	1	2	3	2	2	1	1	1	2	4	4	2	3	3	3		3	1	2	1	1	1	1	1	1	2	2	3	3	3	2	2	2	2	3	2	2	2	2	3	3	2	1
023CSF	Female	SIDEB		1		1	2	1	1	3	3	1		3	2	3	2	2	1	2	3	1	1	4	4	2	1	1	1		3	2	3	2	1	1	2	3	1	2	1	3	3	2	2	2	2	2	3	2	3	2	2	3	3	1	1
024CSM	Male	SIDEB	1		1	2	1	3	2	1	1	1	2		3	2	4	3	1	1	1	1	2	4	4	2	3	1	1	1		1	1	2	3	2	2	1	1	1	1	2	2	2	2	1	1	1	1	2	1	2	2	3	3	1	1
025CSF	Female	SIDEB		1		1	2	1	2	2	1	1		1		1	2	3	1	2	1	1	2	4	4	2	3	2	2		2	2	1	2	2	1	2	1	1	3	2	3	3	3	3	2	2	1	1	2	2	2	2	4	4	1	1
026CSF	Female	SIDEB		1	1	1	3	1	2	2	3	1	1	3	1	3	3	3	1	2	2	2	2	4	4	2	3	2	2	1	2	1	1	3	2	2	1	2	2	3	2	3	3	2	2	3	3	1	1	3	1	1	1	4	4	1	1
027CSF	Female	SIDEB		3	3	1	4	1	1	2	2	1		2	3	2	4	2	1	1	2	1	1	2	2	2	1	2	2	2	3	2	1	4	2	1	1	1	2	3	2	3	3	3	3	3	3	2	3	3	3	2	2	4	4	1	1
028CSM	Male	SIDEB	2	3	2	3	2	2	1	1	1	1	2	2	2	2	2	4	1	1	1	1	2	2	2	2	3	3	2	2	3	1	2	2	2	1	1	1	1	1	1	3	2	3	3	2	2	1	1	1	2	2	2	3	3	1	1
029CSM	Male	SIDEB		3	1	3	3	1	1	1	1	1	3	3	2	2	3	2	1	1	1	1	2	3	3	1	1	1	1		3	2	2	3	2	1	2	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
030CSF	Female	SIDEB		1	1	1	2	1	2	2	1	1		1	1	1	2	3	2	2	1	1	1	2	2	2	3	1	1		1	1	1	2	2	2	2	1	1	2	1	3	2	2	2	3	3	2	2	2	3	2	2	3	3	1	1
031CSF	Female	SIDEB	3	3	3	2	2	2	2	2	1	1		3	3	1	2	3	1	2	1	1	2	4	4	1	3	2	2	3	3	2	1	2	2	2	2	1	1	3	1	3	3	3	3	3	3	1	1	3	2	2	2	3	3	1	1
032CSF	Female	SIDEB	3	3	3	3	4	1	2	2	1	1	3	1	2	1	4	4	2	2	1	1	2	3	3	3	1	2	2	3	1	2	1	4	2	2	2	1	1	2	1	3	3	3	3	2	2	2	2	3	2	2	2	3	3	1	1

Figure 5.8 Gait with Load Carriage (Side Bag) of the Participants were Analysed for Morphology and Recorded in Excel. The lighter purple represents the changes between with load carriage, while the darker purple is indicative of features that were not able to be o

5.4.1.5 Thongs

Footwear is available in numerous styles, shapes and sizes i.e. heels, sandals, sports shoes, etc. Several short-term changes in gait was seen to be affected by footwear as observed by Gefen *et al.*, (2002) (i.e. flip-flops compared to well supported sports shoes). Therefore, the next influence to be assessed were the 'thongs' footwear (Figure 5.9). It was not possible to observe lateral rotation of the hand and finger flexion for backward arm swing for three subjects. This was due to their hand being behind their torso/pelvis in direct line to the camera, in turn. Further variation within the feet was also observed for this feature, specifically within the lateral placement of the lower limbs. Therefore, it is possible that lack of grip from the bottom of the thongs may be the cause of this. Lateral placement of the upper arm was also affected, which may be the body's way of realigning balance.

Subject	Sex		3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat? Placement of Fo	6. Lat? Placement of Fo	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement o	10. Lateral Placement o	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16. Finger Flexion Right	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement o	23. Lateral Placement o	24. Lateral Placement o	25. Lateral Placement o	26. Level of knee Flexio	27. Level of knee Flexio	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Upp	2. lat placement of Upp	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexion	10. Level of knee Flexio	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	THON	3	3	2	3	2	4	2	1	1	1	1	1	1	2	4	4	1	1	1	1	3	3	3	2	2	3	3	2	2	1	2	3	3	1	1	1	1	3	1	3	3	2	2	2	2	1	1	3	2	2	2	3	3	1	1
002CSM	Male	THON	3	2	2	2	3	3	2	1	1	1	1	1	1	1	3	3	1	1	1	1	3	4	4	2	2	2	1	1	2	1	1	2	2	1	1	1	1	1	1	2	3	2	2	2	2	1	1	2	2	2	2	3	3	1	1
003CSM	Male	THON	1	1	1	1	3	2	2	1	1	1	1	1	1	1	4	4	1	1	1	1	2	2	2	2	3	3	2	2	1	1	1	3	3	1	1	1	1	1	1	2	2	2	2	3	2	1	1	1	1	1	1	3	3	1	1
004CSM	Male	THON	3	3	3	3	2	2		2		1	2	2	1	1	4	4	2	2	1	1	1	2	2	1	3	2	1	3	3	3	3	3	3	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	1	2
005CSF	Female	THON	3	3	3	3	1	2		3		1	1	2	1	2	3	3	1	2	1	1	2	4	4	1	2	1	1	3	3	2	3	2	2	2	2	1	1	2	1	3	3	3	3	1	2	2	2	3	3	3	2	3	3	1	2
006CSM	Male	THON	1	2	1	1	1	2	2	2	1	1	3	1	3	1	2	3	1	1	1	1	2	2	2	2	3	2	2	3	1	2	1	2	2	2	2	1	1	1	1	1	1	1	1	4	4	2	1	1	1	1	1	3	3	1	1
007CSM	Male	THON	2	2	1	1	1	1	2	2	2	2	1	1	1	1	3	3	1	1	1	1	2	3	3	1	3	3	3	2	3	1	2	2	2	1	1	2	2	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	1	1
008CSM	Male	THON	1	1	1	1	2	3	2	2	1	1	1	1	1	1	4	4	1	1	1	1	2	2	2	1	3	2	2	2	2	1	1	3	3	2	2	1	1	1	1	2	2	2	2	3	2	1	1	1	1	1	2	3	3	2	1
009CSM	Male	THON	2	2	2	2	2	2	2	1	1	2	2	2	1	1	2	3	1	1	1	2	2	2	2	3	3	1	1	3	2	3	1	2	3	2	1	1	2	1	1	2	2	2	2	3	3	1	1	2	2	2	2	3	3	1	1
010CSM	Male	THON	3	2	2	2	3	2	2	2	1	1	1	1	1	1	3	4	1	2	1	1	1	3	3	2	1	2	2	3	3	2	2	4	4	2	2	1	1	1	1	3	3	2	2	3	2	2	2	3	3	2	2	3	3	1	2
011CSF	Female	THON	3	3	3	3	1	1					1	1	1	1	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	1	1	2	1	2	2	2	2	2	1	2	3	2	2	2	2	3	3	1	1
012CSM	Male	THON	2	1	2	1	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	2	2	2	3	2	1	1	2	1	2	1	3	2	2	1	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
013CSF	Female	THON	3	2	2	2	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	2	3	3	2	3	3	3	3	2	2	2	2	2	1	1	1	1	2	1	3	3	3	2	2	2	2	1	2	3	2	2	3	3	1	1
014CSM	Male	THON	3	1	2	1	1	1	2	1	1	1	1	1	1	1	4	4	2	1	1	1	3	2	2	2	2	1	1	1	1	1	1	3	4	1	1	1	1	1	1	2	2	2	2	2	2	2	1	2	2	2	2	3	3	1	2
015CSM	Male	THON	2	2	2	1	1	1	2	2	1	1	2	2	2	2	3	4	2	2	1	1	2	2	2	1	2	1	1	1	2	1	2	2	2	2	1	1	1	1	1	3	3	2	2	3	3	1	1	3	2	2	2	3	3	1	1
016CSF	Female	THON	3	1	1	1	2	1	2	1	1	1	3	3	2	3	3	3	1	1	1	1	2	4	4	1	3	3	3	3	3	3	3	3	3	1	1	1	1	2	1	3	3	3	3	3	2	2	1	3	3	2	2	3	3	1	1
017CSF	Female	THON	1	2	1	1	2	2	2	2	1	1	1	1	2	1	3	3	1	2	1	1	2	4	4	2	3	3	3	2	2	2	1	2	2	2	1	1	1	3	2	3	3	2	2	2	2	1	2	2	3	2	1	3	3	1	1
018CSF	Female	THON	2	3	2	3	1	1	2	3	1	1	1	1	1	1	4	4	1	1	1	1	1	2	2	3	3	2	2	2	2	1	2	2	2	2	2	1	1	2	1	3	3	2	3	2	2	2	1	3	3	2	2	4	4	1	1
019CSF	Female	THON	3	3	1	1	1	1	1	2	1	1	3	3	3	3	3	3	1	1	1	1	2	5	5	3	2	3	3	3	3	3	2	2	2	1	1	1	2	2	3	3	3	2	2	2	2	2	2	3	3	2	2	4	4	1	2
020CSM	Male	THON	2	2	1	1	2	2	2	2	1	1	3	3	2	2	4	3	2	2	1	1	1	2	2	2	1	2	2	3	3	1	1	3	2	2	2	1	1	1	1	3	3	2	2	2	2	1	2	3	3	2	2	4	4	1	1
021CSF	Female	THON	3	1	3	1	1	1	2	2	1	1	1	3	1	3	2	2	2	1	1	1	2	3	3	2	3	1	1	2	2	2	2	2	2	1	1	1	1	3	2	3	3	3	3	2	2	2	2	2	2	2	2	3	3	1	1
022CSF	Female	THON	2	2	2	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	1	2	4	4	2	3	3	3	3	3	2	2	1	1	1	1	1	1	2	2	3	3	3	2	2	2	2	1	3	3	2	2	3	3	1	1
023CSF	Female	THON	3	3	1	1	1	1	2	2	1	1	3	3	3	2	4	3	1	2	1	1	1	4	4	3	1	1	1	3	3	1	3	1	1	1	2	1	1	2	1	3	3	2	2	2	2	2	2	2	3	2	2	3	3	1	1
024CSM	Male	THON	1	1	1	1	1	1	2	2	1	1	2	2	3	3	4	4	1	1	1	1	2	4	4	2	3	1	1	2	2	2	1	2	2	2	1	1	1	1	1	2	2	2	2	1	1	2	1	2	2	2	2	3	3	1	1
025CSF	Female	THON	2	2	1	2	1	1	2	2	1	1	1	1	1	1	2	2	1	2	1	1	2	4	4	2	3	2	2	3	2	3	2	2	2	1	2	1	1	3	2	3	3	3	3	2	2	1	1	2	2	2	2	4	4	1	1
026CSF	Female	THON	1	1	1	1	2	1	2	2	2	1	1	3	1	3	4	3	1	1	2	2	2	4	4	1	3	2	2	1	3	1	1	3	2	1	1	2	2	3	2	3	3	2	2	3	3	1	1	3	3	2	2	4	4	1	1
027CSF	Female	THON	3	3	1	1	1	1	2	2	1	1	2	3	3	3	3	3	1	1	1	1	1	2	2	2	1	2	2	3	3	1	1	2	2	1	1	2	2	3	2	3	3	3	3	3	2	2	2	2	3	2	2	4	4	1	1
028CSM	Male	THON	2	3	2	3	2	2	1	1	1	1	2	2	3	2	3	3	1	1	1	1	2	2	2	2	3	3	2	1	3	1	2	2	2	1	1	1	2	1	1	3	3	3	3	2	2	1	2	1	1	2	2	3	3	1	1
029CSM	Male	THON	3	3	2	3	1	1	1	2	1	1	3	3	3	2	2	2	1	1	1	1	2	3	3	1	1	1	1	3	3	2	3	2	2	1	2	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
030CSF	Female	THON	3	2	1	1	1	1	2	2	2	1	1	1	1	1	3	3	2	2	1	1	1	2	2	1	3	1	1	1	1	1	1	2	2	2	2	2	2	2	1	3	2	2	2	3	3	2	2	2	3	2	2	3	3	1	1
031CSF	Female	THON	3	3	2	2	2	2	2	2	1	1	2	2	3	1	3	3	2	2	1	1	2	4	4	2	3	2	2	3	3	2	2	2	2	2	2	1	1	3	1	3	3	3	3	3	3	2	1	3	2	2	2	3	3	1	1
032CSF	Female	THON	3	3	3	3	1	1	2	2	1	1	2	1	1	1	4	4	2	2	1	1	2	3	3	3	1	2	2	2	1	1	1	2	2	2	2	1	1	2	1	3	3	3	3	2	2	1	2	3	3	2	2	3	3	1	1

Figure 5.9 Gait with Different Footwear (Thongs) of the Participants were Analysed for Morphology and Recorded in Excel. The lighter pink represents the changes between with footwear, while the darker pink is indicative of features that it was not possible to observe.

5.4.1.6 Barefoot

Following thongs, the impact of bare feet was assessed (Figure 5.10). The changes observed in barefoot and thongs were quite similar, with the same subjects' hands obstructed from view. The same features of the lateral placement of the lower limbs and the placement of the feet were affected, possibly once again due to lack of grip between surface and body. Variations of elbow flexion and lateral placement of the arms, which may be due to the accommodation of the changes to the lower limbs.

Subject	Sex		3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat? Placement of Fo	6. Lat? Placement of Fo	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement o	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16. Finger Flexion Righ	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement o	23. Lateral Placement o	24. Lateral Placement o	25. Lateral Placement o	26. Level of knee Flexio	27. Level of knee Flexio	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Upp	2. lat placement of Upp	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexion	10. Level of knee Flexio	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	BAREF	3	3	2	3	2	4	2	1	1	1	1	1	1	1	4	4	2	1	1	1	3	3	3	3	2	3	3	2	2	1	1	2	3	1	1	1	1	3	1	3	3	2	2	2	3	1	2	3	3	2	2	3	3	1	1
002CSM	Male	BAREF	2	2	2	2	2	2	2	1	1	1	1	1	1	1	3	3	1	1	1	1	3	4	4	2	2	2	1	1	2	1	1	2	2	1	1	1	1	1	1	2	3	2	2	2	2	1	1	2	2	2	2	3	3	1	1
003CSM	Male	BAREF	1	1	1	1	4	3	2	1	1	1	2	1	1	1	3	4	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	3	2	1	1	1	1	1	1	2	2	2	2	3	2	1	1	1	1	1	1	3	3	1	1
004CSM	Male	BAREF	3	3	3	3	2	2		2		1	2	1	1	1	4	4	2	2	1	1	1	2	2	1	3	2	1	3	3	3	2	3	3	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	2
005CSF	Female	BAREF	3	3	3	3	1	1		3		1	1	2	1	2	3	3	2	2	1	1	2	4	4	1	2	1	1	3	2	2	1	2	2	2	2	1	1	2	1	3	3	3	3	1	2	2	1	1	1	3	2	3	3	1	1
006CSM	Male	BAREF	1	1	1	1	1	2	2	2	1	1	3	2	3	1	2	3	2	2	1	1	2	2	2	2	3	2	2	3	1	2	1	2	2	1	2	1	1	1	1	1	1	1	1	3	4	2	1	1	1	1	1	3	3	1	1
007CSM	Male	BAREF	2	3	1	1	1	1	2	2	2	2	1	1	1	1	3	3	1	1	2	1	2	3	3	1	3	3	3	2	2	2	1	2	2	1	1	2	2	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
008CSM	Male	BAREF	1	1	1	1	2	3	2	2	1	1	1	1	1	1	3	4	1	1	1	1	2	2	2	1	3	2	2	1	1	1	1	3	3	2	2	1	1	1	1	2	2	2	2	3	2	1	1	2	2	2	2	3	3	2	1
009CSM	Male	BAREF	2	2	2	1	2	2	1	1	1	2	2	2	1	1	2	2	1	1	1	2	2	2	2	3	3	1	1	2	2	1	1	2	2	1	1	1	2	1	1	2	2	2	2	3	3	1	1	1	1	2	2	3	3	1	1
010CSM	Male	BAREF	2	2	1	1	2	2	1	2	1	1	1	1	1	1	3	3	1	2	1	1	1	3	3	2	1	2	2	3	2	2	2	3	3	1	2	1	1	1	1	3	3	2	2	2	2	2	1	3	2	2	2	3	3	1	1
011CSF	Female	BAREF	3	3	3	3	1	1					1	1	1	1	3	3	2	2	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	1	1	2	1	2	2	2	2	2	1	2	2	2	2	2	1	3	3	1	1
012CSM	Male	BAREF	2	1	2	1	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	2	2	2	2	2	1	1	1	1	1	1	3	2	2	2	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	2
013CSF	Female	BAREF	3	3	2	2	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	3	3	2	3	3	3	2	2	2	2	2	2	1	1	1	1	2	1	3	3	3	3	2	2	1	1	2	3	2	2	3	3	1	1
014CSM	Male	BAREF	3	1	3	1	2	1	2	1	1	1	1	1	1	1	3	3	2	1	1	1	3	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	1	2
015CSM	Male	BAREF	1	1	1	1	1	1	2	2	1	1	2	2	2	2	3	3	2	2	1	1	2	2	2	1	2	1	1	1	2	1	2	2	2	2	2	1	1	1	1	3	3	2	3	3	3	1	1	3	3	2	2	3	3	1	1
016CSF	Female	BAREF	3	2	1	1	2	1	2	1	1	1	2	3	2	3	3	4	1	1	1	1	2	4	4	1	3	3	3	3	3	1	3	2	3	2	1	1	1	2	1	3	3	3	3	3	2	2	2	3	3	2	3	3	3	2	1
017CSF	Female	BAREF	1	1	1	1	2	2	2	2	1	1	1	1	1	1	3	3	1	1	1	1	2	4	4	2	3	3	3	2	1	1	1	2	2	2	1	1	1	3	2	3	3	2	2	2	2	1	2	3	3	2	1	3	3	1	1
018CSF	Female	BAREF	2	3	2	3	1	1	2	3	1	1	1	1	1	1	4	4	1	1	1	1	1	2	2	3	3	2	2	2	2	1	2	2	2	2	2	1	1	2	1	3	3	2	3	2	2	2	1	3	3	2	2	4	4	1	1
019CSF	Female	BAREF	3	3	1	2	1	1	1	1	1	1	3	3	3	3	3	3	1	1	1	1	2	5	5	3	2	3	3	3	3	2	3	2	2	1	1	1	2	2	3	3	3	2	2	2	2	2	1	3	3	2	2	4	4	1	1
020CSM	Male	BAREF	2	2	1	1	2	2	2	2	1	1	3	3	3	3	4	4	2	2	1	1	1	2	2	1	1	2	2	3	3	1	1	2	2	2	2	1	1	1	1	3	3	2	2	3	2	2	2	3	3	2	2	4	4	2	2
021CSF	Female	BAREF	3	2	3	1	1	1	2	1	1	1	1	1	1	2	3	3	1	1	1	1	2	3	3	2	3	1	1	2	2	2	2	2	2	1	1	1	1	3	2	3	3	3	3	2	2	2	2	2	2	2	2	3	3	1	1
022CSF	Female	BAREF	2	1	1	1	1	1	1	1	1	1	2	2	1	1	2	2	1	1	1	1	2	4	4	2	3	3	3	3	3	2	2	1	1	1	1	1	1	2	2	3	3	3	2	2	2	1	2	2	2	2	2	3	3	1	1
023CSF	Female	BAREF	3	3	1	3	1	1	2	2	1	1	3	3	3	1	4	4	2	2	1	1	1	4	4	3	1	1	1	3	3	2	3	1	1	2	2	1	1	2	1	3	3	2	2	2	2	2	2	2	3	1	2	3	3	1	1
024CSM	Male	BAREF	1	1	1	1	1	1	2	2	1	1	2	2	3	3	4	4	1	1	1	1	2	4	4	3	3	1	1	2	2	2	2	2	2	2	1	2	1	1	1	2	2	2	2	1	1	1	1	2	1	2	2	3	3	1	1
025CSF	Female	BAREF	2	3	1	2	1	2	2	2	1	1	2	1	1	1	2	2	1	2	1	1	2	4	4	2	3	2	2	2	2	2	2	2	2	1	2	1	1	3	2	3	3	3	3	2	2	1	1	2	2	2	2	4	4	1	1
026CSF	Female	BAREF	1	1	1	1	2	1	1	2	2	2	1	3	1	3	3	3	1	1	2	2	2	4	4	2	3	2	2	1	2	1	1	3	2	1	1	2	2	3	2	3	3	2	2	3	3	1	1	3	3	2	1	4	4	1	1
027CSF	Female	BAREF	3	3	1	1	1	1	2	2	1	1	2	2	1	1	4	4	1	1	1	1	1	2	2	2	1	2	2	3	3	2	1	2	2	1	1	2	2	3	2	3	3	3	3	3	3	2	1	2	2	2	2	4	4	1	1
028CSM	Male	BAREF	1	2	1	2	2	2	1	1	1	1	2	2	3	2	3	4	1	2	1	1	2	2	2	2	3	3	2	1	2	1	2	2	2	1	1	2	2	1	1	3	3	3	3	2	2	1	2	1	1	2	2	3	3	1	1
029CSM	Male	BAREF	3	3	1	3	1	1	2	1	1	1	3	3	1	2	2	2	1	1	1	1	2	3	3	1	1	1	1	3	3	2	3	2	2	1	2	1	1	1	1	2	2	2	2	2	2	1	1	2	2	2	2	3	3	1	1
030CSF	Female	BAREF	3	2	1	1	1	1	2	2	2	1	2	1	1	1	4	3	2	2	1	1	1	2	2	1	3	1	1	3	1	1	1	3	2	2	2	2	2	2	1	3	2	2	2	3	3	2	2	2	3	2	2	3	3	1	1
031CSF	Female	BAREF	3	3	3	3	2	2	2	2	1	1	2	3	2	1	3	3	2	2	1	1	2	4	4	1	3	2	2	3	3	2	3	2	2	2	2	1	1	3	1	3	3	3	3	3	2	2	1	3	2	2	2	3	3	1	1
032CSF	Female	BAREF	3	3	3	3	1	1	2		1		2	1	1	1	4	4	2	2	1	1	2	3	3	3	1	2	2	2	2	1	1	2	2	2	2	1	1	2	1	3	3	3	3	2	2	1	2	3	3	2	2	3	3	1	1

Figure 5.10 Gait with Different Footwear (Barefoot) of the Participants were Analysed for Morphology and Recorded in Excel. The lighter red represents the changes between with footwear, while the darker red is indicative of features that were not able to be observed.

5.4.1.7 Run

Running consists of the stance and swing phases; however, it does have an extra feature, known as the "floating" phase (Yam *et al.*, 2004). The double limb support (observed in walking) is replaced by the 'floating' phase (*ibid*). The floating phase includes approximately 30% of the running gait cycle, whereas the stance (40%) and the swing (30%) encapsulate the other (70%), where this feature occurs when both feet are airborne (*ibid*). Studies have shown that the increase in stride length and cadence increases speed (Tanawongsuwan and Bobick, 2003). Increasing the speed of one's gait is demonstrated strongly by arm swing, where arms were seen to swing faster and higher to accommodate quicker and longer steps taken by the legs (Collins *et al.*, 2009). During slower speeds, arm motion was observed to be rather variable (*ibid*). Henceforth, changes in velocity were observed by assessing the run of subjects, by completing a holistic assessment of all the features (Figure 5.11). The majority of changes were witnessed within the run influence, where flexion of the limbs (upper and lower) was at the highest level for almost all subjects. Furthermore, lateral placement of the limbs also altered to accommodate the change in speed. This section showed the most consistency in results with almost all subjects affected by the same trends. Head level was also seen to be variable as subjects changed their head level higher to accommodate their speed.

Subject	Sex		3. Lat Placement of Upi	4. Lat Placement of Upi	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upi	4. Lat Placement of Upi	5. Lat? Placement of Fc	6. Lat? Placement of Fc	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement c	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16 Finger Flexion Righ	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement c	23. Lateral Placement c	24. Lateral Placement c	25. Lateral Placement c	26. Level of knee Flexic	27. Level of knee Flexic	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Upp	2. lat placement of Upp	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexior	10. Level of knee Flexic	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	RUN	3	1	2	1	4	4	2	1	1	1	1	1	3	3	4	4	1	1	1	1	3	3	3	3	2	3	3	1	1	1	1	4	4	1	1	1	1	3	1	3	3	2	2	4	4	1	1	3	3	2	2	4	4	2	2
002CSM	Male	RUN	3	3	3	2	4	4	2	2	1	1	1	1	3	3	4	4	1	1	1	1	3	4	4	3	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	2	3	2	2	4	4	1	1	3	2	2	2	4	4	1	1
003CSM	Male	RUN	3	1	2	1	4	4	2	2	1	1	2	1	3	3	4	4	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	4	4	1	1	1	1	1	1	2	2	2	2	4	4	1	1	1	1	1	1	4	4	1	1
004CSM	Male	RUN	3	3	1	2	4	4	2	2	1	1	3	3	3	3	4	4	2	2	1	1	2	2	2	1	3	2	1	3	3	2	2	4	4	2	2	1	1	1	1	3	3	2	2	4	4	2	2	3	2	2	2	4	4	2	2
005CSF	Female	RUN	3	3	3	2	4	4	2	1	1	3	1	1	3	3	4	4	1	2	1	3	2	4	4	2	2	1	1	2	3	2	3	4	4	2	1	3	3	2	1	3	3	3	3	4	4	2	2	3	3	3	2	4	4	2	2
006CSM	Male	RUN	1	3	1	1	4	4	1	2	1	1	1	1	3	3	4	4	2	1	1	1	2	2	2	3	3	2	2	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	1	1	1	4	4	1	1
007CSM	Male	RUN	2	1	2	2	4	4	2	2	1	1	1	2	3	3	4	4	1	1	1	1	3	3	3	3	3	3	3	2	2	3	3	4	4	1	1	1	1	1	1	2	2	2	2	4	4	1	1	1	2	2	2	4	4	1	1
008CSM	Male	RUN	1	3	2	1	4	4	2	2	3	3	1	1	3	3	4	4	1	1	3	3	2	2	2	2	3	2	2	1	1	3	3	4	4	2	2	3	1	1	1	2	2	2	2	4	4	1	1	2	2	2	2	4	4	1	1
009CSM	Male	RUN	3	3	2	2	4	4	2	3	1	1	1	1	3	3	4	4	1	1	1	1	2	2	2	3	3	1	1	2	2	3	3	4	4	1	1	1	1	1	1	2	2	2	2	4	4	1	1	3	3	3	2	4	4	1	1
010CSM	Male	RUN	3	2	3	2	4	4	2	2	1	1	1	2	3	3	4	4	1	1	1	1	2	3	3	2	1	2	2	3	2	3	2	4	4	2	2	1	1	1	1	3	3	3	2	4	4	2	2	2	3	2	2	4	4	2	1
011CSF	Female	RUN	3	3	3	1	4	4	2	3	1	1	1	3	3	3	4	4	2	2	1	1	2	2	2	2	2	2	2	2	1	2	2	4	4	1	2	1	1	2	1	3	3	2	2	4	4	2	3	3	3	2	2	4	4	1	1
012CSM	Male	RUN	2	3	2	3	4	4	2	2	1	1	1	1	3	3	4	4	2	2	1	1	3	2	2	2	2	1	1	1	1	1	1	4	4	1	1	1	1	1	1	3	3	2	2	4	4	1	2	3	3	2	2	4	4	1	2
013CSF	Female	RUN	3	2	3	2	4	4	2	2	1	1	1	1	3	3	4	4	1	1	1	1	2	3	3	2	3	3	3	1	1	3	3	4	4	1	1	1	1	2	1	3	3	3	3	4	4	2	2	3	3	2	2	4	4	1	1
014CSM	Male	RUN	3	2	3	2	4	4	2	2	1	1	1	1	3	3	4	4	2	2	1	1	3	2	2	2	2	1	1	1	1	3	3	4	4	2	1	1	1	1	1	3	3	3	2	4	4	2	3	3	2	2	2	4	4	1	2
015CSM	Male	RUN	1	1	2	1	4	4	2	2	1	1	1	2	3	3	4	4	2	2	1	1	2	2	2	1	3	1	1	1	1	1	3	4	4	2	1	1	1	1	1	3	3	3	3	4	4	1	1	3	3	2	2	4	4	1	1
016CSF	Female	RUN	3	2	1	2	4	4	2	2	1	1	2	3	2	3	4	4	2	1	1	1	2	4	4	2	3	3	3	2	3	2	3	4	4	2	2	1	1	2	1	3	3	3	3	4	4	2	2	3	3	2	3	4	4	1	1
017CSF	Female	RUN	2	2	2	2	4	4	2	2	1	1	2	2	3	3	4	4	2	2	1	1	2	4	4	3	3	3	3	2	2	2	2	4	4	2	1	1	1	3	2	3	3	3	2	4	4	1	2	3	3	2	1	4	4	1	1
018CSF	Female	RUN	3	3	1	2	4	4	2	2	1	1	3	3	3	3	4	4	1	1	1	1	2	2	2	2	3	2	2	1	1	1	3	4	4	1	2	1	1	2	1	3	3	2	3	4	4	2	2	3	3	2	2	4	4	1	2
019CSF	Female	RUN	2	3	2	3	4	4	2	2	1	1	3	3	3	3	4	4	1	1	1	1	3	5	5	3	2	3	3	3	3	3	3	4	4	1	1	1	1	2	3	3	3	2	2	4	4	2	2	3	3	1	2	4	4	1	1
020CSM	Male	RUN	2	2	2	2	4	4	2	2	1	1	2	2	3	3	4	4	2	2	1	1	1	2	2	3	1	2	2	1	1	3	3	4	4	2	2	1	1	1	1	3	3	2	2	4	4	1	1	3	3	2	2	4	4	1	2
021CSF	Female	RUN	3	2	2	2	4	4	2	2	1	1	2	3	3	3	4	4	2	1	1	1	2	3	3	2	3	1	1	1	1	2	3	4	4	2	2	1	1	3	2	3	3	3	3	4	4	1	1	2	3	2	2	4	4	1	1
022CSF	Female	RUN	3	3	3	3	4	4	1	2	1	1	3	3	3	3	4	4	1	1	1	1	2	4	4	2	3	3	3	3	3	3	3	4	4	1	1	1	1	2	2	3	3	3	2	4	4	2	2	2	2	2	2	4	4	1	1
023CSF	Female	RUN	3	3	1	1	4	4	2	2	1	1	2	3	3	3	4	4	2	1	1	1	1	4	4	3	1	1	1	3	3	3	1	4	4	2	2	1	1	2	1	3	3	3	2	4	4	2	2	3	3	2	2	4	4	1	2
024CSM	Male	RUN	1	1	1	1	4	4	2	2	1	1	2	2	3	3	4	4	1	1	1	1	2	4	4	2	3	1	1	1	1	2	2	4	4	2	1	1	1	1	1	3	3	3	3	4	4	1	1	2	2	2	2	4	4	1	1
025CSF	Female	RUN	2	2	2	2	4	4	1	2	1	1	2	3	3	3	4	4	1	2	1	1	2	4	4	2	3	2	2	3	1	3	3	4	4	1	2	1	1	3	2	3	3	3	3	4	4	1	1	3	3	2	2	4	4	1	1
026CSF	Female	RUN	2	2	2	2	4	4	2	2	1	2	1	3	3	3	4	4	1	1	1	1	2	4	4	2	3	2	2	1	3	3	3	4	4	2	1	1	1	3	2	3	3	2	2	4	4	1	1	3	3	1	2	4	4	1	1
027CSF	Female	RUN	1	3	1	3	4	4	1	2	1	1	3	3	3	3	4	4	1	1	1	1	1	2	2	2	1	2	2	1	1	2	3	4	4	1	1	1	1	3	2	3	3	3	3	4	4	2	2	3	3	2	2	4	4	1	1
028CSM	Male	RUN	1	1	1	1	4	4	2	1	1	1	1	2	3	3	4	4	1	1	1	1	2	2	2	2	3	3	2	1	1	3	3	4	4	1	1	1	1	1	1	3	3	3	3	4	4	1	1	1	3	2	2	4	4	1	2
029CSM	Male	RUN	3	3	3	3	4	4	2	2	1	1	3	3	3	3	4	4	1	1	1	1	2	3	3	3	1	1	1	1	2	3	2	4	4	1	2	1	1	1	1	2	3	2	3	4	4	1	1	3	2	2	2	4	4	1	1
030CSF	Female	RUN	3	3	2	1	4	4	2	1	1	1	2	3	3	3	4	4	2	2	1	1	1	2	2	3	3	1	1	1	1	3	3	4	4	2	1	1	1	2	1	3	3	3	2	4	4	1	1	3	3	2	2	4	4	1	1
031CSF	Female	RUN	3	3	3	2	4	4	2	2	1	1	2	3	3	3	4	4	2	2	1	1	2	4	4	3	3	2	2	2	3	3	3	4	4	2	2	1	1	3	1	3	3	3	3	4	4	1	1	3	3	1	2	4	4	1	1
032CSF	Female	RUN	3	3	3	3	4	4	2	2	1	1	2	2	3	3	4	4	2	2	1	1	2	3	3	3	1	2	2	3	2	3	3	4	4	2	2	1	1	2	1	3	3	3	3	4	4	2	1	3	3	2	2	4	4	1	1

Figure 5.11 Gait with Different Speed (Run) of the Participants were Analysed for Morphology and Recorded in Excel. The orange represents the changes between with speed.

5.4.1.8 Treadmill

The use of treadmills to analyse gait has been heavily scrutinised and challenged across many studies; some favour the benefits of a controlled ground surface, speed, and environment, whilst other studies indicate variations caused in gait due to treadmills (Kawabata *et al.*, 2013). Another study by Stolze *et al.*, (1997), showed that in 12 adults, and 14 children, step frequency on a treadmill increased by 7% and 10% in adults and children respectively, whereas the stride length and stance phase of the walking cycle decreased. A study by Zeni Jr and Higginson (2010), concluded that subjects need to be familiarized with a split belt treadmill for a minimum of 5 minutes prior to data collection. Displacements in anatomy, such as the ankle and the head were seen in one particular study, whereas another study states that a subject walking on an 'ideal' treadmill has no difference to walking on ground. Therefore, treadmill assessment was completed to view whether any changes were observed between 'normal' and treadmill walk, as well as act as a control for incline studies to mimic a sloping hill (Figure 5.12).

However, the previous sections were filmed in the dance studio, whereas the treadmill and incline was filmed in the gym. As the gym was under renovations, it was not possible to record the left profile and posterior. Furthermore, the bar of the treadmill completely obstructed certain areas of the body for all participants including the shoulder, upper arm, arm flexion (left), and knee flexion. Some variances were observed with the lateral placement of the forearm in all three states (backward swing, forward swing, and mid stance), and this is most likely a result of walking on a different surface; the treadmill. Subjects who held the bar of the treadmill served as an exclusion criteria for those features associated with the upper arm. It is also observed that the head level was also more variant than all other influences, which supports the study by (Kawabata *et al.*, 2013) as the subject walked on a varying and constantly moving surface.

Subject	Sex		3. Lat Placement of Upr	4. Lat Placement of Upr	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upr	4. Lat Placement of Upr	5. Lat? Placement of Fo	6. Lat? Placement of Fo	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement o	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16. Finger Flexion Righ	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement o	23. Lateral Placement o	24. Lateral Placement o	25. Lateral Placement o	26. Level of knee Flexio	27. Level of knee Flexio	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Upp	2. lat placement of Upp	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexion	10. Level of knee Flexio	11. Placement of the Fe	12. Placement of the Fe
001CSF	Female	TREAD					3										4							3	3	1	1							2						3	1	3	3	2	2	2		1	1	3	2	2	2	3		1	1
002CSM	Male	TREAD					3		2	2	1	1					2		2	1	1	1		5	5	2	2					1	1	2		2	1	1	1	1	1	2	3	1	2	2		1	1	2	1	2	2	3		1	1
003CSM	Male	TREAD			1	1	3		2	1	1	1			1	1	4		1	1	1	1		2	2	1	3					1	1	3		1	1	1	1	1	1	2	2	2	2	3				1	1	1	1	3		1	1
004CSM	Male	TREAD			3	3	3		2	2	1	1			1	1	4		2	2	1	1		2	2	3	3					1	1	3		2	2	1	1	1	1	2	2	2	2	2				2	2	2	2	3		2	2
005CSF	Female	TREAD			3	3	1		2	3	1	1			2	2	2		1	2	1	1		4	4	2	2					2	3	2		2	2	1	1	2	2	3	3	3	3	1				3	3	2	2	3		1	2
006CSM	Male	TREAD			1	1	1		2	2	1	1			3	1	2		1	1	1	1		2	2	2	3					1	1	2		2	2	1	1	1	1	1	1	1	1	4		1	1	1	1	1	1	3		1	1
007CSM	Male	TREAD					1		2	2	2	2					3		1	1	2	1		3	3	1	3							2		1	1	2	1	1	2	2	2	2	2	3				2	2	2	2	3		1	1
008CSM	Male	TREAD			1	1	2		2	2	1	1			1	3	2		1	1	1	1		2	2	1	3					1	2	2		2	2	1	1	1	1	2	2	2	2	3		1	1	2	2	2	2	3		1	1
009CSM	Male	TREAD			2	2	2		2	1	1	1			2	1	2		1	1	1	1		2	2	1	3					1	1	2		2	1	1	2	1	1	2	2	2	2	3		1	1	1	1	1	1	3		1	1
010CSM	Male	TREAD					2		1	2	1	1					3		1	2	1	1		3	3	2	1							3		1	2	1	1	1	1	3	3	2	2	3		2	1	3	3	2	2	3		1	1
011CSF	Female	TREAD							1	1	1	1							1	1	1	1		2	2	2														2	1	2	3	2	2	2				2	2	2	2	3		1	1
012CSM	Male	TREAD			2	2	2		2	2	1	1			2	1	3		2	1	1	1		2	2	1						1	1	3		2	1	1	1	1	1	2	2	2	2	2				2	2	2	2	3		1	1
013CSF	Female	TREAD			1	2	2		1	1	1	1			3	1	2		1	1	1	1		3	3	2	3					2	2	2		1	1	1	1	2	1	3	3	3	3	2		2	1	3	2	2	2	3		1	1
014CSM	Male	TREAD			1	2	1		2	2	1	1					3		2	1	1	1		2	2	2	2					1	1	3		2	1	1	1	1	1	2	2	2	2	2		2	2	2	2	2	2	3		1	1
015CSM	Male	TREAD			2	1	1		2	2	1	1			3	2	2		1	2	1	1		2	2	1	2					1	2	2		2	1	1	1	1	1	3	3	2	2	3		1	1	3	2	2	2	3		1	1
016CSF	Female	TREAD			1	3	2		2	2	1	1			3	3	3		1	1	1	1		4	4	2						1	2	3		2	1	1	1	2	1	3	3	3	3	2				3	3	2	2	3		2	2
017CSF	Female	TREAD			1	1	2		2	2	1	1			1	1	2		2	2	1	1		4	4	2	3					1	2	2		2	1	1	1	3	3	3	3	2	2	2		1	2	3	3	2	2	3		1	1
018CSF	Female	TREAD			2	3	2		2	3	1	1			1	1	4		1	2	1	1		2	2	2	3					1	2	4		1	2	1	1	2	1	3	3	2	3	2		3	1	3	3	2	2	4		1	1
019CSF	Female	TREAD			2	3	1		2	2	1	1			3	3	3		1	1	1	1		5	5	3	2					3	3	2		1	1	1	2	2	3	3	3	2	2	2				3	3	2	2	4		1	1
020CSM	Male	TREAD			1	1	2		2	2	1	1			3	2	4		1	2	1	1		2	2	1	1					1	1	3		2	2	1	1	1	1	3	3	2	2	2		1	1	3	3	2	2	4		1	2
021CSF	Female	TREAD			2	2	1		2	2	1	1			1	2	3		2	2	1	1		3	3	2	3					1	1	2		2	1	1	1	3	2	3	3	3	3	1		2	2	2	2	2	2	3		1	1
022CSF	Female	TREAD			1	1	1		2	2	1	1			3	3	2		1	1	1	1		4	4	2	3					1	3	2		1	1	1	1	2	2	3	3	3	2	2				3	2	2	2	3		1	1
023CSF	Female	TREAD			1	1	1		2	2	1	1			3	3	2		2	1	1	1		4	4	1	1					2	3	2		2	2	1	1	2	1	3	3	2	2	2				2	2	2	2	3		1	1
024CSM	Male	TREAD			1	1	2		2	2	1	1					3							4	4	2	2					1	1	2		2	1	1	1	1	1	2	3	2	2	1		1	1	3	1	2	2	3		1	1
025CSF	Female	TREAD			1	2	2		2	2	1	1			2	1	2		1	1	1	1		4	4	2						3	2	2		1	2	1	1	3	2	3	3	3	3	2		1	1	3	2	3	2			1	1
026CSF	Female	TREAD			1	1	1		2	2	2	2			2	3	3		1	1	2	2		4	4	1						1	1	2		1	1	2	2	3	2	3	3	2	2	3		1	1	1	1	1	1	4		1	1
027CSF	Female	TREAD			1	2	1		2	2	1	1			3	2	4		1	1	1	1		2	2	2	1					2	3	3		1	1	2	2	3	2	3	3	3	3	2				2	3	2	2	4		1	1
028CSM	Male	TREAD			2	3	2		1	1	1	1			3	2	2		1	1	1	1		2	2	2	2					1	1	2		1	1	2	2	1	1	3	3	3	3	2		1	1	1	1	1	2	3		1	1
029CSM	Male	TREAD			1	3	1		2	2	1	1			3	2	2		1	1	1	1		3	3	1	2					2	3	2		1	2	1	1	1	1	2	2	2	2	2				2	2	2	2	3		1	1
030CSF	Female	TREAD																						2	2	1	3													2	1	3	3	2	2	4		2	1	2	3	2	2	4		1	1
031CSF	Female	TREAD					2										2							4	4	2														3	1	3	3	3	3	3		1	1	3	3	2	2	3		1	1
032CSF	Female	TREAD			2	3	2		2	2	1	1			1	1	3		2	1	1	1		3	3	2	1					1	1	3		2	2	1	1	2	1	3	3	3	3	2		1	2	3	2	2	2	3		1	1

Figure 5.12 Gait with Treadmill of the Participants were Analysed for Morphology and Recorded in Excel. The lighter yellow represents the changes between with treadmill, while the darker yellow is indicative of features that were not able to be observed.

5.4.1.9 Incline

Gait variability was observed through one study by (Kawabata *et al.*, 2013), where subjects walking on an incline showed greater forces applied to the ankle, knee and hip of the individuals with distinctly increased ankle motion observed. Another study by Yam *et al.*, (2004), indicated that treadmills showed no difference in the walk of an individual when compared to ground surface. This was further reinforced by a study by Donath et al., (2016), which showed that on 22 subjects, incline of the treadmill did not impact the examination between normal and inclined gait while using the RehaGait system. Studies such as Collins *et al.*, (2009); Herr and Popovic, (2008); McIntosh *et al.*, (2006) showed that subjects walking on an incline showed greater forces applied to the ankle, knee and hip of the individuals with distinctly increased ankle motion observed. Therefore, to view the variances of gait between normal and ascending surfaces, the incline from the treadmill was assessed (Figure 5.13). Similar to the treadmill analysis, both posterior and left profile views were not able to be filmed and other areas of the body were obstructed due to the bars of the treadmill. This can be overcome in future by using with a different treadmill machine without the bars. As there was an incline, the feet were unable to be observed for all participants as the camera height remained consistent to all other influences. Similarly to treadmill, the shoulder, upper arm, arm flexion (left) and knee flexion were not able to be seen due to the bars obstructing the subject in those areas. Additionally, feet and lateral trunk sway were also unable to be observed. Changes in the right side elbow flexion were seen in inclined gait, as participants were either holding onto the bar of the treadmill and/or flexing their arm more as a result of angular momentum. Rotation of the lower arm was also altered, possibly due to holding of the bars.

Subject	Sex		3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat Placement of For	6. Lat Placement of For	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	3. Lat Placement of Upp	4. Lat Placement of Upp	5. Lat? Placement of Fo	6. Lat? Placement of Fo	9. Level of elbow Flexio	10. Level of elbow Flexi	13. Lateral Rotation of t	14. Lateral Rotation of t	15. Finger flexion upon	16. Finger flexion upon	2. lateral trunk sway	3. Orientation of Lower	4. Orientation of Lower
001CSF	Female	INCLIN			2	2	3		2	2	1	1			1	1	3		2	1	1	1		3	3
002CSM	Male	INCLIN			1	1	3		2	2	1	1			1	1	3		1	1	1	1		4	4
003CSM	Male	INCLIN			1	1	2		2	2	1	1			3	1	3		1	1	1	1		2	2
004CSM	Male	INCLIN			3	3	3		2	2	1	1			1	1	3		2	2	1	1		2	2
005CSF	Female	INCLIN			3	3	1		2	2	1	1			1	2	2		2	2	1	1		4	4
006CSM	Male	INCLIN			1	1	2		2	2	1	1			3	1	2		2	2	1	1		2	2
007CSM	Male	INCLIN			1	1	1		1	2	2	2			1	1	2		1	1	2	1		3	3
008CSM	Male	INCLIN			1	1	2		2	2	1	1			3	3	2		1	1	1	1		2	2
009CSM	Male	INCLIN			1	1	2		1	1	1	2			1	1	2		1	1	1	2		2	2
010CSM	Male	INCLIN			2	2	2		1	2	1	1			1	1	3		1	2	1	1		3	3
011CSF	Female	INCLIN																						2	2
012CSM	Male	INCLIN					2										2							2	2
013CSF	Female	INCLIN			1	1	1		2	1	1	1			1	1	2		1	1	1	1		3	3
014CSM	Male	INCLIN			2	1	2		2	2	1	1			1	1	3		1	1	1	1		2	2
015CSM	Male	INCLIN			1	1	1		2	2	1	1			3	2	2		1	1	1	1		2	2
016CSF	Female	INCLIN			3	1	3		2	1	1	1			1	3	3		2	1	1	1		4	4
017CSF	Female	INCLIN			1	1	2		2	2	1	1			2	1	2		1	2	1	1		4	4
018CSF	Female	INCLIN			1	1	1		2	3	1	1			1	3	4		1	1	1	1		2	2
019CSF	Female	INCLIN			1	3	1		1	2	2	2			3	3	3		2	1	2	2		5	5
020CSM	Male	INCLIN			1	1	2		2	2	1	1			3	2	3		1	1	1	1		2	2
021CSF	Female	INCLIN			1	1	1		2	2	1	1			1	3	2		2	1	1	1		3	3
022CSF	Female	INCLIN			1	1	1		2	2	1	1			1	1	3		1	1	1	1		4	4
023CSF	Female	INCLIN			1	1	1		2	2	1	1			3	1	2		1	2	1	1		4	4
024CSM	Male	INCLIN			1	1	1		2	2	1	1			3	3	2		1	1	1	1		4	4
025CSF	Female	INCLIN	2	2	1	1	1		2	2	1	1	1	1	1	1	3		1	1	1	1		4	4
026CSF	Female	INCLIN					2										3							4	4
027CSF	Female	INCLIN			1	1	1		2	2	1	1			2	2	3		1	1	1	1		2	2
028CSM	Male	INCLIN			1	2	2		1	1	1	1			3	2	2		1	2	1	1		2	2
029CSM	Male	INCLIN			1	3	2		2	2	1	1			3	3	2		1	1	1	1		3	3
030CSF	Female	INCLIN					1										4							2	2
031CSF	Female	INCLIN					2										2							4	4
032CSF	Female	INCLIN			3	3	1		2	2	1	1			1	1	3		2	2	1	1		3	3

Subject	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of	8. Lateral Placement of	9. Lateral Placement of	10. Lateral Placement o	11. Level of elbow Flexi	12. Level of elbow Flexi	14. Lateral Rotation of t	15. Lateral Rotation of t	16. Finger Flexion Right	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projectio	22. Lateral Placement o	23. Lateral Placement o	24. Lateral Placement o	25. Lateral Placement o	26. Level of knee Flexio	27. Level of knee Flexio	28. Placement of the Fe	29. Placement of the Fe	1. lat placement of Uppe	2. lat placement of Uppe	5. Lateral Placement of	6. Lateral Placement of	9. Level of knee Flexion	10. Level of knee Flexio	11. Placement of the Fe	12. Placement of the Fe
001CSF	1	2					1	2	3		2	1	1	1	3	1	3	3	3	3	3				3	3	2	2	3			
002CSM	2	2					1	1	3		1	1	1	1	1	1	1	3	1	2	2				2	2	2	2	4			
003CSM	1	3					1	1	3		1	1	1	1	1	1	2	2	2	2	3				1	1	1	1	3			
004CSM	1	3					1	1	3		2	2	1	1	1	1	2	2	2	2	3				3	3	2	2	3			
005CSF	1	2					2	2	2		2	2	1	1	2	1	3	3	3	3	2				3	3	2	2	3			
006CSM	2	3					1	1	2		2	1	1	1	1	1	1	1	1	1	1				1	1	1	1	3			
007CSM	1	3					1	1	2		1	1	2	2	1	1	2	2	2	2	2				3	2	2	2	3			
008CSM	1	3					1	1	2		2	2	1	1	1	1	2	2	2	2	3				2	2	2	2	3			
009CSM	3	3					1	1	2		1	1	1	2	1	1	2	2	2	2	3				1	1	1	1	3			
010CSM	1	1					2	2	2		1	2	1	1	1	1	3	3	2	2	3				3	3	2	2	3			
011CSF	2														2	1	2	2	2	2	1				2	2	1	2	3			
012CSM	1	3							2						1	1	2	2	2	2	2				2	2	2	2	3			
013CSF	2	3					2	2	2		1	1	1	1	2	1	3	3	3	3	2				2	2	2	2	3			
014CSM	1	2					1	1	3		1	2	1	1	1	1	2	2	2	2	3				2	2	2	2	3			
015CSM	1						2	2	2		2	1	1	1	1	1	3	3	2	2	3				2	2	2	2	4			
016CSF	1						1	2	3		1	1	1	1	2	1	3	3	3	3	3				2	3	2	2	3			
017CSF	2						2	2	2		2	1	1	1	3	2	3	3	2	2	3				3	3	1	2	3			
018CSF	2						1	1	2		2	2	1	1	2	1	3	3	2	3	2				3	3	2	2	4			
019CSF	3	1					3	2	2		2	2	1	2	2	3	3	3	2	2	2				3	3	2	2	4			
020CSM	1	1					2	1	2		2	2	1	1	1	1	3	3	2	2	2				3	3	2	2	4			
021CSF	2	3					2	1	2		2	1	1	1	3	2	2	3	2	3	2				2	2	2	2	3			
022CSF	1	3					1	1	1		1	1	1	1	2	2	3	3	3	2	2				2	2	2	2	3			
023CSF	1						2	3	1		2	2	1	1	2	1	3	3	2	2	2				2	3	2	2	3			
024CSM	2	2					2	1	2		2	2	1	1	1	1	3	2	3	2	2				2	1	2	2	3			
025CSF	3						2	2	2		1	2	1	1	3	2	3	3	3	3	2				2	2	2	2	4			
026CSF	1	3							2						3	2	3	3	2	2	2				3	2	1	1	4			
027CSF	1						2	2	2		1	1	2	2	3	2	3	3	3	3	3				2	3	2	2	4			
028CSM	2						1	1	2		1	2	2	1	1	1	3	2	3	3	2				1	1	2	2	3			
029CSM	1						1	3	2		2	2	1	1	1	1	2	2	2	2	3				2	2	2	2	3			
030CSF	1	3							3						2	1	3	3	2	3	3				2	3	2	2	3			
031CSF	1								2						3	1	3	3	3	3	3				3	3	2	2	3			
032CSF	3	1					1	1	2		2	2	2	1	2	1	3	3	3	3	2				3	2	2	2	3			

Figure 5.13 Gait with Treadmill Incline of the Participants were Analysed for Morphology and Recorded in Excel. The lighter brown represents the changes between with incline, while the darker brown is indicative of features that were not able to be observed.

5.4.2 Linear Discriminant Analysis

The ordinal data was assessed to observe whether any trends were present within the influence categories. The influences were grouped into a 'family', whereby load carriage (side bag and backpack), footwear (barefoot and thongs), attire (hoodie), speed (run), and treadmill (flat and incline) were grouped and assessed with the 'normal' as the control.

One limitation was the blanked-out features within the influences dataset, due to visual obstructions. To overcome this, those features were removed collectively for all influences and LDA was conducted. Only the treadmill studies were treated individually due to the assessment of two views only (right profile and anterior).

5.4.2.1 Load Carriage

The first family of influences assessed was load carriage (Figure 5.14), where initially, a degree of separation was observed between the normal (blue), side bag (orange), and backpack (green) with some overlap between them. However, a Wilk's Lambda test provided a p-value of 0.618, which indicates no statistically significant difference between the groups. A confusion matrix (Table 5.3) showed a poor predictive accuracy for the data at 68.75% and the cross-validation at 31.25%.

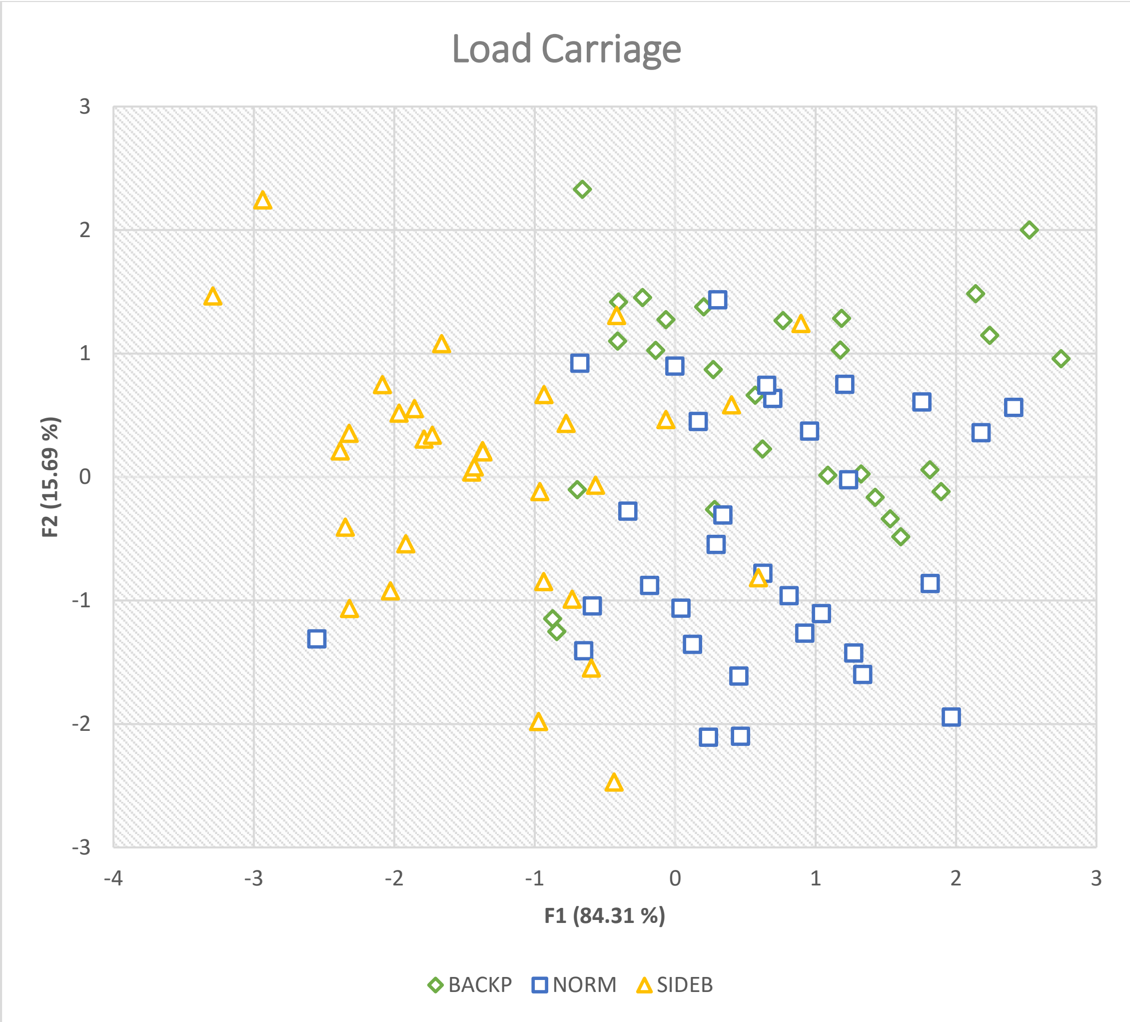


Figure 5.14 Linear Discriminant Analysis for Ordinal Load Carriage

Table 5.3 Confusion Matrix for Data and Cross Validation Ordinal Load Carriage

Confusion Matrix - Data					
from \ to	BACKP	NORM	SIDEB	Total	% correct
BACKP	22	7	3	32	68.75%
NORM	11	19	2	32	59.38%
SIDEB	4	3	25	32	78.13%
Total	37	29	30	96	68.75%
Confusion Matrix - Cross Validation					
from \ to	BACKP	NORM	SIDEB	Total	% correct
BACKP	6	16	10	32	18.75%
NORM	17	8	7	32	25.00%
SIDEB	6	10	16	32	50.00%
Total	29	34	33	96	31.25%

5.4.2.2 Attire

Next, the attire was assessed (Figure 5.15). A degree of separation is evident between the normal (blue), and hoodie (green), with some minor overlap between them. This is further reinforced by the Wilk's Lambda test, showing a p-value of 0.001, which indicates a significant difference between both groups. A confusion matrix (Table 5.4), showed a high predictive accuracy for the data at 95.31% and a moderate predictive accuracy for the cross-validation at 71.88%.

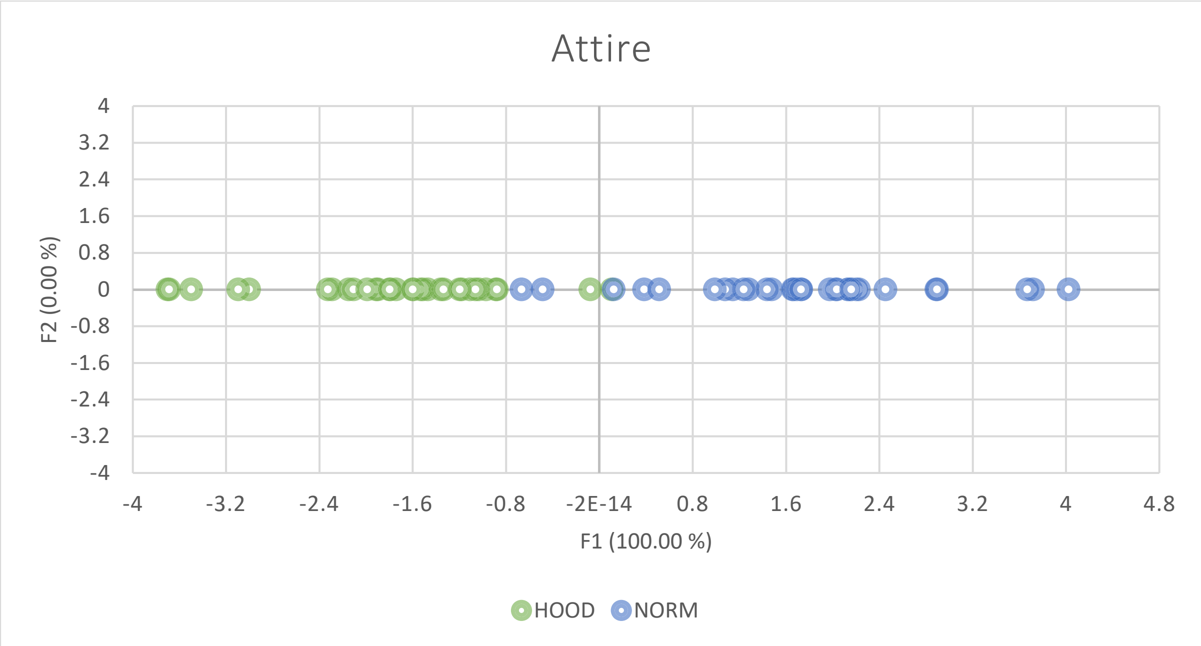


Figure 5.15 Linear Discriminant Analysis for Ordinal Attire

Table 5.4 Confusion Matrix for Data and Cross Validation Ordinal Attire

Confusion Matrix - Data				
from \ to	HOOD	NORM	Total	% correct
HOOD	31	1	32	96.88%
NORM	2	30	32	93.75%
Total	33	31	64	95.31%
Confusion Matrix - Cross Validation				
from \ to	HOOD	NORM	Total	% correct
HOOD	23	9	32	71.88%
NORM	9	23	32	71.88%
Total	32	32	64	71.88%

5.4.2.3 Footwear

The footwear was examined next (Figure 5.16. No degree of separation is apparent between the normal (blue), barefoot (green), and thongs (orange), with significant overlap between these groups. This is further reinforced by the Wilk's Lambda test, showing a p-value of 1.000 indicating no significant differences between the groups. A confusion matrix (Table 5.5), showed a very poor predictive accuracy for the data and cross-validation at 53.13% and 17.71% respectively.

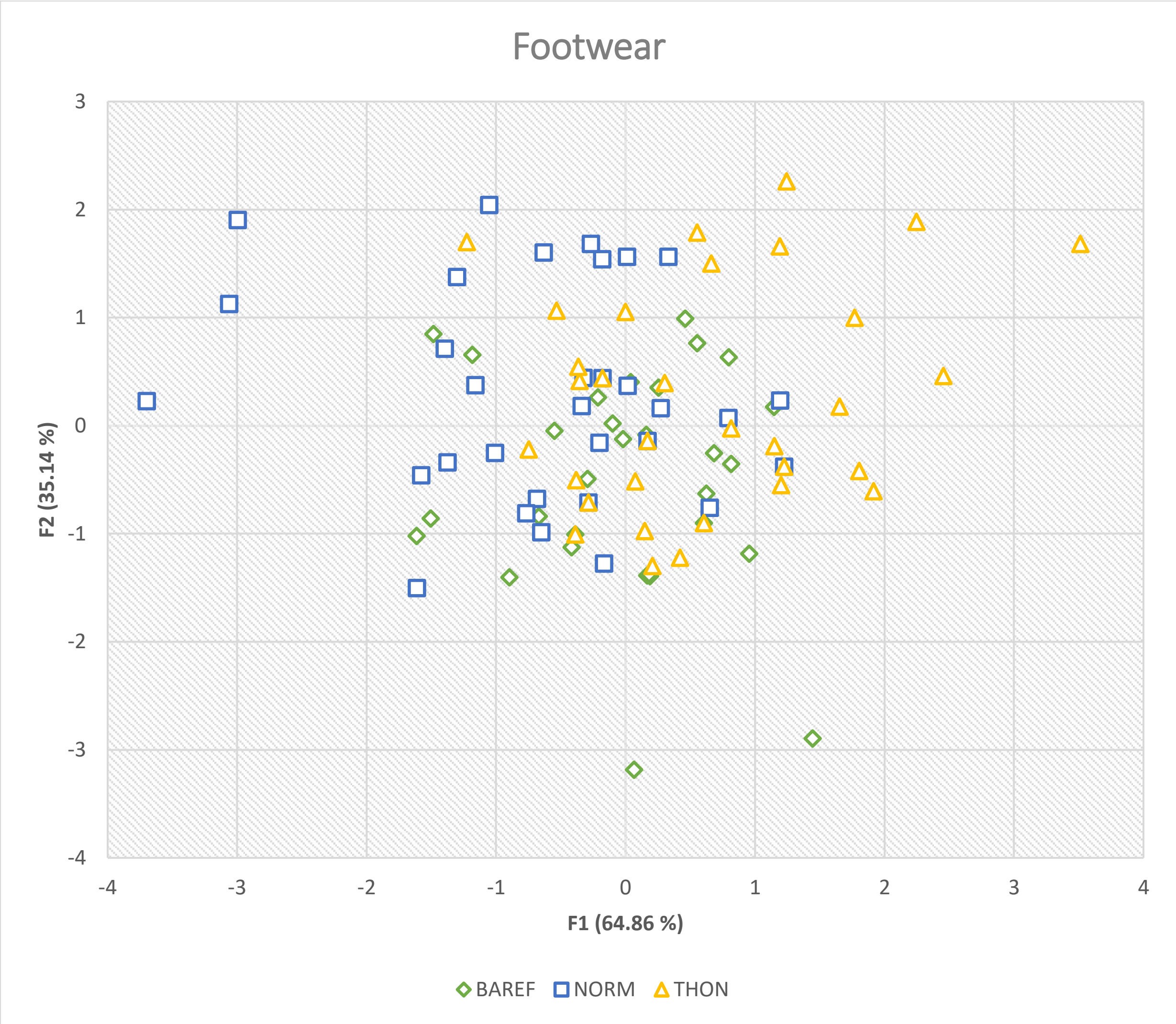


Figure 5.16 Linear Discriminant Analysis for Ordinal Footwear

Table 5.5 Confusion Matrix for Data and Cross Validation Ordinal Footwear

Confusion Matrix - Data					
from \ to	BAREF	NORM	THON	Total	% correct
BAREF	18	6	8	32	56.25%
NORM	9	17	6	32	53.13%
THON	9	7	16	32	50.00%
Total	36	30	30	96	53.13%
Confusion Matrix - Cross Validation					
from \ to	BAREF	NORM	THON	Total	% correct
BAREF	5	14	13	32	15.63%
NORM	14	6	12	32	18.75%
THON	15	11	6	32	18.75%
Total	34	31	31	96	17.71%

5.4.2.4 Run

Next, the run was analysed (Figure 5.17). A complete degree of separation is apparent between the normal (green) and run (blue), with no overlap between them. This is further reinforced by the Wilk's Lambda test, showing a p-value of < 0.0001 indicating a high level of significant difference between both groups. A confusion matrix (Table 5.6), showed a very high predictive accuracy for the data and cross-validation at 100% and 98.44% respectively.

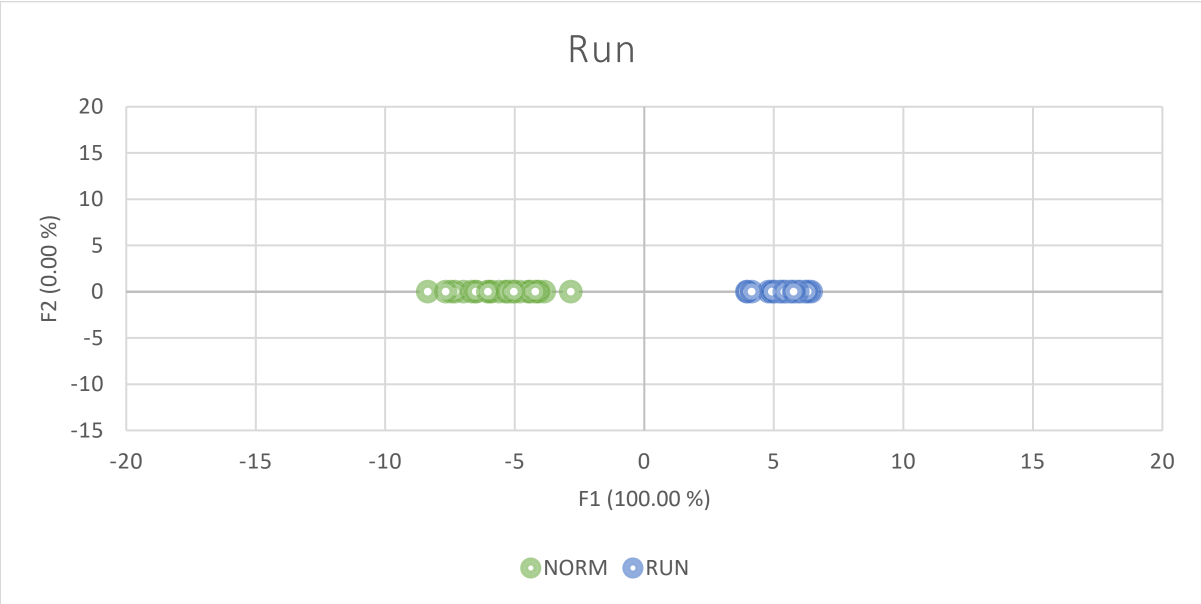


Figure 5.17 Linear Discriminant Analysis for Ordinal Run

Table 5.6 Confusion Matrix for Data and Cross Validation Ordinal Run

Confusion Matrix - Data				
from \ to	NORM	RUN	Total	% correct
NORM	32	0	32	100.00%
RUN	0	32	32	100.00%
Total	32	32	64	100.00%
Confusion Matrix - Cross Validation				
from \ to	NORM	RUN	Total	% correct
NORM	31	1	32	96.88%
RUN	0	32	32	100.00%
Total	31	33	64	98.44%

5.4.2.5 Treadmill

Lastly, the treadmill influence family was analysed (Figure 5.18). No degree of separation is seen between the normal (blue), incline (green), and treadmill (orange), with significant overlap between them. This is further reinforced by the Wilk's Lambda test, showing a p-value of 0.792 indicating no significant difference between the groups. A confusion matrix (Table 5.7), showed a very poor predictive accuracy for the data (52.63%) and cross-validation at 32.63%.

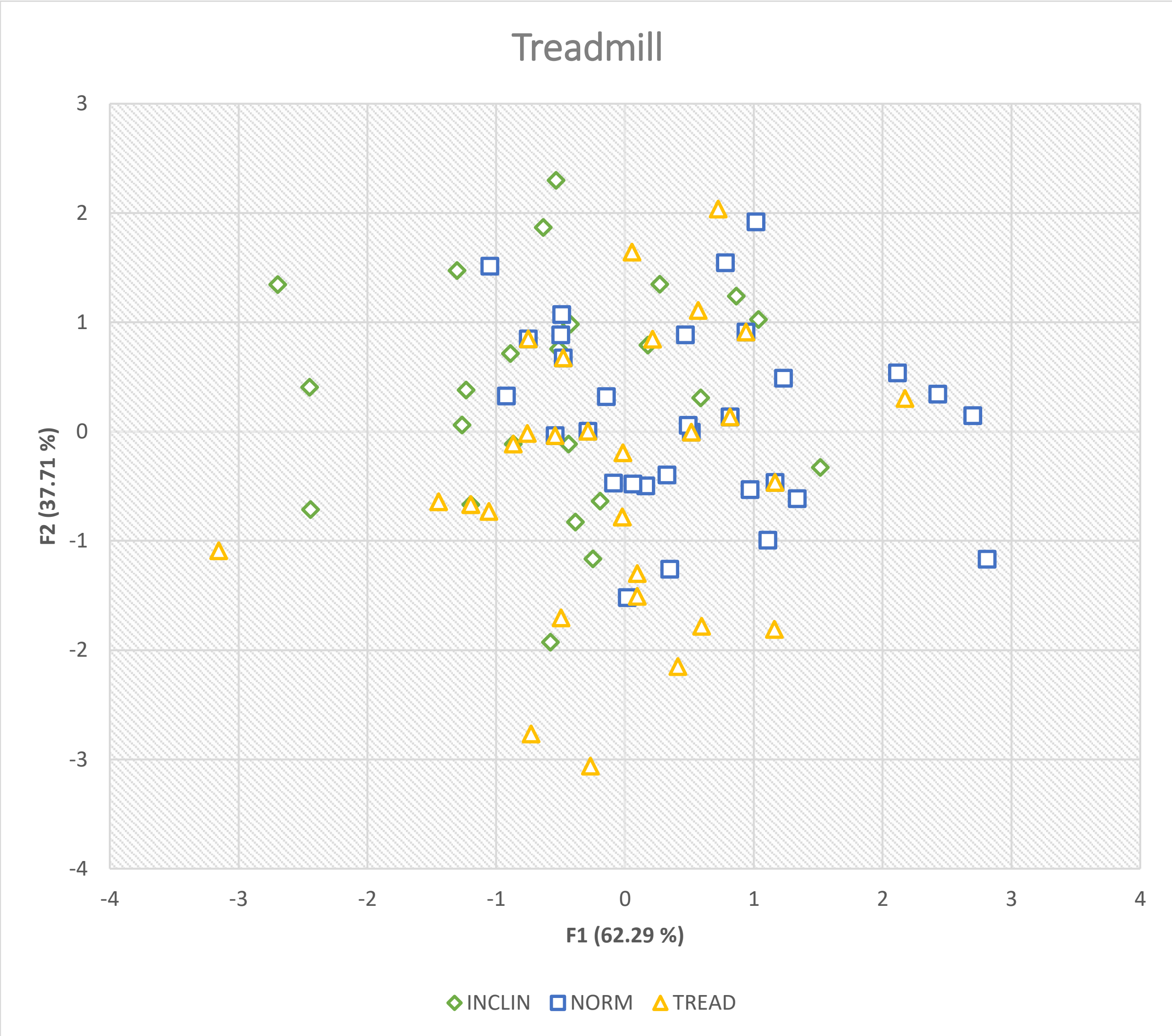


Figure 5.18 Linear Discriminant Analysis for Ordinal Treadmill

Table 5.7 Confusion Matrix for Data and Cross Validation Ordinal Treadmill

Confusion Matrix - Data					
from \ to	INCLIN	NORM	TREAD	Total	% correct
INCLIN	18	9	5	32	56.25%
NORM	9	17	6	32	53.13%
TREAD	8	8	15	31	48.39%
Total	35	34	26	95	52.63%
Confusion Matrix - Cross Validation					
from \ to	INCLIN	NORM	TREAD	Total	% correct
INCLIN	10	9	13	32	31.25%
NORM	10	12	10	32	37.50%
TREAD	12	10	9	31	29.03%
Total	32	31	32	95	32.63%

5.5 Discussion

5.5.1 Observational Analysis

Determination of any trends or distinct features within various age, sex, and ancestry groups, and the frequency of such features, may improve our understanding of gait within each subpopulation (Chapter 2). Further to this, determining the influences that impact upon the manner in which a person walks and viewing correlations strengthens this understanding.

The influences with the least amount of variance when compared to normal gait were backpack, thongs and barefoot, and those with the most variance were run and attire. These results were expected as with run, flexion of the appendicular anatomy is increased to accommodate the 'float' phase within running gait, where a person is 'airborne' (Figure 5.19). Further, the lateral placement of the upper limbs (specifically the forearm) was commonly seen to differ when running.

No conclusion can be deduced from the treadmill studies as two views were unavailable for analysis, although it was observed that gait was significantly different from normal within the observational analysis. This correlates with (Kawabata *et al.*, 2013) research, that observed that walking gait varied on a treadmill when compared to walking on ground surface. Moreover, features of the feet were unavailable as they were cut off from view due to the treadmill, therefore it is also recommended that further assessment with various cameras at different heights and 'angle' views are available to capture the subjects at all views.

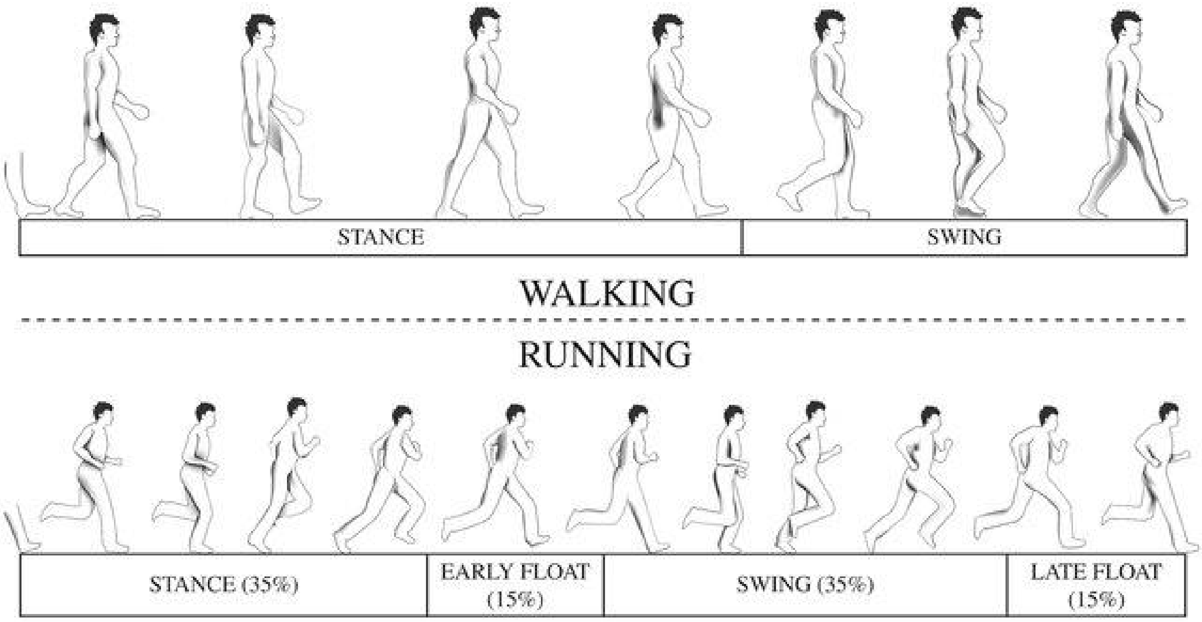


Figure 5.19 Differences Between Walking Gait and Running Gait (Liu, Chen and Chen, 2019).

5.5.2 Linear Discriminant Analysis

The morphological results for correlation studies from the ordinal LDA data showed varying levels of predictive accuracy for each of the 'influence families'. Load carriage and footwear showed no difference between the groups, therefore suggesting that there were low levels of divergence between normal and both load carriage and footwear individually. Attire, however, showed a high level of predictive accuracy, indicating that there were significant differences in the morphological analyses of gait between the normal and attire group. The difference between walking and running showed a very high level of predictive accuracy with significant difference between the groups, whereas treadmill was the opposite, showing no significant difference between groups. Overall, speed was the most discriminating variable and footwear appears to be the least discriminating variable, showing that within this study, there are no differences in a person's morphological gait while using normal shoes, barefoot, and thongs. This will need to be explored further to view if various footwear including different sports shoes, platform shoes, dress shoes etc. perform the same. Speed was expected to cause variability as a result of a different (running) gait cycle compared to walking gait. However, further studies for all influences are required to ensure robust statistical results.

5.6 Conclusions

This chapter provided a preliminary or 'case study' into some influences that may potentially impact upon the manner in which a person walks. The importance of understanding each influence is invaluable as it is imperative to understand how this may impact a trace when captured on CCTV footage. The influences with the least amount of variance when compared to normal gait within this research were observed to be backpack, thongs and barefoot, and those with the most variance were run and attire. The treadmill and incline influences are required to be repeated under more suitable conditions for future studies. Furthermore, the trends observed through LDA analyses show that speed had the highest predictive accuracy, and thus, was the highest discriminating variable, whereas footwear was the least, showing no differences in a person's gait while using normal shoes, barefoot, and thongs. Further studies are required to increase the number of participants to view trends, confirm whether refinement of the methodology is required, and view different influences in various other conditions.

Chapter 6 will provide final thoughts, conclusions, and future directions as a result of this PhD research.

6. CHAPTER 6: Conclusions and Future Directions

6.1 Summary and Conclusions

The aim of this PhD research is to assess and improve the scientific approaches applicable to forensic gait analysis through the investigation and development of an interpretation framework. This research attempted to produce a standardised method for morphometric gait analysis that incorporates image distortion and to determine distinct features of the body during gait (stance and walk). From this, establishing a population database with frequency statistics was aimed to determine the occurrence of distinct identifiers. Subsequently, the inference of forensic gait analysis, derived from a probabilistic approach was developed and proposed and based on an evaluation of likelihood ratios to the morphometric research; forming the interpretation framework in a real forensic context to assess the strength of evidence; fulfilling the aims, hypotheses and objectives of the research. Finally, the influences that impact the way a person walks was explored in the form of case studies.

Chapter two of this thesis highlighted the photographic trials undertaken that aimed to achieve optimal recording conditions for the data collection phase of this research. Furthermore, data was collected and a total of 383 subjects was recruited, from which a demographic study was also completed to view the correlations of the available subjects. Although sex had even numbers for both males and females, the primary group recruited for ancestry were the Caucasian populations, followed by Asian and 'Other'. For age, the 18 – 29 group contained the highest number, followed by the 50 and above, and lastly the 30 – 49 group. Development of a morphometric technique and a step-by-step manual (guide) to assess persons in stance and gait in a standardised manner through feature observation were completed, and repeatability studies were completed for each feature observed. Static and Dynamic features for gait were assessed as error rates were low, however, angle features were removed due to the high level of error produced in these results. An accompanying manual was developed where features were defined, anatomical landmarks identified, and datasheets produced.

Chapter three explored the distinctiveness of the features developed in chapter two. The frequency in the acquired data was observed, and those features that were more distinct or 'less common' were highlighted, such as in-toeing of the feet, lateral rotation of the hand, and extended fingers during mid stance. From here, features with the highest variability were interpreted from the loadings plots. Scatterplots from Principle Component Analysis (PCA) were generated and correlations within the given population were viewed through Linear Discriminant Analysis (LDA) statistics. The PCA plots show an even dispersion in the data, and the LDA showed strong correlations and high predictive accuracy for sex, where males and females clustered in their respective groups with some mix observed, showing overlap of features. Ancestry and age had some correlations but exhibited less degree of separation when compared to sex. The discrimination of anthropometry and morphology measurements were seen to be distinct, where the combination of the two, increases the discriminative power of the technique. For example, individuals who were seen to have similar anthropometric profiles, were observed to have significantly different morphological profiles to one another and vice versa, highlighting that both anthropometry and morphological analyses should both be assessed in forensic gait examination, rather than just one or the other.

Chapter four presented an analytical model for the development of statistical inference to show the strength of evidence in the form of a scientific case study; forming the interpretation framework. The statistical inference of the source from CCTV materials through applications of the Bayesian frameworks were shown. This was then applied (in the form of a case study) to determine the applicability of the developed LR. Firstly, features were determined to be dependant or independent through development of distribution graphs and then the LR was calculated. In the calculation of the likelihood ratio, morphology performed better (approximately 34 million times more likely) for a known source than the anthropometry measurements. However, further analyses are required (dependent/independent, Hp and Hd true tests) for validity. A second model was developed for anthropometry, where preliminary results for LR was obtained from R. Within these tests the Hd and Hp true tests were also carried out and the outcome (especially for Hd true tests) showed low rates of error within the model, where the proportion (greater than 1) values for Hd true tests were closer to 0%, indicating that the model performed well.

Chapter five presented some of the influences that impact the manner in which a person walks, in the form of case studies on 32 participants. The attire, footwear, load carriage, speed, and treadmill (norm and incline) were assessed and any changes between the control and each influence were recorded and correlations between them viewed through LDA. Speed (run) performed the best with complete separation, which a 100% predictive accuracy, followed by attire which had a predictive accuracy in the 90% range.

This new and novel method provided the evaluative framework and fundamentals in attempt to provide a standardised protocol with viewing of correlations in the data. Furthermore, frequency statistics for features produced and statistical inference was developed, and its applicability tested. Though further research is required for reproducibility, and validity, this study showed that the developed LR framework has been demonstrated as a fruitful path for forensic evaluation of gait evidence in forensic science. Additionally, a morphometric manual was developed to aid consistent results across various users in attempt to keep results consistent if applied either nationally or internationally.

The manual and the development of all features are for the purpose of the interpretation framework developed as part of this exploratory PhD research, further validation studies, repeatability and reproducibility tests all need to be completed prior to operational applications.

6.2 Future Directions

As a result of this PhD research, possible research projects have been highlighted, displaying the gaps within the literature that are yet to be addressed. Many of these can be explored further as post-doctoral projects.

6.2.1 Future Directions for Morphometric Technique, Repeatability and Reproducibility

Firstly, the quarter (or 'oblique') view of an individual requires research with the morphometric techniques applied. As the trace is rarely exactly parallel or perpendicular to the camera these variations are lacking within the forensic literature. As the trace can walk diagonal to the camera, the quarter views and three-quarter views need to be assessed and features extracted for analysis. Therefore, all angles of the body (quarter views - midpoint between a frontal and profile view and posterior and profile view) can be observed, features extracted, and analyses conducted. Thus, allowing further robustness to the technique as all views of the body can be assessed with the relevant features developed and extracted for analysis.

Possibly in tandem with the quarter view assessment, improving the standardisation of the photographic conditions through a variety of DSLR cameras and environments is also required. For this study, only one camera was available, however, increasing that to higher quality cameras, may possibly allow the extraction and development of further features of stance and gait. Next, the evaluation of the trace from varying cameras and their associated qualities (ranging from good to poor) is necessary to further the research, to approximate the redundancy of the footage for gait analysis. Activity of the trace can still be assessed with poor quality footage, but a question of assessing source of the trace, and the point it is not able to be assessed requires further studies. From this, possible recommendations can be made.

Also testing on CCTV comparative images, in scenarios where the trace and reference footage are both from different CCTV cameras, and then again repeated with the same CCTV camera is an important analysis to perform. This will allow a comparison of varying artefacts and distortions to be made from different cameras, and also help the understanding of how the data differs with the same camera (used as a control).

Further research into differences between short-term and long-term studies are required. For instance, short-term studies can be considered as a person walking around in a single day, recorded by various CCTV cameras, or over the course of a few weeks or months. Long-term studies on the other hand also are required to analyse the impacts upon the mannerisms in which a person walks.

Meanwhile the repeatability (measurement variation of one person) and reproducibility (measurement variation between persons) of this analysis needs to be addressed and maintained. Repeatability tests between various observers using the manual (Supplementary 1), should be undertaken to determine whether similar results are attained as well as validity studies on both observational and motion capture techniques (tracking such as silhouette, contour, skeletal and so on). Applying these techniques to covert scenarios as well as actual case footage will allow both scenario evaluation to be completed and pave way for operation evaluation in future. Observers could include forensic experts from differing backgrounds (podiatrist, anatomist etc.) from different countries. This will show the applicability of the research within Australia and internationally. Furthermore, persons from several police precincts with the appropriate training can also repeat the test for a large-scale study. Additionally, validation studies of the measurements, specific anatomical landmarks using ground truth measurements are required.

The variabilities inherent in the analysis of individual subjects should be more fully addressed. As highlighted in the author's publication, Seckiner *et al.*, (2019), evaluating the inter-variability extensively will contribute to the body of knowledge for forensic gait analysis, where the variations of measurements can be viewed. These variabilities should all be tested for repeatability (measurement variation of one person) and reproducibility (measurement variation between persons). For instance, other types of repeatability studies should be considered in future studies including:

1. Within-source variability: feature variation of one person at different times: i.e. a person may be 1.5cm longer in the morning than in the evening
2. Intra-variability: within each source variability for several persons: i.e. on average, people are 2cm longer in the morning than in the evening
3. Between source variability: feature variation of a person compared to a population: i.e. one person compared against everybody
4. Inter-variability: feature variation across a population: i.e. everybody compared against everybody

6.2.2 Future Directions for Influences that Impact Gait

Additional studies on varying influences that impact the manner in which a person walks on a full set of data for a large number of subjects are necessary to improve the understanding. The additional studies required for influences are threefold:

1. Increasing the subject pool from a case study into a large-scale study (minimum of 400 for statistical significance) is imperative to view those correlations while mimicking a population. Further, different attire for the same person as a 'trace' and a 'reference' can be adopted as it is unlikely for the offender and suspect to be wearing the same attire and footwear in the two sets of footage.
2. Exploring the numerous types of influences such as surface, fatigue, alcohol consumption etc. will be beneficial to understand how those factors change the way a person walks from their everyday norm.
3. Viewing the differing 'doses' and variances within each of influence will also contribute to the body of literature and understanding. For instance, for load carriage, if a backpack is worn, weights of 1kg, 2kg, 3kg and >4kg can be assessed for the same bag. Or for music assessment, differing types of music for instance, pop, rock, classical music can be trialled; whereas for footwear, high heels, platform, sandals etc. can be viewed.

Trialling these influences and understanding each feature independently as well as merging them randomly to view combinations of these features in the form of case studies with several traces from CCTV footage is required for evaluation.

It is required, that the treadmill/incline study be repeated with all four sides being captured, as areas of the anatomy were unavailable for visual and observational assessment. And further, to move the influences study into full scale studies to improve the validity and reliability of the results with a larger data pool is recommended.

Further assessment of the trace and reference for features including habitual mannerisms, tics and other features will also help in determining distinctness within the given population. Furthermore, to view features that are considered to be ‘secondary identifiers’, including tattoos, on the anatomy of the individual will also enhance the technique and improve robusticity as the tattoos overlay the features observed on the body. A combination of the two (where applicable), can possibly improve the discriminative power of the technique.

6.2.3 Future Directions for Likelihood Ratio

Testing the combination of individual features for Likelihood Ratio (LR) calculations is necessary for the most accurate depicting of the strength of evidence. Trialling to define the dependant and independent features through distribution graphs and also categorising them into ‘families’ will allow the most correct strength of evidence to be exhibited. From here, continuing the analysis for the LR models by repeating the studies with a larger given population will provide further robustness. Also conducting the same tests on more trace subjects will also contribute to this. Finally, testing for further Hd and Hp true tests will improve the understanding of the technique.

Additional to this, as trace ancestry, sex, and age cannot be ascertained, various studies of plotting an ‘unknown’ trace in PCA and LDA plots can be completed to view which correlations the trace aligns with. This future study could start with sex as the independent feature (due to the highest success rate) and observe the false positive and false negative rates. The use of this would be imperative to understand whether the trace viewed is a male or female, rather than deducing sex from initial appearance.

6.2.4 Future Directions for Forensic Investigation and Forensic Intelligence

A further step would be to determine whether corrective studies for CCTV cameras and the assessment of persons can be possible. Collaborations with engineers to develop the relevant algorithms to correct the footage will be invaluable as it provides the opportunity to compare the raw untouched footage and the corrected footage to ascertain whether this could be an avenue for further analyses. From here, supplementary research can be fostered with engineers to determine whether the manual process applied within this research and the methodology can be automated. This will present opportunities to broaden and apply forensic investigation (in this case, comparing traces through the developed biometric technology to the database for the purpose of shortlisting persons) and forensic intelligence (in this case, the application of biometric technology to detect patterns of interest) (Seckiner *et al.*, 2019). This will provide a rapid-fire process (possibly through machine learning algorithms) to shortlist persons quickly for further analyses, allowing forensic gait analysis to reach the next level in development.

These future studies will further enhance the technique to improve the understanding and address gaps within the literature exposed, in turn providing a robust technique with the most accurate strength of evidence to administer within Courts of Law.

APPENDIX

Appendix A: Recruitment of Volunteers

A.1 Flyer

Figure 1. Recruitment Flyer

A.2 Consent Forms and Questionnaire

UNIVERSITY OF TECHNOLOGY SYDNEY

FORENSIC BODY AND GAIT ANALYSIS RESEARCH

CONSENT FORM

I, ____
[name]

of ____
[address]

have read and understood the "Information For Participants" on the above-named research project and have discussed the project with ______________________________ [Researcher's name].

I have been made aware of the procedures involved and how long it takes to participate in the study, including any known or expected inconvenience, risk, distress or damage as far as the researchers currently know them as detailed on the reverse page.

I agree that the researchers have answered all my questions fully and clearly.

I agree that photographs and/or footage of my body (head, torso, and limbs) collected from this project may be published in scientific journals, seminars and conferences for scientific purposes only. I accept that my full body image may be used but will not be associated with my name but may make reference to my age, sex, race/ethnicity and familial relationships. I understand that all images of me will be de-identified, obscuring only my face.

I consent to the Following images and/or footage of my body to be collected by the Research Student (Dilan Seckiner):

- ☐ Body Photographs (stationary)
- ☐ Body Videos (Walking gait)
- ☐ Body Videos (Running/Jogging gait)
- ☐ CCTV Filming

I freely choose to participate in this project and understand I can withdraw at any time without discussion.

I understand that the research student (Dilan Seckiner) and all who are involved within the project excludes liability for any conditions that may arise, if I have not disclosed any of my prior medical conditions with the research student (Dilan Seckiner)

I also understand that the research project is strictly confidential and if I had any queries and questions, I would contact either Dr Phil Maynard on 9514 7584, email: Philip.Maynard@uts.edu.au or Dilan Seckiner at: dilan.seckiner@student.uts.edu.au.

I hereby agree to participate in this research project.

________________________ ____/____/____
Signature (participant)

________________________ ____/____/____
Signature (researcher)

____
Name (researcher)

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Figure 2. Consent Forms

UNIVERSITY OF TECHNOLOGY SYDNEY

FORENSIC BODY AND GAIT ANALYSIS RESEARCH

INFORMATION FOR PARTICIPANTS

Who is doing the research?

We are part of the Centre for Forensic Science. The Chief Investigator is Dr Philip Maynard. This specific project is conducted by Doctor of Philosophy candidate Ms Dilan Seckiner.

What is the research about?

We are interested in collecting data of the human body as biometric measurements and morphological descriptions that can ultimately be used to improve existing protocols, as well as, to develop novel techniques of identifying people from particulars of their body as recorded on images, for example Closed Circuit Television (CCTV) surveillance video.

If I say yes, what will it involve?

The entire process will take approximately 45 minutes starting with a 5-minute survey/questionnaire and followed by 4 sessions of photography and filming: [1] Photography of you standing (10 minutes), [2] Filming of you walking (10 minutes), [3] Filming of you running (5 minutes warm – up, 1-2 minutes running [at maximum] and 3 minutes cool – down), [4] CCTV recording of you standing, walking and/or running as optional (10 minutes). The images collected are to be added onto an existing database. You may choose to participate in all or specific session(s). All images collected of you will be de-identified and issued a code. This completed questionnaire will be stored separately to ensure that all data collected is in a safe and secure room with PIN access, passwords and locks. The attire we request that you wear would be form fitting gym clothes and that any long hair is tied back, so anatomical variations can easily be determined. Private change rooms/bathrooms will be provided for you on level 0 of building 7 (Imaging facilities) to allow your full privacy and comfort.

Are there any risks?

There are none to minimal risks because this research has been carefully designed to be non-invasive. However, it may be possible that you may experience slight discomfort when made to switch from one pose to another during the photography and filming. You may also feel self-conscious whilst being photographed and/or filmed.
Some of the risks included within the running include a possible injury or a heart related complication. The room however is carefully planned so that there would be no obstructions within the path you will be walking upon. The carpet on the ground aims to prevent any slipping and the warm up/cool down intends to prevent any muscle related injuries that may occur. A first aid certificate was obtained by myself (Dilan Seckiner) if any possible complications may arise and safety protocols will be followed immediately. To prevent any extreme strenuous running, you will be encouraged to jog at a pace that they are most comfortable with to prevent any injuries and adverse effects.

Why have I been asked?

You have been asked to participate, to enable the study of anatomical variances (differences) that exist between individuals of the same or different sex and/or population (ethnic) group.

Do I have to say yes?

No, you do not have to say yes.

What will happen if I say no?

If you choose not to participate we shall thank you for your time and you will not be further contacted for this project.

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Figure 3. Information for Participant Forms (Part 1)

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

If I say yes, can I change my mind later?

Yes, you can change your mind at any time without having to provide any reason. Your images and accompanying information will then be destroyed without any question(s) asked.

What if I have concerns or complaints?

If you have any concerns or complaints regarding this research or the way the collection of data has been conducted, please feel free to discuss it with us during the photography and/or filming session(s). This may include your sensitivity or embarrassment to answer items in the questionnaire. If there are any further queries or concerns, please contact either Dr Philip Maynard on 9514 7584, email: Philip.Maynard@uts.edu.au or Dilan Seckiner at: dilan.seckiner@student.uts.edu.au.

During the Running/Jogging sessions, you may feel:

- Tired
- Sweaty
- Slight Discomfort
- Slightly out of Breath

If you feel uncomfortable or concerned at any stage, please alert me immediately so you can stop and rest.

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Figure 4. Information for Participant Forms (Part 2)

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

QUESTIONNAIRE

IMPORTANT: Before answering the following questions, please ensure you have read the accompanying consent form and information sheet. You must sign the consent form before completing any part of this questionnaire.

Complete all relevant sections of this form. Please respond in writing where necessary. If you do not wish to complete a section, please write 'NC' clearly in blank spaces or next to the question.

Participant to complete:

1. Full name: ______________________________
2. Year of birth: ______________________________
3. Sex at birth: Please circle ***Male / Female / Do Not Wish To Disclose***
4. Present Gender: Please circle ***Male / Female / Do Not Wish To Disclose***
5. Race/Ethnicity:
    a. Asian (please specify) ______________________________
    b. Caucasian (please specify) ______________________________
    c. African (please specify) ______________________________
    d. Melanesian (please specify) ______________________________
    e. Polynesian (please specify) ______________________________
    f. Aboriginal or Torres Strait Islanders (please specify) ______________
    g. Mix (please specify) ______________________________
    h. Other (please specify) ______________________________

6. Race/Ethnicity of parents:
    a. Mother______________________________
    b. Father ______________________________

7. Race/Ethnicity of grandparents:
    a. Mother's side:
        i. Grandmother ______________________________
        ii. Grandfather ______________________________
    b. Father's side:
        i. Grandmother ______________________________
        ii. Grandfather ______________________________

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Page 1 of 7

Figure 5. Questionnaire (Part 1)

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

QUESTIONNAIRE

Participant to complete:

8. Hand Preference (Dominance): Please circle ***Left*** / ***Right*** / ***Mixed dominance*** *(selective dominance)* / ***Ambidextrous*** *(equal dominance)*

   Please briefly describe if mixed dominance:

9. Have you experienced facial or body paralysis that may have been caused by a stroke or other medical condition? Please circle ***Yes*** or ***No***.

   If yes, please circle to specify:

   Left / ***Right*** / **Both**

   Body *and/or* ***Limbs (i.e. arm / leg)***

   Please briefly describe the cause if known:

10. Do you have any medical condition(s)? Please circle ***Yes*** or ***No***.

    If yes, please specify:

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Page 2 of 7

Figure 5. Questionnaire (Part 2)

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

QUESTIONNAIRE

11. Have you received any surgery that may have altered the natural anatomy of your head, face, body, arms and/or legs? Please circle ***Yes*** or ***No***

    If yes, which part of your anatomy? Please circle and specify location:

    a. Head / Face ________________
    b. Arm (Left)________________
    c. Arm (Right)________________
    d. Leg (Left)________________
    e. Leg (Right)________________
    f. Body________________

    Please briefly describe the procedure done:

    ____
    ____
    ____
    ____
    ____
    ____
    ____

12. Do you feel you have any permanent or temporary condition that may alter the shape of your body, postural alignment or manner of walking (gait)? This includes any temporary soreness (example: pulled muscle or tightness), or permanent conditions (example: podiatry or chiropractic condition). Please circle ***Yes*** or ***No***

    If yes, please briefly describe your condition:

    ____
    ____
    ____
    ____
    ____
    ____
    ____

13. Have you had any medical/ physiological intervention for permanent conditions (example: orthotics, chiropractic intervention, remedial massage)? Please circle ***Yes*** or ***No***

    If yes, please briefly describe:

    ____
    ____
    ____
    ____
    ____

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Page 3 of 7

Figure 6. Questionnaire (Part 3)

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

QUESTIONNAIRE

14. What type of footwear that you wear on a daily basis: Please circle ***Joggers / Sandals / Heels / Thongs / Barefoot***

    Please briefly describe the style of footwear:

15. In the comfort of your home do you wear shoes? Please circle ***Yes*** or ***No***

    If yes, please briefly describe the type of shoes:

16. How often do you wear high heeled shoes: Please circle Often / Sometimes / Never

    If often or sometimes, please specify your comfort level whilst wearing heels:

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Page 4 of 7

Figure 7. Questionnaire (Part 4)

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

Participant's declaration:

Please PRINT

I, ____,

[Name]

of____

[Address]

____

[Email and/or telephone number]

Declare that the above information is correct and to the best of my knowledge. I have signed the consent form and read the accompanying information letter. I am aware of the purposes of this research in which I am taking part.

______________________ ____/____/____

Signature (participant)

______________________ ____/____/____

Signature (researcher)

____

Name (researcher)

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Page 5 of 7

Figure 8. Participant's Declaration

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

QUESTIONNAIRE

Researcher to complete:

Date: ___________________ Subject no. _______________

Type of image taken/provided (please tick):

Standardised

☐ Body Photographs (stationary)

Perspective (s):

- ☐ Anterior
- ☐ Posterior
- ☐ Left Lateral
- ☐ Right Lateral

☐ Body Videos (gait)

Perspective (s):

- ☐ Anterior
- ☐ Posterior
- ☐ Left Lateral
- ☐ Right Lateral

CCTV Filming

☐Stationary

Perspective (s):

- ☐ Anterior
- ☐ Posterior
- ☐ Left Lateral
- ☐ Right Lateral

☐Gait

Perspective (s):

- ☐ Anterior
- ☐ Posterior
- ☐ Left Lateral
- ☐ Right Lateral

Amount of CCTV cameras filmed with: ____

Please specify which cameras:

____
____
____
____
____
____
____
____
____
____
____
____
____

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Page 6 of 7

Figure 9. Information Recorded by Researcher

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FORENSIC BODY AND GAIT ANALYSIS RESEARCH

Additional Comments:

____

__________________ Signature (researcher)

__________________ Name (researcher)

____/____/____

NOTE: The University of Technology, Sydney Human Research Ethics Committee, has approved this study. If you have any complaints of reservations about any aspect of your participation in this research, which you cannot resolve with the researcher, you may contact the Ethics Committee through email Research.Ethics@uts.edu.au and quote "UTS HREC REF NO. 2015000451". Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Page 7 of 7

Figure 10. Additional Comments

Appendix B: User Manual Sheets

B.1 Stance

Table 1. Stance Morphology Datasheets

Stance - Morphology Datasheets						
Subject Number:	Sex:		Age:	Ancestry:		
Body Region	Feature	View	Left/Right	Classification	Ordinal	Nominal
Head	1. Head Level	Profile		Tilted Down	1	
				Facing Ahead	2	
				Tilted Up	3	
	2. Lateral Head Tilt	Frontal		Tilted left	1	
				Centred	2	
				Tilted right	3	
	3. Projection of Head	Profile		Neutral	1	
				Slight forward projection	2	
				Marked forward projection	3	
	4. Head Displacement	Frontal		Right Displacement	1	
				Central	2	
				Left Displacement	3	
Torso	5. Thoracic Projection	Profile		Flat	1	
				Slightly Projecting	2	
				Markedly Projecting	3	
	6. Abdominal Projection	Profile		Flat	1	
				Slightly Projecting	2	
				Markedly Projecting	3	
	7. Upper Torso Shape	Frontal		V Shape	1	
				Rectangle	2	
				A Shape	3	
	8. Torso Musculature	Frontal		Underdeveloped	1	
				Developed	2	
				Overlaying Adipose	3	

Posture	9. Upper Thoracic Curvature	Profile		Curved	1	
				Neutral	2	
				Flattened	3	
	10. Thoracic Curvature	Profile		Curved	1	
				Neutral	2	
				Flattened	3	
	11. Lumbar Curvature	Profile		Curved	1	
				Neutral	2	
				Flattened	3	
Shoulder	12. Shoulder Level	Posterior		Lowered	1	
				Neutral	2	
				Raised	3	
	13. Position of Shoulder	Profile		Posterior	1	
				Neutral	2	
				Anterior	3	
	14. Rotational Position Shoulder	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
Upper Arm	15. Antero-Posterior Placement of Upper Arm	Profile		Posterolateral	1	
				Lateral	2	
				Slightly Anterolateral	3	
				Markedly Anterolateral	4	
	16. Lateral Placement of Upper Arm	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	17. Upper Arm Muscle Definition	Frontal		Underdeveloped	1	
				Developed	2	
				Overlaying Adipose	3	
	18. Antero-Posterior Placement of Forearm	Profile		Posterolateral	1	
				Lateral	2	
				Slightly Anterolateral	3	
				Markedly Anterolateral	4	
	19. Lateral Placement of Forearm	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	20. Lateral Rotation of the Forearm	Frontal		Medial Rotation	1	

				Neutral	2	
				Lateral Rotation	3	
	21. Lower Arm Muscle Definition	Frontal		Underdeveloped	1	
				Developed	2	
				Overlaying Adipose	3	
Hand	22. Antero-Posterior Placement of Hand	Profile		Posterolateral	1	
				Lateral	2	
				Slightly Anterolateral	3	
				Markedly Anterolateral	4	
	23. Lateral Rotation of the Hand	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
	24. Finger Flexion	Frontal / Profile		Flexed	1	
				Neutral/Partially Flexed	2	
				Extended	3	
Pelvis	25. Antero-Posterior Pelvic Tilt	Profile		Posterior	1	
				Neutral	2	
				Anterior	3	
	26. Lateral Pelvic Tilt	Frontal		Right Elevated	1	
				Neutral	2	
				Left Elevated	3	
	27. Gluteal Projection	Profile		Flat	1	
				Slight Projection	2	
				Marked Projection	3	
	28. Gluteal Shape	Posterior		V Shape	1	
				Square	2	
				Round	3	
				Heart	4	
	29. Antero-Posterior Hip Deviation	Profile		Flexion	1	
				Neutral	2	
				Extension	3	
	30. Lateral Hip Deviation	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
Legs	31. Orientation of Lower Extremities	Frontal / Posterior		Moderate Bow Legs	1	
				Slight Bow Legs	2	
				Straight	3	

				Slight Knock Knees	4	
				Moderate Knock Knees	5	
Upper Leg	32. Lateral Placement of Upper Leg	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	33. Upper Leg Muscle Definition	Frontal		Underdeveloped	1	
				Developed	2	
				Overlaying Adipose	3	
Knees	34. Antero-Posterior Knee Joint Position	Profile		Hyperextended	1	
				Extended	2	
				Neutral	3	
				Flexed	4	
	35. Position/Orientation of the Knee Joint	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
	36. Patellar Level	Frontal		Depressed	1	
				Neutral	2	
				Elevated	3	
	37. Level of Infrapatellar Fat Pad	Frontal		High	1	
				Neutral	2	
				Low	3	
Lower Leg	38. Lateral Placement of Lower Leg	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	39. Lower Leg Muscle Definition	Frontal		Underdeveloped	1	
				Developed	2	
				Overlaying Adipose	3	
Ankles	40. Antero-Posterior Ankle Deviation	Profile		Marked Plantar Flexion	1	
				Slight Plantar Flexion	2	
				Neutral	3	
				Dorsiflexion	4	
	41. Lateral Ankle Deviation	Posterior		Marked Pronation	1	
				Slight Pronation	2	
				Straight	3	
				Slight Supination	4	
				Marked Supination	5	
Feet	42. Placement of Feet	Frontal		Moderate Out-toeing	1	

				Neutral (facing ahead)	2	
				In-toeing	3	
	43. Lateral Positioning of the Foot	Frontal		Inner Foot	1	
				Neutral (evenly balanced)	2	
				Outer Foot	3	
Full Body	44. Somatotype	Frontal		Ectomorph	1	
				Mesomorph	2	
				Endomorph	3	

Table 2. Stance Anthropometry Datasheets

Stance - Anthropometry Datasheets			
Subject Number:	Sex:	Age: Ancestry:	
Feature	View	Measurement Raw	Proportional Indices
1. Shoulder – Elbow Length Right	Frontal		
2. Shoulder – Elbow Length Left			
3. Forearm Length Right			
4. Forearm Length Left			
5. Hand Length Right			
6. Hand Length Left			
7. Maximum Hip Width	Posterior		
8. Thigh Length Right	Frontal		
9. Thigh Length Left			
10. Lower Leg Length Right			
11. Lower Leg Length Left			
12. Knee/Patellar Width Right			
13. Knee/Patellar Width Left			
14. Knee Breadth Right	Profile		
15. Knee Breadth Left			
16. Foot Length Right			
17. Foot Length Left			
18. Bi-Malleolar Width Right	Frontal		
19. Bi-Malleolar Width Left			
20. Foot Width Right			
21. Foot Width Left			
22. Mid Patellar Height Right			
23. Mid Patellar Height Left			
24. Leg Length – Crotch Length Right			
25. Leg Length – Crotch Length Left			
26. Leg Length – Trochanter Right	Posterior		
27. Leg Length – Trochanter Left			
28. Trapezius Length Right	Frontal		
29. Trapezius Length Left			
30. Head Height			
31. Torso Length	Frontal		
32. Jugular to Inguinal Length			

33. Shoulder Width			
34. Total Height - Stature	Profile		

B.2 Gait

Table 3. Gait Morphology Datasheets

Gait - Morphology Datasheets						
Subject Number:	Sex:		Age:	Ancestry:		
Gait Phase	Feature	View	Left/Right	Classification	Ordinal	Nominal
Backward Arm Swing	1. Lateral Placement of Upper Arm	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	2. Lateral Placement of Forearm	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	3. Rotation of the Forearm	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
	4. Level of Elbow Flexion	Profile		Extended	1	
				Neutral	2	
				Flexed	3	
				Markedly Flexed	4	
	5. Rotation of Hand	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
	6. Finger Flexion	Frontal / Profile		Flexed	1	
				Neutral/Partially Flexed	2	
				Extended	3	

Forward Arm Swing	7. Lateral Placement of Upper Arm	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	8. Lateral Placement of Forearm	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	9. Rotation of the Forearm	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
	10. Level of Elbow Flexion	Profile		Extended	1	
				Neutral	2	
				Flexed	3	
				Markedly Flexed	4	
	11. Rotation of Hand	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
	12. Finger Flexion	Frontal / Profile		Flexed	1	
				Neutral/Partially Flexed	2	
				Extended	3	
Complete Cycle	13. Lateral Trunk Sway	Frontal		Rigid	1	
				Neutral (minimal sway)	2	
				Marked Swaying	3	
	14. Orientation of Lower Extremities	Frontal / Posterior		Moderate Bow Legs	1	
				Slight Bow Legs	2	
				Straight	3	
				Slight Knock Knees	4	
				Moderate Knock Knees	5	
Midstance	15. Head Level	Profile		Tilted Down	1	
				Facing Ahead	2	
				Tilted Up	3	
	16. Lateral Head Tilt	Frontal		Tilted left	1	
				Centered	2	
				Tilted right	3	
	17. Shoulder Level	Posterior		Lowered	1	
				Neutral	2	
				Raised	3	
	18. Lateral Placement of Upper Arm	Frontal		Abduction	1	

				Neutral	2	
				Adduction	3	
	19. Lateral Placement of Forearm	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	20. Level of Elbow Flexion	Profile		Extended	1	
				Neutral	2	
				Flexed	3	
				Markedly Flexed	4	
	21. Rotation of Hand	Frontal		Medial Rotation	1	
				Neutral	2	
				Lateral Rotation	3	
	22. Finger Flexion	Frontal / Profile		Flexed	1	
				Neutral/Partially Flexed	2	
				Extended	3	
Midstance	23. Thoracic Projection	Profile		Flat	1	
				Slightly Projecting	2	
				Markedly Projecting	3	
	24. Abdominal Projection	Profile		Flat	1	
				Slightly Projecting	2	
				Markedly Projecting	3	
	25. Upper Thoracic Curvature	Profile		Curved	1	
				Neutral	2	
				Flattened	3	
	26. Thoracic Curvature	Profile		Curved	1	
				Neutral	2	
				Flattened	3	
	27. Lumbar Curvature	Profile		Curved	1	
				Neutral	2	
				Flattened	3	
	28. Gluteal Shape	Posterior		V Shape	1	
				Square	2	
				Round	3	
				Heart	4	
	32. Lateral Placement of Upper Leg	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	

	32. Lateral Placement of Lower Leg	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	33. Knee Flexion	Profile		Extended	1	
				Slightly Flexed	2	
				Flexed	3	
				Markedly Flexed	4	
Mid Stance	34. Placement of Feet	Frontal		Moderate Out-toeing	1	
				Neutral (facing ahead)	2	
				In-toeing	3	
	35. Lateral Positioning of the feet	Frontal		Inner Foot	1	
				Neutral (evenly balanced)	2	
				Outer Foot	3	
Swing	36. Lateral Placement of Upper Leg	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	37. Lateral Placement of Lower Leg	Frontal		Abduction	1	
				Neutral	2	
				Adduction	3	
	38. Placement of Feet	Frontal		Moderate Out-toeing	1	
				Neutral (facing ahead)	2	
				In-toeing	3	
Full Body	39. Somatotype	Frontal		Ectomorph	1	
				Mesomorph	2	
				Endomorph	3	

Table 4. Gait Anthropometry Datasheets

Gait - Anthropometry Datasheets				
Subject Number:	Sex:	Age:	Ancestry:	
Measurement	Feature	View	Measurement Raw	Proportional Indices
Static	1. Shoulder – Elbow Length Right	Frontal		
	2. Shoulder – Elbow Length Left			
	3. Forearm Length Right			
	4. Forearm Length Left			
	5. Hand Length Right			
	6. Hand Length Left			
	7. Maximum Hip Width	Posterior		
	8. Thigh Length Right	Frontal		
	9. Thigh Length Left			
	10. Lower Leg Length Right			
	11. Lower Leg Length Left			
	12. Knee/Patellar Width Right			
	13. Knee/Patellar Width Left			
	14. Knee Breadth Right	Profile		
	15. Knee Breadth Left			
	16. Foot Length Right			
	17. Foot Length Left			
	18. Bi-Malleolar Width Right	Frontal		
	19. Bi-Malleolar Width Left			
	20. Foot Width Right			
	21. Foot Width Left			
	22. Mid Patellar Height Right			
	23. Mid Patellar Height Left			
	24. Leg Length – Crotch Length Right			
	25. Leg Length – Crotch Length Left			
	26. Leg Length – Trochanter Right	Posterior		
	27. Leg Length – Trochanter Left			
	28. Trapezius Length Right	Frontal		
	29. Trapezius Length Left			
	30. Head Height			
	31. Torso Length			
	32. Jugular to Inguinal Length			

	33. Shoulder Width			
	34. Total Height - Stature	Profile		
Dynamic	1. Knee Cap – Knee cap Right			
	2. Knee Cap – Knee cap Left			
	3. Lateral Malleolus – Medial Malleolus Right			
	4. Lateral Malleolus – Medial Malleolus Left			
	5. Hallux – Hallux Right			
	6. Hallux – Hallux Left			
	7. Styloid process – Styloid Process Right	Frontal		
	8. Styloid process – Styloid Process Left			
Angle	1. Elbow Flexion Right	Profile		
	2. Elbow Flexion Left			
	3. Knee Flexion Right			
	4. Knee Flexion Left			
	5. Ankle Flexion Right			
	6. Ankle Flexion Left			

Appendix C: Heat Maps

C.1 Row Orientated

Table 5. Stance Anthropometry (Row)

Subject	Sex	Ancestry	Age	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
003Fc	Female	Cauc	1	2.96	3.11	2.32	2.25	1.68	1.59	3.75	2.32	5.26	3.89	2.33	2.33	0.87	0.89	7.84	7.99	15.67
015F	Female	Cauc	1	3.06	3.07	2.17	2.19	1.48	1.48	3.76	2.3	5.02	3.53	2.35	2.32	0.77	0.78	7.26	7.26	16.36
016Fc	Female	Cauc	1	3.06	3.14	2.41	2.33	1.36	1.31	3.53	2.36	4.96	3.88	2.48	2.38	0.86	0.84	7.81	7.81	16.93
017F	Female	Cauc	1	2.94	2.86	2.12	2.01	1.31	1.23	4.19	2.23	5.58	3.68	2.4	2.36	0.79	0.81	7.54	7.55	16.87
019F	Female	Asian	1	2.64	2.8	1.81	1.75	1.43	1.49	4.13	2.02	4.34	3.19	2	2.11	0.7	0.65	6.75	6.71	14.31
004F	Female	Cauc	2	2.91	2.87	2.02	1.95	1.68	1.76	3.7	1.97	3.93	3.07	2.18	2.17	0.88	0.9	7.22	7.25	14.95
006F	Female	Cauc	1	2.52	2.52	1.89	1.91	1.28	1.3	3.32	1.8	4.16	3	1.98	1.96	0.64	0.64	6.72	6.67	14.06
009F	Female	Cauc	3	2.95	2.95	2.06	1.98	1.84	1.9	4.37	2.11	4.65	3.21	2.27	2.32	0.81	0.86	7.55	7.56	15.9
021F	Female	Cauc	1	2.81	2.88	2.07	1.98	1.65	1.65	3.86	2.01	4.5	3.51	2.36	2.35	0.85	0.81	7.75	7.74	15.85
024Fc	Female	Cauc	1	3.26	3.33	2.35	2.32	1.62	1.54	3.63	2.25	4.47	3.27	2.61	2.6	0.79	0.73	7.87	7.83	17.24
025Fc	Female	Cauc	1	3.23	3.22	2.17	2.12	1.55	1.6	3.85	2.17	4.64	3.29	2.27	2.26	0.8	0.77	7.61	7.56	16.53
032F	Female	Cauc	1	3.12	3.14	2.16	2.14	1.53	1.55	3.63	2.23	4.75	3.62	2.34	2.35	0.75	0.74	7.69	7.65	16.61
033F	Female	Cauc	1	2.98	3.1	2.02	2.05	1.6	1.44	3.83	2.17	4.54	3.43	2.28	2.29	0.85	0.84	7.48	7.46	16.19
042F	Female	Cauc	3	3.14	3.13	2.09	2.17	1.49	1.43	3.3	2.02	4.63	3.17	2.14	2.1	0.74	0.71	7.56	7.55	15.89
047F	Female	Asian	1	2.88	2.9	2.15	2.11	1.64	1.64	3.87	2.11	4.73	3.45	2.45	2.43	0.85	0.85	6.86	6.87	15.97

048F	Female	Asian	3	2.86	2.72	2.02	1.96	1.43	1.61	3.84	2.06	4.07	3.68	2.18	2.27	0.77	0.82	6.74	6.83	15.14
053F	Female	Cauc	3	2.9	2.9	1.87	1.88	1.74	1.71	3.82	2.15	4.21	3.49	2.25	2.27	0.88	0.81	7.43	7.43	15.66
063F	Female	Asian	3	3.2	3.17	2.38	2.37	1.6	1.73	3.89	2.15	5.13	3.83	2.34	2.34	0.78	0.75	8.37	8.37	17.39
064F	Female	Cauc	1	3.16	3.21	2.29	2.21	1.78	1.62	4.15	2.33	5.09	3.78	2.57	2.53	0.78	0.81	8.21	8.16	17.33
069F	Female	Cauc	2	3.01	3.09	1.95	2.06	1.73	1.67	5.16	2.15	4.79	3.84	2.55	2.59	0.94	1	7.46	7.45	16.83
071F	Female	Cauc	1	2.91	2.94	2.16	2.07	1.41	1.58	3.88	2.15	4.76	3.64	2.38	2.44	0.74	0.74	7.66	7.64	16.35
075F	Female	Cauc	1	3.11	3.07	1.89	1.91	1.74	1.77	3.85	2.13	4.94	3.5	2.47	2.47	0.93	0.88	7.59	7.57	16.29
078F	Female	Cauc	1	3.07	3.12	2.08	2.22	1.9	1.78	3.59	2.27	5.3	3.6	2.55	2.53	0.88	0.87	8.02	8.05	17.17
079F	Female	Cauc	3	2.93	2.96	2.09	2.08	1.82	1.85	4.18	2.3	5.06	3.89	2.5	2.46	0.91	0.88	7.76	7.7	16.95
080F	Female	Cauc	3	3.07	2.97	1.93	1.94	1.63	1.62	4.95	2.16	5.28	3.55	2.4	2.4	0.9	0.89	7.32	7.27	16.07
087F	Female	Oth	1	3.21	3.21	2.31	2.26	1.69	1.75	3.81	2.33	5.15	3.44	2.52	2.5	0.9	0.88	7.84	7.81	16.92
088F	Female	Asian	1	3.02	3.01	2.21	2.27	1.59	1.4	3.57	2.05	4.7	3.41	2.54	2.51	0.91	0.86	7.81	7.75	16.47
090F	Female	Asian	1	2.99	2.91	2.13	2.2	1.79	1.64	3.44	2.16	5.01	3.47	2.44	2.48	0.82	0.75	7.52	7.5	16.31
002FD	Female	Cauc	1	3.03	3.07	2.09	2.01	1.45	1.66	3.66	2.09	4.88	3.84	2.62	2.64	0.94	0.93	8.24	8.25	17.04
005FD	Female	Cauc	1	2.88	3.02	2.4	2.38	1.77	1.69	3.68	2.39	5.22	3.77	2.8	2.8	0.95	0.98	8.31	8.25	17.33
006FD	Female	Cauc	1	3.07	3.06	2.15	2.18	1.69	1.69	3.71	2.27	5.02	3.75	2.7	2.71	0.95	0.97	7.9	7.98	17.12
007FD	Female	Asian	1	3.14	3.09	2.35	2.44	1.64	1.74	3.54	2.35	4.94	3.84	2.66	2.69	0.94	0.97	8.38	8.44	17.03
009FD	Female	Cauc	1	3.11	2.99	2.16	2.06	1.74	1.73	3.78	2.39	4.74	3.72	2.72	2.73	0.91	0.89	7.71	7.7	17.03
017FD	Female	Cauc	1	2.99	3.11	2.13	2.19	1.41	1.38	3.46	2.02	4.47	3.61	2.56	2.58	0.81	0.9	8.41	8.44	17.26
020FD	Female	Cauc	1	2.93	3.01	2.05	2.05	1.83	1.71	3.8	2.24	4.77	3.85	2.67	2.69	0.92	0.96	8	7.99	17.23
021FD	Female	Cauc	1	3.3	3.24	2.36	2.33	1.5	1.47	3.74	2.24	4.34	3.62	2.61	2.59	0.91	0.91	8.67	8.66	17.07
022FD	Female	Cauc	1	3.12	3.11	2.23	2.19	1.59	1.58	3.72	2.34	4.52	3.7	2.74	2.71	0.98	0.97	8.25	8.19	17.42
023FD	Female	Cauc	1	3.1	3.18	2.27	2.35	1.89	1.66	3.77	2.47	4.23	3.72	2.86	2.87	0.98	1.02	8.29	8.33	17.26
025FD	Female	Oth	2	3.1	3.11	2.25	2.16	1.51	1.59	4.06	2.44	5.04	3.98	2.58	2.61	0.93	0.95	7.36	7.38	17.23
026FD	Female	Cauc	1	2.95	2.89	2.2	2.26	1.4	1.35	3.84	2.22	5.1	3.81	2.6	2.63	0.89	0.89	7.46	7.52	17.17
030FD	Female	Cauc	1	3.06	3.14	2.21	2.16	1.44	1.48	4.43	2.33	4.98	4.01	2.77	2.78	0.99	0.98	7.82	7.81	17.44
031FD	Female	Cauc	1	3.06	3.07	2.32	2.31	1.51	1.45	3.75	2.22	4.82	3.92	2.61	2.67	0.94	0.92	8.27	8.37	17.11
034FD	Female	Cauc	1	2.91	2.92	2.14	2.16	1.39	1.36	4.2	2.42	4.73	3.99	2.68	2.71	0.93	0.97	7.3	7.37	17.21
035FD	Female	Cauc	1	3.05	3.02	2.28	2.2	1.56	1.69	3.82	2.5	5.26	3.94	2.6	2.68	0.92	0.94	7.95	7.98	16.89
036FD	Female	Cauc	1	2.98	3.01	2.24	2.22	1.45	1.44	4.01	2.45	5.11	3.88	2.64	2.67	0.94	0.94	8.15	8.13	17.24

038FD	Female	Cauc	1	3.07	3.23	2.26	2.03	1.67	1.7	3.95	2.45	4.8	3.9	2.73	2.74	0.95	1	8.06	8.04	17.33
039FD	Female	Cauc	1	3.07	3.01	2.02	1.95	1.3	1.32	3.7	2.4	4.74	4.04	2.68	2.67	0.94	0.94	8.1	8.11	17.34
040FD	Female	Cauc	1	3.01	3.2	2.14	1.97	1.64	1.53	3.93	1.99	4.98	3.76	2.57	2.61	0.89	0.91	8	8.03	17.14
001Mc	Male	Cauc	2	2.82	2.95	2.18	2.19	1.88	1.87	3.64	2.53	4.77	3.75	2.79	2.64	0.83	0.88	7.43	7.47	17.25
005Mc	Male	Cauc	1	3.08	3.15	2.41	2.36	1.63	1.46	3.7	2.2	4.85	3.88	2.55	2.64	0.74	0.85	7.57	7.62	16.96
007M	Male	Asian	1	2.94	2.99	2.1	2.1	1.5	1.43	3.48	2.3	5.04	3.53	2.51	2.5	0.82	0.78	6.6	6.58	16.31
010M	Male	Cauc	1	3.25	3.27	2.03	2.04	1.65	1.72	4.37	2.07	5.25	4.48	2.68	2.66	1.02	1.03	6.7	6.68	16.9
011Mc	Male	Cauc	1	2.95	2.93	2.32	2.29	1.37	1.36	3.17	2.29	4.6	3.49	2.33	2.37	0.8	0.74	7.02	6.99	16.41
012M	Male	Cauc	1	2.74	2.73	2.054	2.03	1.57	1.64	3.47	2.3	4.98	3.88	2.39	2.42	0.73	0.66	6.67	6.69	16.5
013M	Male	Oth	1	2.94	2.92	1.99	2.06	1.75	1.68	3.62	2.33	4.98	3.71	2.44	2.41	0.92	0.88	7.1	7.09	16.85
013Mc	Male	Cauc	2	3.28	3.26	2.39	2.37	1.52	1.57	3.68	2.54	5.03	3.87	2.66	2.65	0.95	0.95	7.25	7.21	17.36
016M	Male	Cauc	1	2.87	2.93	2.1	2.08	1.61	1.66	3.48	2.15	4.12	3.94	2.36	2.35	0.79	0.78	6.82	6.79	16.26
19Mc	Male	Cauc	1	3.17	3.21	2.43	2.29	1.57	1.61	3.47	2.26	4.98	3.95	2.49	2.48	0.89	0.88	7.78	7.74	16.9
022Mc	Male	Cauc	1	3.1	3.04	2.29	2.31	1.59	1.76	3.48	2.29	4.49	3.82	2.49	2.48	0.85	0.86	7.4	7.33	16.55
025M	Male	Cauc	1	3.23	3.15	2.28	2.22	1.67	1.64	3.82	2.29	4.48	3.57	2.76	2.79	0.78	0.78	7.22	7.26	16.89
026M	Male	Cauc	1	2.93	2.93	2.21	2.24	1.72	1.59	3.46	1.91	4.4	3.65	2.45	2.55	0.85	0.89	6.84	6.84	16.14
028Mc	Male	Cauc	2	3.11	3.01	2.52	2.37	1.77	1.88	3.39	2.54	4.53	4.09	2.48	2.49	0.87	0.87	7.05	7.09	16.64
031M	Male	Cauc	1	2.94	2.94	2.15	2.22	1.78	1.78	3.49	2.27	4.41	4.04	2.53	2.54	0.82	0.79	7.02	6.94	17.12
038M	Male	Asian	1	2.92	2.89	2.22	2.23	1.71	1.76	3.63	2.38	4.88	4.03	2.48	2.48	0.73	0.82	7.33	7.27	16.75
040M	Male	Cauc	1	3.07	3.04	2.36	2.36	1.76	1.83	3.73	2.27	5.31	4.22	2.69	2.71	1.06	1.01	7.29	7.31	16.98
041M	Male	Cauc	3	2.83	2.92	2.1	1.97	1.65	1.65	3.31	2.04	3.88	3.37	2.31	2.35	0.66	0.66	6.92	6.89	15.19
044M	Male	Oth	3	3.09	3.01	2.39	2.23	1.66	1.74	3.57	2.16	5.36	3.9	2.67	2.71	0.86	0.79	7.4	7.4	17.45
046M	Male	Asian	2	2.89	3.02	2.16	2.17	1.87	1.87	3.91	2.21	4.87	4.09	2.5	2.55	0.86	0.89	6.33	6.33	16.81
049M	Male	Asian	2	3.09	3.16	2.38	2.44	1.43	1.48	3.69	2.28	4.97	3.92	2.69	2.65	0.74	0.81	7.88	7.9	17.37
050M	Male	Oth	3	3.22	3.24	2.52	2.53	1.57	1.86	3.8	2.3	4.69	4.06	2.76	2.77	0.96	0.99	7.82	7.83	17.67
051M	Male	Oth	1	2.86	2.96	2.32	2.29	1.68	1.51	3.39	2.08	5.16	3.68	2.72	2.73	0.96	0.93	7.18	7.18	17.24
054M	Male	Cauc	3	3.05	3.07	2.01	2.08	1.93	1.9	3.76	2.11	4.86	4.03	2.74	2.68	0.81	0.92	7.5	7.53	17.01
056M	Male	Cauc	2	3.03	3.22	2.39	2.24	1.7	1.51	3.7	2.02	5.08	3.78	2.47	2.49	0.86	0.85	7.64	7.65	17.26
062M	Male	Cauc	3	3.22	3.23	2.16	2.25	1.42	1.41	3.74	2.53	5.34	3.81	2.26	2.33	0.87	0.92	7.04	7.03	16.49
066M	Male	Cauc	1	2.77	2.87	2.26	2.22	1.69	1.86	4.02	2.25	4.67	3.63	2.5	2.51	0.78	0.8	7.15	7.11	16.75

068M	Male	Oth	2	3.02	3.11	2.19	2.17	1.9	1.82	3.83	2.28	4.68	3.81	2.62	2.63	0.92	0.82	7.16	7.15	17.15
070M	Male	Cauc	3	2.95	3.22	1.9	1.63	1.93	1.83	3.91	2.34	4.94	3.75	2.46	2.5	0.86	0.9	6.71	6.71	16.22
077M	Male	Cauc	1	3.2	3.25	2.36	2.26	1.72	1.77	4.15	2.19	4.94	3.88	2.5	2.64	0.77	0.77	7.59	7.57	16.99
086M	Male	Cauc	1	2.98	3	2.21	2.16	1.59	1.63	3.86	2.28	4.69	3.81	2.52	2.52	0.76	0.87	7.28	7.29	17.45
091M	Male	Cauc	1	3.21	3.22	2.33	2.32	1.81	1.78	3.83	2.29	4.88	4.21	2.75	2.75	0.78	0.72	7.45	7.52	17.29
094M	Male	Cauc	1	3.16	3.127	2.37	2.41	1.44	1.48	3.42	2.08	5.04	3.58	2.57	2.59	0.82	0.77	7.2	7.2	17
095M	Male	Cauc	1	3.24	3.27	2.21	2.18	1.62	1.43	3.98	2.21	4.93	4.2	2.63	2.62	0.88	0.87	7.1	7.15	17.08
097M	Male	Cauc	1	3.15	3.18	2.55	2.5	1.87	1.82	3.72	2.27	5.6	4.32	2.81	2.77	0.79	0.85	7.49	7.55	17.64
001MD	Male	Cauc	3	3.42	3.58	1.89	1.83	1.47	1.36	4.14	2.32	5.56	3.53	2.74	2.89	0.94	0.96	7.1	7.11	17.14
003MD	Male	Cauc	3	2.72	2.72	2.3	2.21	1.59	1.58	3.85	2.37	4.67	4.51	2.93	2.9	0.98	0.91	7.7	7.73	17.45
004MD	Male	Oth	1	3.08	3.04	2.34	2.25	1.89	1.95	4.1	2.1	5.18	4.12	2.99	3.07	1.01	1.03	7.86	7.84	17.26
008MD	Male	Cauc	1	3.28	3.2	2.32	2.41	1.43	1.53	3.82	2.24	4.95	3.84	2.71	2.73	0.97	0.92	7.87	7.96	17.17
010MD	Male	Asian	2	3.04	2.97	2.34	2.19	1.42	1.42	3.65	2.37	4.88	3.98	2.73	2.71	0.91	0.86	7.53	7.53	17.49
011MD	Male	Cauc	1	3.07	3.04	2.21	2.23	1.6	1.61	3.92	2.37	5.28	3.84	2.77	2.8	0.94	0.96	7.04	7.08	17.52
012MD	Male	Cauc	1	3	2.98	2.22	2.24	1.36	1.42	3.57	2.16	4.4	3.67	2.73	2.74	0.83	0.88	7.8	7.81	17.3
013MD	Male	Cauc	1	3.03	2.89	2.14	2.16	1.92	1.7	3.75	2.37	5.43	3.83	2.86	2.88	0.98	0.98	6.97	7.03	17.06
014MD	Male	Cauc	1	3.05	3.04	2.34	2.3	1.73	1.7	3.47	2.44	4.54	3.92	2.88	2.87	0.97	0.95	7.47	7.45	17.18
015MD	Male	Cauc	1	3.01	2.97	2.29	2.21	1.78	1.47	3.47	2.44	5.01	4.07	2.72	2.81	0.87	0.95	7.93	7.97	17.28
016MD	Male	Cauc	1	2.96	2.92	2.25	2.22	1.44	1.46	3.67	2.38	5.52	3.83	2.84	2.83	1	1	6.97	6.97	17.35
018MD	Male	Cauc	1	2.9	2.97	2.35	2.36	1.83	1.65	3.9	2.47	5.29	4.1	2.24	2.43	0.79	0.81	6.87	6.82	17.18
019MD	Male	Cauc	3	3.2	3.39	2.19	1.99	1.64	1.66	3.93	2.21	5.22	3.66	2.72	2.73	0.91	0.94	7.69	7.73	17.2
024MD	Male	Asian	1	3.02	3.05	2.45	2.41	1.26	1.7	3.7	2.44	5.03	4.24	2.93	2.93	1	1.03	7.55	7.52	17.13
027MD	Male	Cauc	1	3.06	3	2.16	2.12	1.9	1.92	3.97	2.39	4.64	3.67	2.85	2.83	0.96	0.97	7.57	7.58	17.38
028MD	Male	Oth	1	2.99	2.92	2.29	2.23	1.51	1.58	3.41	2.27	4.36	3.98	2.84	2.88	0.95	0.98	8.15	8.14	17.42
029MD	Male	Cauc	1	3	3.11	2.03	2.01	1.68	1.63	3.69	2.67	4.89	4.26	2.72	2.78	0.87	0.95	7.33	7.37	17.27
032MD	Male	Cauc	1	2.79	2.86	2.23	2.16	1.26	1.45	3.81	2.17	4.94	4.31	2.66	2.69	0.93	0.93	7.29	7.32	17.23
033MD	Male	Cauc	1	3	3.05	2.16	2.18	1.41	1.36	4.06	2.32	4.81	3.94	2.87	2.89	1.01	0.96	7.55	7.57	17.46
037MD	Male	Asian	1	3.09	3.09	2.24	2.22	1.61	1.53	3.75	2.33	5.21	4.29	2.64	2.58	0.75	0.79	7.17	7.12	17.01
041MD	Male	Cauc	1	2.92	3.06	2.21	2.01	1.46	1.48	4.35	2.89	5.18	4.49	2.95	2.99	1	1.02	6.75	6.77	17.34
015CSM	Male	Asian	1	3.15	3.18	2.44	2.3	1.87	1.92	3.4	2.56	4.66	3.89	2.73	2.82	1	0.95	7.17	7.17	17.12

023CSF	Female	Asian	1	3.2	3.21	2.35	2.26	1.54	1.71	3.82	2.3	4.98	3.94	2.61	2.64	0.95	0.97	8.04	8.02	17.39
025CSF	Female	Asian	1	3.21	3.28	2.32	2.04	1.68	1.75	4.2	2.81	5.51	4.28	2.92	2.91	1.04	1.12	7.71	7.69	17.49
029CSM	Male	Asian	1	3.11	3.06	2.16	2.2	1.54	1.5	3.38	2.34	5.03	4	2.52	2.64	0.84	0.9	7.26	7.25	17.41
002SF	Female	Asian	2	2.95	3.02	2.32	2.27	1.44	1.46	3.92	2.41	4.97	4	2.72	2.68	1.04	0.98	8.23	8.23	17.01
004SF	Female	Asian	1	3.26	3.21	2.36	2.23	1.74	1.78	3.8	2.35	5.57	3.83	2.86	2.77	1.03	0.99	8.01	8.01	17.8
005SF	Female	Asian	1	3.33	3.32	2.18	2.25	1.59	1.55	3.74	2.46	4.13	5.37	2.69	2.78	0.92	0.79	7.98	7.99	17.79
007SF	Female	Asian	1	3.31	3.42	2.28	2.19	1.4	1.47	4.02	2.35	4.96	3.97	2.7	2.67	0.98	1.02	8.24	8.25	17.61
012SF	Female	Asian	1	2.93	2.9	2.26	2.27	1.78	1.83	3.93	2.44	5.2	3.68	2.74	2.7	0.99	0.98	7.64	7.64	17.65
015SM	Male	Asian	1	3.16	3.2	2.37	2.32	1.67	1.53	3.52	2.17	5.3	3.82	2.66	2.77	0.92	0.97	7.53	7.54	17.54
017SF	Female	Asian	1	3.04	3.06	1.96	2.02	1.63	1.66	4.45	2.43	4.88	3.62	2.73	2.81	1.02	1.02	7.73	7.72	17.63
019SF	Female	Asian	1	2.98	3.14	2.22	2.2	1.63	1.65	3.46	2.57	5.18	3.89	2.66	2.64	0.86	0.94	7.94	7.94	17.55
020SF	Female	Asian	1	3.24	3.38	2.23	2.14	1.86	1.72	3.52	2.28	5.29	3.93	2.54	2.69	0.93	0.94	8.07	8.06	17.51
021SF	Female	Asian	1	3.42	3.38	2.27	2.27	1.87	1.77	3.98	2.4	5.32	3.92	2.76	2.75	0.97	1.01	8.13	8.13	17.26
023SM	Male	Asian	1	3.06	3.18	2.11	2.08	1.32	1.38	4.04	2.52	5.03	4.09	2.7	2.86	0.98	0.95	7.16	7.09	16.92
024SF	Female	Asian	1	3.01	2.98	2.41	2.27	1.7	1.67	4.04	2.55	5.63	4.1	2.73	2.76	1.02	1.01	7.89	7.89	17.39
026SF	Female	Asian	1	3.12	3.15	2.32	2.26	1.71	1.61	3.94	2.38	5.19	3.78	2.64	2.76	0.94	0.98	7.85	7.87	17.3
041SF	Female	Asian	1	3.01	2.96	2.11	2.29	1.88	1.78	3.68	2.37	5.15	3.87	2.73	2.7	0.92	0.93	8.19	8.19	17.66
042SF	Female	Asian	1	3.29	3.23	2.17	2.22	1.51	1.69	3.9	2.48	5.01	3.94	2.7	2.71	0.97	0.98	8	7.98	17.3
044SF	Female	Asian	1	2.97	3.04	2.26	2.19	1.46	1.54	3.66	2.21	4.78	3.68	2.74	2.75	1.01	1	7.71	7.7	17.4
055SF	Female	Asian	1	3.02	3.06	2.25	2.33	1.67	1.63	3.81	2.13	5.44	3.7	2.76	2.8	0.98	1	7.53	7.54	17.25
058SM	Male	Cauc	3	3.08	3.03	2.22	2.15	1.66	1.54	3.8	2.55	4.92	3.76	2.69	2.9	1.08	1.04	7.3	7.24	17.31
059SM	Male	Cauc	3	3.39	3.2	2.13	2.15	1.36	1.35	3.86	2.09	5.55	4.02	2.67	2.62	0.98	0.94	7.4	7.41	17.34
062SM	Male	Cauc	3	3.28	3.28	2.14	2.16	1.39	1.37	4.13	2.63	5.07	3.83	2.98	3.04	1.07	1.04	6.95	6.94	17.34
064SM	Male	Cauc	3	3.06	2.96	2.19	2.11	1.53	1.68	3.99	2.52	4.78	4.26	2.8	2.8	0.97	1.02	7.21	7.19	17.24
068SM	Male	Cauc	3	3.15	3.08	2.17	2.14	1.91	1.9	4	2.24	5.58	4.17	2.72	2.64	1.04	0.97	7.17	7.12	17.18
069SM	Male	Cauc	3	3.16	3.24	2.14	2.02	1.63	1.64	3.95	2.29	5.45	4.01	3.03	2.87	1.03	0.9	7.39	7.39	17.67
070SM	Male	Cauc	3	3.06	3.14	2.19	2.03	1.55	1.76	3.98	2.22	5.06	4.15	2.9	2.85	1.07	1.06	7.16	7.11	17.28
071SM	Male	Cauc	3	3.42	3.28	2.03	2.01	1.96	2	3.98	2.37	5.7	4	2.91	2.98	1.1	1.04	7.2	7.16	17.14
072SM	Male	Cauc	3	3.12	3.11	2.34	2.32	1.73	1.77	3.77	2.35	5.12	3.94	2.75	2.79	1.16	1.03	7.49	7.46	17.38
075SM	Male	Cauc	3	2.99	2.98	2.03	1.99	1.73	1.87	3.62	2.33	4.75	3.84	2.86	2.51	1.05	1.06	7.53	7.54	17.64

077SM	Male	Cauc	3	3.05	3.17	2.43	2.19	1.76	1.74	3.96	2.22	5.33	3.78	2.94	2.95	1.01	1.05	7.32	7.29	17.01
078SM	Male	Cauc	3	3.52	3.46	2.07	1.99	1.99	2.06	4.02	2.36	5.06	4.06	3.04	3.11	1.09	1.09	7.41	7.38	17.08
080SM	Male	Cauc	3	3.25	3.09	2.33	2.34	1.75	1.79	3.83	2.25	4.88	3.95	2.63	2.67	0.9	0.92	7.3	7.24	16.99
081SM	Male	Cauc	3	3.04	3.21	2.15	2.17	1.91	1.9	4.06	2.48	5.43	3.99	2.96	2.82	1.06	1.05	7	7.01	17.54
082SM	Male	Cauc	3	3.08	3.2	2.35	2.25	1.58	1.47	3.77	2.28	5.16	4.48	2.73	2.88	1.05	0.96	7.35	7.34	17.06
083SM	Male	Cauc	3	3.12	3.14	2.13	2.22	1.78	1.72	4.08	2.48	5.24	4.17	2.89	2.88	1.12	1.02	7.03	6.99	17.23
084SM	Male	Cauc	3	3.16	3.16	2.36	2.17	1.86	2.05	3.64	2.12	4.6	3.64	2.5	2.54	1	0.98	7.64	7.6	16.81
088SM	Male	Cauc	3	2.83	3.09	2.35	2.02	1.82	1.75	3.95	2.47	4.74	4.18	2.75	2.8	1	0.98	7.25	7.22	17.11
089SM	Male	Cauc	3	3.25	3.14	2.13	2.21	1.72	1.59	3.59	2.17	5.11	3.73	2.51	2.55	1.01	0.89	7.76	7.75	16.98
090SM	Male	Cauc	3	3.04	2.99	2.13	2.09	1.61	1.5	4.06	2.25	5.18	4.03	2.67	2.89	0.95	0.98	7.03	7	16.98
093SF	Female	Cauc	3	3.13	3.19	2.15	2.14	1.7	1.54	4.64	2.29	5.35	3.89	2.69	2.68	1	0.98	7.84	7.76	17.14
094SM	Male	Cauc	3	3.22	2.98	2.04	2.22	1.91	1.95	4.09	2.41	5.56	4.19	2.68	3.04	1.08	1.11	7.39	7.33	17.35
096SF	Female	Asian	1	3.03	3.1	2.06	2.03	1.65	1.56	4.07	2.43	5.1	3.6	2.67	2.67	0.95	0.96	7.56	7.56	17.26
101SM	Male	Cauc	3	3.23	3.34	2.24	2.23	1.72	1.64	3.86	2.15	5.52	4.01	2.89	2.93	1.06	0.93	7.41	7.34	17.25
104SF	Female	Cauc	3	3.14	3.08	1.96	2.08	1.9	1.8	4.38	2.18	5.13	4.08	2.88	2.81	1	1.03	7.4	7.4	17.3
105SF	Female	Cauc	3	2.93	3.07	2.11	1.94	1.74	1.86	4.14	2.39	5.28	3.86	2.69	2.78	1.01	0.99	7.5	7.5	16.99
106SM	Male	Cauc	3	3.09	3.09	1.97	1.97	1.81	1.73	3.84	2.15	4.93	3.97	3.04	2.85	1.06	1.02	7.19	7.19	17.21
107SM	Male	Cauc	3	3.08	3.01	2.1	2.06	1.73	1.82	4.21	2.04	6	4.03	2.75	2.76	0.99	0.92	6.97	6.95	17.2
108SF	Female	Cauc	3	2.94	2.94	1.91	1.95	1.68	1.77	3.93	2.61	4.96	3.98	2.69	2.73	0.95	0.98	7.66	7.65	17.02
109SF	Female	Cauc	3	3.15	2.96	2.09	2.21	1.95	1.78	3.86	2.31	5.15	3.75	2.42	2.58	0.98	0.96	7.69	7.66	17
110SF	Female	Cauc	3	3.2	3.15	2.26	2.04	1.68	1.89	4.24	2.35	5.4	3.75	2.82	2.78	1	1.01	7.5	7.5	16.97
111SM	Male	Cauc	3	3.38	3.42	2.27	2.12	1.68	1.8	3.74	2.2	4.86	4.1	2.81	2.82	1.03	0.96	7.48	7.5	17.23
112SM	Male	Cauc	3	2.97	3.06	2.12	2.05	1.83	1.92	3.58	2.58	5.09	3.99	2.46	2.72	0.9	0.91	7.26	7.28	17.2
114SM	Male	Cauc	3	2.94	3.23	2.25	2.08	1.9	1.59	3.78	2.36	5.32	4.03	2.84	2.62	0.98	0.94	7.12	7.14	17.28
133SF	Female	Asian	1	2.95	3.1	2.5	2.34	1.39	1.15	3.63	2.46	4.85	3.61	2.63	2.7	0.99	0.95	7.75	7.75	16.62
134SM	Male	Asian	1	2.86	2.86	2.1	2.05	1.59	1.52	3.8	2.41	4.65	3.78	2.62	2.85	1.02	1	6.72	6.67	17.34
144SF	Female	Asian	1	2.94	3.02	2.23	2.23	1.48	1.42	4.1	2.45	4.84	3.69	2.77	2.83	1.07	1.04	7.18	7.17	16.99
178SM	Male	Asian	2	3.19	3.15	2.33	2.27	1.69	1.83	3.58	2.5	6.16	3.76	2.84	2.85	1.06	1.09	6.25	6.24	17.13
001CSF	Female	Cauc	1	3.09	3.16	2.25	2.3	1.75	1.56	3.89	2.24	4.87	3.93	2.64	2.66	0.93	1	8.34	8.35	17.81
002CSM	Male	Cauc	1	3.15	3.14	2.23	2.24	1.63	1.71	3.76	2.46	5.24	4.04	2.77	2.74	0.98	0.94	7.8	7.83	17.74

003CSM	Male	Cauc	1	2.97	2.99	2.17	2.16	1.63	1.62	3.89	2.49	5.02	4.29	2.95	2.99	1.1	1.09	7.71	7.72	17.76
004CSM	Male	Cauc	1	3.09	3.11	2.41	2.37	1.64	1.44	3.77	2.39	4.95	3.87	2.77	2.82	0.99	1.01	7.92	7.93	17.49
005CSF	Female	Cauc	1	3.17	3.12	2.14	2.11	1.81	1.66	4.25	2.52	5.35	4.09	2.83	2.84	1	1.04	8	8.02	17.51
006CSM	Male	Cauc	1	3.05	3.06	2.13	2.13	1.69	1.78	3.71	2.35	5.92	4.07	2.81	2.56	1.03	0.99	7.25	7.27	17.87
007CSM	Male	Cauc	2	3.07	3.05	2.13	2.08	1.83	1.88	3.67	2.46	5.2	3.88	2.9	2.89	1.02	1.05	7.5	7.48	17.74
008CSM	Male	Cauc	1	3.28	3.32	2.23	2.28	1.75	1.77	4.36	2.56	5.55	4.29	2.5	2.93	1.15	1.16	7.3	7.38	17.79
009CSM	Male	Cauc	1	3.22	3.2	2.29	2.24	1.7	1.84	3.75	2.45	5.59	4.15	2.72	2.7	0.99	0.91	7.2	7.2	17.81
010CSM	Male	Cauc	2	3.19	3.14	2.22	2.28	1.56	1.62	3.67	2.36	5.17	4.08	2.76	2.83	1.05	1.05	7.55	7.56	17.78
011CSF	Female	Cauc	1	3.16	3.27	2.18	1.96	1.68	1.57	4.32	2.79	5.48	3.78	3.03	3.09	1.12	1.15	7.64	7.65	17.7
012CSM	Male	Cauc	1	3.14	3.02	2.13	2.05	1.73	1.8	3.75	2.41	5.28	4.09	2.83	2.78	1.01	1.04	7.37	7.37	17.86
013CSF	Female	Cauc	1	3.38	3.31	2.41	2.23	1.6	1.61	4.17	2.28	5.13	3.74	2.79	2.71	0.96	0.99	8.3	8.29	17.69
014CSM	Male	Cauc	1	3.1	3.08	2.24	2.33	1.9	1.82	3.88	2.5	5.25	4.03	2.73	2.73	0.88	0.96	7.34	7.39	17.8
016CSF	Female	Oth	1	3.29	3.36	2.2	2.36	1.81	1.79	4.17	2.53	5.01	3.76	2.88	2.9	1.06	1.08	8.37	8.37	17.67
017CSF	Female	Cauc	1	3.21	3.21	2.04	2.08	1.65	1.68	4.17	2.55	5.1	3.85	2.83	2.81	1.04	1.05	7.93	7.95	17.72
018CSF	Female	Cauc	1	3.22	3.21	2.28	2.25	1.7	1.81	4.42	2.27	5.05	3.84	2.77	2.75	1.01	1.04	8.17	8.16	17.67
019CSF	Female	Cauc	1	3.26	3.39	2.14	2.07	1.95	1.97	5.52	2.35	5.68	4.24	2.87	2.89	1.04	1.08	7.89	7.94	17.77
020CSM	Male	Cauc	1	3.29	3.13	2.07	2.17	1.52	1.67	3.7	2.65	5.36	4.2	2.9	2.9	1.04	1.08	7.45	7.45	17.84
021CSF	Female	Cauc	1	3.35	3.31	2.24	2.28	1.75	1.76	3.9	2.42	4.82	4.04	2.84	2.87	0.98	1.01	8.16	8.23	17.9
022CSF	Female	Cauc	1	3.29	3.34	2.2	2.16	1.67	1.73	4.38	2.27	5.58	3.81	2.65	2.63	0.92	0.95	8.02	8.06	17.79
024CSM	Male	Cauc	1	3.11	3.05	2.42	2.32	1.73	1.81	3.88	2.23	5.19	4.11	2.71	2.72	1.06	0.96	7.72	7.82	17.89
026CSF	Female	Cauc	2	3.3	3.33	2.03	2.14	1.81	1.83	4.82	2.3	5.67	3.96	2.93	2.88	1.07	1.08	7.85	7.9	17.84
027CSF	Female	Cauc	1	3.16	3.19	2.19	2.27	1.95	1.87	4.17	2.51	5.27	4.11	2.85	2.92	1.02	1.07	8.03	7.98	17.81
028CSM	Male	Cauc	1	3.32	3.25	2.32	2.37	1.89	1.84	3.93	2.55	5.52	4.31	2.84	2.84	1.05	1.07	7.61	7.63	17.76
030CSF	Female	oth	1	3.27	3.24	2.27	2.22	2.06	2	3.71	2.48	5.06	4.14	2.65	2.74	0.92	0.94	7.85	7.8	17.87
031CSF	Female	Cauc	1	3.23	3.19	2.29	2.19	1.45	1.5	3.86	2.52	4.88	3.71	2.77	2.77	1.01	1.03	8.57	8.59	17.76
032CSF	Female	Cauc	2	3.13	3.11	2.2	2.17	1.75	1.81	3.9	2.35	4.88	4.05	2.86	2.84	0.97	0.96	8.19	8.17	17.86
001SF	Female	Cauc	1	3.19	3.1	2.27	2.32	1.97	1.89	4.06	2.35	5.33	4.15	2.77	2.75	0.99	0.97	8.12	8.06	17.63
003SM	Male	Cauc	1	3.06	3.17	2.25	2.2	1.79	1.83	3.55	2.4	5.11	4.07	2.66	2.68	0.97	0.96	7.57	7.56	17.73
006SF	Female	Cauc	1	2.96	3.03	2.14	2.15	1.68	1.8	4.01	2.63	5.13	3.82	2.71	2.77	0.99	1.01	8.03	8.03	17.64
008SF	Female	Cauc	1	3.27	3.32	2.3	2.17	1.78	1.9	3.9	2.32	5.06	3.91	2.78	2.75	0.98	0.99	8.38	8.33	17.59

009SM	Male	Cauc	1	3.41	3.34	2.24	2.31	1.54	1.59	3.77	2.81	5.3	4.34	2.6	2.55	1.15	1.02	7.22	7.21	17.72
010SM	Male	Cauc	1	3.32	3.35	2.33	2.36	1.6	1.57	3.66	2.53	5.8	4.19	2.79	2.63	1.05	1.02	7.61	7.59	17.43
011SF	Female	Cauc	3	3.08	3.07	2.05	2.14	1.78	1.85	4.87	2.53	5.61	3.93	2.8	2.93	1.11	1.03	7.86	7.88	17.79
013SF	Female	Cauc	1	3.54	3.56	2.2	2.21	1.67	1.64	4.09	2.28	5.12	3.78	2.47	2.59	0.93	0.93	8.65	8.65	17.94
014SF	Female	Cauc	3	3.12	3.13	2.24	2.06	1.73	1.92	3.74	2.46	5.07	3.66	2.72	2.94	0.98	1	8.19	8.19	17.6
016SF	Female	Cauc	1	3.28	3.14	2.14	2.43	1.46	1.39	3.76	2.38	4.91	3.87	2.71	2.72	1.06	1.04	8.29	8.32	17.75
018SF	Female	Oth	1	3.32	3.45	2.33	2.38	1.62	1.52	4.05	2.47	5.66	3.67	2.69	2.67	1.03	0.97	7.91	7.88	17.77
022SM	Male	Cauc	2	3.02	3.26	2.19	2.03	1.76	1.83	3.84	2.23	5.37	4.76	2.93	3	1.07	1	7	6.94	17.6
025SF	Female	Oth	1	3.25	3.39	2.11	1.92	1.54	1.5	4.3	2.34	5.47	3.96	2.65	2.75	1	0.98	7.44	7.4	17.46
027SM	Male	Oth	1	3.32	3.38	2.37	2.38	1.5	1.52	4.48	2.43	5.91	4.14	2.89	2.92	1.11	1.09	7.01	7.05	17.83
028SM	Male	Cauc	1	2.9	3.07	2.05	2.15	1.58	1.49	4.51	2.39	5.43	4.09	2.61	2.8	1.01	1.01	7.51	7.48	17.76
029SM	Male	Cauc	1	3.01	3.25	2.51	2.26	1.76	1.6	4.08	2.43	5.45	4.1	2.68	2.88	1.02	0.99	7.53	7.53	18.82
030SF	Female	Cauc	1	3.17	3.26	2.32	2.16	1.81	1.81	4.59	2.19	5.17	3.91	2.72	2.75	0.99	0.94	8.32	8.3	17.84
031SF	Female	Cauc	1	3.12	3.18	2.34	2.22	1.69	1.75	4.52	2.26	5.55	3.72	2.74	2.78	0.98	1	8	7.94	17.92
032SF	Female	Cauc	3	3.32	3.31	2.43	1.87	1.7	2.07	4.39	2.4	5.73	4.04	2.83	2.73	1.08	1.02	7.71	7.7	17.87
033SF	Female	Cauc	1	3.13	3.05	2.4	2.4	1.5	1.45	3.88	2.6	5.46	3.85	2.76	2.78	0.99	0.99	8.03	8.01	17.93
034SF	Female	Cauc	1	3.2	3.27	2.06	2.03	1.44	1.46	5.21	2.35	5.73	4.16	2.96	2.88	1.04	0.99	7.91	7.88	17.88
035SM	Male	Cauc	1	3.08	3.12	2.17	2.18	1.94	1.95	3.73	2.46	4.08	5.05	2.95	2.93	1	1.03	7.93	7.92	17.85
036SF	Female	Cauc	1	3.38	3.42	2.15	2.16	1.79	1.71	4.55	2.2	5.84	3.8	2.97	2.9	1.05	1.02	7.94	7.94	17.87
037SM	Male	Cauc	1	3.15	3.32	2.18	2.09	1.72	1.64	4.02	2.3	5.4	4.34	2.56	2.68	0.97	0.98	7.36	7.33	17.88
038SM	Male	Cauc	1	3.19	3.14	2.45	2.33	1.54	1.44	3.6	2.31	5.04	3.75	2.77	2.77	0.97	0.96	8.14	8.14	17.79
039SF	Female	Cauc	1	3.14	3.25	2.22	2.19	1.78	1.74	4.45	2.42	4.91	4.09	2.8	2.79	1.02	1	8.19	8.19	17.9
040SM	Male	Cauc	1	3.17	3.21	2.51	2.34	1.55	1.59	4.08	2.29	4.91	4.11	2.79	2.9	1.04	1.06	7.69	7.65	17.87
043SF	Female	Cauc	1	3.26	3.18	2.35	2.28	1.77	1.79	3.79	2.44	4.66	4.15	2.81	2.81	1.02	1.04	8.29	8.3	17.89
046SM	Male	Oth	3	3.61	3.52	2.06	2.27	1.86	2.27	2.04	4.46	2.19	4.68	2.72	2.53	1	0.96	7.33	7.35	17.65
047SM	Male	Cauc	2	3.06	3.17	2.28	2.25	1.9	1.83	4.35	2.59	5.31	4.23	2.83	2.77	1.13	1.01	7.13	7.11	17.84
048SM	Male	Cauc	3	3.28	3.55	2.36	2.14	1.76	1.74	4.24	2.37	5.64	4.02	3.06	3.26	1.07	1.11	7.18	7.22	17.92
049SF	Female	Cauc	2	3.33	3.2	2.36	2.39	1.46	1.5	5.73	2.16	5.79	4.38	3.1	3.18	1.13	1.07	7.89	7.91	17.85
050SM	Male	Cauc	1	3.28	3.21	2.29	2.22	1.76	1.88	3.72	2.4	5.53	3.62	2.91	2.84	1.02	1	7.47	7.47	17.82
051SF	Female	Cauc	1	3.2	3.34	2.2	2.11	1.87	1.88	4.32	2.34	5.64	3.62	2.88	2.86	1.05	1.08	7.42	7.45	17.86

052SM	Male	Cauc	1	3.3	3.4	2.36	2.44	1.72	1.7	4.28	2.47	5.39	4.23	2.82	2.78	1.08	1.06	7.8	7.82	17.86
053SM	Male	Cauc	1	3.25	3.2	2.2	2.29	1.73	1.7	4.26	2.37	5.65	4.37	2.69	2.71	0.98	0.98	7.3	7.35	17.87
054SF	Female	Cauc	2	3.47	3.49	2.48	2.46	1.77	1.64	3.95	2.2	4.63	3.89	2.62	2.62	0.91	0.95	8.52	8.49	17.75
056SM	Male	Cauc	2	2.99	2.97	2.22	2.21	1.87	1.85	4.24	2.59	5.52	4.48	2.79	2.88	1.07	1.03	7.47	7.49	17.91
057SF	Female	Cauc	3	3.33	3.2	2.24	2.26	1.72	1.88	4.73	2.35	5.54	3.89	2.86	2.91	1.08	1.06	7.8	7.72	17.86
060SF	Female	Cauc	3	3.41	3.45	2.3	2.06	1.76	1.72	4.43	2.56	5.31	4.08	2.88	2.84	1.08	1.09	7.95	7.94	17.86
061SF	Female	Cauc	1	3.54	3.5	2.18	2.22	1.64	1.78	4.47	2.55	4.88	3.89	2.77	2.75	0.99	1	8.4	8.37	17.87
063SF	Female	Cauc	3	3.38	3.37	2.25	2.04	1.79	1.78	4.96	2.6	5.62	4.24	3.01	2.86	1.15	1.03	7.79	7.72	17.91
065SF	Female	Cauc	3	3.24	3.13	2.09	2.11	1.9	1.9	4.08	2.33	5.03	3.85	2.71	2.75	0.97	0.88	7.95	7.9	17.71
066SF	Female	Cauc	3	3.36	3.34	2.26	2.23	1.73	1.78	4.18	2.42	5.56	3.96	2.87	2.87	1.01	1.07	7.8	7.8	17.82
067SF	Female	Cauc	3	3.36	3.28	2.13	2.06	2	1.9	4.09	2.29	5.48	3.99	2.98	3	1.07	1.03	8.1	8.1	17.85
073SF	Female	Cauc	3	2.98	2.95	2.49	2.34	1.79	1.63	4.52	2.68	5.44	4.06	2.84	2.77	0.93	0.95	7.62	7.6	17.89
074SF	Female	Cauc	3	3.29	3.27	2.22	2.18	2.12	1.95	4.18	2.41	5.22	4	2.86	2.83	1.06	1.05	7.98	7.97	17.84
076SF	Female	Cauc	3	3.13	3.35	2.32	2.3	1.74	1.79	4.35	2.37	5.26	3.97	2.81	2.76	1.03	1.03	7.83	7.83	17.89
079SM	Male	Cauc	3	3.23	2.93	2.09	2.32	2	1.93	4.17	2.39	5.52	4.37	2.61	2.82	0.99	1.04	7.46	7.46	17.91
085SF	Female	Cauc	2	3.29	3.24	2.44	2.25	1.63	1.72	4.22	2.4	5.16	4.16	2.79	2.78	0.98	0.96	8.01	8.02	17.93
086SF	Female	Cauc	2	3.08	2.89	2.22	2.25	1.83	1.9	4.29	2.52	5.19	3.96	2.86	2.86	1.04	1.04	7.97	7.97	17.85
087SF	Female	Cauc	3	3.05	2.93	2.17	2.28	1.89	1.86	4.45	2.43	5.61	4.24	2.9	3.01	1.07	1.12	7.51	7.51	17.86
091SM	Male	Cauc	1	3.16	3.28	2.37	2.24	1.78	1.83	3.95	2.35	5.62	4.28	2.81	2.9	1.08	1.04	7.23	7.17	17.88
092SF	Female	Cauc	2	3.42	3.49	2.2	2.25	1.71	1.57	4.49	2.42	5.46	4.07	2.8	2.89	1.07	0.95	7.82	7.78	17.91
095SM	Male	Cauc	1	3.25	3.21	2.31	2.3	1.67	1.79	4.22	2.25	5.17	4.18	2.82	2.84	0.97	1	7.82	7.78	17.81
097SF	Female	Cauc	1	3.19	3.22	2.13	2.18	1.75	1.81	4.32	2.35	5.14	3.95	2.68	2.53	0.96	0.85	7.9	7.85	17.92
098SF	Female	Cauc	1	3.28	3.2	2.27	2.25	1.81	1.78	4.41	2.51	5.54	4.07	2.77	2.77	0.98	0.99	7.56	7.49	17.81
099SM	Male	Cauc	1	3.12	3.2	2.44	2.46	1.97	1.88	4.15	2.1	5.25	4.37	2.81	2.76	0.92	1	7.69	7.64	17.9
100SM	Male	Cauc	1	3.16	3.1	2.51	2.4	1.67	1.65	3.43	2.59	5.46	4.1	2.7	2.78	1	0.99	7.32	7.27	17.93
102SF	Female	Cauc	2	3.36	3.4	2.33	2.24	1.78	1.96	4.67	2.39	5.3	4.38	2.83	2.86	1.04	1.02	8.31	8.31	17.88
103SF	Female	Cauc	2	3.14	3.17	2.21	2.24	1.86	1.78	4.15	2.42	5.52	4.09	2.75	2.7	1.04	1.01	7.9	7.88	17.84
115SF	Female	Cauc	3	3.46	3.52	2.13	2.09	1.91	1.85	4.54	2.25	5	4.03	2.91	2.94	1.07	1.18	8.22	8.23	17.86
116SF	Female	Cauc	1	3.19	3.24	2.33	2.21	1.81	1.78	4.17	2.31	5.41	3.8	2.96	2.75	0.98	0.89	7.79	7.79	17.75
117SF	Female	Cauc	2	3.34	3.15	2.15	2.26	1.86	1.92	3.82	2.45	5.22	4.03	2.63	2.67	1	1.01	8.17	8.16	17.83

118SM	Male	Cauc	1	3.06	3.12	2.23	2.04	1.77	1.82	3.45	2.32	5.29	3.96	2.9	2.86	0.99	0.98	7.74	7.73	17.82
119SM	Male	Cauc	3	3.27	3.45	2.08	1.97	1.66	1.92	3.75	2.22	5.33	4.11	2.87	2.83	1	0.99	7.93	7.92	17.9
120SM	Male	Cauc	3	3.28	3.38	2.36	2.22	1.74	1.84	4.03	2.31	5.14	4.34	3.01	2.93	1.08	1.05	7.77	7.77	17.85
121SM	Male	Cauc	3	3.36	3.44	2.23	1.91	1.84	1.92	4.18	2.46	4.75	4.57	2.93	2.87	1.06	1.04	7.6	7.63	17.98
122SF	Female	Cauc	3	3.21	3.07	2.23	2.21	1.71	1.72	4.28	2.3	5.28	4.11	2.62	2.77	0.99	1	7.8	7.81	17.91
123SF	Female	Cauc	3	3.62	3.48	1.89	1.95	1.9	2.01	4.33	2.48	5.5	4.05	2.92	2.88	1.05	1.06	7.74	7.75	17.85
124SF	Female	Cauc	2	3.45	3.31	2.24	2.3	1.69	1.75	4.26	2.43	5.73	3.96	3.05	3	1.1	1.04	7.97	7.94	17.85
125SM	Male	Cauc	3	3.28	3.38	2.39	2.21	1.57	1.58	3.73	2.32	5.35	4.23	2.83	2.79	1.13	0.97	7.54	7.56	17.92
126SF	Female	Cauc	2	3.22	3.14	2.07	2.02	1.86	1.82	4.05	2.51	5.25	3.73	2.74	2.7	1.02	1	8.17	8.15	17.86
127SF	Female	Cauc	3	3.37	3.28	1.97	2.12	1.58	1.59	4.43	2.56	5.35	3.74	2.93	2.78	1.03	1.05	8.18	8.22	17.8
128SF	Female	Cauc	3	3.41	3.44	2.14	2.23	1.69	1.34	4.73	2.7	5.85	4.38	3.02	3.04	1.09	1.11	7.58	7.6	17.88
129SF	Female	Cauc	3	3.32	3.27	2.1	2.12	1.99	1.84	4.79	2.16	5.92	4.2	3.05	3.22	1.11	1.08	7.86	7.83	17.93
130SM	Male	Cauc	2	3.2	3.14	2.38	2.14	1.71	1.88	3.88	2.35	5.17	4.15	2.84	2.76	1.02	1.03	7.99	8.01	17.96
131SM	Male	Cauc	3	3.31	3.5	2.22	1.78	1.87	1.94	4.63	2.41	5.55	4.34	3.01	2.75	1.11	1	7.26	7.16	17.86
132SM	Male	Cauc	3	3.23	3.38	2.13	2.03	1.91	1.86	3.82	2.27	5.12	4.63	2.78	2.85	1.04	1.06	7.34	7.34	17.83
135SF	Female	Cauc	2	3.23	3.28	2.26	2.17	1.72	1.69	4.08	2.49	5.26	3.9	2.76	2.78	0.99	1.06	7.88	7.87	17.91
136SF	Female	Cauc	2	3.51	3.35	2.02	2.13	2.12	1.97	4.39	2.49	5.59	4.17	2.8	2.77	0.94	0.93	7.95	7.95	17.9
137SF	Female	Cauc	3	3.19	3.18	2.29	2.04	1.86	1.92	4.68	2.65	5.68	4.64	3.25	3.14	1.14	1.17	7.27	7.25	17.85
138SM	Male	Cauc	2	3.06	3.32	2.16	1.89	1.91	1.9	3.92	1.88	5.15	3.91	2.96	2.75	1.07	1.08	7.5	7.49	17.92
139SM	Male	Cauc	2	3.27	3.37	1.98	1.98	1.87	1.86	4.17	2.62	5.46	4.11	3	2.93	1.06	1.11	7.18	7.1	17.92
140SM	Male	Cauc	2	3.06	3.07	2.38	2.37	1.86	1.84	4.17	2.51	5.68	4.4	2.92	2.9	1.07	1.06	7.53	7.55	17.9
141SM	Male	Cauc	1	3.42	3.35	2.53	2.42	2.15	2.1	3.58	2.34	5.25	4.24	3.02	3.02	1.01	1.06	7.87	7.89	17.9
143SF	Female	Cauc	1	3.01	3.03	2.26	2.25	1.83	1.74	3.86	2.66	4.88	3.73	2.88	2.9	1.05	1.05	8.31	8.27	17.89
145SM	Male	Cauc	1	3.06	3.19	2.28	2.28	2	1.79	3.77	2.39	4.96	3.96	2.94	2.94	1.05	1.03	8	7.97	17.92
146SM	Male	Cauc	3	3.03	3.09	2.38	2.35	1.74	1.82	4.11	2.4	5.65	4.15	2.82	2.81	1.05	1.1	7.75	7.76	17.9
147SM	Male	Cauc	3	3.15	3.18	2.13	2.14	1.88	2.01	4.39	2.7	5.41	4.75	2.9	2.93	1.11	1.06	6.98	6.99	17.95
148SM	Male	Cauc	3	3.21	3.51	2.55	2.19	1.69	1.75	3.95	2.37	4.87	4.65	2.74	2.83	1.05	1.05	7.72	7.7	17.9
149SF	Female	Cauc	3	3.41	3.38	1.98	1.95	1.88	1.79	4.38	2.5	5.48	4.33	3.14	3.11	1.12	1.12	7.33	7.3	17.89
150SF	Female	Cauc	3	3.47	3.63	1.94	1.7	1.93	1.85	4.63	2.62	5.03	3.9	2.86	2.93	1.06	1.06	7.98	7.94	17.84
152SF	Female	Cauc	2	3.1	2.97	2.16	2.37	1.69	1.6	3.91	2.42	5.31	3.81	2.72	2.7	0.97	0.99	8.24	8.26	17.88

153SF	Female	Cauc	3	3.24	3.29	2.16	2.15	1.53	1.4	5.36	2.62	5.98	4.21	2.97	2.99	1.07	1.1	7.19	7.18	17.85
154SM	Male	Cauc	1	3.3	3.29	2.48	2.5	1.91	1.8	3.66	2.31	5.65	4.28	2.93	2.89	0.98	1.06	7.57	7.55	17.92
155SM	Male	Cauc	3	3.23	3.24	2.32	2.16	1.69	1.75	4.19	2.33	5.98	4.2	2.8	2.83	1.03	1	7.31	7.26	17.92
156SF	Female	Cauc	3	3.37	3.27	2.18	2.03	1.76	1.71	5	2.9	5.34	4.03	3.02	3.02	1.12	1	7.87	7.81	17.9
157SM	Male	Cauc	3	3.38	3.24	2.07	2.05	1.86	1.84	4.34	2.44	5.6	4.34	2.8	2.78	1.06	1.09	7.47	7.4	17.87
158SF	Female	Cauc	3	3.07	3.25	2.4	2.33	1.9	1.87	4.33	2.47	5.33	4.07	2.78	3.04	1.1	0.97	7.75	7.75	17.79
159SF	Female	Cauc	3	3.43	3.49	2.13	1.74	2.05	2.07	4.7	2.42	5.6	4.21	2.86	3.1	1.13	1.12	7.56	7.57	17.88
160SM	Male	Cauc	3	3.48	3.42	1.83	1.91	1.6	1.48	4.15	2.72	5.53	4.44	2.94	3.04	1.08	1.05	7.25	7.25	17.85
161SM	Male	Cauc	3	3.19	3.06	2.12	2.29	1.89	1.8	4.24	2.04	5.42	3.99	2.91	2.87	1.08	1.01	7.28	7.28	17.85
162SM	Male	Cauc	3	3.29	3.25	2.15	2.23	1.91	1.78	4.07	2.4	5.19	4.16	2.78	3	1.06	1.05	7.34	7.4	17.82
163SM	Male	Cauc	3	3.48	3.42	2.2	2.12	1.52	1.47	4.06	2.59	5.2	3.87	2.71	2.7	1.03	1	7.39	7.43	17.9
164SM	Male	Cauc	3	2.95	3.08	2.23	2.09	1.76	1.67	3.97	2.3	5.77	4.72	2.94	3.01	1.08	1.07	7.64	7.63	17.89
165SM	Male	Cauc	3	3.17	3.17	2.56	2.55	1.61	1.8	3.9	2.37	5.5	4.09	2.61	2.63	0.97	0.98	7.63	7.62	17.87
166SF	Female	Cauc	2	2.99	3.13	2.42	2.35	1.77	1.62	4.37	2.34	4.77	4.3	2.75	2.77	1.02	0.99	8.48	8.5	17.89
167SM	Male	Cauc	2	3.22	3.19	2.23	2.3	1.74	1.68	3.76	2.67	5.35	4.2	2.68	2.74	0.97	0.98	7.93	7.97	17.89
168SM	Male	Cauc	1	3.58	3.62	2.45	2.37	1.79	1.82	4.04	2.44	6.17	4.44	3.03	3.1	1.09	1.03	7.35	7.38	17.89
169SM	Male	Cauc	3	3.04	3.09	2.13	2.17	1.89	1.87	4.26	2.55	5.28	4.37	3	2.93	1.12	1.06	7.59	7.6	17.9
170SF	Female	Cauc	2	2.91	3	2.38	2.28	1.61	1.55	4.13	2.46	4.57	4.01	2.6	2.72	1	0.99	8.34	8.34	17.91
171SF	Female	Cauc	3	3.7	3.75	1.97	1.9	1.66	1.79	5.05	2.41	5.64	4.42	3.06	3.08	1.08	1.1	7.86	7.86	17.91
172SF	Female	Cauc	2	3.25	3.29	2.22	2.29	1.87	1.8	4.31	2.35	4.88	3.93	2.77	2.82	0.99	1	8.08	8.04	17.95
173SF	Female	Cauc	2	3.16	3.09	2.24	2.3	1.91	1.82	4.37	2.23	5.71	4.3	2.77	2.78	0.99	1	7.9	7.89	17.88
174SM	Male	Cauc	2	3.31	3.33	2.38	2.37	1.94	1.89	3.85	2.18	5.46	4.35	2.93	2.96	1.05	1.03	8.11	8.09	17.89
175SM	Male	Cauc	3	3.28	3.3	2.24	2.23	1.48	1.39	4.41	2.42	5.52	4.49	2.79	2.56	1.06	1.04	7.46	7.44	17.9
176SF	Female	Cauc	3	3.01	2.81	2.24	2.13	1.52	1.4	3.73	2.56	5.21	4.19	2.86	2.68	1.07	1.1	8.17	8.16	17.87
177SM	Male	Cauc	3	3.18	2.93	2.07	2.15	1.83	1.85	4.34	2.22	5.54	4.35	2.6	2.84	1.04	0.98	7.52	7.5	17.89
179SF	Female	Cauc	2	3.31	3.27	2.31	2.33	1.8	1.75	4.02	2.34	4.75	3.7	2.79	2.76	0.97	0.94	8.75	8.8	17.87
180SF	Female	Cauc	2	3.13	3.15	2.34	2.35	1.73	1.62	4.54	2.36	4.92	4.06	2.7	2.69	0.98	0.96	8.45	8.47	17.91
181SM	Male	Cauc	2	3.08	3.05	2.16	2.19	1.87	1.62	3.79	2.56	5.42	4.18	2.76	2.95	1	0.95	7.52	7.52	17.84
182SM	Male	Cauc	1	3.14	3.05	2.29	2.28	1.82	1.85	3.92	2.29	5.76	3.89	2.72	2.78	1.04	0.99	7.7	7.7	17.93
183SF	Female	Cauc	3	3.53	3.78	2.46	2.2	1.74	1.79	5.03	2.32	5.92	4.04	2.84	2.89	1.1	1.08	7.86	7.86	17.85

184SM	Male	Cauc	3	3.15	3.05	2.43	2.34	1.31	1.38	3.71	2.17	4.94	3.9	2.8	2.91	1.07	1.04	7.79	7.79	17.91
185SF	Female	Cauc	2	3.41	3.41	2.29	2.19	1.78	1.77	4.78	2.45	5.08	3.9	2.76	2.74	0.96	0.96	8.39	8.38	17.9
186SF	Female	Cauc	3	3.61	3.4	1.96	2.27	1.78	1.9	5.49	2.35	5.31	4.25	2.92	2.91	1.01	1.03	7.69	7.7	17.88
187SM	Male	Cauc	3	3.55	3.63	2.31	2.05	1.69	1.85	4.18	1.89	5.26	4	2.8	2.78	1.01	0.99	7.6	7.61	17.86
188SF	Female	Cauc	3	2.97	2.98	2.05	2.02	1.96	1.96	4.46	2.39	5.24	3.88	2.82	2.77	1.01	1.03	8.01	8	17.86
189SF	Female	Cauc	2	2.77	2.82	1.19	1.35	1.5	1.61	4.07	2.4	5.12	4.04	2.86	2.81	1.03	1.02	8.33	8.34	17.84
190SM	Male	Cauc	3	3.12	3.01	2.24	2.21	1.97	1.94	4.49	2.57	5.51	4.74	2.68	2.98	1.1	1.13	6.91	6.96	17.91
191SF	Female	Cauc	3	3.35	3.54	2.09	1.95	1.87	1.8	3.67	2.45	5.25	3.86	2.66	2.65	0.99	0.94	8.17	8.14	17.8
192SF	Female	Cauc	3	3.66	3.62	2.32	2.21	1.51	1.53	4.05	2.43	5.43	4.14	2.32	2.64	1.05	1	8.02	8.01	17.84
193SM	Male	Cauc	3	3.42	3.71	1.85	1.53	1.91	1.82	4.04	2.51	5.05	4.38	2.48	2.96	1.1	1.08	7.98	7.98	17.9
194SF	Female	Cauc	2	3.25	3.41	2.35	2.16	1.75	1.77	5.22	2.29	5.93	4.32	2.83	2.98	1.11	1.07	7.85	7.8	17.89
195SF	Female	Cauc	3	3.34	3.4	2.44	2.25	1.76	1.89	4.55	2.32	5.8	4.07	2.94	2.93	1.06	1.04	7.69	7.69	17.9
196SM	Male	Cauc	3	3.42	3.37	2.32	2.21	1.58	1.48	4.18	2.09	5.58	3.88	3.04	3.03	1.04	1.02	7.91	7.9	17.91
197SM	Male	Cauc	1	3.35	3.31	2.44	2.33	1.34	1.26	3.79	2.58	5.28	4.35	2.88	2.88	1.07	1.06	7.17	7.11	17.9
198SF	Female	Cauc	1	3.02	3.03	2.07	2.17	1.35	1.36	3.91	2.42	4.96	3.95	2.72	2.8	1.05	1.02	8.23	8.22	17.89
002Fc	Female	Cauc	1	3.11	3.16	2.29	2.32	1.51	1.43	3.7	2.43	5.21	3.9	2.61	2.53	0.86	0.88	7.91	8	17.84
004Fc	Female	Cauc	1	3.17	3.27	2.36	2.46	1.89	1.65	3.9	2.43	5.34	3.71	2.43	2.43	0.88	0.9	8.1	8.07	17.94
006Mc	Male	Cauc	1	3.1	3.17	2.2	2.19	1.74	1.82	3.88	2.42	5.01	4.08	2.45	2.5	0.85	0.89	7.52	7.61	17.83
007Mc	Male	Cauc	1	3.04	3.11	2.54	2.53	1.72	1.62	4.05	2.57	5.21	4.48	2.53	2.55	0.92	0.91	7.22	7.19	17.9
008Fc	Female	Cauc	1	3.04	3.18	2.41	2.4	1.74	1.66	3.56	2.43	4.91	3.78	2.49	2.43	0.84	0.85	8.25	8.18	17.76
009Mc	Male	Cauc	1	3.31	3.28	2.55	2.53	1.74	1.86	3.79	2.43	5.16	4.36	2.66	2.64	0.95	1.01	7.48	7.44	17.78
010Mc	Male	Cauc	1	3.2	3.39	2.38	2.33	1.74	1.58	4.03	2.45	5.07	4.17	2.58	2.62	0.96	0.88	7.67	7.64	17.77
012Mc	Male	Cauc	1	3.25	3.19	2.56	2.63	1.72	1.73	4.03	2.41	4.65	4.15	2.75	2.77	0.95	0.93	7.6	7.53	17.79
014Fc	Female	Cauc	1	3.09	3.13	2.2	2.28	1.85	1.78	4.15	2.53	5.03	3.72	2.53	2.57	0.99	0.9	7.85	7.86	17.81
015Fc	Female	Cauc	1	3.29	3.29	2.5	2.5	1.71	1.56	4.04	2.78	4.48	4.12	2.56	2.61	0.9	0.88	8.02	8.02	17.79
017Mc	Male	Cauc	1	3.14	3.21	2.41	2.35	1.67	1.72	3.96	2.57	5.25	4.14	2.63	2.64	0.93	0.98	7.45	7.44	17.85
018Fc	Female	Cauc	1	3.15	3.19	2.36	2.27	1.67	1.68	3.64	2.48	4.82	4	2.46	2.42	0.91	0.82	8.26	8.23	17.76
020Fc	Female	Cauc	1	3.28	3.27	2.22	2.2	1.72	1.72	4.3	2.41	5.14	4.11	2.52	2.49	0.94	0.88	8.01	8.01	17.84
021Mc	Male	Cauc	1	3.06	3.12	2.41	2.35	1.73	1.75	3.91	2.61	4.73	4.01	2.71	2.74	1	0.97	7.73	7.69	17.77
023Mc	Male	Cauc	1	3.21	3.23	2.36	2.42	1.7	1.69	3.82	2.46	4.76	4.02	2.54	2.59	0.9	0.91	7.34	7.27	17.81

026Fc	Female	Cauc	1	3.45	3.4	2.6	2.57	1.74	1.61	3.7	2.27	4.91	3.83	2.41	2.36	0.85	0.76	8.59	8.56	17.89
027Fc	Female	Cauc	1	3.25	3.26	2.49	2.53	1.61	1.69	3.94	2.65	4.91	3.85	2.49	2.53	0.82	0.81	8.09	8.09	17.65
029Fc	Female	Cauc	1	3.15	3.15	2.25	2.31	1.85	1.84	4.31	2.59	5.12	4.16	2.56	2.52	0.93	0.88	7.89	7.86	17.9
030Fc	Female	Cauc	1	3.04	3.09	2.33	2.3	1.79	1.78	4.01	2.55	5.26	3.94	2.76	2.68	0.94	0.95	7.88	7.87	17.9
001M	Male	Cauc	2	2.95	3.19	2.15	2.04	1.83	1.84	4.57	2.52	5.24	3.75	2.52	2.56	1	0.98	7.23	7.19	17.81
002F	Female	Cauc	1	3.19	3.2	2.17	2.17	1.68	1.69	3.9	2.37	5.35	3.77	2.5	2.41	0.88	0.86	8.01	8	17.83
005M	Male	Cauc	1	2.74	2.82	2.33	2.4	1.7	1.77	3.86	2.47	5.16	4	2.68	2.67	0.94	0.93	7.74	7.72	17.85
008F	Female	Asian	1	2.98	3.04	2.31	2.27	1.7	1.78	3.95	2.53	5.32	4	2.69	2.64	0.94	0.91	7.76	7.75	17.8
011F	Female	Cauc	1	3.15	3.13	2.3	2.43	1.65	1.67	3.83	2.31	4.81	3.82	2.54	2.53	0.83	0.91	8.21	8.23	17.81
014F	Female	Cauc	1	3.46	3.5	2.42	2.44	1.83	1.9	4.3	2.25	4.84	3.98	2.61	2.6	0.82	0.83	8.7	8.69	17.78
018F	Female	Cauc	1	3.01	3.04	2.45	2.47	1.7	1.56	4.04	2.4	4.94	3.75	2.49	2.53	0.87	0.8	8.59	8.59	17.83
020F	Female	Cauc	1	3.18	3.23	2.31	2.4	1.82	1.78	3.65	2.34	4.59	3.94	2.52	2.51	0.86	0.83	8.51	8.51	17.87
024F	Female	Oth	1	3.22	3.26	2.2	2.21	1.71	1.72	4.49	2.53	5.16	3.96	2.55	2.54	0.82	0.77	8.02	7.96	17.74
027M	Male	Cauc	1	3.26	3.23	2.32	2.41	1.82	1.72	3.53	2.17	4.87	4.04	2.4	2.42	0.97	0.92	7.52	7.5	17.91
028F	Female	Cauc	1	3.31	3.3	2.44	2.43	1.86	1.77	3.89	2.28	4.93	3.92	2.7	2.65	0.88	0.89	8.29	8.31	17.83
029F	Female	Cauc	1	3.33	3.4	2.2	2.14	1.64	1.73	4.65	2.23	4.87	3.97	2.4	2.42	0.97	0.94	8.37	8.37	17.82
030F	Female	Cauc	1	3.17	3.2	2.28	2.26	1.85	1.83	3.89	2.23	4.82	3.75	2.58	2.58	0.93	0.95	8.72	8.75	17.6
034F	Female	Cauc	1	3.26	3.27	2.01	2.15	1.92	1.85	4.03	2.35	4.5	4.22	2.69	2.6	0.95	0.94	8.16	8.18	17.59
035F	Female	Oth	1	3.06	3.1	2.3	2.15	1.6	1.75	3.62	2.25	4.75	3.29	2.4	2.51	0.95	0.94	8.48	8.48	17.78
036F	Female	Oth	1	3.22	2.97	1.92	2.16	1.85	1.7	4	2.4	5.01	3.97	2.57	2.61	1	0.98	8.33	8.32	17.79
037F	Female	Cauc	1	3.35	3.25	2.35	2.41	1.59	1.52	3.79	2.29	4.75	3.74	2.47	2.49	0.91	0.91	8.41	8.44	17.79
039F	Female	Asian	1	3.08	3.07	2.3	2.26	1.83	1.77	3.98	2.44	4.68	4.05	2.64	2.62	0.97	0.92	8.17	8.15	17.9
043F	Female	Cauc	1	3.07	3.2	2.38	2.32	1.46	1.46	4	2.12	5.28	4.19	2.72	2.74	0.86	0.76	8.31	8.28	17.91
045M	Male	Oth	1	3.07	3.12	2.33	2.42	1.51	1.42	3.63	2.32	5.54	4.13	2.82	2.84	1	0.93	7.71	7.7	17.85
058F	Female	Asian	1	3.23	3.17	2.07	2.04	1.64	1.66	3.85	2.33	5.1	3.96	2.53	2.54	0.9	0.98	8.1	8.1	17.8
059F	Female	Cauc	3	3.14	3.37	2.39	2.33	1.78	1.74	3.77	2.25	5.19	3.85	2.64	2.64	0.91	0.9	8.4	8.39	17.87
065F	Female	Cauc	1	3.19	3.13	2.16	2.26	1.73	1.75	4.11	2.3	5.24	3.84	2.45	2.42	0.88	0.8	8.28	8.27	17.88
067F	Female	Cauc	2	3.29	3.18	2.26	2.27	1.57	1.64	3.32	2.38	4.71	3.79	2.54	2.52	0.87	0.76	8.54	8.53	17.9
072M	Male	Cauc	2	3.15	3.15	2.28	2.33	1.85	1.79	4.35	2.04	5.46	3.82	2.73	2.71	0.84	0.82	7.44	7.41	17.8
076F	Female	Cauc	2	3.24	3.19	2.3	2.3	1.73	1.65	4.51	2.34	5.18	4.14	2.5	2.56	0.94	0.95	8.3	8.21	17.78

082M	Male	Cauc	1	3.05	3.02	2.34	2.46	1.8	1.74	3.42	2.16	4.93	4.1	2.51	2.54	0.86	0.86	7.71	7.73	17.76
083F	Female	Asian	1	3.07	3.17	2.24	2.2	1.61	1.54	3.8	2.47	5.08	3.86	2.46	2.48	0.9	0.88	7.94	7.92	17.82
084M	Male	Asian	1	3.21	3.28	2.29	2.25	1.73	1.78	3.78	2.38	5.45	3.98	2.81	2.82	1	0.9	7.52	7.47	17.86
089M	Male	Oth	1	3.15	3.13	2.22	2.27	1.75	1.63	4.13	2.37	5.39	4.21	2.63	2.57	0.85	0.79	7.8	7.74	17.84
092F	Female	Cauc	1	3.22	3.3	2.38	2.29	1.65	1.78	3.59	2.33	5.59	3.97	2.46	2.41	0.85	0.89	8.29	8.28	17.59
096M	Male	Asian	3	3.29	3.28	2.68	2.59	1.96	1.92	4.17	2.63	5.42	4.09	2.7	2.67	0.92	0.83	8.22	8.22	17.86
101M	Male	Cauc	1	3.08	3.19	2.47	2.32	1.41	1.29	3.38	2.4	4.39	3.94	2.63	2.63	0.8	0.81	8.63	8.58	17.84
042FD	Female	Cauc	1	3.28	3.32	2.14	2.16	1.7	1.63	3.81	2.44	5.15	3.67	2.6	2.52	0.73	0.8	8.02	8.01	17.34

Table 6. Stance Morphology (Row)

Subject	1. Head Level R	3. Lateral head tilt	4. Shoulder level R	5. Shoulder level L	6. Position of Shoulder R	7. Position of Shoulder L	10. Position of Upper Arm (Frontal) Right	11. Position of Upper Arm (Frontal) Left	12. Antero-Posterior Placement of Upper Arm Right	13. Antero-Posterior Placement of Upper Arm Left	14. Lateral Placement of Upper Arm Right	15. Lateral Placement of Upper Arm Left	16. Antero-posterior Placement of Forearm Right	17. Antero-posterior Placement of Forearm Left	20. Flexion of arm R	21. Flexion of arm L	22. Lateral placement of forearm R	23. Lateral placement of Forearm L	19. Antero-posterior Placement of Hand Right	20. Antero-posterior Placement of Hand Left	21. Finger Flexion Right	22. Finger Flexion Left	23. Lateral Rotation of the Hand Right	24. Lateral Rotation of the hand Left	25. Thoracic Projection	26. Abdominal projection	21. Shape of Gluteus	25. Orientation of Lower Extremities Right Anterior	26. Orientation of Lower Extremities Left Anterior	29. Lateral Placement of Upper leg Right	30. Lateral Placement of Upper leg Left	41. Lateral Placement of Lower Leg Right	42. Lateral Placement of Lower leg Left	49. Placement of the Feet Right	50. Placement of the Feet Left
003Fc	1	3	1	1	3	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	1	2	1	1	3	1	3	4	4	2	2	1	1	2	2
015F	1	2	3	3	2	2	2	2	1	2	3	3	4	4	2	2	3	3	4	4	2	2	2	2	2	1	3	3	3	1	1	1	1	2	1
016Fc	1	2	1	1	1	2	3	3	1	2	2	3	1	1	1	2	3	3	1	2	2	1	2	2	2	1	4	2	3	1	1	1	1	2	2
017F	2	3	3	3	1	1	3	3	1	1	3	3	2	1	2	2	3	2	2	2	1	1	1	1	2	1	2	3	4	2	2	3	3	2	2
019F	1	2	3	3	1	2	2	2	1	2	2	2	3	4	2	2	3	3	3	4	3	3	1	1	3	2	4	5	5	2	2	1	1	1	1
004F	2	2	3	3	3	3	2	2	3	3	2	2	3	3	3	3	3	3	3	3	3	3	1	1	2	2	3	4	4	3	3	1	1	2	2
006F	2	2	1	1	2	1	2	2	2	1	2	2	3	3	2	2	3	3	4	4	3	1	2	2	2	2	4	4	4	1	1	1	1	2	2
009F	2	2	3	2	2	2	2	2	2	1	3	3	4	2	2	3	1	1	4	3	3	3	2	2	3	2	3	5	5	3	3	1	1	2	2
021F	2	3	2	2	2	2	2	2	1	2	2	2	3	4	2	2	3	3	3	3	3	3	2	2	3	1	4	4	5	2	2	1	1	2	2
024Fc	1	2	1	1	3	2	1	1	4	3	2	2	4	4	1	2	3	3	4	4	2	2	2	2	2	2	1	3	3	1	1	1	1	2	1
025Fc	1	3	3	3	2	2	2	2	1	1	3	3	3	3	2	2	3	3	3	4	3	3	1	1	2	3	2	2	2	2	2	1	1	2	2
032F	1	1	1	1	2	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	2	2	2	2	3	1	4	4	4	2	2	1	1	1	1
033F	2	2	2	2	2	2	1	1	2	2	2	1	4	4	1	2	3	3	3	4	2	2	2	2	2	2	3	3	3	1	1	1	1	2	2
042F	2	3	2	2	2	2	3	3	1	1	3	3	2	2	2	2	3	3	2	2	3	3	2	2	2	1	4	2	2	1	1	1	1	2	1
047F	2	3	3	3	2	2	2	2	2	2	1	1	4	4	2	2	1	1	4	4	3	3	1	1	3	3	2	5	5	3	3	1	1	1	1
048F	2	1	2	2	3	3	1	1	3	3	3	3	4	4	2	2	3	3	3	3	3	3	2	2	3	3	3	3	2	3	3	1	1	1	1
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133SF	1	3	1	2	1	1	1	1	1	1	3	3	1	3	2	2	3	3	3	4	1	1	2	1	2	2	3	2	2	2	2	2	2	2	2
134SM	3	3	3	3	2	1	1	1	2	1	1	1	3	3	2	2	1	1	4	4	1	1	1	1	1	2	2	1	1	3	3	3	3	1	1
144SF	3	2	2	2	2	1	2	2	2	1	3	3	3	3	2	2	3	3	4	4	1	1	1	1	2	1	3	2	2	2	2	1	1	1	1
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115SF	3	3	3	3	1	3	1	1	1	2	2	3	2	4	2	2	3	3	4	4	2	2	2	1	2	2	3	3	3	3	3	3	2	1	3
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014Fc	1	2	1	3	3	3	1	1	2	4	3	2	4	4	2	2	3	1	4	4	1	1	1	1	2	1	3	4	4	1	1	1	1	2	1
015Fc	1	2	2	1	2	3	1	1	2	4	2	2	3	4	2	2	3	3	4	4	1	1	2	2	2	1	3	4	4	1	1	1	1	2	2
017Mc	2	3	1	1	3	3	1	1	4	3	3	2	4	4	2	2	3	1	4	4	1	1	1	2	1	2	2	4	4	2	2	2	2	1	1
018Fc	2	2	1	1	2	3	2	2	2	4	2	2	4	4	2	2	3	3	4	4	1	1	2	1	2	2	3	4	4	1	1	1	1	1	1
020Fc	2	1	1	2	2	1	2	2	1	1	2	2	3	3	2	2	2	2	4	4	1	1	2	1	2	2	3	5	5	3	3	1	1	2	2
021Mc	3	2	1	1	3	3	1	1	4	3	2	2	4	4	2	2	2	1	4	4	1	1	1	1	1	2	2	2	2	1	1	1	1	2	2
023Mc	2	3	1	1	1	2	2	2	1	1	1	2	2	3	2	2	1	1	3	4	1	1	1	1	1	2	2	2	2	1	1	1	1	2	2
026Fc	2	3	3	3	2	2	1	1	2	2	2	2	4	4	2	2	3	2	4	4	1	1	1	1	2	2	2	4	4	2	2	1	1	2	2
027Fc	1	2	1	2	1	2	1	1	1	1	2	2	2	2	2	2	3	3	3	4	1	1	2	1	3	1	3	2	2	1	1	1	1	2	2
029Fc	2	2	2	2	2	2	1	1	1	1	2	2	3	2	2	2	3	1	4	4	1	1	2	2	3	2	3	3	3	1	1	1	1	2	2
030Fc	1	2	1	1	3	2	1	1	3	2	2	2	4	3	2	2	2	3	4	4	1	1	1	1	3	1	3	4	4	2	2	1	1	2	2

001M	1	2	3	3	1	2	2	2	1	2	1	1	3	4	2	2	1	1	4	4	1	1	1	1	2	2	3	4	4	1	1	1	1	2	2
002F	2	1	1	2	1	1	2	2	1	1	2	2	3	3	2	2	2	1	3	4	1	1	2	1	3	2	3	4	4	2	2	1	1	1	2
005M	2	2	1	1	2	3	1	1	1	4	1	1	3	4	2	2	1	1	4	4	1	1	2	2	1	1	2	2	2	2	2	1	1	2	1
008F	2	1	1	1	3	3	1	1	3	2	2	2	4	4	2	2	2	2	4	4	1	1	2	2	3	2	3	4	4	2	2	1	1	2	1
011F	1	2	1	1	3	1	2	1	2	1	2	2	3	3	2	2	3	2	4	4	1	1	2	2	2	1	4	4	4	2	2	1	1	2	2
014F	3	2	1	1	2	2	1	1	2	1	2	2	3	3	2	2	3	2	4	4	2	2	2	2	3	2	4	4	4	3	3	1	1	1	1
018F	1	2	1	2	2	1	1	1	1	1	2	2	3	3	2	2	3	2	4	4	1	1	2	1	2	2	3	4	4	2	2	1	1	2	1
020F	1	2	1	1	2	3	1	1	2	3	2	2	4	4	2	2	3	2	4	4	1	1	2	1	2	2	3	3	3	2	2	2	2	2	1
024F	2	2	1	1	3	3	2	2	2	2	2	2	4	4	1	2	3	3	3	4	1	1	2	2	2	2	3	4	4	1	1	1	1	1	1
027M	2	3	1	1	3	2	2	2	2	1	2	1	4	4	2	2	2	1	4	4	1	1	2	1	1	1	2	2	2	1	1	1	1	2	2
028F	2	2	1	1	3	3	1	1	2	2	2	2	4	4	2	2	3	3	4	4	1	1	2	2	3	1	3	2	2	1	1	1	1	2	2
029F	1	2	1	1	3	2	1	1	4	2	2	2	4	4	2	2	3	3	4	4	1	1	2	2	2	1	3	3	3	1	1	1	1	2	1
030F	3	3	1	1	2	2	2	2	2	2	2	3	4	4	2	2	3	1	4	4	1	1	1	2	3	2	2	2	2	2	2	1	1	2	1
034F	2	2	3	3	2	2	2	2	2	1	2	2	4	2	2	2	1	1	4	3	1	1	1	1	2	3	3	5	5	3	3	2	2	2	2
035F	2	3	1	1	3	2	2	2	2	2	2	2	4	4	3	3	2	1	4	4	1	1	2	2	2	2	3	3	3	2	2	2	2	2	2
036F	2	2	2	2	1	1	2	2	1	1	2	2	3	3	3	3	2	2	4	4	1	1	1	1	3	1	3	3	3	1	1	1	1	2	2
037F	2	2	1	1	3	3	1	1	2	2	2	2	3	4	2	2	3	3	3	4	1	1	2	2	2	2	3	3	3	2	2	1	1	2	2
039F	2	2	3	3	2	2	1	1	1	2	2	3	4	4	2	2	2	2	4	4	1	1	2	2	2	2	3	4	4	1	1	1	1	2	2
043F	3	2	2	2	2	2	1	1	1	1	2	2	3	3	3	3	3	3	4	4	1	1	2	2	2	2	3	3	3	1	1	1	1	1	1
045M	2	3	1	1	3	3	1	1	2	3	2	2	4	4	2	2	2	2	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1
058F	2	1	2	2	3	3	1	1	2	4	2	2	4	4	2	2	2	2	4	4	1	1	2	2	2	1	3	4	4	1	1	1	1	1	1
059F	3	3	1	1	3	2	1	1	3	1	3	3	4	2	2	2	1	1	4	4	1	1	2	2	2	2	3	4	4	3	3	2	2	2	1
065F	2	2	1	1	2	3	1	1	2	4	2	2	4	4	2	2	2	1	4	4	1	1	1	2	2	1	3	4	4	2	2	1	1	2	1
067F	2	3	2	2	2	3	1	1	1	3	2	2	4	4	2	2	2	2	4	4	1	1	2	2	2	1	2	4	4	2	2	2	2	2	1
072M	3	3	2	1	2	2	2	2	2	2	2	2	4	4	2	2	1	1	4	4	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1
076F	3	2	2	2	3	3	1	1	1	2	3	3	2	4	2	2	2	2	3	4	1	1	2	2	3	2	3	5	5	3	3	1	1	1	1
082M	3	2	1	1	3	2	1	1	2	1	2	2	4	4	3	3	2	2	4	4	1	1	1	1	1	1	2	4	4	2	2	1	1	1	1
083F	3	2	1	1	3	2	2	2	2	1	3	3	4	3	2	2	2	2	4	3	1	1	2	2	2	1	3	4	4	3	3	2	2	1	1
084M	1	2	1	1	3	1	1	1	2	1	2	2	4	3	2	2	2	2	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1
089M	2	3	1	1	3	3	1	1	3	3	1	1	4	4	2	2	1	1	4	4	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1

092F	1	2	1	2	3	3	1	1	2	3	2	2	4	4	2	2	3	3	4	4	1	1	1	2	2	2	3	4	4	2	2	1	1	2	2
096M	3	2	3	3	2	2	2	2	2	1	2	3	4	3	2	2	3	3	4	3	2	2	2	2	2	3	2	1	1	1	1	1	1	1	1
101M	2	2	1	1	2	2	1	1	1	1	2	2	1	2	3	3	3	2	3	3	1	1	1	1	1	1	3	4	4	2	2	1	1	1	1
042FD	2	2	2	3	2	2	2	2	2	1	3	3	3	2	2	2	3	2	4	3	1	2	2	1	3	2	3	4	4	3	3	2	2	1	1

Table 7. Gait Anthropometry (Row)

	Static																	Dynamic							
Subject	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11 Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R	1. Knee cap - knee cap R Prof	2. Knee cap - knee cap L	3. Lat mal - Med mal R	4. Lat mal - Med mal L	5. Hallux - Hallux R	6. Hallux - Hallux L	7. Styloid Pro - Styloid Pro R Forward	8. Styloid Pro - Styloid Pro L Forward
002FD	2.95	3.06	1.93	2.04	1.43	1.59	3.68	2.22	4.78	3.64	2.53	2.6	0.96	0.98	8.14	8.11	16.6	3.39	3.32	6.66	6.47	7.26	7.11	3.98	3.88
005FD	3.01	2.92	2.21	2.38	1.69	1.77	3.58	2.38	4.92	3.54	2.76	2.75	0.91	0.98	8.18	8.11	16.8	3.54	2.91	6.82	6.67	7.15	7.46	4.04	4.15
006FD	3.01	3.03	2.16	2.11	1.64	1.67	3.64	2.49	4.68	3.86	2.61	2.61	0.95	0.9	7.86	7.85	17	2.97	2.32	6.46	5.86	7.09	6.94	4.24	4.02
007FD	3.01	2.96	2.34	2.32	1.5	1.68	3.37	2.58	4.69	3.63	2.57	2.56	0.93	0.92	8.29	7.98	16.7	3.12	2.98	6.13	6.04	6.64	6.44	3.81	3.76
009FD	3.07	3.08	2.07	2.12	1.75	1.67	3.84	2.3	4.55	3.54	2.66	2.69	0.95	0.96	7.71	7.67	16.8	3.12	2.44	5.89	5.13	6.63	5.68	4.08	4.33
017FD	3	3.11	2.16	2.13	1.36	1.35	3.39	2.21	4.44	3.69	2.52	2.59	0.84	0.93	8.34	8.29	17.1	3.52	3.37	6.19	6.58	6.62	7.23	3.86	4.14
020FD	2.89	3.1	2.15	2.04	1.73	1.78	3.62	2.45	4.75	3.66	2.54	2.65	0.89	0.95	7.81	7.66	17	3.19	2.92	5.66	5.8	6.06	6.36	4.36	4.28
021FD	3.18	3.2	2.32	2.26	1.38	1.44	3.58	2.39	4.14	3.65	2.54	2.55	0.93	0.97	8.69	8.59	16.7	2.65	2.73	5.77	5.72	6.26	6.11	4.28	4.14
022FD	3.06	3.05	2.2	2.27	1.58	1.4	3.61	2.23	4.5	3.55	2.6	2.33	0.99	0.86	8.32	8.15	16.8	2.21	2.1	5.67	5.21	6.47	5.52	4.14	4.39
023FD	3.14	3.21	2.21	2.3	1.69	1.67	3.6	2.62	4.26	3.7	2.59	2.75	0.95	1.02	8.29	8.25	16.7	3.89	3.43	6.94	6.52	7.5	7	3.97	4.09
025FD	3.05	3.02	2.26	2.21	1.49	1.63	3.71	2.36	5.12	3.91	2.55	2.55	0.93	0.92	7.4	7.45	16.8	3.06	3.07	6.27	6.39	6.66	6.76	4.2	4.36
026FD	3.02	2.91	2.06	2.15	1.38	1.37	3.77	2.36	5.16	3.71	2.58	2.54	0.94	0.94	7.56	7.87	17.1	2.88	2.79	4.97	4.92	5.61	5.99	4.65	4.08
030FD	2.94	3.03	2.12	1.85	1.37	1.34	4.19	2.32	4.72	4	2.63	2.59	0.92	0.98	7.5	7.56	17	2.83	2.58	6.4	6.07	6.94	6.3	6.64	4.7
031FD	2.95	3.05	2.16	2.35	1.45	1.35	3.47	2.12	4.6	3.87	2.6	2.62	0.81	0.96	7.89	8.08	17	3.55	3.34	6.3	6.44	6.68	6.81	3.44	3.78
034FD	3.04	2.93	2.16	2.07	1.35	1.4	4.17	2.31	4.52	3.86	2.61	2.66	0.99	1.02	7.39	7.24	17	3.14	2.76	5.92	5.4	6.13	5.67	4.33	4.12
035FD	2.88	2.83	2.33	2.39	1.35	1.55	3.72	2.53	5.08	3.82	2.58	2.55	0.85	0.9	7.6	7.59	16.2	2.73	2.48	5.88	5.54	6.32	5.84	4.23	3.55
036FD	3	2.99	2.26	2.12	1.41	1.4	3.97	2.41	5.03	3.92	2.56	2.57	0.82	0.87	7.97	7.99	17	2.59	2.58	5.21	5.27	5.45	5.75	4.37	4.2
038FD	2.97	2.98	2.24	1.85	1.45	1.6	3.79	2.5	4.75	3.85	2.66	2.7	0.96	1.05	8.12	8.26	17.1	2.78	2.91	5.79	5.58	6.3	6.16	4.63	4.91
039FD	2.93	3.02	2.13	2.14	1.31	1.34	3.62	2.65	4.82	4.11	2.63	2.59	0.93	0.97	8.42	7.98	17.1	2.73	2.3	5.4	4.86	6.14	5.27	4.27	4.02

040FD	2.98	2.96	2.02	1.85	1.29	1.62	3.86	2.31	4.68	3.61	2.53	2.48	0.85	0.83	7.46	7.79	16.6	2.83	3.18	5.8	5.88	6.23	6.05	4.13	4.58
001MD	3.33	3.22	1.98	2.08	1.47	1.6	4.24	2.6	5.47	3.93	2.79	2.66	0.93	0.98	7.2	6.81	17	2.69	2.54	5.31	5.58	5.79	6.16	5	5.09
003MD	2.68	2.74	2.24	2.22	1.57	1.62	3.94	2.63	4.55	4.4	2.87	2.86	1.05	0.99	7.83	7.68	16.9	2.73	2.88	5.8	5.62	6.19	6	4.33	4.28
004MD	3.09	3.13	2.41	2.34	1.58	1.71	3.8	2.21	5.86	4.07	2.93	2.92	1	1.06	7.67	7.91	16.9	2.67	2.45	6.26	5.81	6.71	6.25	5.03	4.94
008MD	3.29	3.19	2.33	2.42	1.32	1.55	3.87	2.54	4.73	3.82	2.73	2.67	0.85	0.93	7.84	7.92	17.4	2.66	2.38	5.52	4.74	5.98	5.04	5.12	5.18
010MD	3.11	3	2.3	2.46	1.42	1.42	3.44	2.46	4.86	3.9	2.55	2.58	1	0.94	7.51	7.3	17	3.4	2.86	6.52	6.29	7.09	6.79	3.71	3.92
011MD	3.2	3.18	2.21	2.3	1.63	1.58	3.77	2.66	5.21	3.78	2.69	2.76	0.96	0.97	7.12	7.09	17.2	3.52	2.9	6.9	6.1	7.31	6.7	4.51	4.56
012MD	3.01	3.08	2.2	2.19	1.37	1.46	3.45	2.18	4.73	3.61	2.67	2.61	0.88	0.9	8.08	7.99	16.8	3.7	3.18	6.88	6.31	7.46	6.78	4.38	4.3
013MD	2.9	2.77	2.1	2.08	1.8	1.73	3.76	2.66	5.2	3.7	2.82	2.82	0.96	0.95	7.01	6.88	16.9	3.01	2.51	5.67	5.36	6.07	5.79	3.9	4.21
014MD	3.02	3.02	2.28	2.34	1.63	1.62	3.34	2.43	4.38	3.89	2.79	2.75	1.02	0.97	7.5	7.58	16.9	3.16	2.58	6.04	5.61	6.56	6.07	4.45	4.53
015MD	3.08	3	2.29	2.27	1.45	1.44	3.32	2.72	4.76	3.86	2.67	2.67	0.83	0.96	7.82	7.96	17	3.13	3	6.27	6.06	6.8	6.49	4.18	4.4
016MD	2.89	3.18	2.14	1.92	1.34	1.4	3.59	2.51	5.35	3.78	2.74	2.73	1.03	1.01	7.57	7.21	16.8	2.4	2.56	5.61	4.84	6.02	5.37	4.36	4.38
018MD	2.81	2.84	2.37	2.39	1.69	1.58	3.57	2.53	5.25	4.11	2.41	2.38	0.9	0.9	6.9	6.72	17	1.92	2.72	4.96	5.53	5.33	5.92	3.68	3.66
019MD	3.32	3.38	2.2	1.85	1.48	1.77	3.71	2.48	5.32	3.74	2.62	2.59	0.88	0.91	7.62	7.73	16.9	2.99	2.46	5.12	5.25	5.62	5.63	4.1	4.08
024MD	3.12	3.17	2.3	2.37	1.36	1.65	3.57	2.4	4.97	4.23	2.86	2.88	1.06	1.08	7.76	7.92	16.8	2.85	2.19	5.19	5.27	5.73	5.88	4.55	4.11
027MD	2.86	2.99	2.12	2.14	1.5	1.51	3.71	2.54	4.54	3.65	2.74	2.74	1.03	1	7.4	7.52	16.8	3.07	3.55	5.93	5.29	6.5	5.93	4.05	4.1
028MD	2.81	2.73	2.12	2.32	1.47	1.58	3.67	2.38	4.18	3.89	2.69	2.5	0.87	0.9	7.62	8.05	16.9	2.91	2.7	5.3	4.86	6.02	5.52	4.75	4.34
029MD	3.05	3.05	2	2.12	1.8	1.63	3.6	2.59	4.42	4.05	2.58	2.54	0.74	0.89	7.38	7.22	17.2	2.45	1.91	4.36	4.5	5.32	4.98	3.99	4.25
032MD	2.82	2.76	2.3	2.19	1.56	1.26	3.83	2.4	4.86	4.38	2.6	2.61	0.87	0.93	7.49	7.46	17.1	3.03	2.87	5.39	5.44	5.77	5.9	4.07	4.15
033MD	2.99	3.1	2.23	2.29	1.37	1.39	3.79	2.5	4.85	3.98	2.77	2.78	0.73	0.92	7.23	7.42	17.1	2.95	2.18	5.45	4.31	5.34	4.9	3.83	4.49
037MD	2.88	3.18	2.28	2.22	1.57	1.45	3.64	2.3	5.31	4.17	2.72	2.52	0.9	0.82	6.98	7.01	16.9	2.24	2.65	5.71	5.79	6.15	6.3	3.92	3.82
041MD	2.98	3.09	2.28	1.99	1.39	1.42	4.58	3.21	4.79	4.5	2.86	2.88	1	1.04	6.99	7.08	17.1	2.77	2.36	5.73	5.38	6.2	5.9	4.73	4.47
001CSF	3.04	3.18	2.09	2.18	1.35	1.39	3.58	2.15	4.93	3.79	2.56	2.61	0.94	0.94	8.19	8.24	17.4	3.33	3.3	6.67	6.72	7.03	7.21	4.44	4.36
002CSM	3.08	3.22	2.16	2.13	1.53	1.68	3.49	2.57	5.01	3.98	2.72	2.72	0.98	0.95	7.71	7.68	17.3	2.89	3.21	6.32	6.32	6.79	6.72	4.46	4.2
003CSM	2.89	3.08	2.06	2.12	1.5	1.6	4.01	2.61	4.89	4.19	2.91	2.9	1.04	1.02	7.45	7.32	17.5	3.7	3.16	6.73	6.49	7.16	7.09	4.92	4.86
004CSM	3	3.15	1.97	2.53	1.25	1.32	3.57	2.61	4.9	3.93	2.81	2.83	0.97	0.99	8.08	8.12	17.8	3.99	3.28	7.19	7.12	7.7	7.69	4.16	4.38
005CSF	3.07	3.07	2.32	2.13	1.65	1.26	4.04	2.53	5.05	4.18	2.87	2.88	1.01	1.01	8.25	8.15	17.4	3.09	2.87	6.31	6.13	6.65	6.55	5.27	4.94
006CSM	3.06	3.09	2.17	2.21	1.66	1.59	3.41	2.48	5.6	4.05	2.83	2.8	1	1.01	7.28	7.18	17.7	3.15	3.1	6.34	6.37	6.99	7.35	4.83	4.21
007CSM	3.07	2.99	2.19	2.04	1.74	1.71	3.56	2.71	5.13	3.99	2.87	2.86	0.98	0.97	7.53	7.55	17.8	3.15	3.07	6.15	6.16	6.51	6.6	4.59	4.59
008CSM	3.19	3.25	2.13	2.44	1.59	1.65	4.22	2.54	5.31	4.14	3.04	3.04	1.11	1.13	7.25	7.34	17.6	3.47	2.63	6.42	5.58	7.1	6.26	4.76	4.76

009CSM	3.1	3.14	2.3	2.16	1.72	1.88	3.75	2.29	5.25	4.05	2.69	2.71	1	1	7.43	7.54	17.6	3.55	3.29	6.75	6.72	7.36	7.27	4.36	4.37
010CSM	3.11	3.17	2.31	2.32	1.57	1.68	3.62	2.62	5.23	3.97	2.83	2.84	1.02	1.01	7.55	7.68	17.8	3.53	3.78	6.6	6.59	7.01	7.15	4.23	4.42
11CSF	3	2.81	1.66	2.4	1.52	1.48	4.2	2.7	5.09	3.61	2.97	3	1.08	1.09	7.54	7.42	17.3	3.31	2.87	6.65	6.18	7.32	7.07	4.52	4.32
12CSM	2.99	3.13	2.25	2.21	1.56	1.7	3.59	2.57	4.91	4	2.74	2.76	1	0.98	7.23	7.19	17.5	3.23	3.02	5.97	6.06	6.35	6.61	4.37	4.04
13CSF	3.2	3.25	2.38	2.38	1.38	1.5	4	2.32	4.9	3.83	2.67	2.74	0.92	0.94	8.5	8.55	17.5	3.66	3.38	6.76	6.78	7.24	7.27	4.33	4.26
14CSM	2.95	3.11	2.43	2.34	1.53	1.66	3.65	2.45	5.27	3.93	2.69	2.6	0.97	0.98	7.52	7.6	17.8	3	2.97	6.43	6.16	6.92	6.72	4.47	4.6
15CSM	3.2	3.3	2.3	2.26	1.51	1.82	3.41	2.54	5.01	4.11	2.88	2.86	1.04	1.04	7.51	7.38	17.6	4.17	3.98	7.4	7.28	7.99	7.97	3.84	4.29
16CSF	3.19	3.35	2.19	2.38	1.75	1.65	4.16	2.57	5.06	3.75	2.81	2.85	1.04	1.06	8.28	8.22	17.2	3.54	3.31	6.02	6.21	6.5	6.76	4.59	4.45
17CSF	3.21	3.25	2.06	2.07	1.53	1.77	4.12	2.53	5.14	3.95	2.86	2.88	1.11	1.13	7.93	7.9	17.7	3.56	3.05	6.61	6.2	7.06	6.76	4.57	4.54
18CSF	3.17	3.21	2.4	2.27	1.67	1.72	4.39	2.15	4.91	4.01	2.68	2.78	1.04	0.98	8.22	8.25	17.5	2.8	3.33	5.74	6.87	6.38	7.5	4.81	4.79
19CSF	3.26	3.22	2.23	2.08	1.89	1.88	5.39	2.1	5.37	4.22	2.81	2.83	1.04	1.06	7.96	8.04	17.3	3.36	3.96	6.98	7.54	7.53	8.19	5.75	5.59
20CSM	3.09	3.06	2.12	2.2	1.38	1.32	3.63	2.73	5.38	4.2	2.87	2.86	1.05	1.11	7.45	7.39	17.6	2.98	2.39	5.87	5.69	6.24	6.15	4.3	4.51
21CSF	3.29	3.28	2.23	2.32	1.81	1.71	3.84	2.47	4.81	4.08	2.81	2.82	1	1.02	8.41	8.37	17.6	3.72	3.79	7.48	7.46	8.09	8.37	4.29	4.01
22CSF	3.18	3.34	2.19	2.24	1.71	1.55	4.43	2.31	4.83	4.02	2.65	2.57	0.97	0.92	8.1	7.98	17.4	3.59	3.35	7.05	6.94	7.6	7.29	4.65	4.96
23CSF	3.24	3.3	2.39	2.28	1.74	1.36	3.9	2.41	5.16	4.04	2.62	2.65	1.03	1	8.29	8.21	17.4	3.56	3.76	7.28	7	8.25	7.85	4.87	4.18
24CSM	3.19	3.1	2.38	2.03	1.5	1.84	3.74	2.44	5.51	4.16	2.67	2.65	1	0.99	7.55	7.68	17.6	3.01	2.62	6.49	6.21	6.91	6.65	3.67	3.48
25CSF	3.1	3.42	2.4	2.08	1.78	1.62	4.37	2.99	5.4	4.51	3	2.99	1.14	1.07	6.97	6.93	17.7	3.4	3.08	6.91	6.47	7.2	7.1	4.82	4.83
26CSF	3.28	3.32	2.02	2.15	1.79	1.8	4.62	2.56	5.62	3.94	2.83	2.85	1.11	1.08	8.03	8.13	17.5	3.76	3.56	6.4	6.4	6.92	6.86	5.6	5.86
27CSF	3.01	3.19	2.05	2.33	1.62	2	4.15	2.85	4.99	4.13	2.99	3.08	1.04	1.11	7.99	7.84	17.7	4.54	4.38	7.66	7.66	8.16	8.16	4.84	4.73
28CSM	3.27	3.15	2.32	2.26	1.84	1.85	3.77	2.61	5.16	4.22	2.94	2.96	1.09	1.06	7.84	7.71	17.5	3.3	3.08	6.24	5.85	6.64	6.38	4.27	4.45
29CSM	3.17	3.16	2.4	2.39	1.58	1.5	3.35	2.56	5.44	4.33	2.67	2.72	1.04	0.95	7.74	7.84	17.8	3.57	3.65	6.96	6.8	7.36	7.45	3.98	3.9
30CSF	3.28	3.23	2.25	2.31	1.93	1.89	3.52	2.5	5.02	4.08	2.64	2.66	0.94	0.96	7.6	7.56	17.6	2.95	3.11	6.1	6.1	6.62	6.52	4.52	4.62
31CSF	3.27	3.18	2.28	2.15	1.59	1.56	3.66	2.7	4.87	3.74	2.74	2.74	1.01	1.01	8.61	8.6	17.6	4.01	3.8	7.12	7.28	7.44	7.79	4.4	4.41
32CSF	3.12	2.85	2.23	2.14	1.81	1.58	3.74	2.46	4.74	4.1	2.87	2.8	0.98	1.03	8.21	8.1	17.6	3.08	3.29	6.32	6.42	6.84	7.19	4.52	4.2
080SM	3.31	3.05	2.4	2.34	1.82	1.79	4.02	2.69	4.96	4.29	2.74	2.8	1.05	1.02	8.89	7.83	17.7	4.1	4.09	7.22	6.78	7.66	7.34	5.03	4.77
083SM	3.15	3.28	2.24	2.31	1.75	1.86	4.42	2.78	5.4	4.45	3.01	3.14	1.14	1.15	7.6	7.38	17.7	3.98	4.31	7.04	7.21	7.36	7.79	5.34	5.32
102SF	3.34	3.25	2.21	2.33	1.87	1.9	4.6	2.5	5.07	4.44	2.86	2.87	1.04	1.03	8.11	8.13	17.7	3.18	3.57	6.45	6.83	6.8	7.37	5.46	5.98
103SF	3.21	3.08	2.29	2.23	1.87	1.86	4.02	2.42	5.26	4.06	2.78	2.72	1.01	1.05	7.84	7.87	17.6	3.76	3.49	6.86	6.6	7.44	7.19	4.46	4.29
105SF	3.12	3.09	2.16	1.88	1.74	1.81	4.12	2.83	5.32	3.94	2.88	2.93	1.09	1.01	7.77	7.82	17.9	3.41	4.18	6.74	6.84	7.18	7.33	4.72	4.79
108SF	2.72	3.15	1.89	2.28	1.52	1.7	3.93	2.93	4.7	4.19	2.62	2.79	1	1.04	7.63	7.68	17.7	3.08	3.9	6.39	6.89	7.01	7.49	5.51	5.8

109SF	3.34	3.22	2.24	2.14	1.81	1.77	4.01	2.61	5.39	3.94	2.88	2.86	1.03	1.04	7.95	7.97	17.9	3.81	4.25	7.23	7.57	7.66	7.81	4.79	4.73
110SF	3.31	3.65	2.39	2.04	1.69	1.64	4.23	2.57	4.91	4.02	2.91	2.93	1.03	0.99	7.71	7.74	17.8	4.59	4.46	8.02	7.83	8.82	8.49	4.29	4.61
113SM	3.21	3.49	2.47	2.24	1.76	1.78	4.07	2.59	5.34	3.87	2.87	2.84	1.09	1.08	7.78	7.74	17.8	2.39	2.67	5.43	5.64	5.74	5.93	4.49	4.64
115SF	3.4	3.42	2.27	2.31	1.93	1.74	4.4	2.41	5.11	3.99	2.87	2.96	1.07	1.09	8.04	8.16	17.9	3.31	3.01	6.24	5.81	6.51	6.33	5.11	5.29
058SM	3.01	3.05	2.18	1.96	1.92	1.66	4.12	2.7	5.17	4.03	2.65	2.91	1.1	1.06	7.09	7.1	16.9	3.28	3.27	5.66	6.14	6.16	6.61	4.83	4.99
059SM	3.42	3.39	1.73	2.34	1.39	1.56	4.03	2.53	5.64	4.28	2.41	2.43	1.05	1.03	7.39	7.28	16.6	2.84	2.82	5.09	5.54	5.47	5.76	4.58	4.86
062SM	3.21	3.31	2.03	2.18	1.9	1.99	4.2	2.89	5.71	4.09	3	3.06	1.18	1.12	7.34	7.07	17.4	3.81	2.82	7.1	5.82	7.39	6.39	5.28	5.38
064SM	2.87	2.95	2.13	2.21	1.68	1.88	4.24	2.84	5.38	4.5	2.73	2.74	1.09	1.08	7.3	7.41	16.7	3.62	3.33	6.12	6.03	6.42	6.66	4.87	5.21
068SM	3.27	3.1	2.32	2.02	1.93	1.85	4.17	2.5	5.49	4.44	2.89	2.64	1.13	1.05	7.33	7.27	16.9	3.93	3.5	6.97	7.42	7.46	7.35	5.28	4.82
069SM	3.29	3.2	2.16	2.11	1.75	1.69	4.15	2.52	5.6	4.23	2.99	3.06	1.1	1.05	7.73	7.81	17.8	3.25	3.02	6.1	5.63	6.53	5.63	5.02	4.98
001SF	3.09	2.92	2.21	2.17	1.85	1.8	3.83	2.2	5.14	4.29	2.81	2.81	1.01	1.04	8.05	8.06	17.5	3.53	4.02	7.24	6.8	7.67	7.4	4.84	5
002SF	2.98	3.11	2.31	2.37	1.5	1.53	3.93	2.43	5.03	4.08	2.87	2.9	1.06	1.09	8.38	8.31	17.9	3.16	3.49	6.55	6.46	6.83	7.15	4.63	4.89
003SM	3.2	3.16	2.22	2.21	1.81	1.8	3.41	2.52	5.29	4.19	2.73	2.74	1.02	1	8.02	8.1	17.9	2.95	3.11	5.71	5.91	6	6.34	4.05	4.09
004SF	3.1	3.2	2.34	2.36	1.85	1.86	3.88	2.44	5.28	3.96	2.86	2.82	1.05	1.09	8.04	8.05	17.9	3.29	3.95	6.66	7.27	7.05	7.67	4.46	4.8
005SF	3.4	3.42	2.11	2.32	1.61	1.54	3.62	2.64	5.29	4.29	2.81	2.75	1.06	1	8.08	8.15	17.8	3.09	3.58	6.62	6.14	7.38	6.55	3.59	3.8
006SF	3.01	3.01	2	2.22	1.49	1.85	4.16	2.54	5.49	3.94	2.77	2.83	1.03	1.04	8.13	8.19	17.7	3.65	3.73	7.25	6.97	7.75	7.69	4.68	4.83
007SF	3.55	3.43	2.24	2.29	1.58	1.62	3.91	2.53	5.21	4.1	2.74	2.76	1.06	1.03	8.17	8.33	17.8	2.33	2.72	5.5	6.1	5.87	6.76	3.83	3.99
008SF	3.3	3.25	2.26	2.21	1.77	1.91	3.84	2.48	5.26	3.92	2.81	2.86	1.02	1	8.47	8.42	17.4	2.94	3.18	6.39	6.57	6.9	7.73	4.45	4.26
009SM	3.27	3.27	2.3	2.25	1.55	1.6	3.63	2.78	5.28	4.44	2.73	2.77	1.03	1.05	7.37	7.29	17.8	3.27	3.43	5.95	5.93	6.31	6.21	4.16	4.45
010SM	3.43	3.33	2.51	2.13	1.5	1.65	3.67	2.54	5.22	4.29	2.85	2.87	1.05	1.05	7.67	7.68	17.9	3.55	3.29	7.2	7.03	7.61	7.97	4.5	4.59
011SF	2.94	2.85	1.95	2.13	1.81	1.82	5.03	2.61	5.54	4.05	2.88	2.92	1.04	1.06	7.96	7.94	17.8	3.88	3.64	6.2	6.46	6.56	6.8	6.16	6.2
012SF	2.99	3.01	2.29	2.08	1.77	1.89	3.79	2.48	5.17	3.82	2.77	2.77	1.05	1.01	7.76	7.96	17.8	3.43	3.51	6.8	6.77	7.35	7.29	4.48	4.75
013SF	3.52	3.32	2.32	1.84	1.62	1.43	3.98	2.34	4.87	3.88	2.49	2.61	0.96	0.96	8.62	8.47	17.8	2.57	3.26	5.53	5.94	5.93	6.21	4.72	4.5
014SF	3.1	3.15	2.32	2.27	1.82	1.68	3.59	2.45	4.83	3.85	2.81	2.86	1.03	1	7.96	8.03	17.8	3.01	3.38	6.71	7	7.96	8.14	4.32	4.38
015SM	3.22	3.3	2.25	2.43	1.72	1.58	3.49	2.32	5.45	3.99	2.82	2.89	1.02	1.04	7.98	7.96	17.9	2.4	2.72	5.36	5.48	5.75	5.81	4.49	4.84
016SF	3.13	3.15	2.37	2.37	1.59	1.75	3.91	2.31	4.79	4.06	2.78	2.78	1.02	1.04	8.07	8.02	17.8	3.05	2.51	6.21	6.19	6.49	7.48	4.7	4.5
017SF	2.8	3.04	2.25	1.9	1.45	1.53	4.54	2.45	5.23	4	2.89	2.73	1.04	1.1	7.83	7.78	17.8	3.35	3.52	6.58	6.66	7.09	7.35	4.49	4.46
018SF	3.38	3.39	2.37	2.34	1.68	1.68	4.14	2.19	5.32	3.84	2.77	2.78	1.02	1.03	7.93	7.96	17.9	3.41	3.39	7	6.93	7.53	7.37	3.97	4.05
019SF	3.08	3.17	2.25	2.06	1.61	1.79	3.67	2.51	4.91	4.01	2.77	2.73	1	1.03	8.22	8.17	17.8	3.5	3	6.98	6.36	7.43	6.74	3.84	3.93
020SF	3.15	3.21	2.24	2.48	1.8	1.74	3.51	2.26	5.22	4.15	2.71	2.7	1.02	1.02	8.2	8.24	17.7	3.52	3.6	7.17	7.16	8.08	8.11	3.91	3.78

021SF	3.49	3.48	2.38	2.37	1.77	1.61	4.23	2.59	4.94	4.13	2.89	2.8	1.05	1.11	8.46	8.4	17.9	3.64	7.6	7.26	7.09	7.69	3.38	4.7	4.92
022SM	3.22	3.25	1.78	2.17	1.96	1.92	3.85	2.24	5.17	4.79	2.89	3	1.19	1.08	7.25	7.31	17.8	3.39	3.82	6.04	6.57	6.32	7.35	4.45	4.62
023SM	3.11	3.25	2.21	2.26	1.59	1.74	4	2.71	4.93	4.3	2.93	2.93	1.05	1.06	7.63	7.63	17.8	3.15	3.84	6.34	6.38	6.8	6.7	4.35	4.65
024SF	3.05	2.81	2.26	2.36	1.74	1.79	4.02	2.73	4.7	4.32	2.75	2.8	1.06	1.04	7.77	7.82	17.8	2.7	3.02	6.02	5.33	6.42	5.63	4.82	4.7
025SF	3.53	3.44	2.09	1.91	1.47	1.69	4.41	2.35	4.86	3.91	2.8	2.8	1.01	1.02	7.74	7.76	17.5	3.38	3.77	6.56	6.55	7.15	7.58	5.11	4.72
026SF	3.37	3.39	2.34	2.41	1.65	1.64	4.01	2.44	5.08	4.1	2.77	2.76	1.05	1.06	8.11	8.08	17.8	3.12	2.95	5.79	5.85	5.97	6.26	4.17	4.06
027SM	3.28	3.25	2.48	2.35	1.49	1.45	4.37	2.48	5.39	4.18	2.9	2.98	1.13	1.09	7.47	7.44	17.8	3.17	3.64	6.5	5.37	7.26	5.57	4.55	4.48
028SM	2.93	3.11	1.99	2.26	1.6	1.45	4.26	2.37	4.99	4.17	2.85	2.84	1.06	1.03	7.44	7.49	17.8	3.05	3.82	6.72	7.81	7.31	7.99	4.81	4.44
029SM	3.01	3.18	2.47	2.22	1.84	1.72	4	2.61	4.67	4.25	2.86	2.82	1.04	1.01	7.81	7.74	17.9	3.71	3.36	7.13	6.56	7.61	7.25	4.49	5.01
030SF	3.08	3.12	2.28	2.08	1.75	1.82	4.39	2.28	4.95	4.09	2.73	2.77	0.96	0.99	8.43	8.32	17.9	3.59	3.45	6.86	7	7.3	7.47	5.08	4.8
031SF	3.12	3.24	2.33	2.24	1.68	1.81	4.23	2.32	5.22	3.81	2.75	2.82	1.02	1	8.39	8.35	17.8	3.03	3.5	6.41	6.57	6.54	7.17	4.52	4.52
032SF	3.42	3.66	2.2	1.71	1.71	2.01	4.32	2.54	5.5	4.01	2.88	2.91	1.09	1.09	7.73	7.69	17.8	3.09	2.27	6.41	5.85	7.09	7.01	5.07	4.97
033SF	3.12	3.05	2.41	2.1	1.63	1.65	3.87	2.69	5.23	3.83	2.82	2.8	1.03	1.02	8.2	8.11	17.9	3.29	3.05	7.12	6.84	8.07	7.27	3.98	3.88
034SF	2.98	3.06	1.96	2.09	1.58	1.79	5.19	2.29	5.38	4.43	2.91	2.95	1.09	1.04	8.21	8.19	17.7	3.22	3.81	6.48	6.9	6.93	7.32	5.27	5.34
035SM	3.22	3.14	2.16	2.02	1.73	1.95	3.75	2.75	4.7	4.19	2.94	3	1.03	1.04	7.99	8.02	17.8	3.54	3.15	7.22	6.96	7.46	7.14	4.46	4.86
036SF	3.28	3.28	2.06	2.2	1.85	1.73	4.5	2.39	5.31	3.95	3.01	3.01	1.08	1.05	8.19	8.18	17.7	2.33	2.55	5.07	5.16	5.36	5.46	5.24	4.44
037SM	3.24	3.3	2.33	2.21	1.62	1.69	3.87	2.39	5.2	4.53	2.78	2.74	1.01	1.04	7.5	7.48	17.8	3.76	3.33	7.19	6.26	7.74	6.68	4.68	4.44
038SM	3.19	3.13	2.41	2.24	1.57	1.59	3.26	2.59	5.21	3.92	2.79	2.77	1	0.98	8.36	8.35	17.8	3.48	3.87	7.12	7.14	7.68	7.64	3.71	3.8
039SF	3.13	3.21	2.29	2.17	1.74	1.79	4.35	2.41	4.84	4.21	2.83	2.78	1.04	1.03	8.19	8.1	17.8	3.5	3.36	7.37	7.28	7.83	7.77	4.91	4.69
040SM	3.08	3.11	2.47	2.4	1.75	1.71	3.79	2.21	4.76	4.12	2.95	2.97	1.11	1.06	7.89	7.91	17.8	3.31	3.91	6.58	7.03	6.95	7.51	4.97	4.97
041SF	3.08	3.01	2.28	2.33	1.92	1.81	3.67	2.43	5.08	3.99	2.78	2.8	1.03	1.07	8.21	8.22	17.8	3.56	3.45	7.02	6.64	7.63	7.25	4.24	4.21
042SF	3.23	3.19	2.24	2.29	1.55	1.66	3.82	2.51	5.18	4.23	2.8	2.81	1.06	1.08	8.36	8.35	17.9	3.2	3.34	6.71	6.91	7.15	7.42	4.56	4.13
043SF	3.16	3.1	2.32	2.29	1.76	1.47	3.73	2.44	4.83	4.11	2.83	2.83	1.04	1.04	8.33	8.36	17.9	3.15	3.29	6.13	6.19	6.53	6.59	4.62	4.69
044SF	3.02	3.06	2.29	2.33	1.44	1.54	3.6	2.42	5.13	3.93	2.84	2.75	1.1	1.04	7.79	7.82	17.7	3.65	3.69	6.91	6.89	7.3	7.32	3.92	4.12
045SF	3.19	3.2	2.4	2.22	1.86	2.01	4.25	2.52	4.72	3.95	2.75	2.8	1	1.02	8.68	8.73	17.8	3.01	2.51	5.98	5.59	6.37	6.03	5.2	4.78
046SM	3.41	3.8	2.35	2.05	1.92	2.01	4.44	2.28	5	4.3	2.82	2.59	1.08	0.99	7.55	7.55	17.8	2.98	2.99	6.23	6.42	7.17	7.34	5.99	5.54
047SM	2.95	3.18	2.19	2.16	1.76	1.77	4.37	2.62	4.81	4.17	2.91	2.87	1.12	1.12	7.08	7.15	17.7	2.86	2.8	5.84	6.14	6.31	6.65	4.78	4.88
048SM	3.6	3.22	2.07	2.52	1.76	1.77	4.24	2.58	5.77	4.07	3.05	3.04	1.11	1.26	7.51	7.43	17.8	3.08	2.98	6.45	5.76	6.82	6.14	4.96	5
049SF	3.52	3.49	2.04	2.1	1.57	1.58	5.72	2.63	5.71	4.3	3.19	3.14	1.17	1.23	7.86	7.96	17.8	3.41	3.42	6.06	6.25	6.29	6.62	5.63	5.75
050SM	3.19	3.2	2.13	2.14	1.75	1.73	3.71	2.41	5.31	3.96	2.97	2.92	1.04	1.04	7.36	7.42	17.8	2.9	2.85	5.85	6.53	6.12	6.52	4.44	4.3

051SF	3.06	3.23	2.2	1.8	1.85	1.77	4.28	2.21	5.42	3.6	2.84	2.84	1.08	1.07	7.42	7.58	17.7	3.23	3.22	7.11	6.77	7.08	6.79	5.24	4.75
052SM	3.31	3.23	2.14	2.54	1.75	1.73	3.99	2.35	5.21	4.12	2.96	2.82	1.1	1.02	8.33	8.2	17.7	2.93	2.92	6.07	5.99	6.5	6.3	5.15	5.02
053SM	3.34	3.29	2.19	2.15	1.76	1.78	4.23	2.47	5.43	4.41	2.91	2.93	1.11	1.03	7.46	7.46	17.8	3.56	3.21	6.13	6.06	6.33	6.33	4.89	4.97
054SF	3.5	3.44	2.64	2.3	1.74	1.59	3.73	2.15	4.89	3.99	2.69	2.68	1.06	1	8.62	8.62	17.9	3.62	3.3	6.97	6.87	7.28	7.49	4.6	4.08
055SF	3.2	3.25	2.38	2.42	1.84	1.84	3.62	2.33	5.42	4.26	2.84	2.83	1.03	1.08	7.89	7.8	17.8	2.98	2.62	6.78	6.54	6.99	6.79	5	4.28
056SM	3.13	2.99	2.22	2.34	1.9	1.77	4.05	2.51	5.29	4.35	2.84	2.84	1.07	1.08	7.63	7.6	17.9	2.94	3.01	6.14	6.09	6.62	6.47	4.99	4.4
057SF	3.3	3.23	2.22	2.24	1.86	1.86	4.55	2.77	5.03	3.98	2.89	2.87	1.09	1.1	8.39	8.2	17.8	3.58	4.02	7.57	7.87	8.17	7.83	5.21	5.08
060SF	3.43	3.41	2.19	1.98	1.79	1.75	4.47	2.7	4.96	3.94	2.9	2.86	1.08	0.98	7.88	7.92	17.9	3.39	3.14	6.5	6.64	6.72	6.46	5.12	4.79
061SF	3.29	3.32	2.43	1.91	1.7	1.77	4.39	2.65	4.22	4.26	2.77	2.81	1.07	1.03	8.39	8.38	17.9	3.79	3.42	7.01	7.12	7.32	7.86	4.8	4.63
063SF	3.36	3.27	2.22	2.13	1.82	1.72	5.14	2.99	5.23	4.27	3.04	3.08	1.18	1.15	8.04	8.07	17.9	3.51	4.02	6.02	7.07	6.53	7.55	5.88	5.99
065SF	3.39	2.83	2.06	1.83	1.87	1.73	3.97	2.78	4.94	4.28	2.71	2.73	1.1	1.05	7.98	7.94	17.8	2.95	2.74	5.37	6.07	5.88	6.64	4.82	5.15
066SF	3.25	3.39	2.29	2.11	1.78	1.77	4.76	2.63	5.2	4.15	2.88	2.9	1.07	1.07	8.16	8.13	17.8	2.79	3.28	6.38	6.89	6.43	6.92	5.09	4.86
067SF	3.14	3.36	2.01	2.19	1.95	2.05	4.24	2.55	4.95	4.21	2.97	2.99	1.18	1.09	8.3	8.29	17.9	3.14	3.21	5.87	6.71	6.37	6.76	5.87	5.63
070SM	3.1	3.28	2.48	2.18	1.69	1.81	4.34	2.56	5.37	4.54	3	2.98	1.09	1.04	7.58	7.52	17.9	3.69	3.95	7.38	6.84	7.64	7.22	5.53	5.2
071SM	3.14	3.29	1.79	2.21	1.94	2.03	4.33	2.46	5.5	4.54	3.17	3.16	1.14	1.15	7.52	7.52	17.9	3.62	3.63	7.22	6.74	7.55	7.26	5.15	5.11
072SM	3.18	3.12	2.38	2.36	1.64	1.84	3.76	2.43	5.12	4.24	3.01	3.03	1.11	1.08	7.72	7.73	17.9	4.25	2.92	7.78	5.31	8.01	6.06	4.75	4.41
073SF	3.08	3.13	2.08	2.05	1.9	1.92	4.44	2.91	5.11	4.05	2.86	2.85	0.96	1.05	7.59	7.65	17.9	3.33	3.04	6.08	4.85	6.48	5.22	4.98	5.07
074SF	3.13	3.08	2.03	2.31	1.67	1.41	4.29	2.84	5.12	4.04	2.87	2.92	1.06	1.08	7.93	7.82	17.9	3.51	3.15	7.02	6.36	7.62	6.91	5.02	5.45
075SM	3.16	3.15	2.08	1.98	1.5	1.75	3.79	2.72	4.92	4.08	2.93	2.83	1.05	1.04	7.63	7.61	17.9	3.62	3.18	6.52	5.69	7.03	6.44	4.6	4.6
076SF	2.99	3.36	2.51	1.94	1.66	1.74	4.73	2.64	5.51	4.32	2.81	2.84	1.11	0.99	7.77	7.76	17.8	3.32	2.95	6.35	6.57	6.71	6.96	5.8	5.49
077SM	3.13	3.36	2.01	2.25	1.84	1.6	4.12	2.34	5.35	4.06	3.14	3.1	1.12	1.09	7.51	7.41	17.8	2.77	3.03	6.28	6.44	6.63	6.89	4.62	4.95
078SM	3.22	3.57	2.32	2.34	2.14	2.03	4.2	2.61	4.81	4.24	3.25	3.27	1.12	1.16	7.71	7.67	17.9	3.44	3.13	7.17	6.63	7.36	6.9	5.17	4.84
079SM	3.41	2.94	2.04	2.01	1.86	2.02	4.41	2.62	5.26	4.51	2.78	2.94	1.04	1.01	7.63	7.62	17.9	2.84	3.51	5.1	5.89	4.98	6.55	4.89	5.03
081SM	3.1	3.42	2.24	2.2	2.03	1.97	4.45	2.8	5.91	4.28	3.05	2.96	1.16	1.1	7.24	7.21	17.9	3.09	2.94	6.29	5.97	6.59	6.07	5.53	5.1
082SM	3	3.21	2.4	1.84	1.83	1.97	4.06	2.75	5.04	4.5	3.11	3.12	1.13	1.08	7.79	7.91	17.9	3.29	3.39	6.11	5.79	6.86	6.27	4.97	5.12
084SM	3.09	3.02	2.5	2.34	1.91	1.89	3.85	2.75	4.42	4.09	2.82	2.85	1.06	1.04	7.89	7.98	17.9	3.82	3.41	6.9	6.93	7.39	7.44	4.64	4.83
085SF	3.21	3.3	2.28	2.49	1.74	1.44	4.12	2.66	4.86	4.29	2.8	2.78	0.98	0.99	7.97	7.94	17.9	2.44	3.29	6.15	6.29	6.89	6.84	4.66	4.58
086SF	3.01	2.86	2.22	2.3	1.87	1.76	4.26	2.6	5.11	4.05	2.83	2.85	1.06	1.09	8.01	7.91	17.9	4.22	3.79	6.36	5.92	6.75	6.36	4.64	4.43
087SF	2.77	2.9	2.28	2.28	1.81	1.86	4.6	2.82	5.18	4.36	3.05	3.01	1.14	1.25	7.62	7.57	17.7	3.83	2.29	6.51	5.53	7.03	6.27	5.27	4.79
088SM	3.17	3.83	2.43	1.95	1.86	1.59	4.23	2.82	4.75	4.52	3.02	3.07	1.15	1.1	7.55	7.48	17.9	3.15	3.24	6.3	6.42	6.09	6.66	4.89	4.72

089SM	3.32	3.03	2.19	2.23	1.79	1.74	3.77	2.38	5	4.06	2.79	2.7	1.04	0.98	7.9	7.92	17.9	3.81	3.29	7.16	6.83	7.33	6.95	4.58	4.28
090SM	3.13	3.31	2.09	2.19	1.45	1.82	4.47	2.68	5.48	4.38	3.02	3.03	1.12	1.12	7.51	7.42	17.9	3.62	3.91	6.88	6.7	7.29	7.21	5.28	5.06
091SM	3.13	3.19	2.1	2.22	1.83	1.93	3.9	2.5	4.85	4.29	2.96	2.97	1.04	1.08	8.2	8.13	17.9	3.93	3.64	7.01	7.02	7.26	7.54	4.34	4.64
093SF	3.02	3.14	2.12	2.18	1.89	1.81	5.08	2.42	4.5	4.18	2.78	2.86	1.05	1.09	8.14	8.13	17.9	3.51	3.6	6.37	6.89	6.42	7.04	4.88	5.3
094SM	3.28	3.13	2.31	2.41	1.73	1.91	4.32	2.75	5.34	4.51	3.12	3.21	1.18	1.17	7.49	7.52	17.8	3.73	3.62	6.79	6.59	7.09	7.04	4.9	4.68
095SM	3.3	3.43	2.28	1.99	1.62	1.6	4.05	2.22	4.83	4.08	2.85	2.93	1.04	1.02	7.44	7.41	17.9	3.41	3.45	6.29	6.23	6.65	6.81	4.84	5.08
096SF	3.1	3.17	2.07	2.19	1.7	1.75	4.19	2.73	5.01	3.97	2.8	2.76	1.1	1.1	7.99	7.92	17.9	3.04	3.1	6.81	6.42	7.3	6.75	4.51	4.81
097SF	3.22	3.23	2.26	2.01	1.56	1.7	4.12	2.73	4.95	3.89	2.74	2.62	1.01	0.99	7.92	7.95	17.9	3.19	3.13	6.51	6.5	7	6.89	4.61	4.67
098SF	3.11	3.06	2.28	2.22	1.67	1.79	4.33	2.58	5	4.29	2.78	2.79	1	1.01	7.75	7.79	17.8	2.99	3.24	6.17	6.03	6.48	6.48	5.16	4.92
099SM	3	3.16	2.33	2.49	1.93	1.83	4.38	2.66	5.28	4.38	2.92	2.84	1.07	1.05	8.03	7.78	17.9	2.79	3.25	6.2	6.92	6.57	7.29	5.49	5.43
100SM	3.19	3.18	2.41	2.42	1.59	1.7	3.23	2.86	4.98	4.19	2.77	2.78	1.06	1.05	7.76	7.74	17.9	2.81	3.59	6.31	6.53	6.92	7.12	4.25	4.41
101SM	3.39	3.51	2.34	2.39	1.81	1.8	3.99	2.69	5.19	4.08	3.04	3.06	1.11	1.1	7.75	7.6	17.9	3.51	3.73	6.7	6.58	7.12	6.96	4.68	4.86
104SF	3.27	3.14	2.19	1.94	1.83	1.91	4.59	2.82	5.22	4.41	2.98	2.98	1.08	1.13	7.96	7.9	17.8	3.08	2.94	5.88	6.33	6.4	6.78	5.33	4.81
106SM	3.09	3.17	2.33	2.41	1.75	1.81	4.2	2.75	4.9	4.44	3.2	3.25	1.15	1.15	7.87	7.74	17.9	3.4	3.67	6.28	6.31	6.58	6.91	5.35	5.24
107SM	3.03	3.28	2.15	2.3	1.69	1.51	4.42	2.55	5.46	4.11	2.93	3.03	1.08	1.11	7.33	7.15	17.9	2.99	3.41	6.1	6.6	6.54	7.06	5.36	5.55
111SM	3.33	3.26	2.2	2.57	1.83	1.79	3.95	2.67	4.96	4.31	2.96	3.04	1.09	1.1	7.66	7.65	17.9	2.96	3.14	6.66	6.63	6.8	6.91	4.74	4.97
112SM	3.09	3.21	2.07	2.45	2.06	1.99	3.85	2.75	5.05	4.39	2.86	2.93	1.09	1.11	7.54	7.62	17.9	3.88	4.38	6.55	7.97	7.04	7.93	4.33	4.54
114SM	2.87	3.11	2.31	2.27	2.04	1.73	3.99	2.59	4.99	4.22	2.9	2.91	1.07	1.07	7.49	7.46	17.9	3.3	3.28	6.48	6.2	6.77	6.3	5.11	4.93
117SF	3.05	3.09	2.47	2.21	1.89	2.01	3.74	2.78	4.67	4.09	2.76	2.66	1.01	0.99	8.34	8.31	17.9	3.56	4.29	7.75	7.86	8.51	8.35	4.69	5.01
118SM	3.14	3.02	2.33	2.31	1.61	1.79	3.49	2.41	5.04	4.04	2.83	2.92	1.06	1.04	7.87	7.71	17.9	3.59	3.19	6.75	6.52	7.04	7.12	4.92	4.78
119SM	3.19	3.4	2.31	1.86	1.64	1.84	3.77	2.19	5.03	4.2	2.92	2.79	1	1.07	7.9	7.87	17.9	2.82	2.98	5.89	5.35	6.03	5.9	4.84	4.54
120SM	3.32	3.39	2.24	2.32	1.86	1.84	4.22	2.74	4.94	4.4	2.96	3.02	1.09	1.11	7.93	8.04	17.9	3.51	3.61	6.18	6.72	6.57	6.85	4.83	4.96
121SM	3.03	3.15	2.18	2.07	1.87	1.84	4.32	2.51	4.94	4.59	3.08	2.93	1.12	1.05	7.57	7.54	17.8	3.85	3.42	6.26	6.09	6.74	6.63	5.18	5.22
122SF	3.32	3.18	2.07	2.41	1.66	1.47	4.33	2.55	5.25	4	2.7	2.79	1.08	1.04	7.81	7.86	17.8	3.86	3.65	7.19	7.66	7.35	7.65	5.17	5.29
123SF	3.24	1.89	2.27	3.2	1.95	1.87	4.63	2.76	5.79	4.32	2.94	2.97	1.1	1.14	7.97	7.99	17.8	3.71	3.16	6.77	6.61	6.99	7.05	5.79	5.88
124SF	3.38	3.34	2.17	2.21	1.69	1.71	4.35	2.59	5.25	3.93	3.03	3.06	1.17	1.12	7.99	8.09	17.9	3	3.56	6.54	7.16	6.82	7.07	5.16	5.5
125SM	2.92	3.05	2.07	2.39	1.47	1.37	3.87	2.18	5.38	4.17	2.99	2.96	1.05	1.05	7.79	7.71	17.9	3.69	3.25	6.97	6.44	7.19	6.74	4.88	4.68
126SF	3.21	3.19	2.11	2.04	1.88	1.8	4.17	2.6	4.85	3.73	2.79	2.8	1	1.04	8.09	8.11	17.7	3.53	3.48	6.65	6.53	7.12	7.05	4.61	4.23
127SF	3.25	3	2.22	2.33	1.96	1.87	4.5	2.77	5.08	3.78	2.93	2.88	1.12	1.14	7.83	7.9	17.9	3.27	3.28	6.01	6.09	6.56	6.59	4.39	5.18
128SF	3.4	3.22	2.24	1.83	1.9	1.62	4.67	2.92	5.53	4.42	2.89	3.03	0.99	1.06	7.6	7.68	17.9	3.27	2.56	5.86	4.77	5.96	5.06	5.5	5.72

129SF	3.19	3.28	2.15	2.16	2.02	1.88	4.97	2.79	5.62	4.25	3.14	3.13	1.17	1.2	7.87	7.87	17.9	3.18	3.23	6.65	5.6	6.38	6.45	5.62	6.28
130SM	3.18	3.15	2.34	2.03	1.73	1.94	3.93	2.59	5.01	4.19	2.88	2.92	1.07	1.05	7.98	8.05	17.9	3.24	2.9	6.53	6.21	6.83	6.51	4.7	4.95
131SM	3.34	3.26	2.26	2.28	1.81	1.96	4.5	2.59	5.52	4.18	2.98	3.02	1.12	1.14	7.35	7.24	17.8	4.15	4.24	7.63	6.96	8.29	7.71	4.86	4.95
132SM	3.17	3.3	2.21	2.14	1.81	1.79	4.06	2.74	5.05	4.6	2.99	2.94	1.03	1.08	7.53	7.59	17.8	3.49	3.53	6.6	6.93	6.74	7.14	4.33	5.49
133SF	3.11	3.43	2.39	2.34	1.6	1.58	3.78	2.62	4.85	3.9	2.9	2.88	1.1	1.08	8.02	7.96	17.9	3.69	3.79	7.27	7.26	7.65	7.78	4.28	4.52
134SM	3.01	3.01	2.13	2.22	1.6	1.68	3.85	2.63	4.94	4.31	2.91	2.92	1.08	1.06	6.93	6.89	17.9	3.87	3.22	7.06	6.81	7.59	7.23	4.55	4.61
135SF	3.08	3.19	2.22	2.27	1.64	1.63	4.09	2.62	5.23	3.98	2.73	2.81	1.04	1.06	7.9	8.04	17.9	3.85	4.04	7.28	7.49	7.68	8.07	4.64	4.64
136SF	3.21	3.33	2.58	1.87	1.68	1.77	4.61	2.68	4.99	4.28	2.89	2.92	1.11	1.15	7.88	7.88	17.9	3.46	3.77	7.17	7.2	7.68	7.85	5.98	5.11
137SF	3.25	3.13	2.2	1.86	1.96	2.06	4.9	2.74	5.55	4.73	3.28	3.28	1.23	1.19	7.29	7.27	17.8	3.85	3.33	6.79	6.32	7.57	7.02	6.12	5.79
138SM	3.11	3.03	2.15	1.97	1.86	1.94	3.82	2.25	5.22	4.27	2.98	3.01	1.1	1.11	7.76	7.76	17.8	3.27	3.44	5.23	6.57	5.69	7.11	4.85	4.62
139SM	3.05	3.21	2.11	1.8	1.98	1.87	4.15	3.01	5.28	4.36	3.01	3.03	1.15	1.13	7.4	7.18	17.8	3.77	4.53	6.77	7.43	7.49	7.95	5.2	4.89
140SM	3.1	3.19	2.1	2.33	2.05	1.79	4.23	2.26	5.51	4.47	2.99	2.99	1.11	1.12	7.54	7.53	17.8	3.07	3.13	6.4	6.27	6.61	6.52	4.98	4.97
141SM	3.52	3.01	2.47	2.13	1.68	1.64	3.58	2.65	5.22	4.21	3.02	3.05	1.08	1.09	8.06	8.06	17.8	3.33	3.73	6.97	7.34	7.42	7.81	4.29	4.32
142SF	3.43	3.16	2.1	2.41	1.59	1.31	3.82	2.55	4.93	4.01	2.78	2.69	1.02	1	8.45	8.35	17.8	3.54	3.37	6.89	6.72	7.25	7.13	4.25	4.29
143SF	2.99	3.01	2.25	2.17	1.77	1.7	3.84	2.71	4.36	3.81	2.85	2.92	1.08	1.09	8.24	8.33	17.9	3.22	2.81	5.19	5.85	5.24	6.33	4.22	4.32
144SF	3.04	3.26	2.35	2.55	1.48	1.4	4.22	2.81	5.18	4.27	2.99	3.01	1.11	1.09	7.79	7.73	17.8	3.37	2.83	6.99	6.62	7.5	7.08	4.17	4.52
145SM	2.95	2.98	2.32	2.43	2.04	1.83	3.81	2.34	4.82	3.99	2.96	2.98	1.1	1.14	8.07	8.13	17.8	3.05	3.37	6.02	5.95	6.35	6.33	4.17	4.56
146SM	2.91	3.08	2.37	2.03	1.79	1.91	3.98	2.63	4.98	4.22	2.86	2.84	1.08	1.06	8.12	8.26	17.8	2.98	3.56	6.92	7.05	7.4	7.11	5.21	5.24
147SM	3.2	3.56	2.11	1.79	1.92	1.96	4.25	2.69	5.39	4.57	2.95	3.02	1.13	1.12	7.13	7.17	17.9	2.7	2.92	5.78	5.66	6.53	6.71	5.62	5.19
148SM	3.09	3.28	2.55	2.28	1.89	1.86	4.1	2.86	4.71	4.62	2.91	2.98	1.11	1.08	7.92	7.82	17.7	3.55	3.35	6.56	6.5	6.69	6.7	4.83	4.8
149SF	3.52	3.15	1.91	1.71	1.9	1.92	4.48	2.62	5.21	4.26	3.12	3.14	1.15	1.19	7.8	7.79	17.8	3.57	3.72	7.53	7.13	7.55	7.33	5.79	4.49
150SF	3.2	3.31	1.74	1.72	1.97	1.71	4.64	2.82	4.65	4.13	2.86	2.9	1.08	1.08	8.07	8.13	17.8	2.94	2.91	5.66	5.62	7.1	6.34	4.8	5.15
151SF	3.12	3.08	2.04	1.74	1.83	1.86	4.8	2.84	5.29	4.2	2.88	2.87	1.07	1.07	7.88	8.06	17.8	3.61	3.51	7.26	6.6	7.8	7.04	5.11	5.53
152SF	3.27	3	1.88	2.23	1.89	1.7	3.92	2.42	4.81	3.88	2.68	2.71	1.04	1.05	8.28	8.15	17.9	2.44	3.45	6.01	7.26	6.7	7.64	3.96	4.13
153SF	3.31	3.27	2.16	2.08	1.69	1.85	5.31	3	5.7	4.26	3	3.03	1.11	1.18	7.33	7.34	17.9	3.57	3.16	7.12	6.17	7.1	6.34	5.66	5.63
154SM	3.26	3.35	2.48	2.4	1.76	1.77	3.52	2.43	5.5	4.24	2.92	2.9	1.12	0.99	7.55	7.59	17.8	3.56	3.47	7.02	7.07	7.39	7.46	3.8	3.99
155SM	3.11	3.12	2.26	2.21	1.83	1.75	4.1	2.72	5.64	4.35	2.93	2.79	1.07	1.03	7.83	7.81	17.9	3.45	3.26	6.01	6.27	6.47	6.58	4.64	4.68
156SF	3.22	3.17	2.06	2.07	1.81	1.91	5.15	2.92	5.3	4.03	3	2.96	1.11	1.1	7.68	7.72	17.8	3.62	3.31	6.47	6.91	6.74	7.09	5.22	5.28
157SM	3.36	3.09	2.18	2.28	1.9	1.9	4.25	2.84	4.96	4.49	2.87	2.84	1.06	0.99	7.34	7.4	17.8	4.31	3.62	7.14	6.69	7.34	6.84	5.2	5.15
159SF	3.44	3.42	2.05	1.82	2.12	2.1	4.88	2.71	5.5	4.17	3.03	3.06	1.17	1.17	7.5	7.47	17.8	3.67	3.11	5.83	5.7	6.09	5.91	5.52	5.35

160SM	3.32	3.37	2	1.86	1.79	1.72	4.13	3.07	5.18	4.6	3.03	3.02	1.15	1.13	7.1	7.08	17.8	3.54	3.2	6.84	7.05	7.17	7.34	4.47	4.75
161SM	3.13	3.19	2.07	2.24	1.7	1.76	4.18	2.54	5.44	3.99	2.91	2.95	1.11	1.09	7.45	7.53	17.8	3.63	3.96	6.87	7.15	7.11	7.4	5.43	4.9
162SM	3.13	3	2.13	2.11	1.91	1.86	4.11	3.04	4.91	4.38	2.81	3.03	1.17	1.09	7.49	7.33	17.9	3.19	2.96	5.44	5.2	5.77	5.78	4.98	5.48
163SM	3.41	3.42	2.1	2.26	1.79	1.49	4.17	2.89	5.18	4.01	2.85	2.78	1.06	1.06	7.67	7.65	17.7	2.52	3.58	5.76	6.81	6.67	7.08	4.74	4.76
164SM	2.88	2.97	1.69	2.2	1.59	1.62	3.97	2.63	5.13	4.67	3.01	2.98	1.11	1.12	7.59	7.48	17.8	3.53	3.12	7.06	6.68	7.31	7.3	4.67	5.02
165SM	3.19	3.33	2.49	2.21	1.66	1.81	3.85	2.6	5.03	4.22	2.64	2.68	1.03	1.03	7.79	7.62	17.8	3.8	3.54	7.04	6.66	7.35	7.12	4.53	4.4
166SF	3.05	3.12	2.23	1.75	1.82	1.71	4.41	2.61	4.8	4.31	2.81	2.77	1.07	1.05	8.47	8.47	17.8	3.56	3.51	6.76	6.94	7.04	7.33	5.2	5.6
167SM	3.27	3.12	2.31	2.3	1.84	1.79	3.79	2.8	5.08	4.11	2.83	2.79	0.99	0.96	7.82	8.04	17.8	2.98	3.1	6.48	6.73	7.08	7.16	5.39	4.99
168SM	3.33	3.7	2.19	1.86	2.14	1.94	3.82	2.55	5.61	4.52	3.09	3.11	1.17	1.15	7.74	7.8	17.9	3.17	3.002	6.04	6.41	6.36	6.82	4.71	4.94
169SM	3.05	2.98	2.18	2.2	1.45	1.62	4.4	2.87	5	4.6	2.92	2.97	1.12	1.15	7.7	7.69	17.9	3.98	4.95	7.86	8.51	8.36	8.8	4.97	5.14
170SF	2.91	2.97	2.1	1.96	1.66	1.77	3.94	2.54	4.68	3.82	2.67	2.71	1.01	1.06	8.45	8.48	17.9	3.7	3.45	7.37	6.08	7.68	6.58	4.94	4.77
171SF	3.61	3.65	1.97	1.86	1.7	1.8	5.27	2.6	5.04	4.35	3.07	3.05	1.14	1.19	7.42	7.42	17.9	3.28	3.67	5.87	6.82	6.1	6.87	5.82	5.34
172SF	3.27	3.35	2.16	2.36	1.94	1.83	4.26	2.49	4.73	3.95	2.86	2.85	0.94	1.01	8.76	8.79	17.9	2.98	2.98	6.75	6.99	7.08	8.21	5.24	4.99
173SF	3.15	3.12	2.4	2.25	1.85	1.88	4.43	2.52	5.25	4.24	2.8	2.82	1.06	1.01	8.18	8.19	17.8	3.1	4.08	6.99	8.05	7.74	8.72	5.34	5.15
174SM	3.42	3.29	2.35	2.29	1.88	1.74	3.91	2.42	5.17	4.47	2.97	2.98	1.12	1.13	8.22	8.17	17.8	3.16	3.41	6.93	5.83	7.56	6.45	4.46	4.48
175SM	3.24	3.58	2	1.91	1.76	1.61	4.39	2.67	5.41	4.56	2.87	2.88	1.09	1.06	7.45	7.52	17.8	3.32	3.34	6.25	5.8	6.52	6.19	5.14	5.17
176SF	3	3.04	2.07	2.03	1.54	1.53	3.72	2.88	4.68	4.09	2.91	2.84	1.06	1.08	7.91	7.91	17.8	4.1	4	6.89	6.79	7.12	7.29	4.8	4.63
177SM	3.31	3.04	1.84	1.87	1.79	1.95	4.38	2.3	5.2	4.16	2.69	2.84	1.08	1.01	7.55	7.4	17.8	3.29	3.15	7.07	6.85	6.95	7.34	5.1	5.77
178SM	3.28	3.1	2.25	2.5	1.77	1.75	3.68	2.7	5.88	4.1	2.95	2.96	1.08	1.15	6.84	6.81	17.9	3.94	4.21	7.9	7.48	8.82	8.27	4.66	4.91
179SF	3.32	3.03	2.39	1.6	1.65	1.49	4.03	2.4	4.25	3.85	2.72	2.76	1.02	0.99	8.86	8.78	17.7	3.06	3.24	5.5	6.27	6.39	6.58	4.69	4.85
180SF	3.08	3.23	2.21	2.41	1.66	1.59	4.43	2.47	4.31	4.03	2.75	2.74	1.02	1.03	8.43	8.44	17.8	3.58	3.11	6.92	6.62	7.39	6.94	5.03	5.56
181SM	3.01	3.04	2.2	2.19	1.84	1.61	3.81	2.66	4.93	4.1	2.86	2.95	1.04	1.11	7.85	7.83	17.9	3.26	3.1	6.15	5.96	6.37	6.45	4.65	4.73
182SM	3.41	3.43	2.15	1.84	1.8	1.68	4.04	2.72	5.17	3.95	2.85	2.79	1.06	1.04	7.7	7.8	17.8	3.67	3.54	6.37	6.82	6.92	7.44	5.17	4.54
183SF	3.49	3.4	2.83	2.39	1.42	1.49	5.05	2.67	5.39	4.18	2.95	2.96	1.05	1.12	7.81	7.82	17.8	3.07	3.46	4.69	6.17	4.84	6.6	5.48	5.22
184SM	3.18	3.16	2.11	2.15	1.51	1.35	3.85	2.5	4.82	4	2.93	2.91	1.08	1.11	7.71	7.49	17.8	3.8	3.15	6.96	5.51	7.37	6.13	4.5	4.86
185SF	3.55	3.36	2.24	1.52	1.56	1.38	4.95	2.68	4.57	3.84	2.77	2.76	1.01	0.98	8.39	8.42	17.8	2.87	2.94	6.5	6.24	7.04	6.53	5.83	5.08
186SF	3.47	3.19	2.01	2.12	1.91	2.02	5.38	2.63	5.5	4.21	2.96	2.95	1.08	1.08	7.51	7.57	17.8	3.14	3.04	6.31	6.3	6.26	6.82	6.34	6.77
187SM	3.42	3.74	2.06	1.85	1.69	1.96	4.23	2.2	5.28	4.01	2.77	2.81	0.96	1.02	7.42	7.43	17.8	3.11	2.77	6.64	5.24	6.73	5.82	5.05	4.9
188SF	3	2.86	2.18	1.82	1.86	1.9	4.5	2.72	5.41	3.97	2.84	2.85	1.05	1.1	7.78	7.75	17.8	3.07	2.94	6.65	6.44	7.12	6.79	5.6	5.46
189SF	3.32	3.23	2.05	1.5	1.9	1.91	4.11	2.42	4.63	4.14	2.84	2.85	1.05	1.04	8.26	8.2	17.7	3.34	3.33	6.86	6.68	7.52	6.99	4.86	5.49

190SM	2.9	3.13	1.86	2.31	1.98	2	4.73	2.64	5.17	4.67	2.99	2.98	1.17	1.09	6.9	6.85	17.8	3.94	4.15	6.11	6.43	6.58	7.21	6.13	5.9
191SF	3.22	3.34	1.88	2.09	1.8	1.82	3.69	2.73	5.06	3.92	2.59	2.57	1.05	1.05	8.06	8.13	17.8	2.76	2.98	5.56	5.75	6.16	6.32	4.22	4.45
192SF	3.3	3.43	2.4	2.21	1.83	2.1	4.43	2.66	4.85	4.13	2.86	2.56	1.06	1.1	7.64	7.71	17.7	2.69	3.13	5.34	4.59	5.95	5.45	4.84	4.98
193SM	2.96	3.61	1.58	1.79	1.7	1.6	4.28	2.7	4.87	4.53	2.95	2.85	1.09	1.07	7.7	7.74	17.7	2.41	2.75	6.02	6.43	6.53	6.6	4.6	5.19
194SF	3.24	3.13	2.2	1.94	1.93	1.8	5.2	2.26	5.33	4.48	2.86	3	1.17	1.09	8.05	7.92	17.9	3.36	3.62	6.45	6.33	6.66	6.72	6.09	5.87
195SF	3.28	3.33	2.34	2.13	1.99	1.95	4.49	2.35	5.09	4.03	2.91	2.89	1.07	1.04	7.98	7.98	17.8	3.6	3.75	6.65	7.84	7.09	8.02	4.9	5.14
196SM	3.35	3.29	2.33	2.18	1.92	1.9	4.44	2.25	5.39	3.94	2.92	2.94	1.09	1.09	7.7	7.63	17.9	3.59	3.47	6.15	7.57	6.28	7.76	5.14	5.42
197SM	3.2	3.25	2.19	2.16	1.54	1.71	3.93	2.73	5.49	4.32	2.89	2.93	1.09	1.08	6.81	6.84	17.8	3.17	2.69	5.72	5.08	6.13	5.79	4.86	5.13
198SF	2.95	2.91	2.21	1.96	1.52	1.55	3.87	2.51	4.76	4.01	2.83	2.85	1.05	1.08	7.95	7.75	17.9	3.77	3.14	7.36	6.56	7.86	7.13	4.49	4.46

Table 8. Gait Morphology (Row)

	Backward Arm Swing										Forward Arm Swing										Overall			Midstance																						Swing (lower legs)					
Subject	3. Lat Placement of Upper Arm	4. Lat Placement of Upper Arm	5. Lat Placement of Forearm Backward	6. Lat Placement of Forearm Backward	9. Level of elbow Flexion backward	10. Level of elbow Flexion Backward	13. Lateral Rotation of the Hand	14. Lateral Rotation of the hand	15. Finger flexion upon backward arm	16. Finger flexion upon backward arm	3. Lat Placement of Upper Arm	4. Lat Placement of Upper Arm	5. Lat? Placement of Forearm Forward	6. Lat? Placement of Forearm Forward	9. Level of elbow Flexion Forward	10. Level of elbow Flexion Forward	13. Lateral Rotation of the Hand	14. Lateral Rotation of the hand	15. Finger flexion upon Forward arm	16. Finger flexion upon forward arm	2. lateral trunk sway	3. Orientation of Lower Extremities	4. Orientation of Lower Extremities	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of Upper Arm	8. Lateral Placement of Upper Arm	9. Lateral Placement of Forearm Right	10. Lateral Placement of Forearm Left	11. Level of elbow Flexion Midstance	12. Level of elbow Flexion Midstance	14. Lateral Rotation of the Hand Mid	15. Lateral Rotation of the hand Mid	16. Finger Flexion Right	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projection	22. Lateral Placement of Upper leg Mid	23. Lateral Placement of Upper leg Mid	24. Lateral Placement of Lower Leg	25. Lateral Placement of Lower leg	28. Placement of the Feet Mid Stance	29. Placement of the Feet Mid Stance	1. lat placement of Upper Leg Swing	2. lat placement of Upper Leg Swing	5. Lateral Placement of Lower Leg	6. Lateral Placement of Lower leg	11. Placement of the Feet Swing Right	12. Placement of the Feet Swing Left
002FD	1	3	1	1	2	2	2	2	2	2	2	1	3	3	3	3	1	2	2	2	2	3	3	2	2	2	2	1	2	1	1	3	3	2	2	1	2	2	2	3	3	3	3	2	2	3	3	3	3	1	1
005FD	3	3	1	1	1	2	3	2	2	2	3	1	3	3	2	3	2	1	2	2	1	3	3	2	2	2	3	3	3	1	1	1	2	2	2	3	3	2	2	1	1	3	3	1	2	2	2	2	2	1	1
006FD	3	2	1	1	2	2	2	2	2	2	3	3	3	3	2	2	2	1	2	2	1	3	3	1	3	1	2	1	2	2	1	2	2	2	2	2	2	3	2	3	3	3	3	2	2	3	3	3	3	1	1
007FD	3	3	1	1	2	2	2	3	2	2	3	3	3	3	2	3	2	2	2	2	2	4	4	1	1	3	2	3	2	2	3	2	1	2	2	2	2	2	1	3	3	2	2	2	2	3	3	3	3	1	1
009FD	3	1	1	1	2	2	1	1	2	2	2	1	3	3	2	3	2	1	2	2	2	3	3	1	1	2	3	1	1	2	2	2	2	2	1	2	2	2	2	3	3	2	2	2	2	2	1	3	3	1	1
017FD	3	2	1	1	2	3	2	1	2	1	2	1	3	3	3	3	1	1	2	1	2	3	3	1	2	3	3	1	1	1	1	2	2	2	1	2	1	2	1	3	2	2	2	2	1	3	3	2	3	1	1
020FD	3	3	2	1	2	2	2	2	2	2	2	1	3	3	3	2	2	1	2	2	2	1	1	1	3	1	1	2	2	2	2	2	2	2	2	2	2	3	2	3	3	2	1	1	1	3	3	3	3	1	1
021FD	3	3	1	1	2	2	2	2	1	1	2	1	3	3	3	3	1	1	1	1	1	3	3	2	2	3	3	3	2	1	1	2	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	3	3	2	1
022FD	2	3	2	1	2	1	2	2	2	1	2	2	3	3	3	3	2	3	2	2	2	3	3	2	1	2	2	2	2	3	2	2	2	2	2	2	2	3	1	3	3	3	2	2	2	2	1	2	2	1	1
023FD	2	2	1	1	2	2	2	1	2	2	1	3	2	3	2	2	1	1	2	2	1	2	2	1	3	3	3	2	2	1	2	2	2	2	1	2	2	2	1	3	3	2	2	1	1	3	3	2	1	2	2
025FD	1	2	2	1	1	2	2	2	2	2	2	1	2	3	1	3	1	1	2	2	3	4	4	2	2	1	1	2	2	1	1	2	3	2	1	2	2	2	1	2	2	2	2	1	1	2	2	3	3	1	1
026FD	1	3	2	1	1	2	2	2	1	1	2	2	3	3	2	2	1	2	2	1	2	4	4	2	3	2	2	1	2	1	2	2	2	2	2	2	2	2	2	3	2	3	3	2	1	2	3	3	3	2	1
030FD	3	3	3	1	2	1	2	2	1	1	3	3	3	3	2	3	1	2	1	1	2	3	3	2	1	2	2	2	3	1	3	2	2	2	2	1	1	3	2	3	3	3	2	1	1	3	3	3	3	1	1
031FD	3	3	2	1	3	3	2	1	1	1	1	3	3	3	3	3	2	1	1	1	2	3	3	3	3	1	1	1	2	1	1	3	3	2	1	1	2	3	1	3	3	3	3	1	1	3	3	3	3	1	1
034FD	1	2	1	1	2	2	2	2	1	2	2	3	3	3	3	3	1	2	1	2	1	4	4	1	3	3	3	1	1	1	1	3	2	2	2	2	2	3	2	3	3	2	2	3	2	3	3	3	3	1	1
035FD	3	2	1	1	1	1	2	2	2	2	3	3	3	3	3	3	2	1	2	2	2	2	2	1	2	2	3	3	3	1	2	3	1	2	2	2	2	2	1	3	3	2	2	1	1	3	3	3	3	1	1
036FD	2	3	3	1	1	2	1	1	2	2	2	2	3	3	2	2	1	1	2	2	1	2	2	2	1	1	2	2	2	2	2	2	2	1	1	2	2	2	2	3	3	2	2	1	1	3	3	3	3	1	1
038FD	2	3	3	1	2	2	1	2	2	2	2	1	3	3	1	3	1	1	2	1	1	4	4	2	3	3	3	1	1	1	1	2	1	1	1	2	1	2	2	3	3	2	2	3	2	2	3	3	3	2	2
039FD	2	2	3	1	3	3	1	3	1	1	2	2	3	3	3	3	1	2	1	1	2	2	2	1	3	1	1	3	3	1	1	2	2	2	2	1	1	2	1	2	2	2	2	2	2	2	2	2	2	1	1
040FD	3	3	1	1	1	1	1	1	1	1	1	3	3	3	3	4	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	3	2	1	1	1	1	2	1	3	3	2	2	1	1	2	2	3	3	2	1

001MD	2	2	1	1	2	2	2	1	2	2	2	2	3	3	3	2	1	1	2	2	2	3	3	2	3	1	1	3	3	1	1	3	2	2	1	2	2	2	3	3	3	3	3	1	1	2	2	3	3	1	1
003MD	2	2	1	1	2	2	2	2	2	2	1	2	3	3	3	2	2	1	1	2	2	3	3	1	3	1	1	1	1	1	1	2	2	1	1	1	2	2	2	1	1	1	1	2	1	1	1	3	3	1	1
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010MD	3	1	1	1	2	2	2	2	2	2	1	2	3	3	3	3	2	1	2	2	3	4	4	2	2	1	1	1	1	2	2	2	2	2	2	1	1	1	1	2	2	3	2	3	2	2	2	3	3	1	1
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013MD	1	3	1	1	2	1	2	1	2	2	2	1	3	3	3	3	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	3	2	2	2	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1
014MD	3	3	1	1	2	1	2	2	2	2	1	1	2	3	2	3	2	1	2	2	3	4	4	3	2	1	1	1	1	1	1	2	3	2	2	2	2	1	1	3	3	2	2	2	2	1	1	2	2	1	1
015MD	2	3	1	1	2	1	2	1	2	2	1	2	3	3	3	3	2	2	2	2	2	4	4	1	2	3	3	3	3	1	1	3	1	2	2	2	2	1	1	1	2	2	2	1	1	1	1	2	3	1	1
016MD	2	1	2	1	2	2	1	1	1	1	2	1	3	3	3	3	1	1	1	1	2	4	4	2	1	1	1	3	1	1	1	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1
018MD	3	3	1	1	3	2	2	2	2	2	2	3	3	3	3	3	2	1	2	2	3	2	2	1	2	1	1	3	3	3	3	3	3	2	2	2	2	1	1	2	2	2	2	1	1	1	1	2	2	1	1
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024MD	2	2	3	1	3	2	2	1	1	2	2	1	3	3	3	3	1	2	1	2	3	4	4	2	2	3	3	2	1	1	1	3	2	2	2	2	2	1	1	3	2	2	2	1	2	1	1	1	2	1	1
027MD	1	2	3	1	2	2	2	1	1	1	1	1	3	3	3	3	2	1	2	1	2	3	3	1	2	1	1	2	1	1	1	3	3	2	1	1	1	1	1	2	3	2	2	2	2	2	2	1	2	2	1
028MD	2	1	3	1	1	2	2	1	1	2	1	1	3	3	3	2	1	1	1	2	3	2	2	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1	1	1	1
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037MD	1	2	2	1	3	3	2	1	2	2	2	1	1	3	3	3	2	1	2	1	1	2	2	2	3	1	1	1	1	2	2	3	3	2	1	2	2	1	1	2	2	1	1	1	1	1	1	2	2	1	1
041MD	3	2	2	2	2	2	2	2	1	2	2	2	2	3	2	2	2	1	1	2	2	3	3	1	3	2	2	2	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2	2	1	1	1	2	3	1	1
001CSF	3	3	2	3	4	4	2	1	1	1	1	1	1	1	4	4	2	1	1	1	3	3	3	3	2	3	3	2	2	1	1	2	3	2	1	1	1	3	1	3	3	2	2	1	2	3	2	2	2	1	1
002CSM	1	2	1	2	3	3	2	1	1	1	1	1	1	1	3	3	2	1	1	1	3	4	4	2	2	2	1	1	1	1	1	2	2	1	1	1	1	1	1	2	3	2	2	1	1	2	2	2	2	1	1
003CSM	2	1	1	1	4	3	2	1	1	1	2	1	1	1	3	4	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	3	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1
004CSM	3	3	3	3	2	2	2	2	1	1	2	1	1	1	4	4	2	2	1	1	1	2	2	1	3	2	1	3	3	3	3	3	3	2	2	1	1	1	1	2	2	2	2	1	2	2	2	2	2	2	2
005CSF	3	3	3	3	1	1	2	3	1	1	1	2	1	2	3	3	1	2	1	1	2	4	4	1	2	1	1	3	2	2	1	2	2	2	2	1	1	2	1	3	3	3	3	2	2	3	3	3	2	1	2
006CSM	1	1	1	1	1	2	2	2	1	1	3	1	3	1	2	3	2	1	1	1	2	2	2	2	3	2	2	3	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
007CSM	2	2	1	1	1	1	2	2	2	2	1	1	1	1	3	3	1	1	2	1	2	3	3	1	3	3	3	2	3	1	2	2	2	1	1	2	2	1	1	2	2	2	2	1	1	2	2	2	2	1	1
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009CSM	2	2	2	2	2	2	1	1	1	2	1	1	1	1	2	2	1	1	1	2	2	2	2	3	3	1	1	2	2	1	1	3	3	1	1	1	2	1	1	2	2	2	2	1	1	2	2	2	2	1	1
010CSM	2	2	2	2	3	2	1	2	1	1	1	1	1	1	3	3	1	2	1	1	1	3	3	2	1	2	2	3	2	2	2	4	4	1	2	1	1	1	1	3	3	2	2	2	2	3	3	2	2	2	2
11CSF	3	3	3	3	1	1	3	3	1	1	1	1	1	1	2	3	2	2	1	1	2	2	2	2	2	2	2	1	2	1	1	2	2	2	2	1	1	2	1	2	2	2	2	2	3	2	2	2	2	1	1
12CSM	2	1	2	1	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	2	2	2	2	2	1	1	1	1	1	1	3	3	2	1	1	1	1	1	2	2	2	2	1	1	2	2	2	2	1	3
13CSF	3	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	3	3	2	3	3	3	2	2	2	2	2	2	1	1	1	1	2	1	3	3	3	3	2	2	2	3	2	2	1	1
14CSM	3	1	3	1	1	1	2	2	1	1	1	1	1	1	3	3	2	1	1	1	3	2	2	2	2	1	1	1	1	1	1	3	4	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	2
15CSM	2	2	2	1	1	1	2	2	1	1	2	2	2	2	3	3	2	2	1	1	2	2	2	1	2	1	1	1	2	1	2	2	2	2	1	1	1	1	1	3	3	2	2	1	1	3	3	2	2	1	1
16CSF	3	2	1	1	2	1	2	1	1	1	2	3	2	3	2	3	1	1	1	1	2	4	4	1	3	3	3	3	3	1	2	4	3	2	1	1	1	2	1	3	3	3	3	2	2	3	3	2	2	2	2
17CSF	1	2	1	1	2	2	2	2	1	1	1	1	2	1	3	3	1	2	1	1	2	4	4	2	3	3	3	3	2	2	3	2	2	2	1	1	1	3	2	3	3	2	2	1	2	3	3	2	2	1	1
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19CSF	3	3	1	3	1	1	1	1	1	1	3	3	3	3	3	3	1	1	1	1	2	5	5	3	2	3	3	3	3	3	2	2	2	1	1	1	2	2	3	3	3	2	2	3	3	3	3	2	2	1	1
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21CSF	3	2	3	2	1	1	2	1	1	1	1	1	1	2	3	3	2	1	1	1	2	3	3	2	3	1	1	2	3	2	3	2	2	2	1	1	1	3	2	3	3	3	3	2	2	2	2	2	2	1	1
22CSF	2	3	2	2	1	1	1	2	1	1	1	1	1	1	3	2	1	1	1	1	2	4	4	2	3	3	3	3	3	1	3	1	1	1	1	1	1	2	2	3	3	3	2	2	3	2	2	2	2	2	2
23CSF	3	3	1	1	1	1	2	2	1	1	3	3	3	3	4	3	2	1	1	1	1	4	4	3	1	1	1	3	3	3	2	1	1	2	2	1	1	2	1	3	3	2	2	2	3	2	2	2	2	1	1
24CSM	1	1	1	1	1	1	2	2	1	1	2	2	3	3	4	4	1	1	1	1	2	4	4	2	3	1	1	2	1	2	1	2	2	2	1	1	1	1	1	2	2	2	2	1	1	2	1	2	2	1	1
25CSF	2	2	1	2	1	2	2	2	1	1	2	1	3	1	2	2	1	2	1	1	2	4	4	2	3	2	2	3	3	3	2	2	2	1	2	1	1	3	2	3	3	3	3	1	1	2	2	2	2	1	1
26CSF	1	1	1	1	2	1	2	2	2	2	1	1	1	1	3	3	1	1	2	2	2	4	4	2	3	2	2	1	2	1	1	3	2	1	1	2	2	3	2	3	3	2	2	1	1	1	1	1	1	1	1
27CSF	3	2	1	1	1	1	2	2	1	1	2	2	3	3	4	4	1	1	1	1	1	2	2	2	1	2	2	3	3	2	3	2	2	1	1	2	2	3	2	3	3	3	3	2	3	2	3	2	2	1	1
28CSM	2	3	2	3	2	2	1	1	1	1	2	2	3	2	3	3	1	1	1	1	2	2	2	2	3	3	2	1	1	1	1	2	2	1	1	2	2	1	1	3	3	3	3	1	1	3	3	2	2	1	1
29CSM	3	3	1	3	1	1	2	1	1	1	3	3	3	2	2	2	1	1	1	1	2	3	3	1	1	1	1	3	3	2	2	2	2	1	2	1	1	1	1	2	2	2	2	1	1	2	2	2	2	1	1
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150SF	1	3	1	2	2	2	2	2	1	1	2	3	3	3	3	3	1	1	1	1	2	4	4	2	1	3	3	2	2	2	2	2	2	1	1	1	1	3	3	3	3	2	2	1	1	3	3	1	1	1	1
151SF	2	3	1	1	1	1	1	2	1	1	2	3	2	3	3	3	1	2	1	1	2	4	4	2	3	3	3	1	2	1	1	2	2	1	2	1	1	3	3	3	3	2	2	1	1	3	3	2	2	1	1
152SF	3	3	1	3	2	2	2	2	1	1	3	3	3	3	3	3	2	2	1	1	2	4	4	2	3	3	3	3	3	3	3	2	2	1	2	1	1	2	1	3	3	2	2	2	2	3	3	2	2	1	3
153SF	2	2	1	1	2	1	2	2	1	1	3	3	3	3	3	3	1	1	1	1	3	4	4	2	2	3	3	3	3	1	1	2	2	2	1	1	1	3	3	3	3	3	3	1	2	3	3	3	3	1	1
154SM	3	2	2	2	2	2	2	1	1	1	1	1	2	3	2	3	2	1	1	1	2	2	2	2	3	3	2	2	1	2	1	2	2	2	1	1	1	1	1	2	3	3	3	1	1	3	2	3	2	1	1
155SM	1	1	1	1	2	2	2	2	1	1	2	2	3	2	2	2	1	1	1	1	3	2	2	2	1	1	1	2	2	2	2	2	2	1	1	1	1	1	2	2	2	3	3	1	1	1	1	1	1	1	1
156SF	3	3	1	1	2	3	2	2	1	1	2	2	2	2	3	3	1	1	1	1	2	4	4	1	1	3	3	3	3	1	2	3	3	2	2	1	1	3	3	3	3	3	3	1	1	3	3	2	2	1	1
157SM	2	1	1	1	3	2	1	2	1	1	2	2	2	3	2	2	1	1	1	1	3	2	2	1	1	1	1	2	2	1	2	2	2	1	1	1	1	1	2	3	2	3	2	1	1	2	1	2	1	1	1
159SF	3	3	2	2	2	3	1	2	1	1	3	3	3	3	2	2	1	1	1	2	2	2	2	2	2	3	3	2	3	2	1	2	3	1	2	1	1	3	3	3	3	3	3	1	3	3	3	2	2	2	1

160SM	2	3	2	3	2	2	2	2	1	1	3	3	2	2	3	3	1	2	1	1	3	4	4	1	2	3	3	3	3	2	2	2	2	1	2	1	1	1	2	3	3	2	3	1	2	3	3	2	2	1	2
161SM	2	3	1	3	3	3	1	2	1	1	1	1	1	1	3	2	1	1	1	1	3	2	2	3	3	2	2	1	1	1	1	2	3	1	2	1	1	1	2	2	2	2	2	1	2	1	2	2	2	1	2
162SM	2	3	2	2	1	1	1	2	1	1	1	1	1	1	3	4	1	2	1	1	2	1	1	1	1	2	3	2	1	1	1	2	3	1	2	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1
163SM	3	2	2	2	3	3	2	1	1	1	1	2	1	2	4	4	1	1	1	1	3	2	2	1	3	3	3	2	2	1	2	3	3	2	1	1	1	1	2	2	2	3	3	1	1	1	1	2	2	1	1
164SM	3	2	1	1	2	1	2	1	1	1	3	2	3	2	3	2	1	1	1	1	2	2	2	1	3	1	1	2	3	2	3	2	2	1	1	1	2	1	2	2	2	3	3	1	2	2	2	2	2	1	1
165SM	3	3	3	3	1	1	2	2	1	1	2	1	1	1	2	3	2	2	1	1	3	2	2	2	3	1	1	2	3	2	2	2	2	2	2	1	1	1	2	2	3	3	3	1	1	2	1	3	2	1	1
166SF	3	3	1	1	3	2	1	1	1	1	3	3	1	3	3	3	1	1	1	1	2	4	4	3	2	1	1	3	3	1	2	3	2	1	1	1	1	3	3	3	3	3	3	1	2	2	3	2	2	1	1
167SM	1	2	1	2	2	2	2	1	1	1	1	1	1	1	3	3	1	1	1	1	2	2	2	3	1	3	3	1	1	1	1	2	2	2	1	1	1	1	2	3	2	3	3	1	1	2	2	3	2	1	1
168SM	3	3	1	2	2	2	2	1	1	1	3	3	2	1	2	2	2	1	1	1	2	3	3	1	1	2	2	3	3	3	3	2	2	1	1	1	1	1	2	3	2	3	3	1	1	2	2	2	2	1	1
169SM	2	2	2	1	2	2	2	2	1	1	2	2	2	2	2	3	1	1	1	1	3	2	2	1	1	1	1	3	3	2	2	2	2	1	2	1	1	1	2	3	2	3	3	1	1	1	2	2	2	1	1
170SF	3	3	1	3	1	1	2	2	1	1	1	1	1	1	3	3	2	1	1	1	2	4	4	3	2	3	3	3	3	1	2	2	2	2	2	1	1	2	1	3	3	3	3	1	2	2	2	2	2	1	1
171SF	3	3	1	1	1	2	2	2	1	1	3	3	3	3	3	3	1	1	1	1	2	4	4	2	1	3	3	3	3	3	2	2	3	1	1	1	1	3	3	3	3	3	3	1	2	3	3	2	2	1	2
172SF	2	2	1	2	2	2	1	2	1	1	1	2	1	2	3	3	1	2	1	1	2	4	4	3	2	3	3	1	2	1	2	2	2	1	2	1	1	3	2	3	3	2	2	2	2	3	3	2	2	1	1
173SF	1	1	1	1	1	1	1	2	1	1	1	1	3	1	2	3	1	2	1	1	2	4	4	3	2	1	1	1	1	1	1	2	2	1	2	1	1	3	2	3	3	3	3	1	1	3	3	2	3	1	1
174SM	2	1	2	1	2	2	2	1	1	1	1	2	1	3	4	4	2	2	1	1	3	2	2	1	3	3	2	1	2	1	2	2	2	2	1	1	1	1	2	2	2	2	3	3	3	1	1	1	1	3	2
175SM	3	3	1	2	2	2	2	1	1	1	3	3	2	2	3	3	1	1	1	1	3	3	3	2	2	1	1	3	3	2	2	3	2	1	1	1	1	2	2	3	3	3	3	1	1	2	2	2	2	2	2
176SF	3	3	2	1	2	3	2	2	1	1	2	2	1	1	2	2	2	2	1	1	2	3	3	1	1	2	2	3	3	1	1	2	2	2	2	1	1	3	3	3	3	3	3	1	1	2	3	2	1	1	1
177SM	2	2	2	1	3	3	2	2	1	1	1	1	1	1	3	4	1	2	1	1	3	2	2	3	3	1	1	2	2	1	1	3	3	2	1	1	1	1	3	2	2	3	3	1	2	2	2	2	2	1	1
178SM	3	3	3	1	1	1	2	2	1	1	1	2	1	2	4	4	2	1	1	1	2	2	2	2	2	3	3	3	1	1	1	2	2	2	2	1	1	1	1	3	3	3	3	1	2	3	3	2	2	1	1
179SF	3	3	1	1	1	1	2	2	1	1	2	2	2	2	3	3	2	2	1	1	1	4	4	2	1	2	2	3	2	2	2	2	2	2	2	1	1	2	1	3	3	3	3	2	2	2	3	2	2	1	1
180SF	2	2	1	1	1	1	2	2	1	1	1	2	1	2	3	3	2	2	1	1	2	4	4	1	3	2	2	1	2	1	1	2	2	2	2	1	1	3	3	3	3	3	3	2	2	3	3	2	2	1	1
181SM	1	3	1	2	2	1	2	2	1	1	1	1	1	1	2	3	2	2	1	1	3	2	2	1	1	2	2	1	2	1	2	2	2	2	2	1	1	1	2	2	2	2	2	1	2	1	1	1	1	1	3
182SM	2	3	1	2	2	2	2	2	1	1	1	1	2	1	4	4	2	2	1	1	3	2	2	3	2	3	3	1	1	1	1	2	2	1	1	1	1	1	1	3	2	3	2	1	1	2	2	2	2	1	1
183SF	2	3	1	3	1	1	2	2	1	1	2	1	2	1	3	3	1	1	1	1	1	4	4	2	3	3	3	3	3	3	2	2	2	2	2	1	1	3	3	3	3	2	3	1	1	3	2	2	2	2	1
184SM	1	2	1	2	2	2	1	1	1	1	1	1	1	1	3	3	1	1	1	1	2	4	4	3	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	3	3	3	3	2	2	3	3	2	2	1	2
185SF	2	2	1	1	1	1	2	2	1	1	3	2	3	2	3	3	1	2	1	1	2	4	4	1	2	3	3	3	3	2	1	2	2	2	2	1	1	3	2	3	3	3	3	2	2	3	3	2	2	1	2
186SF	3	1	1	1	2	2	1	2	1	1	2	3	1	2	2	2	1	1	1	1	3	3	3	2	2	3	3	3	3	2	1	2	2	1	1	1	1	3	3	3	3	3	3	3	2	3	3	3	2	1	2
187SM	2	1	2	1	2	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	3	3	3	2	2	2	2	1	1	1	1	2	2	2	2	1	1	1	3	3	3	3	3	1	1	3	2	2	2	1	1
188SF	3	3	1	1	1	1	2	2	1	2	2	2	1	1	3	2	2	2	1	2	2	2	2	1	2	3	3	1	1	1	1	2	2	2	2	1	1	3	2	3	3	2	2	1	2	3	3	2	2	2	1
189SF	3	3	1	1	2	1	2	2	1	1	2	3	1	2	3	3	2	2	1	1	1	2	2	2	1	1	1	3	3	1	2	2	2	2	2	1	1	2	2	3	3	2	3	1	1	2	3	2	2	1	1

190SM	1	1	1	1	2	2	2	2	1	1	1	2	1	1	3	3	2	1	1	1	2	2	2	2	1	2	2	2	2	1	1	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
191SF	3	1	2	1	1	1	2	2	1	1	1	2	1	1	2	2	2	1	1	1	2	3	3	1	2	3	3	2	3	1	2	2	2	2	2	1	1	2	1	3	3	3	3	1	1	2	2	2	2	1	1
192SF	2	3	2	1	2	2	2	2	1	2	1	3	1	3	2	2	2	2	1	2	3	3	3	2	2	1	1	2	3	2	2	2	2	2	2	1	2	2	2	3	3	3	3	1	1	3	3	2	2	1	1
193SM	3	3	1	2	2	2	2	2	1	1	1	1	1	1	2	2	1	1	1	1	3	2	2	1	1	2	3	3	3	1	3	2	2	2	2	1	1	1	2	3	3	3	3	1	1	2	2	2	2	1	1
194SF	3	3	1	1	1	1	2	2	1	1	3	3	3	1	2	2	1	2	1	1	2	5	5	2	1	3	3	3	3	1	1	2	2	2	2	1	1	3	3	3	3	2	2	1	1	3	3	2	2	1	1
195SF	3	3	3	3	1	1	1	1	1	1	1	2	1	2	2	2	2	1	2	2	2	2	2	2	1	1	1	1	2	1	2	2	2	2	1	2	2	2	2	3	3	3	3	1	2	2	3	2	3	1	1
196SM	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	3	1	1	1	1	3	2	2	1	3	1	1	1	1	1	1	2	2	1	1	1	1	1	2	3	3	2	2	2	1	3	3	2	2	1	1
197SM	1	3	1	1	1	1	2	2	1	1	1	2	1	1	2	3	2	2	1	1	3	4	4	1	3	3	3	1	3	1	1	2	2	2	2	1	1	1	2	3	3	2	2	1	2	3	3	2	2	1	1
198SF	1	2	1	1	2	1	2	2	1	1	2	2	3	2	3	3	2	2	1	1	2	4	4	3	2	1	1	2	3	2	2	2	2	2	2	1	1	2	1	3	3	3	3	1	2	3	3	1	2	1	1

C.2 Column Orientated

Table 9. Stance Anthropometry (Column)

Sex	Ancestry	Age	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
Female	Cauc	1	2.96	3.11	2.32	2.25	1.68	1.59	3.75	2.32	5.26	3.89	2.33	2.33	0.87	0.89	7.84	7.99	15.67
Female	Cauc	1	3.06	3.07	2.17	2.19	1.48	1.48	3.76	2.3	5.02	3.53	2.35	2.32	0.77	0.78	7.26	7.26	16.36
Female	Cauc	1	3.06	3.14	2.41	2.33	1.36	1.31	3.53	2.36	4.96	3.88	2.48	2.38	0.86	0.84	7.81	7.81	16.93
Female	Cauc	1	2.94	2.86	2.12	2.01	1.31	1.23	4.19	2.23	5.58	3.68	2.4	2.36	0.79	0.81	7.54	7.55	16.87
Female	Asian	1	2.64	2.8	1.81	1.75	1.43	1.49	4.13	2.02	4.34	3.19	2	2.11	0.7	0.65	6.75	6.71	14.31
Female	Cauc	2	2.91	2.87	2.02	1.95	1.68	1.76	3.7	1.97	3.93	3.07	2.18	2.17	0.88	0.9	7.22	7.25	14.95
Female	Cauc	1	2.52	2.52	1.89	1.91	1.28	1.3	3.32	1.8	4.16	3	1.98	1.96	0.64	0.64	6.72	6.67	14.06
Female	Cauc	3	2.95	2.95	2.06	1.98	1.84	1.9	4.37	2.11	4.65	3.21	2.27	2.32	0.81	0.86	7.55	7.56	15.9
Female	Cauc	1	2.81	2.88	2.07	1.98	1.65	1.65	3.86	2.01	4.5	3.51	2.36	2.35	0.85	0.81	7.75	7.74	15.85
Female	Cauc	1	3.26	3.33	2.35	2.32	1.62	1.54	3.63	2.25	4.47	3.27	2.61	2.6	0.79	0.73	7.87	7.83	17.24
Female	Cauc	1	3.23	3.22	2.17	2.12	1.55	1.6	3.85	2.17	4.64	3.29	2.27	2.26	0.8	0.77	7.61	7.56	16.53
Female	Cauc	1	3.12	3.14	2.16	2.14	1.53	1.55	3.63	2.23	4.75	3.62	2.34	2.35	0.75	0.74	7.69	7.65	16.61
Female	Cauc	1	2.98	3.1	2.02	2.05	1.6	1.44	3.83	2.17	4.54	3.43	2.28	2.29	0.85	0.84	7.48	7.46	16.19
Female	Cauc	3	3.14	3.13	2.09	2.17	1.49	1.43	3.3	2.02	4.63	3.17	2.14	2.1	0.74	0.71	7.56	7.55	15.89
Female	Asian	1	2.88	2.9	2.15	2.11	1.64	1.64	3.87	2.11	4.73	3.45	2.45	2.43	0.85	0.85	6.86	6.87	15.97
Female	Asian	3	2.86	2.72	2.02	1.96	1.43	1.61	3.84	2.06	4.07	3.68	2.18	2.27	0.77	0.82	6.74	6.83	15.14
Female	Cauc	3	2.9	2.9	1.87	1.88	1.74	1.71	3.82	2.15	4.21	3.49	2.25	2.27	0.88	0.81	7.43	7.43	15.66

Female	Asian	3	3.2	3.17	2.38	2.37	1.6	1.73	3.89	2.15	5.13	3.83	2.34	2.34	0.78	0.75	8.37	8.37	17.39
Female	Cauc	1	3.16	3.21	2.29	2.21	1.78	1.62	4.15	2.33	5.09	3.78	2.57	2.53	0.78	0.81	8.21	8.16	17.33
Female	Cauc	2	3.01	3.09	1.95	2.06	1.73	1.67	5.16	2.15	4.79	3.84	2.55	2.59	0.94	1	7.46	7.45	16.83
Female	Cauc	1	2.91	2.94	2.16	2.07	1.41	1.58	3.88	2.15	4.76	3.64	2.38	2.44	0.74	0.74	7.66	7.64	16.35
Female	Cauc	1	3.11	3.07	1.89	1.91	1.74	1.77	3.85	2.13	4.94	3.5	2.47	2.47	0.93	0.88	7.59	7.57	16.29
Female	Cauc	1	3.07	3.12	2.08	2.22	1.9	1.78	3.59	2.27	5.3	3.6	2.55	2.53	0.88	0.87	8.02	8.05	17.17
Female	Cauc	3	2.93	2.96	2.09	2.08	1.82	1.85	4.18	2.3	5.06	3.89	2.5	2.46	0.91	0.88	7.76	7.7	16.95
Female	Cauc	3	3.07	2.97	1.93	1.94	1.63	1.62	4.95	2.16	5.28	3.55	2.4	2.4	0.9	0.89	7.32	7.27	16.07
Female	Oth	1	3.21	3.21	2.31	2.26	1.69	1.75	3.81	2.33	5.15	3.44	2.52	2.5	0.9	0.88	7.84	7.81	16.92
Female	Asian	1	3.02	3.01	2.21	2.27	1.59	1.4	3.57	2.05	4.7	3.41	2.54	2.51	0.91	0.86	7.81	7.75	16.47
Female	Asian	1	2.99	2.91	2.13	2.2	1.79	1.64	3.44	2.16	5.01	3.47	2.44	2.48	0.82	0.75	7.52	7.5	16.31
Female	Cauc	1	3.03	3.07	2.09	2.01	1.45	1.66	3.66	2.09	4.88	3.84	2.62	2.64	0.94	0.93	8.24	8.25	17.04
Female	Cauc	1	2.88	3.02	2.4	2.38	1.77	1.69	3.68	2.39	5.22	3.77	2.8	2.8	0.95	0.98	8.31	8.25	17.33
Female	Cauc	1	3.07	3.06	2.15	2.18	1.69	1.69	3.71	2.27	5.02	3.75	2.7	2.71	0.95	0.97	7.9	7.98	17.12
Female	Asian	1	3.14	3.09	2.35	2.44	1.64	1.74	3.54	2.35	4.94	3.84	2.66	2.69	0.94	0.97	8.38	8.44	17.03
Female	Cauc	1	3.11	2.99	2.16	2.06	1.74	1.73	3.78	2.39	4.74	3.72	2.72	2.73	0.91	0.89	7.71	7.7	17.03
Female	Cauc	1	2.99	3.11	2.13	2.19	1.41	1.38	3.46	2.02	4.47	3.61	2.56	2.58	0.81	0.9	8.41	8.44	17.26
Female	Cauc	1	2.93	3.01	2.05	2.05	1.83	1.71	3.8	2.24	4.77	3.85	2.67	2.69	0.92	0.96	8	7.99	17.23
Female	Cauc	1	3.3	3.24	2.36	2.33	1.5	1.47	3.74	2.24	4.34	3.62	2.61	2.59	0.91	0.91	8.67	8.66	17.07
Female	Cauc	1	3.12	3.11	2.23	2.19	1.59	1.58	3.72	2.34	4.52	3.7	2.74	2.71	0.98	0.97	8.25	8.19	17.42
Female	Cauc	1	3.1	3.18	2.27	2.35	1.89	1.66	3.77	2.47	4.23	3.72	2.86	2.87	0.98	1.02	8.29	8.33	17.26
Female	Oth	2	3.1	3.11	2.25	2.16	1.51	1.59	4.06	2.44	5.04	3.98	2.58	2.61	0.93	0.95	7.36	7.38	17.23
Female	Cauc	1	2.95	2.89	2.2	2.26	1.4	1.35	3.84	2.22	5.1	3.81	2.6	2.63	0.89	0.89	7.46	7.52	17.17
Female	Cauc	1	3.06	3.14	2.21	2.16	1.44	1.48	4.43	2.33	4.98	4.01	2.77	2.78	0.99	0.98	7.82	7.81	17.44
Female	Cauc	1	3.06	3.07	2.32	2.31	1.51	1.45	3.75	2.22	4.82	3.92	2.61	2.67	0.94	0.92	8.27	8.37	17.11
Female	Cauc	1	2.91	2.92	2.14	2.16	1.39	1.36	4.2	2.42	4.73	3.99	2.68	2.71	0.93	0.97	7.3	7.37	17.21
Female	Cauc	1	3.05	3.02	2.28	2.2	1.56	1.69	3.82	2.5	5.26	3.94	2.6	2.68	0.92	0.94	7.95	7.98	16.89
Female	Cauc	1	2.98	3.01	2.24	2.22	1.45	1.44	4.01	2.45	5.11	3.88	2.64	2.67	0.94	0.94	8.15	8.13	17.24
Female	Cauc	1	3.07	3.23	2.26	2.03	1.67	1.7	3.95	2.45	4.8	3.9	2.73	2.74	0.95	1	8.06	8.04	17.33
Female	Cauc	1	3.07	3.01	2.02	1.95	1.3	1.32	3.7	2.4	4.74	4.04	2.68	2.67	0.94	0.94	8.1	8.11	17.34

Female	Cauc	1	3.01	3.2	2.14	1.97	1.64	1.53	3.93	1.99	4.98	3.76	2.57	2.61	0.89	0.91	8	8.03	17.14
Male	Cauc	2	2.82	2.95	2.18	2.19	1.88	1.87	3.64	2.53	4.77	3.75	2.79	2.64	0.83	0.88	7.43	7.47	17.25
Male	Cauc	1	3.08	3.15	2.41	2.36	1.63	1.46	3.7	2.2	4.85	3.88	2.55	2.64	0.74	0.85	7.57	7.62	16.96
Male	Asian	1	2.94	2.99	2.1	2.1	1.5	1.43	3.48	2.3	5.04	3.53	2.51	2.5	0.82	0.78	6.6	6.58	16.31
Male	Cauc	1	3.25	3.27	2.03	2.04	1.65	1.72	4.37	2.07	5.25	4.48	2.68	2.66	1.02	1.03	6.7	6.68	16.9
Male	Cauc	1	2.95	2.93	2.32	2.29	1.37	1.36	3.17	2.29	4.6	3.49	2.33	2.37	0.8	0.74	7.02	6.99	16.41
Male	Cauc	1	2.74	2.73	2.054	2.03	1.57	1.64	3.47	2.3	4.98	3.88	2.39	2.42	0.73	0.66	6.67	6.69	16.5
Male	Oth	1	2.94	2.92	1.99	2.06	1.75	1.68	3.62	2.33	4.98	3.71	2.44	2.41	0.92	0.88	7.1	7.09	16.85
Male	Cauc	2	3.28	3.26	2.39	2.37	1.52	1.57	3.68	2.54	5.03	3.87	2.66	2.65	0.95	0.95	7.25	7.21	17.36
Male	Cauc	1	2.87	2.93	2.1	2.08	1.61	1.66	3.48	2.15	4.12	3.94	2.36	2.35	0.79	0.78	6.82	6.79	16.26
Male	Cauc	1	3.17	3.21	2.43	2.29	1.57	1.61	3.47	2.26	4.98	3.95	2.49	2.48	0.89	0.88	7.78	7.74	16.9
Male	Cauc	1	3.1	3.04	2.29	2.31	1.59	1.76	3.48	2.29	4.49	3.82	2.49	2.48	0.85	0.86	7.4	7.33	16.55
Male	Cauc	1	3.23	3.15	2.28	2.22	1.67	1.64	3.82	2.29	4.48	3.57	2.76	2.79	0.78	0.78	7.22	7.26	16.89
Male	Cauc	1	2.93	2.93	2.21	2.24	1.72	1.59	3.46	1.91	4.4	3.65	2.45	2.55	0.85	0.89	6.84	6.84	16.14
Male	Cauc	2	3.11	3.01	2.52	2.37	1.77	1.88	3.39	2.54	4.53	4.09	2.48	2.49	0.87	0.87	7.05	7.09	16.64
Male	Cauc	1	2.94	2.94	2.15	2.22	1.78	1.78	3.49	2.27	4.41	4.04	2.53	2.54	0.82	0.79	7.02	6.94	17.12
Male	Asian	1	2.92	2.89	2.22	2.23	1.71	1.76	3.63	2.38	4.88	4.03	2.48	2.48	0.73	0.82	7.33	7.27	16.75
Male	Cauc	1	3.07	3.04	2.36	2.36	1.76	1.83	3.73	2.27	5.31	4.22	2.69	2.71	1.06	1.01	7.29	7.31	16.98
Male	Cauc	3	2.83	2.92	2.1	1.97	1.65	1.65	3.31	2.04	3.88	3.37	2.31	2.35	0.66	0.66	6.92	6.89	15.19
Male	Oth	3	3.09	3.01	2.39	2.23	1.66	1.74	3.57	2.16	5.36	3.9	2.67	2.71	0.86	0.79	7.4	7.4	17.45
Male	Asian	2	2.89	3.02	2.16	2.17	1.87	1.87	3.91	2.21	4.87	4.09	2.5	2.55	0.86	0.89	6.33	6.33	16.81
Male	Asian	2	3.09	3.16	2.38	2.44	1.43	1.48	3.69	2.28	4.97	3.92	2.69	2.65	0.74	0.81	7.88	7.9	17.37
Male	Oth	3	3.22	3.24	2.52	2.53	1.57	1.86	3.8	2.3	4.69	4.06	2.76	2.77	0.96	0.99	7.82	7.83	17.67
Male	Oth	1	2.86	2.96	2.32	2.29	1.68	1.51	3.39	2.08	5.16	3.68	2.72	2.73	0.96	0.93	7.18	7.18	17.24
Male	Cauc	3	3.05	3.07	2.01	2.08	1.93	1.9	3.76	2.11	4.86	4.03	2.74	2.68	0.81	0.92	7.5	7.53	17.01
Male	Cauc	2	3.03	3.22	2.39	2.24	1.7	1.51	3.7	2.02	5.08	3.78	2.47	2.49	0.86	0.85	7.64	7.65	17.26
Male	Cauc	3	3.22	3.23	2.16	2.25	1.42	1.41	3.74	2.53	5.34	3.81	2.26	2.33	0.87	0.92	7.04	7.03	16.49
Male	Cauc	1	2.77	2.87	2.26	2.22	1.69	1.86	4.02	2.25	4.67	3.63	2.5	2.51	0.78	0.8	7.15	7.11	16.75
Male	Oth	2	3.02	3.11	2.19	2.17	1.9	1.82	3.83	2.28	4.68	3.81	2.62	2.63	0.92	0.82	7.16	7.15	17.15
Male	Cauc	3	2.95	3.22	1.9	1.63	1.93	1.83	3.91	2.34	4.94	3.75	2.46	2.5	0.86	0.9	6.71	6.71	16.22

Male	Cauc	1	3.2	3.25	2.36	2.26	1.72	1.77	4.15	2.19	4.94	3.88	2.5	2.64	0.77	0.77	7.59	7.57	16.99
Male	Cauc	1	2.98	3	2.21	2.16	1.59	1.63	3.86	2.28	4.69	3.81	2.52	2.52	0.76	0.87	7.28	7.29	17.45
Male	Cauc	1	3.21	3.22	2.33	2.32	1.81	1.78	3.83	2.29	4.88	4.21	2.75	2.75	0.78	0.72	7.45	7.52	17.29
Male	Cauc	1	3.16	3.127	2.37	2.41	1.44	1.48	3.42	2.08	5.04	3.58	2.57	2.59	0.82	0.77	7.2	7.2	17
Male	Cauc	1	3.24	3.27	2.21	2.18	1.62	1.43	3.98	2.21	4.93	4.2	2.63	2.62	0.88	0.87	7.1	7.15	17.08
Male	Cauc	1	3.15	3.18	2.55	2.5	1.87	1.82	3.72	2.27	5.6	4.32	2.81	2.77	0.79	0.85	7.49	7.55	17.64
Male	Cauc	3	3.42	3.58	1.89	1.83	1.47	1.36	4.14	2.32	5.56	3.53	2.74	2.89	0.94	0.96	7.1	7.11	17.14
Male	Cauc	3	2.72	2.72	2.3	2.21	1.59	1.58	3.85	2.37	4.67	4.51	2.93	2.9	0.98	0.91	7.7	7.73	17.45
Male	Oth	1	3.08	3.04	2.34	2.25	1.89	1.95	4.1	2.1	5.18	4.12	2.99	3.07	1.01	1.03	7.86	7.84	17.26
Male	Cauc	1	3.28	3.2	2.32	2.41	1.43	1.53	3.82	2.24	4.95	3.84	2.71	2.73	0.97	0.92	7.87	7.96	17.17
Male	Asian	2	3.04	2.97	2.34	2.19	1.42	1.42	3.65	2.37	4.88	3.98	2.73	2.71	0.91	0.86	7.53	7.53	17.49
Male	Cauc	1	3.07	3.04	2.21	2.23	1.6	1.61	3.92	2.37	5.28	3.84	2.77	2.8	0.94	0.96	7.04	7.08	17.52
Male	Cauc	1	3	2.98	2.22	2.24	1.36	1.42	3.57	2.16	4.4	3.67	2.73	2.74	0.83	0.88	7.8	7.81	17.3
Male	Cauc	1	3.03	2.89	2.14	2.16	1.92	1.7	3.75	2.37	5.43	3.83	2.86	2.88	0.98	0.98	6.97	7.03	17.06
Male	Cauc	1	3.05	3.04	2.34	2.3	1.73	1.7	3.47	2.44	4.54	3.92	2.88	2.87	0.97	0.95	7.47	7.45	17.18
Male	Cauc	1	3.01	2.97	2.29	2.21	1.78	1.47	3.47	2.44	5.01	4.07	2.72	2.81	0.87	0.95	7.93	7.97	17.28
Male	Cauc	1	2.96	2.92	2.25	2.22	1.44	1.46	3.67	2.38	5.52	3.83	2.84	2.83	1	1	6.97	6.97	17.35
Male	Cauc	1	2.9	2.97	2.35	2.36	1.83	1.65	3.9	2.47	5.29	4.1	2.24	2.43	0.79	0.81	6.87	6.82	17.18
Male	Cauc	3	3.2	3.39	2.19	1.99	1.64	1.66	3.93	2.21	5.22	3.66	2.72	2.73	0.91	0.94	7.69	7.73	17.2
Male	Asian	1	3.02	3.05	2.45	2.41	1.26	1.7	3.7	2.44	5.03	4.24	2.93	2.93	1	1.03	7.55	7.52	17.13
Male	Cauc	1	3.06	3	2.16	2.12	1.9	1.92	3.97	2.39	4.64	3.67	2.85	2.83	0.96	0.97	7.57	7.58	17.38
Male	Oth	1	2.99	2.92	2.29	2.23	1.51	1.58	3.41	2.27	4.36	3.98	2.84	2.88	0.95	0.98	8.15	8.14	17.42
Male	Cauc	1	3	3.11	2.03	2.01	1.68	1.63	3.69	2.67	4.89	4.26	2.72	2.78	0.87	0.95	7.33	7.37	17.27
Male	Cauc	1	2.79	2.86	2.23	2.16	1.26	1.45	3.81	2.17	4.94	4.31	2.66	2.69	0.93	0.93	7.29	7.32	17.23
Male	Cauc	1	3	3.05	2.16	2.18	1.41	1.36	4.06	2.32	4.81	3.94	2.87	2.89	1.01	0.96	7.55	7.57	17.46
Male	Asian	1	3.09	3.09	2.24	2.22	1.61	1.53	3.75	2.33	5.21	4.29	2.64	2.58	0.75	0.79	7.17	7.12	17.01
Male	Cauc	1	2.92	3.06	2.21	2.01	1.46	1.48	4.35	2.89	5.18	4.49	2.95	2.99	1	1.02	6.75	6.77	17.34
Male	Asian	1	3.15	3.18	2.44	2.3	1.87	1.92	3.4	2.56	4.66	3.89	2.73	2.82	1	0.95	7.17	7.17	17.12
Female	Asian	1	3.2	3.21	2.35	2.26	1.54	1.71	3.82	2.3	4.98	3.94	2.61	2.64	0.95	0.97	8.04	8.02	17.39
Female	Asian	1	3.21	3.28	2.32	2.04	1.68	1.75	4.2	2.81	5.51	4.28	2.92	2.91	1.04	1.12	7.71	7.69	17.49

Male	Asian	1	3.11	3.06	2.16	2.2	1.54	1.5	3.38	2.34	5.03	4	2.52	2.64	0.84	0.9	7.26	7.25	17.41
Female	Asian	2	2.95	3.02	2.32	2.27	1.44	1.46	3.92	2.41	4.97	4	2.72	2.68	1.04	0.98	8.23	8.23	17.01
Female	Asian	1	3.26	3.21	2.36	2.23	1.74	1.78	3.8	2.35	5.57	3.83	2.86	2.77	1.03	0.99	8.01	8.01	17.8
Female	Asian	1	3.33	3.32	2.18	2.25	1.59	1.55	3.74	2.46	4.13	5.37	2.69	2.78	0.92	0.79	7.98	7.99	17.79
Female	Asian	1	3.31	3.42	2.28	2.19	1.4	1.47	4.02	2.35	4.96	3.97	2.7	2.67	0.98	1.02	8.24	8.25	17.61
Female	Asian	1	2.93	2.9	2.26	2.27	1.78	1.83	3.93	2.44	5.2	3.68	2.74	2.7	0.99	0.98	7.64	7.64	17.65
Male	Asian	1	3.16	3.2	2.37	2.32	1.67	1.53	3.52	2.17	5.3	3.82	2.66	2.77	0.92	0.97	7.53	7.54	17.54
Female	Asian	1	3.04	3.06	1.96	2.02	1.63	1.66	4.45	2.43	4.88	3.62	2.73	2.81	1.02	1.02	7.73	7.72	17.63
Female	Asian	1	2.98	3.14	2.22	2.2	1.63	1.65	3.46	2.57	5.18	3.89	2.66	2.64	0.86	0.94	7.94	7.94	17.55
Female	Asian	1	3.24	3.38	2.23	2.14	1.86	1.72	3.52	2.28	5.29	3.93	2.54	2.69	0.93	0.94	8.07	8.06	17.51
Female	Asian	1	3.42	3.38	2.27	2.27	1.87	1.77	3.98	2.4	5.32	3.92	2.76	2.75	0.97	1.01	8.13	8.13	17.26
Male	Asian	1	3.06	3.18	2.11	2.08	1.32	1.38	4.04	2.52	5.03	4.09	2.7	2.86	0.98	0.95	7.16	7.09	16.92
Female	Asian	1	3.01	2.98	2.41	2.27	1.7	1.67	4.04	2.55	5.63	4.1	2.73	2.76	1.02	1.01	7.89	7.89	17.39
Female	Asian	1	3.12	3.15	2.32	2.26	1.71	1.61	3.94	2.38	5.19	3.78	2.64	2.76	0.94	0.98	7.85	7.87	17.3
Female	Asian	1	3.01	2.96	2.11	2.29	1.88	1.78	3.68	2.37	5.15	3.87	2.73	2.7	0.92	0.93	8.19	8.19	17.66
Female	Asian	1	3.29	3.23	2.17	2.22	1.51	1.69	3.9	2.48	5.01	3.94	2.7	2.71	0.97	0.98	8	7.98	17.3
Female	Asian	1	2.97	3.04	2.26	2.19	1.46	1.54	3.66	2.21	4.78	3.68	2.74	2.75	1.01	1	7.71	7.7	17.4
Female	Asian	1	3.02	3.06	2.25	2.33	1.67	1.63	3.81	2.13	5.44	3.7	2.76	2.8	0.98	1	7.53	7.54	17.25
Male	Cauc	3	3.08	3.03	2.22	2.15	1.66	1.54	3.8	2.55	4.92	3.76	2.69	2.9	1.08	1.04	7.3	7.24	17.31
Male	Cauc	3	3.39	3.2	2.13	2.15	1.36	1.35	3.86	2.09	5.55	4.02	2.67	2.62	0.98	0.94	7.4	7.41	17.34
Male	Cauc	3	3.28	3.28	2.14	2.16	1.39	1.37	4.13	2.63	5.07	3.83	2.98	3.04	1.07	1.04	6.95	6.94	17.34
Male	Cauc	3	3.06	2.96	2.19	2.11	1.53	1.68	3.99	2.52	4.78	4.26	2.8	2.8	0.97	1.02	7.21	7.19	17.24
Male	Cauc	3	3.15	3.08	2.17	2.14	1.91	1.9	4	2.24	5.58	4.17	2.72	2.64	1.04	0.97	7.17	7.12	17.18
Male	Cauc	3	3.16	3.24	2.14	2.02	1.63	1.64	3.95	2.29	5.45	4.01	3.03	2.87	1.03	0.9	7.39	7.39	17.67
Male	Cauc	3	3.06	3.14	2.19	2.03	1.55	1.76	3.98	2.22	5.06	4.15	2.9	2.85	1.07	1.06	7.16	7.11	17.28
Male	Cauc	3	3.42	3.28	2.03	2.01	1.96	2	3.98	2.37	5.7	4	2.91	2.98	1.1	1.04	7.2	7.16	17.14
Male	Cauc	3	3.12	3.11	2.34	2.32	1.73	1.77	3.77	2.35	5.12	3.94	2.75	2.79	1.16	1.03	7.49	7.46	17.38
Male	Cauc	3	2.99	2.98	2.03	1.99	1.73	1.87	3.62	2.33	4.75	3.84	2.86	2.51	1.05	1.06	7.53	7.54	17.64
Male	Cauc	3	3.05	3.17	2.43	2.19	1.76	1.74	3.96	2.22	5.33	3.78	2.94	2.95	1.01	1.05	7.32	7.29	17.01
Male	Cauc	3	3.52	3.46	2.07	1.99	1.99	2.06	4.02	2.36	5.06	4.06	3.04	3.11	1.09	1.09	7.41	7.38	17.08

Male	Cauc	3	3.25	3.09	2.33	2.34	1.75	1.79	3.83	2.25	4.88	3.95	2.63	2.67	0.9	0.92	7.3	7.24	16.99
Male	Cauc	3	3.04	3.21	2.15	2.17	1.91	1.9	4.06	2.48	5.43	3.99	2.96	2.82	1.06	1.05	7	7.01	17.54
Male	Cauc	3	3.08	3.2	2.35	2.25	1.58	1.47	3.77	2.28	5.16	4.48	2.73	2.88	1.05	0.96	7.35	7.34	17.06
Male	Cauc	3	3.12	3.14	2.13	2.22	1.78	1.72	4.08	2.48	5.24	4.17	2.89	2.88	1.12	1.02	7.03	6.99	17.23
Male	Cauc	3	3.16	3.16	2.36	2.17	1.86	2.05	3.64	2.12	4.6	3.64	2.5	2.54	1	0.98	7.64	7.6	16.81
Male	Cauc	3	2.83	3.09	2.35	2.02	1.82	1.75	3.95	2.47	4.74	4.18	2.75	2.8	1	0.98	7.25	7.22	17.11
Male	Cauc	3	3.25	3.14	2.13	2.21	1.72	1.59	3.59	2.17	5.11	3.73	2.51	2.55	1.01	0.89	7.76	7.75	16.98
Male	Cauc	3	3.04	2.99	2.13	2.09	1.61	1.5	4.06	2.25	5.18	4.03	2.67	2.89	0.95	0.98	7.03	7	16.98
Female	Cauc	3	3.13	3.19	2.15	2.14	1.7	1.54	4.64	2.29	5.35	3.89	2.69	2.68	1	0.98	7.84	7.76	17.14
Male	Cauc	3	3.22	2.98	2.04	2.22	1.91	1.95	4.09	2.41	5.56	4.19	2.68	3.04	1.08	1.11	7.39	7.33	17.35
Female	Asian	1	3.03	3.1	2.06	2.03	1.65	1.56	4.07	2.43	5.1	3.6	2.67	2.67	0.95	0.96	7.56	7.56	17.26
Male	Cauc	3	3.23	3.34	2.24	2.23	1.72	1.64	3.86	2.15	5.52	4.01	2.89	2.93	1.06	0.93	7.41	7.34	17.25
Female	Cauc	3	3.14	3.08	1.96	2.08	1.9	1.8	4.38	2.18	5.13	4.08	2.88	2.81	1	1.03	7.4	7.4	17.3
Female	Cauc	3	2.93	3.07	2.11	1.94	1.74	1.86	4.14	2.39	5.28	3.86	2.69	2.78	1.01	0.99	7.5	7.5	16.99
Male	Cauc	3	3.09	3.09	1.97	1.97	1.81	1.73	3.84	2.15	4.93	3.97	3.04	2.85	1.06	1.02	7.19	7.19	17.21
Male	Cauc	3	3.08	3.01	2.1	2.06	1.73	1.82	4.21	2.04	6	4.03	2.75	2.76	0.99	0.92	6.97	6.95	17.2
Female	Cauc	3	2.94	2.94	1.91	1.95	1.68	1.77	3.93	2.61	4.96	3.98	2.69	2.73	0.95	0.98	7.66	7.65	17.02
Female	Cauc	3	3.15	2.96	2.09	2.21	1.95	1.78	3.86	2.31	5.15	3.75	2.42	2.58	0.98	0.96	7.69	7.66	17
Female	Cauc	3	3.2	3.15	2.26	2.04	1.68	1.89	4.24	2.35	5.4	3.75	2.82	2.78	1	1.01	7.5	7.5	16.97
Male	Cauc	3	3.38	3.42	2.27	2.12	1.68	1.8	3.74	2.2	4.86	4.1	2.81	2.82	1.03	0.96	7.48	7.5	17.23
Male	Cauc	3	2.97	3.06	2.12	2.05	1.83	1.92	3.58	2.58	5.09	3.99	2.46	2.72	0.9	0.91	7.26	7.28	17.2
Male	Cauc	3	2.94	3.23	2.25	2.08	1.9	1.59	3.78	2.36	5.32	4.03	2.84	2.62	0.98	0.94	7.12	7.14	17.28
Female	Asian	1	2.95	3.1	2.5	2.34	1.39	1.15	3.63	2.46	4.85	3.61	2.63	2.7	0.99	0.95	7.75	7.75	16.62
Male	Asian	1	2.86	2.86	2.1	2.05	1.59	1.52	3.8	2.41	4.65	3.78	2.62	2.85	1.02	1	6.72	6.67	17.34
Female	Asian	1	2.94	3.02	2.23	2.23	1.48	1.42	4.1	2.45	4.84	3.69	2.77	2.83	1.07	1.04	7.18	7.17	16.99
Male	Asian	2	3.19	3.15	2.33	2.27	1.69	1.83	3.58	2.5	6.16	3.76	2.84	2.85	1.06	1.09	6.25	6.24	17.13
Female	Cauc	1	3.09	3.16	2.25	2.3	1.75	1.56	3.89	2.24	4.87	3.93	2.64	2.66	0.93	1	8.34	8.35	17.81
Male	Cauc	1	3.15	3.14	2.23	2.24	1.63	1.71	3.76	2.46	5.24	4.04	2.77	2.74	0.98	0.94	7.8	7.83	17.74
Male	Cauc	1	2.97	2.99	2.17	2.16	1.63	1.62	3.89	2.49	5.02	4.29	2.95	2.99	1.1	1.09	7.71	7.72	17.76
Male	Cauc	1	3.09	3.11	2.41	2.37	1.64	1.44	3.77	2.39	4.95	3.87	2.77	2.82	0.99	1.01	7.92	7.93	17.49

Female	Cauc	1	3.17	3.12	2.14	2.11	1.81	1.66	4.25	2.52	5.35	4.09	2.83	2.84	1	1.04	8	8.02	17.51
Male	Cauc	1	3.05	3.06	2.13	2.13	1.69	1.78	3.71	2.35	5.92	4.07	2.81	2.56	1.03	0.99	7.25	7.27	17.87
Male	Cauc	2	3.07	3.05	2.13	2.08	1.83	1.88	3.67	2.46	5.2	3.88	2.9	2.89	1.02	1.05	7.5	7.48	17.74
Male	Cauc	1	3.28	3.32	2.23	2.28	1.75	1.77	4.36	2.56	5.55	4.29	2.5	2.93	1.15	1.16	7.3	7.38	17.79
Male	Cauc	1	3.22	3.2	2.29	2.24	1.7	1.84	3.75	2.45	5.59	4.15	2.72	2.7	0.99	0.91	7.2	7.2	17.81
Male	Cauc	2	3.19	3.14	2.22	2.28	1.56	1.62	3.67	2.36	5.17	4.08	2.76	2.83	1.05	1.05	7.55	7.56	17.78
Female	Cauc	1	3.16	3.27	2.18	1.96	1.68	1.57	4.32	2.79	5.48	3.78	3.03	3.09	1.12	1.15	7.64	7.65	17.7
Male	Cauc	1	3.14	3.02	2.13	2.05	1.73	1.8	3.75	2.41	5.28	4.09	2.83	2.78	1.01	1.04	7.37	7.37	17.86
Female	Cauc	1	3.38	3.31	2.41	2.23	1.6	1.61	4.17	2.28	5.13	3.74	2.79	2.71	0.96	0.99	8.3	8.29	17.69
Male	Cauc	1	3.1	3.08	2.24	2.33	1.9	1.82	3.88	2.5	5.25	4.03	2.73	2.73	0.88	0.96	7.34	7.39	17.8
Female	Oth	1	3.29	3.36	2.2	2.36	1.81	1.79	4.17	2.53	5.01	3.76	2.88	2.9	1.06	1.08	8.37	8.37	17.67
Female	Cauc	1	3.21	3.21	2.04	2.08	1.65	1.68	4.17	2.55	5.1	3.85	2.83	2.81	1.04	1.05	7.93	7.95	17.72
Female	Cauc	1	3.22	3.21	2.28	2.25	1.7	1.81	4.42	2.27	5.05	3.84	2.77	2.75	1.01	1.04	8.17	8.16	17.67
Female	Cauc	1	3.26	3.39	2.14	2.07	1.95	1.97	5.52	2.35	5.68	4.24	2.87	2.89	1.04	1.08	7.89	7.94	17.77
Male	Cauc	1	3.29	3.13	2.07	2.17	1.52	1.67	3.7	2.65	5.36	4.2	2.9	2.9	1.04	1.08	7.45	7.45	17.84
Female	Cauc	1	3.35	3.31	2.24	2.28	1.75	1.76	3.9	2.42	4.82	4.04	2.84	2.87	0.98	1.01	8.16	8.23	17.9
Female	Cauc	1	3.29	3.34	2.2	2.16	1.67	1.73	4.38	2.27	5.58	3.81	2.65	2.63	0.92	0.95	8.02	8.06	17.79
Male	Cauc	1	3.11	3.05	2.42	2.32	1.73	1.81	3.88	2.23	5.19	4.11	2.71	2.72	1.06	0.96	7.72	7.82	17.89
Female	Cauc	2	3.3	3.33	2.03	2.14	1.81	1.83	4.82	2.3	5.67	3.96	2.93	2.88	1.07	1.08	7.85	7.9	17.84
Female	Cauc	1	3.16	3.19	2.19	2.27	1.95	1.87	4.17	2.51	5.27	4.11	2.85	2.92	1.02	1.07	8.03	7.98	17.81
Male	Cauc	1	3.32	3.25	2.32	2.37	1.89	1.84	3.93	2.55	5.52	4.31	2.84	2.84	1.05	1.07	7.61	7.63	17.76
Female	oth	1	3.27	3.24	2.27	2.22	2.06	2	3.71	2.48	5.06	4.14	2.65	2.74	0.92	0.94	7.85	7.8	17.87
Female	Cauc	1	3.23	3.19	2.29	2.19	1.45	1.5	3.86	2.52	4.88	3.71	2.77	2.77	1.01	1.03	8.57	8.59	17.76
Female	Cauc	2	3.13	3.11	2.2	2.17	1.75	1.81	3.9	2.35	4.88	4.05	2.86	2.84	0.97	0.96	8.19	8.17	17.86
Female	Cauc	1	3.19	3.1	2.27	2.32	1.97	1.89	4.06	2.35	5.33	4.15	2.77	2.75	0.99	0.97	8.12	8.06	17.63
Male	Cauc	1	3.06	3.17	2.25	2.2	1.79	1.83	3.55	2.4	5.11	4.07	2.66	2.68	0.97	0.96	7.57	7.56	17.73
Female	Cauc	1	2.96	3.03	2.14	2.15	1.68	1.8	4.01	2.63	5.13	3.82	2.71	2.77	0.99	1.01	8.03	8.03	17.64
Female	Cauc	1	3.27	3.32	2.3	2.17	1.78	1.9	3.9	2.32	5.06	3.91	2.78	2.75	0.98	0.99	8.38	8.33	17.59
Male	Cauc	1	3.41	3.34	2.24	2.31	1.54	1.59	3.77	2.81	5.3	4.34	2.6	2.55	1.15	1.02	7.22	7.21	17.72
Male	Cauc	1	3.32	3.35	2.33	2.36	1.6	1.57	3.66	2.53	5.8	4.19	2.79	2.63	1.05	1.02	7.61	7.59	17.43

Female	Cauc	3	3.08	3.07	2.05	2.14	1.78	1.85	4.87	2.53	5.61	3.93	2.8	2.93	1.11	1.03	7.86	7.88	17.79
Female	Cauc	1	3.54	3.56	2.2	2.21	1.67	1.64	4.09	2.28	5.12	3.78	2.47	2.59	0.93	0.93	8.65	8.65	17.94
Female	Cauc	3	3.12	3.13	2.24	2.06	1.73	1.92	3.74	2.46	5.07	3.66	2.72	2.94	0.98	1	8.19	8.19	17.6
Female	Cauc	1	3.28	3.14	2.14	2.43	1.46	1.39	3.76	2.38	4.91	3.87	2.71	2.72	1.06	1.04	8.29	8.32	17.75
Female	Oth	1	3.32	3.45	2.33	2.38	1.62	1.52	4.05	2.47	5.66	3.67	2.69	2.67	1.03	0.97	7.91	7.88	17.77
Male	Cauc	2	3.02	3.26	2.19	2.03	1.76	1.83	3.84	2.23	5.37	4.76	2.93	3	1.07	1	7	6.94	17.6
Female	Oth	1	3.25	3.39	2.11	1.92	1.54	1.5	4.3	2.34	5.47	3.96	2.65	2.75	1	0.98	7.44	7.4	17.46
Male	Oth	1	3.32	3.38	2.37	2.38	1.5	1.52	4.48	2.43	5.91	4.14	2.89	2.92	1.11	1.09	7.01	7.05	17.83
Male	Cauc	1	2.9	3.07	2.05	2.15	1.58	1.49	4.51	2.39	5.43	4.09	2.61	2.8	1.01	1.01	7.51	7.48	17.76
Male	Cauc	1	3.01	3.25	2.51	2.26	1.76	1.6	4.08	2.43	5.45	4.1	2.68	2.88	1.02	0.99	7.53	7.53	18.82
Female	Cauc	1	3.17	3.26	2.32	2.16	1.81	1.81	4.59	2.19	5.17	3.91	2.72	2.75	0.99	0.94	8.32	8.3	17.84
Female	Cauc	1	3.12	3.18	2.34	2.22	1.69	1.75	4.52	2.26	5.55	3.72	2.74	2.78	0.98	1	8	7.94	17.92
Female	Cauc	3	3.32	3.31	2.43	1.87	1.7	2.07	4.39	2.4	5.73	4.04	2.83	2.73	1.08	1.02	7.71	7.7	17.87
Female	Cauc	1	3.13	3.05	2.4	2.4	1.5	1.45	3.88	2.6	5.46	3.85	2.76	2.78	0.99	0.99	8.03	8.01	17.93
Female	Cauc	1	3.2	3.27	2.06	2.03	1.44	1.46	5.21	2.35	5.73	4.16	2.96	2.88	1.04	0.99	7.91	7.88	17.88
Male	Cauc	1	3.08	3.12	2.17	2.18	1.94	1.95	3.73	2.46	4.08	5.05	2.95	2.93	1	1.03	7.93	7.92	17.85
Female	Cauc	1	3.38	3.42	2.15	2.16	1.79	1.71	4.55	2.2	5.84	3.8	2.97	2.9	1.05	1.02	7.94	7.94	17.87
Male	Cauc	1	3.15	3.32	2.18	2.09	1.72	1.64	4.02	2.3	5.4	4.34	2.56	2.68	0.97	0.98	7.36	7.33	17.88
Male	Cauc	1	3.19	3.14	2.45	2.33	1.54	1.44	3.6	2.31	5.04	3.75	2.77	2.77	0.97	0.96	8.14	8.14	17.79
Female	Cauc	1	3.14	3.25	2.22	2.19	1.78	1.74	4.45	2.42	4.91	4.09	2.8	2.79	1.02	1	8.19	8.19	17.9
Male	Cauc	1	3.17	3.21	2.51	2.34	1.55	1.59	4.08	2.29	4.91	4.11	2.79	2.9	1.04	1.06	7.69	7.65	17.87
Female	Cauc	1	3.26	3.18	2.35	2.28	1.77	1.79	3.79	2.44	4.66	4.15	2.81	2.81	1.02	1.04	8.29	8.3	17.89
Male	Oth	3	3.61	3.52	2.06	2.27	1.86	2.27	2.04	4.46	2.19	4.68	2.72	2.53	1	0.96	7.33	7.35	17.65
Male	Cauc	2	3.06	3.17	2.28	2.25	1.9	1.83	4.35	2.59	5.31	4.23	2.83	2.77	1.13	1.01	7.13	7.11	17.84
Male	Cauc	3	3.28	3.55	2.36	2.14	1.76	1.74	4.24	2.37	5.64	4.02	3.06	3.26	1.07	1.11	7.18	7.22	17.92
Female	Cauc	2	3.33	3.2	2.36	2.39	1.46	1.5	5.73	2.16	5.79	4.38	3.1	3.18	1.13	1.07	7.89	7.91	17.85
Male	Cauc	1	3.28	3.21	2.29	2.22	1.76	1.88	3.72	2.4	5.53	3.62	2.91	2.84	1.02	1	7.47	7.47	17.82
Female	Cauc	1	3.2	3.34	2.2	2.11	1.87	1.88	4.32	2.34	5.64	3.62	2.88	2.86	1.05	1.08	7.42	7.45	17.86
Male	Cauc	1	3.3	3.4	2.36	2.44	1.72	1.7	4.28	2.47	5.39	4.23	2.82	2.78	1.08	1.06	7.8	7.82	17.86
Male	Cauc	1	3.25	3.2	2.2	2.29	1.73	1.7	4.26	2.37	5.65	4.37	2.69	2.71	0.98	0.98	7.3	7.35	17.87

Female	Cauc	2	3.47	3.49	2.48	2.46	1.77	1.64	3.95	2.2	4.63	3.89	2.62	2.62	0.91	0.95	8.52	8.49	17.75
Male	Cauc	2	2.99	2.97	2.22	2.21	1.87	1.85	4.24	2.59	5.52	4.48	2.79	2.88	1.07	1.03	7.47	7.49	17.91
Female	Cauc	3	3.33	3.2	2.24	2.26	1.72	1.88	4.73	2.35	5.54	3.89	2.86	2.91	1.08	1.06	7.8	7.72	17.86
Female	Cauc	3	3.41	3.45	2.3	2.06	1.76	1.72	4.43	2.56	5.31	4.08	2.88	2.84	1.08	1.09	7.95	7.94	17.86
Female	Cauc	1	3.54	3.5	2.18	2.22	1.64	1.78	4.47	2.55	4.88	3.89	2.77	2.75	0.99	1	8.4	8.37	17.87
Female	Cauc	3	3.38	3.37	2.25	2.04	1.79	1.78	4.96	2.6	5.62	4.24	3.01	2.86	1.15	1.03	7.79	7.72	17.91
Female	Cauc	3	3.24	3.13	2.09	2.11	1.9	1.9	4.08	2.33	5.03	3.85	2.71	2.75	0.97	0.88	7.95	7.9	17.71
Female	Cauc	3	3.36	3.34	2.26	2.23	1.73	1.78	4.18	2.42	5.56	3.96	2.87	2.87	1.01	1.07	7.8	7.8	17.82
Female	Cauc	3	3.36	3.28	2.13	2.06	2	1.9	4.09	2.29	5.48	3.99	2.98	3	1.07	1.03	8.1	8.1	17.85
Female	Cauc	3	2.98	2.95	2.49	2.34	1.79	1.63	4.52	2.68	5.44	4.06	2.84	2.77	0.93	0.95	7.62	7.6	17.89
Female	Cauc	3	3.29	3.27	2.22	2.18	2.12	1.95	4.18	2.41	5.22	4	2.86	2.83	1.06	1.05	7.98	7.97	17.84
Female	Cauc	3	3.13	3.35	2.32	2.3	1.74	1.79	4.35	2.37	5.26	3.97	2.81	2.76	1.03	1.03	7.83	7.83	17.89
Male	Cauc	3	3.23	2.93	2.09	2.32	2	1.93	4.17	2.39	5.52	4.37	2.61	2.82	0.99	1.04	7.46	7.46	17.91
Female	Cauc	2	3.29	3.24	2.44	2.25	1.63	1.72	4.22	2.4	5.16	4.16	2.79	2.78	0.98	0.96	8.01	8.02	17.93
Female	Cauc	2	3.08	2.89	2.22	2.25	1.83	1.9	4.29	2.52	5.19	3.96	2.86	2.86	1.04	1.04	7.97	7.97	17.85
Female	Cauc	3	3.05	2.93	2.17	2.28	1.89	1.86	4.45	2.43	5.61	4.24	2.9	3.01	1.07	1.12	7.51	7.51	17.86
Male	Cauc	1	3.16	3.28	2.37	2.24	1.78	1.83	3.95	2.35	5.62	4.28	2.81	2.9	1.08	1.04	7.23	7.17	17.88
Female	Cauc	2	3.42	3.49	2.2	2.25	1.71	1.57	4.49	2.42	5.46	4.07	2.8	2.89	1.07	0.95	7.82	7.78	17.91
Male	Cauc	1	3.25	3.21	2.31	2.3	1.67	1.79	4.22	2.25	5.17	4.18	2.82	2.84	0.97	1	7.82	7.78	17.81
Female	Cauc	1	3.19	3.22	2.13	2.18	1.75	1.81	4.32	2.35	5.14	3.95	2.68	2.53	0.96	0.85	7.9	7.85	17.92
Female	Cauc	1	3.28	3.2	2.27	2.25	1.81	1.78	4.41	2.51	5.54	4.07	2.77	2.77	0.98	0.99	7.56	7.49	17.81
Male	Cauc	1	3.12	3.2	2.44	2.46	1.97	1.88	4.15	2.1	5.25	4.37	2.81	2.76	0.92	1	7.69	7.64	17.9
Male	Cauc	1	3.16	3.1	2.51	2.4	1.67	1.65	3.43	2.59	5.46	4.1	2.7	2.78	1	0.99	7.32	7.27	17.93
Female	Cauc	2	3.36	3.4	2.33	2.24	1.78	1.96	4.67	2.39	5.3	4.38	2.83	2.86	1.04	1.02	8.31	8.31	17.88
Female	Cauc	2	3.14	3.17	2.21	2.24	1.86	1.78	4.15	2.42	5.52	4.09	2.75	2.7	1.04	1.01	7.9	7.88	17.84
Female	Cauc	3	3.46	3.52	2.13	2.09	1.91	1.85	4.54	2.25	5	4.03	2.91	2.94	1.07	1.18	8.22	8.23	17.86
Female	Cauc	1	3.19	3.24	2.33	2.21	1.81	1.78	4.17	2.31	5.41	3.8	2.96	2.75	0.98	0.89	7.79	7.79	17.75
Female	Cauc	2	3.34	3.15	2.15	2.26	1.86	1.92	3.82	2.45	5.22	4.03	2.63	2.67	1	1.01	8.17	8.16	17.83
Male	Cauc	1	3.06	3.12	2.23	2.04	1.77	1.82	3.45	2.32	5.29	3.96	2.9	2.86	0.99	0.98	7.74	7.73	17.82
Male	Cauc	3	3.27	3.45	2.08	1.97	1.66	1.92	3.75	2.22	5.33	4.11	2.87	2.83	1	0.99	7.93	7.92	17.9

Male	Cauc	3	3.28	3.38	2.36	2.22	1.74	1.84	4.03	2.31	5.14	4.34	3.01	2.93	1.08	1.05	7.77	7.77	17.85
Male	Cauc	3	3.36	3.44	2.23	1.91	1.84	1.92	4.18	2.46	4.75	4.57	2.93	2.87	1.06	1.04	7.6	7.63	17.98
Female	Cauc	3	3.21	3.07	2.23	2.21	1.71	1.72	4.28	2.3	5.28	4.11	2.62	2.77	0.99	1	7.8	7.81	17.91
Female	Cauc	3	3.62	3.48	1.89	1.95	1.9	2.01	4.33	2.48	5.5	4.05	2.92	2.88	1.05	1.06	7.74	7.75	17.85
Female	Cauc	2	3.45	3.31	2.24	2.3	1.69	1.75	4.26	2.43	5.73	3.96	3.05	3	1.1	1.04	7.97	7.94	17.85
Male	Cauc	3	3.28	3.38	2.39	2.21	1.57	1.58	3.73	2.32	5.35	4.23	2.83	2.79	1.13	0.97	7.54	7.56	17.92
Female	Cauc	2	3.22	3.14	2.07	2.02	1.86	1.82	4.05	2.51	5.25	3.73	2.74	2.7	1.02	1	8.17	8.15	17.86
Female	Cauc	3	3.37	3.28	1.97	2.12	1.58	1.59	4.43	2.56	5.35	3.74	2.93	2.78	1.03	1.05	8.18	8.22	17.8
Female	Cauc	3	3.41	3.44	2.14	2.23	1.69	1.34	4.73	2.7	5.85	4.38	3.02	3.04	1.09	1.11	7.58	7.6	17.88
Female	Cauc	3	3.32	3.27	2.1	2.12	1.99	1.84	4.79	2.16	5.92	4.2	3.05	3.22	1.11	1.08	7.86	7.83	17.93
Male	Cauc	2	3.2	3.14	2.38	2.14	1.71	1.88	3.88	2.35	5.17	4.15	2.84	2.76	1.02	1.03	7.99	8.01	17.96
Male	Cauc	3	3.31	3.5	2.22	1.78	1.87	1.94	4.63	2.41	5.55	4.34	3.01	2.75	1.11	1	7.26	7.16	17.86
Male	Cauc	3	3.23	3.38	2.13	2.03	1.91	1.86	3.82	2.27	5.12	4.63	2.78	2.85	1.04	1.06	7.34	7.34	17.83
Female	Cauc	2	3.23	3.28	2.26	2.17	1.72	1.69	4.08	2.49	5.26	3.9	2.76	2.78	0.99	1.06	7.88	7.87	17.91
Female	Cauc	2	3.51	3.35	2.02	2.13	2.12	1.97	4.39	2.49	5.59	4.17	2.8	2.77	0.94	0.93	7.95	7.95	17.9
Female	Cauc	3	3.19	3.18	2.29	2.04	1.86	1.92	4.68	2.65	5.68	4.64	3.25	3.14	1.14	1.17	7.27	7.25	17.85
Male	Cauc	2	3.06	3.32	2.16	1.89	1.91	1.9	3.92	1.88	5.15	3.91	2.96	2.75	1.07	1.08	7.5	7.49	17.92
Male	Cauc	2	3.27	3.37	1.98	1.98	1.87	1.86	4.17	2.62	5.46	4.11	3	2.93	1.06	1.11	7.18	7.1	17.92
Male	Cauc	2	3.06	3.07	2.38	2.37	1.86	1.84	4.17	2.51	5.68	4.4	2.92	2.9	1.07	1.06	7.53	7.55	17.9
Male	Cauc	1	3.42	3.35	2.53	2.42	2.15	2.1	3.58	2.34	5.25	4.24	3.02	3.02	1.01	1.06	7.87	7.89	17.9
Female	Cauc	1	3.01	3.03	2.26	2.25	1.83	1.74	3.86	2.66	4.88	3.73	2.88	2.9	1.05	1.05	8.31	8.27	17.89
Male	Cauc	1	3.06	3.19	2.28	2.28	2	1.79	3.77	2.39	4.96	3.96	2.94	2.94	1.05	1.03	8	7.97	17.92
Male	Cauc	3	3.03	3.09	2.38	2.35	1.74	1.82	4.11	2.4	5.65	4.15	2.82	2.81	1.05	1.1	7.75	7.76	17.9
Male	Cauc	3	3.15	3.18	2.13	2.14	1.88	2.01	4.39	2.7	5.41	4.75	2.9	2.93	1.11	1.06	6.98	6.99	17.95
Male	Cauc	3	3.21	3.51	2.55	2.19	1.69	1.75	3.95	2.37	4.87	4.65	2.74	2.83	1.05	1.05	7.72	7.7	17.9
Female	Cauc	3	3.41	3.38	1.98	1.95	1.88	1.79	4.38	2.5	5.48	4.33	3.14	3.11	1.12	1.12	7.33	7.3	17.89
Female	Cauc	3	3.47	3.63	1.94	1.7	1.93	1.85	4.63	2.62	5.03	3.9	2.86	2.93	1.06	1.06	7.98	7.94	17.84
Female	Cauc	2	3.1	2.97	2.16	2.37	1.69	1.6	3.91	2.42	5.31	3.81	2.72	2.7	0.97	0.99	8.24	8.26	17.88
Female	Cauc	3	3.24	3.29	2.16	2.15	1.53	1.4	5.36	2.62	5.98	4.21	2.97	2.99	1.07	1.1	7.19	7.18	17.85
Male	Cauc	1	3.3	3.29	2.48	2.5	1.91	1.8	3.66	2.31	5.65	4.28	2.93	2.89	0.98	1.06	7.57	7.55	17.92

Male	Cauc	3	3.23	3.24	2.32	2.16	1.69	1.75	4.19	2.33	5.98	4.2	2.8	2.83	1.03	1	7.31	7.26	17.92
Female	Cauc	3	3.37	3.27	2.18	2.03	1.76	1.71	5	2.9	5.34	4.03	3.02	3.02	1.12	1	7.87	7.81	17.9
Male	Cauc	3	3.38	3.24	2.07	2.05	1.86	1.84	4.34	2.44	5.6	4.34	2.8	2.78	1.06	1.09	7.47	7.4	17.87
Female	Cauc	3	3.07	3.25	2.4	2.33	1.9	1.87	4.33	2.47	5.33	4.07	2.78	3.04	1.1	0.97	7.75	7.75	17.79
Female	Cauc	3	3.43	3.49	2.13	1.74	2.05	2.07	4.7	2.42	5.6	4.21	2.86	3.1	1.13	1.12	7.56	7.57	17.88
Male	Cauc	3	3.48	3.42	1.83	1.91	1.6	1.48	4.15	2.72	5.53	4.44	2.94	3.04	1.08	1.05	7.25	7.25	17.85
Male	Cauc	3	3.19	3.06	2.12	2.29	1.89	1.8	4.24	2.04	5.42	3.99	2.91	2.87	1.08	1.01	7.28	7.28	17.85
Male	Cauc	3	3.29	3.25	2.15	2.23	1.91	1.78	4.07	2.4	5.19	4.16	2.78	3	1.06	1.05	7.34	7.4	17.82
Male	Cauc	3	3.48	3.42	2.2	2.12	1.52	1.47	4.06	2.59	5.2	3.87	2.71	2.7	1.03	1	7.39	7.43	17.9
Male	Cauc	3	2.95	3.08	2.23	2.09	1.76	1.67	3.97	2.3	5.77	4.72	2.94	3.01	1.08	1.07	7.64	7.63	17.89
Male	Cauc	3	3.17	3.17	2.56	2.55	1.61	1.8	3.9	2.37	5.5	4.09	2.61	2.63	0.97	0.98	7.63	7.62	17.87
Female	Cauc	2	2.99	3.13	2.42	2.35	1.77	1.62	4.37	2.34	4.77	4.3	2.75	2.77	1.02	0.99	8.48	8.5	17.89
Male	Cauc	2	3.22	3.19	2.23	2.3	1.74	1.68	3.76	2.67	5.35	4.2	2.68	2.74	0.97	0.98	7.93	7.97	17.89
Male	Cauc	1	3.58	3.62	2.45	2.37	1.79	1.82	4.04	2.44	6.17	4.44	3.03	3.1	1.09	1.03	7.35	7.38	17.89
Male	Cauc	3	3.04	3.09	2.13	2.17	1.89	1.87	4.26	2.55	5.28	4.37	3	2.93	1.12	1.06	7.59	7.6	17.9
Female	Cauc	2	2.91	3	2.38	2.28	1.61	1.55	4.13	2.46	4.57	4.01	2.6	2.72	1	0.99	8.34	8.34	17.91
Female	Cauc	3	3.7	3.75	1.97	1.9	1.66	1.79	5.05	2.41	5.64	4.42	3.06	3.08	1.08	1.1	7.86	7.86	17.91
Female	Cauc	2	3.25	3.29	2.22	2.29	1.87	1.8	4.31	2.35	4.88	3.93	2.77	2.82	0.99	1	8.08	8.04	17.95
Female	Cauc	2	3.16	3.09	2.24	2.3	1.91	1.82	4.37	2.23	5.71	4.3	2.77	2.78	0.99	1	7.9	7.89	17.88
Male	Cauc	2	3.31	3.33	2.38	2.37	1.94	1.89	3.85	2.18	5.46	4.35	2.93	2.96	1.05	1.03	8.11	8.09	17.89
Male	Cauc	3	3.28	3.3	2.24	2.23	1.48	1.39	4.41	2.42	5.52	4.49	2.79	2.56	1.06	1.04	7.46	7.44	17.9
Female	Cauc	3	3.01	2.81	2.24	2.13	1.52	1.4	3.73	2.56	5.21	4.19	2.86	2.68	1.07	1.1	8.17	8.16	17.87
Male	Cauc	3	3.18	2.93	2.07	2.15	1.83	1.85	4.34	2.22	5.54	4.35	2.6	2.84	1.04	0.98	7.52	7.5	17.89
Female	Cauc	2	3.31	3.27	2.31	2.33	1.8	1.75	4.02	2.34	4.75	3.7	2.79	2.76	0.97	0.94	8.75	8.8	17.87
Female	Cauc	2	3.13	3.15	2.34	2.35	1.73	1.62	4.54	2.36	4.92	4.06	2.7	2.69	0.98	0.96	8.45	8.47	17.91
Male	Cauc	2	3.08	3.05	2.16	2.19	1.87	1.62	3.79	2.56	5.42	4.18	2.76	2.95	1	0.95	7.52	7.52	17.84
Male	Cauc	1	3.14	3.05	2.29	2.28	1.82	1.85	3.92	2.29	5.76	3.89	2.72	2.78	1.04	0.99	7.7	7.7	17.93
Female	Cauc	3	3.53	3.78	2.46	2.2	1.74	1.79	5.03	2.32	5.92	4.04	2.84	2.89	1.1	1.08	7.86	7.86	17.85
Male	Cauc	3	3.15	3.05	2.43	2.34	1.31	1.38	3.71	2.17	4.94	3.9	2.8	2.91	1.07	1.04	7.79	7.79	17.91
Female	Cauc	2	3.41	3.41	2.29	2.19	1.78	1.77	4.78	2.45	5.08	3.9	2.76	2.74	0.96	0.96	8.39	8.38	17.9

Female	Cauc	3	3.61	3.4	1.96	2.27	1.78	1.9	5.49	2.35	5.31	4.25	2.92	2.91	1.01	1.03	7.69	7.7	17.88
Male	Cauc	3	3.55	3.63	2.31	2.05	1.69	1.85	4.18	1.89	5.26	4	2.8	2.78	1.01	0.99	7.6	7.61	17.86
Female	Cauc	3	2.97	2.98	2.05	2.02	1.96	1.96	4.46	2.39	5.24	3.88	2.82	2.77	1.01	1.03	8.01	8	17.86
Female	Cauc	2	2.77	2.82	1.19	1.35	1.5	1.61	4.07	2.4	5.12	4.04	2.86	2.81	1.03	1.02	8.33	8.34	17.84
Male	Cauc	3	3.12	3.01	2.24	2.21	1.97	1.94	4.49	2.57	5.51	4.74	2.68	2.98	1.1	1.13	6.91	6.96	17.91
Female	Cauc	3	3.35	3.54	2.09	1.95	1.87	1.8	3.67	2.45	5.25	3.86	2.66	2.65	0.99	0.94	8.17	8.14	17.8
Female	Cauc	3	3.66	3.62	2.32	2.21	1.51	1.53	4.05	2.43	5.43	4.14	2.32	2.64	1.05	1	8.02	8.01	17.84
Male	Cauc	3	3.42	3.71	1.85	1.53	1.91	1.82	4.04	2.51	5.05	4.38	2.48	2.96	1.1	1.08	7.98	7.98	17.9
Female	Cauc	2	3.25	3.41	2.35	2.16	1.75	1.77	5.22	2.29	5.93	4.32	2.83	2.98	1.11	1.07	7.85	7.8	17.89
Female	Cauc	3	3.34	3.4	2.44	2.25	1.76	1.89	4.55	2.32	5.8	4.07	2.94	2.93	1.06	1.04	7.69	7.69	17.9
Male	Cauc	3	3.42	3.37	2.32	2.21	1.58	1.48	4.18	2.09	5.58	3.88	3.04	3.03	1.04	1.02	7.91	7.9	17.91
Male	Cauc	1	3.35	3.31	2.44	2.33	1.34	1.26	3.79	2.58	5.28	4.35	2.88	2.88	1.07	1.06	7.17	7.11	17.9
Female	Cauc	1	3.02	3.03	2.07	2.17	1.35	1.36	3.91	2.42	4.96	3.95	2.72	2.8	1.05	1.02	8.23	8.22	17.89
Female	Cauc	1	3.11	3.16	2.29	2.32	1.51	1.43	3.7	2.43	5.21	3.9	2.61	2.53	0.86	0.88	7.91	8	17.84
Female	Cauc	1	3.17	3.27	2.36	2.46	1.89	1.65	3.9	2.43	5.34	3.71	2.43	2.43	0.88	0.9	8.1	8.07	17.94
Male	Cauc	1	3.1	3.17	2.2	2.19	1.74	1.82	3.88	2.42	5.01	4.08	2.45	2.5	0.85	0.89	7.52	7.61	17.83
Male	Cauc	1	3.04	3.11	2.54	2.53	1.72	1.62	4.05	2.57	5.21	4.48	2.53	2.55	0.92	0.91	7.22	7.19	17.9
Female	Cauc	1	3.04	3.18	2.41	2.4	1.74	1.66	3.56	2.43	4.91	3.78	2.49	2.43	0.84	0.85	8.25	8.18	17.76
Male	Cauc	1	3.31	3.28	2.55	2.53	1.74	1.86	3.79	2.43	5.16	4.36	2.66	2.64	0.95	1.01	7.48	7.44	17.78
Male	Cauc	1	3.2	3.39	2.38	2.33	1.74	1.58	4.03	2.45	5.07	4.17	2.58	2.62	0.96	0.88	7.67	7.64	17.77
Male	Cauc	1	3.25	3.19	2.56	2.63	1.72	1.73	4.03	2.41	4.65	4.15	2.75	2.77	0.95	0.93	7.6	7.53	17.79
Female	Cauc	1	3.09	3.13	2.2	2.28	1.85	1.78	4.15	2.53	5.03	3.72	2.53	2.57	0.99	0.9	7.85	7.86	17.81
Female	Cauc	1	3.29	3.29	2.5	2.5	1.71	1.56	4.04	2.78	4.48	4.12	2.56	2.61	0.9	0.88	8.02	8.02	17.79
Male	Cauc	1	3.14	3.21	2.41	2.35	1.67	1.72	3.96	2.57	5.25	4.14	2.63	2.64	0.93	0.98	7.45	7.44	17.85
Female	Cauc	1	3.15	3.19	2.36	2.27	1.67	1.68	3.64	2.48	4.82	4	2.46	2.42	0.91	0.82	8.26	8.23	17.76
Female	Cauc	1	3.28	3.27	2.22	2.2	1.72	1.72	4.3	2.41	5.14	4.11	2.52	2.49	0.94	0.88	8.01	8.01	17.84
Male	Cauc	1	3.06	3.12	2.41	2.35	1.73	1.75	3.91	2.61	4.73	4.01	2.71	2.74	1	0.97	7.73	7.69	17.77
Male	Cauc	1	3.21	3.23	2.36	2.42	1.7	1.69	3.82	2.46	4.76	4.02	2.54	2.59	0.9	0.91	7.34	7.27	17.81
Female	Cauc	1	3.45	3.4	2.6	2.57	1.74	1.61	3.7	2.27	4.91	3.83	2.41	2.36	0.85	0.76	8.59	8.56	17.89
Female	Cauc	1	3.25	3.26	2.49	2.53	1.61	1.69	3.94	2.65	4.91	3.85	2.49	2.53	0.82	0.81	8.09	8.09	17.65

Female	Cauc	1	3.15	3.15	2.25	2.31	1.85	1.84	4.31	2.59	5.12	4.16	2.56	2.52	0.93	0.88	7.89	7.86	17.9
Female	Cauc	1	3.04	3.09	2.33	2.3	1.79	1.78	4.01	2.55	5.26	3.94	2.76	2.68	0.94	0.95	7.88	7.87	17.9
Male	Cauc	2	2.95	3.19	2.15	2.04	1.83	1.84	4.57	2.52	5.24	3.75	2.52	2.56	1	0.98	7.23	7.19	17.81
Female	Cauc	1	3.19	3.2	2.17	2.17	1.68	1.69	3.9	2.37	5.35	3.77	2.5	2.41	0.88	0.86	8.01	8	17.83
Male	Cauc	1	2.74	2.82	2.33	2.4	1.7	1.77	3.86	2.47	5.16	4	2.68	2.67	0.94	0.93	7.74	7.72	17.85
Female	Asian	1	2.98	3.04	2.31	2.27	1.7	1.78	3.95	2.53	5.32	4	2.69	2.64	0.94	0.91	7.76	7.75	17.8
Female	Cauc	1	3.15	3.13	2.3	2.43	1.65	1.67	3.83	2.31	4.81	3.82	2.54	2.53	0.83	0.91	8.21	8.23	17.81
Female	Cauc	1	3.46	3.5	2.42	2.44	1.83	1.9	4.3	2.25	4.84	3.98	2.61	2.6	0.82	0.83	8.7	8.69	17.78
Female	Cauc	1	3.01	3.04	2.45	2.47	1.7	1.56	4.04	2.4	4.94	3.75	2.49	2.53	0.87	0.8	8.59	8.59	17.83
Female	Cauc	1	3.18	3.23	2.31	2.4	1.82	1.78	3.65	2.34	4.59	3.94	2.52	2.51	0.86	0.83	8.51	8.51	17.87
Female	Oth	1	3.22	3.26	2.2	2.21	1.71	1.72	4.49	2.53	5.16	3.96	2.55	2.54	0.82	0.77	8.02	7.96	17.74
Male	Cauc	1	3.26	3.23	2.32	2.41	1.82	1.72	3.53	2.17	4.87	4.04	2.4	2.42	0.97	0.92	7.52	7.5	17.91
Female	Cauc	1	3.31	3.3	2.44	2.43	1.86	1.77	3.89	2.28	4.93	3.92	2.7	2.65	0.88	0.89	8.29	8.31	17.83
Female	Cauc	1	3.33	3.4	2.2	2.14	1.64	1.73	4.65	2.23	4.87	3.97	2.4	2.42	0.97	0.94	8.37	8.37	17.82
Female	Cauc	1	3.17	3.2	2.28	2.26	1.85	1.83	3.89	2.23	4.82	3.75	2.58	2.58	0.93	0.95	8.72	8.75	17.6
Female	Cauc	1	3.26	3.27	2.01	2.15	1.92	1.85	4.03	2.35	4.5	4.22	2.69	2.6	0.95	0.94	8.16	8.18	17.59
Female	Oth	1	3.06	3.1	2.3	2.15	1.6	1.75	3.62	2.25	4.75	3.29	2.4	2.51	0.95	0.94	8.48	8.48	17.78
Female	Oth	1	3.22	2.97	1.92	2.16	1.85	1.7	4	2.4	5.01	3.97	2.57	2.61	1	0.98	8.33	8.32	17.79
Female	Cauc	1	3.35	3.25	2.35	2.41	1.59	1.52	3.79	2.29	4.75	3.74	2.47	2.49	0.91	0.91	8.41	8.44	17.79
Female	Asian	1	3.08	3.07	2.3	2.26	1.83	1.77	3.98	2.44	4.68	4.05	2.64	2.62	0.97	0.92	8.17	8.15	17.9
Female	Cauc	1	3.07	3.2	2.38	2.32	1.46	1.46	4	2.12	5.28	4.19	2.72	2.74	0.86	0.76	8.31	8.28	17.91
Male	Oth	1	3.07	3.12	2.33	2.42	1.51	1.42	3.63	2.32	5.54	4.13	2.82	2.84	1	0.93	7.71	7.7	17.85
Female	Asian	1	3.23	3.17	2.07	2.04	1.64	1.66	3.85	2.33	5.1	3.96	2.53	2.54	0.9	0.98	8.1	8.1	17.8
Female	Cauc	3	3.14	3.37	2.39	2.33	1.78	1.74	3.77	2.25	5.19	3.85	2.64	2.64	0.91	0.9	8.4	8.39	17.87
Female	Cauc	1	3.19	3.13	2.16	2.26	1.73	1.75	4.11	2.3	5.24	3.84	2.45	2.42	0.88	0.8	8.28	8.27	17.88
Female	Cauc	2	3.29	3.18	2.26	2.27	1.57	1.64	3.32	2.38	4.71	3.79	2.54	2.52	0.87	0.76	8.54	8.53	17.9
Male	Cauc	2	3.15	3.15	2.28	2.33	1.85	1.79	4.35	2.04	5.46	3.82	2.73	2.71	0.84	0.82	7.44	7.41	17.8
Female	Cauc	2	3.24	3.19	2.3	2.3	1.73	1.65	4.51	2.34	5.18	4.14	2.5	2.56	0.94	0.95	8.3	8.21	17.78
Male	Cauc	1	3.05	3.02	2.34	2.46	1.8	1.74	3.42	2.16	4.93	4.1	2.51	2.54	0.86	0.86	7.71	7.73	17.76
Female	Asian	1	3.07	3.17	2.24	2.2	1.61	1.54	3.8	2.47	5.08	3.86	2.46	2.48	0.9	0.88	7.94	7.92	17.82

Male	Asian	1	3.21	3.28	2.29	2.25	1.73	1.78	3.78	2.38	5.45	3.98	2.81	2.82	1	0.9	7.52	7.47	17.86
Male	Oth	1	3.15	3.13	2.22	2.27	1.75	1.63	4.13	2.37	5.39	4.21	2.63	2.57	0.85	0.79	7.8	7.74	17.84
Female	Cauc	1	3.22	3.3	2.38	2.29	1.65	1.78	3.59	2.33	5.59	3.97	2.46	2.41	0.85	0.89	8.29	8.28	17.59
Male	Asian	3	3.29	3.28	2.68	2.59	1.96	1.92	4.17	2.63	5.42	4.09	2.7	2.67	0.92	0.83	8.22	8.22	17.86
Male	Cauc	1	3.08	3.19	2.47	2.32	1.41	1.29	3.38	2.4	4.39	3.94	2.63	2.63	0.8	0.81	8.63	8.58	17.84
Female	Cauc	1	3.28	3.32	2.14	2.16	1.7	1.63	3.81	2.44	5.15	3.67	2.6	2.52	0.73	0.8	8.02	8.01	17.34

Table 10. Stance Morphology (Column)

Subject	Sex	1. Head Level R	3. Lateral head tilt	4. Shoulder level R	5. Shoulder level L	6. Position of Shoulder R	7. Position of Shoulder L	10. Position of Upper Arm (Frontal) Right	11. Position of Upper Arm (Frontal) Left	12. Antero-Posterior Placement of Upper Arm Right	13. Antero-Posterior Placement of Upper Arm Left	14. Lateral Placement of Upper Arm Right	15. Lateral Placement of Upper Arm Left	16. Antero-posterior Placement of Forearm Right	17. Antero-posterior Placement of Forearm Left	20. Flexion of arm R	21. Flexion of arm L	22. Lateral placement of forearm R	23. Lateral placement of Forearm L	19. Antero-posterior Placement of Hand Right	20. Antero-posterior Placement of Hand Left	21. Finger Flexion Right	22. Finger Flexion Left	23. Lateral Rotation of the Hand Right	24. Lateral Rotation of the hand Left	25. Thoracic Projection	26. Abdominal projection	21. Shape of Gluteus	25. Orientation of Lower Extremities Right Anterior	26. Orientation of Lower Extremities Left Anterior	29. Lateral Placement of Upper leg Right	30. Lateral Placement of Upper leg Left	41. Lateral Placement of Lower Leg Right	42. Lateral Placement of Lower leg Left	49. Placement of the Feet Right	50. Placement of the Feet Left
003Fc	Fem	1	3	1	1	3	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	1	2	1	1	3	1	3	4	4	2	2	1	1	2	2
015F	Fem	1	2	3	3	2	2	2	2	1	2	3	3	4	4	2	2	3	3	4	4	2	2	2	2	2	1	3	3	3	1	1	1	1	2	1
016Fc	Fem	1	2	1	1	1	2	3	3	1	2	2	3	1	1	1	2	3	3	1	2	2	1	2	2	2	1	4	2	3	1	1	1	1	2	2
017F	Fem	2	3	3	3	1	1	3	3	1	1	3	3	2	1	2	2	3	2	2	2	1	1	1	1	2	1	2	3	4	2	2	3	3	2	2
019F	Fem	1	2	3	3	1	2	2	2	1	2	2	2	3	4	2	2	3	3	3	4	3	3	1	1	3	2	4	5	5	2	2	1	1	1	1
004F	Fem	2	2	3	3	3	3	2	2	3	3	2	2	3	3	3	3	3	3	3	3	3	3	1	1	2	2	3	4	4	3	3	1	1	2	2
006F	Fem	2	2	1	1	2	1	2	2	2	1	2	2	3	3	2	2	3	3	4	4	3	1	2	2	2	2	4	4	4	1	1	1	1	2	2
009F	Fem	2	2	3	2	2	2	2	2	2	1	3	3	4	2	2	3	1	1	4	3	3	3	2	2	3	2	3	5	5	3	3	1	1	2	2
021F	Fem	2	3	2	2	2	2	2	2	1	2	2	2	3	4	2	2	3	3	3	3	3	3	2	2	3	1	4	4	5	2	2	1	1	2	2
024Fc	Fem	1	2	1	1	3	2	1	1	4	3	2	2	4	4	1	2	3	3	4	4	2	2	2	2	2	2	1	3	3	1	1	1	1	2	1
025Fc	Fem	1	3	3	3	2	2	2	2	1	1	3	3	3	3	2	2	3	3	3	4	3	3	1	1	2	3	2	2	2	2	2	1	1	2	2
032F	Fem	1	1	1	1	2	3	2	2	2	3	2	2	4	4	2	2	3	3	4	4	2	2	2	2	3	1	4	4	4	2	2	1	1	1	1
033F	Fem	2	2	2	2	2	2	1	1	2	2	2	1	4	4	1	2	3	3	3	4	2	2	2	2	2	2	3	3	3	1	1	1	1	2	2
042F	Fem	2	3	2	2	2	2	3	3	1	1	3	3	2	2	2	2	3	3	2	2	3	3	2	2	2	1	4	2	2	1	1	1	1	2	1
047F	Fem	2	3	3	3	2	2	2	2	2	2	1	1	4	4	2	2	1	1	4	4	3	3	1	1	3	3	2	5	5	3	3	1	1	1	1
048F	Fem	2	1	2	2	3	3	1	1	3	3	3	3	4	4	2	2	3	3	3	3	3	3	2	2	3	3	3	3	2	3	3	1	1	1	1

053F	Fem	2	2	1	1	1	2	1	2	1	1	2	2	3	3	2	2	2	2	4	4	3	3	1	1	2	2	3	4	5	3	3	1	1	2	1
063F	Fem	2	3	2	2	1	1	2	1	1	1	3	3	2	3	1	1	1	1	2	2	3	3	2	2	2	2	4	3	3	2	2	1	1	2	2
064F	Fem	2	1	1	2	2	2	1	2	2	1	3	3	1	1	3	3	3	3	3	3	3	1	2	2	3	3	2	3	3	3	3	2	2	1	1
069F	Fem	2	3	2	1	1	2	3	2	1	1	3	3	3	3	2	2	3	3	3	3	3	3	1	2	3	3	4	5	5	3	3	1	1	2	2
071F	Fem	2	3	1	2	3	3	1	1	4	4	2	2	3	2	2	2	2	2	4	3	2	2	2	2	3	2	3	3	3	2	2	2	2	1	1
075F	Fem	1	3	1	2	2	2	1	3	2	1	2	3	3	3	2	2	3	3	4	3	2	2	1	2	3	2	2	3	3	3	3	3	3	2	2
078F	Fem	1	3	2	2	3	3	1	1	3	3	2	2	4	4	2	2	3	3	4	4	3	3	2	2	2	2	3	3	3	2	2	1	1	2	1
079F	Fem	2	2	2	3	3	3	2	2	3	4	3	2	4	4	3	3	2	1	4	3	2	2	2	2	2	3	2	4	4	2	2	1	1	2	1
080F	Fem	2	2	1	2	1	1	2	2	1	1	1	1	2	3	3	3	1	1	2	3	2	2	1	1	3	3	2	2	2	3	3	1	1	2	2
087F	Fem	3	2	2	3	1	1	2	2	1	1	2	2	3	3	2	2	3	3	3	4	2	2	2	2	2	1	3	4	4	1	1	1	1	2	2
088F	Fem	1	3	1	1	3	3	2	2	3	3	3	3	3	3	2	2	3	3	3	3	2	2	2	2	2	1	1	3	3	2	2	2	2	2	2
090F	Fem	2	3	1	1	1	1	2	2	1	1	2	2	3	3	2	2	3	3	3	4	3	3	2	2	2	1	2	4	4	1	1	1	1	2	1
002FD	Fem	2	2	2	2	2	2	1	2	1	2	2	2	3	4	2	2	3	2	4	4	1	2	2	2	2	2	4	3	3	3	3	3	3	2	2
005FD	Fem	2	2	2	3	2	3	2	2	2	2	2	2	4	4	1	2	1	1	3	4	3	3	2	2	2	2	4	3	3	3	3	3	3	2	2
006FD	Fem	2	3	1	2	1	2	1	1	3	3	2	2	4	4	2	2	3	3	4	4	2	2	1	2	3	2	2	3	3	2	2	2	2	2	2
007FD	Fem	1	1	3	3	3	2	1	1	1	3	3	3	3	4	2	2	3	3	4	4	1	2	2	2	3	1	4	4	4	3	3	2	2	2	2
009FD	Fem	2	2	1	2	1	1	1	2	1	1	2	2	1	1	3	3	3	3	3	4	2	2	2	1	2	2	3	3	3	2	2	2	2	2	1
017FD	Fem	2	2	2	2	1	2	3	2	1	2	2	2	1	2	2	2	2	3	3	3	2	1	2	1	2	1	2	3	3	3	3	3	3	1	1
020FD	Fem	3	3	1	1	1	3	2	1	1	3	3	2	3	4	1	2	2	2	4	4	2	2	2	2	3	2	2	1	1	1	1	1	1	2	2
021FD	Fem	1	2	3	3	2	1	2	2	2	1	2	2	2	1	2	2	3	3	3	3	2	1	1	1	2	2	3	3	3	3	3	2	2	2	2
022FD	Fem	1	2	2	3	1	1	2	2	1	1	2	2	2	3	2	2	3	2	4	4	2	2	2	2	3	1	2	3	3	1	1	1	1	2	2
023FD	Fem	1	3	3	3	2	2	1	1	3	3	2	2	3	3	2	2	3	3	3	3	3	2	2	1	2	1	3	2	2	2	2	1	1	2	2
025FD	Fem	2	2	1	1	1	2	2	2	1	2	2	2	3	4	2	2	2	2	3	3	2	2	2	2	3	2	2	4	4	1	1	1	1	1	1
026FD	Fem	2	3	2	2	3	3	2	1	3	3	1	1	4	4	2	2	2	2	4	4	2	2	2	2	3	2	2	4	4	2	2	1	2	1	1
030FD	Fem	2	3	2	2	2	3	1	1	2	3	1	3	2	4	1	2	2	3	3	4	1	1	2	2	3	2	3	3	3	2	2	3	1	2	2
031FD	Fem	3	3	1	1	1	1	2	1	1	1	3	3	1	1	2	2	3	3	4	4	1	2	2	1	3	1	2	3	3	1	1	1	1	2	1
034FD	Fem	2	3	3	3	2	3	1	1	2	4	2	2	3	4	2	2	2	2	4	4	2	2	2	2	3	2	3	4	4	3	3	2	2	2	2
035FD	Fem	1	2	2	2	2	3	1	1	2	3	3	3	3	4	2	2	3	3	3	4	2	2	2	2	2	1	4	2	2	2	2	2	2	2	2
036FD	Fem	2	1	1	2	2	2	1	1	2	2	2	2	3	4	2	2	2	2	3	4	1	1	1	1	2	2	1	2	2	1	1	1	1	2	2
038FD	Fem	2	3	3	3	3	3	1	1	4	4	2	3	4	4	2	2	2	2	4	4	2	2	1	1	2	1	3	4	4	3	3	2	2	2	2

039FD	Fem	1	3	1	1	2	3	1	1	2	3	1	1	4	4	2	2	2	3	4	4	1	1	2	2	3	1	2	2	2	1	1	1	1	2	2
040FD	Fem	3	2	2	1	2	3	1	1	2	3	3	3	3	4	2	2	3	3	3	3	2	2	1	1	2	1	2	2	2	2	2	2	2	2	2
001Mc	Male	2	2	2	1	1	1	2	2	1	1	1	1	1	1	2	2	1	1	3	2	2	3	2	2	1	2	2	2	2	2	2	2	2	2	2
005Mc	Male	3	3	3	3	3	3	1	1	4	4	1	1	4	4	2	2	1	1	4	4	2	2	1	2	1	2	2	3	3	1	1	1	1	1	2
007M	Male	1	2	1	1	2	3	2	1	2	3	2	1	3	4	2	2	3	2	4	4	2	2	1	1	1	1	1	4	4	3	3	1	1	1	1
010M	Male	2	3	1	3	3	3	3	3	4	4	3	3	4	4	2	2	1	1	4	4	2	2	1	1	2	1	2	5	5	3	3	1	1	2	2
011Mc	Male	2	2	1	1	1	1	3	3	1	1	3	3	1	1	1	2	1	1	4	4	2	2	2	1	1	1	3	2	2	1	1	1	1	2	1
012M	Male	2	2	2	2	2	3	3	3	1	4	1	1	3	4	3	3	1	3	4	4	1	2	1	1	1	1	2	2	2	1	1	1	1	1	1
013M	Male	2	3	2	1	1	1	2	2	1	1	3	3	1	1	2	2	3	3	2	2	3	3	2	1	1	2	2	4	4	1	1	1	1	2	2
013Mc	Male	1	3	2	2	1	1	3	3	1	1	2	2	2	2	2	2	2	2	3	3	2	2	2	2	1	1	2	4	4	2	2	1	1	1	1
016M	Male	1	2	1	1	3	3	1	1	3	3	2	2	3	3	2	2	3	3	3	3	3	3	1	1	1	1	4	1	1	1	1	1	1	1	1
19Mc	Male	2	2	1	2	2	3	1	1	1	2	2	2	3	4	2	2	1	2	3	4	2	2	2	1	1	1	2	4	3	1	1	1	1	2	1
022Mc	Male	2	3	1	2	1	2	3	3	1	2	1	1	3	3	2	2	1	1	3	3	2	2	2	2	1	1	2	4	4	1	1	1	1	2	2
025M	Male	2	3	2	3	1	2	3	3	1	1	3	3	2	1	2	2	3	1	3	3	2	2	2	2	1	2	2	2	2	1	1	1	1	1	1
026M	Male	2	3	1	2	3	1	2	2	2	1	2	1	3	3	1	1	3	2	4	4	2	2	2	2	1	1	2	4	4	1	1	1	1	1	1
028Mc	Male	2	3	1	1	2	3	1	1	3	3	2	2	2	2	2	2	2	2	3	3	1	2	2	2	1	2	2	4	4	1	1	1	1	1	1
031M	Male	2	2	1	1	2	2	1	1	2	1	1	1	3	3	2	1	1	1	4	4	1	2	1	1	1	1	2	5	5	1	1	1	1	1	1
038M	Male	2	2	2	2	1	2	2	2	1	2	2	2	3	3	1	2	3	3	3	3	3	3	2	2	1	1	3	4	4	1	1	1	1	1	1
040M	Male	2	2	3	2	2	3	2	2	1	4	2	3	3	4	3	3	2	2	3	4	2	2	1	2	1	1	1	2	2	1	1	1	1	2	2
041M	Male	2	2	2	3	3	3	3	3	3	4	2	1	4	4	1	1	3	1	4	4	2	3	2	1	1	1	2	4	4	1	1	1	1	1	1
044M	Male	2	3	1	2	3	3	2	2	4	4	2	2	4	4	2	2	3	3	3	3	2	3	2	2	1	2	1	4	4	1	1	1	1	2	1
046M	Male	2	2	3	2	2	2	2	2	2	2	2	2	4	4	1	1	2	2	4	4	3	3	2	2	1	2	2	4	4	1	1	1	1	1	2
049M	Male	3	2	2	3	2	3	3	2	2	4	3	1	3	4	3	3	1	1	3	4	1	1	2	2	1	1	1	4	4	2	2	1	1	1	1
050M	Male	2	2	1	2	3	3	2	2	3	3	3	2	4	4	1	1	3	2	3	3	2	3	2	2	1	3	2	3	3	2	2	2	2	2	2
051M	Male	1	2	1	1	1	2	1	1	1	2	3	3	1	3	3	3	3	3	3	4	2	2	2	2	1	1	3	2	2	1	1	1	1	2	2
054M	Male	2	2	2	1	2	2	2	1	2	2	2	2	3	4	1	1	2	2	3	4	2	2	2	2	1	1	2	3	3	2	2	1	1	1	2
056M	Male	2	1	1	2	2	2	2	1	3	3	2	3	3	3	2	2	3	3	3	3	2	1	2	2	1	2	2	4	4	2	2	1	1	1	1
062M	Male	1	2	3	3	2	2	1	1	3	2	3	3	4	4	2	1	3	3	4	4	2	2	1	1	1	3	2	3	3	3	3	3	3	1	2
066M	Male	2	3	2	1	2	2	3	1	1	2	3	1	1	2	2	2	3	1	3	3	2	2	2	2	1	1	3	1	1	1	1	1	1	1	1
068M	Male	2	3	1	1	3	3	1	1	4	4	3	3	4	4	2	2	3	3	4	4	3	3	1	1	1	2	2	3	3	3	3	2	2	2	1

070M	Male	2	3	2	3	2	1	2	1	2	1	2	1	2	1	2	2	3	2	3	3	3	3	2	2	1	3	3	4	4	3	3	1	1	1	1
077M	Male	2	2	3	2	3	3	1	1	3	4	2	2	4	4	2	2	3	3	4	4	3	3	1	1	1	1	3	4	4	1	1	1	1	1	1
086M	Male	2	1	3	3	2	3	1	1	1	3	2	2	2	4	2	2	3	3	4	4	1	1	2	2	1	1	3	4	4	1	1	1	1	1	2
091M	Male	2	2	1	1	3	3	1	1	4	3	3	3	4	4	2	2	3	3	4	4	3	3	1	1	1	1	2	3	3	1	1	1	1	1	1
094M	Male	2	2	2	2	2	3	1	1	1	3	2	1	1	4	2	2	3	3	3	4	1	1	1	1	1	2	1	3	3	1	1	1	1	2	1
095M	Male	2	2	2	2	2	1	2	2	2	1	1	1	3	3	2	2	1	1	4	4	2	2	2	2	2	2	2	5	5	3	3	1	1	1	1
097M	Male	2	3	1	1	1	3	2	2	1	3	3	3	1	2	2	2	3	3	2	3	1	3	2	2	1	1	2	2	2	1	1	1	1	1	1
001M D	Male	3	3	1	1	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	2	2	2	1	2	3	3	3	3	3	3	3	3	1	2
003M D	Male	2	3	1	1	3	3	2	2	4	4	1	1	4	4	2	2	1	1	4	4	1	1	1	2	2	2	2	3	3	1	1	1	1	2	1
004M D	Male	3	2	3	3	3	2	1	1	3	1	3	3	4	4	2	2	3	2	4	4	2	2	1	1	1	1	1	2	2	1	1	1	1	2	2
008M D	Male	1	3	2	3	3	3	1	2	2	4	1	1	3	4	2	2	1	1	4	4	1	2	1	1	2	2	2	3	3	2	2	1	1	2	1
010M D	Male	2	2	1	1	1	3	2	1	1	3	1	1	1	4	2	2	1	1	3	4	1	1	2	2	1	1	2	4	4	2	2	1	1	2	1
011M D	Male	1	2	1	1	1	3	3	2	1	3	1	1	1	3	2	2	1	1	3	3	2	2	2	2	1	1	2	3	3	1	1	1	1	1	2
012M D	Male	2	3	1	1	1	3	1	1	1	2	3	2	3	3	2	2	2	1	3	4	1	2	2	1	1	1	2	2	2	1	1	1	1	1	2
013M D	Male	3	2	1	1	2	1	2	2	1	1	3	3	4	4	2	2	3	3	4	4	2	2	2	2	1	1	2	2	2	1	1	1	1	2	1
014M D	Male	3	2	1	1	1	2	2	2	1	2	3	3	1	2	2	2	1	1	2	3	2	3	2	2	1	1	2	4	4	1	1	1	1	2	1
015M D	Male	1	2	3	3	2	2	2	2	1	1	1	2	2	3	2	2	1	1	3	3	2	1	2	2	1	1	2	4	4	2	2	1	1	1	2
016M D	Male	2	1	1	1	2	3	1	1	2	1	2	1	3	4	2	2	2	2	3	4	2	2	2	2	1	1	2	4	4	1	1	1	1	2	2
018M D	Male	1	1	1	1	2	3	1	1	1	4	3	2	3	4	2	2	3	3	4	4	2	2	2	2	1	1	2	2	2	1	1	1	1	1	1
019M D	Male	3	3	2	3	1	1	2	1	1	1	3	3	4	4	2	2	3	3	4	4	2	2	1	2	1	2	2	1	1	1	1	1	1	2	2
024M D	Male	2	2	2	2	2	2	1	2	1	1	2	2	3	3	2	2	1	1	4	4	2	2	2	2	1	1	1	4	4	1	1	2	2	1	2
027M D	Male	3	2	1	1	1	2	1	1	1	1	2	2	3	4	2	2	3	3	3	4	3	1	2	2	1	1	2	3	3	2	2	1	1	2	2
028M D	Male	2	2	1	1	2	3	2	2	2	2	1	1	2	3	2	2	3	3	3	3	1	1	2	2	1	1	2	2	2	1	1	1	1	2	2
029M D	Male	2	3	1	1	2	3	1	1	2	4	1	1	4	4	2	2	1	1	4	4	2	2	1	1	1	1	2	3	3	2	2	2	2	1	1
032M D	Male	3	2	2	2	2	3	3	3	2	4	3	1	3	4	2	2	1	1	3	4	1	1	2	2	1	1	2	3	3	2	2	1	1	2	2
033M D	Male	3	2	2	2	2	3	2	1	2	4	1	1	3	4	2	2	1	2	3	4	1	1	1	1	1	1	2	4	4	2	2	1	1	2	2

037MD	Male	3	3	1	1	1	3	2	2	1	1	1	1	3	3	3	3	1	1	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1
041MD	Male	1	3	2	2	2	3	1	1	2	3	3	3	4	4	2	2	3	3	4	4	1	2	2	2	1	2	2	3	3	2	2	3	2	2	2
002SF	Fem	3	2	3	3	1	1	2	2	1	1	3	3	1	2	2	2	3	2	3	3	1	1	1	1	3	3	2	3	2	3	3	2	2	2	2
004SF	Fem	3	2	2	3	1	3	2	2	2	4	3	3	3	4	2	1	3	3	4	4	2	1	2	2	3	2	2	4	4	2	1	3	3	1	1
005SF	Fem	2	2	2	3	3	3	1	1	3	4	3	3	4	4	2	1	3	3	4	4	1	1	2	1	1	1	3	2	2	3	3	3	3	1	1
007SF	Fem	1	2	3	2	1	3	2	2	1	3	3	3	3	4	2	1	3	3	4	4	1	1	2	2	2	2	3	2	2	3	1	3	1	2	2
012SF	Fem	3	2	2	1	1	1	3	3	1	1	2	2	1	3	2	1	1	1	3	4	2	2	2	2	3	2	3	2	2	1	1	1	1	2	2
015CSM	Male	2	2	1	2	2	1	1	1	2	1	2	3	3	2	2	2	3	3	4	4	3	2	2	2	1	1	2	2	2	2	2	3	3	1	1
015SM	Male	3	2	2	3	1	1	2	2	1	1	2	3	1	2	3	3	1	1	3	4	1	1	2	1	1	2	2	2	2	2	1	2	1	1	1
017SF	Fem	2	2	3	2	1	1	1	1	1	1	2	1	2	1	2	2	1	1	4	2	2	2	2	2	2	1	3	2	2	1	1	1	1	1	2
019SF	Fem	1	2	2	2	2	3	1	1	3	4	2	1	4	4	2	2	3	1	4	4	1	1	1	1	2	1	3	2	2	2	1	2	1	1	1
020SF	Fem	2	2	3	3	1	2	1	1	1	2	2	1	2	4	2	2	2	3	4	4	1	1	1	1	2	1	3	4	4	2	1	2	1	2	2
021SF	Fem	2	2	3	3	1	1	2	2	1	1	3	3	1	3	2	2	3	2	3	4	2	2	2	2	3	1	3	2	2	3	3	3	2	2	2
023CSF	Fem	3	3	1	1	2	3	1	1	2	3	3	3	2	4	2	2	3	3	3	4	1	1	1	1	2	1	3	2	2	3	3	2	2	2	2
023SM	Male	2	2	1	1	1	3	1	1	1	3	1	1	3	4	2	2	2	1	4	4	1	1	1	1	1	2	2	4	4	2	1	1	1	1	1
024SF	Fem	2	2	3	3	1	3	1	1	2	4	3	3	3	4	2	2	3	3	4	4	1	1	1	1	2	2	3	4	4	3	3	1	1	2	2
025CSF	Fem	1	2	1	2	1	1	1	1	2	2	3	3	3	3	2	2	3	3	4	4	1	1	1	1	3	2	2	4	4	3	3	1	1	1	1
026SF	Fem	2	2	2	1	1	2	2	1	1	2	2	2	2	4	2	2	3	3	4	4	1	1	2	1	2	2	3	2	2	2	1	2	1	2	2
029CSM	Male	2	3	1	1	3	1	1	1	3	1	3	3	4	3	2	2	3	3	4	4	1	1	1	2	1	1	2	3	3	1	2	1	1	1	1
041SF	Fem	2	3	1	1	1	1	1	2	2	2	3	3	3	4	2	2	3	3	4	4	2	2	1	1	3	1	3	4	4	3	3	1	1	1	1
042SF	Fem	1	3	3	1	2	2	1	1	2	2	3	3	3	3	2	2	3	3	4	4	1	2	1	2	2	2	2	2	2	3	2	2	2	2	2
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058SM	Male	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	3	1	1	2	3	1	1	2	2	1	1	2	3	3	2	2	1	1	1	1
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062SM	Male	3	3	1	1	2	2	1	1	2	2	3	3	3	3	3	3	1	1	4	4	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1
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069SM	Male	3	3	2	2	2	2	1	1	1	1	1	1	2	2	3	3	1	1	3	3	1	1	2	1	1	2	2	4	4	2	1	2	1	1	1

070SM	Male	3	2	1	1	1	2	2	2	1	2	1	2	3	3	2	2	1	2	4	4	1	2	1	1	1	3	2	3	3	1	1	1	1	1	1
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088SM	Male	1	3	1	1	1	2	1	2	1	2	3	3	3	2	2	2	3	3	4	3	1	1	1	2	1	2	2	4	4	3	3	2	2	1	1
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093SF	Fem	3	3	2	3	2	3	2	2	1	3	3	3	3	4	2	2	3	3	4	4	2	2	1	1	2	3	3	5	5	3	3	3	1	1	1
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096SF	Fem	1	2	3	2	1	1	1	1	1	1	2	2	1	3	3	3	3	3	3	4	1	1	2	1	2	1	3	2	2	3	3	3	2	1	1
101SM	Male	2	1	1	1	1	2	1	1	1	2	2	2	3	3	2	2	2	2	4	4	1	1	1	1	1	2	1	4	4	2	1	1	1	1	1
104SF	Fem	3	3	3	3	3	3	1	1	3	3	3	3	4	4	2	2	3	3	4	4	1	1	1	2	2	2	3	3	3	3	3	3	2	2	1
105SF	Fem	2	1	1	1	1	2	2	2	1	2	3	3	1	3	2	2	3	2	2	4	1	2	2	2	2	2	3	2	2	3	2	3	1	2	2
106SM	Male	2	3	2	3	1	3	2	2	1	2	1	1	3	4	3	3	1	1	4	4	1	1	1	1	1	2	2	2	2	1	1	1	1	2	1
107SM	Male	3	3	3	3	3	2	1	1	3	2	1	1	4	4	2	2	1	1	4	4	1	1	1	1	1	3	2	3	3	2	2	1	1	1	1
108SF	Fem	3	3	3	3	3	3	1	1	3	3	1	1	3	3	2	2	1	1	4	4	1	1	1	1	2	1	1	4	4	3	3	2	3	1	1
109SF	Fem	3	3	1	1	2	1	1	1	2	1	1	3	3	1	2	2	1	1	4	3	1	1	1	1	2	2	3	2	2	3	3	3	3	1	1
110SF	Fem	3	2	3	3	2	1	1	1	2	1	3	3	2	2	2	2	3	3	4	4	1	1	2	2	2	1	3	1	1	2	2	3	2	1	1
111SM	Male	3	1	2	2	2	2	1	1	2	2	3	3	2	2	2	2	3	3	3	4	1	1	2	1	1	2	1	2	2	3	3	2	2	1	1
112SM	Male	2	3	1	1	2	2	2	2	2	2	1	1	4	4	3	3	1	1	4	4	1	1	1	1	1	2	2	1	1	3	3	2	2	1	1
114SM	Male	2	2	3	3	1	1	1	1	1	1	3	1	2	1	2	2	2	1	3	2	1	1	1	1	1	3	2	1	1	3	3	3	2	1	1
133SF	Fem	1	3	1	2	1	1	1	1	1	1	3	3	1	3	2	2	3	3	3	4	1	1	2	1	2	2	3	2	2	2	2	2	2	2	2
134SM	Male	3	3	3	3	2	1	1	1	2	1	1	1	3	3	2	2	1	1	4	4	1	1	1	1	1	2	2	1	1	3	3	3	3	1	1

144SF	Fem	3	2	2	2	2	1	2	2	2	1	3	3	3	3	2	2	3	3	4	4	1	1	1	1	2	1	3	2	2	2	2	1	1	1	1
178SM	Male	3	2	1	2	2	1	1	1	2	1	1	1	3	3	3	3	3	1	4	4	3	2	1	2	1	1	2	1	1	1	1	1	1	2	2
001CS F	Fem	3	2	2	3	3	3	1	1	3	2	3	3	4	3	2	2	2	3	4	3	2	1	2	1	3	2	2	4	4	2	2	1	1	1	1
002CS M	Male	2	1	2	1	2	2	2	2	2	2	1	1	4	4	2	2	1	2	4	4	1	1	1	1	1	1	1	5	5	2	2	1	1	1	1
003CS M	Male	3	3	3	3	1	2	2	2	1	2	2	1	3	4	2	2	1	1	4	4	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1
004CS M	Male	3	2	1	2	3	3	1	1	2	2	3	2	2	3	2	2	3	2	4	4	1	1	2	2	1	1	2	3	3	1	1	1	1	1	1
005CS F	Fem	2	2	1	1	3	1	1	1	3	1	3	3	4	3	2	2	3	3	4	4	1	1	2	2	2	2	4	4	4	2	2	1	1	2	2
006CS M	Male	3	3	2	2	2	1	2	2	2	2	2	3	4	4	2	2	1	2	4	4	1	1	1	1	1	1	2	2	2	2	2	1	2	1	1
007CS M	Male	2	2	3	3	3	3	1	1	4	3	1	1	4	4	2	2	1	1	4	4	3	3	1	1	1	2	2	4	4	2	3	1	2	1	1
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009CS M	Male	2	3	1	1	3	3	1	1	4	2	2	2	4	4	2	2	2	2	4	4	1	2	1	1	1	1	2	2	2	2	2	2	2	1	1
010CS M	Male	3	2	2	2	3	2	2	2	2	2	2	2	3	3	2	2	2	1	4	4	1	1	1	1	1	2	1	4	4	3	3	2	2	1	1
011CS F	Fem	2	2	2	2	3	2	2	2	2	2	2	2	3	3	2	2	2	2	3	4	3	3	2	2	2	2	3	2	2	2	2	2	2	2	2
012CS M	Male	2	2	1	1	2	1	2	2	2	1	1	1	2	2	3	3	1	1	4	4	1	1	2	2	1	1	1	2	2	3	3	2	3	1	1
013CS F	Fem	3	3	3	3	1	1	1	1	1	1	2	2	3	3	2	2	2	2	4	4	1	1	1	1	2	2	2	3	3	3	3	2	2	2	2
014CS M	Male	2	3	1	1	1	2	2	2	4	3	2	2	4	4	2	2	3	3	4	4	2	2	1	1	1	1	2	2	2	1	1	1	1	1	1
016CS F	Fem	2	2	3	3	3	3	1	1	4	4	3	3	4	4	2	2	3	3	4	4	1	1	1	1	2	2	3	4	4	3	3	2	2	2	2
017CS F	Fem	2	2	3	3	3	2	1	1	3	2	2	2	4	4	2	2	2	1	4	4	1	1	1	1	3	3	3	4	4	3	3	2	2	2	2
018CS F	Fem	2	3	2	2	2	2	2	2	2	2	2	2	3	3	2	2	3	3	4	4	1	1	1	2	2	1	4	2	2	3	3	2	2	3	3
019CS F	Fem	3	2	3	3	3	3	2	2	3	2	3	3	4	3	2	2	3	3	4	4	1	1	1	1	3	3	3	5	5	3	3	1	1	2	3
020CS M	Male	1	2	1	2	3	3	2	2	3	3	2	2	4	4	3	3	2	2	4	4	1	1	1	1	1	1	1	2	2	3	3	2	2	2	3
021CS F	Fem	2	2	1	1	3	2	2	2	3	2	2	2	4	3	2	2	2	3	4	4	1	1	1	1	3	2	2	3	3	2	2	1	1	2	2
022CS F	Fem	2	3	3	3	1	3	1	1	1	3	2	2	3	4	2	2	2	2	4	4	2	2	1	1	2	2	3	4	4	3	3	2	2	2	2
024CS M	Male	2	3	3	1	1	1	2	2	2	1	1	1	3	3	2	2	1	1	4	4	1	1	2	1	1	1	2	3	3	2	2	1	1	1	1
026CS F	Fem	3	2	2	2	3	2	2	2	3	2	2	2	4	4	2	2	1	2	4	4	1	1	1	1	3	3	2	4	4	1	1	1	1	1	1

027CSF	Fem	3	2	3	2	1	1	3	3	1	1	3	3	3	3	2	2	2	3	4	4	2	2	1	1	3	2	3	2	2	3	2	2	1	2	1
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031CSF	Fem	2	2	2	2	2	2	2	2	2	2	2	2	3	4	2	2	3	3	4	4	1	1	2	2	3	1	2	4	4	2	2	1	1	1	1
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001SF	Fem	3	2	2	2	3	3	2	2	3	4	3	3	4	4	2	2	1	1	4	4	2	2	2	2	3	2	2	3	3	2	2	2	1	1	1
003SM	Male	2	3	2	3	2	2	2	2	2	2	2	2	3	3	3	3	1	1	4	4	2	2	2	2	1	1	3	4	4	2	2	2	2	2	1
006SF	Fem	2	2	2	2	2	3	2	2	2	4	3	2	4	4	2	2	2	2	4	4	1	1	1	1	3	2	3	2	2	3	3	3	2	2	2
008SF	Fem	2	2	1	1	3	3	1	1	2	4	2	2	4	4	2	2	2	3	4	4	1	1	1	1	2	1	3	2	2	3	2	2	2	1	2
009SM	Male	2	2	2	2	1	2	3	3	1	2	2	3	2	3	2	2	2	3	3	3	1	1	2	1	1	2	1	3	3	2	2	2	1	1	1
010SM	Male	2	3	2	3	2	3	2	2	2	4	2	2	4	4	2	2	2	2	4	4	1	1	1	1	1	2	1	4	4	3	3	2	2	1	1
011SF	Fem	2	2	3	3	1	2	3	3	1	2	3	3	1	4	2	2	2	2	3	4	2	2	1	1	3	3	3	4	4	3	2	3	1	1	1
013SF	Fem	1	3	3	2	1	2	1	1	1	3	3	2	2	4	2	2	3	3	4	4	1	1	1	1	2	1	3	2	2	3	2	2	1	1	1
014SF	Fem	2	3	3	3	1	2	3	3	1	1	3	1	1	2	3	3	3	1	3	4	2	1	2	1	2	1	3	2	2	2	2	1	1	1	1
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018SF	Fem	3	3	1	1	1	3	1	1	2	4	3	2	4	4	3	3	3	3	4	4	1	1	1	1	2	1	3	4	4	3	2	3	2	1	1
022SM	Male	3	2	1	1	2	3	2	2	1	4	1	1	3	4	2	2	1	1	4	4	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1
025SF	Fem	2	2	3	2	2	1	1	1	2	2	3	3	3	4	2	2	3	3	4	4	1	1	1	1	3	2	1	4	4	3	3	1	1	1	1
027SM	Male	3	1	1	1	2	3	2	2	1	4	2	3	3	4	2	2	3	3	4	4	1	1	2	1	1	1	3	5	5	3	3	1	1	1	1
028SM	Male	1	3	1	2	2	3	1	1	2	4	1	1	3	4	2	2	1	1	4	4	1	1	2	1	1	2	2	2	2	2	2	1	1	1	1
029SM	Male	3	1	1	1	1	3	2	2	1	4	2	1	3	4	2	2	1	1	4	4	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1
030SF	Fem	3	2	3	2	3	3	2	2	4	4	2	2	4	4	2	2	1	1	4	4	1	1	1	2	2	2	3	2	2	1	1	1	1	1	2
031SF	Fem	2	2	1	1	2	2	2	2	2	2	2	2	4	4	2	2	3	3	4	4	1	1	1	1	3	2	3	4	4	2	2	1	1	2	2
032SF	Fem	2	2	2	3	3	3	3	3	4	3	3	3	4	4	2	3	3	3	4	4	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1
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034SF	Fem	2	2	3	3	1	2	3	3	1	2	3	3	2	4	2	2	3	3	4	4	1	1	1	1	3	3	3	5	5	3	3	1	1	2	1
035SM	Male	3	3	2	2	2	2	2	2	2	2	2	2	4	4	2	2	1	1	4	4	2	2	1	1	1	1	2	3	3	2	2	2	2	1	1
036SF	Fem	1	2	3	3	3	2	2	2	3	2	3	3	4	4	2	2	3	3	4	4	1	1	1	1	3	3	3	4	4	3	3	3	2	1	1
037SM	Male	2	2	1	2	3	3	1	1	2	3	1	1	4	4	2	2	2	1	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1

038SM	Male	1	2	1	1	2	3	1	1	2	2	3	3	4	4	2	2	2	2	4	4	1	1	1	1	1	1	3	1	1	1	1	1	1	2	1
039SF	Fem	3	2	1	1	3	3	2	2	4	4	3	3	4	4	2	2	3	3	4	4	1	1	1	1	2	1	3	2	2	3	2	2	2	3	2
040SM	Male	3	2	1	1	3	2	2	2	4	2	2	2	4	4	2	2	1	1	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1
043SF	Fem	1	3	2	2	2	2	2	2	2	2	2	1	3	4	2	2	2	1	4	4	2	2	3	1	2	1	2	2	2	3	3	2	2	2	2
046SM	Male	3	2	3	3	3	2	3	3	3	2	1	1	4	3	2	2	1	1	4	4	2	2	1	1	2	3	2	4	4	3	2	3	2	1	1
047SM	Male	1	2	1	1	1	1	3	3	1	1	1	1	3	3	2	2	1	1	4	4	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1
048SM	Male	1	3	3	3	3	1	3	3	3	1	2	1	4	1	2	2	1	1	4	3	2	2	1	2	1	3	2	2	2	2	1	2	1	2	2
049SF	Fem	2	2	2	2	2	1	2	2	2	1	3	3	3	3	2	2	3	3	4	4	1	1	1	1	3	3	3	3	3	3	3	3	3	2	1
050SM	Male	1	2	2	2	3	2	1	1	2	1	3	3	3	2	2	2	2	2	4	4	1	1	2	2	1	1	2	2	2	1	3	1	3	2	1
051SF	Fem	3	2	2	2	2	1	3	3	2	1	2	2	3	2	2	2	2	2	4	3	1	1	1	1	3	3	3	2	2	3	3	2	3	1	1
052SM	Male	2	2	3	3	3	3	2	2	2	3	1	1	4	4	3	3	1	1	4	4	1	1	1	1	1	2	2	3	3	1	1	1	1	1	1
053SM	Male	2	1	1	1	3	2	2	2	3	2	1	1	4	4	2	2	1	1	4	4	1	1	1	1	1	3	2	4	4	2	2	1	1	1	1
054SF	Fem	2	1	3	3	2	2	1	1	1	2	2	3	3	4	2	2	3	3	4	4	2	2	1	2	3	1	3	2	2	2	2	2	2	2	2
056SM	Male	3	3	3	3	3	3	2	2	4	4	3	3	4	4	2	2	2	2	4	4	1	1	1	1	2	2	3	5	5	3	3	1	1	1	1
057SF	Fem	2	2	3	3	2	3	2	2	1	4	3	3	3	4	2	2	2	3	4	4	1	1	2	2	2	2	3	2	2	1	1	1	1	3	1
060SF	Fem	3	2	3	3	2	2	2	2	2	2	3	3	4	4	2	2	3	3	4	4	1	1	2	1	2	2	3	3	3	3	3	3	3	1	2
061SF	Fem	2	3	3	3	2	3	1	1	2	4	3	3	4	4	2	2	3	3	4	4	1	1	1	1	2	2	3	2	2	3	3	2	2	2	2
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065SF	Fem	3	2	2	2	1	2	2	2	1	2	3	3	2	3	2	2	2	2	4	4	1	1	1	1	2	2	3	4	4	2	2	1	1	1	1
066SF	Fem	2	3	3	3	1	2	2	2	1	2	3	3	2	2	2	2	3	3	4	4	1	2	2	2	2	2	3	4	4	2	2	3	2	2	2
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085SF	Fem	2	1	2	2	1	1	2	2	1	1	3	1	2	3	2	2	3	1	4	4	1	1	1	1	2	2	3	2	2	2	2	2	2	3	1
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087SF	Fem	3	1	3	3	1	1	3	3	2	1	3	3	3	1	3	3	3	3	4	4	3	3	1	1	2	2	1	2	2	3	3	3	2	1	1
091SM	Male	2	2	2	2	2	3	2	2	1	3	1	2	4	4	2	3	1	1	4	4	1	1	2	2	1	2	2	2	2	1	1	1	1	1	1
092SF	Fem	2	2	2	2	2	2	2	2	2	3	2	1	4	4	2	2	3	2	4	4	1	1	1	1	2	2	3	2	2	3	3	2	2	1	1

095SM	Male	3	2	3	3	3	3	1	1	3	4	3	1	4	4	2	2	2	1	4	4	1	1	2	2	2	2	2	5	5	3	3	1	1	1	1
097SF	Fem	2	2	2	1	3	3	2	2	4	4	2	2	4	4	2	2	3	3	4	4	1	1	2	2	2	2	3	2	2	2	2	1	1	1	1
098SF	Fem	1	2	2	2	1	2	2	2	1	2	3	3	3	4	3	3	3	3	4	4	1	1	2	2	2	2	3	4	4	3	2	1	1	2	1
099SM	Male	2	2	2	1	2	2	1	1	2	2	3	1	3	4	2	2	2	1	4	4	1	1	1	2	1	2	3	4	4	2	2	1	1	1	1
100SM	Male	2	3	1	1	1	3	1	1	1	4	2	2	2	4	2	2	2	2	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1
102SF	Fem	3	1	3	3	1	3	2	2	1	4	3	3	2	4	2	2	3	3	4	4	1	1	1	1	2	2	3	3	3	3	3	2	2	2	1
103SF	Fem	2	3	2	2	1	3	1	1	1	3	3	3	1	4	2	2	1	1	3	4	1	1	2	2	2	2	3	4	4	3	3	2	2	1	1
115SF	Fem	3	3	3	3	1	3	1	1	1	2	2	3	2	4	2	2	3	3	4	4	2	2	2	1	2	2	3	3	3	3	3	3	2	1	3
116SF	Fem	3	2	3	3	2	1	2	2	2	1	1	1	3	3	2	2	2	2	4	4	1	1	1	1	2	1	3	2	2	3	3	3	3	2	2
117SF	Fem	2	3	2	2	2	3	1	1	2	2	2	2	4	4	3	2	2	2	4	4	1	1	1	1	2	2	1	1	1	2	2	2	2	1	1
118SM	Male	2	2	3	3	2	2	1	1	1	1	1	1	3	1	3	3	1	1	4	4	1	1	1	1	1	2	1	4	4	3	3	2	2	1	1
119SM	Male	2	3	1	1	2	3	1	1	1	2	2	3	3	3	2	2	2	2	4	4	1	1	1	1	1	2	2	2	2	3	3	2	2	1	1
120SM	Male	3	2	3	3	3	3	2	2	3	2	3	3	4	3	2	2	3	3	4	4	1	1	1	1	1	3	2	4	4	3	3	2	2	1	1
121SM	Male	2	2	3	3	2	2	1	1	2	2	2	2	3	3	3	3	1	1	4	4	1	1	1	2	1	2	2	1	1	2	2	2	2	1	1
122SF	Fem	2	2	2	2	2	1	2	2	2	1	3	3	4	1	3	3	1	2	4	3	1	1	1	1	3	3	2	2	2	2	2	2	2	1	2
123SF	Fem	1	3	3	3	1	1	3	3	1	1	2	2	3	1	2	2	1	2	4	4	1	2	1	1	3	3	2	4	4	3	3	2	2	1	1
124SF	Fem	2	3	3	3	1	2	2	2	1	2	3	3	2	4	2	2	2	2	4	4	1	1	1	1	3	3	2	4	4	3	3	3	3	2	1
125SM	Male	3	2	1	2	3	3	1	1	2	2	3	2	2	2	2	2	3	2	4	4	2	2	2	2	1	3	2	2	2	2	2	2	2	1	1
126SF	Fem	2	1	2	2	1	2	1	1	1	2	3	2	2	4	3	3	3	3	4	4	1	1	1	1	3	2	3	2	2	2	2	2	2	1	1
127SF	Fem	2	1	3	3	1	1	3	3	1	1	3	3	3	3	2	2	3	3	4	4	1	1	1	1	3	3	2	2	2	2	2	2	2	1	1
128SF	Fem	3	2	3	3	2	2	2	2	4	2	3	3	4	3	3	3	2	2	4	4	1	1	1	1	3	3	2	4	4	3	3	3	3	1	1
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131SM	Male	2	1	1	1	2	2	1	1	2	2	2	3	3	3	2	2	3	3	4	4	1	1	1	1	1	3	2	2	2	2	2	2	2	1	1
132SM	Male	2	3	2	2	2	2	1	1	2	2	3	2	3	3	2	2	3	1	4	4	1	1	1	1	1	3	1	2	2	2	2	2	2	1	1
135SF	Fem	2	2	3	3	2	3	2	2	1	4	2	2	2	4	2	2	3	3	4	4	1	1	2	2	2	1	3	4	4	3	3	1	2	1	1
136SF	Fem	1	3	3	3	1	1	1	1	1	1	3	3	3	3	2	2	2	2	4	4	2	1	1	1	3	3	2	4	4	3	3	2	2	1	1
137SF	Fem	2	2	3	3	1	2	3	3	1	1	2	2	3	3	3	3	1	1	4	4	1	1	1	1	3	3	2	3	3	3	3	3	2	2	1
138SM	Male	3	2	1	1	2	3	2	2	2	3	3	3	2	4	2	2	3	3	4	4	2	2	2	1	1	2	2	3	3	1	1	1	1	1	1
139SM	Male	2	2	2	2	2	2	2	2	2	2	1	3	2	2	2	2	1	2	4	4	1	1	1	1	1	2	2	2	2	2	1	2	1	1	1

140SM	Male	2	3	3	3	2	1	2	2	2	1	3	3	3	3	1	1	1	2	4	4	1	1	1	1	2	3	1	5	5	3	3	3	2	1	1
141SM	Male	2	2	3	3	3	2	1	1	2	1	3	3	3	2	3	3	3	3	4	4	3	3	2	2	1	1	1	2	2	2	2	2	2	2	2
143SF	Fem	1	2	3	3	3	3	2	2	3	2	2	2	4	4	2	2	2	2	4	4	1	1	1	1	2	1	2	2	2	2	3	1	2	2	1
145SM	Male	2	2	1	2	2	3	2	2	2	3	3	3	4	4	2	2	3	3	4	4	1	1	2	1	1	1	3	4	4	3	3	2	2	1	1
146SM	Male	1	3	2	2	1	3	3	3	1	3	1	1	3	4	2	2	1	1	4	4	1	1	1	2	1	2	2	2	2	1	1	1	1	1	1
147SM	Male	2	1	2	2	1	1	3	3	1	1	1	1	2	1	3	3	1	1	4	2	1	1	1	1	2	3	2	3	3	3	3	2	3	1	1
148SM	Male	2	3	1	3	1	2	1	1	1	1	2	2	1	2	2	2	1	1	3	4	1	1	1	2	1	2	3	2	2	1	1	1	1	1	1
149SF	Fem	1	2	3	3	1	3	2	2	1	3	3	3	1	4	1	1	3	3	2	4	1	1	1	2	2	3	3	4	4	3	3	3	2	2	2
150SF	Fem	2	1	3	3	1	1	3	3	1	2	1	1	3	3	2	2	1	3	4	4	1	1	1	1	3	3	3	3	3	3	3	3	3	1	2
152SF	Fem	2	2	2	1	3	2	1	1	4	2	3	3	4	3	3	3	3	3	4	4	1	1	2	2	2	2	3	4	4	3	3	3	2	2	2
153SF	Fem	2	2	3	3	2	2	1	1	2	2	3	3	3	3	2	2	2	3	4	4	1	1	1	1	3	3	2	4	4	3	3	2	2	1	1
154SM	Male	2	3	3	2	2	3	1	1	2	2	3	2	4	4	3	3	1	2	4	4	3	2	2	2	1	1	2	1	1	2	2	2	2	1	1
155SM	Male	3	2	1	1	2	2	1	1	2	3	1	1	3	4	1	1	1	1	4	4	1	1	2	1	1	2	2	2	2	1	1	1	1	1	1
156SF	Fem	2	1	3	3	1	2	3	3	1	1	3	3	3	3	2	2	3	3	4	4	1	1	1	2	2	3	3	4	4	3	3	2	2	2	1
157SM	Male	2	3	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	4	4	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1
158SF	Fem	3	3	3	3	1	1	2	2	1	2	2	3	1	3	2	2	2	2	3	4	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1
159SF	Fem	3	3	3	3	1	3	1	2	3	3	1	3	3	4	2	2	3	3	4	4	1	1	1	1	3	3	3	2	2	3	3	2	2	1	2
160SM	Male	1	2	3	3	1	1	1	1	1	1	3	3	1	2	2	2	2	2	2	4	1	1	1	2	1	2	2	4	4	3	2	3	1	1	1
161SM	Male	3	2	2	2	1	1	2	2	1	1	2	1	1	1	3	3	2	1	3	2	2	2	2	1	1	2	3	2	2	1	1	1	1	1	1
162SM	Male	3	1	2	2	1	1	1	1	1	1	3	2	1	1	2	2	2	1	3	3	1	1	1	2	1	2	2	1	1	1	1	1	1	1	1
163SM	Male	1	2	3	2	2	1	1	1	1	1	2	1	2	1	3	3	1	1	4	3	1	1	2	1	1	2	2	2	2	1	1	1	1	1	1
164SM	Male	3	3	1	1	1	2	2	2	1	2	1	1	2	3	2	2	1	1	4	4	1	1	1	1	1	2	1	2	2	2	2	2	2	1	1
165SM	Male	2	3	1	1	3	2	1	1	3	2	3	3	3	3	2	2	3	3	4	4	1	1	2	1	1	2	2	2	2	2	2	2	2	1	1
166SF	Fem	3	2	2	2	2	1	3	3	2	1	3	3	3	2	3	3	3	3	4	4	1	1	1	1	3	3	3	4	4	3	3	3	2	1	1
167SM	Male	2	1	3	3	2	2	1	1	1	2	1	1	3	3	3	3	1	1	4	4	1	1	1	1	1	2	2	4	4	2	2	1	1	1	1
168SM	Male	3	2	2	2	2	2	2	2	2	2	3	3	4	3	1	1	3	3	4	4	1	1	1	1	1	2	1	3	3	2	2	2	2	1	1
169SM	Male	1	2	1	1	1	1	1	1	1	1	3	3	3	1	2	2	1	1	4	3	1	2	2	2	1	3	2	2	2	3	2	3	2	1	1
170SF	Fem	3	1	3	3	1	2	1	1	1	1	3	3	2	3	2	2	2	2	3	4	1	1	2	2	2	2	3	4	4	2	2	1	1	1	1
171SF	Fem	2	1	3	3	1	2	2	2	1	1	3	3	2	2	3	3	3	3	3	3	1	1	1	1	2	3	3	4	4	3	3	2	2	2	1
172SF	Fem	2	2	3	3	2	3	1	1	2	3	1	1	3	4	3	3	2	2	4	4	2	1	1	1	2	2	3	4	4	2	2	1	1	1	1

173SF	Fem	3	1	1	1	1	2	1	1	1	2	2	2	3	4	2	2	1	2	3	4	1	1	1	1	3	2	3	3	3	3	3	3	3	1	1
174SM	Male	3	3	3	2	3	3	1	1	3	4	1	1	4	4	3	3	1	1	4	4	1	1	1	1	1	2	1	2	2	1	1	1	1	1	1
175SM	Male	3	2	1	1	2	1	1	1	1	1	3	3	2	1	2	3	3	3	3	3	1	1	1	1	2	3	2	3	3	2	2	2	2	1	1
176SF	Fem	2	2	2	2	1	1	1	1	1	1	3	3	2	1	2	2	3	3	3	3	1	1	2	2	3	2	2	2	2	3	3	2	3	2	1
177SM	Male	3	3	1	1	1	2	1	1	1	1	2	1	2	3	2	2	2	1	3	4	1	1	2	2	1	3	2	2	2	3	3	3	2	1	1
179SF	Fem	2	2	2	2	2	2	2	2	1	2	3	2	3	4	2	2	3	2	4	4	2	2	2	2	2	2	3	4	4	2	2	1	1	1	1
180SF	Fem	1	3	1	2	1	1	2	2	1	1	2	2	2	4	2	2	3	1	3	4	1	1	1	1	3	3	3	4	4	3	3	1	1	1	1
181SM	Male	2	2	2	1	1	3	2	2	1	4	1	1	3	4	2	2	1	1	4	4	1	1	1	2	1	2	2	2	2	1	1	1	1	1	1
182SM	Male	3	3	2	2	3	3	1	1	2	3	2	2	4	4	3	3	2	2	4	4	1	1	1	1	1	2	2	2	2	1	2	1	2	1	1
183SF	Fem	3	3	3	3	1	1	2	2	1	1	3	3	1	3	2	2	1	3	2	3	2	2	2	2	3	3	3	4	4	3	3	2	2	1	1
184SM	Male	3	2	1	1	2	2	1	1	1	1	1	1	1	1	2	2	1	1	3	3	1	1	1	1	1	1	1	4	4	3	3	3	3	1	1
185SF	Fem	1	2	3	3	3	1	1	1	3	1	3	3	4	1	2	2	3	3	4	2	1	1	2	2	3	2	3	4	4	3	3	3	3	2	2
186SF	Fem	3	2	3	3	1	1	1	1	1	2	3	3	1	3	2	2	2	1	3	4	1	1	2	1	3	3	3	3	3	3	3	3	3	2	2
187SM	Male	3	2	3	3	2	1	1	1	2	1	2	2	2	2	2	2	1	1	4	3	1	1	2	1	1	3	3	3	3	3	3	3	3	2	1
188SF	Fem	2	1	2	2	2	1	2	2	2	1	2	2	3	2	2	2	1	1	4	3	1	1	1	1	2	2	3	2	2	3	3	2	2	1	1
189SF	Fem	3	3	3	2	1	2	1	1	1	2	1	1	3	4	3	3	1	1	4	4	1	1	1	1	2	3	3	2	2	3	3	2	2	2	1
190SM	Male	2	1	2	2	1	1	2	2	1	1	1	1	1	2	3	3	1	1	3	3	1	1	2	1	1	2	2	2	2	1	1	1	1	1	1
191SF	Fem	2	3	3	3	1	2	1	1	1	2	2	2	1	4	2	2	2	1	3	4	1	1	1	1	2	2	1	3	3	2	2	2	2	1	1
192SF	Fem	1	3	1	1	2	2	1	1	1	2	3	3	1	3	3	2	3	3	1	4	1	2	2	1	2	2	2	3	3	3	3	2	2	1	1
193SM	Male	1	2	1	1	1	1	1	1	1	1	2	2	1	1	2	2	1	2	2	3	1	1	2	2	1	3	2	3	3	2	2	2	2	1	1
194SF	Fem	3	1	3	3	2	3	1	1	2	2	3	3	3	3	2	2	3	3	4	4	2	2	1	2	3	3	3	4	4	3	3	2	2	1	2
195SF	Fem	3	2	1	1	1	2	2	2	1	1	3	3	1	3	1	1	3	3	3	4	1	1	2	1	2	2	3	2	2	2	2	2	2	2	2
196SM	Male	2	2	2	2	1	2	2	2	1	2	1	1	2	4	2	2	1	1	4	4	1	1	1	1	1	2	2	2	2	3	3	3	3	2	1
197SM	Male	3	2	3	3	1	1	2	2	1	1	3	3	1	1	1	1	3	3	1	2	1	1	2	2	1	2	2	4	4	3	3	1	1	1	1
198SF	Fem	2	2	1	1	2	1	1	1	2	1	3	2	4	3	2	2	3	2	4	4	1	1	1	1	2	2	3	4	4	3	3	2	2	1	2
002Fc	Fem	2	3	1	2	3	2	1	1	2	2	2	2	3	4	2	2	3	1	4	4	1	1	2	1	2	1	3	2	2	1	1	1	1	2	2
004Fc	Fem	2	3	1	1	2	1	2	2	2	1	2	2	4	3	2	2	3	1	4	4	2	1	2	2	3	1	3	3	3	1	1	1	1	2	1
006Mc	Male	3	2	2	2	1	1	3	3	1	1	2	2	1	2	2	2	1	1	3	3	1	1	2	2	1	1	3	3	3	1	1	1	1	1	1
007Mc	Male	3	3	1	1	2	2	1	1	2	2	2	2	3	4	2	3	2	2	4	4	1	1	2	2	1	1	3	3	3	3	3	1	1	1	1
008Fc	Fem	2	1	2	2	2	3	1	1	1	3	2	3	3	4	2	2	3	3	4	4	1	1	2	2	2	1	3	4	4	2	2	2	2	1	1

009Mc	Male	3	3	2	2	3	3	1	1	4	4	2	2	4	4	2	2	3	1	4	4	1	1	2	2	1	1	2	3	3	1	1	1	1	2	2
010Mc	Male	2	3	3	3	2	2	2	2	2	3	3	2	3	4	2	2	3	1	4	4	1	1	1	1	2	2	2	4	4	2	2	1	1	2	1
012Mc	Male	3	2	1	1	2	3	1	1	2	3	2	2	4	4	3	3	3	3	4	4	1	1	2	2	1	2	3	4	4	1	1	1	1	2	1
014Fc	Fem	1	2	1	3	3	3	1	1	2	4	3	2	4	4	2	2	3	1	4	4	1	1	1	1	2	1	3	4	4	1	1	1	1	2	1
015Fc	Fem	1	2	2	1	2	3	1	1	2	4	2	2	3	4	2	2	3	3	4	4	1	1	2	2	2	1	3	4	4	1	1	1	1	2	2
017Mc	Male	2	3	1	1	3	3	1	1	4	3	3	2	4	4	2	2	3	1	4	4	1	1	1	2	1	2	2	4	4	2	2	2	2	1	1
018Fc	Fem	2	2	1	1	2	3	2	2	2	4	2	2	4	4	2	2	3	3	4	4	1	1	2	1	2	2	3	4	4	1	1	1	1	1	1
020Fc	Fem	2	1	1	2	2	1	2	2	1	1	2	2	3	3	2	2	2	2	4	4	1	1	2	1	2	2	3	5	5	3	3	1	1	2	2
021Mc	Male	3	2	1	1	3	3	1	1	4	3	2	2	4	4	2	2	2	1	4	4	1	1	1	1	1	2	2	2	2	1	1	1	1	2	2
023Mc	Male	2	3	1	1	1	2	2	2	1	1	1	2	2	3	2	2	1	1	3	4	1	1	1	1	1	2	2	2	2	1	1	1	1	2	2
026Fc	Fem	2	3	3	3	2	2	1	1	2	2	2	2	4	4	2	2	3	2	4	4	1	1	1	1	2	2	2	4	4	2	2	1	1	2	2
027Fc	Fem	1	2	1	2	1	2	1	1	1	1	2	2	2	2	2	2	3	3	3	4	1	1	2	1	3	1	3	2	2	1	1	1	1	2	2
029Fc	Fem	2	2	2	2	2	2	1	1	1	1	2	2	3	2	2	2	3	1	4	4	1	1	2	2	3	2	3	3	3	1	1	1	1	2	2
030Fc	Fem	1	2	1	1	3	2	1	1	3	2	2	2	4	3	2	2	2	3	4	4	1	1	1	1	3	1	3	4	4	2	2	1	1	2	2
001M	Male	1	2	3	3	1	2	2	2	1	2	1	1	3	4	2	2	1	1	4	4	1	1	1	1	2	2	3	4	4	1	1	1	1	2	2
002F	Fem	2	1	1	2	1	1	2	2	1	1	2	2	3	3	2	2	2	1	3	4	1	1	2	1	3	2	3	4	4	2	2	1	1	1	2
005M	Male	2	2	1	1	2	3	1	1	1	4	1	1	3	4	2	2	1	1	4	4	1	1	2	2	1	1	2	2	2	2	2	1	1	2	1
008F	Fem	2	1	1	1	3	3	1	1	3	2	2	2	4	4	2	2	2	2	4	4	1	1	2	2	3	2	3	4	4	2	2	1	1	2	1
011F	Fem	1	2	1	1	3	1	2	1	2	1	2	2	3	3	2	2	3	2	4	4	1	1	2	2	2	1	4	4	4	2	2	1	1	2	2
014F	Fem	3	2	1	1	2	2	1	1	2	1	2	2	3	3	2	2	3	2	4	4	2	2	2	2	3	2	4	4	4	3	3	1	1	1	1
018F	Fem	1	2	1	2	2	1	1	1	1	1	2	2	3	3	2	2	3	2	4	4	1	1	2	1	2	2	3	4	4	2	2	1	1	2	1
020F	Fem	1	2	1	1	2	3	1	1	2	3	2	2	4	4	2	2	3	2	4	4	1	1	2	1	2	2	3	3	3	2	2	2	2	2	1
024F	Fem	2	2	1	1	3	3	2	2	2	2	2	2	4	4	1	2	3	3	3	4	1	1	2	2	2	2	3	4	4	1	1	1	1	1	1
027M	Male	2	3	1	1	3	2	2	2	2	1	2	1	4	4	2	2	2	1	4	4	1	1	2	1	1	1	2	2	2	1	1	1	1	2	2
028F	Fem	2	2	1	1	3	3	1	1	2	2	2	2	4	4	2	2	3	3	4	4	1	1	2	2	3	1	3	2	2	1	1	1	1	2	2
029F	Fem	1	2	1	1	3	2	1	1	4	2	2	2	4	4	2	2	3	3	4	4	1	1	2	2	2	1	3	3	3	1	1	1	1	2	1
030F	Fem	3	3	1	1	2	2	2	2	2	2	2	3	4	4	2	2	3	1	4	4	1	1	1	2	3	2	2	2	2	2	2	1	1	2	1
034F	Fem	2	2	3	3	2	2	2	2	2	1	2	2	4	2	2	2	1	1	4	3	1	1	1	1	2	3	3	5	5	3	3	2	2	2	2
035F	Fem	2	3	1	1	3	2	2	2	2	2	2	2	4	4	3	3	2	1	4	4	1	1	2	2	2	2	3	3	3	2	2	2	2	2	2
036F	Fem	2	2	2	2	1	1	2	2	1	1	2	2	3	3	3	3	2	2	4	4	1	1	1	1	3	1	3	3	3	1	1	1	1	2	2

037F	Fem	2	2	1	1	3	3	1	1	2	2	2	2	3	4	2	2	3	3	3	4	1	1	2	2	2	2	3	3	3	2	2	1	1	2	2
039F	Fem	2	2	3	3	2	2	1	1	1	2	2	3	4	4	2	2	2	2	4	4	1	1	2	2	2	2	3	4	4	1	1	1	1	2	2
043F	Fem	3	2	2	2	2	2	1	1	1	1	2	2	3	3	3	3	3	3	4	4	1	1	2	2	2	2	3	3	3	1	1	1	1	1	1
045M	Male	2	3	1	1	3	3	1	1	2	3	2	2	4	4	2	2	2	2	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1
058F	Fem	2	1	2	2	3	3	1	1	2	4	2	2	4	4	2	2	2	2	4	4	1	1	2	2	2	1	3	4	4	1	1	1	1	1	1
059F	Fem	3	3	1	1	3	2	1	1	3	1	3	3	4	2	2	2	1	1	4	4	1	1	2	2	2	2	3	4	4	3	3	2	2	2	1
065F	Fem	2	2	1	1	2	3	1	1	2	4	2	2	4	4	2	2	2	1	4	4	1	1	1	2	2	1	3	4	4	2	2	1	1	2	1
067F	Fem	2	3	2	2	2	3	1	1	1	3	2	2	4	4	2	2	2	2	4	4	1	1	2	2	2	1	2	4	4	2	2	2	2	2	1
072M	Male	3	3	2	1	2	2	2	2	2	2	2	2	4	4	2	2	1	1	4	4	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1
076F	Fem	3	2	2	2	3	3	1	1	1	2	3	3	2	4	2	2	2	2	3	4	1	1	2	2	3	2	3	5	5	3	3	1	1	1	1
082M	Male	3	2	1	1	3	2	1	1	2	1	2	2	4	4	3	3	2	2	4	4	1	1	1	1	1	1	2	4	4	2	2	1	1	1	1
083F	Fem	3	2	1	1	3	2	2	2	2	1	3	3	4	3	2	2	2	2	4	3	1	1	2	2	2	1	3	4	4	3	3	2	2	1	1
084M	Male	1	2	1	1	3	1	1	1	2	1	2	2	4	3	2	2	2	2	4	4	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1
089M	Male	2	3	1	1	3	3	1	1	3	3	1	1	4	4	2	2	1	1	4	4	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1
092F	Fem	1	2	1	2	3	3	1	1	2	3	2	2	4	4	2	2	3	3	4	4	1	1	1	2	2	2	3	4	4	2	2	1	1	2	2
096M	Male	3	2	3	3	2	2	2	2	2	1	2	3	4	3	2	2	3	3	4	3	2	2	2	2	2	3	2	1	1	1	1	1	1	1	1
101M	Male	2	2	1	1	2	2	1	1	1	1	2	2	1	2	3	3	3	2	3	3	1	1	1	1	1	1	3	4	4	2	2	1	1	1	1
042FD	Fem	2	2	2	3	2	2	2	2	2	1	3	3	3	2	2	2	3	2	4	3	1	2	2	1	3	2	3	4	4	3	3	2	2	1	1

Table 11. Gait Anthropometry (Column)

		Static																	Dynamic							
Subject	Sex	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11 Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R	1. Knee cap - knee cap R Prof	2. Knee cap - knee cap L	3. Lat mal - Med mal R	4. Lat mal - Med mal L	5. Hallux - Hallux R	6. Hallux - Hallux L	7. Styloid Pro - Styloid Pro R Forward	8. Styloid Pro - Styloid Pro L Forward
002FD	Female	2.95	3.06	1.93	2.04	1.43	1.59	3.68	2.22	4.78	3.64	2.53	2.6	0.96	0.98	8.14	8.11	16.63	3.39	3.32	6.66	6.47	7.26	7.11	3.98	3.88
005FD	Female	3.01	2.92	2.21	2.38	1.69	1.77	3.58	2.38	4.92	3.54	2.76	2.75	0.91	0.98	8.18	8.11	16.84	3.54	2.91	6.82	6.67	7.15	7.46	4.04	4.15
006FD	Female	3.01	3.03	2.16	2.11	1.64	1.67	3.64	2.49	4.68	3.86	2.61	2.61	0.95	0.9	7.86	7.85	16.96	2.97	2.32	6.46	5.86	7.09	6.94	4.24	4.02
007FD	Female	3.01	2.96	2.34	2.32	1.5	1.68	3.37	2.58	4.69	3.63	2.57	2.56	0.93	0.92	8.29	7.98	16.73	3.12	2.98	6.13	6.04	6.64	6.44	3.81	3.76
009FD	Female	3.07	3.08	2.07	2.12	1.75	1.67	3.84	2.3	4.55	3.54	2.66	2.69	0.95	0.96	7.71	7.67	16.82	3.12	2.44	5.89	5.13	6.63	5.68	4.08	4.33
017FD	Female	3	3.11	2.16	2.13	1.36	1.35	3.39	2.21	4.44	3.69	2.52	2.59	0.84	0.93	8.34	8.29	17.1	3.52	3.37	6.19	6.58	6.62	7.23	3.86	4.14
020FD	Female	2.89	3.1	2.15	2.04	1.73	1.78	3.62	2.45	4.75	3.66	2.54	2.65	0.89	0.95	7.81	7.66	16.97	3.19	2.92	5.66	5.8	6.06	6.36	4.36	4.28
021FD	Female	3.18	3.2	2.32	2.26	1.38	1.44	3.58	2.39	4.14	3.65	2.54	2.55	0.93	0.97	8.69	8.59	16.74	2.65	2.73	5.77	5.72	6.26	6.11	4.28	4.14
022FD	Female	3.06	3.05	2.2	2.27	1.58	1.4	3.61	2.23	4.5	3.55	2.6	2.33	0.99	0.86	8.32	8.15	16.79	2.21	2.1	5.67	5.21	6.47	5.52	4.14	4.39
023FD	Female	3.14	3.21	2.21	2.3	1.69	1.67	3.6	2.62	4.26	3.7	2.59	2.75	0.95	1.02	8.29	8.25	16.69	3.89	3.43	6.94	6.52	7.5	7	3.97	4.09
025FD	Female	3.05	3.02	2.26	2.21	1.49	1.63	3.71	2.36	5.12	3.91	2.55	2.55	0.93	0.92	7.4	7.45	16.84	3.06	3.07	6.27	6.39	6.66	6.76	4.2	4.36
026FD	Female	3.02	2.91	2.06	2.15	1.38	1.37	3.77	2.36	5.16	3.71	2.58	2.54	0.94	0.94	7.56	7.87	17.06	2.88	2.79	4.97	4.92	5.61	5.99	4.65	4.08
030FD	Female	2.94	3.03	2.12	1.85	1.37	1.34	4.19	2.32	4.72	4	2.63	2.59	0.92	0.98	7.5	7.56	16.98	2.83	2.58	6.4	6.07	6.94	6.3	6.64	4.7
031FD	Female	2.95	3.05	2.16	2.35	1.45	1.35	3.47	2.12	4.6	3.87	2.6	2.62	0.81	0.96	7.89	8.08	17.01	3.55	3.34	6.3	6.44	6.68	6.81	3.44	3.78
034FD	Female	3.04	2.93	2.16	2.07	1.35	1.4	4.17	2.31	4.52	3.86	2.61	2.66	0.99	1.02	7.39	7.24	16.95	3.14	2.76	5.92	5.4	6.13	5.67	4.33	4.12
035FD	Female	2.88	2.83	2.33	2.39	1.35	1.55	3.72	2.53	5.08	3.82	2.58	2.55	0.85	0.9	7.6	7.59	16.21	2.73	2.48	5.88	5.54	6.32	5.84	4.23	3.55
036FD	Female	3	2.99	2.26	2.12	1.41	1.4	3.97	2.41	5.03	3.92	2.56	2.57	0.82	0.87	7.97	7.99	17.04	2.59	2.58	5.21	5.27	5.45	5.75	4.37	4.2
038FD	Female	2.97	2.98	2.24	1.85	1.45	1.6	3.79	2.5	4.75	3.85	2.66	2.7	0.96	1.05	8.12	8.26	17.05	2.78	2.91	5.79	5.58	6.3	6.16	4.63	4.91

039FD	Female	2.93	3.02	2.13	2.14	1.31	1.34	3.62	2.65	4.82	4.11	2.63	2.59	0.93	0.97	8.42	7.98	17.09	2.73	2.3	5.4	4.86	6.14	5.27	4.27	4.02
040FD	Female	2.98	2.96	2.02	1.85	1.29	1.62	3.86	2.31	4.68	3.61	2.53	2.48	0.85	0.83	7.46	7.79	16.6	2.83	3.18	5.8	5.88	6.23	6.05	4.13	4.58
001MD	Male	3.33	3.22	1.98	2.08	1.47	1.6	4.24	2.6	5.47	3.93	2.79	2.66	0.93	0.98	7.2	6.81	16.95	2.69	2.54	5.31	5.58	5.79	6.16	5	5.09
003MD	Male	2.68	2.74	2.24	2.22	1.57	1.62	3.94	2.63	4.55	4.4	2.87	2.86	1.05	0.99	7.83	7.68	16.91	2.73	2.88	5.8	5.62	6.19	6	4.33	4.28
004MD	Male	3.09	3.13	2.41	2.34	1.58	1.71	3.8	2.21	5.86	4.07	2.93	2.92	1	1.06	7.67	7.91	16.89	2.67	2.45	6.26	5.81	6.71	6.25	5.03	4.94
008MD	Male	3.29	3.19	2.33	2.42	1.32	1.55	3.87	2.54	4.73	3.82	2.73	2.67	0.85	0.93	7.84	7.92	17.37	2.66	2.38	5.52	4.74	5.98	5.04	5.12	5.18
010MD	Male	3.11	3	2.3	2.46	1.42	1.42	3.44	2.46	4.86	3.9	2.55	2.58	1	0.94	7.51	7.3	17.01	3.4	2.86	6.52	6.29	7.09	6.79	3.71	3.92
011MD	Male	3.2	3.18	2.21	2.3	1.63	1.58	3.77	2.66	5.21	3.78	2.69	2.76	0.96	0.97	7.12	7.09	17.15	3.52	2.9	6.9	6.1	7.31	6.7	4.51	4.56
012MD	Male	3.01	3.08	2.2	2.19	1.37	1.46	3.45	2.18	4.73	3.61	2.67	2.61	0.88	0.9	8.08	7.99	16.84	3.7	3.18	6.88	6.31	7.46	6.78	4.38	4.3
013MD	Male	2.9	2.77	2.1	2.08	1.8	1.73	3.76	2.66	5.2	3.7	2.82	2.82	0.96	0.95	7.01	6.88	16.87	3.01	2.51	5.67	5.36	6.07	5.79	3.9	4.21
014MD	Male	3.02	3.02	2.28	2.34	1.63	1.62	3.34	2.43	4.38	3.89	2.79	2.75	1.02	0.97	7.5	7.58	16.89	3.16	2.58	6.04	5.61	6.56	6.07	4.45	4.53
015MD	Male	3.08	3	2.29	2.27	1.45	1.44	3.32	2.72	4.76	3.86	2.67	2.67	0.83	0.96	7.82	7.96	17.03	3.13	3	6.27	6.06	6.8	6.49	4.18	4.4
016MD	Male	2.89	3.18	2.14	1.92	1.34	1.4	3.59	2.51	5.35	3.78	2.74	2.73	1.03	1.01	7.57	7.21	16.75	2.4	2.56	5.61	4.84	6.02	5.37	4.36	4.38
018MD	Male	2.81	2.84	2.37	2.39	1.69	1.58	3.57	2.53	5.25	4.11	2.41	2.38	0.9	0.9	6.9	6.72	17.04	1.92	2.72	4.96	5.53	5.33	5.92	3.68	3.66
019MD	Male	3.32	3.38	2.2	1.85	1.48	1.77	3.71	2.48	5.32	3.74	2.62	2.59	0.88	0.91	7.62	7.73	16.93	2.99	2.46	5.12	5.25	5.62	5.63	4.1	4.08
024MD	Male	3.12	3.17	2.3	2.37	1.36	1.65	3.57	2.4	4.97	4.23	2.86	2.88	1.06	1.08	7.76	7.92	16.84	2.85	2.19	5.19	5.27	5.73	5.88	4.55	4.11
027MD	Male	2.86	2.99	2.12	2.14	1.5	1.51	3.71	2.54	4.54	3.65	2.74	2.74	1.03	1	7.4	7.52	16.8	3.07	3.55	5.93	5.29	6.5	5.93	4.05	4.1
028MD	Male	2.81	2.73	2.12	2.32	1.47	1.58	3.67	2.38	4.18	3.89	2.69	2.5	0.87	0.9	7.62	8.05	16.87	2.91	2.7	5.3	4.86	6.02	5.52	4.75	4.34
029MD	Male	3.05	3.05	2	2.12	1.8	1.63	3.6	2.59	4.42	4.05	2.58	2.54	0.74	0.89	7.38	7.22	17.18	2.45	1.91	4.36	4.5	5.32	4.98	3.99	4.25
032MD	Male	2.82	2.76	2.3	2.19	1.56	1.26	3.83	2.4	4.86	4.38	2.6	2.61	0.87	0.93	7.49	7.46	17.07	3.03	2.87	5.39	5.44	5.77	5.9	4.07	4.15
033MD	Male	2.99	3.1	2.23	2.29	1.37	1.39	3.79	2.5	4.85	3.98	2.77	2.78	0.73	0.92	7.23	7.42	17.12	2.95	2.18	5.45	4.31	5.34	4.9	3.83	4.49
037MD	Male	2.88	3.18	2.28	2.22	1.57	1.45	3.64	2.3	5.31	4.17	2.72	2.52	0.9	0.82	6.98	7.01	16.94	2.24	2.65	5.71	5.79	6.15	6.3	3.92	3.82
041MD	Male	2.98	3.09	2.28	1.99	1.39	1.42	4.58	3.21	4.79	4.5	2.86	2.88	1	1.04	6.99	7.08	17.08	2.77	2.36	5.73	5.38	6.2	5.9	4.73	4.47
001CSF	Female	3.04	3.18	2.09	2.18	1.35	1.39	3.58	2.15	4.93	3.79	2.56	2.61	0.94	0.94	8.19	8.24	17.4	3.33	3.3	6.67	6.72	7.03	7.21	4.44	4.36
002CSM	Male	3.08	3.22	2.16	2.13	1.53	1.68	3.49	2.57	5.01	3.98	2.72	2.72	0.98	0.95	7.71	7.68	17.26	2.89	3.21	6.32	6.32	6.79	6.72	4.46	4.2
003CSM	Male	2.89	3.08	2.06	2.12	1.5	1.6	4.01	2.61	4.89	4.19	2.91	2.9	1.04	1.02	7.45	7.32	17.54	3.7	3.16	6.73	6.49	7.16	7.09	4.92	4.86
004CSM	Male	3	3.15	1.97	2.53	1.25	1.32	3.57	2.61	4.9	3.93	2.81	2.83	0.97	0.99	8.08	8.12	17.77	3.99	3.28	7.19	7.12	7.7	7.69	4.16	4.38
005CSF	Female	3.07	3.07	2.32	2.13	1.65	1.26	4.04	2.53	5.05	4.18	2.87	2.88	1.01	1.01	8.25	8.15	17.44	3.09	2.87	6.31	6.13	6.65	6.55	5.27	4.94
006CSM	Male	3.06	3.09	2.17	2.21	1.66	1.59	3.41	2.48	5.6	4.05	2.83	2.8	1	1.01	7.28	7.18	17.72	3.15	3.1	6.34	6.37	6.99	7.35	4.83	4.21
007CSM	Male	3.07	2.99	2.19	2.04	1.74	1.71	3.56	2.71	5.13	3.99	2.87	2.86	0.98	0.97	7.53	7.55	17.79	3.15	3.07	6.15	6.16	6.51	6.6	4.59	4.59

008CSM	Male	3.19	3.25	2.13	2.44	1.59	1.65	4.22	2.54	5.31	4.14	3.04	3.04	1.11	1.13	7.25	7.34	17.59	3.47	2.63	6.42	5.58	7.1	6.26	4.76	4.76
009CSM	Male	3.1	3.14	2.3	2.16	1.72	1.88	3.75	2.29	5.25	4.05	2.69	2.71	1	1	7.43	7.54	17.62	3.55	3.29	6.75	6.72	7.36	7.27	4.36	4.37
010CSM	Male	3.11	3.17	2.31	2.32	1.57	1.68	3.62	2.62	5.23	3.97	2.83	2.84	1.02	1.01	7.55	7.68	17.78	3.53	3.78	6.6	6.59	7.01	7.15	4.23	4.42
11CSF	Female	3	2.81	1.66	2.4	1.52	1.48	4.2	2.7	5.09	3.61	2.97	3	1.08	1.09	7.54	7.42	17.34	3.31	2.87	6.65	6.18	7.32	7.07	4.52	4.32
12CSM	Male	2.99	3.13	2.25	2.21	1.56	1.7	3.59	2.57	4.91	4	2.74	2.76	1	0.98	7.23	7.19	17.52	3.23	3.02	5.97	6.06	6.35	6.61	4.37	4.04
13CSF	Female	3.2	3.25	2.38	2.38	1.38	1.5	4	2.32	4.9	3.83	2.67	2.74	0.92	0.94	8.5	8.55	17.5	3.66	3.38	6.76	6.78	7.24	7.27	4.33	4.26
14CSM	Male	2.95	3.11	2.43	2.34	1.53	1.66	3.65	2.45	5.27	3.93	2.69	2.6	0.97	0.98	7.52	7.6	17.75	3	2.97	6.43	6.16	6.92	6.72	4.47	4.6
15CSM	Male	3.2	3.3	2.3	2.26	1.51	1.82	3.41	2.54	5.01	4.11	2.88	2.86	1.04	1.04	7.51	7.38	17.6	4.17	3.98	7.4	7.28	7.99	7.97	3.84	4.29
16CSF	Female	3.19	3.35	2.19	2.38	1.75	1.65	4.16	2.57	5.06	3.75	2.81	2.85	1.04	1.06	8.28	8.22	17.23	3.54	3.31	6.02	6.21	6.5	6.76	4.59	4.45
17CSF	Female	3.21	3.25	2.06	2.07	1.53	1.77	4.12	2.53	5.14	3.95	2.86	2.88	1.11	1.13	7.93	7.9	17.74	3.56	3.05	6.61	6.2	7.06	6.76	4.57	4.54
18CSF	Female	3.17	3.21	2.4	2.27	1.67	1.72	4.39	2.15	4.91	4.01	2.68	2.78	1.04	0.98	8.22	8.25	17.48	2.8	3.33	5.74	6.87	6.38	7.5	4.81	4.79
19CSF	Female	3.26	3.22	2.23	2.08	1.89	1.88	5.39	2.1	5.37	4.22	2.81	2.83	1.04	1.06	7.96	8.04	17.34	3.36	3.96	6.98	7.54	7.53	8.19	5.75	5.59
20CSM	Male	3.09	3.06	2.12	2.2	1.38	1.32	3.63	2.73	5.38	4.2	2.87	2.86	1.05	1.11	7.45	7.39	17.62	2.98	2.39	5.87	5.69	6.24	6.15	4.3	4.51
21CSF	Female	3.29	3.28	2.23	2.32	1.81	1.71	3.84	2.47	4.81	4.08	2.81	2.82	1	1.02	8.41	8.37	17.6	3.72	3.79	7.48	7.46	8.09	8.37	4.29	4.01
22CSF	Female	3.18	3.34	2.19	2.24	1.71	1.55	4.43	2.31	4.83	4.02	2.65	2.57	0.97	0.92	8.1	7.98	17.39	3.59	3.35	7.05	6.94	7.6	7.29	4.65	4.96
23CSF	Female	3.24	3.3	2.39	2.28	1.74	1.36	3.9	2.41	5.16	4.04	2.62	2.65	1.03	1	8.29	8.21	17.41	3.56	3.76	7.28	7	8.25	7.85	4.87	4.18
24CSM	Male	3.19	3.1	2.38	2.03	1.5	1.84	3.74	2.44	5.51	4.16	2.67	2.65	1	0.99	7.55	7.68	17.57	3.01	2.62	6.49	6.21	6.91	6.65	3.67	3.48
25CSF	Female	3.1	3.42	2.4	2.08	1.78	1.62	4.37	2.99	5.4	4.51	3	2.99	1.14	1.07	6.97	6.93	17.65	3.4	3.08	6.91	6.47	7.2	7.1	4.82	4.83
26CSF	Female	3.28	3.32	2.02	2.15	1.79	1.8	4.62	2.56	5.62	3.94	2.83	2.85	1.11	1.08	8.03	8.13	17.54	3.76	3.56	6.4	6.4	6.92	6.86	5.6	5.86
27CSF	Female	3.01	3.19	2.05	2.33	1.62	2	4.15	2.85	4.99	4.13	2.99	3.08	1.04	1.11	7.99	7.84	17.71	4.54	4.38	7.66	7.66	8.16	8.16	4.84	4.73
28CSM	Male	3.27	3.15	2.32	2.26	1.84	1.85	3.77	2.61	5.16	4.22	2.94	2.96	1.09	1.06	7.84	7.71	17.53	3.3	3.08	6.24	5.85	6.64	6.38	4.27	4.45
29CSM	Male	3.17	3.16	2.4	2.39	1.58	1.5	3.35	2.56	5.44	4.33	2.67	2.72	1.04	0.95	7.74	7.84	17.77	3.57	3.65	6.96	6.8	7.36	7.45	3.98	3.9
30CSF	Female	3.28	3.23	2.25	2.31	1.93	1.89	3.52	2.5	5.02	4.08	2.64	2.66	0.94	0.96	7.6	7.56	17.6	2.95	3.11	6.1	6.1	6.62	6.52	4.52	4.62
31CSF	Female	3.27	3.18	2.28	2.15	1.59	1.56	3.66	2.7	4.87	3.74	2.74	2.74	1.01	1.01	8.61	8.6	17.59	4.01	3.8	7.12	7.28	7.44	7.79	4.4	4.41
32CSF	Female	3.12	2.85	2.23	2.14	1.81	1.58	3.74	2.46	4.74	4.1	2.87	2.8	0.98	1.03	8.21	8.1	17.56	3.08	3.29	6.32	6.42	6.84	7.19	4.52	4.2
080SM	Male	3.31	3.05	2.4	2.34	1.82	1.79	4.02	2.69	4.96	4.29	2.74	2.8	1.05	1.02	8.89	7.83	17.69	4.1	4.09	7.22	6.78	7.66	7.34	5.03	4.77
083SM	Male	3.15	3.28	2.24	2.31	1.75	1.86	4.42	2.78	5.4	4.45	3.01	3.14	1.14	1.15	7.6	7.38	17.69	3.98	4.31	7.04	7.21	7.36	7.79	5.34	5.32
102SF	Female	3.34	3.25	2.21	2.33	1.87	1.9	4.6	2.5	5.07	4.44	2.86	2.87	1.04	1.03	8.11	8.13	17.73	3.18	3.57	6.45	6.83	6.8	7.37	5.46	5.98
103SF	Female	3.21	3.08	2.29	2.23	1.87	1.86	4.02	2.42	5.26	4.06	2.78	2.72	1.01	1.05	7.84	7.87	17.64	3.76	3.49	6.86	6.6	7.44	7.19	4.46	4.29
105SF	Female	3.12	3.09	2.16	1.88	1.74	1.81	4.12	2.83	5.32	3.94	2.88	2.93	1.09	1.01	7.77	7.82	17.94	3.41	4.18	6.74	6.84	7.18	7.33	4.72	4.79

108SF	Female	2.72	3.15	1.89	2.28	1.52	1.7	3.93	2.93	4.7	4.19	2.62	2.79	1	1.04	7.63	7.68	17.74	3.08	3.9	6.39	6.89	7.01	7.49	5.51	5.8
109SF	Female	3.34	3.22	2.24	2.14	1.81	1.77	4.01	2.61	5.39	3.94	2.88	2.86	1.03	1.04	7.95	7.97	17.88	3.81	4.25	7.23	7.57	7.66	7.81	4.79	4.73
110SF	Female	3.31	3.65	2.39	2.04	1.69	1.64	4.23	2.57	4.91	4.02	2.91	2.93	1.03	0.99	7.71	7.74	17.81	4.59	4.46	8.02	7.83	8.82	8.49	4.29	4.61
113SM	Male	3.21	3.49	2.47	2.24	1.76	1.78	4.07	2.59	5.34	3.87	2.87	2.84	1.09	1.08	7.78	7.74	17.78	2.39	2.67	5.43	5.64	5.74	5.93	4.49	4.64
115SF	Female	3.4	3.42	2.27	2.31	1.93	1.74	4.4	2.41	5.11	3.99	2.87	2.96	1.07	1.09	8.04	8.16	17.86	3.31	3.01	6.24	5.81	6.51	6.33	5.11	5.29
058SM	Male	3.01	3.05	2.18	1.96	1.92	1.66	4.12	2.7	5.17	4.03	2.65	2.91	1.1	1.06	7.09	7.1	16.91	3.28	3.27	5.66	6.14	6.16	6.61	4.83	4.99
059SM	Male	3.42	3.39	1.73	2.34	1.39	1.56	4.03	2.53	5.64	4.28	2.41	2.43	1.05	1.03	7.39	7.28	16.57	2.84	2.82	5.09	5.54	5.47	5.76	4.58	4.86
062SM	Male	3.21	3.31	2.03	2.18	1.9	1.99	4.2	2.89	5.71	4.09	3	3.06	1.18	1.12	7.34	7.07	17.4	3.81	2.82	7.1	5.82	7.39	6.39	5.28	5.38
064SM	Male	2.87	2.95	2.13	2.21	1.68	1.88	4.24	2.84	5.38	4.5	2.73	2.74	1.09	1.08	7.3	7.41	16.7	3.62	3.33	6.12	6.03	6.42	6.66	4.87	5.21
068SM	Male	3.27	3.1	2.32	2.02	1.93	1.85	4.17	2.5	5.49	4.44	2.89	2.64	1.13	1.05	7.33	7.27	16.89	3.93	3.5	6.97	7.42	7.46	7.35	5.28	4.82
069SM	Male	3.29	3.2	2.16	2.11	1.75	1.69	4.15	2.52	5.6	4.23	2.99	3.06	1.1	1.05	7.73	7.81	17.82	3.25	3.02	6.1	5.63	6.53	5.63	5.02	4.98
001SF	Female	3.09	2.92	2.21	2.17	1.85	1.8	3.83	2.2	5.14	4.29	2.81	2.81	1.01	1.04	8.05	8.06	17.51	3.53	4.02	7.24	6.8	7.67	7.4	4.84	5
002SF	Female	2.98	3.11	2.31	2.37	1.5	1.53	3.93	2.43	5.03	4.08	2.87	2.9	1.06	1.09	8.38	8.31	17.88	3.16	3.49	6.55	6.46	6.83	7.15	4.63	4.89
003SM	Male	3.2	3.16	2.22	2.21	1.81	1.8	3.41	2.52	5.29	4.19	2.73	2.74	1.02	1	8.02	8.1	17.87	2.95	3.11	5.71	5.91	6	6.34	4.05	4.09
004SF	Female	3.1	3.2	2.34	2.36	1.85	1.86	3.88	2.44	5.28	3.96	2.86	2.82	1.05	1.09	8.04	8.05	17.91	3.29	3.95	6.66	7.27	7.05	7.67	4.46	4.8
005SF	Female	3.4	3.42	2.11	2.32	1.61	1.54	3.62	2.64	5.29	4.29	2.81	2.75	1.06	1	8.08	8.15	17.83	3.09	3.58	6.62	6.14	7.38	6.55	3.59	3.8
006SF	Female	3.01	3.01	2	2.22	1.49	1.85	4.16	2.54	5.49	3.94	2.77	2.83	1.03	1.04	8.13	8.19	17.7	3.65	3.73	7.25	6.97	7.75	7.69	4.68	4.83
007SF	Female	3.55	3.43	2.24	2.29	1.58	1.62	3.91	2.53	5.21	4.1	2.74	2.76	1.06	1.03	8.17	8.33	17.8	2.33	2.72	5.5	6.1	5.87	6.76	3.83	3.99
008SF	Female	3.3	3.25	2.26	2.21	1.77	1.91	3.84	2.48	5.26	3.92	2.81	2.86	1.02	1	8.47	8.42	17.39	2.94	3.18	6.39	6.57	6.9	7.73	4.45	4.26
009SM	Male	3.27	3.27	2.3	2.25	1.55	1.6	3.63	2.78	5.28	4.44	2.73	2.77	1.03	1.05	7.37	7.29	17.76	3.27	3.43	5.95	5.93	6.31	6.21	4.16	4.45
010SM	Male	3.43	3.33	2.51	2.13	1.5	1.65	3.67	2.54	5.22	4.29	2.85	2.87	1.05	1.05	7.67	7.68	17.85	3.55	3.29	7.2	7.03	7.61	7.97	4.5	4.59
011SF	Female	2.94	2.85	1.95	2.13	1.81	1.82	5.03	2.61	5.54	4.05	2.88	2.92	1.04	1.06	7.96	7.94	17.77	3.88	3.64	6.2	6.46	6.56	6.8	6.16	6.2
012SF	Female	2.99	3.01	2.29	2.08	1.77	1.89	3.79	2.48	5.17	3.82	2.77	2.77	1.05	1.01	7.76	7.96	17.81	3.43	3.51	6.8	6.77	7.35	7.29	4.48	4.75
013SF	Female	3.52	3.32	2.32	1.84	1.62	1.43	3.98	2.34	4.87	3.88	2.49	2.61	0.96	0.96	8.62	8.47	17.8	2.57	3.26	5.53	5.94	5.93	6.21	4.72	4.5
014SF	Female	3.1	3.15	2.32	2.27	1.82	1.68	3.59	2.45	4.83	3.85	2.81	2.86	1.03	1	7.96	8.03	17.77	3.01	3.38	6.71	7	7.96	8.14	4.32	4.38
015SM	Male	3.22	3.3	2.25	2.43	1.72	1.58	3.49	2.32	5.45	3.99	2.82	2.89	1.02	1.04	7.98	7.96	17.86	2.4	2.72	5.36	5.48	5.75	5.81	4.49	4.84
016SF	Female	3.13	3.15	2.37	2.37	1.59	1.75	3.91	2.31	4.79	4.06	2.78	2.78	1.02	1.04	8.07	8.02	17.78	3.05	2.51	6.21	6.19	6.49	7.48	4.7	4.5
017SF	Female	2.8	3.04	2.25	1.9	1.45	1.53	4.54	2.45	5.23	4	2.89	2.73	1.04	1.1	7.83	7.78	17.76	3.35	3.52	6.58	6.66	7.09	7.35	4.49	4.46
018SF	Female	3.38	3.39	2.37	2.34	1.68	1.68	4.14	2.19	5.32	3.84	2.77	2.78	1.02	1.03	7.93	7.96	17.88	3.41	3.39	7	6.93	7.53	7.37	3.97	4.05
019SF	Female	3.08	3.17	2.25	2.06	1.61	1.79	3.67	2.51	4.91	4.01	2.77	2.73	1	1.03	8.22	8.17	17.8	3.5	3	6.98	6.36	7.43	6.74	3.84	3.93

020SF	Female	3.15	3.21	2.24	2.48	1.8	1.74	3.51	2.26	5.22	4.15	2.71	2.7	1.02	1.02	8.2	8.24	17.71	3.52	3.6	7.17	7.16	8.08	8.11	3.91	3.78
021SF	Female	3.49	3.48	2.38	2.37	1.77	1.61	4.23	2.59	4.94	4.13	2.89	2.8	1.05	1.11	8.46	8.4	17.86	3.64	7.6	7.26	7.09	7.69	3.38	4.7	4.92
022SM	Male	3.22	3.25	1.78	2.17	1.96	1.92	3.85	2.24	5.17	4.79	2.89	3	1.19	1.08	7.25	7.31	17.76	3.39	3.82	6.04	6.57	6.32	7.35	4.45	4.62
023SM	Male	3.11	3.25	2.21	2.26	1.59	1.74	4	2.71	4.93	4.3	2.93	2.93	1.05	1.06	7.63	7.63	17.8	3.15	3.84	6.34	6.38	6.8	6.7	4.35	4.65
024SF	Female	3.05	2.81	2.26	2.36	1.74	1.79	4.02	2.73	4.7	4.32	2.75	2.8	1.06	1.04	7.77	7.82	17.83	2.7	3.02	6.02	5.33	6.42	5.63	4.82	4.7
025SF	Female	3.53	3.44	2.09	1.91	1.47	1.69	4.41	2.35	4.86	3.91	2.8	2.8	1.01	1.02	7.74	7.76	17.51	3.38	3.77	6.56	6.55	7.15	7.58	5.11	4.72
026SF	Female	3.37	3.39	2.34	2.41	1.65	1.64	4.01	2.44	5.08	4.1	2.77	2.76	1.05	1.06	8.11	8.08	17.8	3.12	2.95	5.79	5.85	5.97	6.26	4.17	4.06
027SM	Male	3.28	3.25	2.48	2.35	1.49	1.45	4.37	2.48	5.39	4.18	2.9	2.98	1.13	1.09	7.47	7.44	17.84	3.17	3.64	6.5	5.37	7.26	5.57	4.55	4.48
028SM	Male	2.93	3.11	1.99	2.26	1.6	1.45	4.26	2.37	4.99	4.17	2.85	2.84	1.06	1.03	7.44	7.49	17.79	3.05	3.82	6.72	7.81	7.31	7.99	4.81	4.44
029SM	Male	3.01	3.18	2.47	2.22	1.84	1.72	4	2.61	4.67	4.25	2.86	2.82	1.04	1.01	7.81	7.74	17.87	3.71	3.36	7.13	6.56	7.61	7.25	4.49	5.01
030SF	Female	3.08	3.12	2.28	2.08	1.75	1.82	4.39	2.28	4.95	4.09	2.73	2.77	0.96	0.99	8.43	8.32	17.85	3.59	3.45	6.86	7	7.3	7.47	5.08	4.8
031SF	Female	3.12	3.24	2.33	2.24	1.68	1.81	4.23	2.32	5.22	3.81	2.75	2.82	1.02	1	8.39	8.35	17.8	3.03	3.5	6.41	6.57	6.54	7.17	4.52	4.52
032SF	Female	3.42	3.66	2.2	1.71	1.71	2.01	4.32	2.54	5.5	4.01	2.88	2.91	1.09	1.09	7.73	7.69	17.77	3.09	2.27	6.41	5.85	7.09	7.01	5.07	4.97
033SF	Female	3.12	3.05	2.41	2.1	1.63	1.65	3.87	2.69	5.23	3.83	2.82	2.8	1.03	1.02	8.2	8.11	17.863	3.29	3.05	7.12	6.84	8.07	7.27	3.98	3.88
034SF	Female	2.98	3.06	1.96	2.09	1.58	1.79	5.19	2.29	5.38	4.43	2.91	2.95	1.09	1.04	8.21	8.19	17.73	3.22	3.81	6.48	6.9	6.93	7.32	5.27	5.34
035SM	Male	3.22	3.14	2.16	2.02	1.73	1.95	3.75	2.75	4.7	4.19	2.94	3	1.03	1.04	7.99	8.02	17.78	3.54	3.15	7.22	6.96	7.46	7.14	4.46	4.86
036SF	Female	3.28	3.28	2.06	2.2	1.85	1.73	4.5	2.39	5.31	3.95	3.01	3.01	1.08	1.05	8.19	8.18	17.72	2.33	2.55	5.07	5.16	5.36	5.46	5.24	4.44
037SM	Male	3.24	3.3	2.33	2.21	1.62	1.69	3.87	2.39	5.2	4.53	2.78	2.74	1.01	1.04	7.5	7.48	17.82	3.76	3.33	7.19	6.26	7.74	6.68	4.68	4.44
038SM	Male	3.19	3.13	2.41	2.24	1.57	1.59	3.26	2.59	5.21	3.92	2.79	2.77	1	0.98	8.36	8.35	17.81	3.48	3.87	7.12	7.14	7.68	7.64	3.71	3.8
039SF	Female	3.13	3.21	2.29	2.17	1.74	1.79	4.35	2.41	4.84	4.21	2.83	2.78	1.04	1.03	8.19	8.1	17.8	3.5	3.36	7.37	7.28	7.83	7.77	4.91	4.69
040SM	Male	3.08	3.11	2.47	2.4	1.75	1.71	3.79	2.21	4.76	4.12	2.95	2.97	1.11	1.06	7.89	7.91	17.81	3.31	3.91	6.58	7.03	6.95	7.51	4.97	4.97
041SF	Female	3.08	3.01	2.28	2.33	1.92	1.81	3.67	2.43	5.08	3.99	2.78	2.8	1.03	1.07	8.21	8.22	17.78	3.56	3.45	7.02	6.64	7.63	7.25	4.24	4.21
042SF	Female	3.23	3.19	2.24	2.29	1.55	1.66	3.82	2.51	5.18	4.23	2.8	2.81	1.06	1.08	8.36	8.35	17.87	3.2	3.34	6.71	6.91	7.15	7.42	4.56	4.13
043SF	Female	3.16	3.1	2.32	2.29	1.76	1.47	3.73	2.44	4.83	4.11	2.83	2.83	1.04	1.04	8.33	8.36	17.87	3.15	3.29	6.13	6.19	6.53	6.59	4.62	4.69
044SF	Female	3.02	3.06	2.29	2.33	1.44	1.54	3.6	2.42	5.13	3.93	2.84	2.75	1.1	1.04	7.79	7.82	17.65	3.65	3.69	6.91	6.89	7.3	7.32	3.92	4.12
045SF	Female	3.19	3.2	2.4	2.22	1.86	2.01	4.25	2.52	4.72	3.95	2.75	2.8	1	1.02	8.68	8.73	17.82	3.01	2.51	5.98	5.59	6.37	6.03	5.2	4.78
046SM	Male	3.41	3.8	2.35	2.05	1.92	2.01	4.44	2.28	5	4.3	2.82	2.59	1.08	0.99	7.55	7.55	17.77	2.98	2.99	6.23	6.42	7.17	7.34	5.99	5.54
047SM	Male	2.95	3.18	2.19	2.16	1.76	1.77	4.37	2.62	4.81	4.17	2.91	2.87	1.12	1.12	7.08	7.15	17.67	2.86	2.8	5.84	6.14	6.31	6.65	4.78	4.88
048SM	Male	3.6	3.22	2.07	2.52	1.76	1.77	4.24	2.58	5.77	4.07	3.05	3.04	1.11	1.26	7.51	7.43	17.82	3.08	2.98	6.45	5.76	6.82	6.14	4.96	5
049SF	Female	3.52	3.49	2.04	2.1	1.57	1.58	5.72	2.63	5.71	4.3	3.19	3.14	1.17	1.23	7.86	7.96	17.79	3.41	3.42	6.06	6.25	6.29	6.62	5.63	5.75

050SM	Male	3.19	3.2	2.13	2.14	1.75	1.73	3.71	2.41	5.31	3.96	2.97	2.92	1.04	1.04	7.36	7.42	17.83	2.9	2.85	5.85	6.53	6.12	6.52	4.44	4.3
051SF	Female	3.06	3.23	2.2	1.8	1.85	1.77	4.28	2.21	5.42	3.6	2.84	2.84	1.08	1.07	7.42	7.58	17.73	3.23	3.22	7.11	6.77	7.08	6.79	5.24	4.75
052SM	Male	3.31	3.23	2.14	2.54	1.75	1.73	3.99	2.35	5.21	4.12	2.96	2.82	1.1	1.02	8.33	8.2	17.69	2.93	2.92	6.07	5.99	6.5	6.3	5.15	5.02
053SM	Male	3.34	3.29	2.19	2.15	1.76	1.78	4.23	2.47	5.43	4.41	2.91	2.93	1.11	1.03	7.46	7.46	17.81	3.56	3.21	6.13	6.06	6.33	6.33	4.89	4.97
054SF	Female	3.5	3.44	2.64	2.3	1.74	1.59	3.73	2.15	4.89	3.99	2.69	2.68	1.06	1	8.62	8.62	17.86	3.62	3.3	6.97	6.87	7.28	7.49	4.6	4.08
055SF	Female	3.2	3.25	2.38	2.42	1.84	1.84	3.62	2.33	5.42	4.26	2.84	2.83	1.03	1.08	7.89	7.8	17.81	2.98	2.62	6.78	6.54	6.99	6.79	5	4.28
056SM	Male	3.13	2.99	2.22	2.34	1.9	1.77	4.05	2.51	5.29	4.35	2.84	2.84	1.07	1.08	7.63	7.6	17.87	2.94	3.01	6.14	6.09	6.62	6.47	4.99	4.4
057SF	Female	3.3	3.23	2.22	2.24	1.86	1.86	4.55	2.77	5.03	3.98	2.89	2.87	1.09	1.1	8.39	8.2	17.79	3.58	4.02	7.57	7.87	8.17	7.83	5.21	5.08
060SF	Female	3.43	3.41	2.19	1.98	1.79	1.75	4.47	2.7	4.96	3.94	2.9	2.86	1.08	0.98	7.88	7.92	17.86	3.39	3.14	6.5	6.64	6.72	6.46	5.12	4.79
061SF	Female	3.29	3.32	2.43	1.91	1.7	1.77	4.39	2.65	4.22	4.26	2.77	2.81	1.07	1.03	8.39	8.38	17.91	3.79	3.42	7.01	7.12	7.32	7.86	4.8	4.63
063SF	Female	3.36	3.27	2.22	2.13	1.82	1.72	5.14	2.99	5.23	4.27	3.04	3.08	1.18	1.15	8.04	8.07	17.91	3.51	4.02	6.02	7.07	6.53	7.55	5.88	5.99
065SF	Female	3.39	2.83	2.06	1.83	1.87	1.73	3.97	2.78	4.94	4.28	2.71	2.73	1.1	1.05	7.98	7.94	17.81	2.95	2.74	5.37	6.07	5.88	6.64	4.82	5.15
066SF	Female	3.25	3.39	2.29	2.11	1.78	1.77	4.76	2.63	5.2	4.15	2.88	2.9	1.07	1.07	8.16	8.13	17.79	2.79	3.28	6.38	6.89	6.43	6.92	5.09	4.86
067SF	Female	3.14	3.36	2.01	2.19	1.95	2.05	4.24	2.55	4.95	4.21	2.97	2.99	1.18	1.09	8.3	8.29	17.88	3.14	3.21	5.87	6.71	6.37	6.76	5.87	5.63
070SM	Male	3.1	3.28	2.48	2.18	1.69	1.81	4.34	2.56	5.37	4.54	3	2.98	1.09	1.04	7.58	7.52	17.91	3.69	3.95	7.38	6.84	7.64	7.22	5.53	5.2
071SM	Male	3.14	3.29	1.79	2.21	1.94	2.03	4.33	2.46	5.5	4.54	3.17	3.16	1.14	1.15	7.52	7.52	17.91	3.62	3.63	7.22	6.74	7.55	7.26	5.15	5.11
072SM	Male	3.18	3.12	2.38	2.36	1.64	1.84	3.76	2.43	5.12	4.24	3.01	3.03	1.11	1.08	7.72	7.73	17.85	4.25	2.92	7.78	5.31	8.01	6.06	4.75	4.41
073SF	Female	3.08	3.13	2.08	2.05	1.9	1.92	4.44	2.91	5.11	4.05	2.86	2.85	0.96	1.05	7.59	7.65	17.85	3.33	3.04	6.08	4.85	6.48	5.22	4.98	5.07
074SF	Female	3.13	3.08	2.03	2.31	1.67	1.41	4.29	2.84	5.12	4.04	2.87	2.92	1.06	1.08	7.93	7.82	17.86	3.51	3.15	7.02	6.36	7.62	6.91	5.02	5.45
075SM	Male	3.16	3.15	2.08	1.98	1.5	1.75	3.79	2.72	4.92	4.08	2.93	2.83	1.05	1.04	7.63	7.61	17.86	3.62	3.18	6.52	5.69	7.03	6.44	4.6	4.6
076SF	Female	2.99	3.36	2.51	1.94	1.66	1.74	4.73	2.64	5.51	4.32	2.81	2.84	1.11	0.99	7.77	7.76	17.83	3.32	2.95	6.35	6.57	6.71	6.96	5.8	5.49
077SM	Male	3.13	3.36	2.01	2.25	1.84	1.6	4.12	2.34	5.35	4.06	3.14	3.1	1.12	1.09	7.51	7.41	17.83	2.77	3.03	6.28	6.44	6.63	6.89	4.62	4.95
078SM	Male	3.22	3.57	2.32	2.34	2.14	2.03	4.2	2.61	4.81	4.24	3.25	3.27	1.12	1.16	7.71	7.67	17.87	3.44	3.13	7.17	6.63	7.36	6.9	5.17	4.84
079SM	Male	3.41	2.94	2.04	2.01	1.86	2.02	4.41	2.62	5.26	4.51	2.78	2.94	1.04	1.01	7.63	7.62	17.88	2.84	3.51	5.1	5.89	4.98	6.55	4.89	5.03
081SM	Male	3.1	3.42	2.24	2.2	2.03	1.97	4.45	2.8	5.91	4.28	3.05	2.96	1.16	1.1	7.24	7.21	17.87	3.09	2.94	6.29	5.97	6.59	6.07	5.53	5.1
082SM	Male	3	3.21	2.4	1.84	1.83	1.97	4.06	2.75	5.04	4.5	3.11	3.12	1.13	1.08	7.79	7.91	17.87	3.29	3.39	6.11	5.79	6.86	6.27	4.97	5.12
084SM	Male	3.09	3.02	2.5	2.34	1.91	1.89	3.85	2.75	4.42	4.09	2.82	2.85	1.06	1.04	7.89	7.98	17.88	3.82	3.41	6.9	6.93	7.39	7.44	4.64	4.83
085SF	Female	3.21	3.3	2.28	2.49	1.74	1.44	4.12	2.66	4.86	4.29	2.8	2.78	0.98	0.99	7.97	7.94	17.86	2.44	3.29	6.15	6.29	6.89	6.84	4.66	4.58
086SF	Female	3.01	2.86	2.22	2.3	1.87	1.76	4.26	2.6	5.11	4.05	2.83	2.85	1.06	1.09	8.01	7.91	17.87	4.22	3.79	6.36	5.92	6.75	6.36	4.64	4.43
087SF	Female	2.77	2.9	2.28	2.28	1.81	1.86	4.6	2.82	5.18	4.36	3.05	3.01	1.14	1.25	7.62	7.57	17.74	3.83	2.29	6.51	5.53	7.03	6.27	5.27	4.79

088SM	Male	3.17	3.83	2.43	1.95	1.86	1.59	4.23	2.82	4.75	4.52	3.02	3.07	1.15	1.1	7.55	7.48	17.89	3.15	3.24	6.3	6.42	6.09	6.66	4.89	4.72
089SM	Male	3.32	3.03	2.19	2.23	1.79	1.74	3.77	2.38	5	4.06	2.79	2.7	1.04	0.98	7.9	7.92	17.9	3.81	3.29	7.16	6.83	7.33	6.95	4.58	4.28
090SM	Male	3.13	3.31	2.09	2.19	1.45	1.82	4.47	2.68	5.48	4.38	3.02	3.03	1.12	1.12	7.51	7.42	17.89	3.62	3.91	6.88	6.7	7.29	7.21	5.28	5.06
091SM	Male	3.13	3.19	2.1	2.22	1.83	1.93	3.9	2.5	4.85	4.29	2.96	2.97	1.04	1.08	8.2	8.13	17.86	3.93	3.64	7.01	7.02	7.26	7.54	4.34	4.64
093SF	Female	3.02	3.14	2.12	2.18	1.89	1.81	5.08	2.42	4.5	4.18	2.78	2.86	1.05	1.09	8.14	8.13	17.85	3.51	3.6	6.37	6.89	6.42	7.04	4.88	5.3
094SM	Male	3.28	3.13	2.31	2.41	1.73	1.91	4.32	2.75	5.34	4.51	3.12	3.21	1.18	1.17	7.49	7.52	17.84	3.73	3.62	6.79	6.59	7.09	7.04	4.9	4.68
095SM	Male	3.3	3.43	2.28	1.99	1.62	1.6	4.05	2.22	4.83	4.08	2.85	2.93	1.04	1.02	7.44	7.41	17.87	3.41	3.45	6.29	6.23	6.65	6.81	4.84	5.08
096SF	Female	3.1	3.17	2.07	2.19	1.7	1.75	4.19	2.73	5.01	3.97	2.8	2.76	1.1	1.1	7.99	7.92	17.87	3.04	3.1	6.81	6.42	7.3	6.75	4.51	4.81
097SF	Female	3.22	3.23	2.26	2.01	1.56	1.7	4.12	2.73	4.95	3.89	2.74	2.62	1.01	0.99	7.92	7.95	17.87	3.19	3.13	6.51	6.5	7	6.89	4.61	4.67
098SF	Female	3.11	3.06	2.28	2.22	1.67	1.79	4.33	2.58	5	4.29	2.78	2.79	1	1.01	7.75	7.79	17.75	2.99	3.24	6.17	6.03	6.48	6.48	5.16	4.92
099SM	Male	3	3.16	2.33	2.49	1.93	1.83	4.38	2.66	5.28	4.38	2.92	2.84	1.07	1.05	8.03	7.78	17.86	2.79	3.25	6.2	6.92	6.57	7.29	5.49	5.43
100SM	Male	3.19	3.18	2.41	2.42	1.59	1.7	3.23	2.86	4.98	4.19	2.77	2.78	1.06	1.05	7.76	7.74	17.89	2.81	3.59	6.31	6.53	6.92	7.12	4.25	4.41
101SM	Male	3.39	3.51	2.34	2.39	1.81	1.8	3.99	2.69	5.19	4.08	3.04	3.06	1.11	1.1	7.75	7.6	17.9	3.51	3.73	6.7	6.58	7.12	6.96	4.68	4.86
104SF	Female	3.27	3.14	2.19	1.94	1.83	1.91	4.59	2.82	5.22	4.41	2.98	2.98	1.08	1.13	7.96	7.9	17.77	3.08	2.94	5.88	6.33	6.4	6.78	5.33	4.81
106SM	Male	3.09	3.17	2.33	2.41	1.75	1.81	4.2	2.75	4.9	4.44	3.2	3.25	1.15	1.15	7.87	7.74	17.86	3.4	3.67	6.28	6.31	6.58	6.91	5.35	5.24
107SM	Male	3.03	3.28	2.15	2.3	1.69	1.51	4.42	2.55	5.46	4.11	2.93	3.03	1.08	1.11	7.33	7.15	17.9	2.99	3.41	6.1	6.6	6.54	7.06	5.36	5.55
111SM	Male	3.33	3.26	2.2	2.57	1.83	1.79	3.95	2.67	4.96	4.31	2.96	3.04	1.09	1.1	7.66	7.65	17.89	2.96	3.14	6.66	6.63	6.8	6.91	4.74	4.97
112SM	Male	3.09	3.21	2.07	2.45	2.06	1.99	3.85	2.75	5.05	4.39	2.86	2.93	1.09	1.11	7.54	7.62	17.9	3.88	4.38	6.55	7.97	7.04	7.93	4.33	4.54
114SM	Male	2.87	3.11	2.31	2.27	2.04	1.73	3.99	2.59	4.99	4.22	2.9	2.91	1.07	1.07	7.49	7.46	17.9	3.3	3.28	6.48	6.2	6.77	6.3	5.11	4.93
117SF	Female	3.05	3.09	2.47	2.21	1.89	2.01	3.74	2.78	4.67	4.09	2.76	2.66	1.01	0.99	8.34	8.31	17.87	3.56	4.29	7.75	7.86	8.51	8.35	4.69	5.01
118SM	Male	3.14	3.02	2.33	2.31	1.61	1.79	3.49	2.41	5.04	4.04	2.83	2.92	1.06	1.04	7.87	7.71	17.85	3.59	3.19	6.75	6.52	7.04	7.12	4.92	4.78
119SM	Male	3.19	3.4	2.31	1.86	1.64	1.84	3.77	2.19	5.03	4.2	2.92	2.79	1	1.07	7.9	7.87	17.85	2.82	2.98	5.89	5.35	6.03	5.9	4.84	4.54
120SM	Male	3.32	3.39	2.24	2.32	1.86	1.84	4.22	2.74	4.94	4.4	2.96	3.02	1.09	1.11	7.93	8.04	17.86	3.51	3.61	6.18	6.72	6.57	6.85	4.83	4.96
121SM	Male	3.03	3.15	2.18	2.07	1.87	1.84	4.32	2.51	4.94	4.59	3.08	2.93	1.12	1.05	7.57	7.54	17.77	3.85	3.42	6.26	6.09	6.74	6.63	5.18	5.22
122SF	Female	3.32	3.18	2.07	2.41	1.66	1.47	4.33	2.55	5.25	4	2.7	2.79	1.08	1.04	7.81	7.86	17.83	3.86	3.65	7.19	7.66	7.35	7.65	5.17	5.29
123SF	Female	3.24	1.89	2.27	3.2	1.95	1.87	4.63	2.76	5.79	4.32	2.94	2.97	1.1	1.14	7.97	7.99	17.83	3.71	3.16	6.77	6.61	6.99	7.05	5.79	5.88
124SF	Female	3.38	3.34	2.17	2.21	1.69	1.71	4.35	2.59	5.25	3.93	3.03	3.06	1.17	1.12	7.99	8.09	17.89	3	3.56	6.54	7.16	6.82	7.07	5.16	5.5
125SM	Male	2.92	3.05	2.07	2.39	1.47	1.37	3.87	2.18	5.38	4.17	2.99	2.96	1.05	1.05	7.79	7.71	17.87	3.69	3.25	6.97	6.44	7.19	6.74	4.88	4.68
126SF	Female	3.21	3.19	2.11	2.04	1.88	1.8	4.17	2.6	4.85	3.73	2.79	2.8	1	1.04	8.09	8.11	17.74	3.53	3.48	6.65	6.53	7.12	7.05	4.61	4.23
127SF	Female	3.25	3	2.22	2.33	1.96	1.87	4.5	2.77	5.08	3.78	2.93	2.88	1.12	1.14	7.83	7.9	17.85	3.27	3.28	6.01	6.09	6.56	6.59	4.39	5.18

128SF	Female	3.4	3.22	2.24	1.83	1.9	1.62	4.67	2.92	5.53	4.42	2.89	3.03	0.99	1.06	7.6	7.68	17.87	3.27	2.56	5.86	4.77	5.96	5.06	5.5	5.72
129SF	Female	3.19	3.28	2.15	2.16	2.02	1.88	4.97	2.79	5.62	4.25	3.14	3.13	1.17	1.2	7.87	7.87	17.85	3.18	3.23	6.65	5.6	6.38	6.45	5.62	6.28
130SM	Male	3.18	3.15	2.34	2.03	1.73	1.94	3.93	2.59	5.01	4.19	2.88	2.92	1.07	1.05	7.98	8.05	17.89	3.24	2.9	6.53	6.21	6.83	6.51	4.7	4.95
131SM	Male	3.34	3.26	2.26	2.28	1.81	1.96	4.5	2.59	5.52	4.18	2.98	3.02	1.12	1.14	7.35	7.24	17.82	4.15	4.24	7.63	6.96	8.29	7.71	4.86	4.95
132SM	Male	3.17	3.3	2.21	2.14	1.81	1.79	4.06	2.74	5.05	4.6	2.99	2.94	1.03	1.08	7.53	7.59	17.77	3.49	3.53	6.6	6.93	6.74	7.14	4.33	5.49
133SF	Female	3.11	3.43	2.39	2.34	1.6	1.58	3.78	2.62	4.85	3.9	2.9	2.88	1.1	1.08	8.02	7.96	17.88	3.69	3.79	7.27	7.26	7.65	7.78	4.28	4.52
134SM	Male	3.01	3.01	2.13	2.22	1.6	1.68	3.85	2.63	4.94	4.31	2.91	2.92	1.08	1.06	6.93	6.89	17.86	3.87	3.22	7.06	6.81	7.59	7.23	4.55	4.61
135SF	Female	3.08	3.19	2.22	2.27	1.64	1.63	4.09	2.62	5.23	3.98	2.73	2.81	1.04	1.06	7.9	8.04	17.87	3.85	4.04	7.28	7.49	7.68	8.07	4.64	4.64
136SF	Female	3.21	3.33	2.58	1.87	1.68	1.77	4.61	2.68	4.99	4.28	2.89	2.92	1.11	1.15	7.88	7.88	17.88	3.46	3.77	7.17	7.2	7.68	7.85	5.98	5.11
137SF	Female	3.25	3.13	2.2	1.86	1.96	2.06	4.9	2.74	5.55	4.73	3.28	3.28	1.23	1.19	7.29	7.27	17.82	3.85	3.33	6.79	6.32	7.57	7.02	6.12	5.79
138SM	Male	3.11	3.03	2.15	1.97	1.86	1.94	3.82	2.25	5.22	4.27	2.98	3.01	1.1	1.11	7.76	7.76	17.8	3.27	3.44	5.23	6.57	5.69	7.11	4.85	4.62
139SM	Male	3.05	3.21	2.11	1.8	1.98	1.87	4.15	3.01	5.28	4.36	3.01	3.03	1.15	1.13	7.4	7.18	17.79	3.77	4.53	6.77	7.43	7.49	7.95	5.2	4.89
140SM	Male	3.1	3.19	2.1	2.33	2.05	1.79	4.23	2.26	5.51	4.47	2.99	2.99	1.11	1.12	7.54	7.53	17.83	3.07	3.13	6.4	6.27	6.61	6.52	4.98	4.97
141SM	Male	3.52	3.01	2.47	2.13	1.68	1.64	3.58	2.65	5.22	4.21	3.02	3.05	1.08	1.09	8.06	8.06	17.78	3.33	3.73	6.97	7.34	7.42	7.81	4.29	4.32
142SF	Female	3.43	3.16	2.1	2.41	1.59	1.31	3.82	2.55	4.93	4.01	2.78	2.69	1.02	1	8.45	8.35	17.75	3.54	3.37	6.89	6.72	7.25	7.13	4.25	4.29
143SF	Female	2.99	3.01	2.25	2.17	1.77	1.7	3.84	2.71	4.36	3.81	2.85	2.92	1.08	1.09	8.24	8.33	17.85	3.22	2.81	5.19	5.85	5.24	6.33	4.22	4.32
144SF	Female	3.04	3.26	2.35	2.55	1.48	1.4	4.22	2.81	5.18	4.27	2.99	3.01	1.11	1.09	7.79	7.73	17.84	3.37	2.83	6.99	6.62	7.5	7.08	4.17	4.52
145SM	Male	2.95	2.98	2.32	2.43	2.04	1.83	3.81	2.34	4.82	3.99	2.96	2.98	1.1	1.14	8.07	8.13	17.78	3.05	3.37	6.02	5.95	6.35	6.33	4.17	4.56
146SM	Male	2.91	3.08	2.37	2.03	1.79	1.91	3.98	2.63	4.98	4.22	2.86	2.84	1.08	1.06	8.12	8.26	17.82	2.98	3.56	6.92	7.05	7.4	7.11	5.21	5.24
147SM	Male	3.2	3.56	2.11	1.79	1.92	1.96	4.25	2.69	5.39	4.57	2.95	3.02	1.13	1.12	7.13	7.17	17.86	2.7	2.92	5.78	5.66	6.53	6.71	5.62	5.19
148SM	Male	3.09	3.28	2.55	2.28	1.89	1.86	4.1	2.86	4.71	4.62	2.91	2.98	1.11	1.08	7.92	7.82	17.72	3.55	3.35	6.56	6.5	6.69	6.7	4.83	4.8
149SF	Female	3.52	3.15	1.91	1.71	1.9	1.92	4.48	2.62	5.21	4.26	3.12	3.14	1.15	1.19	7.8	7.79	17.76	3.57	3.72	7.53	7.13	7.55	7.33	5.79	4.49
150SF	Female	3.2	3.31	1.74	1.72	1.97	1.71	4.64	2.82	4.65	4.13	2.86	2.9	1.08	1.08	8.07	8.13	17.81	2.94	2.91	5.66	5.62	7.1	6.34	4.8	5.15
151SF	Female	3.12	3.08	2.04	1.74	1.83	1.86	4.8	2.84	5.29	4.2	2.88	2.87	1.07	1.07	7.88	8.06	17.76	3.61	3.51	7.26	6.6	7.8	7.04	5.11	5.53
152SF	Female	3.27	3	1.88	2.23	1.89	1.7	3.92	2.42	4.81	3.88	2.68	2.71	1.04	1.05	8.28	8.15	17.86	2.44	3.45	6.01	7.26	6.7	7.64	3.96	4.13
153SF	Female	3.31	3.27	2.16	2.08	1.69	1.85	5.31	3	5.7	4.26	3	3.03	1.11	1.18	7.33	7.34	17.86	3.57	3.16	7.12	6.17	7.1	6.34	5.66	5.63
154SM	Male	3.26	3.35	2.48	2.4	1.76	1.77	3.52	2.43	5.5	4.24	2.92	2.9	1.12	0.99	7.55	7.59	17.78	3.56	3.47	7.02	7.07	7.39	7.46	3.8	3.99
155SM	Male	3.11	3.12	2.26	2.21	1.83	1.75	4.1	2.72	5.64	4.35	2.93	2.79	1.07	1.03	7.83	7.81	17.85	3.45	3.26	6.01	6.27	6.47	6.58	4.64	4.68
156SF	Female	3.22	3.17	2.06	2.07	1.81	1.91	5.15	2.92	5.3	4.03	3	2.96	1.11	1.1	7.68	7.72	17.84	3.62	3.31	6.47	6.91	6.74	7.09	5.22	5.28
157SM	Male	3.36	3.09	2.18	2.28	1.9	1.9	4.25	2.84	4.96	4.49	2.87	2.84	1.06	0.99	7.34	7.4	17.76	4.31	3.62	7.14	6.69	7.34	6.84	5.2	5.15

159SF	Female	3.44	3.42	2.05	1.82	2.12	2.1	4.88	2.71	5.5	4.17	3.03	3.06	1.17	1.17	7.5	7.47	17.75	3.67	3.11	5.83	5.7	6.09	5.91	5.52	5.35
160SM	Male	3.32	3.37	2	1.86	1.79	1.72	4.13	3.07	5.18	4.6	3.03	3.02	1.15	1.13	7.1	7.08	17.78	3.54	3.2	6.84	7.05	7.17	7.34	4.47	4.75
161SM	Male	3.13	3.19	2.07	2.24	1.7	1.76	4.18	2.54	5.44	3.99	2.91	2.95	1.11	1.09	7.45	7.53	17.83	3.63	3.96	6.87	7.15	7.11	7.4	5.43	4.9
162SM	Male	3.13	3	2.13	2.11	1.91	1.86	4.11	3.04	4.91	4.38	2.81	3.03	1.17	1.09	7.49	7.33	17.88	3.19	2.96	5.44	5.2	5.77	5.78	4.98	5.48
163SM	Male	3.41	3.42	2.1	2.26	1.79	1.49	4.17	2.89	5.18	4.01	2.85	2.78	1.06	1.06	7.67	7.65	17.73	2.52	3.58	5.76	6.81	6.67	7.08	4.74	4.76
164SM	Male	2.88	2.97	1.69	2.2	1.59	1.62	3.97	2.63	5.13	4.67	3.01	2.98	1.11	1.12	7.59	7.48	17.83	3.53	3.12	7.06	6.68	7.31	7.3	4.67	5.02
165SM	Male	3.19	3.33	2.49	2.21	1.66	1.81	3.85	2.6	5.03	4.22	2.64	2.68	1.03	1.03	7.79	7.62	17.77	3.8	3.54	7.04	6.66	7.35	7.12	4.53	4.4
166SF	Female	3.05	3.12	2.23	1.75	1.82	1.71	4.41	2.61	4.8	4.31	2.81	2.77	1.07	1.05	8.47	8.47	17.81	3.56	3.51	6.76	6.94	7.04	7.33	5.2	5.6
167SM	Male	3.27	3.12	2.31	2.3	1.84	1.79	3.79	2.8	5.08	4.11	2.83	2.79	0.99	0.96	7.82	8.04	17.79	2.98	3.1	6.48	6.73	7.08	7.16	5.39	4.99
168SM	Male	3.33	3.7	2.19	1.86	2.14	1.94	3.82	2.55	5.61	4.52	3.09	3.11	1.17	1.15	7.74	7.8	17.86	3.17	3.002	6.04	6.41	6.36	6.82	4.71	4.94
169SM	Male	3.05	2.98	2.18	2.2	1.45	1.62	4.4	2.87	5	4.6	2.92	2.97	1.12	1.15	7.7	7.69	17.85	3.98	4.95	7.86	8.51	8.36	8.8	4.97	5.14
170SF	Female	2.91	2.97	2.1	1.96	1.66	1.77	3.94	2.54	4.68	3.82	2.67	2.71	1.01	1.06	8.45	8.48	17.85	3.7	3.45	7.37	6.08	7.68	6.58	4.94	4.77
171SF	Female	3.61	3.65	1.97	1.86	1.7	1.8	5.27	2.6	5.04	4.35	3.07	3.05	1.14	1.19	7.42	7.42	17.85	3.28	3.67	5.87	6.82	6.1	6.87	5.82	5.34
172SF	Female	3.27	3.35	2.16	2.36	1.94	1.83	4.26	2.49	4.73	3.95	2.86	2.85	0.94	1.01	8.76	8.79	17.88	2.98	2.98	6.75	6.99	7.08	8.21	5.24	4.99
173SF	Female	3.15	3.12	2.4	2.25	1.85	1.88	4.43	2.52	5.25	4.24	2.8	2.82	1.06	1.01	8.18	8.19	17.77	3.1	4.08	6.99	8.05	7.74	8.72	5.34	5.15
174SM	Male	3.42	3.29	2.35	2.29	1.88	1.74	3.91	2.42	5.17	4.47	2.97	2.98	1.12	1.13	8.22	8.17	17.83	3.16	3.41	6.93	5.83	7.56	6.45	4.46	4.48
175SM	Male	3.24	3.58	2	1.91	1.76	1.61	4.39	2.67	5.41	4.56	2.87	2.88	1.09	1.06	7.45	7.52	17.79	3.32	3.34	6.25	5.8	6.52	6.19	5.14	5.17
176SF	Female	3	3.04	2.07	2.03	1.54	1.53	3.72	2.88	4.68	4.09	2.91	2.84	1.06	1.08	7.91	7.91	17.79	4.1	4	6.89	6.79	7.12	7.29	4.8	4.63
177SM	Male	3.31	3.04	1.84	1.87	1.79	1.95	4.38	2.3	5.2	4.16	2.69	2.84	1.08	1.01	7.55	7.4	17.83	3.29	3.15	7.07	6.85	6.95	7.34	5.1	5.77
178SM	Male	3.28	3.1	2.25	2.5	1.77	1.75	3.68	2.7	5.88	4.1	2.95	2.96	1.08	1.15	6.84	6.81	17.87	3.94	4.21	7.9	7.48	8.82	8.27	4.66	4.91
179SF	Female	3.32	3.03	2.39	1.6	1.65	1.49	4.03	2.4	4.25	3.85	2.72	2.76	1.02	0.99	8.86	8.78	17.74	3.06	3.24	5.5	6.27	6.39	6.58	4.69	4.85
180SF	Female	3.08	3.23	2.21	2.41	1.66	1.59	4.43	2.47	4.31	4.03	2.75	2.74	1.02	1.03	8.43	8.44	17.84	3.58	3.11	6.92	6.62	7.39	6.94	5.03	5.56
181SM	Male	3.01	3.04	2.2	2.19	1.84	1.61	3.81	2.66	4.93	4.1	2.86	2.95	1.04	1.11	7.85	7.83	17.85	3.26	3.1	6.15	5.96	6.37	6.45	4.65	4.73
182SM	Male	3.41	3.43	2.15	1.84	1.8	1.68	4.04	2.72	5.17	3.95	2.85	2.79	1.06	1.04	7.7	7.8	17.83	3.67	3.54	6.37	6.82	6.92	7.44	5.17	4.54
183SF	Female	3.49	3.4	2.83	2.39	1.42	1.49	5.05	2.67	5.39	4.18	2.95	2.96	1.05	1.12	7.81	7.82	17.75	3.07	3.46	4.69	6.17	4.84	6.6	5.48	5.22
184SM	Male	3.18	3.16	2.11	2.15	1.51	1.35	3.85	2.5	4.82	4	2.93	2.91	1.08	1.11	7.71	7.49	17.8	3.8	3.15	6.96	5.51	7.37	6.13	4.5	4.86
185SF	Female	3.55	3.36	2.24	1.52	1.56	1.38	4.95	2.68	4.57	3.84	2.77	2.76	1.01	0.98	8.39	8.42	17.81	2.87	2.94	6.5	6.24	7.04	6.53	5.83	5.08
186SF	Female	3.47	3.19	2.01	2.12	1.91	2.02	5.38	2.63	5.5	4.21	2.96	2.95	1.08	1.08	7.51	7.57	17.8	3.14	3.04	6.31	6.3	6.26	6.82	6.34	6.77
187SM	Male	3.42	3.74	2.06	1.85	1.69	1.96	4.23	2.2	5.28	4.01	2.77	2.81	0.96	1.02	7.42	7.43	17.84	3.11	2.77	6.64	5.24	6.73	5.82	5.05	4.9
188SF	Female	3	2.86	2.18	1.82	1.86	1.9	4.5	2.72	5.41	3.97	2.84	2.85	1.05	1.1	7.78	7.75	17.82	3.07	2.94	6.65	6.44	7.12	6.79	5.6	5.46

189SF	Female	3.32	3.23	2.05	1.5	1.9	1.91	4.11	2.42	4.63	4.14	2.84	2.85	1.05	1.04	8.26	8.2	17.69	3.34	3.33	6.86	6.68	7.52	6.99	4.86	5.49
190SM	Male	2.9	3.13	1.86	2.31	1.98	2	4.73	2.64	5.17	4.67	2.99	2.98	1.17	1.09	6.9	6.85	17.78	3.94	4.15	6.11	6.43	6.58	7.21	6.13	5.9
191SF	Female	3.22	3.34	1.88	2.09	1.8	1.82	3.69	2.73	5.06	3.92	2.59	2.57	1.05	1.05	8.06	8.13	17.77	2.76	2.98	5.56	5.75	6.16	6.32	4.22	4.45
192SF	Female	3.3	3.43	2.4	2.21	1.83	2.1	4.43	2.66	4.85	4.13	2.86	2.56	1.06	1.1	7.64	7.71	17.71	2.69	3.13	5.34	4.59	5.95	5.45	4.84	4.98
193SM	Male	2.96	3.61	1.58	1.79	1.7	1.6	4.28	2.7	4.87	4.53	2.95	2.85	1.09	1.07	7.7	7.74	17.67	2.41	2.75	6.02	6.43	6.53	6.6	4.6	5.19
194SF	Female	3.24	3.13	2.2	1.94	1.93	1.8	5.2	2.26	5.33	4.48	2.86	3	1.17	1.09	8.05	7.92	17.88	3.36	3.62	6.45	6.33	6.66	6.72	6.09	5.87
195SF	Female	3.28	3.33	2.34	2.13	1.99	1.95	4.49	2.35	5.09	4.03	2.91	2.89	1.07	1.04	7.98	7.98	17.79	3.6	3.75	6.65	7.84	7.09	8.02	4.9	5.14
196SM	Male	3.35	3.29	2.33	2.18	1.92	1.9	4.44	2.25	5.39	3.94	2.92	2.94	1.09	1.09	7.7	7.63	17.85	3.59	3.47	6.15	7.57	6.28	7.76	5.14	5.42
197SM	Male	3.2	3.25	2.19	2.16	1.54	1.71	3.93	2.73	5.49	4.32	2.89	2.93	1.09	1.08	6.81	6.84	17.81	3.17	2.69	5.72	5.08	6.13	5.79	4.86	5.13
198SF	Female	2.95	2.91	2.21	1.96	1.52	1.55	3.87	2.51	4.76	4.01	2.83	2.85	1.05	1.08	7.95	7.75	17.85	3.77	3.14	7.36	6.56	7.86	7.13	4.49	4.46

Table 12. Gait Morphology (Column)

Backward Arm Swing										Forward Arm Swing										Overall			Midstance																						Swing (lower legs)					
3. Lat Placement of Upper Arm Backward Swing Right	4. Lat Placement of Upper Arm Backward Swing Left	5. Lat Placement of Forearm Backward Arm Swing Right	6. Lat Placement of Forearm Backward Arm Swing Left	9. Level of elbow Flexion backward Arm Swing Right	10. Level of elbow Flexion Backward Arm Swing Left	13. Lateral Rotation of the Hand Backwards swing Right	14. Lateral Rotation of the hand Backwards swing Left	15. Finger flexion upon backward arm swing Right	16. Finger flexion upon backward arm swing Right	3. Lat Placement of Upper Arm Forward Swing Right	4. Lat Placement of Upper Arm Forward Swing Left	5. Lat? Placement of Forearm Forward Arm Swing Right	6. Lat? Placement of Forearm Forward Arm Swing Left	9. Level of elbow Flexion Forward Arm Swing Right	10. Level of elbow Flexion Forward Arm Swing Left	13. Lateral Rotation of the Hand Forward swing Right	14. Lateral Rotation of the hand Forward swing Left	15. Finger flexion upon Forward arm swing Right	16. Finger flexion upon forward arm swing Right	2. lateral trunk sway	3. Orientation of Lower Extremities Right Anterior	4. Orientation of Lower Extremities Left Anterior	1. Head Level	2. Lateral head tilt	3. Shoulder level Right	4. Shoulder level Left	7. Lateral Placement of Upper Arm Right	8. Lateral Placement of Upper Arm Left	9. Lateral Placement of Forearm Right	10. Lateral Placement of Forearm Left	11. Level of elbow Flexion Midstance Right	12. Level of elbow Flexion Midstance Left	14. Lateral Rotation of the Hand Mid stance Right	15. Lateral Rotation of the hand Mid Stance Left	16. Finger Flexion Right	17. Finger Flexion Left	18. Thoracic Projection	19. Abdominal projection	22. Lateral Placement of Upper leg Mid Stance Right	23. Lateral Placement of Upper leg Mid Stance Left	24. Lateral Placement of Lower Leg Mid Stance Right	25. Lateral Placement of Lower leg Mid Stance Left	28. Placement of the Feet Mid Stance Right	29. Placement of the Feet Mid Stance Left	1. lat placement of Upper Leg Swing Right	2. lat placement of Upper Leg Swing Left	5. Lateral Placement of Lower Leg Swing Right	6. Lateral Placement of Lower leg Swing Left	11. Placement of the Feet Swing Right	12. Placement of the Feet Swing Left
1	3	1	1	2	2	2	2	2	2	2	1	3	3	3	3	1	2	2	2	2	3	3	2	2	2	2	1	2	1	1	3	3	2	2	1	2	2	2	3	3	3	3	2	2	3	3	3	3	1	1
3	3	1	1	1	2	3	2	2	2	3	1	3	3	2	3	2	1	2	2	1	3	3	2	2	2	3	3	3	1	1	1	2	2	2	3	3	2	2	1	1	3	3	1	2	2	2	2	2	1	1
3	2	1	1	2	2	2	2	2	2	3	3	3	3	2	2	2	1	2	2	1	3	3	1	3	1	2	1	2	2	1	2	2	2	2	2	2	3	2	3	3	3	3	2	2	3	3	3	3	1	1
3	3	1	1	2	2	2	3	2	2	3	3	3	3	2	3	2	2	2	2	2	4	4	1	1	3	2	3	2	2	3	2	1	2	2	2	2	2	1	3	3	2	2	2	2	3	3	3	3	1	1
3	1	1	1	2	2	1	1	2	2	2	1	3	3	2	3	2	1	2	2	2	3	3	1	1	2	3	1	1	2	2	2	2	2	1	2	2	2	2	3	3	2	2	2	2	2	1	3	3	1	1
3	2	1	1	2	3	2	1	2	1	2	1	3	3	3	3	1	1	2	1	2	3	3	1	2	3	3	1	1	1	1	2	2	2	1	2	1	2	1	3	2	2	2	2	1	3	3	2	3	1	1
3	3	2	1	2	2	2	2	2	2	2	1	3	3	3	2	2	1	2	2	2	1	1	1	3	1	1	2	2	2	2	2	2	2	2	2	2	3	2	3	3	2	1	1	1	3	3	3	3	1	1
3	3	1	1	2	2	2	2	1	1	2	1	3	3	3	3	1	1	1	1	1	3	3	2	2	3	3	3	2	1	1	2	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	3	3	2	1
2	3	2	1	2	1	2	2	2	1	2	2	3	3	3	3	2	3	2	2	2	3	3	2	1	2	2	2	2	3	2	2	2	2	2	2	2	3	1	3	3	3	2	2	2	2	1	2	2	1	1
2	2	1	1	2	2	2	1	2	2	1	3	2	3	2	2	1	1	2	2	1	2	2	1	3	3	3	2	2	1	2	2	2	2	1	2	2	2	1	3	3	2	2	1	1	3	3	2	1	2	2
1	2	2	1	1	2	2	2	2	2	2	1	2	3	1	3	1	1	2	2	3	4	4	2	2	1	1	2	2	1	1	2	3	2	1	2	2	2	1	2	2	2	2	1	1	2	2	3	3	1	1
1	3	2	1	1	2	2	2	1	1	2	2	3	3	2	2	1	2	2	1	2	4	4	2	3	2	2	1	2	1	2	2	2	2	2	2	2	2	2	3	2	3	3	2	1	2	3	3	3	2	1
3	3	3	1	2	1	2	2	1	1	3	3	3	3	2	3	1	2	1	1	2	3	3	2	1	2	2	2	3	1	3	2	2	2	2	1	1	3	2	3	3	3	2	1	1	3	3	3	3	1	1
3	3	2	1	3	3	2	1	1	1	1	3	3	3	3	3	2	1	1	1	2	3	3	3	3	1	1	1	2	1	1	3	3	2	1	1	2	3	1	3	3	3	3	1	1	3	3	3	3	1	1
1	2	1	1	2	2	2	2	1	2	2	3	3	3	3	3	1	2	1	2	1	4	4	1	3	3	3	1	1	1	1	3	2	2	2	2	2	3	2	3	3	2	2	3	2	3	3	3	3	1	1

3	2	1	1	1	1	2	2	2	2	3	3	3	3	3	3	2	1	2	2	2	2	2	1	2	2	3	3	3	1	2	3	1	2	2	2	2	2	1	3	3	2	2	1	1	3	3	3	3	1	1
2	3	3	1	1	2	1	1	2	2	2	2	3	3	2	2	1	1	2	2	1	2	2	2	1	1	2	2	2	2	2	2	2	1	1	2	2	2	2	3	3	2	2	1	1	3	3	3	3	1	1
2	3	3	1	2	2	1	2	2	2	2	1	3	3	1	3	1	1	2	1	1	4	4	2	3	3	3	1	1	1	1	2	1	1	1	2	1	2	2	3	3	2	2	3	2	2	3	3	3	2	2
2	2	3	1	3	3	1	3	1	1	2	2	3	3	3	3	1	2	1	1	2	2	2	1	3	1	1	3	3	1	1	2	2	2	2	1	1	2	1	2	2	2	2	2	2	2	2	2	2	1	1
3	3	1	1	1	1	1	1	1	1	1	3	3	3	3	4	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	3	2	1	1	1	1	2	1	3	3	2	2	1	1	2	2	3	3	2	1
2	2	1	1	2	2	2	1	2	2	2	2	3	3	3	2	1	1	2	2	2	3	3	2	3	1	1	3	3	1	1	3	2	2	1	2	2	2	3	3	3	3	3	1	1	2	2	3	3	1	1
2	2	1	1	2	2	2	2	2	2	1	2	3	3	3	2	2	1	1	2	2	3	3	1	3	1	1	1	1	1	1	2	2	1	1	1	2	2	2	1	1	1	1	2	1	1	1	3	3	1	1
2	1	2	1	2	1	2	1	2	2	3	3	3	3	2	2	1	1	2	2	2	2	2	2	2	3	3	1	1	1	1	2	2	1	1	2	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1
1	1	1	1	2	2	1	1	2	2	1	1	2	3	3	3	1	1	2	2	2	3	3	1	3	2	3	1	1	1	1	2	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	2	3	1	1
3	1	1	1	2	2	2	2	2	2	1	2	3	3	3	3	2	1	2	2	3	4	4	2	2	1	1	1	1	2	2	2	2	2	2	1	1	1	1	2	2	3	2	3	2	2	2	3	3	1	1
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3	3	1	1	2	1	2	2	1	1	2	3	1	2	3	3	2	2	1	1	1	2	2	2	1	1	1	3	3	1	2	2	2	2	2	1	1	2	2	3	3	2	3	1	1	2	3	2	2	1	1
1	1	1	1	2	2	2	2	1	1	1	2	1	1	3	3	2	1	1	1	2	2	2	2	1	2	2	2	2	1	1	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
3	1	2	1	1	1	2	2	1	1	1	2	1	1	2	2	2	1	1	1	2	3	3	1	2	3	3	2	3	1	2	2	2	2	2	1	1	2	1	3	3	3	3	1	1	2	2	2	2	1	1
2	3	2	1	2	2	2	2	1	2	1	3	1	3	2	2	2	2	1	2	3	3	3	2	2	1	1	2	3	2	2	2	2	2	2	1	2	2	2	3	3	3	3	1	1	3	3	2	2	1	1
3	3	1	2	2	2	2	2	1	1	1	1	1	1	2	2	1	1	1	1	3	2	2	1	1	2	3	3	3	1	3	2	2	2	2	1	1	1	2	3	3	3	3	1	1	2	2	2	2	1	1
3	3	1	1	1	1	2	2	1	1	3	3	3	1	2	2	1	2	1	1	2	5	5	2	1	3	3	3	3	1	1	2	2	2	2	1	1	3	3	3	3	2	2	1	1	3	3	2	2	1	1
3	3	3	3	1	1	1	1	1	1	1	2	1	2	2	2	2	1	2	2	2	2	2	2	1	1	1	1	2	1	2	2	2	2	1	2	2	2	2	3	3	3	3	1	2	2	3	2	3	1	1
1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	3	1	1	1	1	3	2	2	1	3	1	1	1	1	1	1	2	2	1	1	1	1	1	2	3	3	2	2	2	1	3	3	2	2	1	1
1	3	1	1	1	1	2	2	1	1	1	2	1	1	2	3	2	2	1	1	3	4	4	1	3	3	3	1	3	1	1	2	2	2	2	1	1	1	2	3	3	2	2	1	2	3	3	2	2	1	1
1	2	1	1	2	1	2	2	1	1	2	2	3	2	3	3	2	2	1	1	2	4	4	3	2	1	1	2	3	2	2	2	2	2	2	1	1	2	1	3	3	3	3	1	2	3	3	1	2	1	1

Appendix D: Data Conversion

D.1 Proportional Indices

Table 13. Stance Anthropometry Conversion

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0.044	0.046	0.035	0.034	0.025	0.024	0.056	0.035	0.078	0.058	0.035	0.035	0.013	0.013	0.117	0.119	0.234
0.047	0.047	0.033	0.034	0.023	0.023	0.058	0.035	0.077	0.054	0.036	0.036	0.012	0.012	0.111	0.111	0.251
0.045	0.047	0.036	0.035	0.02	0.019	0.052	0.035	0.074	0.058	0.037	0.035	0.013	0.012	0.116	0.116	0.251
0.044	0.043	0.032	0.03	0.02	0.019	0.063	0.034	0.084	0.055	0.036	0.036	0.012	0.012	0.113	0.114	0.254
0.045	0.045	0.034	0.034	0.023	0.023	0.059	0.032	0.074	0.053	0.035	0.035	0.011	0.011	0.119	0.118	0.249
0.043	0.045	0.032	0.031	0.026	0.026	0.06	0.031	0.07	0.054	0.037	0.036	0.013	0.013	0.12	0.12	0.245
0.048	0.049	0.035	0.034	0.024	0.023	0.054	0.033	0.066	0.048	0.039	0.038	0.012	0.011	0.116	0.116	0.255
0.049	0.049	0.033	0.032	0.024	0.024	0.059	0.033	0.071	0.05	0.035	0.034	0.012	0.012	0.116	0.115	0.252
0.047	0.048	0.033	0.032	0.023	0.023	0.055	0.034	0.072	0.055	0.035	0.036	0.011	0.011	0.117	0.116	0.252
0.046	0.048	0.031	0.032	0.025	0.022	0.059	0.034	0.07	0.053	0.035	0.035	0.013	0.013	0.116	0.116	0.251
0.045	0.046	0.033	0.032	0.025	0.023	0.059	0.033	0.073	0.054	0.037	0.036	0.011	0.012	0.117	0.117	0.248
0.044	0.045	0.033	0.032	0.022	0.024	0.059	0.033	0.073	0.056	0.036	0.037	0.011	0.011	0.117	0.117	0.25
0.047	0.046	0.029	0.029	0.026	0.027	0.058	0.032	0.075	0.053	0.037	0.037	0.014	0.013	0.115	0.115	0.246
0.044	0.045	0.03	0.032	0.028	0.026	0.052	0.033	0.077	0.052	0.037	0.037	0.013	0.013	0.116	0.117	0.249
0.044	0.045	0.031	0.029	0.021	0.024	0.053	0.031	0.071	0.056	0.038	0.039	0.014	0.014	0.12	0.121	0.249
0.041	0.043	0.034	0.034	0.025	0.024	0.052	0.034	0.074	0.053	0.04	0.04	0.013	0.014	0.118	0.117	0.245
0.045	0.044	0.031	0.032	0.025	0.025	0.054	0.033	0.073	0.054	0.039	0.039	0.014	0.014	0.115	0.116	0.248
0.046	0.044	0.032	0.03	0.026	0.025	0.055	0.035	0.07	0.055	0.04	0.04	0.013	0.013	0.113	0.113	0.25
0.044	0.046	0.031	0.032	0.021	0.02	0.051	0.03	0.066	0.053	0.038	0.038	0.012	0.013	0.124	0.125	0.255
0.043	0.044	0.03	0.03	0.027	0.025	0.055	0.033	0.069	0.056	0.039	0.039	0.013	0.014	0.116	0.116	0.251
0.047	0.047	0.034	0.033	0.022	0.021	0.054	0.032	0.062	0.052	0.038	0.037	0.013	0.013	0.125	0.124	0.245
0.045	0.045	0.032	0.032	0.023	0.023	0.054	0.034	0.065	0.053	0.04	0.039	0.014	0.014	0.119	0.118	0.251
0.044	0.045	0.032	0.033	0.027	0.024	0.054	0.035	0.06	0.053	0.041	0.041	0.014	0.015	0.118	0.119	0.246
0.044	0.043	0.033	0.034	0.021	0.02	0.057	0.033	0.076	0.057	0.039	0.039	0.013	0.013	0.111	0.112	0.256
0.044	0.045	0.032	0.031	0.021	0.021	0.063	0.033	0.071	0.057	0.04	0.04	0.014	0.014	0.112	0.112	0.25
0.044	0.044	0.033	0.033	0.022	0.021	0.054	0.032	0.07	0.057	0.038	0.039	0.014	0.013	0.119	0.121	0.247
0.043	0.043	0.032	0.032	0.021	0.02	0.062	0.036	0.07	0.059	0.04	0.04	0.014	0.014	0.108	0.109	0.255
0.044	0.044	0.033	0.032	0.023	0.024	0.055	0.036	0.076	0.057	0.038	0.039	0.013	0.014	0.115	0.115	0.244
0.043	0.043	0.032	0.032	0.021	0.021	0.058	0.035	0.074	0.056	0.038	0.038	0.014	0.014	0.117	0.117	0.248
0.044	0.046	0.032	0.029	0.024	0.024	0.057	0.035	0.069	0.056	0.039	0.039	0.014	0.014	0.115	0.115	0.248
0.045	0.044	0.03	0.029	0.019	0.019	0.054	0.035	0.069	0.059	0.039	0.039	0.014	0.014	0.119	0.119	0.254
0.044	0.047	0.031	0.029	0.024	0.022	0.058	0.029	0.073	0.055	0.038	0.038	0.013	0.013	0.117	0.118	0.251
0.044	0.045	0.032	0.032	0.025	0.022	0.055	0.032	0.069	0.056	0.037	0.038	0.013	0.014	0.118	0.118	0.252
0.044	0.044	0.03	0.03	0.025	0.023	0.059	0.035	0.075	0.057	0.04	0.04	0.014	0.015	0.112	0.112	0.245
0.044	0.046	0.03	0.027	0.023	0.022	0.06	0.039	0.077	0.053	0.042	0.043	0.016	0.016	0.107	0.107	0.247
0.047	0.046	0.034	0.031	0.022	0.022	0.058	0.032	0.072	0.052	0.039	0.038	0.013	0.014	0.116	0.116	0.247
0.045	0.045	0.029	0.029	0.023	0.024	0.059	0.036	0.072	0.054	0.04	0.04	0.015	0.015	0.112	0.112	0.25
0.045	0.045	0.032	0.031	0.024	0.025	0.062	0.032	0.071	0.054	0.039	0.038	0.014	0.015	0.114	0.114	0.247
0.044	0.046	0.029	0.028	0.026	0.027	0.075	0.032	0.077	0.057	0.039	0.039	0.014	0.015	0.107	0.107	0.24
0.047	0.046	0.031	0.032	0.024	0.024	0.054	0.034	0.067	0.056	0.04	0.04	0.014	0.014	0.114	0.115	0.249

0.046	0.047	0.031	0.03	0.023	0.024	0.061	0.032	0.078	0.053	0.037	0.037	0.013	0.013	0.112	0.113	0.249
0.044	0.044	0.03	0.031	0.027	0.026	0.058	0.035	0.073	0.057	0.039	0.04	0.014	0.015	0.111	0.11	0.246
0.045	0.045	0.032	0.031	0.02	0.021	0.054	0.035	0.068	0.052	0.039	0.039	0.014	0.014	0.12	0.12	0.249
0.044	0.043	0.032	0.032	0.027	0.026	0.056	0.033	0.074	0.058	0.039	0.038	0.014	0.013	0.113	0.112	0.245
0.042	0.043	0.03	0.03	0.024	0.026	0.057	0.037	0.073	0.054	0.038	0.039	0.014	0.014	0.114	0.114	0.25
0.046	0.046	0.032	0.03	0.025	0.026	0.054	0.032	0.071	0.055	0.039	0.038	0.014	0.014	0.117	0.116	0.245
0.049	0.049	0.03	0.031	0.023	0.023	0.057	0.032	0.071	0.052	0.034	0.036	0.013	0.013	0.12	0.12	0.248
0.046	0.044	0.03	0.034	0.021	0.02	0.053	0.034	0.069	0.055	0.038	0.038	0.015	0.015	0.117	0.118	0.251
0.044	0.045	0.032	0.03	0.025	0.025	0.064	0.03	0.072	0.054	0.038	0.038	0.014	0.013	0.115	0.115	0.247
0.044	0.044	0.033	0.031	0.024	0.024	0.063	0.032	0.077	0.052	0.038	0.039	0.014	0.014	0.112	0.111	0.25
0.044	0.043	0.034	0.034	0.021	0.02	0.054	0.037	0.077	0.054	0.039	0.039	0.014	0.014	0.113	0.112	0.252
0.044	0.045	0.028	0.028	0.02	0.02	0.072	0.032	0.079	0.057	0.041	0.04	0.014	0.014	0.109	0.109	0.247
0.046	0.047	0.03	0.03	0.025	0.024	0.063	0.03	0.08	0.052	0.041	0.04	0.014	0.014	0.109	0.109	0.246
0.044	0.045	0.031	0.03	0.025	0.024	0.062	0.034	0.068	0.057	0.039	0.039	0.014	0.014	0.114	0.114	0.248
0.045	0.044	0.033	0.032	0.025	0.025	0.053	0.034	0.065	0.058	0.039	0.039	0.014	0.014	0.115	0.116	0.249
0.045	0.047	0.031	0.03	0.026	0.026	0.061	0.033	0.079	0.051	0.04	0.04	0.015	0.015	0.104	0.105	0.251
0.049	0.048	0.03	0.03	0.023	0.024	0.061	0.035	0.067	0.053	0.038	0.038	0.014	0.014	0.115	0.115	0.245
0.045	0.046	0.03	0.031	0.025	0.026	0.061	0.033	0.073	0.056	0.038	0.036	0.014	0.012	0.112	0.111	0.253
0.046	0.045	0.032	0.031	0.025	0.025	0.062	0.035	0.077	0.057	0.039	0.039	0.014	0.014	0.106	0.105	0.249
0.045	0.046	0.033	0.031	0.025	0.025	0.059	0.032	0.076	0.053	0.042	0.039	0.014	0.013	0.109	0.109	0.249
0.042	0.042	0.032	0.031	0.026	0.024	0.054	0.037	0.068	0.052	0.04	0.041	0.015	0.015	0.116	0.116	0.25
0.043	0.043	0.029	0.031	0.019	0.019	0.056	0.034	0.071	0.056	0.039	0.04	0.015	0.015	0.117	0.117	0.255
0.045	0.045	0.033	0.033	0.022	0.021	0.053	0.035	0.075	0.056	0.037	0.036	0.012	0.013	0.114	0.115	0.256
0.045	0.046	0.033	0.035	0.027	0.023	0.055	0.034	0.075	0.052	0.034	0.034	0.012	0.013	0.114	0.114	0.253
0.043	0.045	0.034	0.034	0.025	0.024	0.051	0.035	0.07	0.054	0.036	0.035	0.012	0.012	0.118	0.117	0.254
0.044	0.045	0.031	0.032	0.026	0.025	0.059	0.036	0.072	0.053	0.036	0.037	0.014	0.013	0.112	0.112	0.253
0.046	0.046	0.035	0.035	0.024	0.022	0.057	0.039	0.063	0.058	0.036	0.037	0.013	0.012	0.113	0.113	0.25
0.045	0.045	0.034	0.032	0.024	0.024	0.052	0.035	0.069	0.057	0.035	0.035	0.013	0.012	0.118	0.117	0.253
0.046	0.046	0.031	0.031	0.024	0.024	0.061	0.034	0.072	0.058	0.035	0.035	0.013	0.012	0.113	0.113	0.251
0.048	0.048	0.036	0.036	0.024	0.023	0.052	0.032	0.069	0.054	0.034	0.033	0.012	0.011	0.12	0.12	0.25
0.046	0.046	0.035	0.036	0.023	0.024	0.056	0.038	0.069	0.054	0.035	0.036	0.012	0.011	0.114	0.114	0.25
0.044	0.044	0.032	0.032	0.026	0.026	0.06	0.036	0.072	0.058	0.036	0.035	0.013	0.012	0.111	0.11	0.251
0.043	0.043	0.033	0.032	0.025	0.025	0.056	0.036	0.074	0.055	0.039	0.038	0.013	0.013	0.111	0.111	0.252
0.046	0.046	0.031	0.031	0.024	0.024	0.056	0.034	0.076	0.054	0.036	0.034	0.013	0.012	0.114	0.114	0.255
0.045	0.045	0.033	0.035	0.024	0.024	0.055	0.033	0.069	0.054	0.036	0.036	0.012	0.013	0.117	0.117	0.254
0.047	0.048	0.033	0.033	0.025	0.026	0.059	0.031	0.066	0.055	0.036	0.036	0.011	0.011	0.119	0.119	0.244
0.042	0.043	0.034	0.035	0.024	0.022	0.057	0.034	0.07	0.053	0.035	0.036	0.012	0.011	0.121	0.121	0.251
0.045	0.046	0.033	0.034	0.026	0.025	0.052	0.033	0.065	0.056	0.036	0.035	0.012	0.012	0.12	0.12	0.252
0.046	0.046	0.034	0.034	0.026	0.025	0.054	0.032	0.069	0.055	0.038	0.037	0.012	0.012	0.116	0.116	0.249
0.047	0.048	0.031	0.03	0.023	0.024	0.065	0.031	0.068	0.056	0.034	0.034	0.014	0.013	0.117	0.117	0.249
0.044	0.045	0.032	0.032	0.026	0.026	0.054	0.031	0.068	0.053	0.036	0.036	0.013	0.013	0.122	0.123	0.247
0.046	0.046	0.028	0.03	0.027	0.026	0.057	0.033	0.064	0.06	0.038	0.037	0.013	0.013	0.115	0.116	0.249
0.048	0.046	0.033	0.034	0.023	0.022	0.054	0.033	0.067	0.053	0.035	0.035	0.013	0.013	0.119	0.12	0.252
0.043	0.045	0.033	0.033	0.021	0.021	0.056	0.03	0.074	0.059	0.038	0.039	0.012	0.011	0.117	0.117	0.252
0.045	0.044	0.031	0.032	0.024	0.025	0.058	0.033	0.074	0.054	0.035	0.034	0.012	0.011	0.117	0.117	0.253
0.045	0.047	0.034	0.032	0.023	0.025	0.051	0.033	0.079	0.056	0.035	0.034	0.012	0.013	0.117	0.117	0.248
0.047	0.048	0.031	0.031	0.025	0.024	0.055	0.035	0.074	0.053	0.038	0.036	0.011	0.012	0.116	0.116	0.25

0.047	0.047	0.033	0.032	0.027	0.029	0.06	0.032	0.064	0.05	0.035	0.035	0.014	0.015	0.118	0.118	0.243
0.044	0.045	0.029	0.03	0.025	0.024	0.076	0.031	0.07	0.056	0.037	0.038	0.014	0.015	0.109	0.109	0.247
0.045	0.046	0.028	0.029	0.025	0.025	0.066	0.032	0.078	0.054	0.04	0.04	0.015	0.015	0.108	0.109	0.245
0.044	0.044	0.031	0.03	0.025	0.025	0.055	0.033	0.069	0.057	0.04	0.04	0.014	0.013	0.115	0.115	0.251
0.045	0.043	0.032	0.032	0.02	0.02	0.077	0.029	0.078	0.059	0.042	0.043	0.015	0.014	0.106	0.106	0.24
0.048	0.049	0.035	0.034	0.025	0.023	0.055	0.031	0.064	0.054	0.036	0.036	0.013	0.013	0.119	0.118	0.247
0.046	0.045	0.034	0.031	0.023	0.024	0.059	0.033	0.072	0.058	0.039	0.039	0.014	0.013	0.111	0.111	0.249
0.043	0.04	0.031	0.031	0.026	0.026	0.06	0.035	0.072	0.055	0.04	0.04	0.015	0.015	0.111	0.111	0.249
0.047	0.048	0.03	0.031	0.024	0.022	0.062	0.033	0.076	0.056	0.039	0.04	0.015	0.013	0.108	0.108	0.248
0.045	0.046	0.031	0.03	0.024	0.026	0.063	0.032	0.072	0.059	0.038	0.039	0.014	0.014	0.112	0.112	0.241
0.044	0.044	0.031	0.031	0.026	0.025	0.058	0.034	0.077	0.057	0.038	0.038	0.015	0.014	0.11	0.11	0.249
0.047	0.044	0.03	0.032	0.026	0.027	0.053	0.034	0.073	0.056	0.037	0.037	0.014	0.014	0.114	0.114	0.249
0.047	0.045	0.031	0.031	0.023	0.024	0.058	0.033	0.078	0.054	0.042	0.041	0.015	0.014	0.109	0.109	0.244
0.045	0.044	0.029	0.028	0.026	0.026	0.057	0.035	0.074	0.052	0.038	0.038	0.014	0.014	0.115	0.114	0.25
0.045	0.046	0.032	0.03	0.024	0.024	0.057	0.035	0.074	0.055	0.039	0.039	0.014	0.015	0.11	0.11	0.251
0.048	0.046	0.028	0.029	0.029	0.027	0.06	0.034	0.077	0.057	0.038	0.038	0.013	0.013	0.109	0.109	0.245
0.044	0.042	0.03	0.033	0.024	0.023	0.055	0.034	0.075	0.054	0.038	0.038	0.014	0.014	0.116	0.116	0.251
0.041	0.043	0.033	0.032	0.024	0.022	0.06	0.032	0.066	0.059	0.038	0.038	0.014	0.014	0.117	0.117	0.247
0.041	0.042	0.034	0.032	0.023	0.022	0.058	0.035	0.065	0.057	0.037	0.038	0.014	0.014	0.118	0.118	0.253
0.045	0.046	0.031	0.032	0.026	0.025	0.06	0.033	0.068	0.055	0.039	0.039	0.014	0.014	0.112	0.112	0.25
0.044	0.043	0.031	0.032	0.026	0.025	0.06	0.031	0.079	0.059	0.038	0.038	0.014	0.014	0.109	0.109	0.247
0.046	0.045	0.032	0.032	0.025	0.024	0.055	0.032	0.066	0.051	0.039	0.038	0.013	0.013	0.121	0.121	0.247
0.043	0.044	0.032	0.032	0.024	0.022	0.063	0.033	0.068	0.056	0.037	0.037	0.014	0.013	0.117	0.117	0.248
0.047	0.047	0.031	0.03	0.024	0.024	0.065	0.033	0.069	0.053	0.038	0.037	0.013	0.013	0.115	0.115	0.245
0.04	0.041	0.017	0.02	0.022	0.023	0.059	0.035	0.074	0.058	0.041	0.041	0.015	0.015	0.121	0.121	0.258
0.044	0.046	0.032	0.029	0.024	0.024	0.071	0.031	0.08	0.058	0.038	0.04	0.015	0.014	0.106	0.105	0.242
0.047	0.045	0.032	0.032	0.022	0.023	0.047	0.034	0.067	0.054	0.036	0.036	0.012	0.011	0.122	0.122	0.255
0.045	0.044	0.032	0.032	0.024	0.023	0.063	0.033	0.072	0.058	0.035	0.036	0.013	0.013	0.116	0.114	0.248
0.045	0.045	0.032	0.03	0.028	0.029	0.067	0.032	0.071	0.049	0.035	0.036	0.012	0.013	0.116	0.116	0.244
0.05	0.049	0.033	0.034	0.024	0.023	0.052	0.032	0.073	0.05	0.034	0.033	0.012	0.011	0.12	0.119	0.251
0.046	0.046	0.029	0.03	0.027	0.027	0.06	0.034	0.066	0.055	0.035	0.036	0.014	0.013	0.117	0.117	0.247
0.043	0.043	0.031	0.03	0.027	0.027	0.061	0.034	0.074	0.057	0.037	0.036	0.013	0.013	0.114	0.113	0.248
0.046	0.045	0.029	0.029	0.025	0.024	0.075	0.033	0.08	0.054	0.036	0.036	0.014	0.013	0.11	0.11	0.242
0.045	0.045	0.031	0.031	0.024	0.022	0.066	0.033	0.076	0.055	0.038	0.038	0.014	0.014	0.112	0.111	0.244
0.045	0.044	0.028	0.03	0.027	0.026	0.063	0.031	0.074	0.059	0.041	0.04	0.014	0.015	0.106	0.106	0.249
0.043	0.045	0.031	0.028	0.025	0.027	0.06	0.035	0.077	0.056	0.039	0.04	0.015	0.014	0.109	0.109	0.247
0.043	0.043	0.028	0.029	0.025	0.026	0.057	0.038	0.073	0.058	0.039	0.04	0.014	0.014	0.112	0.112	0.249
0.046	0.043	0.031	0.032	0.028	0.026	0.056	0.034	0.075	0.055	0.035	0.038	0.014	0.014	0.112	0.112	0.248
0.046	0.045	0.032	0.029	0.024	0.027	0.061	0.034	0.078	0.054	0.041	0.04	0.014	0.015	0.108	0.108	0.244
0.043	0.042	0.028	0.03	0.025	0.026	0.067	0.035	0.078	0.054	0.039	0.041	0.015	0.014	0.109	0.109	0.246
0.044	0.044	0.032	0.029	0.024	0.027	0.053	0.035	0.072	0.052	0.038	0.042	0.014	0.014	0.116	0.116	0.249
0.046	0.046	0.034	0.026	0.024	0.029	0.061	0.033	0.079	0.056	0.039	0.038	0.015	0.014	0.107	0.107	0.248
0.046	0.044	0.031	0.031	0.024	0.026	0.065	0.032	0.076	0.054	0.039	0.04	0.015	0.015	0.108	0.107	0.247
0.047	0.047	0.032	0.028	0.024	0.024	0.061	0.035	0.073	0.056	0.04	0.039	0.015	0.015	0.109	0.109	0.246
0.046	0.046	0.031	0.028	0.024	0.024	0.067	0.035	0.076	0.058	0.041	0.039	0.016	0.014	0.106	0.105	0.244
0.046	0.044	0.03	0.03	0.027	0.027	0.058	0.033	0.071	0.055	0.038	0.039	0.014	0.012	0.113	0.112	0.251
0.047	0.046	0.031	0.031	0.024	0.025	0.058	0.034	0.077	0.055	0.04	0.04	0.014	0.015	0.108	0.108	0.247

0.046	0.045	0.029	0.028	0.028	0.026	0.056	0.031	0.075	0.055	0.041	0.041	0.015	0.014	0.111	0.111	0.245
0.042	0.041	0.035	0.033	0.025	0.023	0.063	0.037	0.076	0.057	0.04	0.039	0.013	0.013	0.107	0.106	0.25
0.045	0.045	0.031	0.03	0.029	0.027	0.058	0.033	0.072	0.055	0.039	0.039	0.015	0.014	0.11	0.11	0.246
0.044	0.047	0.032	0.032	0.024	0.025	0.061	0.033	0.073	0.055	0.039	0.038	0.014	0.014	0.109	0.109	0.249
0.042	0.041	0.03	0.032	0.026	0.026	0.062	0.034	0.078	0.059	0.04	0.042	0.015	0.016	0.104	0.104	0.248
0.047	0.048	0.029	0.029	0.026	0.025	0.062	0.031	0.068	0.055	0.04	0.04	0.015	0.016	0.112	0.112	0.244
0.045	0.043	0.031	0.031	0.024	0.024	0.06	0.032	0.074	0.058	0.037	0.039	0.014	0.014	0.11	0.11	0.252
0.05	0.048	0.026	0.027	0.026	0.028	0.06	0.034	0.076	0.056	0.04	0.04	0.014	0.015	0.107	0.107	0.246
0.047	0.046	0.027	0.029	0.022	0.022	0.062	0.036	0.074	0.052	0.041	0.039	0.014	0.015	0.114	0.114	0.247
0.047	0.047	0.029	0.03	0.023	0.018	0.065	0.037	0.08	0.06	0.041	0.042	0.015	0.015	0.104	0.104	0.244
0.045	0.044	0.028	0.029	0.027	0.025	0.065	0.029	0.08	0.057	0.041	0.044	0.015	0.015	0.107	0.106	0.243
0.044	0.043	0.031	0.028	0.025	0.026	0.064	0.036	0.078	0.063	0.044	0.043	0.016	0.016	0.099	0.099	0.244
0.047	0.047	0.027	0.027	0.026	0.025	0.061	0.035	0.076	0.06	0.044	0.043	0.016	0.016	0.102	0.101	0.248
0.048	0.05	0.027	0.023	0.027	0.026	0.064	0.036	0.07	0.054	0.04	0.04	0.015	0.015	0.11	0.11	0.247
0.045	0.046	0.03	0.03	0.021	0.019	0.074	0.036	0.083	0.058	0.041	0.041	0.015	0.015	0.099	0.099	0.247
0.046	0.045	0.03	0.028	0.024	0.023	0.068	0.04	0.073	0.055	0.041	0.041	0.015	0.014	0.107	0.107	0.244
0.043	0.045	0.033	0.032	0.026	0.026	0.06	0.034	0.074	0.056	0.039	0.042	0.015	0.013	0.107	0.107	0.246
0.047	0.048	0.029	0.024	0.028	0.028	0.064	0.033	0.077	0.058	0.039	0.042	0.015	0.015	0.103	0.104	0.245
0.05	0.051	0.027	0.026	0.022	0.024	0.068	0.032	0.076	0.06	0.041	0.041	0.015	0.015	0.106	0.106	0.241
0.043	0.04	0.032	0.03	0.021	0.02	0.053	0.036	0.074	0.059	0.04	0.038	0.015	0.016	0.116	0.115	0.253
0.048	0.051	0.033	0.03	0.023	0.024	0.068	0.031	0.08	0.054	0.038	0.039	0.015	0.015	0.106	0.106	0.24
0.049	0.046	0.027	0.031	0.024	0.026	0.075	0.032	0.072	0.058	0.04	0.04	0.014	0.014	0.105	0.105	0.243
0.042	0.042	0.029	0.028	0.027	0.027	0.062	0.033	0.073	0.054	0.039	0.039	0.014	0.014	0.112	0.112	0.25
0.047	0.05	0.029	0.027	0.026	0.025	0.052	0.034	0.074	0.054	0.037	0.037	0.014	0.013	0.115	0.114	0.25
0.051	0.05	0.032	0.031	0.021	0.021	0.056	0.034	0.076	0.058	0.032	0.037	0.015	0.014	0.112	0.112	0.249
0.046	0.047	0.033	0.031	0.024	0.026	0.062	0.032	0.079	0.056	0.04	0.04	0.015	0.014	0.105	0.105	0.245
0.044	0.047	0.033	0.033	0.025	0.024	0.053	0.031	0.073	0.054	0.037	0.037	0.013	0.013	0.117	0.117	0.25
0.045	0.048	0.031	0.03	0.024	0.025	0.07	0.034	0.074	0.054	0.034	0.036	0.012	0.011	0.115	0.114	0.243
0.045	0.045	0.034	0.033	0.026	0.026	0.061	0.033	0.074	0.054	0.038	0.038	0.013	0.013	0.108	0.108	0.25
0.046	0.046	0.033	0.034	0.024	0.021	0.054	0.031	0.071	0.052	0.038	0.038	0.014	0.013	0.118	0.117	0.249
0.046	0.044	0.032	0.034	0.027	0.025	0.052	0.033	0.076	0.053	0.037	0.038	0.013	0.011	0.115	0.114	0.249
0.045	0.044	0.033	0.035	0.023	0.025	0.05	0.033	0.07	0.055	0.038	0.038	0.013	0.014	0.119	0.12	0.243
0.046	0.046	0.034	0.032	0.022	0.024	0.055	0.033	0.071	0.056	0.037	0.038	0.014	0.014	0.115	0.115	0.249
0.045	0.046	0.032	0.028	0.023	0.024	0.058	0.039	0.077	0.059	0.041	0.04	0.014	0.016	0.107	0.107	0.243
0.046	0.045	0.033	0.031	0.024	0.025	0.053	0.033	0.078	0.053	0.04	0.039	0.014	0.014	0.112	0.112	0.249
0.047	0.047	0.031	0.032	0.022	0.022	0.053	0.035	0.058	0.076	0.038	0.039	0.013	0.011	0.113	0.113	0.251
0.047	0.048	0.032	0.031	0.02	0.021	0.057	0.033	0.07	0.056	0.038	0.038	0.014	0.014	0.116	0.116	0.249
0.042	0.042	0.032	0.033	0.026	0.026	0.056	0.035	0.075	0.053	0.039	0.039	0.014	0.014	0.11	0.11	0.254
0.044	0.044	0.028	0.029	0.023	0.024	0.064	0.035	0.07	0.052	0.039	0.04	0.015	0.015	0.111	0.111	0.254
0.043	0.045	0.032	0.032	0.023	0.024	0.05	0.037	0.075	0.056	0.038	0.038	0.012	0.014	0.114	0.114	0.253
0.046	0.048	0.032	0.03	0.026	0.024	0.05	0.032	0.075	0.056	0.036	0.038	0.013	0.013	0.115	0.115	0.249
0.048	0.047	0.032	0.032	0.026	0.025	0.056	0.034	0.074	0.055	0.039	0.038	0.014	0.014	0.114	0.114	0.241
0.042	0.042	0.034	0.032	0.024	0.024	0.057	0.036	0.079	0.058	0.038	0.039	0.014	0.014	0.111	0.111	0.245
0.045	0.045	0.033	0.032	0.024	0.023	0.056	0.034	0.074	0.054	0.038	0.04	0.013	0.014	0.112	0.113	0.248
0.043	0.042	0.03	0.033	0.027	0.025	0.052	0.034	0.073	0.055	0.039	0.038	0.013	0.013	0.116	0.116	0.251
0.047	0.046	0.031	0.032	0.022	0.024	0.056	0.035	0.071	0.056	0.039	0.039	0.014	0.014	0.114	0.114	0.247
0.044	0.045	0.033	0.032	0.021	0.023	0.054	0.032	0.07	0.054	0.04	0.04	0.015	0.015	0.113	0.113	0.256

0.044	0.044	0.033	0.034	0.024	0.024	0.055	0.031	0.079	0.054	0.04	0.041	0.014	0.015	0.109	0.109	0.25
0.044	0.045	0.03	0.03	0.024	0.023	0.06	0.036	0.075	0.053	0.039	0.039	0.014	0.014	0.111	0.111	0.253
0.044	0.046	0.037	0.035	0.021	0.017	0.054	0.037	0.072	0.054	0.039	0.04	0.015	0.014	0.115	0.115	0.247
0.044	0.045	0.033	0.033	0.022	0.021	0.061	0.036	0.072	0.055	0.041	0.042	0.016	0.015	0.106	0.106	0.252
0.042	0.043	0.033	0.032	0.024	0.025	0.056	0.036	0.076	0.057	0.038	0.038	0.013	0.013	0.11	0.11	0.253
0.043	0.043	0.032	0.032	0.026	0.025	0.056	0.034	0.066	0.057	0.037	0.037	0.014	0.013	0.115	0.115	0.253
0.046	0.045	0.03	0.029	0.023	0.024	0.055	0.033	0.073	0.057	0.036	0.036	0.013	0.014	0.116	0.116	0.254
0.044	0.046	0.032	0.032	0.023	0.022	0.055	0.036	0.073	0.056	0.035	0.036	0.013	0.013	0.114	0.114	0.257
0.042	0.043	0.033	0.033	0.021	0.021	0.056	0.035	0.071	0.057	0.039	0.038	0.015	0.014	0.118	0.118	0.244
0.047	0.045	0.033	0.032	0.023	0.026	0.063	0.034	0.067	0.06	0.036	0.037	0.013	0.013	0.11	0.112	0.248
0.046	0.045	0.034	0.034	0.023	0.025	0.056	0.031	0.074	0.055	0.034	0.034	0.011	0.011	0.12	0.12	0.249
0.047	0.047	0.034	0.033	0.025	0.026	0.056	0.034	0.075	0.05	0.037	0.036	0.013	0.013	0.114	0.114	0.247
0.045	0.046	0.03	0.033	0.025	0.025	0.057	0.035	0.069	0.052	0.04	0.04	0.015	0.015	0.115	0.115	0.243
0.046	0.045	0.032	0.031	0.029	0.028	0.052	0.035	0.071	0.058	0.037	0.038	0.013	0.013	0.11	0.11	0.251
0.047	0.048	0.033	0.033	0.023	0.021	0.057	0.035	0.079	0.051	0.038	0.037	0.014	0.014	0.111	0.11	0.249
0.047	0.049	0.03	0.028	0.022	0.022	0.062	0.034	0.079	0.057	0.038	0.04	0.014	0.014	0.107	0.107	0.251
0.045	0.046	0.031	0.031	0.024	0.024	0.063	0.036	0.073	0.056	0.036	0.036	0.012	0.011	0.113	0.112	0.25
0.044	0.045	0.033	0.031	0.023	0.025	0.052	0.032	0.068	0.047	0.035	0.036	0.014	0.014	0.122	0.122	0.256
0.045	0.042	0.027	0.031	0.026	0.024	0.056	0.034	0.071	0.056	0.036	0.037	0.014	0.014	0.118	0.118	0.251
0.045	0.046	0.033	0.032	0.022	0.023	0.059	0.036	0.074	0.058	0.038	0.038	0.014	0.014	0.108	0.108	0.252
0.046	0.047	0.036	0.035	0.024	0.022	0.055	0.033	0.072	0.057	0.038	0.039	0.011	0.013	0.112	0.113	0.251
0.048	0.048	0.03	0.03	0.024	0.025	0.064	0.031	0.077	0.066	0.04	0.039	0.015	0.015	0.099	0.099	0.249
0.047	0.046	0.037	0.036	0.022	0.021	0.05	0.036	0.073	0.055	0.037	0.037	0.013	0.012	0.111	0.11	0.259
0.043	0.043	0.032	0.032	0.025	0.026	0.055	0.036	0.078	0.061	0.038	0.038	0.012	0.01	0.105	0.105	0.26
0.045	0.046	0.033	0.033	0.026	0.026	0.055	0.034	0.065	0.062	0.037	0.037	0.013	0.012	0.108	0.108	0.258
0.047	0.047	0.036	0.034	0.023	0.024	0.051	0.033	0.073	0.058	0.037	0.036	0.013	0.013	0.114	0.114	0.248
0.047	0.046	0.035	0.035	0.024	0.027	0.053	0.035	0.068	0.058	0.038	0.038	0.013	0.013	0.112	0.111	0.25
0.048	0.047	0.034	0.033	0.025	0.025	0.057	0.034	0.067	0.053	0.041	0.042	0.012	0.012	0.108	0.109	0.253
0.046	0.046	0.035	0.035	0.027	0.025	0.054	0.03	0.069	0.057	0.039	0.04	0.013	0.014	0.108	0.108	0.254
0.045	0.045	0.033	0.034	0.027	0.027	0.053	0.035	0.067	0.061	0.038	0.039	0.012	0.012	0.107	0.106	0.26
0.044	0.044	0.034	0.034	0.026	0.027	0.054	0.033	0.077	0.061	0.039	0.039	0.015	0.015	0.106	0.106	0.246
0.042	0.044	0.034	0.034	0.026	0.028	0.061	0.034	0.071	0.055	0.038	0.038	0.012	0.012	0.109	0.108	0.254
0.047	0.047	0.034	0.033	0.025	0.026	0.061	0.032	0.072	0.057	0.036	0.039	0.011	0.011	0.111	0.11	0.248
0.045	0.045	0.033	0.032	0.024	0.024	0.058	0.034	0.07	0.057	0.038	0.038	0.011	0.013	0.109	0.109	0.261
0.046	0.047	0.034	0.034	0.026	0.026	0.055	0.033	0.071	0.061	0.04	0.04	0.011	0.01	0.108	0.109	0.25
0.048	0.047	0.036	0.036	0.022	0.022	0.052	0.031	0.076	0.054	0.039	0.039	0.012	0.012	0.109	0.109	0.257
0.048	0.048	0.033	0.032	0.024	0.021	0.059	0.033	0.073	0.062	0.039	0.039	0.013	0.013	0.105	0.106	0.253
0.044	0.045	0.036	0.035	0.026	0.026	0.052	0.032	0.079	0.061	0.04	0.039	0.011	0.012	0.106	0.107	0.249
0.047	0.046	0.033	0.035	0.021	0.022	0.055	0.032	0.071	0.055	0.039	0.039	0.014	0.013	0.113	0.115	0.248
0.045	0.045	0.032	0.033	0.023	0.024	0.057	0.035	0.077	0.056	0.041	0.041	0.014	0.014	0.103	0.104	0.257
0.045	0.044	0.033	0.033	0.02	0.021	0.053	0.032	0.066	0.055	0.041	0.041	0.012	0.013	0.116	0.116	0.258
0.045	0.043	0.031	0.032	0.028	0.025	0.055	0.035	0.08	0.056	0.042	0.042	0.014	0.014	0.103	0.103	0.251
0.045	0.045	0.034	0.034	0.025	0.025	0.051	0.036	0.066	0.057	0.042	0.042	0.014	0.014	0.109	0.109	0.252
0.043	0.043	0.033	0.032	0.026	0.021	0.05	0.035	0.072	0.059	0.039	0.041	0.013	0.014	0.115	0.115	0.25
0.044	0.043	0.033	0.033	0.021	0.022	0.054	0.035	0.082	0.057	0.042	0.042	0.015	0.015	0.103	0.103	0.257
0.043	0.044	0.035	0.035	0.027	0.025	0.058	0.037	0.079	0.061	0.033	0.036	0.012	0.012	0.103	0.102	0.257
0.044	0.043	0.031	0.031	0.028	0.028	0.058	0.035	0.067	0.053	0.041	0.041	0.014	0.014	0.11	0.11	0.252

0.044	0.046	0.03	0.029	0.025	0.024	0.054	0.039	0.072	0.062	0.04	0.041	0.013	0.014	0.107	0.108	0.253
0.042	0.043	0.033	0.032	0.019	0.022	0.057	0.032	0.074	0.064	0.04	0.04	0.014	0.014	0.109	0.109	0.257
0.044	0.044	0.031	0.032	0.021	0.02	0.059	0.034	0.07	0.057	0.042	0.042	0.015	0.014	0.11	0.11	0.255
0.042	0.044	0.032	0.029	0.021	0.021	0.063	0.042	0.075	0.065	0.043	0.043	0.015	0.015	0.098	0.098	0.252
0.045	0.045	0.032	0.032	0.023	0.024	0.053	0.035	0.074	0.057	0.039	0.039	0.014	0.013	0.111	0.111	0.252
0.042	0.042	0.031	0.031	0.023	0.023	0.055	0.035	0.071	0.061	0.042	0.042	0.016	0.015	0.109	0.109	0.252
0.044	0.044	0.034	0.034	0.023	0.021	0.054	0.034	0.071	0.055	0.04	0.04	0.014	0.014	0.113	0.113	0.25
0.044	0.044	0.031	0.031	0.024	0.026	0.053	0.034	0.085	0.058	0.04	0.037	0.015	0.014	0.104	0.104	0.256
0.046	0.046	0.031	0.032	0.024	0.025	0.061	0.036	0.078	0.06	0.035	0.041	0.016	0.016	0.102	0.103	0.248
0.046	0.046	0.033	0.032	0.024	0.026	0.054	0.035	0.08	0.059	0.039	0.039	0.014	0.013	0.103	0.103	0.255
0.045	0.043	0.031	0.029	0.025	0.026	0.054	0.035	0.076	0.059	0.041	0.04	0.014	0.015	0.106	0.106	0.256
0.044	0.044	0.032	0.033	0.027	0.026	0.055	0.036	0.075	0.058	0.039	0.039	0.013	0.014	0.105	0.106	0.254
0.047	0.044	0.029	0.031	0.022	0.024	0.053	0.038	0.076	0.06	0.041	0.041	0.015	0.015	0.106	0.106	0.253
0.044	0.043	0.034	0.033	0.024	0.026	0.055	0.032	0.073	0.058	0.038	0.038	0.015	0.014	0.109	0.111	0.253
0.046	0.045	0.032	0.033	0.026	0.026	0.055	0.035	0.077	0.06	0.039	0.039	0.015	0.015	0.106	0.106	0.246
0.044	0.046	0.032	0.032	0.026	0.026	0.051	0.035	0.073	0.059	0.038	0.039	0.014	0.014	0.109	0.109	0.255
0.049	0.048	0.032	0.033	0.022	0.023	0.054	0.04	0.076	0.062	0.037	0.036	0.016	0.015	0.103	0.103	0.253
0.047	0.047	0.033	0.033	0.023	0.022	0.052	0.036	0.082	0.059	0.039	0.037	0.015	0.014	0.107	0.107	0.246
0.042	0.044	0.029	0.031	0.023	0.021	0.065	0.034	0.078	0.059	0.037	0.04	0.014	0.014	0.108	0.107	0.254
0.042	0.045	0.035	0.031	0.024	0.022	0.057	0.034	0.076	0.057	0.037	0.04	0.014	0.014	0.105	0.105	0.262
0.043	0.044	0.03	0.031	0.027	0.027	0.052	0.034	0.057	0.071	0.041	0.041	0.014	0.014	0.111	0.111	0.25
0.045	0.047	0.031	0.03	0.025	0.023	0.057	0.033	0.077	0.062	0.037	0.038	0.014	0.014	0.105	0.105	0.256
0.045	0.045	0.035	0.033	0.022	0.02	0.051	0.033	0.072	0.053	0.039	0.039	0.014	0.014	0.116	0.116	0.253
0.045	0.045	0.035	0.033	0.022	0.022	0.058	0.032	0.069	0.058	0.039	0.041	0.015	0.015	0.109	0.108	0.253
0.047	0.046	0.033	0.032	0.025	0.027	0.053	0.034	0.079	0.051	0.041	0.04	0.014	0.014	0.106	0.106	0.253
0.046	0.047	0.033	0.034	0.024	0.023	0.059	0.034	0.074	0.058	0.039	0.038	0.015	0.015	0.108	0.108	0.246
0.046	0.045	0.031	0.032	0.024	0.024	0.06	0.033	0.08	0.062	0.038	0.038	0.014	0.014	0.103	0.104	0.252
0.045	0.046	0.033	0.032	0.025	0.026	0.056	0.033	0.079	0.06	0.04	0.041	0.015	0.015	0.102	0.101	0.252
0.046	0.045	0.032	0.032	0.023	0.025	0.059	0.032	0.072	0.059	0.04	0.04	0.014	0.014	0.11	0.109	0.249
0.044	0.045	0.034	0.034	0.027	0.026	0.058	0.029	0.073	0.061	0.039	0.039	0.013	0.014	0.107	0.107	0.25
0.045	0.044	0.036	0.034	0.024	0.024	0.049	0.037	0.078	0.059	0.039	0.04	0.014	0.014	0.104	0.104	0.256
0.044	0.045	0.032	0.029	0.025	0.026	0.049	0.033	0.075	0.057	0.041	0.041	0.014	0.014	0.11	0.11	0.254
0.047	0.046	0.035	0.033	0.029	0.029	0.049	0.032	0.072	0.058	0.041	0.041	0.014	0.014	0.108	0.108	0.245
0.043	0.045	0.032	0.032	0.028	0.025	0.053	0.033	0.069	0.055	0.041	0.041	0.015	0.014	0.112	0.111	0.251
0.046	0.046	0.034	0.035	0.026	0.025	0.051	0.032	0.078	0.059	0.041	0.04	0.014	0.015	0.105	0.105	0.249
0.049	0.049	0.033	0.032	0.024	0.025	0.055	0.033	0.084	0.06	0.041	0.042	0.015	0.014	0.1	0.1	0.243
0.044	0.043	0.032	0.032	0.026	0.026	0.055	0.032	0.081	0.055	0.038	0.039	0.015	0.014	0.108	0.108	0.252
0.048	0.047	0.035	0.033	0.019	0.018	0.054	0.037	0.075	0.062	0.041	0.041	0.015	0.015	0.102	0.101	0.255
0.045	0.046	0.032	0.032	0.025	0.026	0.056	0.035	0.072	0.059	0.035	0.036	0.012	0.013	0.109	0.11	0.257
0.043	0.044	0.036	0.036	0.025	0.023	0.058	0.037	0.074	0.064	0.036	0.036	0.013	0.013	0.103	0.103	0.255
0.047	0.046	0.036	0.036	0.025	0.026	0.053	0.034	0.073	0.061	0.037	0.037	0.013	0.014	0.105	0.105	0.251
0.045	0.048	0.034	0.033	0.025	0.022	0.057	0.035	0.072	0.059	0.037	0.037	0.014	0.012	0.109	0.108	0.252
0.046	0.045	0.036	0.037	0.024	0.024	0.057	0.034	0.066	0.059	0.039	0.039	0.013	0.013	0.108	0.107	0.252
0.045	0.046	0.034	0.033	0.024	0.024	0.056	0.037	0.075	0.059	0.037	0.038	0.013	0.014	0.106	0.106	0.254
0.044	0.044	0.034	0.033	0.025	0.025	0.056	0.037	0.067	0.057	0.039	0.039	0.014	0.014	0.11	0.109	0.253
0.047	0.047	0.034	0.035	0.025	0.024	0.055	0.036	0.069	0.058	0.037	0.038	0.013	0.013	0.106	0.105	0.258
0.039	0.04	0.033	0.034	0.024	0.025	0.055	0.035	0.074	0.057	0.038	0.038	0.013	0.013	0.111	0.111	0.256

0.047	0.047	0.034	0.035	0.026	0.025	0.051	0.031	0.071	0.059	0.035	0.035	0.014	0.013	0.109	0.109	0.26
0.044	0.044	0.034	0.036	0.026	0.025	0.05	0.031	0.071	0.059	0.036	0.037	0.012	0.012	0.112	0.112	0.257
0.044	0.046	0.035	0.033	0.02	0.018	0.048	0.034	0.063	0.056	0.038	0.038	0.011	0.012	0.124	0.123	0.256
0.042	0.043	0.032	0.032	0.028	0.028	0.054	0.037	0.07	0.055	0.041	0.039	0.012	0.013	0.109	0.11	0.254
0.048	0.048	0.035	0.035	0.022	0.023	0.054	0.037	0.073	0.056	0.039	0.039	0.014	0.014	0.106	0.105	0.253
0.047	0.045	0.038	0.036	0.027	0.028	0.051	0.038	0.068	0.061	0.037	0.037	0.013	0.013	0.106	0.106	0.249
0.045	0.047	0.035	0.033	0.025	0.022	0.054	0.03	0.075	0.056	0.036	0.037	0.013	0.013	0.113	0.113	0.254
0.044	0.044	0.031	0.03	0.026	0.027	0.053	0.035	0.074	0.056	0.042	0.041	0.015	0.015	0.107	0.107	0.254
0.046	0.045	0.032	0.033	0.022	0.023	0.053	0.034	0.074	0.058	0.04	0.041	0.015	0.015	0.108	0.108	0.254
0.043	0.047	0.031	0.029	0.025	0.026	0.055	0.032	0.077	0.068	0.042	0.043	0.015	0.014	0.1	0.099	0.252
0.043	0.045	0.032	0.032	0.027	0.026	0.061	0.037	0.075	0.06	0.04	0.039	0.016	0.014	0.101	0.1	0.252
0.042	0.041	0.031	0.031	0.026	0.026	0.059	0.036	0.077	0.063	0.039	0.04	0.015	0.014	0.104	0.105	0.25
0.045	0.044	0.033	0.03	0.024	0.026	0.054	0.033	0.072	0.058	0.04	0.039	0.014	0.014	0.112	0.112	0.251
0.044	0.048	0.031	0.027	0.027	0.027	0.056	0.027	0.074	0.056	0.042	0.039	0.015	0.015	0.107	0.107	0.256
0.046	0.047	0.028	0.028	0.026	0.026	0.059	0.037	0.077	0.058	0.042	0.041	0.015	0.016	0.101	0.1	0.252
0.042	0.042	0.033	0.033	0.026	0.025	0.058	0.035	0.079	0.061	0.04	0.04	0.015	0.015	0.104	0.104	0.248
0.045	0.045	0.031	0.032	0.024	0.023	0.053	0.037	0.075	0.059	0.037	0.038	0.014	0.014	0.111	0.111	0.25
0.045	0.046	0.033	0.032	0.027	0.026	0.053	0.03	0.075	0.059	0.04	0.04	0.014	0.014	0.111	0.111	0.245
0.044	0.043	0.031	0.031	0.027	0.023	0.054	0.036	0.077	0.059	0.039	0.042	0.014	0.013	0.107	0.107	0.253
0.043	0.046	0.031	0.029	0.026	0.027	0.066	0.036	0.076	0.054	0.036	0.037	0.014	0.014	0.104	0.104	0.257
0.045	0.045	0.033	0.033	0.026	0.026	0.062	0.029	0.078	0.055	0.039	0.039	0.012	0.012	0.106	0.106	0.254
0.047	0.048	0.035	0.032	0.027	0.027	0.055	0.034	0.064	0.056	0.038	0.039	0.011	0.011	0.114	0.114	0.25
0.045	0.045	0.03	0.031	0.028	0.028	0.055	0.031	0.071	0.059	0.04	0.039	0.012	0.014	0.11	0.111	0.25
0.049	0.049	0.033	0.034	0.021	0.021	0.057	0.038	0.081	0.058	0.034	0.035	0.013	0.014	0.107	0.106	0.25
0.046	0.05	0.029	0.025	0.03	0.028	0.06	0.036	0.076	0.058	0.038	0.039	0.013	0.014	0.104	0.104	0.25
0.05	0.053	0.028	0.027	0.022	0.02	0.061	0.034	0.082	0.052	0.04	0.043	0.014	0.014	0.104	0.105	0.252
0.039	0.039	0.033	0.032	0.023	0.023	0.056	0.034	0.068	0.065	0.042	0.042	0.014	0.013	0.111	0.112	0.252
0.046	0.049	0.032	0.029	0.024	0.024	0.057	0.032	0.076	0.053	0.039	0.04	0.013	0.014	0.111	0.112	0.249
0.045	0.044	0.033	0.031	0.024	0.023	0.056	0.037	0.072	0.055	0.039	0.042	0.016	0.015	0.107	0.106	0.254
0.05	0.047	0.031	0.031	0.02	0.02	0.056	0.031	0.081	0.059	0.039	0.038	0.014	0.014	0.108	0.108	0.253
0.048	0.048	0.031	0.031	0.02	0.02	0.06	0.038	0.074	0.056	0.043	0.044	0.016	0.015	0.101	0.101	0.253
0.045	0.043	0.032	0.031	0.022	0.025	0.058	0.037	0.07	0.062	0.041	0.041	0.014	0.015	0.106	0.105	0.252
0.046	0.045	0.031	0.031	0.028	0.027	0.058	0.032	0.081	0.06	0.039	0.038	0.015	0.014	0.104	0.103	0.248
0.045	0.046	0.031	0.029	0.023	0.023	0.057	0.033	0.078	0.057	0.043	0.041	0.015	0.013	0.106	0.106	0.253
0.045	0.046	0.032	0.03	0.023	0.026	0.058	0.032	0.074	0.061	0.042	0.042	0.016	0.015	0.104	0.104	0.252
0.049	0.047	0.029	0.029	0.028	0.028	0.057	0.034	0.081	0.057	0.041	0.042	0.016	0.015	0.102	0.102	0.244
0.045	0.045	0.034	0.033	0.025	0.025	0.054	0.034	0.074	0.057	0.039	0.04	0.017	0.015	0.108	0.107	0.25
0.044	0.044	0.03	0.029	0.025	0.027	0.053	0.034	0.07	0.056	0.042	0.037	0.015	0.016	0.11	0.11	0.258
0.044	0.046	0.035	0.032	0.025	0.025	0.057	0.032	0.077	0.055	0.042	0.043	0.015	0.015	0.106	0.105	0.246
0.05	0.049	0.029	0.028	0.028	0.029	0.057	0.033	0.071	0.057	0.043	0.044	0.015	0.015	0.105	0.104	0.241
0.048	0.045	0.034	0.034	0.026	0.026	0.056	0.033	0.072	0.058	0.039	0.039	0.013	0.014	0.107	0.106	0.249
0.044	0.046	0.031	0.031	0.027	0.027	0.058	0.036	0.078	0.057	0.042	0.04	0.015	0.015	0.1	0.1	0.251
0.045	0.046	0.034	0.033	0.023	0.021	0.055	0.033	0.075	0.065	0.04	0.042	0.015	0.014	0.107	0.106	0.247
0.045	0.045	0.031	0.032	0.026	0.025	0.059	0.036	0.076	0.06	0.042	0.042	0.016	0.015	0.102	0.101	0.249
0.047	0.047	0.035	0.032	0.027	0.03	0.054	0.031	0.068	0.054	0.037	0.037	0.015	0.014	0.113	0.112	0.248
0.041	0.045	0.034	0.03	0.027	0.026	0.058	0.036	0.069	0.061	0.04	0.041	0.015	0.014	0.106	0.106	0.25
0.048	0.046	0.031	0.032	0.025	0.023	0.053	0.032	0.075	0.055	0.037	0.037	0.015	0.013	0.114	0.114	0.249

0.045	0.044	0.032	0.031	0.024	0.022	0.06	0.033	0.077	0.06	0.04	0.043	0.014	0.015	0.104	0.104	0.252
0.046	0.042	0.029	0.031	0.027	0.028	0.058	0.034	0.079	0.059	0.038	0.043	0.015	0.016	0.105	0.104	0.246
0.046	0.048	0.032	0.032	0.025	0.024	0.055	0.031	0.079	0.057	0.041	0.042	0.015	0.013	0.106	0.105	0.247
0.045	0.045	0.029	0.029	0.027	0.025	0.056	0.032	0.072	0.058	0.045	0.042	0.016	0.015	0.106	0.106	0.253
0.045	0.044	0.031	0.03	0.025	0.027	0.061	0.03	0.087	0.059	0.04	0.04	0.014	0.013	0.102	0.101	0.251
0.049	0.049	0.033	0.031	0.024	0.026	0.054	0.032	0.07	0.059	0.04	0.041	0.015	0.014	0.108	0.108	0.248
0.044	0.045	0.031	0.03	0.027	0.028	0.053	0.038	0.075	0.059	0.036	0.04	0.013	0.013	0.107	0.107	0.253
0.043	0.047	0.033	0.03	0.028	0.023	0.055	0.035	0.078	0.059	0.042	0.038	0.014	0.014	0.104	0.104	0.253
0.046	0.049	0.033	0.03	0.024	0.024	0.059	0.033	0.078	0.056	0.043	0.045	0.015	0.015	0.1	0.1	0.249
0.045	0.041	0.029	0.033	0.028	0.027	0.059	0.034	0.077	0.061	0.037	0.04	0.014	0.015	0.105	0.105	0.251
0.046	0.048	0.029	0.028	0.023	0.027	0.053	0.031	0.075	0.058	0.04	0.04	0.014	0.014	0.111	0.111	0.251
0.045	0.047	0.033	0.031	0.024	0.026	0.056	0.032	0.071	0.06	0.042	0.041	0.015	0.015	0.108	0.108	0.248
0.047	0.048	0.031	0.027	0.026	0.027	0.058	0.034	0.066	0.064	0.041	0.04	0.015	0.014	0.106	0.106	0.251
0.046	0.048	0.034	0.031	0.022	0.022	0.053	0.033	0.076	0.06	0.04	0.039	0.016	0.014	0.107	0.107	0.253
0.046	0.049	0.031	0.025	0.026	0.027	0.065	0.034	0.077	0.061	0.042	0.038	0.015	0.014	0.101	0.1	0.249
0.046	0.048	0.03	0.029	0.027	0.026	0.054	0.032	0.073	0.066	0.039	0.04	0.015	0.015	0.104	0.104	0.252
0.042	0.043	0.033	0.033	0.024	0.025	0.057	0.033	0.079	0.058	0.039	0.039	0.015	0.015	0.108	0.108	0.249
0.044	0.044	0.03	0.03	0.026	0.028	0.061	0.038	0.075	0.066	0.04	0.041	0.015	0.015	0.097	0.098	0.25
0.045	0.049	0.036	0.031	0.024	0.024	0.055	0.033	0.068	0.065	0.038	0.039	0.015	0.015	0.108	0.107	0.25
0.045	0.045	0.033	0.03	0.024	0.025	0.059	0.033	0.084	0.059	0.039	0.04	0.014	0.014	0.103	0.102	0.252
0.047	0.045	0.029	0.029	0.026	0.026	0.061	0.034	0.078	0.061	0.039	0.039	0.015	0.015	0.104	0.103	0.249
0.049	0.048	0.026	0.027	0.023	0.021	0.058	0.038	0.078	0.063	0.041	0.043	0.015	0.015	0.102	0.102	0.251
0.045	0.044	0.03	0.033	0.027	0.026	0.06	0.029	0.077	0.057	0.041	0.041	0.015	0.014	0.104	0.104	0.254
0.046	0.046	0.03	0.031	0.027	0.025	0.057	0.034	0.073	0.059	0.039	0.042	0.015	0.015	0.104	0.104	0.251
0.05	0.049	0.031	0.03	0.022	0.021	0.058	0.037	0.074	0.055	0.039	0.039	0.015	0.014	0.105	0.106	0.255
0.041	0.043	0.031	0.029	0.025	0.023	0.055	0.032	0.08	0.066	0.041	0.042	0.015	0.015	0.106	0.106	0.249
0.045	0.045	0.036	0.036	0.023	0.025	0.055	0.033	0.077	0.058	0.037	0.037	0.014	0.014	0.107	0.107	0.252
0.042	0.043	0.03	0.03	0.026	0.026	0.059	0.035	0.073	0.061	0.042	0.041	0.016	0.015	0.106	0.106	0.249
0.046	0.046	0.032	0.031	0.021	0.02	0.062	0.034	0.078	0.063	0.039	0.036	0.015	0.015	0.105	0.105	0.252
0.045	0.041	0.029	0.03	0.026	0.026	0.061	0.031	0.078	0.061	0.037	0.04	0.015	0.014	0.106	0.106	0.253
0.045	0.044	0.035	0.034	0.019	0.02	0.053	0.031	0.071	0.056	0.04	0.042	0.015	0.015	0.112	0.112	0.257
0.05	0.051	0.033	0.029	0.024	0.026	0.059	0.027	0.074	0.056	0.039	0.039	0.014	0.014	0.107	0.107	0.251
0.044	0.042	0.031	0.031	0.028	0.027	0.063	0.036	0.077	0.066	0.037	0.042	0.015	0.016	0.097	0.097	0.251
0.048	0.052	0.026	0.021	0.027	0.025	0.056	0.035	0.07	0.061	0.035	0.041	0.015	0.015	0.111	0.111	0.25
0.048	0.047	0.032	0.031	0.022	0.021	0.058	0.029	0.078	0.054	0.042	0.042	0.014	0.014	0.11	0.11	0.249
0.046	0.047	0.033	0.033	0.024	0.023	0.055	0.036	0.079	0.056	0.04	0.039	0.013	0.012	0.104	0.104	0.257
0.044	0.043	0.033	0.034	0.026	0.026	0.055	0.036	0.073	0.061	0.037	0.037	0.011	0.012	0.11	0.109	0.252
0.044	0.044	0.035	0.035	0.018	0.024	0.053	0.035	0.072	0.061	0.042	0.042	0.014	0.015	0.109	0.108	0.247
0.046	0.046	0.033	0.033	0.024	0.023	0.056	0.035	0.077	0.064	0.039	0.038	0.011	0.012	0.106	0.106	0.252
0.046	0.047	0.036	0.034	0.027	0.028	0.05	0.037	0.068	0.057	0.04	0.041	0.015	0.014	0.105	0.105	0.251
0.046	0.046	0.032	0.033	0.023	0.022	0.05	0.035	0.075	0.06	0.038	0.039	0.013	0.013	0.108	0.108	0.259
0.046	0.046	0.034	0.034	0.024	0.022	0.051	0.031	0.077	0.055	0.039	0.04	0.013	0.014	0.109	0.109	0.254
0.045	0.047	0.031	0.031	0.02	0.02	0.06	0.037	0.075	0.061	0.04	0.042	0.015	0.014	0.106	0.105	0.251
0.043	0.043	0.032	0.031	0.024	0.023	0.058	0.037	0.071	0.057	0.04	0.043	0.015	0.015	0.102	0.101	0.263
0.046	0.047	0.032	0.032	0.025	0.025	0.054	0.034	0.077	0.056	0.04	0.04	0.014	0.013	0.107	0.106	0.253
0.044	0.046	0.033	0.033	0.029	0.029	0.06	0.034	0.075	0.063	0.038	0.039	0.013	0.014	0.097	0.097	0.257
0.045	0.046	0.035	0.035	0.021	0.021	0.054	0.033	0.072	0.057	0.039	0.038	0.011	0.012	0.114	0.115	0.252

0.045	0.044	0.034	0.032	0.021	0.021	0.054	0.035	0.072	0.059	0.04	0.04	0.013	0.013	0.111	0.111	0.257
0.047	0.046	0.034	0.033	0.025	0.027	0.053	0.037	0.091	0.055	0.042	0.042	0.016	0.016	0.092	0.092	0.252
0.045	0.045	0.036	0.035	0.027	0.026	0.057	0.036	0.074	0.056	0.037	0.036	0.013	0.011	0.112	0.112	0.243
0.045	0.044	0.03	0.031	0.027	0.026	0.055	0.035	0.076	0.056	0.037	0.037	0.014	0.013	0.108	0.108	0.257
0.043	0.044	0.035	0.034	0.025	0.023	0.051	0.031	0.077	0.055	0.041	0.041	0.014	0.014	0.107	0.107	0.258
0.043	0.043	0.033	0.032	0.027	0.027	0.058	0.03	0.073	0.058	0.042	0.043	0.014	0.014	0.111	0.11	0.243
0.043	0.042	0.033	0.032	0.022	0.023	0.049	0.033	0.063	0.058	0.041	0.042	0.014	0.014	0.118	0.118	0.253
0.047	0.047	0.033	0.033	0.021	0.021	0.063	0.034	0.083	0.058	0.041	0.041	0.016	0.015	0.098	0.099	0.25
0.044	0.044	0.033	0.034	0.021	0.02	0.052	0.033	0.079	0.059	0.04	0.04	0.014	0.013	0.11	0.109	0.254
0.045	0.044	0.032	0.032	0.025	0.023	0.059	0.034	0.076	0.06	0.037	0.036	0.012	0.011	0.111	0.11	0.253
0.045	0.046	0.033	0.032	0.028	0.027	0.057	0.034	0.07	0.057	0.039	0.039	0.014	0.012	0.106	0.106	0.255
0.045	0.044	0.035	0.033	0.024	0.025	0.052	0.032	0.078	0.057	0.039	0.04	0.013	0.012	0.108	0.108	0.255
0.046	0.046	0.036	0.036	0.022	0.026	0.054	0.033	0.066	0.058	0.039	0.039	0.014	0.014	0.111	0.111	0.25
0.053	0.051	0.03	0.033	0.027	0.033	0.03	0.065	0.032	0.068	0.04	0.037	0.015	0.014	0.107	0.107	0.258

Table 14. Gait Anthropometry Conversion

1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11 Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R	1. Knee cap - knee cap R Prof	2. Knee cap - knee cap L	3. Lat mal - Med mal R	4. Lat mal - Med mal L	5. Hallux - Hallux R	6. Hallux - Hallux L	7. Styloid Pro - Styloid Pro R Forward	8. Styloid Pro - Styloid Pro L Forward	Index Sum
0.027	0.028	0.018	0.019	0.013	0.015	0.034	0.02	0.044	0.033	0.023	0.024	0.009	0.009	0.074	0.074	0.152	0.031	0.03	0.061	0.059	0.066	0.065	0.036	0.035	1
0.027	0.026	0.02	0.021	0.015	0.016	0.032	0.021	0.044	0.032	0.025	0.025	0.008	0.009	0.073	0.073	0.151	0.032	0.026	0.061	0.06	0.064	0.067	0.036	0.037	1
0.028	0.028	0.02	0.02	0.015	0.015	0.034	0.023	0.043	0.036	0.024	0.024	0.009	0.008	0.073	0.073	0.157	0.028	0.021	0.06	0.054	0.066	0.064	0.039	0.037	1
0.028	0.028	0.022	0.022	0.014	0.016	0.032	0.024	0.044	0.034	0.024	0.024	0.009	0.009	0.077	0.075	0.156	0.029	0.028	0.057	0.056	0.062	0.06	0.036	0.035	1
0.029	0.029	0.02	0.02	0.017	0.016	0.037	0.022	0.043	0.034	0.025	0.026	0.009	0.009	0.074	0.073	0.161	0.03	0.023	0.056	0.049	0.063	0.054	0.039	0.041	1
0.028	0.029	0.02	0.02	0.012	0.012	0.031	0.02	0.041	0.034	0.023	0.024	0.008	0.009	0.077	0.076	0.157	0.032	0.031	0.057	0.06	0.061	0.066	0.035	0.038	1
0.027	0.029	0.02	0.019	0.016	0.017	0.034	0.023	0.045	0.034	0.024	0.025	0.008	0.009	0.073	0.072	0.16	0.03	0.027	0.053	0.055	0.057	0.06	0.041	0.04	1
0.03	0.03	0.022	0.021	0.013	0.014	0.034	0.023	0.039	0.034	0.024	0.024	0.009	0.009	0.082	0.081	0.158	0.025	0.026	0.054	0.054	0.059	0.058	0.04	0.039	1
0.03	0.03	0.021	0.022	0.015	0.014	0.035	0.022	0.044	0.034	0.025	0.023	0.01	0.008	0.081	0.079	0.163	0.021	0.02	0.055	0.05	0.063	0.053	0.04	0.043	1
0.028	0.029	0.02	0.02	0.015	0.015	0.032	0.023	0.038	0.033	0.023	0.024	0.008	0.009	0.074	0.073	0.149	0.035	0.031	0.062	0.058	0.067	0.062	0.035	0.036	1
0.028	0.028	0.021	0.02	0.014	0.015	0.034	0.022	0.047	0.036	0.024	0.024	0.009	0.009	0.068	0.069	0.156	0.028	0.028	0.058	0.059	0.062	0.062	0.039	0.04	1
0.029	0.028	0.02	0.021	0.013	0.013	0.037	0.023	0.05	0.036	0.025	0.025	0.009	0.009	0.073	0.076	0.165	0.028	0.027	0.048	0.048	0.054	0.058	0.045	0.04	1
0.027	0.028	0.019	0.017	0.013	0.012	0.038	0.021	0.043	0.037	0.024	0.024	0.008	0.009	0.068	0.069	0.155	0.026	0.024	0.058	0.055	0.063	0.058	0.061	0.043	1
0.027	0.028	0.02	0.022	0.013	0.013	0.032	0.02	0.043	0.036	0.024	0.024	0.008	0.009	0.073	0.075	0.158	0.033	0.031	0.059	0.06	0.062	0.063	0.032	0.035	1
0.029	0.028	0.021	0.02	0.013	0.013	0.04	0.022	0.043	0.037	0.025	0.026	0.01	0.01	0.071	0.07	0.163	0.03	0.027	0.057	0.052	0.059	0.054	0.042	0.04	1
0.028	0.027	0.023	0.023	0.013	0.015	0.036	0.024	0.049	0.037	0.025	0.025	0.008	0.009	0.074	0.073	0.157	0.026	0.024	0.057	0.054	0.061	0.057	0.041	0.034	1
0.029	0.029	0.022	0.02	0.014	0.013	0.038	0.023	0.048	0.038	0.025	0.025	0.008	0.008	0.077	0.077	0.164	0.025	0.025	0.05	0.051	0.053	0.055	0.042	0.04	1
0.028	0.028	0.021	0.017	0.013	0.015	0.035	0.023	0.044	0.036	0.025	0.025	0.009	0.01	0.075	0.077	0.158	0.026	0.027	0.054	0.052	0.058	0.057	0.043	0.046	1
0.028	0.029	0.021	0.021	0.013	0.013	0.035	0.026	0.046	0.04	0.025	0.025	0.009	0.009	0.081	0.077	0.165	0.026	0.022	0.052	0.047	0.059	0.051	0.041	0.039	1
0.029	0.028	0.019	0.018	0.012	0.016	0.037	0.022	0.045	0.035	0.024	0.024	0.008	0.008	0.071	0.075	0.159	0.027	0.03	0.056	0.056	0.06	0.058	0.04	0.044	1
0.031	0.03	0.019	0.02	0.014	0.015	0.04	0.024	0.051	0.037	0.026	0.025	0.009	0.009	0.068	0.064	0.159	0.025	0.024	0.05	0.052	0.054	0.058	0.047	0.048	1
0.025	0.026	0.021	0.021	0.015	0.015	0.037	0.025	0.043	0.041	0.027	0.027	0.01	0.009	0.073	0.072	0.159	0.026	0.027	0.054	0.053	0.058	0.056	0.041	0.04	1
0.028	0.028	0.022	0.021	0.014	0.015	0.034	0.02	0.053	0.037	0.026	0.026	0.009	0.01	0.069	0.071	0.153	0.024	0.022	0.057	0.052	0.061	0.056	0.045	0.045	1
0.031	0.03	0.022	0.023	0.012	0.015	0.037	0.024	0.045	0.036	0.026	0.025	0.008	0.009	0.074	0.075	0.164	0.025	0.022	0.052	0.045	0.056	0.048	0.048	0.049	1
0.029	0.028	0.021	0.023	0.013	0.013	0.032	0.023	0.045	0.036	0.024	0.024	0.009	0.009	0.07	0.068	0.158	0.032	0.027	0.06	0.058	0.066	0.063	0.034	0.036	1
0.029	0.029	0.02	0.021	0.015	0.014	0.034	0.024	0.047	0.034	0.024	0.025	0.009	0.009	0.064	0.064	0.155	0.032	0.026	0.062	0.055	0.066	0.06	0.041	0.041	1
0.027	0.028	0.02	0.02	0.012	0.013	0.031	0.02	0.043	0.033	0.024	0.024	0.008	0.008	0.073	0.072	0.153	0.034	0.029	0.062	0.057	0.068	0.062	0.04	0.039	1
0.028	0.027	0.02	0.02	0.017	0.017	0.036	0.026	0.05	0.036	0.027	0.027	0.009	0.009	0.068	0.066	0.163	0.029	0.024	0.055	0.052	0.059	0.056	0.038	0.041	1
0.028	0.028	0.021	0.022	0.015	0.015	0.031	0.023	0.041	0.037	0.026	0.026	0.01	0.009	0.07	0.071	0.159	0.03	0.024	0.057	0.053	0.062	0.057	0.042	0.043	1
0.028	0.028	0.021	0.021	0.013	0.013	0.031	0.025	0.044	0.036	0.025	0.025	0.008	0.009	0.072	0.073	0.157	0.029	0.028	0.058	0.056	0.063	0.06	0.039	0.041	1
0.028	0.031	0.021	0.019	0.013	0.014	0.035	0.024	0.052	0.037	0.027	0.027	0.01	0.01	0.074	0.07	0.163	0.023	0.025	0.055	0.047	0.059	0.052	0.042	0.043	1

0.028	0.028	0.024	0.024	0.017	0.016	0.036	0.025	0.052	0.041	0.024	0.024	0.009	0.009	0.069	0.067	0.17	0.019	0.027	0.05	0.055	0.053	0.059	0.037	0.037	1
0.032	0.033	0.021	0.018	0.014	0.017	0.036	0.024	0.051	0.036	0.025	0.025	0.008	0.009	0.073	0.074	0.163	0.029	0.024	0.049	0.051	0.054	0.054	0.04	0.039	1
0.03	0.03	0.022	0.023	0.013	0.016	0.034	0.023	0.047	0.04	0.027	0.027	0.01	0.01	0.074	0.075	0.16	0.027	0.021	0.049	0.05	0.054	0.056	0.043	0.039	1
0.027	0.028	0.02	0.02	0.014	0.014	0.035	0.024	0.043	0.035	0.026	0.026	0.01	0.01	0.07	0.071	0.16	0.029	0.034	0.056	0.05	0.062	0.056	0.038	0.039	1
0.027	0.026	0.021	0.023	0.014	0.015	0.036	0.023	0.041	0.038	0.026	0.024	0.008	0.009	0.074	0.078	0.164	0.028	0.026	0.051	0.047	0.058	0.054	0.046	0.042	1
0.031	0.031	0.02	0.022	0.018	0.017	0.037	0.026	0.045	0.041	0.026	0.026	0.008	0.009	0.075	0.073	0.174	0.025	0.019	0.044	0.046	0.054	0.051	0.04	0.043	1
0.027	0.027	0.022	0.021	0.015	0.012	0.037	0.023	0.047	0.042	0.025	0.025	0.008	0.009	0.072	0.072	0.164	0.029	0.028	0.052	0.052	0.055	0.057	0.039	0.04	1
0.03	0.031	0.022	0.023	0.014	0.014	0.038	0.025	0.048	0.039	0.027	0.028	0.007	0.009	0.072	0.074	0.17	0.029	0.022	0.054	0.043	0.053	0.049	0.038	0.044	1
0.028	0.031	0.022	0.021	0.015	0.014	0.035	0.022	0.051	0.04	0.026	0.024	0.009	0.008	0.067	0.068	0.164	0.022	0.026	0.055	0.056	0.059	0.061	0.038	0.037	1
0.028	0.029	0.021	0.019	0.013	0.013	0.043	0.03	0.045	0.042	0.027	0.027	0.009	0.01	0.066	0.066	0.16	0.026	0.022	0.054	0.05	0.058	0.055	0.044	0.042	1
0.027	0.028	0.019	0.02	0.012	0.012	0.032	0.019	0.044	0.034	0.023	0.023	0.008	0.008	0.073	0.074	0.156	0.03	0.03	0.06	0.06	0.063	0.065	0.04	0.039	1
0.028	0.029	0.02	0.019	0.014	0.015	0.032	0.023	0.046	0.036	0.025	0.025	0.009	0.009	0.07	0.07	0.157	0.026	0.029	0.058	0.058	0.062	0.061	0.041	0.038	1
0.026	0.027	0.018	0.019	0.013	0.014	0.035	0.023	0.043	0.037	0.026	0.026	0.009	0.009	0.066	0.065	0.155	0.033	0.028	0.059	0.057	0.063	0.063	0.043	0.043	1
0.026	0.027	0.017	0.022	0.011	0.011	0.031	0.023	0.042	0.034	0.024	0.025	0.008	0.009	0.07	0.07	0.154	0.035	0.028	0.062	0.062	0.067	0.067	0.036	0.038	1
0.027	0.027	0.021	0.019	0.015	0.011	0.036	0.022	0.045	0.037	0.025	0.026	0.009	0.009	0.073	0.072	0.155	0.027	0.025	0.056	0.054	0.059	0.058	0.047	0.044	1
0.027	0.028	0.019	0.02	0.015	0.014	0.031	0.022	0.05	0.036	0.025	0.025	0.009	0.009	0.065	0.064	0.159	0.028	0.028	0.057	0.057	0.063	0.066	0.043	0.038	1
0.028	0.027	0.02	0.018	0.016	0.015	0.032	0.025	0.046	0.036	0.026	0.026	0.009	0.009	0.068	0.068	0.161	0.029	0.028	0.056	0.056	0.059	0.06	0.042	0.042	1
0.028	0.029	0.019	0.022	0.014	0.015	0.038	0.023	0.047	0.037	0.027	0.027	0.01	0.01	0.065	0.066	0.157	0.031	0.023	0.057	0.05	0.063	0.056	0.043	0.043	1
0.027	0.028	0.02	0.019	0.015	0.017	0.033	0.02	0.046	0.036	0.024	0.024	0.009	0.009	0.066	0.067	0.156	0.031	0.029	0.06	0.059	0.065	0.064	0.038	0.039	1
0.027	0.028	0.02	0.02	0.014	0.015	0.032	0.023	0.046	0.035	0.025	0.025	0.009	0.009	0.066	0.068	0.156	0.031	0.033	0.058	0.058	0.062	0.063	0.037	0.039	1
0.027	0.025	0.015	0.022	0.014	0.013	0.038	0.024	0.046	0.032	0.027	0.027	0.01	0.01	0.068	0.067	0.156	0.03	0.026	0.06	0.056	0.066	0.064	0.041	0.039	1
0.028	0.029	0.021	0.02	0.014	0.016	0.033	0.024	0.045	0.037	0.025	0.026	0.009	0.009	0.067	0.067	0.162	0.03	0.028	0.055	0.056	0.059	0.061	0.04	0.037	1
0.028	0.028	0.021	0.021	0.012	0.013	0.035	0.02	0.043	0.033	0.023	0.024	0.008	0.008	0.074	0.075	0.153	0.032	0.029	0.059	0.059	0.063	0.063	0.038	0.037	1
0.027	0.028	0.022	0.021	0.014	0.015	0.033	0.022	0.048	0.036	0.024	0.023	0.009	0.009	0.068	0.069	0.16	0.027	0.027	0.058	0.056	0.063	0.061	0.04	0.042	1
0.027	0.028	0.02	0.019	0.013	0.016	0.029	0.022	0.043	0.035	0.025	0.025	0.009	0.009	0.064	0.063	0.151	0.036	0.034	0.063	0.062	0.068	0.068	0.033	0.037	1
0.028	0.03	0.019	0.021	0.015	0.015	0.037	0.023	0.045	0.033	0.025	0.025	0.009	0.009	0.073	0.073	0.153	0.031	0.029	0.053	0.055	0.058	0.06	0.041	0.039	1
0.028	0.029	0.018	0.018	0.013	0.016	0.036	0.022	0.045	0.035	0.025	0.025	0.01	0.01	0.07	0.07	0.156	0.031	0.027	0.058	0.055	0.062	0.06	0.04	0.04	1
0.028	0.028	0.021	0.02	0.015	0.015	0.039	0.019	0.043	0.035	0.024	0.024	0.009	0.009	0.072	0.073	0.154	0.025	0.029	0.051	0.061	0.056	0.066	0.042	0.042	1
0.027	0.026	0.018	0.017	0.016	0.015	0.044	0.017	0.044	0.035	0.023	0.023	0.009	0.009	0.065	0.066	0.143	0.028	0.033	0.057	0.062	0.062	0.067	0.047	0.046	1
0.029	0.028	0.02	0.02	0.013	0.012	0.034	0.025	0.05	0.039	0.027	0.027	0.01	0.01	0.069	0.069	0.164	0.028	0.022	0.055	0.053	0.058	0.057	0.04	0.042	1
0.028	0.028	0.019	0.019	0.015	0.014	0.032	0.021	0.04	0.034	0.024	0.024	0.008	0.009	0.071	0.07	0.148	0.031	0.032	0.063	0.063	0.068	0.07	0.036	0.034	1
0.027	0.029	0.019	0.019	0.015	0.013	0.038	0.02	0.042	0.035	0.023	0.022	0.008	0.008	0.07	0.069	0.15	0.031	0.029	0.061	0.06	0.066	0.063	0.04	0.043	1
0.028	0.028	0.02	0.019	0.015	0.012	0.033	0.02	0.044	0.034	0.022	0.022	0.009	0.008	0.07	0.07	0.148	0.03	0.032	0.062	0.059	0.07	0.067	0.041	0.035	1
0.029	0.028	0.022	0.019	0.014	0.017	0.034	0.022	0.051	0.038	0.024	0.024	0.009	0.009	0.069	0.07	0.161	0.028	0.024	0.06	0.057	0.063	0.061	0.034	0.032	1
0.027	0.03	0.021	0.018	0.015	0.014	0.038	0.026	0.047	0.039	0.026	0.026	0.01	0.009	0.06	0.06	0.153	0.03	0.027	0.06	0.056	0.062	0.062	0.042	0.042	1
0.028	0.028	0.017	0.018	0.015	0.015	0.039	0.022	0.048	0.033	0.024	0.024	0.009	0.009	0.068	0.069	0.149	0.032	0.03	0.054	0.054	0.059	0.058	0.047	0.05	1
0.025	0.026	0.017	0.019	0.013	0.016	0.034	0.023	0.041	0.034	0.024	0.025	0.009	0.009	0.065	0.064	0.145	0.037	0.036	0.063	0.063	0.067	0.067	0.04	0.039	1

0.029	0.028	0.021	0.02	0.016	0.017	0.034	0.023	0.046	0.038	0.026	0.026	0.01	0.009	0.07	0.069	0.157	0.03	0.028	0.056	0.052	0.059	0.057	0.038	0.04	1
0.028	0.028	0.021	0.021	0.014	0.013	0.029	0.022	0.048	0.038	0.023	0.024	0.009	0.008	0.068	0.069	0.155	0.031	0.032	0.061	0.06	0.064	0.065	0.035	0.034	1
0.03	0.029	0.02	0.021	0.017	0.017	0.032	0.023	0.045	0.037	0.024	0.024	0.009	0.009	0.069	0.068	0.159	0.027	0.028	0.055	0.055	0.06	0.059	0.041	0.042	1
0.028	0.027	0.019	0.018	0.014	0.013	0.031	0.023	0.041	0.032	0.023	0.023	0.009	0.009	0.073	0.073	0.15	0.034	0.032	0.061	0.062	0.063	0.066	0.037	0.038	1
0.028	0.025	0.02	0.019	0.016	0.014	0.033	0.022	0.042	0.037	0.026	0.025	0.009	0.009	0.073	0.072	0.157	0.027	0.029	0.056	0.057	0.061	0.064	0.04	0.037	1
0.028	0.025	0.02	0.02	0.015	0.015	0.034	0.022	0.041	0.036	0.023	0.023	0.009	0.009	0.074	0.065	0.148	0.034	0.034	0.06	0.057	0.064	0.061	0.042	0.04	1
0.026	0.027	0.018	0.019	0.014	0.015	0.036	0.023	0.045	0.037	0.025	0.026	0.009	0.009	0.063	0.061	0.146	0.033	0.036	0.058	0.06	0.061	0.064	0.044	0.044	1
0.028	0.027	0.019	0.02	0.016	0.016	0.039	0.021	0.043	0.037	0.024	0.024	0.009	0.009	0.068	0.068	0.149	0.027	0.03	0.054	0.057	0.057	0.062	0.046	0.05	1
0.028	0.027	0.02	0.019	0.016	0.016	0.035	0.021	0.046	0.035	0.024	0.024	0.009	0.009	0.068	0.068	0.153	0.033	0.03	0.059	0.057	0.065	0.062	0.039	0.037	1
0.027	0.026	0.019	0.016	0.015	0.016	0.035	0.024	0.046	0.034	0.025	0.025	0.009	0.009	0.067	0.067	0.154	0.029	0.036	0.058	0.059	0.062	0.063	0.04	0.041	1
0.024	0.027	0.016	0.02	0.013	0.015	0.034	0.025	0.041	0.036	0.023	0.024	0.009	0.009	0.066	0.066	0.153	0.027	0.034	0.055	0.06	0.061	0.065	0.048	0.05	1
0.028	0.027	0.019	0.018	0.015	0.015	0.033	0.022	0.045	0.033	0.024	0.024	0.009	0.009	0.066	0.066	0.149	0.032	0.035	0.06	0.063	0.064	0.065	0.04	0.039	1
0.027	0.03	0.019	0.017	0.014	0.013	0.034	0.021	0.04	0.033	0.024	0.024	0.008	0.008	0.063	0.063	0.145	0.037	0.036	0.065	0.064	0.072	0.069	0.035	0.038	1
0.029	0.032	0.023	0.021	0.016	0.016	0.037	0.024	0.049	0.036	0.026	0.026	0.01	0.01	0.071	0.071	0.163	0.022	0.025	0.05	0.052	0.053	0.054	0.041	0.043	1
0.03	0.03	0.02	0.02	0.017	0.015	0.038	0.021	0.045	0.035	0.025	0.026	0.009	0.01	0.07	0.071	0.156	0.029	0.026	0.054	0.051	0.057	0.055	0.045	0.046	1
0.027	0.028	0.02	0.018	0.018	0.015	0.038	0.025	0.047	0.037	0.024	0.027	0.01	0.01	0.065	0.065	0.154	0.03	0.03	0.052	0.056	0.056	0.06	0.044	0.046	1
0.032	0.032	0.016	0.022	0.013	0.015	0.038	0.024	0.053	0.041	0.023	0.023	0.01	0.01	0.07	0.069	0.157	0.027	0.027	0.048	0.053	0.052	0.055	0.043	0.046	1
0.028	0.029	0.018	0.019	0.016	0.017	0.036	0.025	0.049	0.035	0.026	0.026	0.01	0.01	0.063	0.061	0.15	0.033	0.024	0.061	0.05	0.064	0.055	0.046	0.047	1
0.026	0.026	0.019	0.02	0.015	0.017	0.038	0.025	0.048	0.04	0.024	0.024	0.01	0.01	0.065	0.066	0.149	0.032	0.03	0.055	0.054	0.057	0.059	0.043	0.047	1
0.028	0.026	0.02	0.017	0.016	0.016	0.036	0.021	0.047	0.038	0.025	0.023	0.01	0.009	0.063	0.062	0.144	0.034	0.03	0.06	0.063	0.064	0.063	0.045	0.041	1
0.029	0.028	0.019	0.019	0.016	0.015	0.037	0.022	0.05	0.038	0.027	0.027	0.01	0.009	0.069	0.069	0.159	0.029	0.027	0.054	0.05	0.058	0.05	0.045	0.044	1
0.026	0.025	0.019	0.019	0.016	0.015	0.033	0.019	0.044	0.037	0.024	0.024	0.009	0.009	0.069	0.069	0.149	0.03	0.034	0.062	0.058	0.065	0.063	0.041	0.043	1
0.026	0.027	0.02	0.021	0.013	0.013	0.034	0.021	0.044	0.036	0.025	0.025	0.009	0.009	0.073	0.072	0.156	0.027	0.03	0.057	0.056	0.059	0.062	0.04	0.043	1
0.029	0.029	0.02	0.02	0.017	0.016	0.031	0.023	0.048	0.038	0.025	0.025	0.009	0.009	0.073	0.074	0.163	0.027	0.028	0.052	0.054	0.055	0.058	0.037	0.037	1
0.026	0.027	0.02	0.02	0.016	0.016	0.033	0.021	0.045	0.034	0.024	0.024	0.009	0.009	0.069	0.069	0.153	0.028	0.034	0.057	0.062	0.06	0.065	0.038	0.041	1
0.03	0.03	0.019	0.021	0.014	0.014	0.032	0.023	0.047	0.038	0.025	0.024	0.009	0.009	0.072	0.072	0.158	0.027	0.032	0.059	0.054	0.066	0.058	0.032	0.034	1
0.026	0.026	0.017	0.019	0.013	0.016	0.035	0.022	0.047	0.033	0.023	0.024	0.009	0.009	0.069	0.069	0.15	0.031	0.032	0.061	0.059	0.066	0.065	0.04	0.041	1
0.032	0.031	0.02	0.021	0.014	0.015	0.036	0.023	0.048	0.037	0.025	0.025	0.01	0.009	0.075	0.076	0.163	0.021	0.025	0.05	0.056	0.054	0.062	0.035	0.036	1
0.029	0.028	0.02	0.019	0.015	0.017	0.034	0.022	0.046	0.034	0.025	0.025	0.009	0.009	0.074	0.073	0.152	0.026	0.028	0.056	0.057	0.06	0.067	0.039	0.037	1
0.03	0.03	0.021	0.02	0.014	0.015	0.033	0.025	0.048	0.04	0.025	0.025	0.009	0.01	0.067	0.066	0.161	0.03	0.031	0.054	0.054	0.057	0.056	0.038	0.04	1
0.029	0.028	0.021	0.018	0.013	0.014	0.031	0.022	0.045	0.037	0.024	0.025	0.009	0.009	0.066	0.066	0.153	0.03	0.028	0.062	0.06	0.065	0.068	0.038	0.039	1
0.025	0.024	0.016	0.018	0.015	0.015	0.043	0.022	0.047	0.034	0.024	0.025	0.009	0.009	0.067	0.067	0.15	0.033	0.031	0.052	0.055	0.055	0.058	0.052	0.052	1
0.026	0.026	0.02	0.018	0.015	0.016	0.033	0.022	0.045	0.033	0.024	0.024	0.009	0.009	0.068	0.069	0.155	0.03	0.031	0.059	0.059	0.064	0.064	0.039	0.041	1
0.032	0.03	0.021	0.017	0.015	0.013	0.036	0.021	0.044	0.035	0.023	0.024	0.009	0.009	0.079	0.077	0.162	0.023	0.03	0.05	0.054	0.054	0.057	0.043	0.041	1
0.027	0.027	0.02	0.02	0.016	0.015	0.031	0.021	0.042	0.033	0.024	0.025	0.009	0.009	0.069	0.07	0.154	0.026	0.029	0.058	0.061	0.069	0.071	0.037	0.038	1
0.03	0.031	0.021	0.022	0.016	0.015	0.032	0.021	0.05	0.037	0.026	0.027	0.009	0.01	0.074	0.074	0.165	0.022	0.025	0.05	0.051	0.053	0.054	0.042	0.045	1
0.028	0.028	0.021	0.021	0.014	0.016	0.035	0.021	0.043	0.036	0.025	0.025	0.009	0.009	0.072	0.072	0.159	0.027	0.022	0.055	0.055	0.058	0.067	0.042	0.04	1

0.025	0.027	0.02	0.017	0.013	0.013	0.04	0.022	0.046	0.035	0.025	0.024	0.009	0.01	0.069	0.068	0.156	0.029	0.031	0.058	0.059	0.062	0.065	0.039	0.039	1
0.029	0.029	0.021	0.02	0.015	0.015	0.036	0.019	0.046	0.033	0.024	0.024	0.009	0.009	0.069	0.069	0.155	0.03	0.029	0.061	0.06	0.065	0.064	0.034	0.035	1
0.027	0.028	0.02	0.018	0.014	0.016	0.033	0.022	0.044	0.036	0.025	0.024	0.009	0.009	0.073	0.073	0.158	0.031	0.027	0.062	0.057	0.066	0.06	0.034	0.035	1
0.027	0.028	0.019	0.021	0.015	0.015	0.03	0.019	0.045	0.036	0.023	0.023	0.009	0.009	0.07	0.071	0.152	0.03	0.031	0.061	0.061	0.069	0.07	0.034	0.032	1
0.029	0.029	0.02	0.02	0.015	0.013	0.035	0.022	0.041	0.034	0.024	0.023	0.009	0.009	0.071	0.07	0.149	0.03	0.063	0.061	0.059	0.064	0.028	0.039	0.041	1
0.028	0.029	0.016	0.019	0.017	0.017	0.034	0.02	0.046	0.042	0.025	0.026	0.01	0.01	0.064	0.064	0.157	0.03	0.034	0.053	0.058	0.056	0.065	0.039	0.041	1
0.027	0.029	0.019	0.02	0.014	0.015	0.035	0.024	0.043	0.038	0.026	0.026	0.009	0.009	0.067	0.067	0.157	0.028	0.034	0.056	0.056	0.06	0.059	0.038	0.041	1
0.028	0.026	0.021	0.022	0.016	0.016	0.037	0.025	0.043	0.039	0.025	0.026	0.01	0.009	0.071	0.071	0.163	0.025	0.028	0.055	0.049	0.059	0.051	0.044	0.043	1
0.031	0.03	0.018	0.017	0.013	0.015	0.038	0.02	0.042	0.034	0.024	0.024	0.009	0.009	0.067	0.067	0.152	0.029	0.033	0.057	0.057	0.062	0.066	0.044	0.041	1
0.031	0.031	0.021	0.022	0.015	0.015	0.036	0.022	0.046	0.037	0.025	0.025	0.01	0.01	0.074	0.073	0.161	0.028	0.027	0.053	0.053	0.054	0.057	0.038	0.037	1
0.029	0.029	0.022	0.021	0.013	0.013	0.039	0.022	0.048	0.037	0.026	0.027	0.01	0.01	0.067	0.066	0.159	0.028	0.032	0.058	0.048	0.065	0.05	0.041	0.04	1
0.025	0.027	0.017	0.02	0.014	0.013	0.037	0.021	0.043	0.036	0.025	0.025	0.009	0.009	0.064	0.065	0.154	0.026	0.033	0.058	0.068	0.063	0.069	0.042	0.038	1
0.026	0.027	0.021	0.019	0.016	0.015	0.034	0.022	0.04	0.037	0.025	0.024	0.009	0.009	0.067	0.067	0.154	0.032	0.029	0.061	0.056	0.065	0.062	0.039	0.043	1
0.026	0.027	0.019	0.018	0.015	0.015	0.037	0.019	0.042	0.035	0.023	0.024	0.008	0.008	0.072	0.071	0.152	0.031	0.029	0.058	0.06	0.062	0.064	0.043	0.041	1
0.027	0.028	0.02	0.02	0.015	0.016	0.037	0.02	0.046	0.033	0.024	0.025	0.009	0.009	0.073	0.073	0.156	0.026	0.031	0.056	0.057	0.057	0.063	0.04	0.04	1
0.03	0.032	0.019	0.015	0.015	0.018	0.038	0.022	0.048	0.035	0.025	0.026	0.01	0.01	0.068	0.067	0.156	0.027	0.02	0.056	0.051	0.062	0.061	0.044	0.044	1
0.027	0.027	0.021	0.018	0.014	0.014	0.034	0.023	0.046	0.033	0.025	0.024	0.009	0.009	0.071	0.071	0.155	0.029	0.027	0.062	0.06	0.07	0.063	0.035	0.034	1
0.025	0.026	0.017	0.018	0.013	0.015	0.044	0.019	0.046	0.037	0.025	0.025	0.009	0.009	0.069	0.069	0.15	0.027	0.032	0.055	0.058	0.059	0.062	0.045	0.045	1
0.028	0.027	0.019	0.017	0.015	0.017	0.032	0.024	0.04	0.036	0.025	0.026	0.009	0.009	0.069	0.069	0.153	0.03	0.027	0.062	0.06	0.064	0.061	0.038	0.042	1
0.03	0.03	0.019	0.02	0.017	0.016	0.042	0.022	0.049	0.036	0.028	0.028	0.01	0.01	0.076	0.075	0.163	0.021	0.024	0.047	0.048	0.049	0.05	0.048	0.041	1
0.028	0.029	0.02	0.019	0.014	0.015	0.034	0.021	0.045	0.039	0.024	0.024	0.009	0.009	0.065	0.065	0.155	0.033	0.029	0.063	0.055	0.067	0.058	0.041	0.039	1
0.028	0.027	0.021	0.019	0.014	0.014	0.028	0.022	0.045	0.034	0.024	0.024	0.009	0.008	0.072	0.072	0.154	0.03	0.033	0.062	0.062	0.066	0.066	0.032	0.033	1
0.026	0.027	0.019	0.018	0.015	0.015	0.037	0.02	0.041	0.035	0.024	0.023	0.009	0.009	0.069	0.068	0.15	0.03	0.028	0.062	0.061	0.066	0.066	0.041	0.04	1
0.026	0.027	0.021	0.021	0.015	0.015	0.033	0.019	0.041	0.035	0.025	0.026	0.01	0.009	0.068	0.068	0.153	0.028	0.034	0.057	0.06	0.06	0.065	0.043	0.043	1
0.027	0.026	0.02	0.02	0.017	0.016	0.032	0.021	0.044	0.035	0.024	0.024	0.009	0.009	0.071	0.071	0.154	0.031	0.03	0.061	0.057	0.066	0.063	0.037	0.036	1
0.028	0.028	0.019	0.02	0.013	0.014	0.033	0.022	0.045	0.037	0.024	0.024	0.009	0.009	0.072	0.072	0.155	0.028	0.029	0.058	0.06	0.062	0.064	0.039	0.036	1
0.028	0.028	0.021	0.02	0.016	0.013	0.033	0.022	0.043	0.036	0.025	0.025	0.009	0.009	0.074	0.074	0.159	0.028	0.029	0.054	0.055	0.058	0.058	0.041	0.042	1
0.027	0.027	0.02	0.021	0.013	0.014	0.032	0.021	0.045	0.035	0.025	0.024	0.01	0.009	0.069	0.069	0.155	0.032	0.032	0.061	0.061	0.064	0.064	0.035	0.036	1
0.028	0.028	0.021	0.02	0.017	0.018	0.038	0.022	0.042	0.035	0.024	0.025	0.009	0.009	0.077	0.078	0.158	0.027	0.022	0.053	0.05	0.057	0.054	0.046	0.042	1
0.029	0.033	0.02	0.018	0.016	0.017	0.038	0.02	0.043	0.037	0.024	0.022	0.009	0.008	0.065	0.065	0.152	0.026	0.026	0.053	0.055	0.062	0.063	0.051	0.048	1
0.027	0.029	0.02	0.02	0.016	0.016	0.04	0.024	0.044	0.038	0.026	0.026	0.01	0.01	0.064	0.065	0.16	0.026	0.025	0.053	0.056	0.057	0.06	0.043	0.044	1
0.032	0.028	0.018	0.022	0.015	0.016	0.037	0.023	0.051	0.036	0.027	0.027	0.01	0.011	0.066	0.065	0.156	0.027	0.026	0.057	0.051	0.06	0.054	0.044	0.044	1
0.03	0.029	0.017	0.018	0.013	0.013	0.048	0.022	0.048	0.036	0.027	0.027	0.01	0.01	0.066	0.067	0.15	0.029	0.029	0.051	0.053	0.053	0.056	0.048	0.049	1
0.029	0.029	0.019	0.02	0.016	0.016	0.034	0.022	0.048	0.036	0.027	0.027	0.009	0.009	0.067	0.068	0.163	0.026	0.026	0.053	0.06	0.056	0.059	0.041	0.039	1
0.027	0.028	0.019	0.016	0.016	0.016	0.037	0.019	0.047	0.032	0.025	0.025	0.009	0.009	0.065	0.066	0.155	0.028	0.028	0.062	0.059	0.062	0.059	0.046	0.042	1
0.029	0.028	0.019	0.022	0.015	0.015	0.035	0.021	0.046	0.036	0.026	0.025	0.01	0.009	0.073	0.072	0.156	0.026	0.026	0.054	0.053	0.057	0.056	0.045	0.044	1
0.029	0.029	0.019	0.019	0.016	0.016	0.037	0.022	0.048	0.039	0.026	0.026	0.01	0.009	0.066	0.066	0.157	0.031	0.028	0.054	0.054	0.056	0.056	0.043	0.044	1

0.03	0.029	0.023	0.02	0.015	0.014	0.032	0.018	0.042	0.034	0.023	0.023	0.009	0.009	0.074	0.074	0.153	0.031	0.028	0.06	0.059	0.062	0.064	0.039	0.035	1
0.028	0.029	0.021	0.021	0.016	0.016	0.032	0.02	0.048	0.037	0.025	0.025	0.009	0.009	0.069	0.069	0.156	0.026	0.023	0.06	0.057	0.061	0.06	0.044	0.038	1
0.028	0.027	0.02	0.021	0.017	0.016	0.036	0.022	0.047	0.039	0.025	0.025	0.01	0.01	0.068	0.068	0.159	0.026	0.027	0.055	0.054	0.059	0.058	0.044	0.039	1
0.027	0.026	0.018	0.018	0.015	0.015	0.037	0.023	0.041	0.032	0.024	0.023	0.009	0.009	0.068	0.067	0.145	0.029	0.033	0.062	0.064	0.067	0.064	0.042	0.041	1
0.03	0.03	0.019	0.017	0.016	0.015	0.039	0.024	0.043	0.034	0.025	0.025	0.009	0.009	0.069	0.069	0.155	0.03	0.027	0.057	0.058	0.059	0.056	0.045	0.042	1
0.028	0.028	0.021	0.016	0.014	0.015	0.037	0.022	0.036	0.036	0.023	0.024	0.009	0.009	0.071	0.071	0.151	0.032	0.029	0.059	0.06	0.062	0.066	0.041	0.039	1
0.028	0.027	0.018	0.018	0.015	0.014	0.042	0.025	0.043	0.035	0.025	0.025	0.01	0.009	0.066	0.067	0.148	0.029	0.033	0.05	0.058	0.054	0.062	0.049	0.049	1
0.031	0.026	0.019	0.017	0.017	0.016	0.036	0.025	0.045	0.039	0.024	0.025	0.01	0.009	0.072	0.072	0.161	0.027	0.025	0.049	0.055	0.053	0.06	0.044	0.047	1
0.028	0.029	0.02	0.018	0.015	0.015	0.041	0.023	0.045	0.036	0.025	0.025	0.009	0.009	0.07	0.07	0.153	0.024	0.028	0.055	0.059	0.055	0.06	0.044	0.042	1
0.027	0.029	0.017	0.019	0.017	0.018	0.036	0.022	0.042	0.036	0.025	0.026	0.01	0.009	0.071	0.071	0.153	0.027	0.027	0.05	0.057	0.054	0.058	0.05	0.048	1
0.026	0.027	0.021	0.018	0.014	0.015	0.036	0.021	0.045	0.038	0.025	0.025	0.009	0.009	0.063	0.063	0.149	0.031	0.033	0.062	0.057	0.064	0.06	0.046	0.043	1
0.026	0.028	0.015	0.019	0.016	0.017	0.036	0.021	0.046	0.038	0.027	0.027	0.01	0.01	0.063	0.063	0.15	0.03	0.03	0.061	0.057	0.063	0.061	0.043	0.043	1
0.028	0.027	0.021	0.021	0.014	0.016	0.033	0.021	0.044	0.037	0.026	0.026	0.01	0.009	0.067	0.067	0.155	0.037	0.025	0.068	0.046	0.07	0.053	0.041	0.038	1
0.028	0.028	0.019	0.019	0.017	0.017	0.04	0.026	0.046	0.037	0.026	0.026	0.009	0.009	0.069	0.069	0.161	0.03	0.028	0.055	0.044	0.059	0.047	0.045	0.046	1
0.027	0.026	0.017	0.02	0.014	0.012	0.037	0.024	0.044	0.035	0.025	0.025	0.009	0.009	0.068	0.067	0.153	0.03	0.027	0.06	0.055	0.065	0.059	0.043	0.047	1
0.028	0.028	0.019	0.018	0.013	0.016	0.034	0.024	0.044	0.037	0.026	0.025	0.009	0.009	0.068	0.068	0.16	0.032	0.028	0.058	0.051	0.063	0.058	0.041	0.041	1
0.026	0.029	0.022	0.017	0.014	0.015	0.041	0.023	0.047	0.037	0.024	0.024	0.01	0.008	0.067	0.067	0.153	0.028	0.025	0.054	0.056	0.058	0.06	0.05	0.047	1
0.028	0.03	0.018	0.02	0.016	0.014	0.037	0.021	0.047	0.036	0.028	0.027	0.01	0.01	0.067	0.066	0.158	0.025	0.027	0.056	0.057	0.059	0.061	0.041	0.044	1
0.027	0.03	0.02	0.02	0.018	0.017	0.036	0.022	0.041	0.036	0.028	0.028	0.009	0.01	0.065	0.065	0.151	0.029	0.026	0.061	0.056	0.062	0.058	0.044	0.041	1
0.031	0.027	0.018	0.018	0.017	0.018	0.04	0.024	0.047	0.041	0.025	0.027	0.009	0.009	0.069	0.069	0.161	0.026	0.032	0.046	0.053	0.045	0.059	0.044	0.045	1
0.027	0.03	0.02	0.019	0.018	0.017	0.039	0.024	0.052	0.037	0.027	0.026	0.01	0.01	0.063	0.063	0.156	0.027	0.026	0.055	0.052	0.058	0.053	0.048	0.045	1
0.026	0.028	0.021	0.016	0.016	0.017	0.035	0.024	0.044	0.039	0.027	0.027	0.01	0.009	0.068	0.069	0.156	0.029	0.03	0.053	0.051	0.06	0.055	0.043	0.045	1
0.026	0.026	0.021	0.02	0.016	0.016	0.033	0.024	0.038	0.035	0.024	0.024	0.009	0.009	0.068	0.068	0.153	0.033	0.029	0.059	0.059	0.063	0.064	0.04	0.041	1
0.028	0.029	0.02	0.022	0.015	0.013	0.037	0.024	0.043	0.038	0.025	0.025	0.009	0.009	0.071	0.07	0.158	0.022	0.029	0.054	0.056	0.061	0.061	0.041	0.041	1
0.026	0.025	0.019	0.02	0.016	0.015	0.037	0.023	0.045	0.035	0.025	0.025	0.009	0.01	0.07	0.069	0.157	0.037	0.033	0.056	0.052	0.059	0.056	0.041	0.039	1
0.024	0.025	0.02	0.02	0.016	0.016	0.04	0.025	0.046	0.038	0.027	0.026	0.01	0.011	0.067	0.067	0.156	0.034	0.02	0.057	0.049	0.062	0.055	0.046	0.042	1
0.028	0.034	0.021	0.017	0.016	0.014	0.037	0.025	0.042	0.04	0.027	0.027	0.01	0.01	0.066	0.066	0.157	0.028	0.028	0.055	0.056	0.053	0.058	0.043	0.041	1
0.029	0.026	0.019	0.019	0.016	0.015	0.033	0.021	0.043	0.035	0.024	0.023	0.009	0.009	0.069	0.069	0.156	0.033	0.029	0.062	0.059	0.064	0.06	0.04	0.037	1
0.027	0.028	0.018	0.019	0.012	0.015	0.038	0.023	0.046	0.037	0.026	0.026	0.009	0.009	0.064	0.063	0.152	0.031	0.033	0.058	0.057	0.062	0.061	0.045	0.043	1
0.027	0.027	0.018	0.019	0.016	0.016	0.033	0.021	0.041	0.036	0.025	0.025	0.009	0.009	0.07	0.069	0.152	0.033	0.031	0.06	0.06	0.062	0.064	0.037	0.039	1
0.026	0.027	0.018	0.019	0.016	0.016	0.044	0.021	0.039	0.036	0.024	0.025	0.009	0.009	0.07	0.07	0.154	0.03	0.031	0.055	0.059	0.055	0.061	0.042	0.046	1
0.028	0.027	0.02	0.02	0.015	0.016	0.037	0.023	0.045	0.038	0.027	0.027	0.01	0.01	0.064	0.064	0.152	0.032	0.031	0.058	0.056	0.06	0.06	0.042	0.04	1
0.029	0.03	0.02	0.018	0.014	0.014	0.036	0.02	0.043	0.036	0.025	0.026	0.009	0.009	0.066	0.066	0.159	0.03	0.031	0.056	0.055	0.059	0.06	0.043	0.045	1
0.027	0.028	0.018	0.019	0.015	0.015	0.037	0.024	0.044	0.035	0.025	0.024	0.01	0.01	0.07	0.069	0.157	0.027	0.027	0.06	0.056	0.064	0.059	0.04	0.042	1
0.028	0.029	0.02	0.018	0.014	0.015	0.036	0.024	0.044	0.034	0.024	0.023	0.009	0.009	0.07	0.07	0.158	0.028	0.028	0.057	0.057	0.062	0.061	0.041	0.041	1
0.028	0.027	0.02	0.02	0.015	0.016	0.038	0.023	0.044	0.038	0.025	0.025	0.009	0.009	0.069	0.069	0.158	0.027	0.029	0.055	0.054	0.058	0.058	0.046	0.044	1
0.026	0.027	0.02	0.021	0.017	0.016	0.037	0.023	0.045	0.037	0.025	0.024	0.009	0.009	0.069	0.067	0.153	0.024	0.028	0.053	0.059	0.056	0.062	0.047	0.046	1

0.028	0.028	0.021	0.021	0.014	0.015	0.029	0.025	0.044	0.037	0.025	0.025	0.009	0.009	0.069	0.069	0.159	0.025	0.032	0.056	0.058	0.061	0.063	0.038	0.039	1
0.029	0.03	0.02	0.02	0.015	0.015	0.034	0.023	0.044	0.035	0.026	0.026	0.009	0.009	0.066	0.065	0.153	0.03	0.032	0.057	0.056	0.061	0.06	0.04	0.042	1
0.029	0.027	0.019	0.017	0.016	0.017	0.04	0.025	0.046	0.038	0.026	0.026	0.009	0.01	0.069	0.069	0.155	0.027	0.026	0.051	0.055	0.056	0.059	0.046	0.042	1
0.026	0.027	0.02	0.021	0.015	0.015	0.036	0.024	0.042	0.038	0.027	0.028	0.01	0.01	0.067	0.066	0.153	0.029	0.031	0.054	0.054	0.056	0.059	0.046	0.045	1
0.026	0.029	0.019	0.02	0.015	0.013	0.039	0.022	0.048	0.036	0.026	0.026	0.009	0.01	0.064	0.062	0.156	0.026	0.03	0.053	0.058	0.057	0.062	0.047	0.048	1
0.029	0.028	0.019	0.022	0.016	0.016	0.034	0.023	0.043	0.037	0.026	0.026	0.009	0.01	0.067	0.066	0.155	0.026	0.027	0.058	0.058	0.059	0.06	0.041	0.043	1
0.026	0.027	0.017	0.021	0.017	0.017	0.032	0.023	0.043	0.037	0.024	0.025	0.009	0.009	0.064	0.064	0.151	0.033	0.037	0.055	0.067	0.059	0.067	0.037	0.038	1
0.025	0.027	0.02	0.02	0.018	0.015	0.035	0.023	0.044	0.037	0.026	0.026	0.009	0.009	0.066	0.066	0.158	0.029	0.029	0.057	0.055	0.06	0.056	0.045	0.044	1
0.025	0.025	0.02	0.018	0.015	0.016	0.031	0.023	0.038	0.034	0.023	0.022	0.008	0.008	0.068	0.068	0.147	0.029	0.035	0.064	0.064	0.07	0.068	0.038	0.041	1
0.027	0.026	0.02	0.02	0.014	0.016	0.031	0.021	0.044	0.035	0.025	0.026	0.009	0.009	0.069	0.067	0.156	0.031	0.028	0.059	0.057	0.062	0.062	0.043	0.042	1
0.029	0.031	0.021	0.017	0.015	0.017	0.035	0.02	0.046	0.038	0.027	0.026	0.009	0.01	0.072	0.072	0.163	0.026	0.027	0.054	0.049	0.055	0.054	0.044	0.042	1
0.028	0.029	0.019	0.02	0.016	0.016	0.036	0.024	0.042	0.038	0.025	0.026	0.009	0.01	0.068	0.069	0.153	0.03	0.031	0.053	0.058	0.056	0.059	0.041	0.043	1
0.026	0.027	0.019	0.018	0.016	0.016	0.038	0.022	0.043	0.04	0.027	0.025	0.01	0.009	0.066	0.066	0.155	0.033	0.03	0.054	0.053	0.059	0.058	0.045	0.045	1
0.028	0.027	0.017	0.02	0.014	0.012	0.036	0.021	0.044	0.034	0.023	0.023	0.009	0.009	0.066	0.066	0.15	0.032	0.031	0.06	0.064	0.062	0.064	0.043	0.044	1
0.027	0.016	0.019	0.027	0.016	0.016	0.039	0.023	0.048	0.036	0.025	0.025	0.009	0.01	0.067	0.067	0.149	0.031	0.026	0.057	0.055	0.058	0.059	0.048	0.049	1
0.029	0.028	0.018	0.019	0.014	0.015	0.037	0.022	0.045	0.033	0.026	0.026	0.01	0.01	0.068	0.069	0.152	0.025	0.03	0.056	0.061	0.058	0.06	0.044	0.047	1
0.026	0.027	0.018	0.021	0.013	0.012	0.034	0.019	0.047	0.037	0.026	0.026	0.009	0.009	0.068	0.068	0.157	0.032	0.028	0.061	0.056	0.063	0.059	0.043	0.041	1
0.028	0.028	0.018	0.018	0.016	0.016	0.036	0.023	0.042	0.033	0.024	0.024	0.009	0.009	0.071	0.071	0.155	0.031	0.03	0.058	0.057	0.062	0.062	0.04	0.037	1
0.029	0.026	0.02	0.02	0.017	0.016	0.04	0.024	0.045	0.033	0.026	0.025	0.01	0.01	0.069	0.069	0.157	0.029	0.029	0.053	0.054	0.058	0.058	0.039	0.046	1
0.03	0.029	0.02	0.016	0.017	0.015	0.042	0.026	0.05	0.04	0.026	0.027	0.009	0.01	0.068	0.069	0.16	0.029	0.023	0.053	0.043	0.053	0.045	0.049	0.051	1
0.027	0.028	0.018	0.018	0.017	0.016	0.042	0.024	0.048	0.036	0.027	0.027	0.01	0.01	0.067	0.067	0.151	0.027	0.027	0.056	0.047	0.054	0.055	0.048	0.053	1
0.028	0.028	0.021	0.018	0.015	0.017	0.035	0.023	0.044	0.037	0.025	0.026	0.009	0.009	0.07	0.071	0.157	0.028	0.025	0.057	0.055	0.06	0.057	0.041	0.043	1
0.028	0.027	0.019	0.019	0.015	0.016	0.037	0.021	0.046	0.034	0.025	0.025	0.009	0.009	0.061	0.06	0.147	0.034	0.035	0.063	0.057	0.068	0.064	0.04	0.041	1
0.027	0.028	0.019	0.018	0.016	0.015	0.035	0.024	0.044	0.04	0.026	0.025	0.009	0.009	0.065	0.065	0.153	0.03	0.03	0.057	0.06	0.058	0.062	0.037	0.047	1
0.026	0.029	0.02	0.02	0.014	0.013	0.032	0.022	0.041	0.033	0.025	0.024	0.009	0.009	0.068	0.068	0.152	0.031	0.032	0.062	0.062	0.065	0.066	0.036	0.038	1
0.026	0.026	0.019	0.019	0.014	0.015	0.034	0.023	0.043	0.038	0.026	0.026	0.009	0.009	0.061	0.06	0.157	0.034	0.028	0.062	0.06	0.067	0.063	0.04	0.04	1
0.026	0.027	0.019	0.019	0.014	0.014	0.034	0.022	0.044	0.033	0.023	0.024	0.009	0.009	0.066	0.068	0.15	0.032	0.034	0.061	0.063	0.064	0.068	0.039	0.039	1
0.027	0.028	0.021	0.015	0.014	0.015	0.038	0.022	0.041	0.035	0.024	0.024	0.009	0.01	0.065	0.065	0.148	0.029	0.031	0.059	0.06	0.064	0.065	0.049	0.042	1
0.027	0.026	0.018	0.015	0.016	0.017	0.041	0.023	0.046	0.039	0.027	0.027	0.01	0.01	0.06	0.06	0.148	0.032	0.028	0.056	0.052	0.063	0.058	0.051	0.048	1
0.028	0.027	0.019	0.018	0.017	0.017	0.034	0.02	0.047	0.038	0.027	0.027	0.01	0.01	0.069	0.069	0.159	0.029	0.031	0.047	0.059	0.051	0.064	0.043	0.041	1
0.026	0.027	0.018	0.015	0.017	0.016	0.035	0.025	0.044	0.036	0.025	0.025	0.01	0.009	0.062	0.06	0.149	0.032	0.038	0.057	0.062	0.063	0.067	0.044	0.041	1
0.027	0.028	0.018	0.02	0.018	0.016	0.037	0.02	0.048	0.039	0.026	0.026	0.01	0.01	0.066	0.066	0.156	0.027	0.027	0.056	0.055	0.058	0.057	0.044	0.044	1
0.03	0.026	0.021	0.018	0.014	0.014	0.03	0.023	0.044	0.036	0.026	0.026	0.009	0.009	0.069	0.069	0.151	0.028	0.032	0.059	0.062	0.063	0.066	0.037	0.037	1
0.03	0.028	0.018	0.021	0.014	0.011	0.033	0.022	0.043	0.035	0.024	0.023	0.009	0.009	0.074	0.073	0.155	0.031	0.029	0.06	0.059	0.063	0.062	0.037	0.037	1
0.028	0.028	0.021	0.02	0.016	0.016	0.036	0.025	0.04	0.035	0.026	0.027	0.01	0.01	0.076	0.077	0.165	0.03	0.026	0.048	0.054	0.048	0.059	0.039	0.04	1
0.026	0.028	0.02	0.022	0.013	0.012	0.037	0.024	0.045	0.037	0.026	0.026	0.01	0.009	0.068	0.067	0.155	0.029	0.025	0.061	0.057	0.065	0.061	0.036	0.039	1
0.026	0.027	0.021	0.022	0.018	0.016	0.034	0.021	0.043	0.036	0.027	0.027	0.01	0.01	0.072	0.073	0.16	0.027	0.03	0.054	0.053	0.057	0.057	0.037	0.041	1

0.025	0.026	0.02	0.017	0.015	0.016	0.034	0.022	0.042	0.036	0.024	0.024	0.009	0.009	0.069	0.07	0.152	0.025	0.03	0.059	0.06	0.063	0.061	0.044	0.045	1
0.028	0.032	0.019	0.016	0.017	0.017	0.038	0.024	0.048	0.04	0.026	0.027	0.01	0.01	0.063	0.063	0.158	0.024	0.026	0.051	0.05	0.058	0.059	0.05	0.046	1
0.027	0.028	0.022	0.02	0.016	0.016	0.035	0.025	0.041	0.04	0.025	0.026	0.01	0.009	0.068	0.068	0.153	0.031	0.029	0.057	0.056	0.058	0.058	0.042	0.041	1
0.029	0.026	0.016	0.014	0.016	0.016	0.037	0.022	0.044	0.036	0.026	0.026	0.01	0.01	0.065	0.065	0.148	0.03	0.031	0.063	0.06	0.063	0.061	0.048	0.037	1
0.028	0.029	0.015	0.015	0.018	0.015	0.041	0.025	0.041	0.037	0.025	0.026	0.01	0.01	0.072	0.072	0.159	0.026	0.026	0.05	0.05	0.063	0.056	0.043	0.046	1
0.026	0.026	0.017	0.015	0.015	0.016	0.04	0.024	0.045	0.035	0.024	0.024	0.009	0.009	0.066	0.068	0.149	0.03	0.03	0.061	0.056	0.066	0.059	0.043	0.047	1
0.029	0.027	0.017	0.02	0.017	0.015	0.035	0.022	0.043	0.035	0.024	0.024	0.009	0.009	0.074	0.073	0.159	0.022	0.031	0.053	0.065	0.06	0.068	0.035	0.037	1
0.028	0.028	0.018	0.018	0.014	0.016	0.045	0.025	0.048	0.036	0.025	0.026	0.009	0.01	0.062	0.062	0.151	0.03	0.027	0.06	0.052	0.06	0.054	0.048	0.048	1
0.028	0.029	0.022	0.021	0.015	0.015	0.031	0.021	0.048	0.037	0.025	0.025	0.01	0.009	0.065	0.066	0.154	0.031	0.03	0.061	0.061	0.064	0.065	0.033	0.035	1
0.027	0.027	0.02	0.019	0.016	0.015	0.036	0.024	0.05	0.038	0.026	0.025	0.009	0.009	0.069	0.069	0.157	0.03	0.029	0.053	0.055	0.057	0.058	0.041	0.041	1
0.027	0.027	0.018	0.018	0.015	0.016	0.044	0.025	0.045	0.034	0.025	0.025	0.009	0.009	0.065	0.066	0.152	0.031	0.028	0.055	0.059	0.057	0.06	0.044	0.045	1
0.029	0.026	0.019	0.019	0.016	0.016	0.036	0.024	0.042	0.038	0.024	0.024	0.009	0.008	0.062	0.063	0.151	0.037	0.031	0.061	0.057	0.062	0.058	0.044	0.044	1
0.03	0.03	0.018	0.016	0.019	0.018	0.043	0.024	0.048	0.036	0.026	0.027	0.01	0.01	0.065	0.065	0.155	0.032	0.027	0.051	0.05	0.053	0.052	0.048	0.047	1
0.029	0.029	0.017	0.016	0.015	0.015	0.036	0.027	0.045	0.04	0.026	0.026	0.01	0.01	0.061	0.061	0.154	0.031	0.028	0.059	0.061	0.062	0.063	0.039	0.041	1
0.027	0.027	0.018	0.019	0.014	0.015	0.036	0.022	0.046	0.034	0.025	0.025	0.009	0.009	0.063	0.064	0.152	0.031	0.034	0.058	0.061	0.06	0.063	0.046	0.042	1
0.028	0.027	0.019	0.019	0.017	0.017	0.037	0.028	0.045	0.04	0.026	0.028	0.011	0.01	0.068	0.067	0.162	0.029	0.027	0.049	0.047	0.052	0.052	0.045	0.05	1
0.03	0.03	0.019	0.02	0.016	0.013	0.037	0.025	0.046	0.035	0.025	0.025	0.009	0.009	0.068	0.067	0.156	0.022	0.032	0.051	0.06	0.059	0.062	0.042	0.042	1
0.025	0.026	0.015	0.019	0.014	0.014	0.034	0.023	0.045	0.041	0.026	0.026	0.01	0.01	0.066	0.065	0.155	0.031	0.027	0.061	0.058	0.063	0.063	0.041	0.044	1
0.028	0.029	0.022	0.019	0.014	0.016	0.033	0.023	0.044	0.037	0.023	0.023	0.009	0.009	0.068	0.066	0.154	0.033	0.031	0.061	0.058	0.064	0.062	0.039	0.038	1
0.026	0.026	0.019	0.015	0.015	0.014	0.037	0.022	0.041	0.036	0.024	0.023	0.009	0.009	0.072	0.072	0.151	0.03	0.03	0.057	0.059	0.06	0.062	0.044	0.047	1
0.028	0.027	0.02	0.02	0.016	0.015	0.033	0.024	0.044	0.036	0.024	0.024	0.009	0.008	0.068	0.07	0.154	0.026	0.027	0.056	0.058	0.061	0.062	0.047	0.043	1
0.029	0.032	0.019	0.016	0.019	0.017	0.033	0.022	0.049	0.039	0.027	0.027	0.01	0.01	0.067	0.068	0.155	0.028	0.026	0.053	0.056	0.055	0.059	0.041	0.043	1
0.025	0.024	0.018	0.018	0.012	0.013	0.035	0.023	0.04	0.037	0.023	0.024	0.009	0.009	0.062	0.062	0.144	0.032	0.04	0.063	0.068	0.067	0.071	0.04	0.041	1
0.025	0.026	0.018	0.017	0.014	0.015	0.034	0.022	0.041	0.033	0.023	0.024	0.009	0.009	0.073	0.074	0.155	0.032	0.03	0.064	0.053	0.067	0.057	0.043	0.041	1
0.031	0.031	0.017	0.016	0.015	0.015	0.045	0.022	0.043	0.037	0.026	0.026	0.01	0.01	0.064	0.064	0.153	0.028	0.031	0.05	0.058	0.052	0.059	0.05	0.046	1
0.028	0.028	0.018	0.02	0.016	0.015	0.036	0.021	0.04	0.033	0.024	0.024	0.008	0.009	0.074	0.074	0.151	0.025	0.025	0.057	0.059	0.06	0.069	0.044	0.042	1
0.026	0.026	0.02	0.018	0.015	0.015	0.036	0.021	0.043	0.035	0.023	0.023	0.009	0.008	0.067	0.067	0.146	0.025	0.033	0.057	0.066	0.063	0.071	0.044	0.042	1
0.03	0.028	0.02	0.02	0.016	0.015	0.034	0.021	0.045	0.039	0.026	0.026	0.01	0.01	0.071	0.071	0.154	0.027	0.029	0.06	0.05	0.065	0.056	0.039	0.039	1
0.029	0.032	0.018	0.017	0.016	0.014	0.039	0.024	0.048	0.04	0.025	0.025	0.01	0.009	0.066	0.066	0.157	0.029	0.029	0.055	0.051	0.057	0.055	0.045	0.046	1
0.026	0.026	0.018	0.018	0.013	0.013	0.032	0.025	0.04	0.035	0.025	0.025	0.009	0.009	0.068	0.068	0.154	0.035	0.035	0.06	0.059	0.062	0.063	0.041	0.04	1
0.029	0.026	0.016	0.016	0.015	0.017	0.038	0.02	0.045	0.036	0.023	0.025	0.009	0.009	0.065	0.064	0.154	0.028	0.027	0.061	0.059	0.06	0.063	0.044	0.05	1
0.027	0.026	0.019	0.021	0.015	0.014	0.03	0.022	0.049	0.034	0.024	0.024	0.009	0.01	0.057	0.056	0.148	0.033	0.035	0.065	0.062	0.073	0.068	0.039	0.041	1
0.03	0.027	0.021	0.014	0.015	0.013	0.036	0.022	0.038	0.035	0.024	0.025	0.009	0.009	0.079	0.079	0.159	0.027	0.029	0.049	0.056	0.057	0.059	0.042	0.044	1
0.026	0.028	0.019	0.021	0.014	0.014	0.038	0.021	0.037	0.034	0.024	0.023	0.009	0.009	0.072	0.072	0.153	0.031	0.027	0.059	0.057	0.063	0.059	0.043	0.048	1
0.027	0.027	0.02	0.02	0.016	0.014	0.034	0.024	0.044	0.037	0.026	0.026	0.009	0.01	0.07	0.07	0.16	0.029	0.028	0.055	0.053	0.057	0.058	0.042	0.042	1
0.029	0.03	0.019	0.016	0.016	0.015	0.035	0.024	0.045	0.034	0.025	0.024	0.009	0.009	0.067	0.067	0.154	0.032	0.031	0.055	0.059	0.06	0.064	0.045	0.039	1
0.031	0.03	0.025	0.021	0.013	0.013	0.045	0.024	0.048	0.037	0.026	0.026	0.009	0.01	0.069	0.069	0.157	0.027	0.031	0.041	0.054	0.043	0.058	0.048	0.046	1

0.028	0.028	0.019	0.019	0.013	0.012	0.034	0.022	0.043	0.036	0.026	0.026	0.01	0.01	0.069	0.067	0.159	0.034	0.028	0.062	0.049	0.066	0.055	0.04	0.043	1
0.031	0.029	0.02	0.013	0.014	0.012	0.043	0.023	0.04	0.033	0.024	0.024	0.009	0.009	0.073	0.073	0.155	0.025	0.026	0.057	0.054	0.061	0.057	0.051	0.044	1
0.029	0.027	0.017	0.018	0.016	0.017	0.045	0.022	0.046	0.036	0.025	0.025	0.009	0.009	0.063	0.064	0.15	0.027	0.026	0.053	0.053	0.053	0.058	0.054	0.057	1
0.031	0.034	0.019	0.017	0.015	0.018	0.038	0.02	0.048	0.036	0.025	0.025	0.009	0.009	0.067	0.067	0.161	0.028	0.025	0.06	0.047	0.061	0.052	0.046	0.044	1
0.026	0.025	0.019	0.016	0.016	0.016	0.039	0.024	0.047	0.034	0.025	0.025	0.009	0.01	0.067	0.067	0.154	0.027	0.025	0.058	0.056	0.062	0.059	0.048	0.047	1
0.029	0.028	0.018	0.013	0.016	0.016	0.035	0.021	0.04	0.036	0.024	0.025	0.009	0.009	0.071	0.071	0.152	0.029	0.029	0.059	0.057	0.065	0.06	0.042	0.047	1
0.025	0.027	0.016	0.02	0.017	0.017	0.04	0.022	0.044	0.04	0.025	0.025	0.01	0.009	0.059	0.058	0.151	0.034	0.035	0.052	0.055	0.056	0.061	0.052	0.05	1
0.03	0.031	0.017	0.019	0.017	0.017	0.034	0.025	0.046	0.036	0.024	0.024	0.01	0.01	0.074	0.075	0.163	0.025	0.027	0.051	0.053	0.057	0.058	0.039	0.041	1
0.03	0.031	0.022	0.02	0.017	0.019	0.041	0.024	0.045	0.038	0.026	0.023	0.01	0.01	0.07	0.071	0.163	0.025	0.029	0.049	0.042	0.055	0.05	0.044	0.046	1
0.027	0.032	0.014	0.016	0.015	0.014	0.038	0.024	0.044	0.041	0.027	0.026	0.01	0.01	0.069	0.07	0.159	0.022	0.025	0.054	0.058	0.059	0.059	0.041	0.047	1
0.027	0.026	0.019	0.016	0.016	0.015	0.044	0.019	0.045	0.038	0.024	0.025	0.01	0.009	0.068	0.067	0.151	0.028	0.031	0.054	0.053	0.056	0.057	0.051	0.05	1
0.027	0.028	0.02	0.018	0.017	0.016	0.038	0.02	0.043	0.034	0.024	0.024	0.009	0.009	0.067	0.067	0.149	0.03	0.031	0.056	0.066	0.059	0.067	0.041	0.043	1
0.028	0.028	0.02	0.019	0.016	0.016	0.038	0.019	0.046	0.034	0.025	0.025	0.009	0.009	0.065	0.065	0.152	0.031	0.03	0.052	0.064	0.053	0.066	0.044	0.046	1
0.029	0.03	0.02	0.02	0.014	0.016	0.036	0.025	0.051	0.04	0.027	0.027	0.01	0.01	0.063	0.063	0.164	0.029	0.025	0.053	0.047	0.056	0.053	0.045	0.047	1
0.026	0.025	0.019	0.017	0.013	0.014	0.034	0.022	0.042	0.035	0.025	0.025	0.009	0.009	0.07	0.068	0.156	0.033	0.027	0.064	0.057	0.069	0.062	0.039	0.039	1

Appendix E: Frequency Statistics

E.1 Dichotomous Conversions and Normalising Data

Table 15. Stance Anthropometry

Some features from the proportional indices are absent as Dichotomous conversions were only applied to those features within the dataset that applied to features observed within CCTV footage for Likelihood Ratio (LR) calculation.

1. Shoulder – Elbow Length R

Smallest	0.04246
Largest	0.057843
1	0.042 - 0.048
2	0.04801 - 0.052
3	>0.05201

2. Shoulder – Elbow Length L

Smallest	0.04246
Largest	0.0566
1	0.042 - 0.048
2	0.04801 - 0.052
3	>0.05201

3. Forearm Length R

Smallest	0.018611
Largest	0.041103
1	0.01 - 0.03
2	0.0301 - 0.035
3	>0.03501

4. Forearm Length L

Smallest	0.021114
Largest	0.040269
1	0.021 - 0.03
2	0.0301 - 0.035
3	>0.03501

7. Maximum Hip Width

Smallest	0.032687
Largest	0.08272
1	0.03 - 0.055
2	0.05501 - 0.06
3	>0.0601

8. Head Height

Smallest	0.028846
Largest	0.071463
1	0.02 - 0.034
2	0.03401 - 0.038
3	>0.03801

9. Torso length

Smallest	0.035091
Largest	0.098956
1	0.03 - 0.075
2	0.07501 - 0.08
3	>0.0801

10. Shoulder width

Smallest	0.05127
Largest	0.081351
1	0.05 -0.06
2	0.0601 - 0.065
3	>0.06501

11. Foot length R

Smallest	0.034788
Largest	0.048648
1	0.034 - 0.04
2	0.0401 - 0.043
3	>0.04301

12. Foot length L

Smallest	0.035467
Largest	0.049215
1	0.035 - 0.04
2	0.0401 - 0.043
3	>0.04301

15. Leg Length-Crotch R

Smallest	0.100402
Largest	0.133858
1	0.1 - 0.11
2	0.1101 - 0.12
3	>0.1201

16. Leg Length-Crotch L

Smallest	0.100241
Largest	0.133704
1	0.1 - 0.11
2	0.1101 - 0.12
3	>0.1201

17. Total Height (stature) R

Smallest	0.25266
Largest	0.28562
1	0.25 - 0.267
2	0.26701 - 0.275
3	>0.27501

Table 16. Gait Anthropometry

1. Shoulder – Elbow Length R	
Smallest	0.026320883
Largest	0.036098797
1	0.026 - 0.03
2	0.0301 - 0.032
3	>0.03201

2. Shoulder – Elbow Length L	
Smallest	0.017681729
Largest	0.037626486
1	0.01 - 0.03
2	0.0301 - 0.032
3	>0.03201

3. Forearm (elbow-wrist) Length R	
Smallest	0.015705765
Largest	0.027829678
1	0.015 - 0.02
2	0.0201 - 0.022
3	>0.02201

4. Forearm (elbow-wrist) Length L	
Smallest	0.014473176
Largest	0.029937319
1	0.014 - 0.02
2	0.0201 - 0.022
3	>0.02201

7. Maximum Hip Width	
Smallest	0.031613654
Largest	0.053936822
1	0.03 - 0.038
2	0.03801 - 0.042
3	>0.04201

8. Head Height	
Smallest	0.019367334
Largest	0.033188586
1	0.019 - 0.023
2	0.02301 - 0.028
3	>0.02801

9. Torso length	
Smallest	0.040011378
Largest	0.059531349
1	0.04 - 0.048
2	0.04801 - 0.053
3	> 0.05301

10. Shoulder width	
Smallest	0.035311427
Largest	0.047885634
1	0.035 - 0.038
2	0.03801 - 0.042
3	> 0.04201

11. Foot length R	
Smallest	0.024874205
Largest	0.030960363
1	0.024 - 0.027
2	0.02701 - 0.029
3	>0.02901

12. Foot length L	
Smallest	0.024581832
Largest	0.031286099
1	0.024 - 0.027
2	0.02701 - 0.029
3	>0.02901

15. Leg Length-Crotch R	
Smallest	0.06394914
Largest	0.09041723
1	0.06 - 0.073
2	0.07301 - 0.078
3	>0.07801

16. Leg Length-Crotch L	
Smallest	0.063668661
Largest	0.089376756
1	0.06 - 0.073
2	0.07301 - 0.078
3	>0.07801

17. Total Height (stature) R	
Smallest	0.159918842
Largest	0.192644091
1	0.15 - 0.17
2	0.1701 - 0.18
3	>0.1801

3. Lat mal - Med mal R	
Smallest	0.046120562
Largest	0.07608802
1	0.04 - 0.06
2	0.0601 - 0.068
3	>0.06801

4. Lat mal - Med mal L	
Smallest	0.047170844
Largest	0.077328487
1	0.04 - 0.06
2	0.0601 - 0.068
3	>0.06801

5. Hallux - Hallux R	
Smallest	0.047595634
Largest	0.082460733
1	0.04 - 0.06
2	0.0601 - 0.07
3	>0.0701

6. Hallux - Hallux L	
Smallest	0.032796429
Largest	0.079963653
1	0.03 - 0.06
2	0.0601 - 0.07
3	>0.0701

7. Styloid Pro - Styloid Pro R Forward	
Smallest	0.035618613
Largest	0.066747085
1	0.03 - 0.044
2	0.4401 - 0.05
3	>0.0501

8. Styloid Pro - Styloid Pro L Forward	
Smallest	0.03548124
Largest	0.063807729
1	0.03 - 0.044
2	0.4401 - 0.05
3	>0.0501

Table 16. Stance Anthropometry Normalising from Proportional Indices

1	0.052701	0.039266	0.013434
2	0.052663	0.039352	0.013311
3	0.037781	0.017221	0.02056
4	0.037231	0.019537	0.017694
5	0.029802	0.018158	0.011644
6	0.033139	0.01707	0.016069
7	0.076985	0.029781	0.047204
8	0.065109	0.026597	0.038512
9	0.090695	0.031971	0.058724
10	0.075783	0.0474	0.028384
11	0.044634	0.032321	0.012313
12	0.045328	0.033007	0.012321
13	0.016659	0.010531	0.006129
14	0.016201	0.010401	0.0058
15	0.124641	0.09202	0.032621
16	0.124612	0.091873	0.03274
17	0.263366	0.233706	0.02966

Table 17. Stance Anthropometry Normalised Data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0.363	0.528	0.845	0.792	0.592	0.413	0.554	0.208	0.791	0.374	0.197	0.141	0.399	0.495	0.764	0.834	0
0.573	0.583	0.782	0.795	0.391	0.351	0.592	0.226	0.767	0.239	0.304	0.211	0.21	0.271	0.595	0.597	0.586
0.454	0.541	0.9	0.848	0.172	0.146	0.478	0.218	0.708	0.357	0.361	0.185	0.362	0.354	0.729	0.731	0.583
0.37	0.276	0.714	0.605	0.133	0.089	0.704	0.181	0.885	0.281	0.307	0.203	0.221	0.308	0.656	0.663	0.677
0.405	0.402	0.793	0.811	0.391	0.373	0.617	0.139	0.712	0.205	0.228	0.143	0.134	0.164	0.834	0.808	0.53
0.314	0.391	0.72	0.627	0.633	0.526	0.634	0.117	0.641	0.243	0.341	0.272	0.428	0.368	0.855	0.852	0.389
0.661	0.738	0.85	0.832	0.495	0.353	0.505	0.172	0.58	0.032	0.506	0.438	0.185	0.066	0.742	0.726	0.705
0.74	0.729	0.77	0.721	0.469	0.455	0.612	0.168	0.659	0.096	0.184	0.116	0.27	0.229	0.733	0.712	0.611
0.596	0.618	0.754	0.728	0.431	0.399	0.534	0.187	0.681	0.262	0.254	0.211	0.136	0.14	0.751	0.734	0.606
0.514	0.652	0.684	0.691	0.569	0.326	0.626	0.182	0.653	0.202	0.244	0.2	0.43	0.45	0.731	0.724	0.577
0.437	0.488	0.753	0.68	0.624	0.378	0.625	0.174	0.694	0.232	0.356	0.254	0.1	0.201	0.774	0.754	0.466
0.387	0.418	0.768	0.683	0.291	0.44	0.625	0.162	0.694	0.289	0.328	0.347	0.127	0.156	0.767	0.759	0.543
0.579	0.532	0.553	0.529	0.701	0.604	0.603	0.146	0.728	0.195	0.409	0.353	0.577	0.502	0.699	0.691	0.428
0.389	0.441	0.629	0.714	0.805	0.543	0.471	0.164	0.764	0.168	0.376	0.297	0.363	0.381	0.742	0.757	0.51
0.373	0.414	0.648	0.556	0.26	0.447	0.502	0.102	0.67	0.307	0.484	0.452	0.523	0.55	0.87	0.876	0.515
0.113	0.256	0.815	0.801	0.593	0.427	0.473	0.188	0.714	0.211	0.595	0.539	0.477	0.599	0.786	0.762	0.394
0.393	0.379	0.68	0.684	0.546	0.464	0.509	0.165	0.696	0.247	0.557	0.512	0.531	0.633	0.693	0.73	0.496
0.476	0.342	0.705	0.605	0.635	0.518	0.545	0.221	0.641	0.254	0.618	0.574	0.462	0.46	0.649	0.647	0.551
0.363	0.493	0.692	0.723	0.228	0.206	0.451	0.084	0.579	0.208	0.445	0.413	0.233	0.498	0.986	1	0.712
0.252	0.335	0.614	0.582	0.728	0.487	0.541	0.156	0.638	0.304	0.531	0.499	0.467	0.616	0.749	0.746	0.576
0.608	0.543	0.813	0.789	0.292	0.253	0.508	0.146	0.518	0.164	0.422	0.343	0.416	0.462	1	0.996	0.394
0.426	0.412	0.726	0.68	0.409	0.355	0.505	0.185	0.565	0.209	0.583	0.492	0.587	0.618	0.825	0.8	0.588
0.362	0.444	0.734	0.786	0.751	0.408	0.506	0.222	0.481	0.196	0.681	0.637	0.558	0.71	0.797	0.816	0.404
0.346	0.275	0.755	0.797	0.23	0.188	0.58	0.167	0.748	0.328	0.518	0.498	0.443	0.491	0.583	0.613	0.738
0.339	0.422	0.702	0.644	0.212	0.257	0.713	0.176	0.67	0.353	0.597	0.552	0.595	0.626	0.612	0.61	0.541
0.363	0.371	0.79	0.779	0.311	0.239	0.515	0.141	0.64	0.322	0.433	0.447	0.494	0.495	0.836	0.882	0.442
0.291	0.299	0.707	0.707	0.212	0.194	0.689	0.242	0.651	0.416	0.605	0.585	0.533	0.688	0.5	0.534	0.731
0.354	0.318	0.763	0.691	0.374	0.456	0.537	0.246	0.748	0.334	0.423	0.461	0.448	0.546	0.697	0.712	0.34
0.269	0.297	0.73	0.701	0.232	0.227	0.591	0.225	0.708	0.297	0.46	0.439	0.489	0.539	0.774	0.767	0.484
0.346	0.515	0.735	0.537	0.492	0.451	0.566	0.219	0.625	0.295	0.547	0.502	0.499	0.673	0.713	0.707	0.478
0.422	0.353	0.6	0.509	0.074	0.14	0.516	0.221	0.637	0.413	0.56	0.492	0.526	0.579	0.813	0.819	0.676
0.358	0.563	0.686	0.526	0.503	0.332	0.588	0.066	0.697	0.27	0.431	0.423	0.408	0.504	0.77	0.785	0.581
0.327	0.398	0.709	0.733	0.564	0.31	0.534	0.131	0.627	0.287	0.405	0.372	0.426	0.643	0.792	0.798	0.605
0.379	0.324	0.619	0.565	0.616	0.383	0.629	0.225	0.73	0.347	0.591	0.547	0.565	0.716	0.611	0.622	0.382
0.364	0.476	0.644	0.444	0.456	0.303	0.648	0.322	0.759	0.191	0.813	0.825	0.835	0.977	0.452	0.459	0.459
0.592	0.517	0.8	0.656	0.36	0.337	0.603	0.136	0.676	0.171	0.54	0.393	0.47	0.591	0.733	0.731	0.452
0.449	0.446	0.562	0.555	0.44	0.413	0.616	0.244	0.681	0.244	0.618	0.539	0.676	0.761	0.609	0.62	0.551
0.424	0.411	0.711	0.671	0.479	0.51	0.677	0.132	0.656	0.219	0.516	0.437	0.583	0.71	0.676	0.674	0.439
0.354	0.483	0.568	0.476	0.702	0.593	0.948	0.133	0.762	0.347	0.523	0.489	0.573	0.721	0.445	0.469	0.211
0.547	0.504	0.679	0.689	0.532	0.462	0.519	0.184	0.598	0.311	0.585	0.563	0.507	0.63	0.66	0.692	0.519
0.505	0.556	0.66	0.604	0.448	0.445	0.668	0.134	0.785	0.209	0.387	0.309	0.383	0.499	0.62	0.639	0.515
0.327	0.355	0.634	0.669	0.755	0.546	0.59	0.21	0.696	0.331	0.573	0.596	0.581	0.756	0.581	0.562	0.418
0.448	0.404	0.724	0.631	0.187	0.247	0.516	0.227	0.621	0.163	0.529	0.473	0.592	0.697	0.863	0.873	0.516
0.379	0.282	0.698	0.719	0.793	0.573	0.565	0.158	0.718	0.363	0.503	0.424	0.528	0.532	0.64	0.617	0.385
0.201	0.271	0.638	0.619	0.486	0.526	0.574	0.278	0.694	0.238	0.496	0.509	0.572	0.676	0.669	0.671	0.553
0.471	0.521	0.722	0.606	0.572	0.586	0.521	0.149	0.657	0.251	0.523	0.433	0.511	0.586	0.76	0.741	0.388

0.724	0.745	0.643	0.625	0.426	0.35	0.568	0.129	0.662	0.173	0.152	0.231	0.382	0.426	0.849	0.851	0.492
0.533	0.383	0.636	0.84	0.215	0.162	0.497	0.184	0.639	0.26	0.49	0.446	0.73	0.745	0.776	0.791	0.591
0.343	0.433	0.724	0.585	0.592	0.497	0.715	0.096	0.674	0.237	0.433	0.41	0.517	0.45	0.709	0.703	0.446
0.316	0.375	0.75	0.645	0.465	0.456	0.704	0.128	0.774	0.158	0.478	0.468	0.512	0.611	0.599	0.576	0.546
0.349	0.261	0.802	0.801	0.25	0.205	0.523	0.257	0.761	0.235	0.523	0.49	0.55	0.604	0.636	0.63	0.61
0.365	0.434	0.545	0.479	0.148	0.192	0.893	0.152	0.802	0.353	0.693	0.547	0.624	0.563	0.526	0.516	0.441
0.538	0.578	0.601	0.575	0.555	0.402	0.695	0.095	0.824	0.172	0.693	0.559	0.639	0.626	0.528	0.53	0.409
0.32	0.431	0.66	0.613	0.561	0.44	0.677	0.181	0.616	0.329	0.53	0.463	0.591	0.599	0.662	0.664	0.493
0.455	0.37	0.754	0.69	0.557	0.489	0.487	0.191	0.56	0.366	0.552	0.496	0.599	0.703	0.717	0.723	0.518
0.426	0.572	0.667	0.573	0.699	0.583	0.656	0.164	0.806	0.123	0.664	0.585	0.691	0.825	0.377	0.393	0.587
0.697	0.655	0.619	0.619	0.375	0.459	0.67	0.219	0.597	0.213	0.465	0.387	0.501	0.575	0.716	0.706	0.397
0.434	0.464	0.627	0.638	0.565	0.53	0.663	0.172	0.693	0.298	0.452	0.224	0.496	0.279	0.603	0.584	0.663
0.492	0.406	0.707	0.675	0.615	0.487	0.676	0.221	0.775	0.336	0.522	0.466	0.518	0.594	0.421	0.394	0.52
0.414	0.464	0.755	0.651	0.625	0.494	0.611	0.152	0.75	0.211	0.753	0.458	0.529	0.363	0.535	0.538	0.53
0.206	0.223	0.698	0.672	0.636	0.45	0.511	0.274	0.616	0.165	0.642	0.608	0.675	0.735	0.737	0.722	0.545
0.281	0.288	0.597	0.644	0.093	0.144	0.55	0.205	0.659	0.313	0.523	0.56	0.723	0.713	0.775	0.772	0.716
0.399	0.45	0.761	0.777	0.301	0.215	0.494	0.215	0.729	0.302	0.417	0.268	0.295	0.384	0.659	0.7	0.751
0.404	0.507	0.781	0.856	0.729	0.385	0.534	0.199	0.738	0.173	0.157	0.102	0.306	0.394	0.68	0.669	0.648
0.314	0.461	0.839	0.836	0.578	0.415	0.448	0.212	0.652	0.235	0.268	0.142	0.242	0.303	0.797	0.768	0.686
0.35	0.39	0.685	0.73	0.702	0.514	0.62	0.244	0.675	0.195	0.299	0.289	0.58	0.415	0.604	0.61	0.666
0.524	0.522	0.874	0.884	0.507	0.304	0.574	0.325	0.529	0.373	0.301	0.303	0.349	0.342	0.639	0.642	0.562
0.421	0.461	0.799	0.725	0.486	0.429	0.469	0.228	0.626	0.34	0.224	0.122	0.399	0.223	0.79	0.779	0.66
0.513	0.501	0.682	0.646	0.519	0.444	0.651	0.19	0.687	0.368	0.255	0.165	0.44	0.342	0.635	0.637	0.585
0.669	0.616	0.931	0.927	0.531	0.339	0.465	0.134	0.625	0.217	0.113	0	0.221	0.039	0.862	0.851	0.556
0.501	0.51	0.876	0.919	0.397	0.426	0.55	0.283	0.639	0.25	0.237	0.227	0.175	0.183	0.689	0.691	0.542
0.367	0.364	0.698	0.728	0.67	0.544	0.65	0.253	0.679	0.386	0.292	0.191	0.411	0.336	0.573	0.562	0.588
0.261	0.31	0.757	0.725	0.604	0.496	0.564	0.241	0.716	0.283	0.529	0.382	0.44	0.511	0.578	0.576	0.612
0.47	0.479	0.671	0.648	0.502	0.441	0.55	0.189	0.757	0.228	0.276	0.116	0.334	0.326	0.688	0.686	0.711
0.419	0.395	0.757	0.853	0.46	0.419	0.526	0.164	0.623	0.248	0.315	0.248	0.212	0.443	0.766	0.777	0.679
0.608	0.648	0.776	0.786	0.595	0.559	0.618	0.11	0.585	0.252	0.281	0.214	0.116	0.168	0.835	0.832	0.338
0.23	0.258	0.839	0.86	0.495	0.304	0.574	0.186	0.639	0.189	0.221	0.211	0.279	0.148	0.885	0.886	0.58
0.418	0.469	0.748	0.81	0.647	0.501	0.46	0.167	0.559	0.289	0.264	0.196	0.262	0.226	0.861	0.863	0.624
0.514	0.502	0.818	0.812	0.669	0.474	0.519	0.135	0.627	0.257	0.434	0.322	0.285	0.347	0.724	0.735	0.507
0.546	0.619	0.66	0.589	0.412	0.445	0.748	0.12	0.616	0.288	0.103	0.07	0.497	0.475	0.77	0.772	0.529
0.382	0.411	0.716	0.685	0.666	0.533	0.523	0.12	0.605	0.181	0.31	0.254	0.407	0.501	0.924	0.937	0.432
0.511	0.52	0.546	0.615	0.774	0.567	0.577	0.173	0.54	0.434	0.466	0.307	0.475	0.5	0.719	0.729	0.512
0.616	0.509	0.785	0.829	0.379	0.28	0.509	0.153	0.604	0.2	0.222	0.189	0.389	0.433	0.838	0.853	0.633
0.293	0.427	0.791	0.741	0.205	0.216	0.562	0.084	0.721	0.407	0.484	0.451	0.256	0.051	0.764	0.753	0.618
0.436	0.37	0.649	0.703	0.542	0.478	0.601	0.154	0.718	0.244	0.19	0.1	0.313	0.158	0.77	0.767	0.648
0.459	0.542	0.796	0.722	0.44	0.501	0.442	0.163	0.799	0.304	0.194	0.081	0.239	0.372	0.765	0.762	0.489
0.599	0.642	0.664	0.657	0.547	0.401	0.533	0.223	0.721	0.195	0.421	0.272	0	0.196	0.726	0.723	0.554
0.604	0.555	0.762	0.69	0.79	0.721	0.645	0.142	0.545	0.091	0.258	0.189	0.62	0.734	0.783	0.8	0.328
0.359	0.444	0.552	0.601	0.617	0.46	0.97	0.127	0.65	0.312	0.409	0.4	0.528	0.732	0.529	0.527	0.432
0.454	0.483	0.52	0.559	0.578	0.503	0.773	0.13	0.783	0.248	0.646	0.535	0.682	0.767	0.487	0.511	0.389
0.349	0.325	0.665	0.618	0.551	0.52	0.529	0.166	0.623	0.334	0.637	0.558	0.505	0.531	0.705	0.699	0.578
0.407	0.274	0.705	0.711	0.125	0.192	1	0.063	0.78	0.403	0.758	0.789	0.759	0.685	0.429	0.44	0.206
0.673	0.693	0.841	0.831	0.556	0.358	0.534	0.105	0.553	0.238	0.337	0.281	0.349	0.487	0.815	0.804	0.451
0.479	0.425	0.811	0.662	0.385	0.425	0.611	0.175	0.676	0.366	0.523	0.456	0.503	0.506	0.59	0.597	0.519

0.274	0.071	0.668	0.669	0.632	0.586	0.636	0.222	0.688	0.275	0.614	0.558	0.648	0.707	0.586	0.588	0.512
0.598	0.67	0.642	0.655	0.472	0.289	0.685	0.178	0.742	0.313	0.52	0.565	0.696	0.472	0.495	0.481	0.472
0.454	0.493	0.693	0.605	0.505	0.585	0.705	0.147	0.674	0.414	0.478	0.455	0.573	0.581	0.619	0.621	0.26
0.337	0.365	0.662	0.661	0.668	0.483	0.595	0.186	0.767	0.34	0.49	0.377	0.648	0.635	0.557	0.551	0.509
0.546	0.346	0.621	0.678	0.669	0.605	0.498	0.197	0.696	0.311	0.355	0.345	0.558	0.636	0.674	0.671	0.508
0.592	0.447	0.653	0.675	0.427	0.428	0.604	0.173	0.791	0.239	0.765	0.653	0.738	0.661	0.523	0.513	0.357
0.438	0.352	0.574	0.497	0.681	0.526	0.572	0.223	0.709	0.173	0.496	0.394	0.616	0.625	0.691	0.685	0.565
0.448	0.498	0.703	0.615	0.511	0.412	0.581	0.216	0.711	0.256	0.518	0.484	0.546	0.769	0.566	0.564	0.586
0.657	0.492	0.509	0.545	0.935	0.618	0.643	0.195	0.76	0.343	0.491	0.402	0.383	0.404	0.519	0.521	0.39
0.323	0.182	0.64	0.78	0.482	0.338	0.534	0.193	0.727	0.218	0.482	0.403	0.508	0.607	0.732	0.742	0.599
0.149	0.289	0.787	0.729	0.538	0.329	0.647	0.148	0.577	0.421	0.457	0.424	0.579	0.562	0.767	0.777	0.445
0.137	0.227	0.797	0.716	0.393	0.3	0.605	0.212	0.555	0.326	0.358	0.439	0.586	0.618	0.79	0.792	0.649
0.445	0.484	0.665	0.697	0.676	0.497	0.64	0.159	0.612	0.257	0.507	0.507	0.53	0.607	0.627	0.612	0.545
0.329	0.253	0.668	0.693	0.708	0.503	0.649	0.11	0.8	0.424	0.485	0.44	0.515	0.59	0.527	0.525	0.454
0.477	0.434	0.713	0.713	0.574	0.441	0.544	0.148	0.572	0.129	0.502	0.413	0.466	0.443	0.881	0.903	0.435
0.297	0.314	0.735	0.731	0.494	0.331	0.698	0.156	0.613	0.307	0.405	0.338	0.492	0.494	0.759	0.769	0.465
0.547	0.546	0.685	0.588	0.53	0.444	0.753	0.179	0.638	0.208	0.439	0.361	0.423	0.469	0.695	0.693	0.371
0.061	0.11	0	0	0.305	0.388	0.617	0.211	0.717	0.39	0.737	0.622	0.714	0.752	0.875	0.88	0.825
0.347	0.506	0.707	0.546	0.472	0.427	0.864	0.113	0.821	0.387	0.482	0.59	0.73	0.7	0.432	0.414	0.274
0.572	0.453	0.731	0.727	0.365	0.394	0.373	0.191	0.6	0.236	0.319	0.24	0.308	0.077	0.915	0.912	0.733
0.435	0.381	0.72	0.706	0.509	0.367	0.699	0.155	0.684	0.361	0.202	0.214	0.417	0.487	0.722	0.685	0.467
0.44	0.438	0.697	0.61	0.861	0.749	0.787	0.149	0.668	0.062	0.199	0.205	0.306	0.478	0.724	0.731	0.331
0.772	0.761	0.769	0.835	0.463	0.344	0.474	0.139	0.702	0.096	0.122	0.015	0.19	0.142	0.843	0.839	0.589
0.482	0.48	0.597	0.572	0.798	0.616	0.646	0.19	0.586	0.269	0.257	0.227	0.546	0.409	0.772	0.773	0.448
0.269	0.299	0.65	0.616	0.728	0.623	0.665	0.184	0.717	0.336	0.347	0.243	0.455	0.427	0.661	0.636	0.485
0.521	0.406	0.577	0.548	0.55	0.457	0.95	0.155	0.811	0.215	0.313	0.257	0.495	0.519	0.561	0.541	0.286
0.4	0.462	0.654	0.621	0.523	0.305	0.771	0.158	0.755	0.285	0.491	0.424	0.609	0.617	0.607	0.575	0.363
0.438	0.371	0.533	0.586	0.787	0.548	0.703	0.123	0.712	0.397	0.738	0.6	0.628	0.76	0.441	0.444	0.507
0.248	0.397	0.654	0.49	0.613	0.621	0.644	0.212	0.763	0.307	0.551	0.602	0.678	0.688	0.522	0.524	0.449
0.279	0.275	0.522	0.508	0.551	0.549	0.587	0.301	0.691	0.382	0.571	0.563	0.55	0.679	0.615	0.612	0.516
0.5	0.29	0.646	0.719	0.885	0.555	0.563	0.185	0.736	0.259	0.244	0.378	0.616	0.623	0.621	0.609	0.488
0.502	0.447	0.743	0.554	0.515	0.629	0.661	0.187	0.778	0.23	0.669	0.566	0.628	0.711	0.485	0.488	0.348
0.248	0.233	0.541	0.568	0.555	0.53	0.796	0.218	0.777	0.245	0.52	0.61	0.786	0.663	0.511	0.522	0.415
0.36	0.367	0.702	0.541	0.541	0.627	0.489	0.212	0.676	0.153	0.497	0.694	0.542	0.644	0.728	0.73	0.508
0.5	0.488	0.799	0.36	0.463	0.722	0.657	0.173	0.807	0.301	0.558	0.39	0.722	0.642	0.453	0.451	0.465
0.499	0.363	0.667	0.659	0.48	0.553	0.753	0.152	0.758	0.222	0.582	0.582	0.715	0.73	0.48	0.449	0.434
0.568	0.608	0.701	0.497	0.519	0.41	0.66	0.223	0.699	0.307	0.592	0.491	0.705	0.791	0.53	0.529	0.401
0.5	0.488	0.651	0.464	0.532	0.445	0.799	0.228	0.758	0.362	0.701	0.479	0.835	0.623	0.428	0.402	0.336
0.497	0.378	0.604	0.587	0.754	0.614	0.595	0.167	0.67	0.253	0.496	0.486	0.526	0.358	0.635	0.615	0.586
0.548	0.526	0.688	0.645	0.502	0.475	0.598	0.181	0.769	0.266	0.61	0.554	0.569	0.767	0.497	0.5	0.458
0.517	0.433	0.587	0.497	0.803	0.564	0.561	0.127	0.739	0.263	0.704	0.67	0.683	0.649	0.594	0.596	0.397
0.18	0.144	0.857	0.746	0.591	0.357	0.709	0.283	0.752	0.331	0.602	0.466	0.405	0.498	0.447	0.441	0.559
0.458	0.435	0.653	0.597	0.954	0.613	0.592	0.173	0.683	0.276	0.582	0.492	0.67	0.706	0.557	0.555	0.425
0.324	0.551	0.735	0.707	0.523	0.49	0.653	0.167	0.704	0.279	0.555	0.443	0.624	0.681	0.524	0.527	0.526
0.235	0.106	0.631	0.688	0.698	0.548	0.68	0.187	0.784	0.408	0.651	0.719	0.71	0.893	0.382	0.385	0.497
0.596	0.657	0.578	0.51	0.682	0.511	0.683	0.108	0.619	0.27	0.604	0.581	0.667	0.986	0.622	0.628	0.348
0.442	0.291	0.69	0.655	0.508	0.445	0.646	0.15	0.722	0.369	0.371	0.487	0.556	0.634	0.546	0.553	0.623
0.796	0.652	0.431	0.417	0.692	0.664	0.635	0.198	0.748	0.299	0.648	0.547	0.646	0.729	0.454	0.461	0.426

0.562	0.467	0.494	0.56	0.326	0.312	0.673	0.233	0.721	0.161	0.681	0.456	0.617	0.722	0.663	0.682	0.458
0.543	0.573	0.584	0.617	0.423	0.076	0.737	0.267	0.816	0.437	0.724	0.69	0.71	0.82	0.352	0.364	0.353
0.426	0.373	0.547	0.52	0.757	0.49	0.744	0.069	0.822	0.335	0.732	0.863	0.736	0.73	0.444	0.435	0.313
0.321	0.307	0.684	0.471	0.623	0.57	0.724	0.249	0.777	0.563	0.981	0.803	0.823	0.962	0.224	0.219	0.342
0.598	0.566	0.498	0.425	0.68	0.483	0.656	0.21	0.75	0.446	0.913	0.822	0.817	0.885	0.296	0.287	0.487
0.646	0.812	0.466	0.223	0.731	0.529	0.724	0.249	0.639	0.229	0.585	0.607	0.672	0.732	0.559	0.545	0.432
0.413	0.463	0.616	0.577	0.258	0.143	0.94	0.25	0.864	0.382	0.712	0.678	0.697	0.83	0.228	0.228	0.446
0.498	0.394	0.608	0.46	0.502	0.389	0.814	0.336	0.696	0.266	0.72	0.664	0.774	0.558	0.469	0.447	0.351
0.242	0.425	0.779	0.72	0.701	0.55	0.64	0.198	0.713	0.316	0.502	0.738	0.768	0.523	0.47	0.472	0.428
0.572	0.632	0.58	0.242	0.85	0.701	0.732	0.169	0.761	0.36	0.554	0.765	0.805	0.85	0.351	0.359	0.372
0.787	0.838	0.453	0.342	0.361	0.438	0.81	0.152	0.749	0.428	0.723	0.688	0.655	0.761	0.425	0.428	0.254
0.246	0.029	0.703	0.598	0.287	0.17	0.487	0.249	0.71	0.418	0.66	0.397	0.751	0.889	0.721	0.719	0.641
0.614	0.866	0.773	0.569	0.452	0.437	0.803	0.12	0.813	0.246	0.48	0.478	0.698	0.713	0.422	0.425	0.221
0.735	0.521	0.46	0.642	0.522	0.547	0.952	0.14	0.686	0.368	0.603	0.536	0.525	0.624	0.388	0.395	0.327
0.173	0.179	0.559	0.495	0.798	0.646	0.692	0.178	0.705	0.244	0.582	0.469	0.589	0.694	0.618	0.616	0.553
0.58	0.78	0.591	0.444	0.697	0.511	0.461	0.203	0.712	0.241	0.41	0.343	0.551	0.484	0.698	0.687	0.552
0.873	0.832	0.734	0.636	0.247	0.264	0.564	0.188	0.744	0.362	0	0.306	0.669	0.609	0.604	0.602	0.5
0.48	0.539	0.787	0.636	0.509	0.547	0.688	0.134	0.807	0.292	0.643	0.576	0.649	0.661	0.405	0.408	0.38
0.343	0.582	0.787	0.736	0.577	0.451	0.485	0.126	0.691	0.226	0.371	0.315	0.357	0.375	0.778	0.775	0.54
0.417	0.619	0.659	0.577	0.528	0.514	0.856	0.201	0.712	0.24	0.136	0.232	0.223	0.112	0.696	0.678	0.322
0.439	0.461	0.802	0.766	0.65	0.538	0.655	0.169	0.719	0.236	0.496	0.414	0.457	0.505	0.477	0.485	0.565
0.479	0.466	0.789	0.837	0.507	0.256	0.514	0.115	0.667	0.148	0.497	0.404	0.529	0.451	0.802	0.776	0.524
0.472	0.378	0.743	0.792	0.785	0.494	0.481	0.165	0.757	0.195	0.398	0.391	0.323	0.179	0.695	0.688	0.508
0.408	0.351	0.791	0.861	0.447	0.481	0.438	0.179	0.654	0.258	0.453	0.432	0.467	0.59	0.84	0.867	0.302
0.483	0.492	0.797	0.722	0.332	0.459	0.526	0.163	0.668	0.315	0.406	0.385	0.498	0.598	0.704	0.697	0.505
0.398	0.468	0.73	0.498	0.446	0.451	0.606	0.323	0.759	0.426	0.671	0.603	0.64	0.89	0.464	0.458	0.315
0.466	0.412	0.766	0.656	0.528	0.485	0.493	0.162	0.78	0.215	0.619	0.461	0.629	0.591	0.609	0.611	0.502
0.575	0.564	0.659	0.69	0.368	0.299	0.487	0.211	0.448	1	0.458	0.505	0.4	0.129	0.631	0.638	0.585
0.555	0.671	0.728	0.643	0.138	0.229	0.571	0.171	0.648	0.304	0.47	0.38	0.539	0.689	0.745	0.751	0.502
0.213	0.176	0.743	0.74	0.638	0.575	0.566	0.22	0.729	0.194	0.574	0.471	0.604	0.636	0.546	0.549	0.675
0.337	0.356	0.536	0.541	0.457	0.426	0.727	0.218	0.653	0.168	0.569	0.607	0.68	0.74	0.593	0.591	0.684
0.271	0.44	0.717	0.686	0.456	0.416	0.425	0.27	0.726	0.303	0.486	0.406	0.302	0.54	0.684	0.686	0.64
0.506	0.654	0.705	0.616	0.712	0.46	0.429	0.151	0.736	0.299	0.308	0.425	0.439	0.511	0.697	0.694	0.515
0.632	0.59	0.704	0.687	0.683	0.476	0.547	0.18	0.721	0.259	0.505	0.438	0.492	0.638	0.659	0.662	0.247
0.231	0.195	0.812	0.701	0.495	0.4	0.574	0.241	0.805	0.363	0.496	0.474	0.624	0.658	0.583	0.586	0.373
0.404	0.434	0.779	0.726	0.545	0.373	0.565	0.195	0.722	0.238	0.447	0.53	0.479	0.627	0.627	0.638	0.477
0.259	0.201	0.62	0.734	0.733	0.511	0.476	0.183	0.701	0.266	0.524	0.433	0.413	0.484	0.744	0.746	0.576
0.572	0.506	0.668	0.686	0.291	0.438	0.548	0.228	0.673	0.311	0.504	0.46	0.54	0.618	0.679	0.672	0.444
0.324	0.397	0.777	0.713	0.282	0.345	0.508	0.152	0.651	0.234	0.643	0.599	0.702	0.738	0.65	0.647	0.735
0.34	0.38	0.751	0.807	0.522	0.41	0.541	0.112	0.8	0.222	0.628	0.619	0.603	0.709	0.529	0.536	0.562
0.381	0.455	0.63	0.577	0.516	0.36	0.632	0.234	0.728	0.188	0.552	0.496	0.553	0.632	0.574	0.577	0.646
0.337	0.501	0.967	0.859	0.212	0	0.511	0.258	0.681	0.218	0.546	0.574	0.679	0.638	0.706	0.708	0.438
0.322	0.407	0.77	0.764	0.325	0.248	0.657	0.253	0.678	0.257	0.71	0.726	0.87	0.865	0.442	0.441	0.613
0.229	0.289	0.759	0.719	0.515	0.512	0.558	0.243	0.743	0.333	0.48	0.366	0.461	0.436	0.56	0.558	0.649
0.314	0.3	0.742	0.699	0.659	0.493	0.559	0.204	0.581	0.345	0.402	0.323	0.516	0.446	0.715	0.708	0.641
0.512	0.446	0.601	0.543	0.453	0.413	0.534	0.174	0.696	0.323	0.31	0.266	0.38	0.62	0.726	0.728	0.694
0.368	0.473	0.731	0.686	0.432	0.318	0.528	0.233	0.701	0.288	0.252	0.22	0.396	0.392	0.684	0.678	0.773
0.23	0.301	0.783	0.738	0.216	0.242	0.561	0.208	0.671	0.353	0.547	0.444	0.718	0.633	0.801	0.803	0.355

0.567	0.394	0.773	0.712	0.454	0.58	0.703	0.186	0.592	0.455	0.277	0.341	0.341	0.524	0.566	0.614	0.489
0.49	0.456	0.821	0.815	0.409	0.48	0.55	0.109	0.707	0.264	0.098	0.042	0.105	0.06	0.856	0.857	0.522
0.564	0.563	0.802	0.76	0.558	0.527	0.547	0.192	0.735	0.099	0.362	0.282	0.425	0.421	0.686	0.675	0.445
0.45	0.52	0.636	0.733	0.581	0.472	0.586	0.214	0.631	0.154	0.596	0.563	0.664	0.771	0.713	0.715	0.325
0.495	0.461	0.713	0.658	0.925	0.685	0.473	0.214	0.665	0.378	0.397	0.444	0.389	0.482	0.558	0.539	0.58
0.539	0.674	0.75	0.78	0.389	0.263	0.571	0.208	0.806	0.141	0.435	0.357	0.636	0.549	0.576	0.565	0.513
0.56	0.71	0.64	0.458	0.345	0.282	0.681	0.184	0.797	0.339	0.474	0.534	0.631	0.639	0.463	0.448	0.595
0.46	0.5	0.672	0.658	0.513	0.448	0.711	0.236	0.696	0.299	0.298	0.23	0.17	0.08	0.649	0.625	0.561
0.359	0.399	0.774	0.646	0.42	0.507	0.474	0.151	0.621	0	0.183	0.256	0.515	0.542	0.924	0.925	0.757
0.463	0.195	0.481	0.62	0.685	0.432	0.566	0.19	0.661	0.306	0.323	0.313	0.586	0.593	0.786	0.783	0.592
0.457	0.465	0.765	0.684	0.34	0.387	0.629	0.237	0.713	0.384	0.444	0.423	0.504	0.606	0.483	0.495	0.628
0.466	0.542	0.895	0.867	0.51	0.281	0.528	0.154	0.676	0.351	0.436	0.488	0.067	0.373	0.609	0.634	0.573
0.645	0.667	0.619	0.596	0.531	0.516	0.735	0.102	0.774	0.658	0.585	0.505	0.736	0.826	0.208	0.203	0.524
0.539	0.514	0.941	0.936	0.295	0.272	0.428	0.247	0.691	0.269	0.358	0.354	0.34	0.218	0.572	0.56	0.843
0.291	0.276	0.737	0.704	0.565	0.546	0.528	0.251	0.792	0.484	0.434	0.416	0.159	0	0.401	0.414	0.888
0.463	0.533	0.781	0.759	0.632	0.575	0.538	0.194	0.568	0.53	0.413	0.344	0.325	0.338	0.493	0.481	0.81
0.542	0.585	0.898	0.796	0.42	0.409	0.449	0.171	0.701	0.374	0.345	0.277	0.414	0.435	0.681	0.665	0.487
0.567	0.497	0.847	0.87	0.505	0.594	0.484	0.209	0.612	0.365	0.433	0.365	0.379	0.449	0.609	0.579	0.558
0.675	0.585	0.822	0.773	0.587	0.465	0.58	0.199	0.597	0.212	0.729	0.709	0.186	0.219	0.491	0.512	0.641
0.506	0.505	0.852	0.886	0.763	0.494	0.522	0.089	0.634	0.352	0.504	0.575	0.462	0.619	0.476	0.479	0.677
0.404	0.401	0.752	0.803	0.764	0.622	0.493	0.205	0.597	0.494	0.499	0.455	0.316	0.277	0.451	0.416	0.895
0.389	0.354	0.826	0.829	0.631	0.588	0.514	0.164	0.766	0.485	0.541	0.509	0.788	0.73	0.418	0.43	0.417
0.209	0.318	0.832	0.801	0.645	0.696	0.663	0.197	0.663	0.272	0.459	0.415	0.215	0.302	0.508	0.492	0.698
0.552	0.605	0.837	0.759	0.595	0.545	0.652	0.139	0.683	0.324	0.337	0.447	0.115	0.143	0.573	0.567	0.477
0.393	0.413	0.769	0.721	0.482	0.454	0.591	0.194	0.649	0.337	0.434	0.378	0.135	0.449	0.515	0.522	0.915
0.533	0.542	0.801	0.792	0.689	0.54	0.543	0.169	0.657	0.475	0.605	0.549	0.122	0.002	0.482	0.516	0.552
0.627	0.589	0.902	0.952	0.307	0.328	0.463	0.125	0.751	0.234	0.525	0.494	0.301	0.21	0.51	0.513	0.771
0.645	0.678	0.752	0.718	0.499	0.254	0.616	0.158	0.697	0.519	0.535	0.467	0.406	0.426	0.399	0.424	0.639
0.385	0.414	0.912	0.889	0.706	0.536	0.481	0.141	0.801	0.477	0.595	0.493	0.1	0.274	0.418	0.447	0.511
0.598	0.51	0.79	0.86	0.211	0.311	0.536	0.148	0.671	0.281	0.549	0.516	0.564	0.494	0.658	0.7	0.468
0.424	0.388	0.737	0.742	0.453	0.405	0.585	0.211	0.772	0.311	0.67	0.649	0.528	0.631	0.34	0.361	0.772
0.405	0.38	0.771	0.782	0.181	0.254	0.496	0.145	0.572	0.257	0.679	0.635	0.3	0.468	0.742	0.748	0.812
0.395	0.237	0.694	0.692	0.866	0.494	0.538	0.215	0.816	0.315	0.792	0.76	0.634	0.692	0.322	0.352	0.582
0.401	0.387	0.829	0.799	0.616	0.487	0.445	0.237	0.588	0.352	0.8	0.732	0.599	0.605	0.532	0.526	0.601
0.313	0.266	0.771	0.699	0.648	0.259	0.431	0.224	0.688	0.401	0.565	0.614	0.332	0.572	0.69	0.709	0.534
0.336	0.288	0.781	0.752	0.27	0.282	0.519	0.223	0.846	0.326	0.787	0.718	0.695	0.757	0.339	0.343	0.773
0.301	0.376	0.869	0.888	0.788	0.471	0.603	0.267	0.801	0.487	0.092	0.266	0.207	0.292	0.324	0.305	0.771
0.38	0.311	0.686	0.633	0.806	0.67	0.589	0.209	0.601	0.205	0.731	0.651	0.553	0.632	0.544	0.551	0.617
0.349	0.466	0.609	0.56	0.554	0.424	0.514	0.325	0.675	0.529	0.611	0.627	0.361	0.606	0.471	0.492	0.651
0.175	0.249	0.781	0.717	0.055	0.284	0.573	0.15	0.711	0.595	0.598	0.578	0.546	0.599	0.513	0.529	0.787
0.332	0.384	0.694	0.692	0.206	0.171	0.623	0.188	0.65	0.354	0.773	0.74	0.684	0.619	0.553	0.564	0.702
0.233	0.382	0.723	0.545	0.261	0.275	0.707	0.399	0.736	0.627	0.854	0.845	0.651	0.76	0.184	0.196	0.609
0.408	0.394	0.703	0.694	0.429	0.449	0.501	0.217	0.723	0.352	0.571	0.48	0.553	0.509	0.576	0.591	0.616
0.211	0.228	0.658	0.626	0.425	0.367	0.537	0.226	0.667	0.472	0.771	0.761	0.826	0.871	0.529	0.536	0.608
0.364	0.383	0.838	0.81	0.453	0.218	0.511	0.196	0.66	0.279	0.59	0.592	0.59	0.695	0.649	0.656	0.548
0.336	0.343	0.649	0.624	0.524	0.528	0.497	0.185	0.903	0.388	0.651	0.303	0.694	0.657	0.369	0.381	0.768
0.487	0.527	0.677	0.696	0.54	0.476	0.659	0.238	0.776	0.441	0.211	0.642	0.902	1	0.305	0.342	0.498
0.503	0.48	0.754	0.705	0.527	0.574	0.505	0.219	0.816	0.42	0.533	0.453	0.591	0.449	0.334	0.337	0.704

0.432	0.301	0.65	0.559	0.573	0.546	0.51	0.208	0.746	0.399	0.675	0.56	0.647	0.781	0.422	0.425	0.765
0.376	0.351	0.72	0.778	0.773	0.557	0.544	0.237	0.733	0.36	0.544	0.488	0.334	0.573	0.395	0.42	0.699
0.555	0.383	0.592	0.637	0.294	0.414	0.482	0.287	0.752	0.431	0.72	0.663	0.691	0.851	0.422	0.425	0.662
0.35	0.283	0.827	0.75	0.541	0.53	0.531	0.128	0.705	0.377	0.487	0.442	0.727	0.547	0.525	0.571	0.648
0.505	0.43	0.727	0.754	0.692	0.526	0.524	0.228	0.759	0.436	0.574	0.518	0.658	0.765	0.415	0.426	0.425
0.352	0.467	0.736	0.683	0.651	0.575	0.45	0.205	0.707	0.391	0.481	0.448	0.557	0.586	0.515	0.513	0.714
0.697	0.622	0.716	0.758	0.327	0.349	0.508	0.35	0.743	0.511	0.386	0.273	0.958	0.715	0.336	0.334	0.641
0.566	0.597	0.762	0.779	0.381	0.317	0.464	0.237	0.85	0.414	0.574	0.335	0.701	0.69	0.473	0.467	0.417
0.168	0.346	0.59	0.636	0.383	0.265	0.737	0.198	0.78	0.393	0.41	0.575	0.641	0.7	0.476	0.465	0.694
0.193	0.439	0.86	0.672	0.543	0.323	0.571	0.187	0.746	0.339	0.402	0.572	0.596	0.581	0.39	0.393	0.946
0.289	0.328	0.641	0.622	0.775	0.638	0.476	0.204	0.429	0.823	0.732	0.653	0.568	0.695	0.585	0.583	0.553
0.431	0.611	0.679	0.585	0.553	0.397	0.587	0.164	0.771	0.517	0.349	0.432	0.545	0.623	0.406	0.396	0.742
0.453	0.398	0.857	0.768	0.321	0.212	0.453	0.162	0.676	0.209	0.574	0.518	0.532	0.56	0.727	0.729	0.649
0.412	0.452	0.888	0.765	0.322	0.336	0.591	0.15	0.637	0.376	0.577	0.647	0.68	0.789	0.511	0.496	0.635
0.543	0.467	0.744	0.677	0.586	0.599	0.488	0.194	0.792	0.141	0.73	0.593	0.644	0.654	0.43	0.433	0.65
0.465	0.566	0.745	0.798	0.478	0.397	0.62	0.194	0.721	0.385	0.534	0.433	0.712	0.727	0.477	0.488	0.425
0.489	0.434	0.672	0.721	0.536	0.43	0.642	0.177	0.813	0.502	0.456	0.423	0.537	0.59	0.335	0.36	0.618
0.391	0.516	0.787	0.68	0.595	0.542	0.548	0.169	0.804	0.455	0.591	0.638	0.765	0.733	0.302	0.28	0.615
0.466	0.422	0.736	0.717	0.45	0.498	0.621	0.128	0.689	0.393	0.583	0.55	0.499	0.622	0.537	0.522	0.532
0.318	0.398	0.819	0.836	0.801	0.57	0.596	0.07	0.703	0.479	0.56	0.447	0.377	0.613	0.469	0.45	0.542
0.435	0.368	0.905	0.832	0.488	0.403	0.406	0.269	0.783	0.392	0.505	0.542	0.611	0.643	0.382	0.363	0.749
0.327	0.388	0.71	0.541	0.61	0.554	0.412	0.169	0.741	0.321	0.736	0.633	0.587	0.618	0.565	0.563	0.694
0.557	0.484	0.845	0.766	0.965	0.724	0.406	0.14	0.678	0.372	0.728	0.672	0.535	0.705	0.477	0.488	0.371
0.261	0.394	0.713	0.697	0.842	0.495	0.486	0.177	0.636	0.281	0.713	0.657	0.677	0.689	0.608	0.597	0.567
0.485	0.473	0.836	0.856	0.716	0.492	0.445	0.142	0.79	0.422	0.676	0.575	0.5	0.742	0.399	0.393	0.503
0.698	0.739	0.782	0.716	0.53	0.477	0.532	0.17	0.883	0.456	0.719	0.74	0.699	0.62	0.241	0.257	0.317
0.362	0.264	0.728	0.707	0.637	0.556	0.536	0.145	0.834	0.256	0.48	0.492	0.667	0.606	0.497	0.499	0.617
0.634	0.591	0.855	0.774	0.082	0.056	0.514	0.265	0.738	0.516	0.712	0.656	0.772	0.814	0.315	0.292	0.73
0.409	0.482	0.707	0.683	0.598	0.573	0.556	0.217	0.687	0.405	0.248	0.251	0.284	0.422	0.508	0.55	0.8
0.306	0.377	0.925	0.936	0.548	0.376	0.593	0.261	0.721	0.582	0.307	0.274	0.423	0.445	0.337	0.327	0.731
0.549	0.516	0.91	0.911	0.546	0.569	0.5	0.198	0.694	0.494	0.419	0.34	0.466	0.66	0.41	0.396	0.567
0.458	0.658	0.805	0.765	0.561	0.333	0.581	0.212	0.681	0.415	0.349	0.339	0.505	0.36	0.516	0.506	0.624
0.502	0.436	0.925	1	0.532	0.462	0.578	0.195	0.577	0.4	0.537	0.504	0.476	0.477	0.477	0.45	0.611
0.4	0.472	0.829	0.784	0.48	0.459	0.562	0.258	0.727	0.404	0.412	0.367	0.439	0.609	0.426	0.425	0.676
0.318	0.378	0.83	0.785	0.554	0.487	0.548	0.274	0.601	0.34	0.506	0.485	0.603	0.586	0.55	0.535	0.644
0.539	0.559	0.825	0.877	0.556	0.461	0.541	0.235	0.63	0.382	0.363	0.366	0.409	0.48	0.439	0.411	0.819
0	0.08	0.786	0.84	0.533	0.516	0.541	0.228	0.715	0.35	0.494	0.427	0.48	0.505	0.579	0.573	0.745
0.593	0.56	0.798	0.87	0.705	0.489	0.453	0.126	0.657	0.393	0.2	0.167	0.575	0.505	0.52	0.513	0.871
0.368	0.332	0.812	0.911	0.681	0.507	0.419	0.122	0.672	0.424	0.33	0.309	0.316	0.356	0.605	0.616	0.8
0.362	0.478	0.884	0.775	0.176	0.088	0.395	0.202	0.527	0.319	0.436	0.38	0.152	0.208	0.97	0.949	0.739
0.17	0.309	0.725	0.719	0.819	0.652	0.505	0.277	0.652	0.277	0.714	0.478	0.277	0.442	0.535	0.556	0.69
0.639	0.617	0.858	0.85	0.345	0.363	0.507	0.272	0.705	0.319	0.527	0.459	0.543	0.596	0.422	0.407	0.66
0.548	0.434	1	0.904	0.72	0.692	0.446	0.298	0.612	0.49	0.395	0.351	0.41	0.456	0.419	0.441	0.532
0.399	0.607	0.875	0.761	0.591	0.322	0.524	0.082	0.73	0.292	0.33	0.298	0.349	0.365	0.629	0.636	0.692
0.35	0.325	0.646	0.579	0.691	0.613	0.482	0.224	0.724	0.288	0.748	0.68	0.665	0.799	0.472	0.466	0.686
0.476	0.42	0.708	0.74	0.358	0.381	0.482	0.186	0.716	0.387	0.583	0.608	0.734	0.798	0.492	0.499	0.7
0.296	0.551	0.688	0.539	0.605	0.569	0.534	0.139	0.765	0.732	0.783	0.808	0.782	0.676	0.252	0.229	0.618
0.295	0.408	0.729	0.692	0.746	0.546	0.671	0.259	0.733	0.435	0.622	0.497	0.886	0.667	0.267	0.262	0.617

0.186	0.161	0.671	0.641	0.684	0.546	0.624	0.249	0.769	0.535	0.541	0.587	0.721	0.688	0.378	0.39	0.556
0.403	0.338	0.779	0.585	0.491	0.572	0.517	0.161	0.685	0.372	0.596	0.449	0.606	0.687	0.6	0.61	0.576
0.337	0.613	0.666	0.425	0.788	0.63	0.558	0.008	0.711	0.302	0.816	0.516	0.78	0.872	0.47	0.468	0.768
0.506	0.61	0.519	0.472	0.703	0.568	0.613	0.268	0.765	0.37	0.807	0.671	0.718	0.903	0.28	0.249	0.631
0.229	0.235	0.764	0.749	0.651	0.522	0.591	0.211	0.794	0.475	0.656	0.578	0.698	0.736	0.373	0.385	0.471
0.429	0.395	0.679	0.714	0.531	0.4	0.483	0.279	0.73	0.4	0.419	0.431	0.495	0.57	0.579	0.599	0.556
0.447	0.465	0.746	0.728	0.719	0.546	0.485	0.084	0.727	0.426	0.629	0.607	0.625	0.635	0.579	0.573	0.37
0.331	0.296	0.653	0.652	0.72	0.369	0.509	0.253	0.765	0.42	0.556	0.719	0.597	0.531	0.451	0.454	0.657
0.243	0.498	0.67	0.558	0.706	0.588	0.765	0.253	0.742	0.235	0.325	0.316	0.634	0.642	0.374	0.36	0.777
0.428	0.426	0.747	0.778	0.711	0.53	0.686	0.066	0.784	0.254	0.544	0.465	0.241	0.227	0.439	0.429	0.698
0.548	0.658	0.845	0.73	0.775	0.629	0.524	0.182	0.544	0.286	0.466	0.463	0.056	0.081	0.674	0.661	0.558
0.416	0.436	0.6	0.625	0.878	0.677	0.541	0.115	0.673	0.418	0.648	0.52	0.226	0.54	0.561	0.577	0.556
0.706	0.718	0.753	0.821	0.287	0.266	0.569	0.304	0.832	0.362	0.154	0.184	0.431	0.608	0.447	0.445	0.538
0.468	0.779	0.589	0.318	1	0.696	0.648	0.248	0.755	0.37	0.46	0.454	0.449	0.603	0.355	0.359	0.565
0.822	1	0.515	0.417	0.298	0.183	0.659	0.196	0.848	0.16	0.649	0.771	0.538	0.641	0.381	0.388	0.621
0.006	0	0.781	0.703	0.416	0.36	0.549	0.2	0.606	0.629	0.818	0.726	0.595	0.477	0.594	0.61	0.632
0.529	0.734	0.706	0.526	0.481	0.435	0.576	0.141	0.744	0.199	0.576	0.532	0.433	0.555	0.595	0.615	0.524
0.435	0.378	0.744	0.676	0.529	0.342	0.548	0.279	0.683	0.27	0.575	0.769	0.863	0.833	0.457	0.433	0.669
0.763	0.555	0.676	0.671	0.147	0.165	0.564	0.102	0.836	0.399	0.543	0.427	0.617	0.574	0.493	0.5	0.66
0.634	0.634	0.679	0.674	0.18	0.18	0.644	0.304	0.713	0.296	0.901	0.916	0.825	0.819	0.283	0.282	0.638
0.412	0.299	0.722	0.642	0.364	0.468	0.606	0.267	0.647	0.527	0.704	0.648	0.599	0.781	0.415	0.409	0.63
0.466	0.388	0.688	0.644	0.812	0.647	0.594	0.15	0.829	0.454	0.568	0.418	0.735	0.624	0.356	0.337	0.493
0.447	0.53	0.653	0.531	0.446	0.4	0.568	0.161	0.785	0.354	0.9	0.658	0.689	0.429	0.424	0.427	0.654
0.399	0.484	0.716	0.569	0.382	0.535	0.599	0.15	0.712	0.462	0.81	0.694	0.828	0.872	0.38	0.361	0.617
0.699	0.55	0.567	0.512	0.836	0.709	0.569	0.185	0.837	0.335	0.738	0.762	0.836	0.758	0.32	0.306	0.343
0.413	0.399	0.797	0.779	0.574	0.52	0.516	0.186	0.708	0.324	0.583	0.573	1	0.757	0.477	0.466	0.536
0.335	0.321	0.608	0.542	0.615	0.641	0.492	0.195	0.64	0.31	0.775	0.303	0.789	0.882	0.558	0.565	0.826
0.358	0.485	0.87	0.684	0.625	0.503	0.581	0.142	0.767	0.255	0.826	0.781	0.663	0.823	0.422	0.412	0.408
0.778	0.716	0.585	0.485	0.855	0.749	0.572	0.175	0.673	0.351	0.863	0.887	0.794	0.861	0.388	0.378	0.255
0.629	0.452	0.826	0.838	0.647	0.573	0.56	0.167	0.676	0.373	0.511	0.503	0.438	0.536	0.465	0.441	0.531
0.32	0.5	0.661	0.653	0.791	0.632	0.602	0.232	0.781	0.345	0.82	0.601	0.76	0.801	0.254	0.262	0.595
0.4	0.528	0.819	0.739	0.407	0.264	0.527	0.168	0.729	0.618	0.589	0.709	0.765	0.606	0.445	0.443	0.458
0.431	0.451	0.659	0.708	0.648	0.484	0.617	0.239	0.744	0.452	0.765	0.697	0.921	0.747	0.292	0.277	0.51
0.545	0.544	0.855	0.704	0.796	0.819	0.506	0.121	0.61	0.221	0.368	0.36	0.687	0.698	0.632	0.616	0.476
0.161	0.442	0.836	0.567	0.729	0.532	0.594	0.248	0.637	0.486	0.645	0.648	0.67	0.68	0.433	0.422	0.565
0.63	0.508	0.684	0.73	0.61	0.391	0.486	0.137	0.734	0.26	0.369	0.361	0.702	0.46	0.673	0.67	0.528
0.436	0.377	0.7	0.649	0.493	0.323	0.646	0.176	0.765	0.437	0.593	0.802	0.582	0.714	0.377	0.367	0.617
0.475	0.217	0.569	0.674	0.766	0.658	0.597	0.196	0.798	0.422	0.46	0.818	0.78	0.919	0.39	0.367	0.412
0.524	0.641	0.724	0.703	0.558	0.401	0.541	0.11	0.803	0.356	0.74	0.73	0.761	0.506	0.436	0.408	0.459
0.454	0.452	0.569	0.531	0.723	0.518	0.563	0.129	0.688	0.384	1	0.717	0.821	0.789	0.415	0.418	0.64
0.418	0.339	0.651	0.592	0.606	0.588	0.669	0.081	0.945	0.399	0.63	0.586	0.636	0.518	0.293	0.287	0.571
0.702	0.746	0.753	0.622	0.52	0.552	0.511	0.133	0.648	0.411	0.663	0.619	0.703	0.592	0.483	0.495	0.491
0.332	0.428	0.681	0.602	0.754	0.697	0.486	0.296	0.732	0.4	0.317	0.571	0.444	0.517	0.456	0.468	0.659
0.277	0.591	0.762	0.614	0.826	0.384	0.54	0.205	0.78	0.406	0.747	0.43	0.619	0.576	0.37	0.382	0.638
0.472	0.752	0.758	0.578	0.542	0.443	0.618	0.165	0.791	0.299	0.831	1	0.709	0.868	0.24	0.26	0.521
0.452	0.133	0.589	0.736	0.852	0.624	0.609	0.18	0.775	0.491	0.351	0.534	0.549	0.724	0.389	0.392	0.597
0.496	0.684	0.583	0.46	0.443	0.616	0.485	0.119	0.73	0.364	0.649	0.547	0.573	0.604	0.593	0.591	0.597
0.463	0.566	0.754	0.636	0.513	0.526	0.553	0.141	0.67	0.451	0.766	0.619	0.726	0.718	0.483	0.485	0.468

0.562	0.645	0.674	0.4	0.642	0.603	0.603	0.199	0.583	0.573	0.691	0.567	0.692	0.705	0.425	0.441	0.567
0.527	0.631	0.805	0.66	0.346	0.327	0.485	0.16	0.743	0.436	0.622	0.52	0.887	0.57	0.445	0.456	0.657
0.513	0.711	0.668	0.299	0.68	0.622	0.737	0.182	0.774	0.463	0.785	0.434	0.808	0.611	0.283	0.244	0.519
0.482	0.639	0.629	0.52	0.763	0.577	0.515	0.144	0.69	0.64	0.572	0.597	0.685	0.795	0.365	0.368	0.633
0.214	0.272	0.772	0.743	0.519	0.513	0.58	0.176	0.794	0.363	0.56	0.493	0.664	0.844	0.483	0.49	0.513
0.349	0.377	0.608	0.584	0.694	0.683	0.667	0.288	0.741	0.665	0.662	0.64	0.809	0.757	0.165	0.173	0.566
0.408	0.72	0.891	0.621	0.464	0.456	0.536	0.167	0.612	0.614	0.477	0.523	0.67	0.731	0.478	0.473	0.534
0.452	0.46	0.746	0.609	0.478	0.466	0.615	0.159	0.885	0.407	0.567	0.545	0.641	0.627	0.325	0.307	0.601
0.59	0.442	0.568	0.513	0.671	0.536	0.653	0.194	0.787	0.465	0.55	0.471	0.696	0.83	0.376	0.349	0.532
0.725	0.661	0.416	0.416	0.375	0.235	0.607	0.304	0.782	0.533	0.737	0.795	0.763	0.756	0.309	0.312	0.594
0.454	0.313	0.629	0.736	0.749	0.531	0.646	0.063	0.768	0.329	0.736	0.634	0.788	0.683	0.353	0.356	0.679
0.532	0.488	0.638	0.674	0.755	0.501	0.586	0.189	0.702	0.398	0.56	0.756	0.722	0.761	0.354	0.383	0.597
0.773	0.709	0.689	0.605	0.303	0.243	0.596	0.269	0.719	0.275	0.515	0.448	0.68	0.667	0.411	0.432	0.731
0.135	0.266	0.673	0.541	0.546	0.385	0.54	0.141	0.824	0.646	0.701	0.724	0.736	0.776	0.441	0.44	0.521
0.399	0.396	0.915	0.925	0.387	0.515	0.532	0.176	0.774	0.359	0.359	0.326	0.51	0.585	0.472	0.471	0.603
0.227	0.275	0.604	0.603	0.7	0.557	0.625	0.231	0.707	0.473	0.766	0.631	0.825	0.75	0.417	0.425	0.52
0.515	0.535	0.697	0.671	0.23	0.156	0.685	0.194	0.779	0.558	0.566	0.247	0.717	0.732	0.4	0.394	0.619
0.419	0.151	0.584	0.611	0.659	0.563	0.667	0.123	0.787	0.494	0.356	0.575	0.678	0.592	0.434	0.428	0.636
0.442	0.332	0.858	0.794	0.055	0.17	0.497	0.118	0.663	0.302	0.638	0.71	0.787	0.78	0.606	0.608	0.785
0.796	0.881	0.744	0.526	0.483	0.558	0.615	0	0.716	0.313	0.575	0.496	0.601	0.609	0.458	0.465	0.594
0.327	0.208	0.687	0.643	0.808	0.627	0.7	0.243	0.768	0.667	0.42	0.705	0.793	0.933	0.143	0.168	0.569
0.628	0.931	0.417	0.102	0.728	0.517	0.563	0.218	0.655	0.482	0.184	0.672	0.785	0.804	0.591	0.593	0.538
0.615	0.562	0.73	0.632	0.326	0.218	0.6	0.064	0.776	0.23	0.806	0.739	0.64	0.651	0.549	0.547	0.512
0.523	0.581	0.771	0.765	0.469	0.339	0.53	0.25	0.807	0.288	0.585	0.516	0.388	0.324	0.365	0.358	0.779
0.345	0.308	0.786	0.791	0.649	0.585	0.525	0.239	0.705	0.465	0.403	0.347	0.073	0.332	0.558	0.533	0.611
0.317	0.346	0.88	0.859	0	0.462	0.499	0.222	0.69	0.483	0.804	0.748	0.633	0.766	0.515	0.504	0.444
0.489	0.487	0.778	0.757	0.491	0.35	0.547	0.207	0.772	0.572	0.555	0.427	0.097	0.227	0.439	0.419	0.627
0.509	0.54	0.899	0.798	0.791	0.686	0.423	0.282	0.617	0.336	0.62	0.671	0.67	0.604	0.396	0.399	0.568
0.525	0.468	0.727	0.748	0.41	0.328	0.436	0.214	0.731	0.429	0.423	0.512	0.323	0.518	0.494	0.492	0.863
0.487	0.528	0.833	0.796	0.519	0.318	0.45	0.126	0.764	0.281	0.506	0.58	0.458	0.631	0.525	0.532	0.692
0.453	0.585	0.683	0.638	0.121	0.211	0.638	0.279	0.725	0.466	0.625	0.761	0.652	0.634	0.432	0.404	0.576
0.311	0.307	0.714	0.656	0.515	0.374	0.592	0.26	0.658	0.353	0.607	0.834	0.81	0.825	0.308	0.288	1
0.466	0.538	0.742	0.699	0.548	0.509	0.505	0.186	0.772	0.319	0.612	0.567	0.596	0.407	0.449	0.43	0.661
0.37	0.517	0.771	0.773	0.899	0.719	0.637	0.188	0.725	0.536	0.483	0.489	0.43	0.556	0.149	0.153	0.796
0.416	0.49	0.843	0.898	0.224	0.275	0.504	0.169	0.684	0.335	0.547	0.444	0.035	0.234	0.686	0.697	0.623
0.404	0.324	0.836	0.715	0.233	0.237	0.506	0.214	0.677	0.392	0.635	0.555	0.465	0.387	0.573	0.575	0.79
0.573	0.528	0.831	0.785	0.577	0.614	0.486	0.265	1	0.28	0.771	0.727	0.828	0.974	0	0	0.624
0.411	0.399	0.937	0.889	0.732	0.564	0.572	0.239	0.712	0.292	0.36	0.271	0.325	0.155	0.61	0.612	0.319
0.41	0.384	0.636	0.669	0.729	0.53	0.537	0.231	0.747	0.32	0.393	0.3	0.568	0.517	0.493	0.491	0.771
0.261	0.369	0.85	0.831	0.598	0.343	0.443	0.117	0.77	0.269	0.679	0.635	0.624	0.605	0.471	0.473	0.813
0.301	0.255	0.763	0.684	0.723	0.644	0.591	0.076	0.696	0.371	0.79	0.825	0.599	0.704	0.568	0.561	0.304
0.307	0.228	0.779	0.725	0.323	0.365	0.418	0.165	0.533	0.365	0.723	0.714	0.531	0.659	0.805	0.802	0.645
0.542	0.604	0.778	0.782	0.247	0.264	0.7	0.194	0.866	0.375	0.666	0.644	0.821	0.841	0.192	0.213	0.548
0.326	0.376	0.774	0.84	0.284	0.194	0.462	0.166	0.797	0.399	0.631	0.598	0.601	0.486	0.539	0.537	0.676
0.404	0.38	0.695	0.716	0.573	0.377	0.611	0.183	0.758	0.435	0.406	0.281	0.25	0.14	0.572	0.549	0.656
0.419	0.517	0.746	0.719	0.867	0.622	0.575	0.19	0.64	0.326	0.539	0.495	0.514	0.309	0.442	0.441	0.717
0.44	0.35	0.862	0.739	0.525	0.521	0.475	0.129	0.79	0.339	0.546	0.537	0.334	0.198	0.496	0.499	0.723
0.473	0.492	0.899	0.921	0.351	0.577	0.51	0.155	0.587	0.356	0.55	0.506	0.501	0.625	0.575	0.582	0.56

1	0.904	0.625	0.769	0.772	1	0	1	0	0.737	0.6	0.319	0.664	0.623	0.459	0.471	0.808

Appendix F: Principle Component Analysis

F.1 Gait Anthropometry Combined

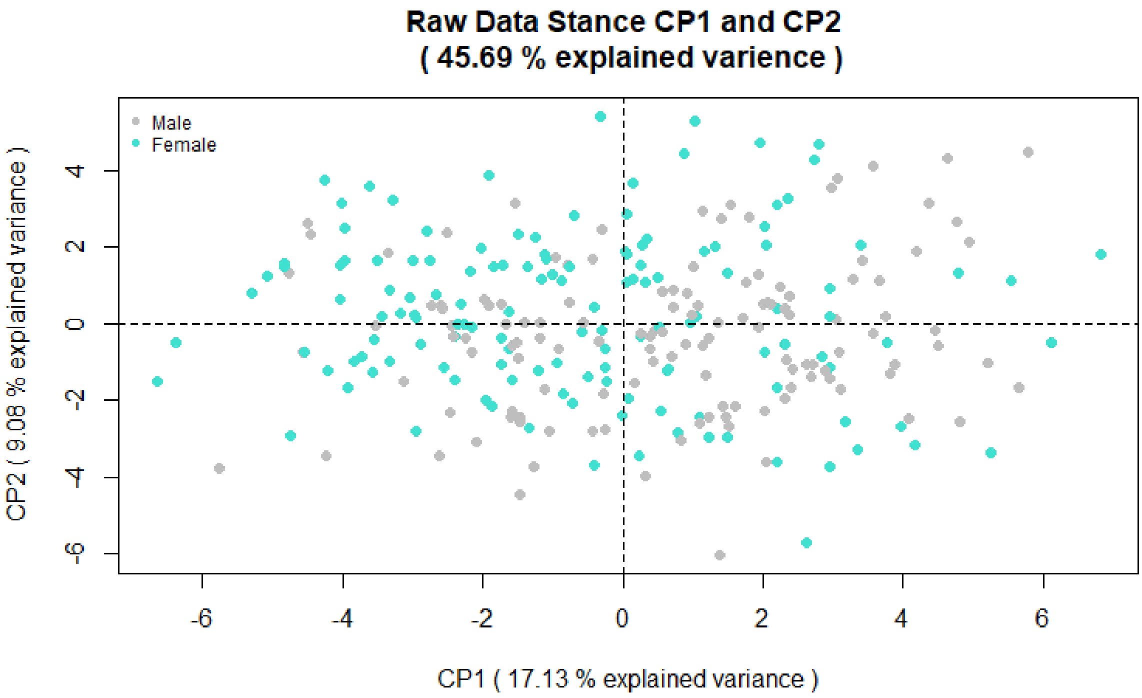

Figure 11. Scatterplot of Normalised Data - Sex

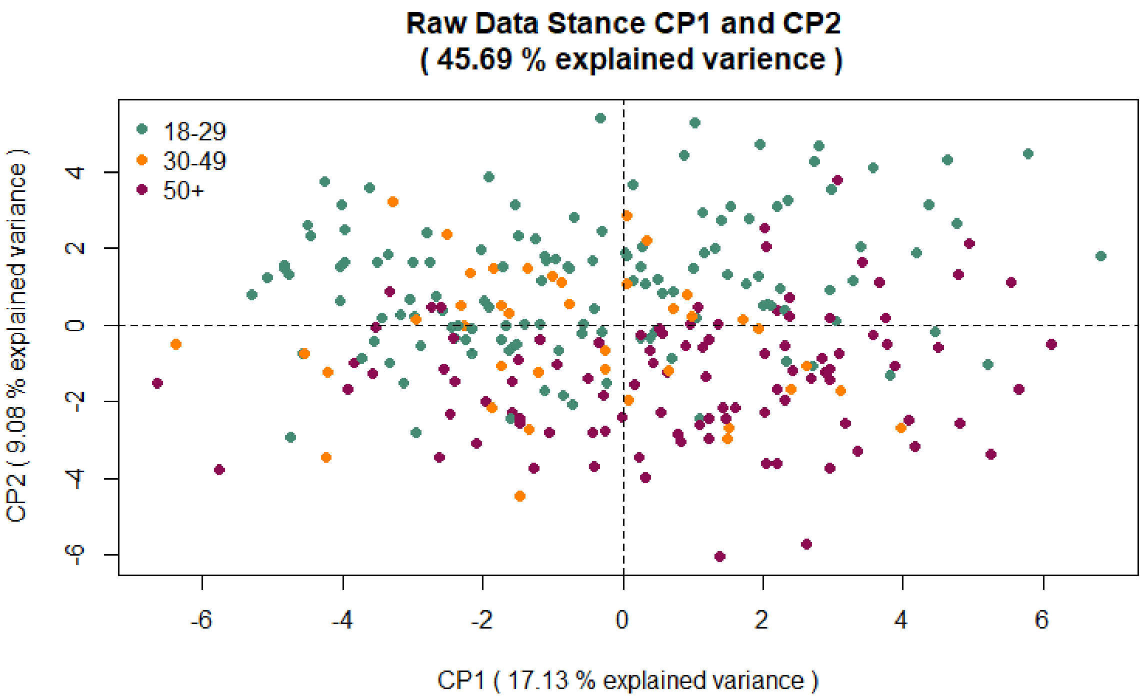

Figure 12. Scatterplot of Normalised Data - Age

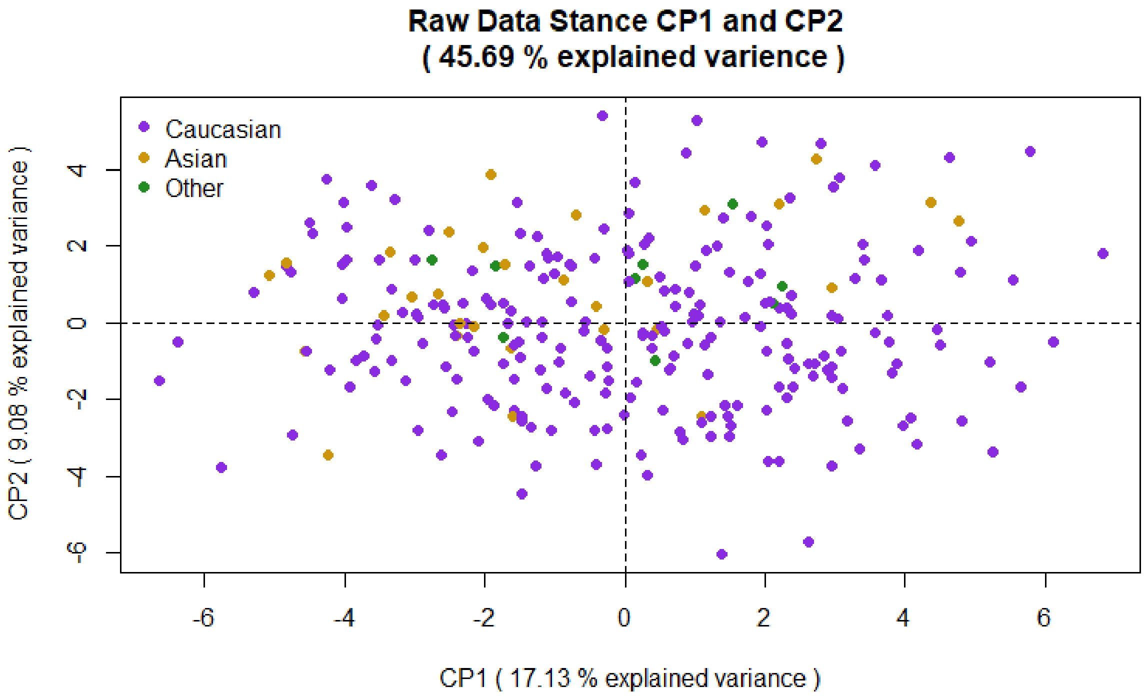

Figure 13. Scatterplot of Normalised Data - Ancestry

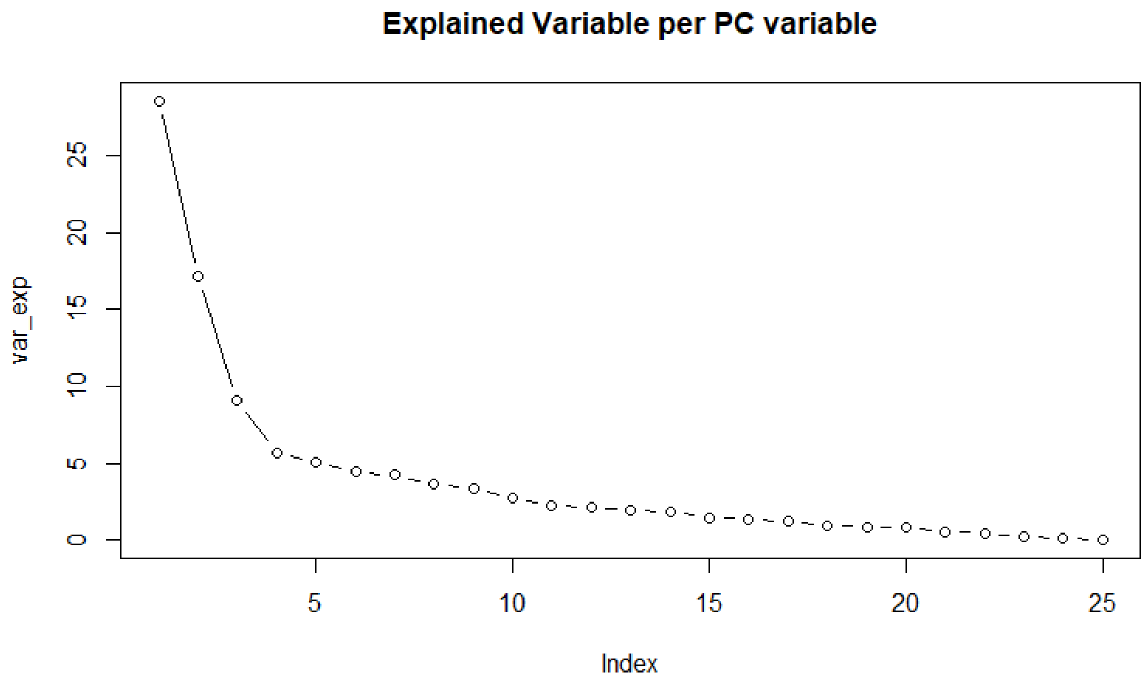

Figure 14. Scree Plot of Normalised Data

Hierarchical Cluster for Sex Gait anthropometry combined

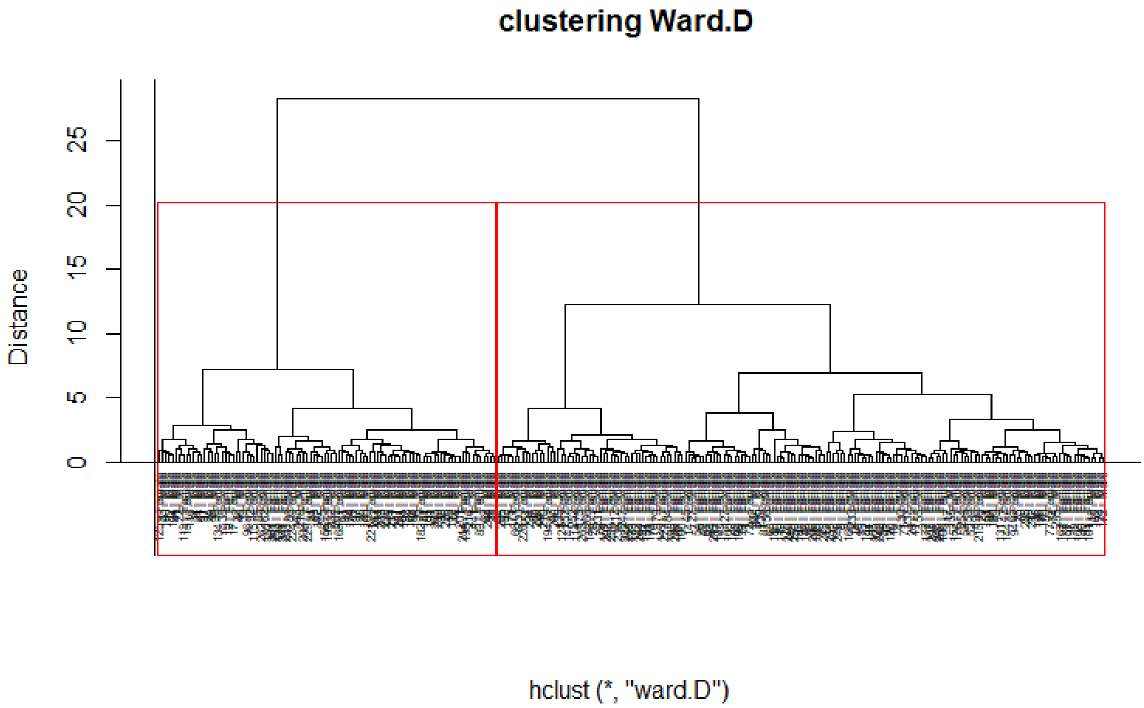

Figure 15. Hierarchical Cluster of Normalised Data (Ward)

Table 18. Master Table Linear Discriminant Analysis Gait Anthropometry Combined

Model	**1**		**2**		**3**		**4**	
Pre-treatment	no		no		YES- WARD SEX		yes- reactivity	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=replicate/samples	SAMPLE SIZE		SAMPLE SIZE		SAMPLE SIZE		SAMPLE SIZE	
Performance %	**89.9**		**79.8**		**98.3**		**72.5**	
Variable 1 classified%	FEMALE	89.8	1	88.4	FEMALE	100	1	84.1
Variable 1 misclassified		10.2		11.6		0		15.9
Variable 2 classified%	MALE	90	2	63	MALE	95.9	2	45.5
Variable 2 misclassified		10		37		4.1		54.5
Variable 3 classified%			3	75.4			3	70.2
Variable 3 misclassified		100		24.6				29.8

Table 19. Master Table 2/3rds Data Prediction Test Gait Anthropometry Combined

Model	1		2		3		4	
Pre-treatment	no		no		YES - WARD SEX		YES - WARD SEX	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=samples	1/3 RESAMPLED		1/3 RESAMPLED		1/3 RESAMPLED		1/3 RESAMPLED	
Performance %	**95.6**		**66.9**		**93.6**		**64.9**	
Variable 1 classified%	FEMALE	97.7	1	79.1	FEMALE	93.9	1	78.4
Variable 1 misclassified		2.3		20.9		6.1		21.6
Variable 2 classified%	MALE	83.1	2	25	MALE	93.3	2	54.5
Variable 2 misclassified		16.9		75		6.7		45.5
Variable 3 classified%			3	64.3			3	50
Variable 3 misclassified				35.7				50

Table 20. Master Table 100 Resampling Gait Anthropometry Combined

Model	1		2		3		4	
Pre-treatment	no		no		YES - WARD SEX		YES - WARD SEX	
Variable	**SEX**		**AGE**		**SEX**		**AGE**	
n=replicate/samples	100		100		100		100	
Performance %	**85.382**		**64.483**		**95.031**		**60.172**	
Variable 1 false positives %	FEMALE	16.513	1	32.459	FEMALE	6.6325	1	36.302
Variable 1 false negatives %				21.579				26.671
Variable 2 false positives %	MALE	12.634	2	6.0966	MALE	3.4308	2	8.5351
Variable 2 false negatives %				84.978				75.588
Variable 3 false positives %			3	20.828			3	21.254
Variable 3 false negatives %				31.964				39.724

F.2 Gait Anthropometry Static

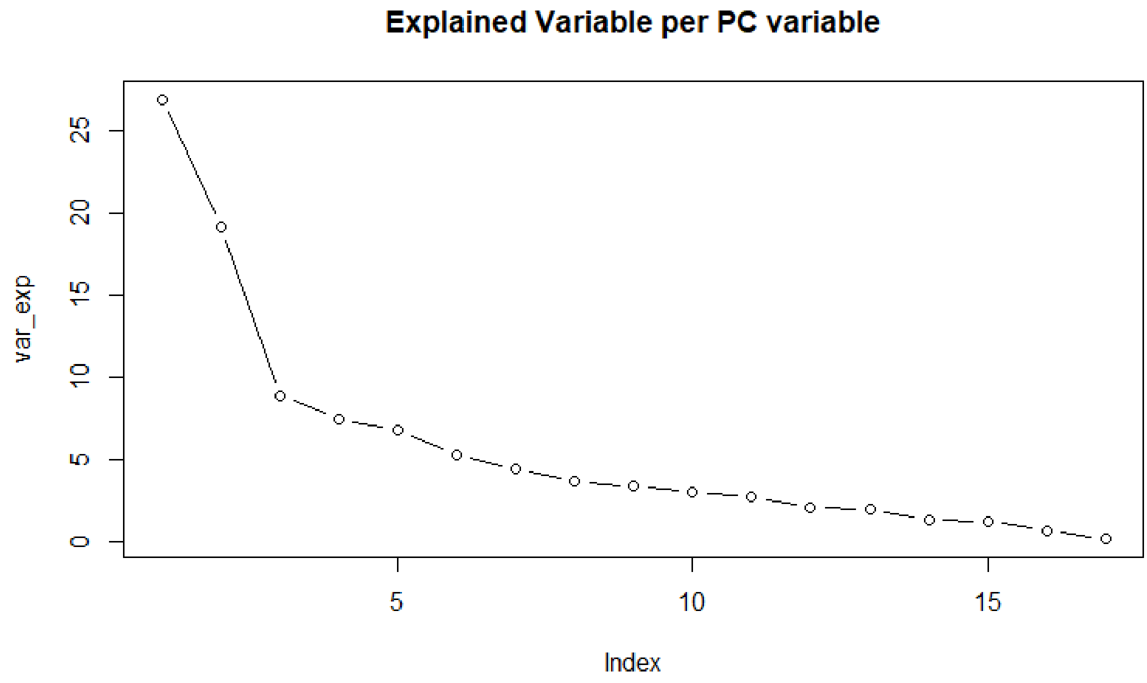

Figure 16. Scree Plot of Normalised Data

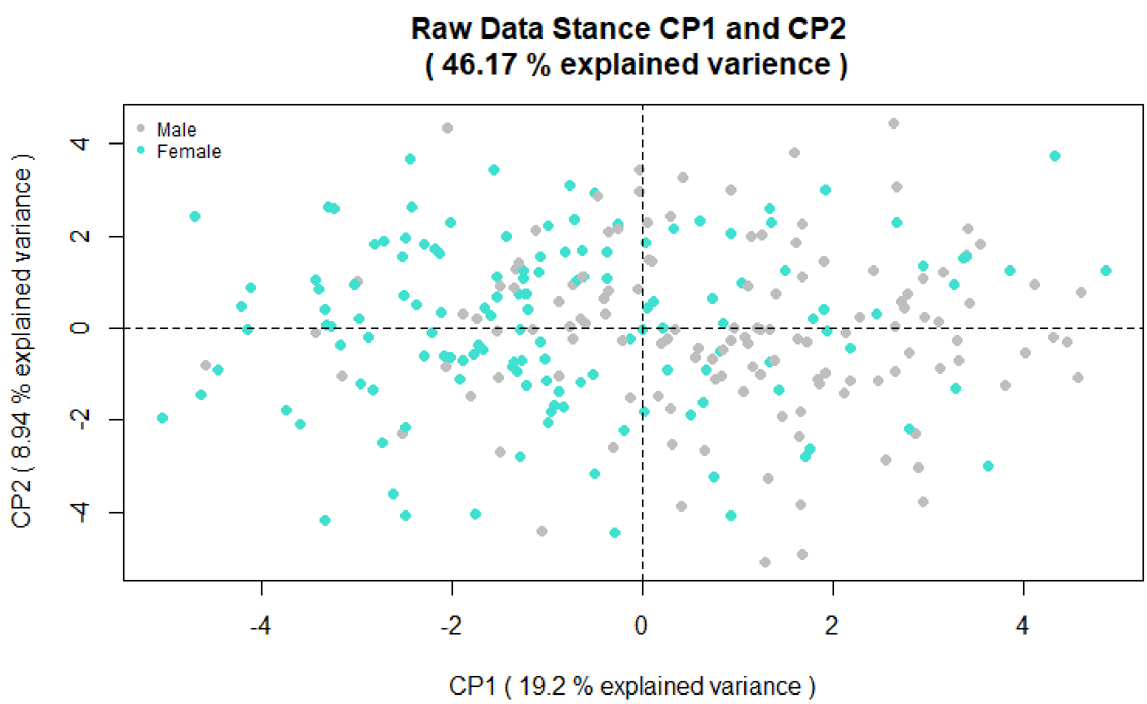

Figure 17. Scatterplot of Normalised Data - Sex

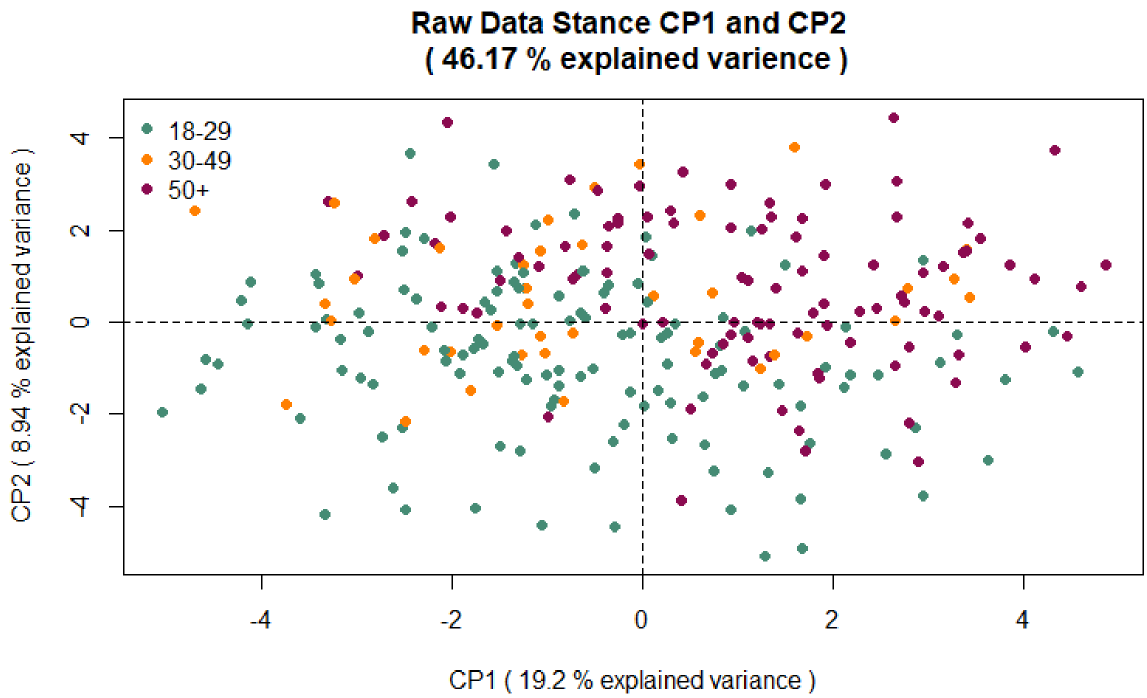

Figure 18. Scatterplot of Normalised Data - Age

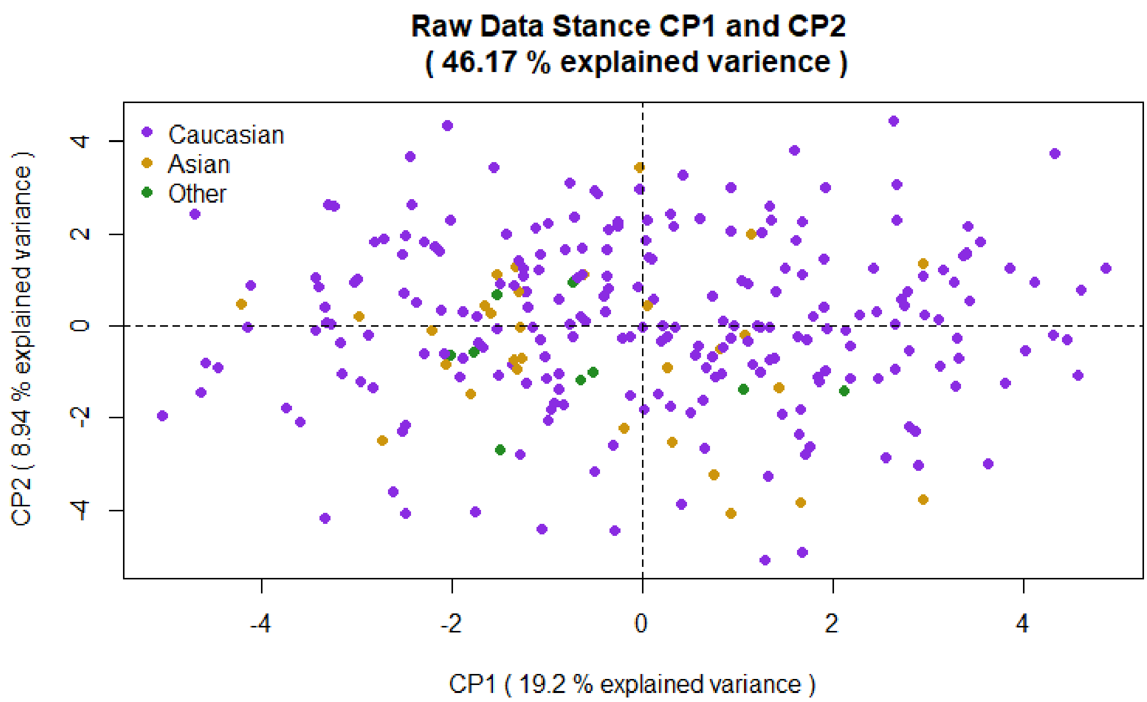

Figure 19. Scatterplot of Normalised Data - Ancestry

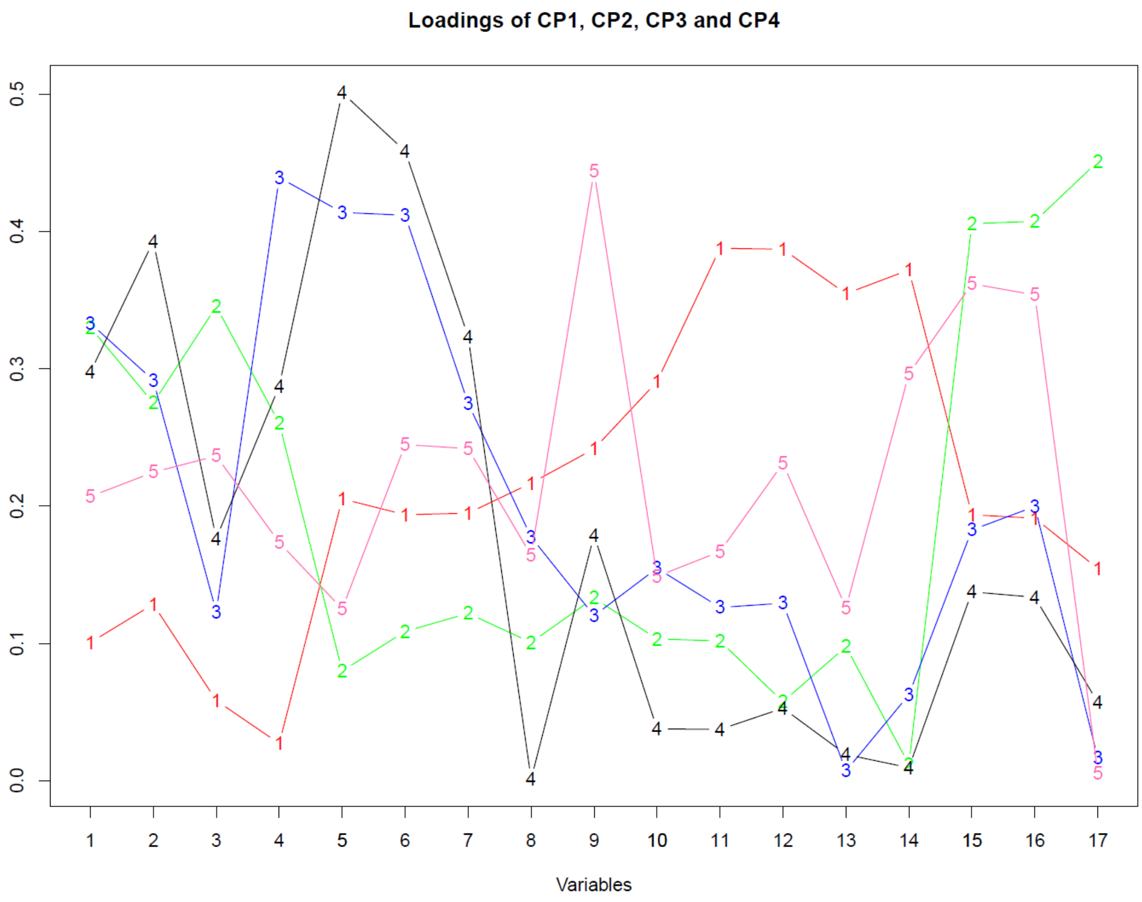

Figure 20. Loadings Line Graph Normalised Data

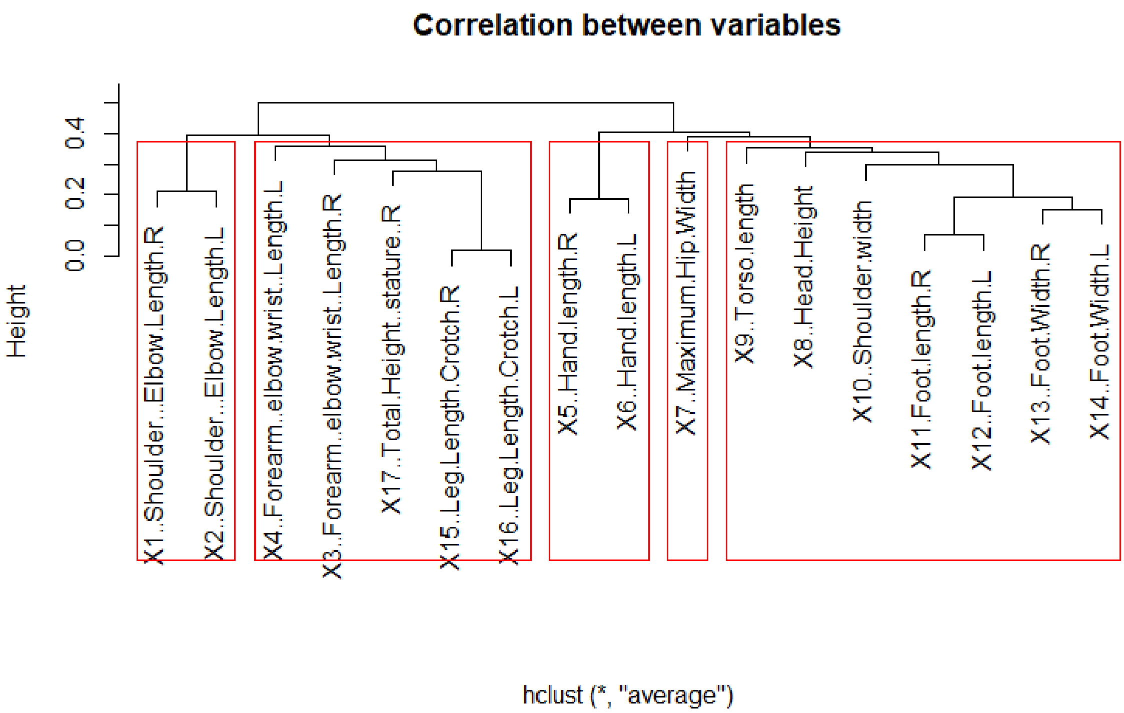

Figure 21. Correlation Matrix for Normalised Data

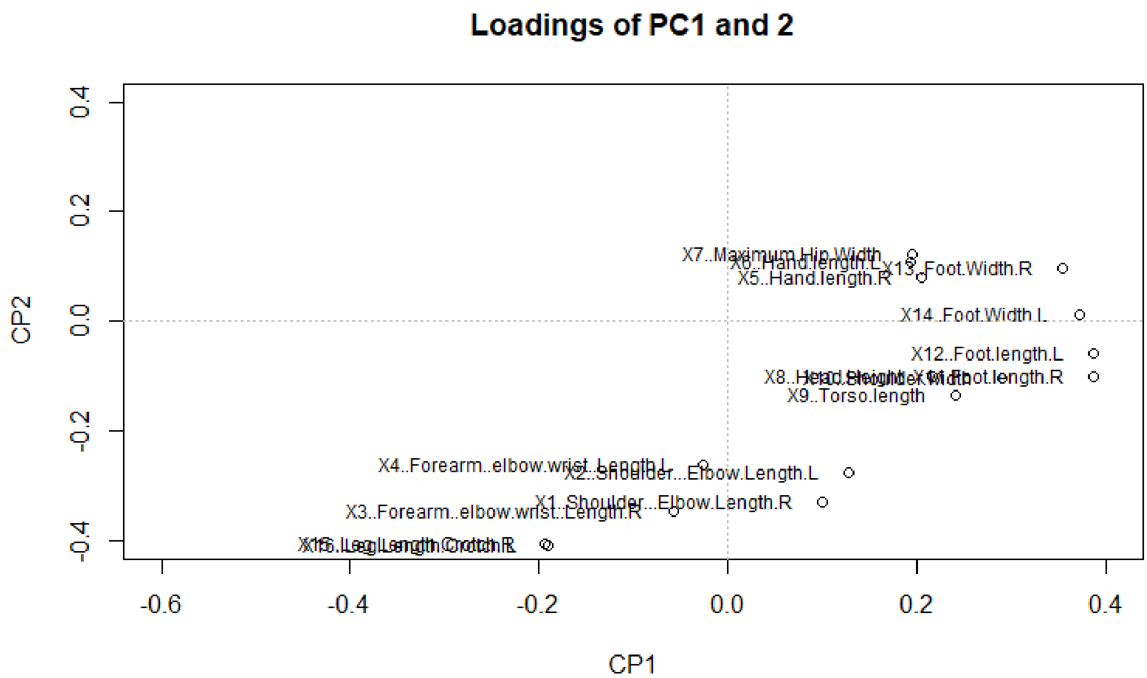

Figure 22. Loadings Distribution

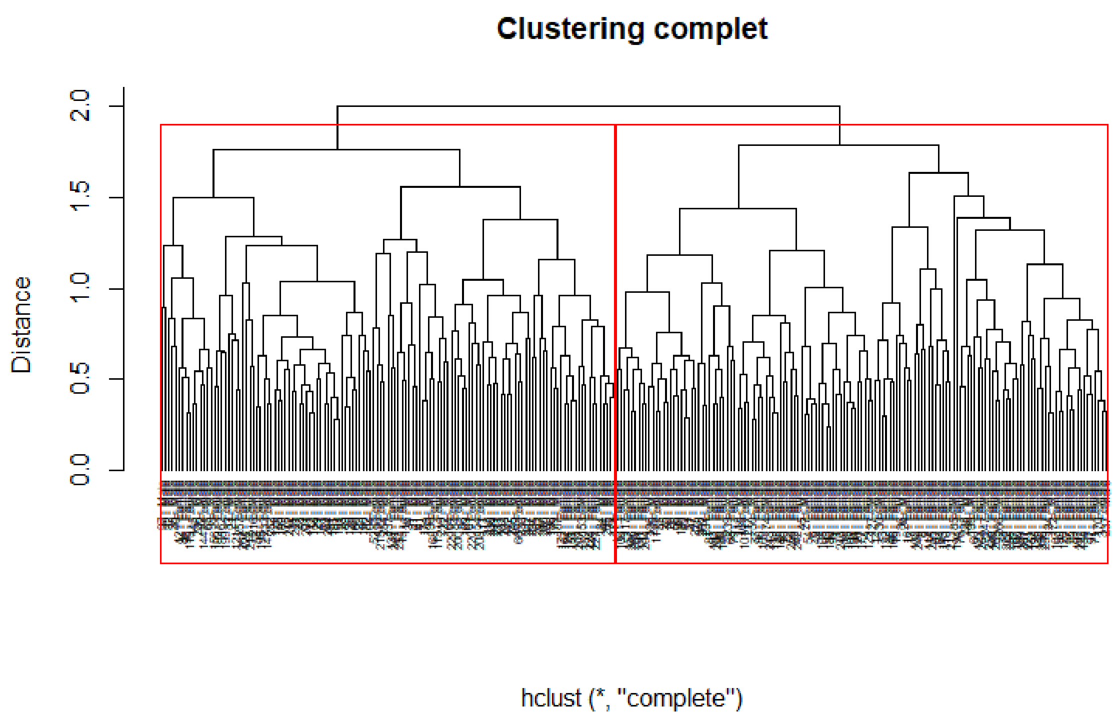

Figure 23. Hierarchical Cluster of Normalised Data (Complete)

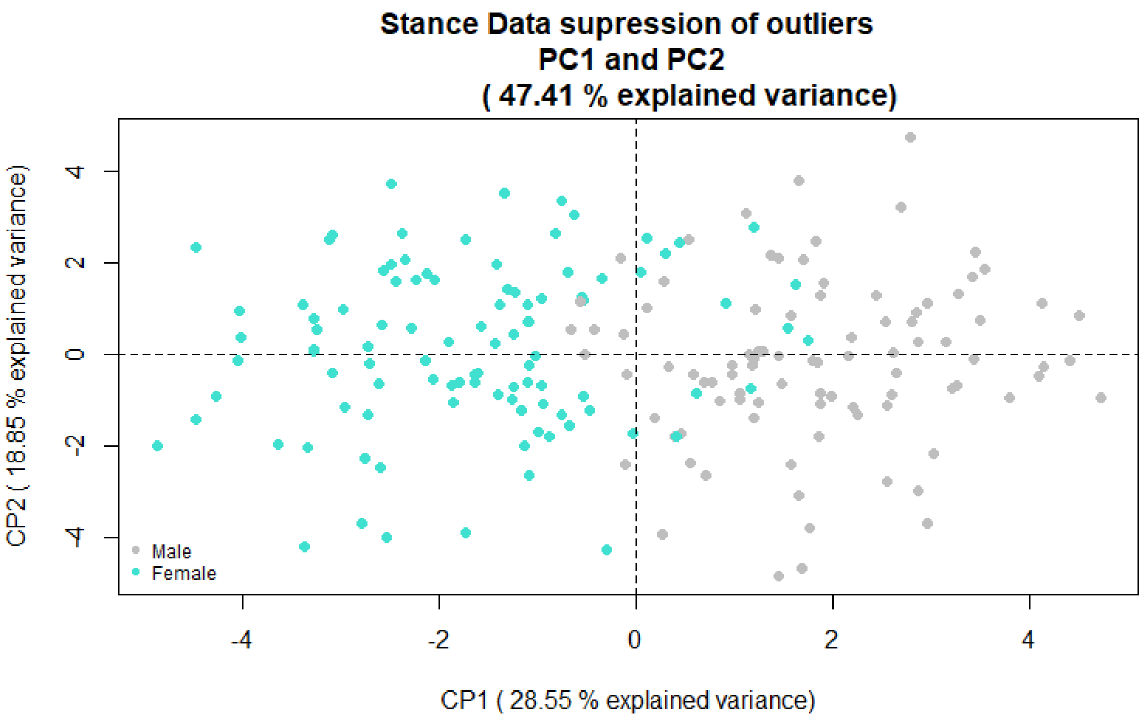

Figure 24. Removal of Outliers for Sex Treatment - Sex

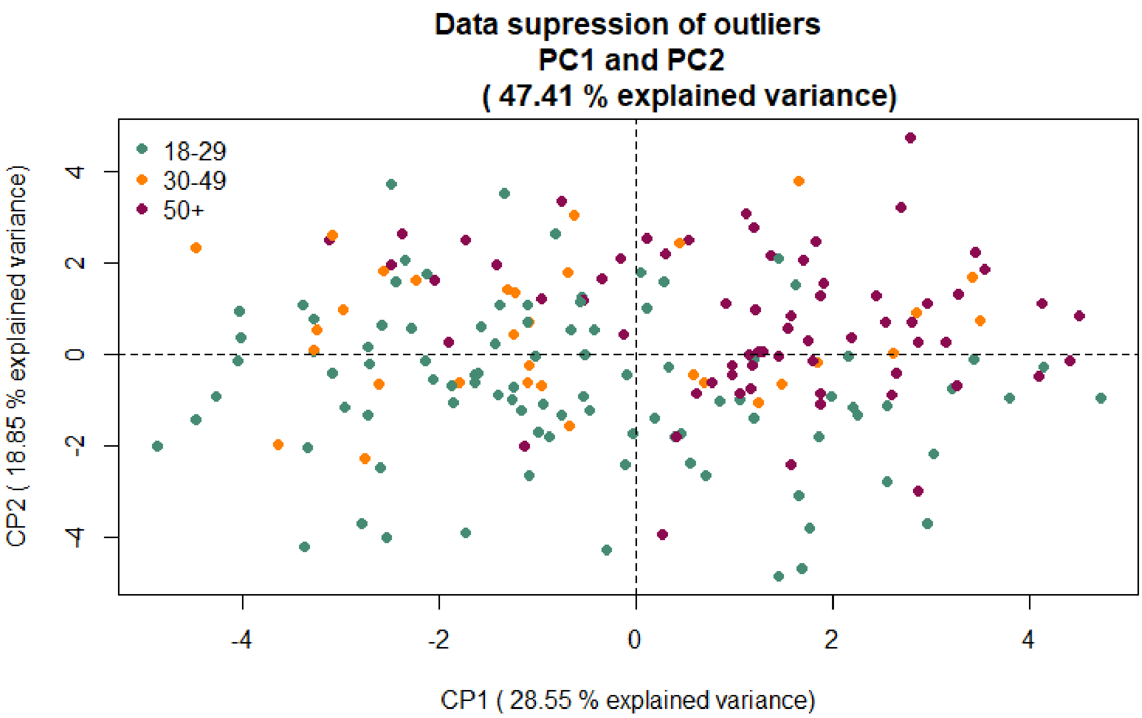

Figure 25. Removal of Outliers for Sex Treatment - Age

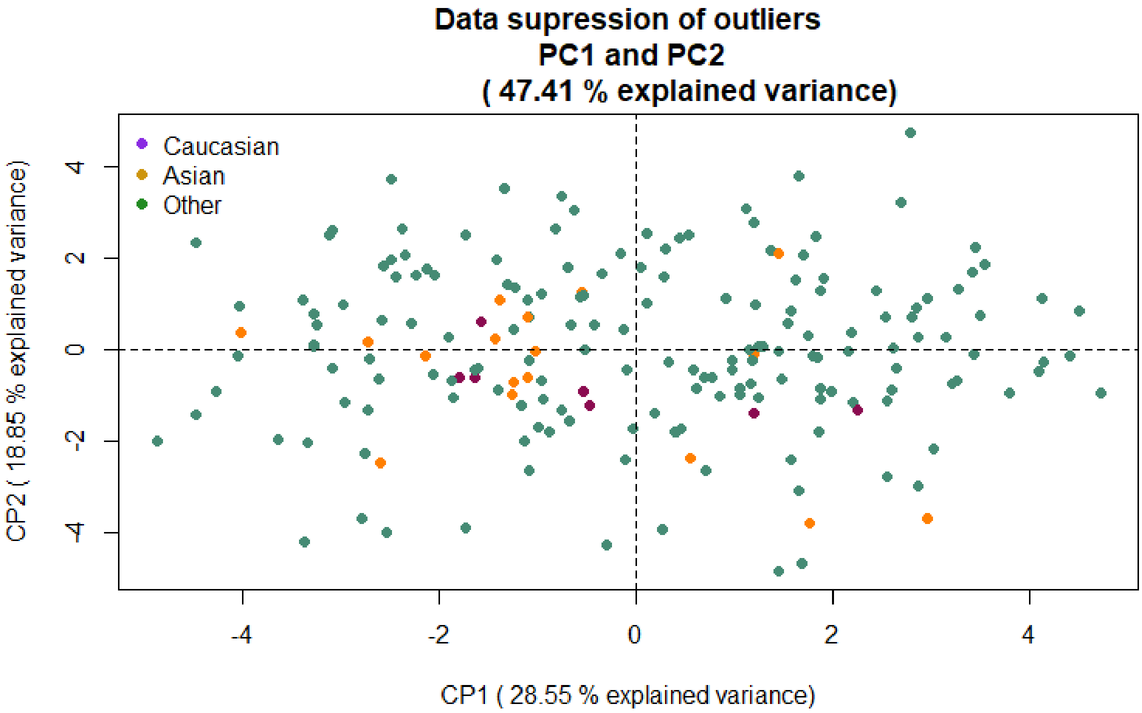

Figure 26. Removal of Outliers for Sex Treatment - Ancestry

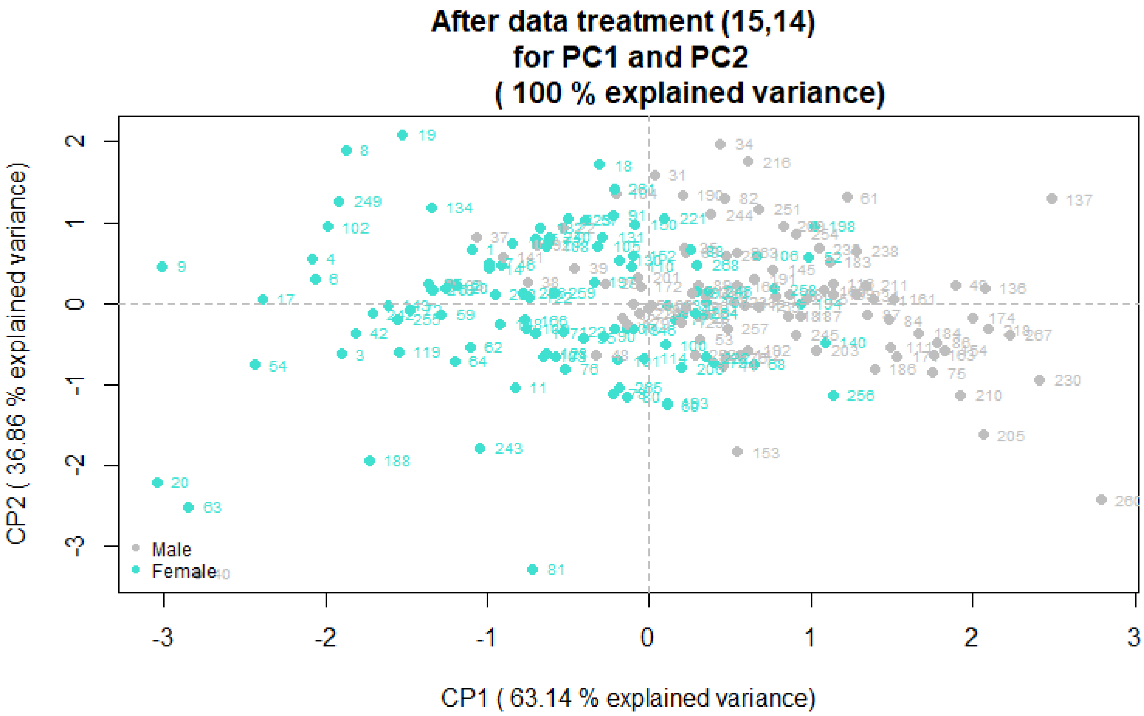

Figure 27. After Data treatment - Sex

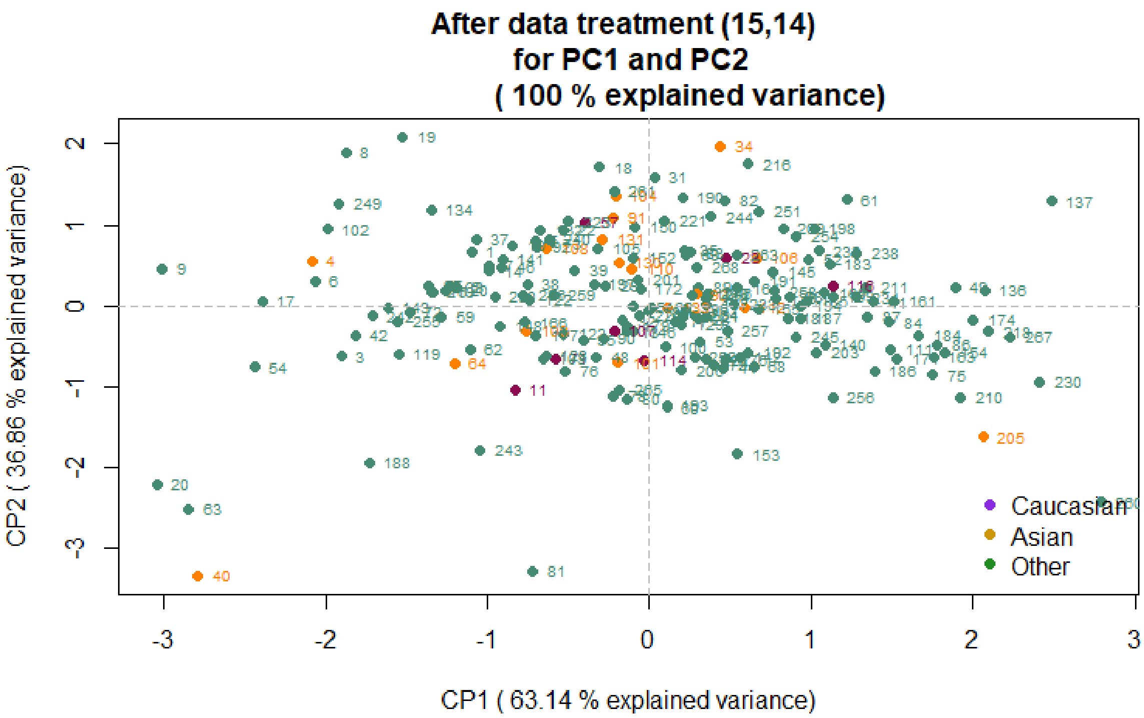

Figure 28. After Data treatment - Ancestry

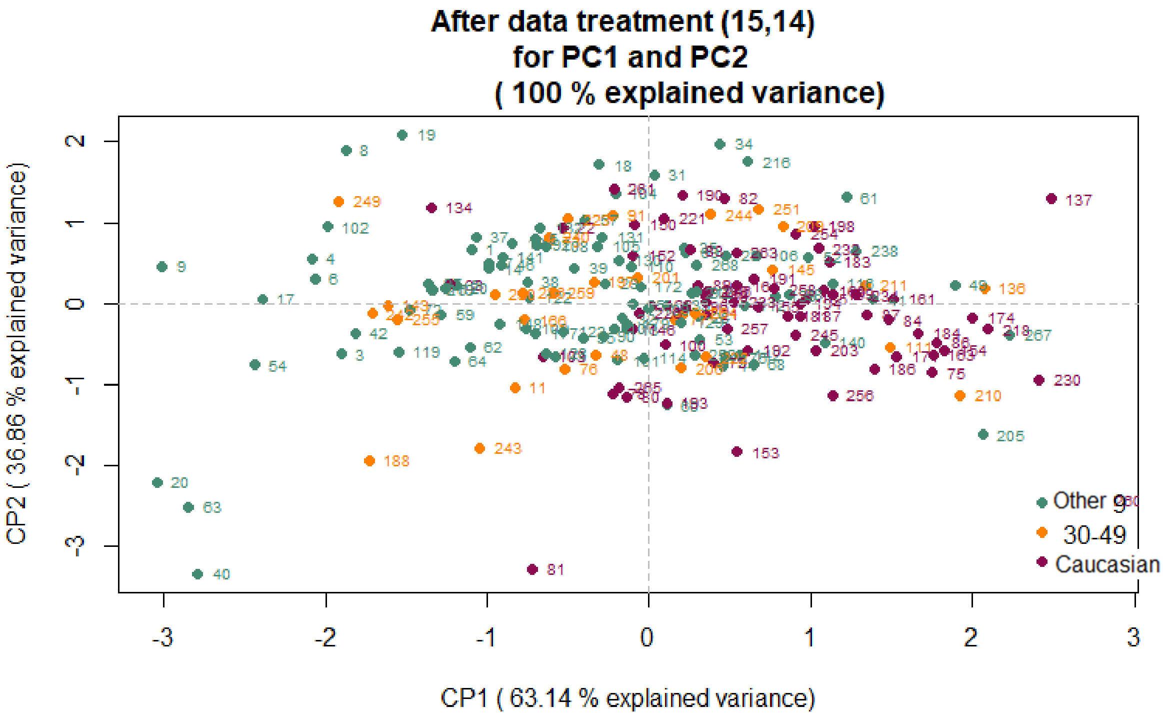

Figure 29. After Data treatment - Age

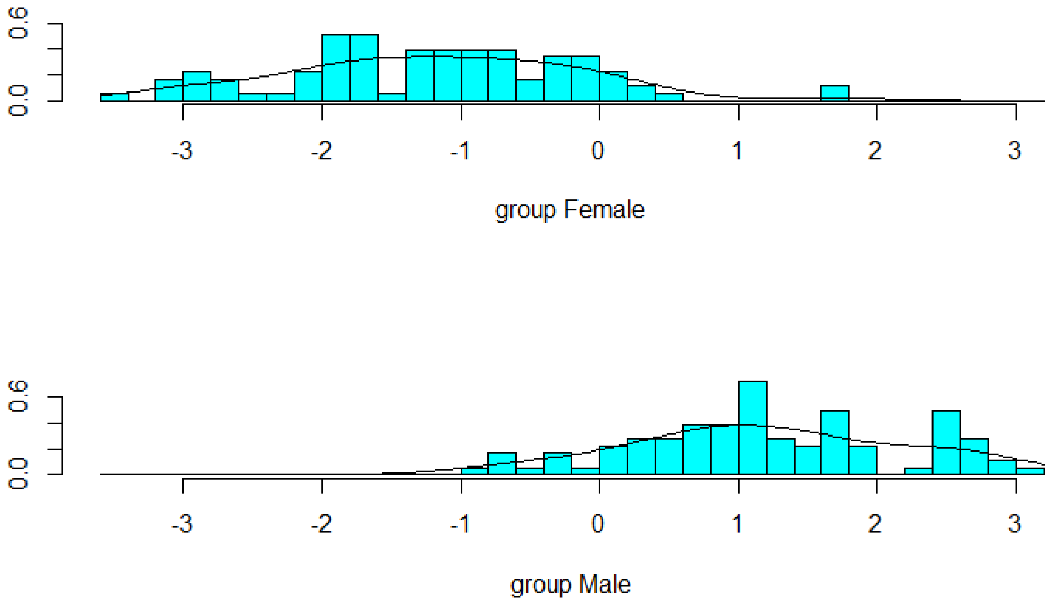

Figure 30. Linear Discriminant Analysis - Sex

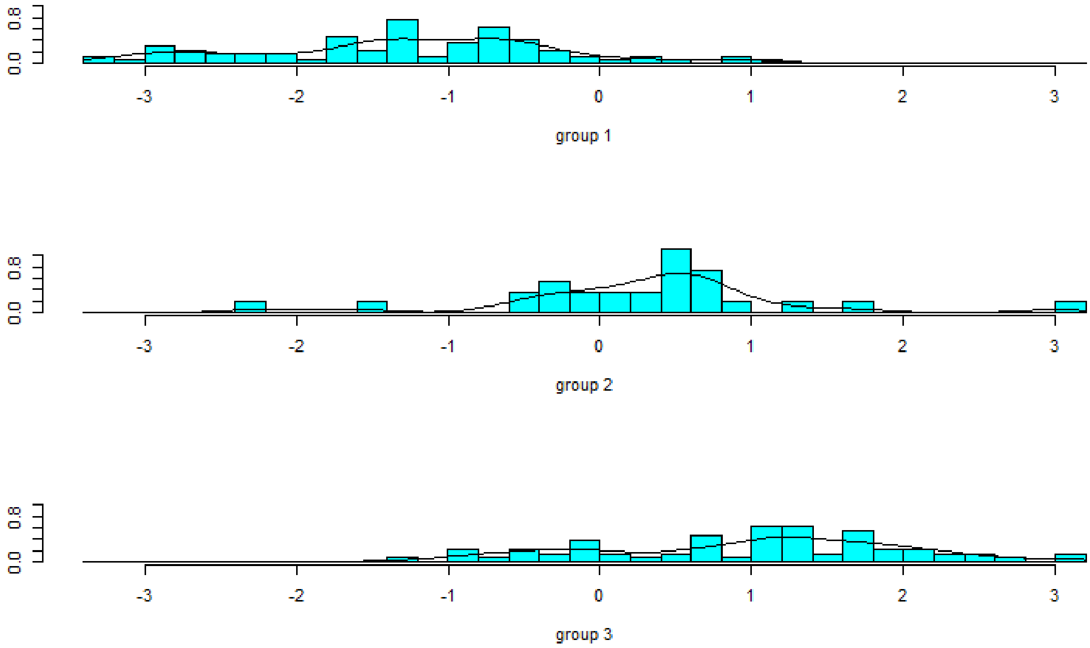

Figure 31. Linear Discriminant Analysis - Age

F.3 Gait Anthropometry Dynamic

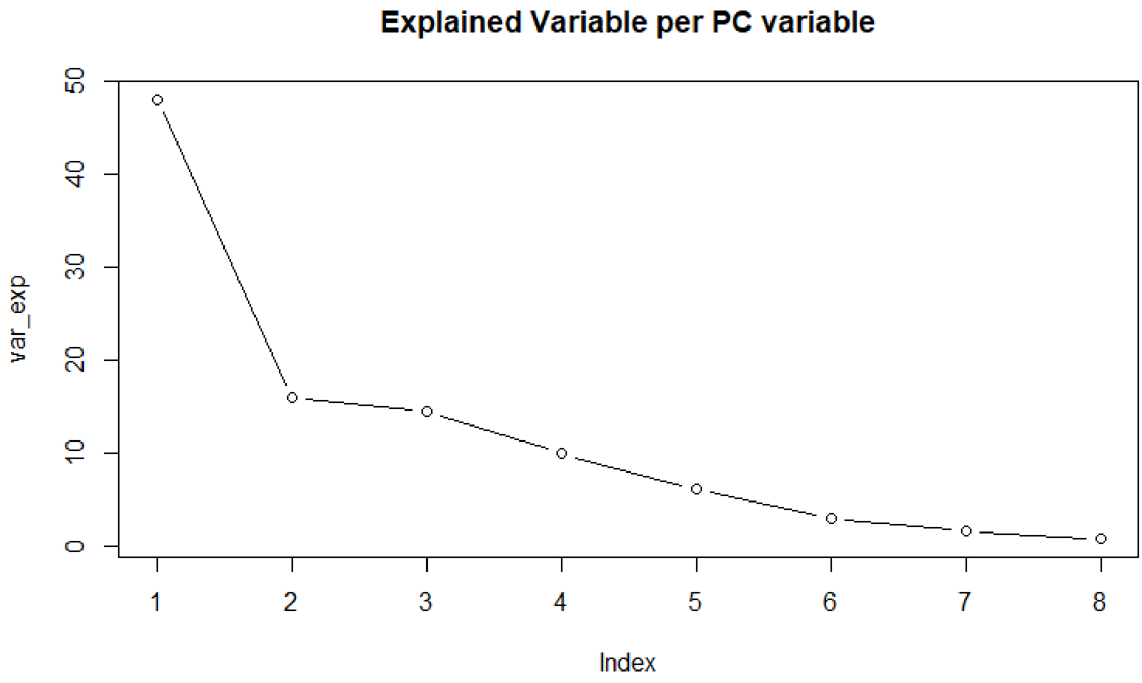

Figure 32. Scree Plot of Normalised Data

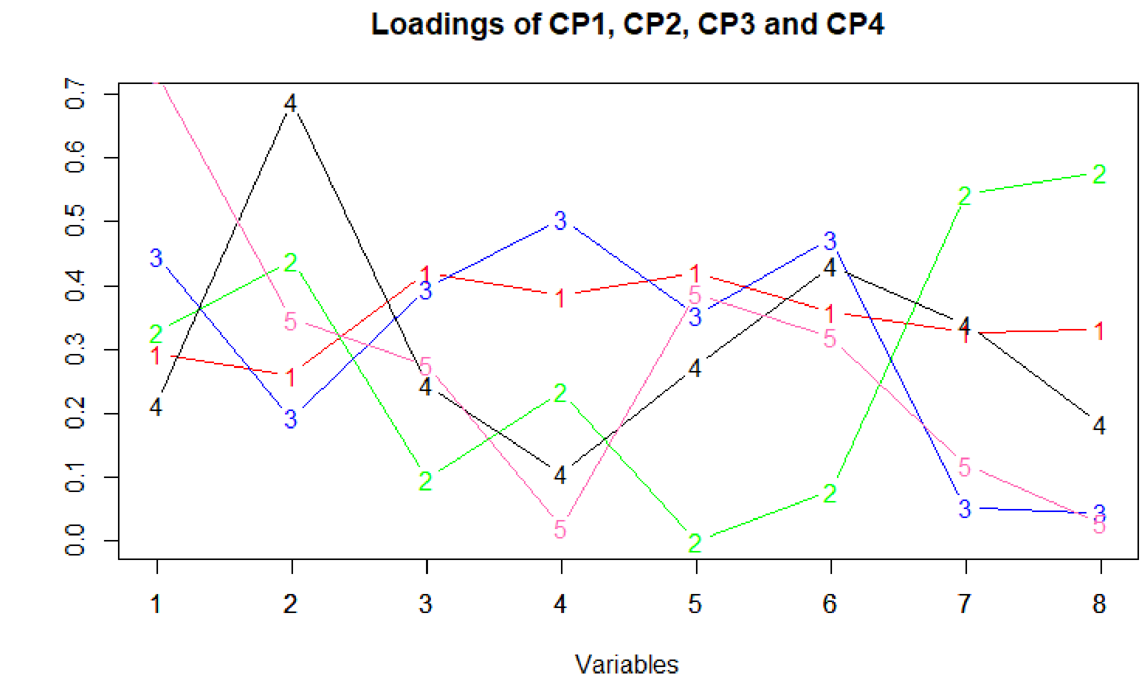

Figure 33. Loadings Line Graph Normalised Data

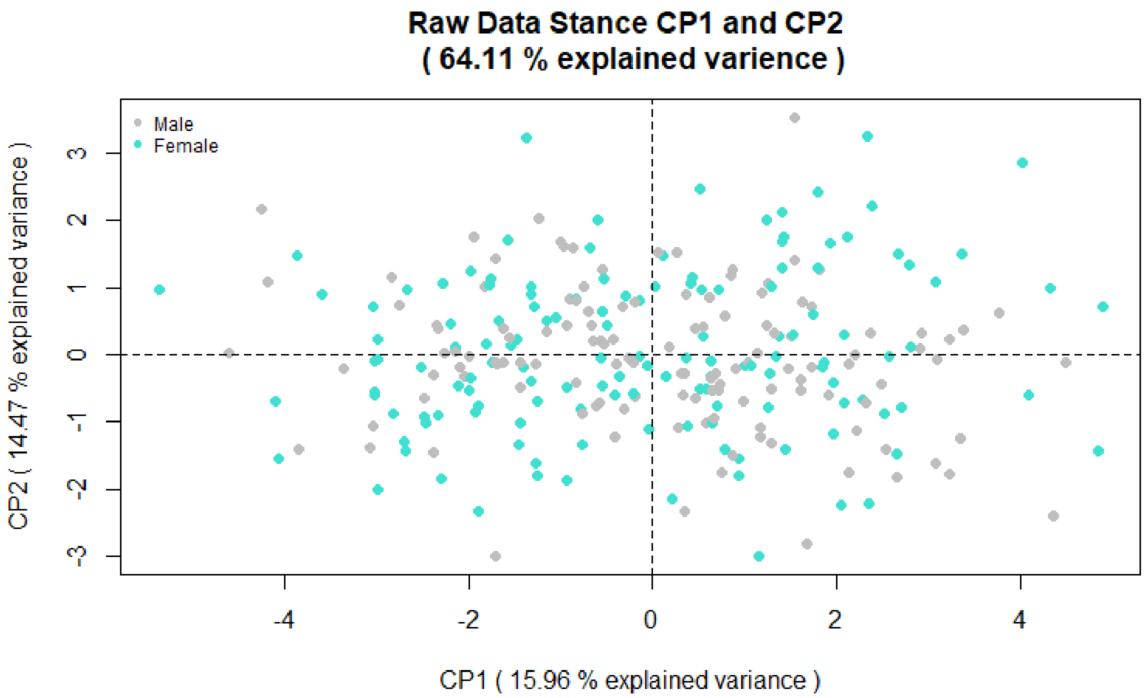

Figure 34. Scatterplot of Normalised Data - Sex

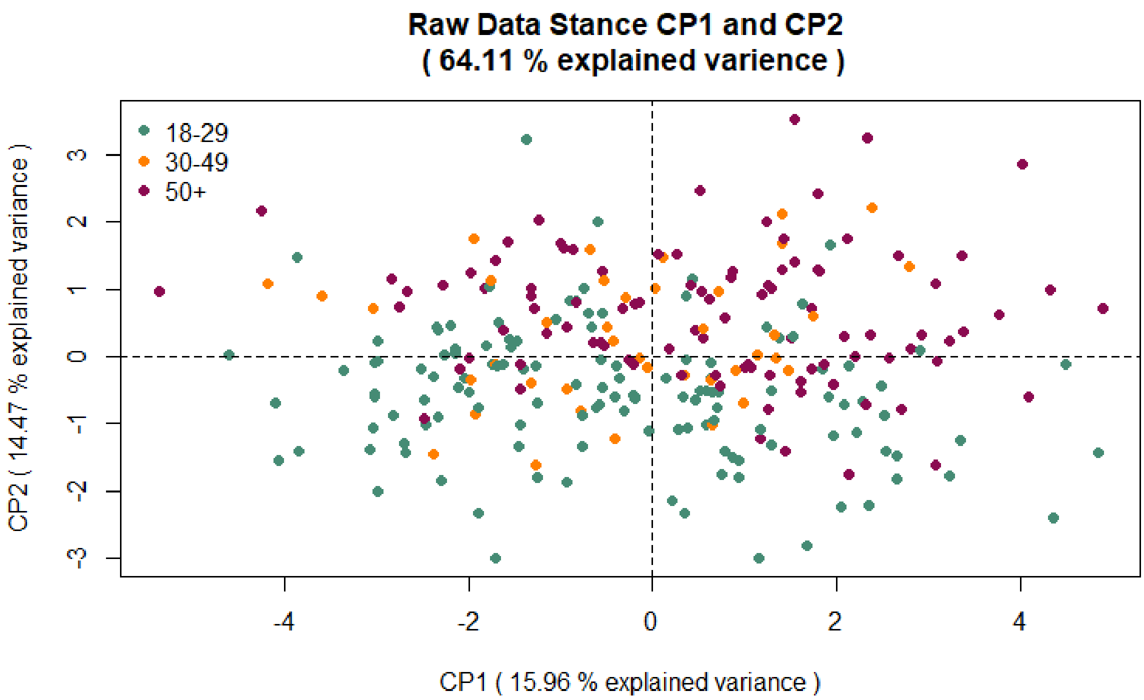

Figure 34. Scatterplot of Normalised Data - Age

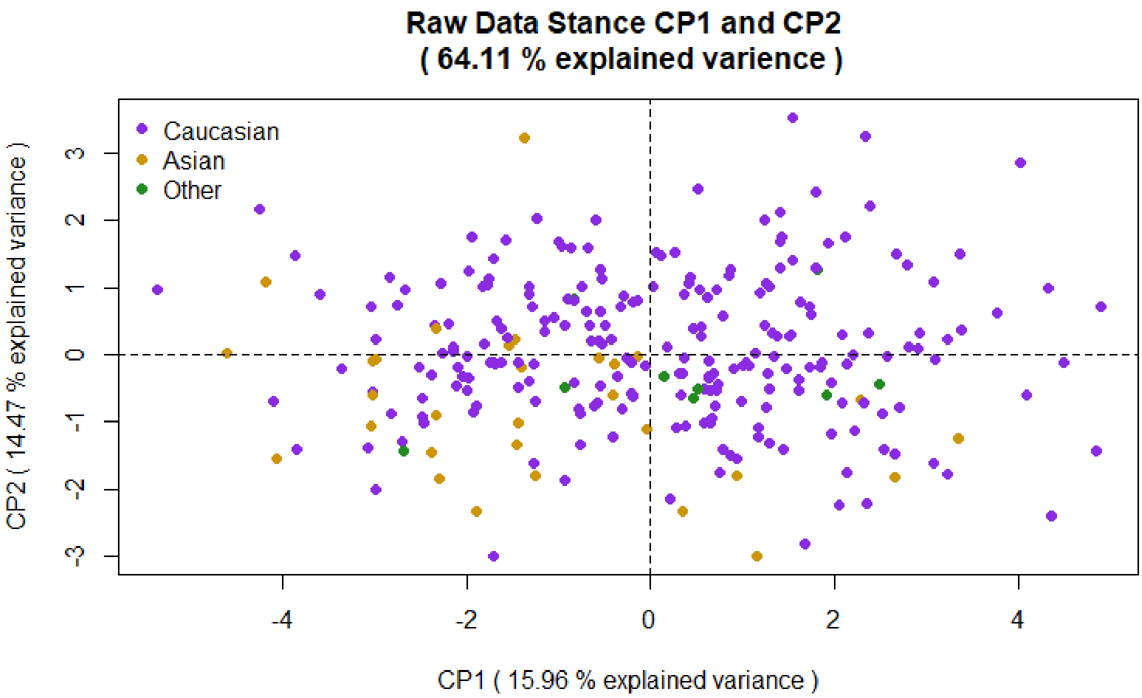

Figure 34. Scatterplot of Normalised Data - Ancestry

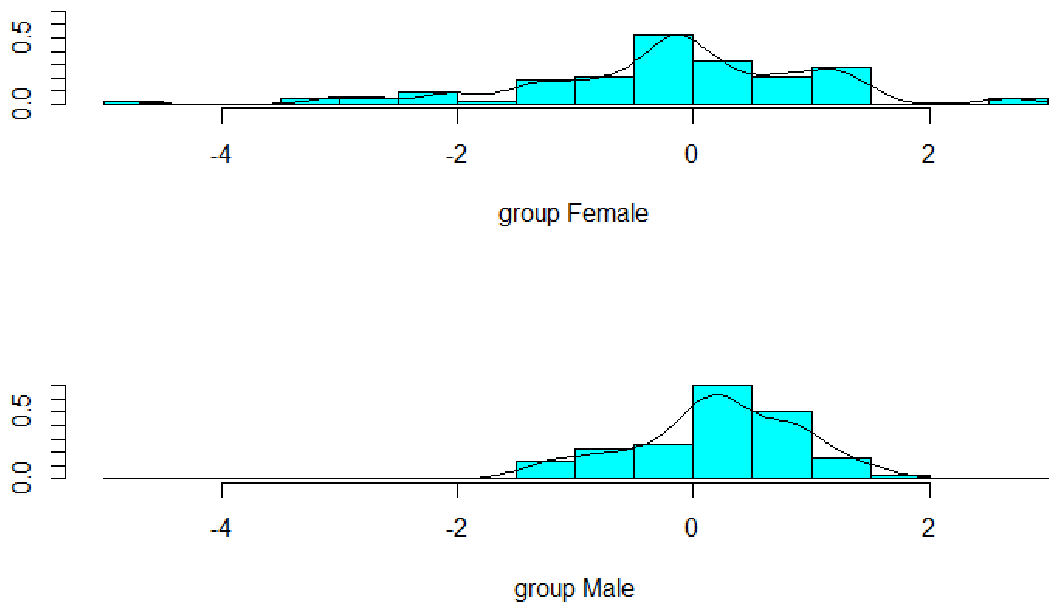

Figure 35. Linear Discriminant Analysis - Sex

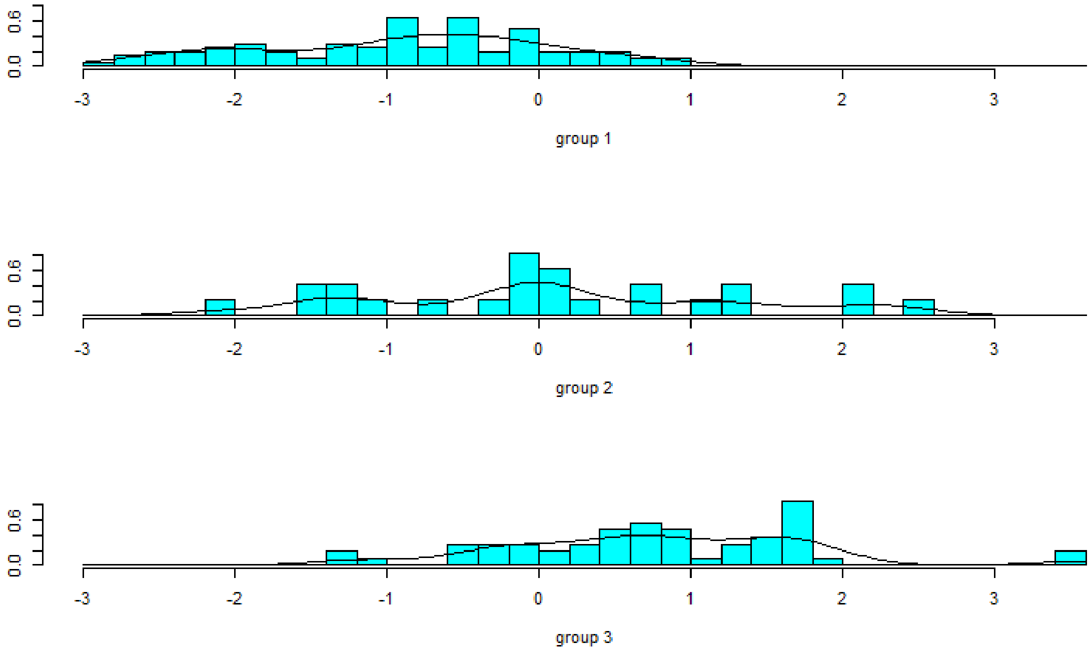

Figure 36. Linear Discriminant Analysis - Age

F.4 Stance Morphology

Scree Plot

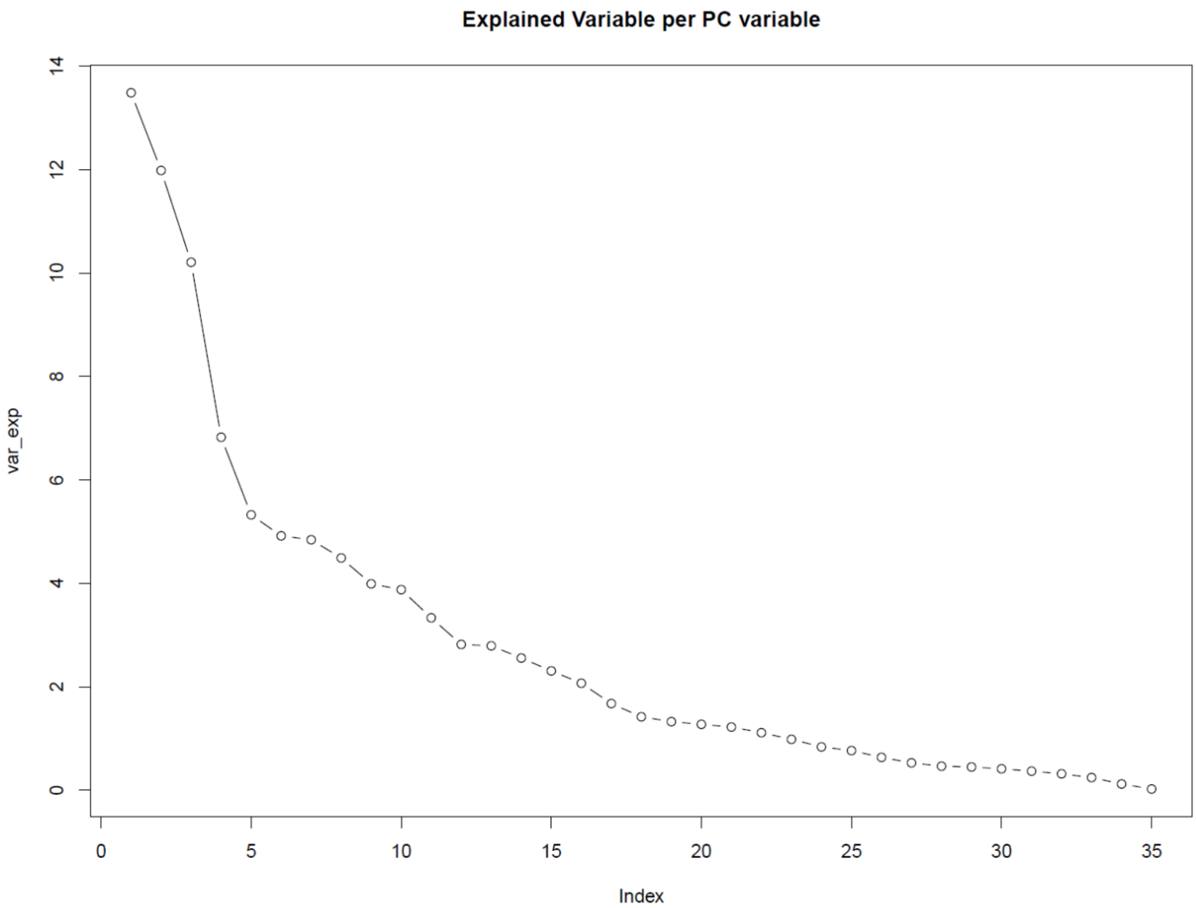

Figure 37. Scree Plot of Raw Data

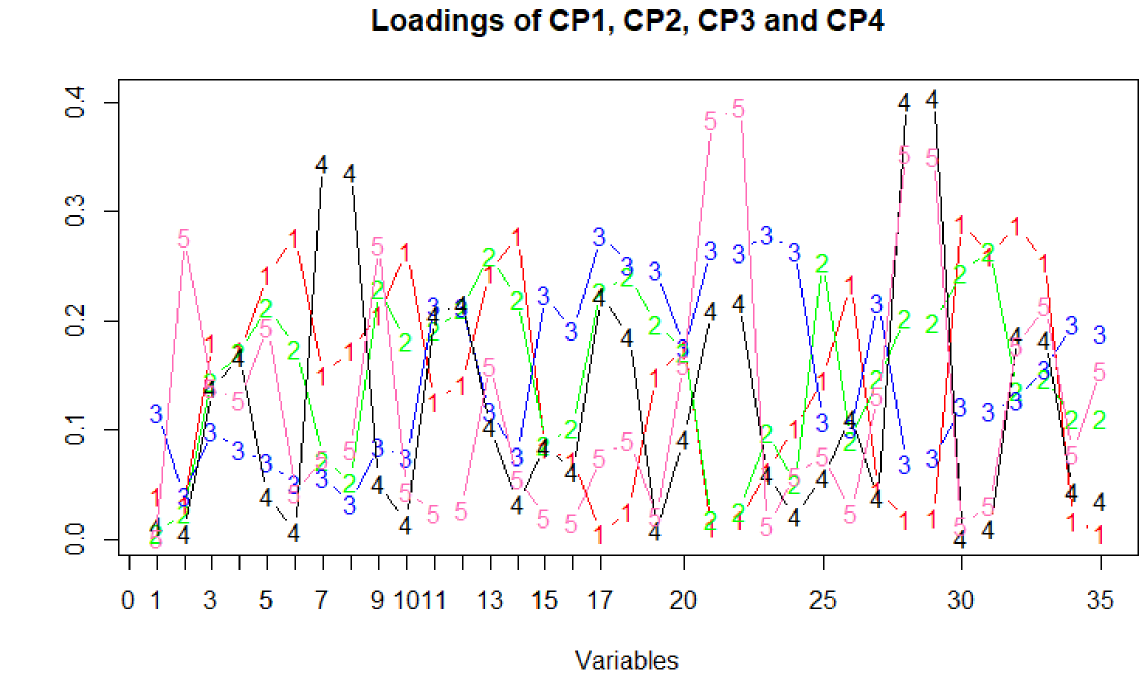

Figure 38. Loadings Line Graph Raw Data

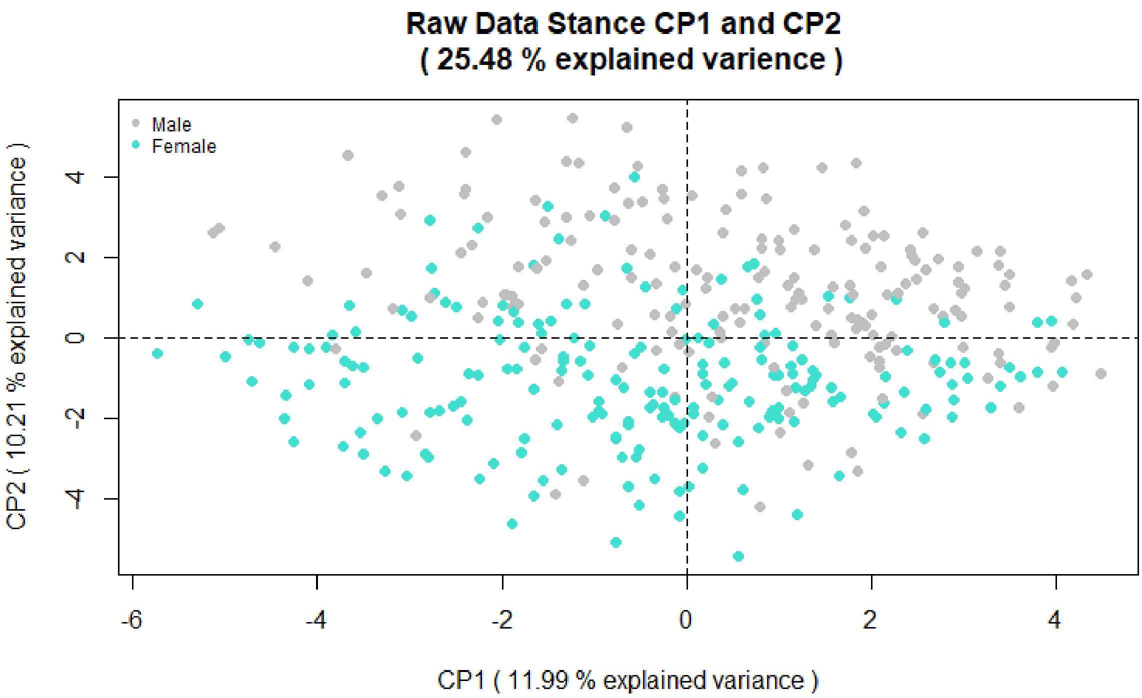

Figure 39. Scatterplot of Raw Data - Sex

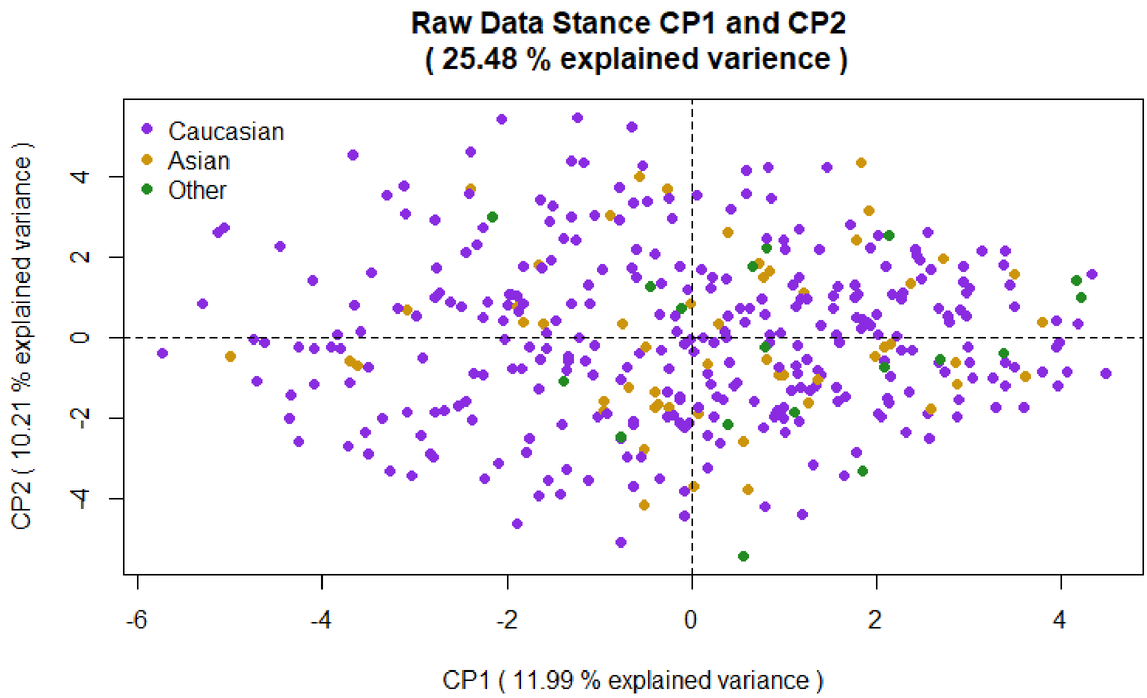

Figure 40. Scatterplot of Raw Data - Ancestry

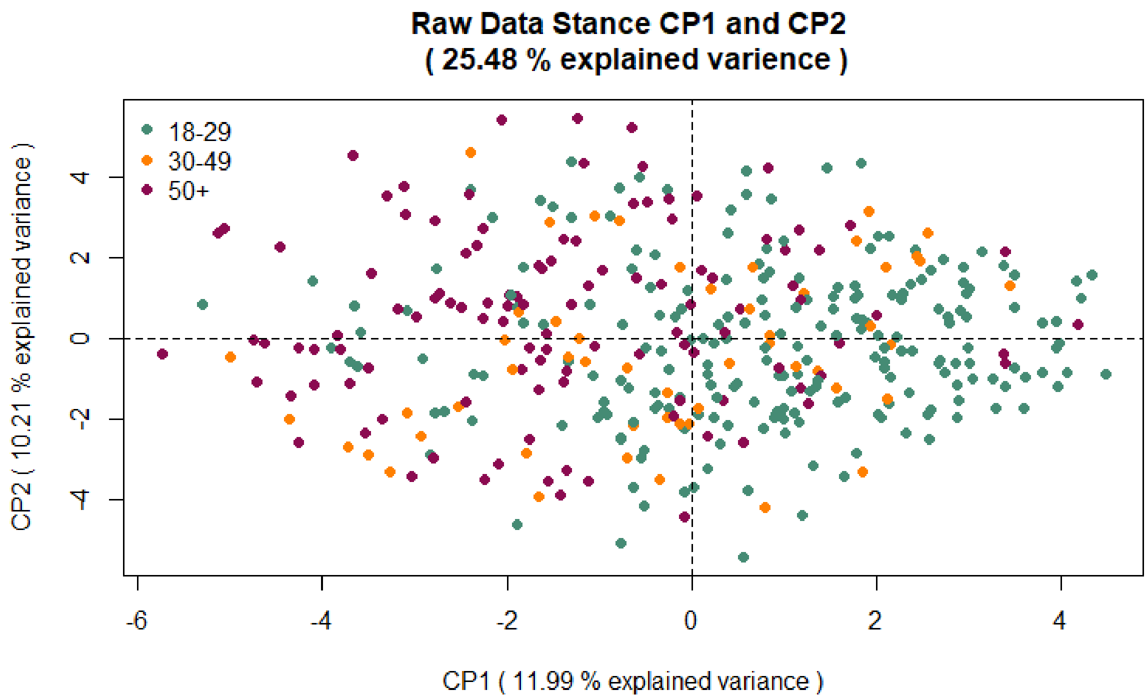

Figure 41. Scatterplot of Raw Data - Age

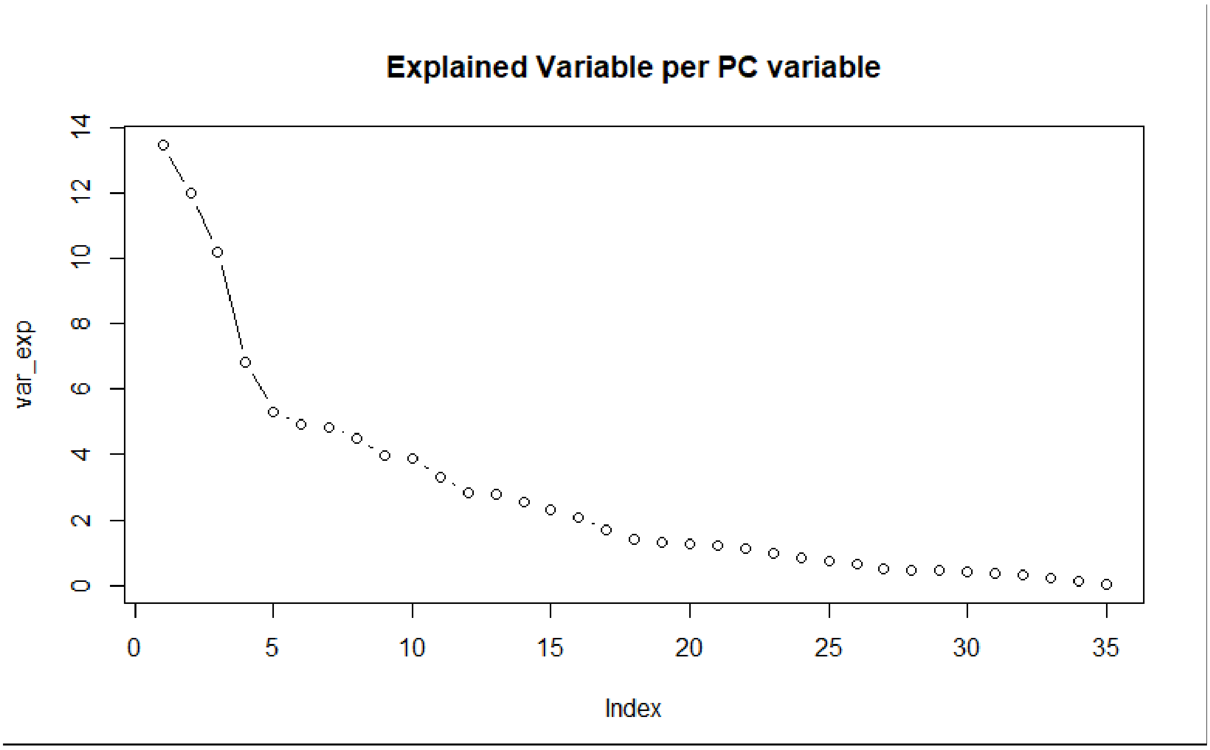

Figure 42. Scree plot of Normalised Data

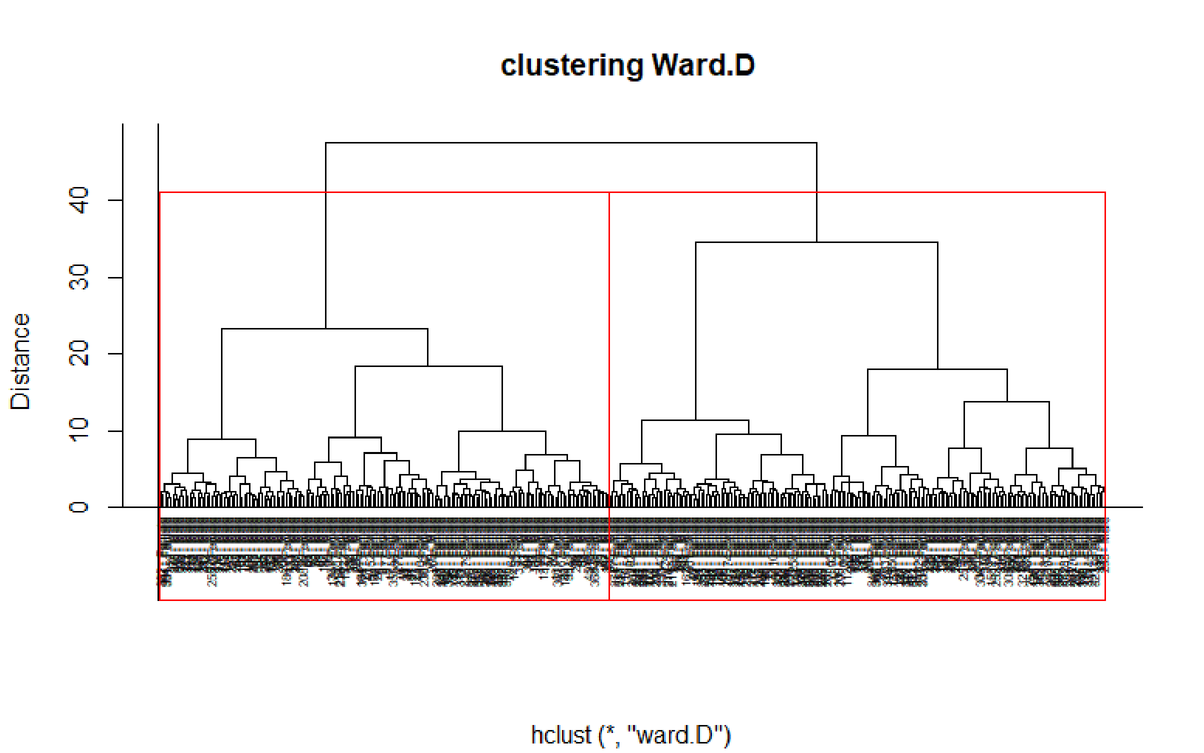

Figure 43. Hierarchical Cluster of Normalised Data (Ward)

F.5 Gait Morphology

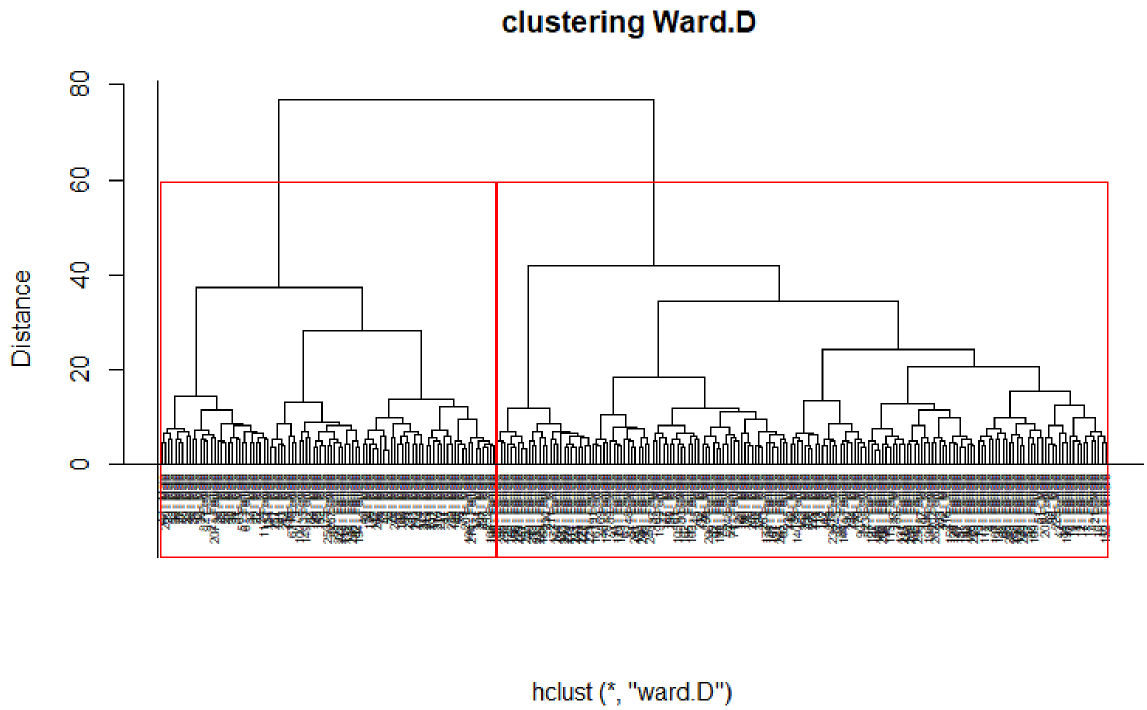

Figure 44. Hierarchical Cluster of Normalised Data (Ward)

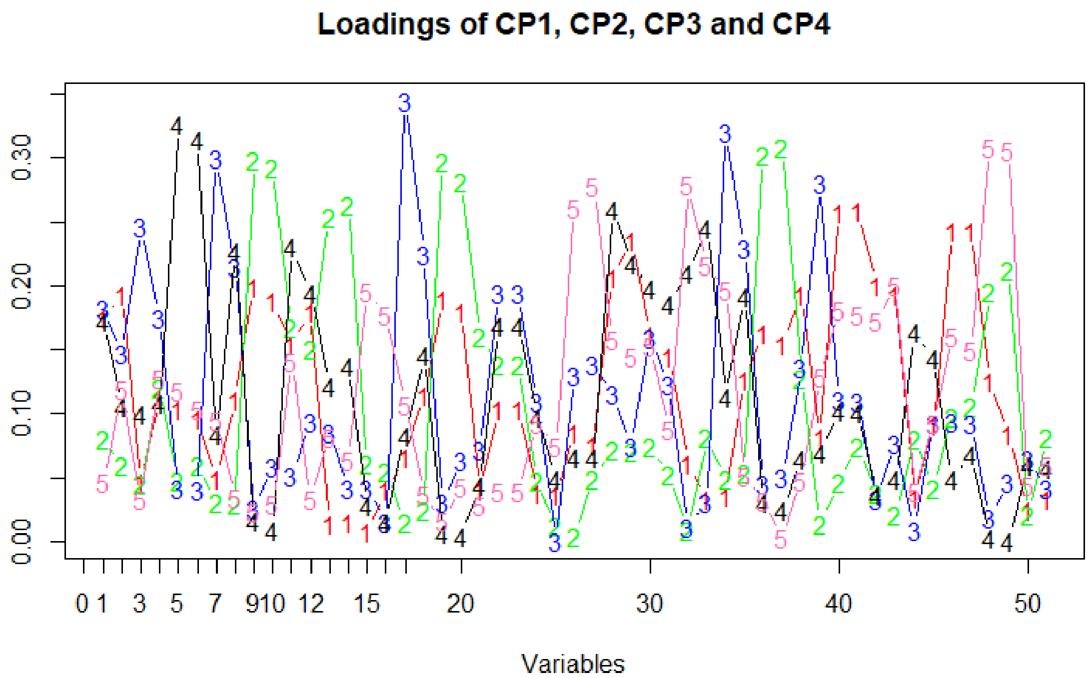

Figure 45. Loadings Line Graph Raw Data

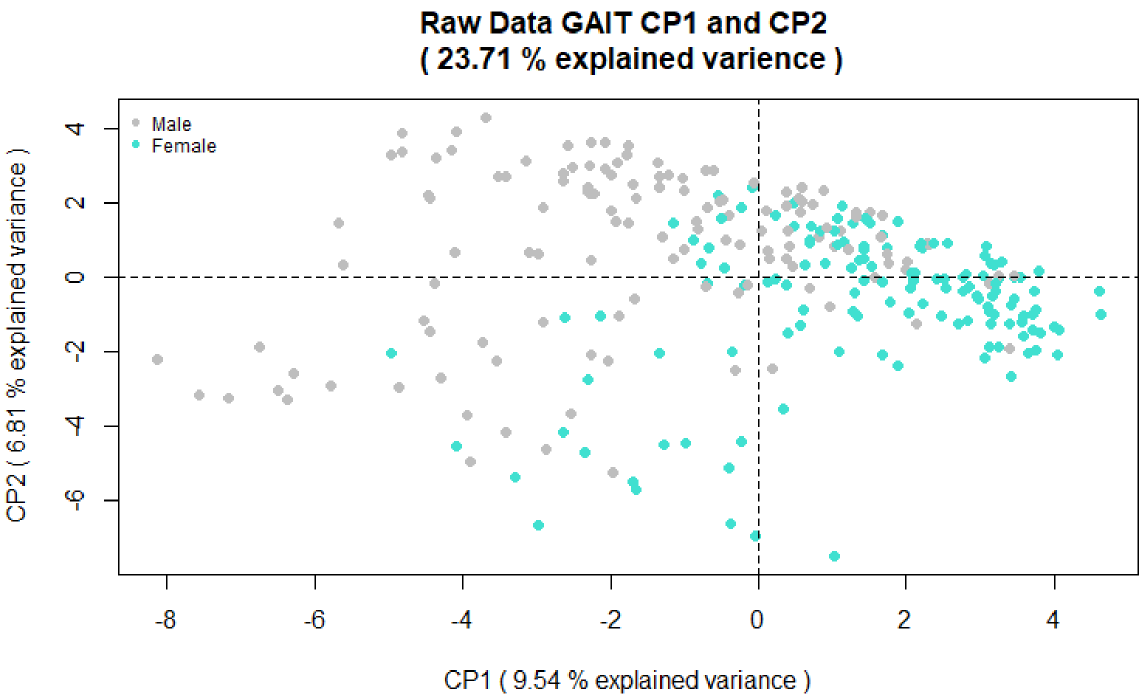

Figure 46. Scatterplot of Raw Data - Sex

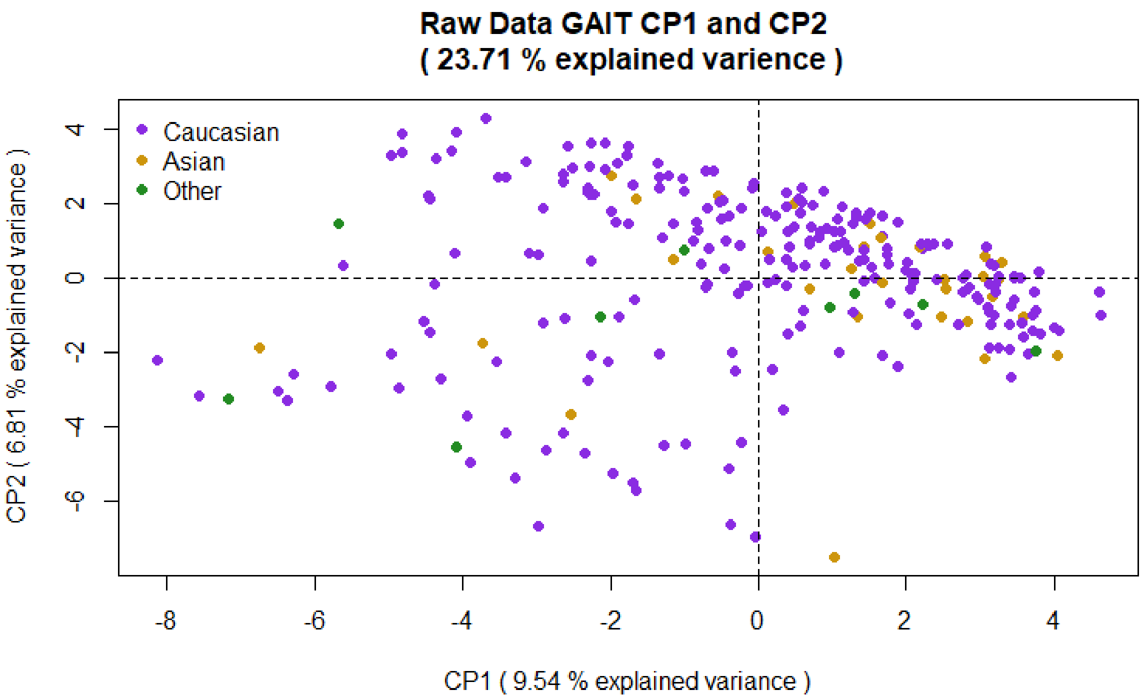

Figure 47. Scatterplot of Raw Data - Ancestry

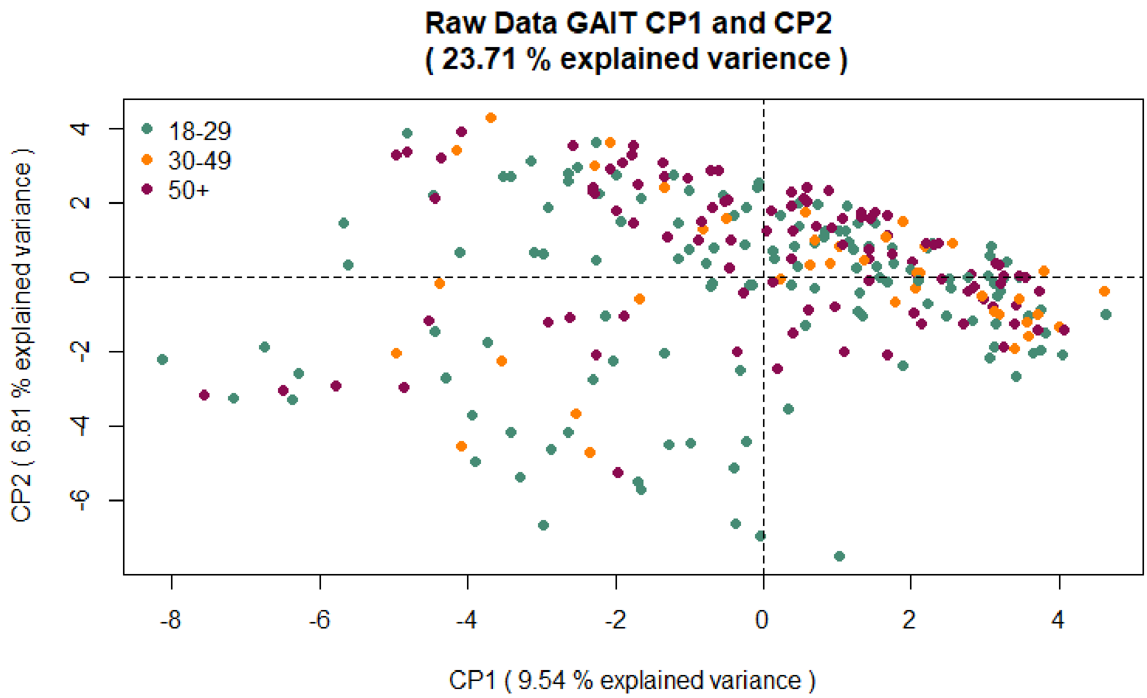

Figure 48. Scatterplot of Raw Data - Age

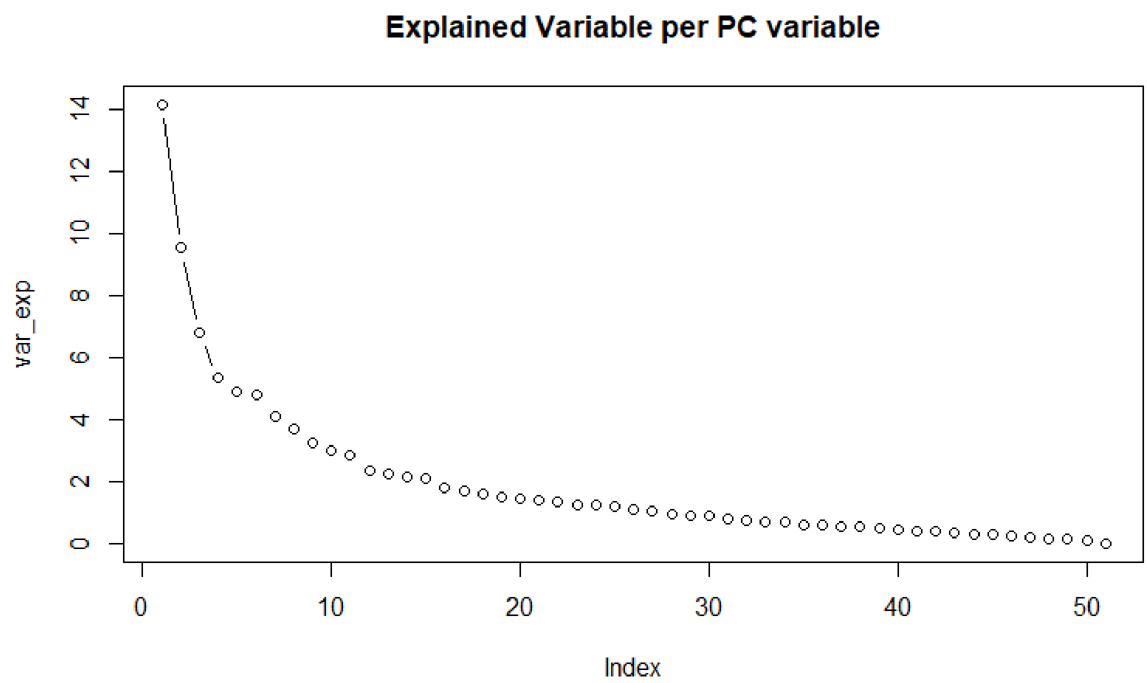

Figure 49. Scree plot of Normalised Data

Appendix G: Correlations Morphology

G.1 Ordinal Data

Table 21. Linear Discriminant Analysis Gait Morphology Age

Feature	Age F1	F2
3. Lat Placement of Upper Arm Backward Swing Right	0.051	-0.096
4. Lat Placement of Upper Arm Backward Swing Left	0.113	0.058
5. Lat Placement of Forearm Backward Arm Swing Right	-0.095	-0.081
6. Lat Placement of Forearm Backward Arm Swing Left	0.043	0.015
9. Level of elbow Flexion backward Arm Swing Right	0.073	-0.239
10. Level of elbow Flexion Backward Arm Swing Left	0.101	-0.437
13. Lateral Rotation of the Hand Backwards swing Right	-0.292	0.003
14. Lateral Rotation of the hand Backwards swing Left	0.041	0.082
15. Finger flexion upon backward arm swing Right	-0.082	0.037
16. Finger flexion upon backward arm swing Right	-0.137	0.017
3. Lat Placement of Upper Arm Forward Swing Right	0.022	-0.111
4. Lat Placement of Upper Arm Forward Swing Left	0.120	0.074
5. Lat Placement of Forearm Forward Arm Swing Right	-0.279	-0.300
6. Lat Placement of Forearm Forward Arm Swing Left	-0.317	-0.011
9. Level of elbow Flexion Forward Arm Swing Right	-0.027	0.191
10. Level of elbow Flexion Forward Arm Swing Left	-0.110	0.263
13. Lateral Rotation of the Hand Forward swing Right	-0.302	-0.044
14. Lateral Rotation of the hand Forward swing Left	-0.105	0.081
15. Finger flexion upon Forward arm swing Right	-0.071	-0.055
16. Finger flexion upon forward arm swing Right	-0.018	-0.099
2. Lateral trunk sway	0.434	-0.012
3. Orientation of Lower Extremities Right Anterior	-0.178	0.366
4. Orientation of Lower Extremities Left Anterior	-0.178	0.366
1. Head Level	0.000	0.130
2. Lateral head tilt	-0.123	-0.231
3. Shoulder level Right	0.080	0.231
4. Shoulder level Left	0.182	0.221
7. Lateral Placement of Upper Arm Right	0.087	0.028
8. Lateral Placement of Upper Arm Left	0.119	0.051
9. Lateral Placement of Forearm Right	-0.164	-0.120
10. Lateral Placement of Forearm Left	-0.177	0.124
11. Level of elbow Flexion Mid stance Right	-0.017	0.030
12. Level of elbow Flexion Mid stance Left	0.061	-0.035
14. Lateral Rotation of the Hand Mid stance Right	-0.340	0.010
15. Lateral Rotation of the hand Mid Stance Left	-0.150	0.138
16. Finger Flexion Right	-0.286	-0.117

17. Finger Flexion Left	-0.200	-0.130
18. Thoracic Projection	0.051	0.228
19. Abdominal projection	0.743	0.013
22. Lateral Placement of Upper leg Mid Stance Right	-0.004	0.234
23. Lateral Placement of Upper leg Mid Stance Left	0.023	0.225
24. Lateral Placement of Lower Leg Mid Stance Right	0.230	0.045
25. Lateral Placement of Lower leg Mid Stance Left	0.365	0.111
28. Placement of the Feet Mid Stance Right	-0.251	0.004
29. Placement of the Feet Mid Stance Left	-0.176	0.024
1. Lat placement of Upper Leg Swing Right	0.022	0.120
2. Lat placement of Upper Leg Swing Left	-0.029	0.235
5. Lateral Placement of Lower Leg Swing Right	-0.069	-0.004
6. Lateral Placement of Lower leg Swing Left	-0.204	-0.035
11. Placement of the Feet Swing Right	0.064	-0.171
12. Placement of the Feet Swing Left	0.205	0.058

Table 22. Linear Discriminant Analysis Gait Morphology Sex

Feature	Sex
3. Lat Placement of Upper Arm Backward Swing Right	0.278
4. Lat Placement of Upper Arm Backward Swing Left	0.317
5. Lat Placement of Forearm Backward Arm Swing Right	-0.011
6. Lat Placement of Forearm Backward Arm Swing Left	0.074
9. Level of elbow Flexion backward Arm Swing Right	-0.243
10. Level of elbow Flexion Backward Arm Swing Left	-0.188
13. Lateral Rotation of the Hand Backwards swing Right	0.091
14. Lateral Rotation of the hand Backwards swing Left	0.245
15. Finger flexion upon backward arm swing Right	-0.088
16. Finger flexion upon backward arm swing Right	-0.131
3. Lat Placement of Upper Arm Forward Swing Right	0.310
4. Lat Placement of Upper Arm Forward Swing Left	0.293
5. Lat Placement of Forearm Forward Arm Swing Right	0.196
6. Lat Placement of Forearm Forward Arm Swing Left	0.142
9. Level of elbow Flexion Forward Arm Swing Right	-0.048
10. Level of elbow Flexion Forward Arm Swing Left	-0.096
13. Lateral Rotation of the Hand Forward swing Right	0.058
14. Lateral Rotation of the hand Forward swing Left	0.140
15. Finger flexion upon Forward arm swing Right	-0.073
16. Finger flexion upon forward arm swing Right	-0.102
2. Lateral trunk sway	-0.477
3. Orientation of Lower Extremities Right Anterior	0.262
4. Orientation of Lower Extremities Left Anterior	0.262
1. Head Level	0.029
2. Lateral head tilt	-0.059
3. Shoulder level Right	0.273
4. Shoulder level Left	0.305
7. Lateral Placement of Upper Arm Right	0.365
8. Lateral Placement of Upper Arm Left	0.352
9. Lateral Placement of Forearm Right	0.288
10. Lateral Placement of Forearm Left	0.200
11. Level of elbow Flexion Mid stance Right	-0.125
12. Level of elbow Flexion Mid stance Left	-0.128
14. Lateral Rotation of the Hand Mid stance Right	0.135
15. Lateral Rotation of the hand Mid Stance Left	0.243
16. Finger Flexion Right	-0.009
17. Finger Flexion Left	-0.060
18. Thoracic Projection	0.909
19. Abdominal projection	0.097
22. Lateral Placement of Upper leg Mid Stance Right	0.523

23. Lateral Placement of Upper leg Mid Stance Left	0.492
24. Lateral Placement of Lower Leg Mid Stance Right	0.218
25. Lateral Placement of Lower leg Mid Stance Left	0.174
28. Placement of the Feet Mid Stance Right	0.203
29. Placement of the Feet Mid Stance Left	0.227
1. Lat placement of Upper Leg Swing Right	0.515
2. Lat placement of Upper Leg Swing Left	0.604
5. Lateral Placement of Lower Leg Swing Right	0.298
6. Lateral Placement of Lower leg Swing Left	0.229
11. Placement of the Feet Swing Right	0.003
12. Placement of the Feet Swing Left	-0.130

Table 23. Linear Discriminant Analysis Gait Morphology Ancestry

Feature	Ancestry
3. Lat Placement of Upper Arm Backward Swing Right	-0.172
4. Lat Placement of Upper Arm Backward Swing Left	-0.003
5. Lat Placement of Forearm Backward Arm Swing Right	-0.133
6. Lat Placement of Forearm Backward Arm Swing Left	-0.054
9. Level of elbow Flexion backward Arm Swing Right	0.086
10. Level of elbow Flexion Backward Arm Swing Left	0.114
13. Lateral Rotation of the Hand Backwards swing Right	-0.278
14. Lateral Rotation of the hand Backwards swing Left	-0.095
15. Finger flexion upon backward arm swing Right	0.105
16. Finger flexion upon backward arm swing Right	0.055
3. Lat Placement of Upper Arm Forward Swing Right	-0.078
4. Lat Placement of Upper Arm Forward Swing Left	-0.027
5. Lat Placement of Forearm Forward Arm Swing Right	-0.076
6. Lat Placement of Forearm Forward Arm Swing Left	-0.104
9. Level of elbow Flexion Forward Arm Swing Right	0.119
10. Level of elbow Flexion Forward Arm Swing Left	0.147
13. Lateral Rotation of the Hand Forward swing Right	-0.289
14. Lateral Rotation of the hand Forward swing Left	-0.250
15. Finger flexion upon Forward arm swing Right	0.126
16. Finger flexion upon forward arm swing Right	0.149
2. Lateral trunk sway	0.477
3. Orientation of Lower Extremities Right Anterior	0.015
4. Orientation of Lower Extremities Left Anterior	0.015
1. Head Level	0.039
2. Lateral head tilt	0.025
3. Shoulder level Right	-0.030
4. Shoulder level Left	0.096
7. Lateral Placement of Upper Arm Right	-0.243
8. Lateral Placement of Upper Arm Left	-0.057
9. Lateral Placement of Forearm Right	-0.410
10. Lateral Placement of Forearm Left	-0.313
11. Level of elbow Flexion Mid stance Right	0.239
12. Level of elbow Flexion Mid stance Left	0.202
14. Lateral Rotation of the Hand Mid stance Right	-0.333
15. Lateral Rotation of the hand Mid Stance Left	-0.336
16. Finger Flexion Right	0.060
17. Finger Flexion Left	0.109
18. Thoracic Projection	0.028
19. Abdominal projection	0.500
22. Lateral Placement of Upper leg Mid Stance Right	-0.162

23. Lateral Placement of Upper leg Mid Stance Left	-0.114
24. Lateral Placement of Lower Leg Mid Stance Right	-0.190
25. Lateral Placement of Lower leg Mid Stance Left	0.030
28. Placement of the Feet Mid Stance Right	-0.109
29. Placement of the Feet Mid Stance Left	-0.199
1. Lat placement of Upper Leg Swing Right	-0.138
2. Lat placement of Upper Leg Swing Left	-0.235
5. Lateral Placement of Lower Leg Swing Right	-0.061
6. Lateral Placement of Lower leg Swing Left	-0.152
11. Placement of the Feet Swing Right	0.251
12. Placement of the Feet Swing Left	0.152

Table 24. Linear Discriminant Analysis Stance Morphology Age

Feature	Age F1	F2
1. Head Level R	0.249	0.117
2. Lateral head tilt	0.020	-0.208
3. Shoulder level R	0.227	0.293
4. Shoulder level L	0.204	0.114
5. Position of Shoulder R	-0.353	-0.055
6. Position of Shoulder L	-0.334	0.208
7. Position of Upper Arm (Frontal) Right	0.172	0.080
8. Position of Upper Arm (Frontal) Left	0.190	-0.024
9. Antero-Posterior Placement of Upper Arm Right	-0.239	-0.036
10. Antero-Posterior Placement of Upper Arm Left	-0.318	0.270
11. Lateral Placement of Upper Arm Right	0.088	-0.105
12. Lateral Placement of Upper Arm Left	0.107	-0.108
13. Antero-posterior Placement of Forearm Right	-0.419	0.043
14. Antero-posterior Placement of Forearm Left	-0.463	0.395
15. Flexion of arm R	0.205	0.127
16. Flexion of arm L	0.175	0.051
17. Lateral placement of forearm R	-0.281	-0.064
18. Lateral placement of Forearm L	-0.228	-0.054
19. Antero-posterior Placement of Hand Right	-0.245	0.181
20. Antero-posterior Placement of Hand Left	-0.273	0.157
21. Finger Flexion Right	-0.072	-0.001
22. Finger Flexion Left	0.021	-0.114
23. Lateral Rotation of the Hand Right	-0.221	-0.254
24. Lateral Rotation of the hand Left	-0.119	0.019
25. Thoracic Projection	-0.092	0.223
26. Abdominal projection	0.752	0.126
27. Shape of Gluteus	-0.195	0.036
28. Orientation of Lower Extremities Right Anterior	-0.168	0.438
29. Orientation of Lower Extremities Left Anterior	-0.174	0.412
30. Lateral Placement of Upper leg Right	0.359	0.163
31. Lateral Placement of Upper leg Left	0.283	0.280
32. Lateral Placement of Lower Leg Right	0.493	-0.092
33. Lateral Placement of Lower leg Left	0.364	0.040
34. Placement of the Feet Right	-0.344	-0.036
35. Placement of the Feet Left	-0.357	-0.167

Table 25. Linear Discriminant Analysis Stance Morphology Sex

Feature	Sex
1. Head Level R	-0.101
2. Lateral head tilt	-0.109
3. Shoulder level R	0.228
4. Shoulder level L	0.242
5. Position of Shoulder R	-0.004
6. Position of Shoulder L	-0.029
7. Position of Upper Arm (Frontal) Right	0.020
8. Position of Upper Arm (Frontal) Left	0.048
9. Antero-Posterior Placement of Upper Arm Right	0.008
10. Antero-Posterior Placement of Upper Arm Left	-0.017
11. Lateral Placement of Upper Arm Right	0.312
12. Lateral Placement of Upper Arm Left	0.353
13. Antero-posterior Placement of Forearm Right	0.124
14. Antero-posterior Placement of Forearm Left	0.120
15. Flexion of arm R	-0.064
16. Flexion of arm L	-0.066
17. Lateral placement of forearm R	0.424
18. Lateral placement of Forearm L	0.432
19. Antero-posterior Placement of Hand Right	0.075
20. Antero-posterior Placement of Hand Left	0.082
21. Finger Flexion Right	0.024
22. Finger Flexion Left	-0.053
23. Lateral Rotation of the Hand Right	0.041
24. Lateral Rotation of the hand Left	0.004
25. Thoracic Projection	0.942
26. Abdominal projection	0.136
27. Shape of Gluteus	0.573
28. Orientation of Lower Extremities Right Anterior	0.180
29. Orientation of Lower Extremities Left Anterior	0.187
30. Lateral Placement of Upper leg Right	0.358
31. Lateral Placement of Upper leg Left	0.365
32. Lateral Placement of Lower Leg Right	0.217
33. Lateral Placement of Lower leg Left	0.211
34. Placement of the Feet Right	0.395
35. Placement of the Feet Left	0.316

Table 26. Linear Discriminant Analysis Stance Morphology Ancestry

Feature	Ancestry
1. Head Level R	0.106
2. Lateral head tilt	0.118
3. Shoulder level R	-0.020
4. Shoulder level L	0.035
5. Position of Shoulder R	0.111
6. Position of Shoulder L	0.149
7. Position of Upper Arm (Frontal) Right	0.128
8. Position of Upper Arm (Frontal) Left	0.190
9. Antero-Posterior Placement of Upper Arm Right	0.022
10. Antero-Posterior Placement of Upper Arm Left	0.055
11. Lateral Placement of Upper Arm Right	-0.103
12. Lateral Placement of Upper Arm Left	-0.100
13. Antero-posterior Placement of Forearm Right	-0.018
14. Antero-posterior Placement of Forearm Left	-0.160
15. Flexion of arm R	0.209
16. Flexion of arm L	0.363
17. Lateral placement of forearm R	-0.208
18. Lateral placement of Forearm L	-0.189
19. Antero-posterior Placement of Hand Right	0.049
20. Antero-posterior Placement of Hand Left	0.067
21. Finger Flexion Right	-0.324
22. Finger Flexion Left	-0.254
23. Lateral Rotation of the Hand Right	-0.383
24. Lateral Rotation of the hand Left	-0.273
25. Thoracic Projection	-0.126
26. Abdominal projection	0.438
27. Shape of Gluteus	-0.100
28. Orientation of Lower Extremities Right Anterior	0.006
29. Orientation of Lower Extremities Left Anterior	0.046
30. Lateral Placement of Upper leg Right	0.098
31. Lateral Placement of Upper leg Left	0.178
32. Lateral Placement of Lower Leg Right	0.151
33. Lateral Placement of Lower leg Left	0.230
34. Placement of the Feet Right	-0.068
35. Placement of the Feet Left	-0.186

Appendix H: Stance Anthropometry Model Two

H.1 Feature-to-Height Ratio

Table 27. Conversions of Raw data to Feature-to Height Ratio

Subject	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand length R	6. Hand length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot Width R	14. Foot Width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L	17. Total Height (stature) R
003Fc	0.1889	0.19847	0.14805	0.14359	0.10721	0.10147	0.23931	0.14805	0.33567	0.24825	0.14869	0.14869	0.05552	0.0568	0.50032	0.50989	1
015F	0.18704	0.18765	0.13264	0.13386	0.09046	0.09046	0.22983	0.14059	0.30685	0.21577	0.14364	0.14181	0.04707	0.04768	0.44377	0.44377	1
016Fc	0.18074	0.18547	0.14235	0.13763	0.08033	0.07738	0.20851	0.1394	0.29297	0.22918	0.14649	0.14058	0.0508	0.04962	0.46131	0.46131	1
017F	0.17427	0.16953	0.12567	0.11915	0.07765	0.07291	0.24837	0.13219	0.33076	0.21814	0.14226	0.13989	0.04683	0.04801	0.44695	0.44754	1
019F	0.18449	0.19567	0.12648	0.12229	0.09993	0.10412	0.28861	0.14116	0.30328	0.22292	0.13976	0.14745	0.04892	0.04542	0.4717	0.4689	1
004F	0.19465	0.19197	0.13512	0.13043	0.11237	0.11773	0.24749	0.13177	0.26288	0.20535	0.14582	0.14515	0.05886	0.0602	0.48294	0.48495	1
006F	0.17923	0.17923	0.13442	0.13585	0.09104	0.09246	0.23613	0.12802	0.29587	0.21337	0.14083	0.1394	0.04552	0.04552	0.47795	0.4744	1
009F	0.18553	0.18553	0.12956	0.12453	0.11572	0.1195	0.27484	0.1327	0.29245	0.20189	0.14277	0.14591	0.05094	0.05409	0.47484	0.47547	1
021F	0.17729	0.1817	0.1306	0.12492	0.1041	0.1041	0.24353	0.12681	0.28391	0.22145	0.1489	0.14826	0.05363	0.0511	0.48896	0.48833	1
024Fc	0.1891	0.19316	0.13631	0.13457	0.09397	0.08933	0.21056	0.13051	0.25928	0.18968	0.15139	0.15081	0.04582	0.04234	0.4565	0.45418	1
025Fc	0.1954	0.1948	0.13128	0.12825	0.09377	0.09679	0.23291	0.13128	0.2807	0.19903	0.13733	0.13672	0.0484	0.04658	0.46038	0.45735	1
032F	0.18784	0.18904	0.13004	0.12884	0.09211	0.09332	0.21854	0.13426	0.28597	0.21794	0.14088	0.14148	0.04515	0.04455	0.46297	0.46057	1
033F	0.18406	0.19148	0.12477	0.12662	0.09883	0.08894	0.23657	0.13403	0.28042	0.21186	0.14083	0.14145	0.0525	0.05188	0.46201	0.46078	1
042F	0.19761	0.19698	0.13153	0.13656	0.09377	0.08999	0.20768	0.12712	0.29138	0.1995	0.13468	0.13216	0.04657	0.04468	0.47577	0.47514	1
047F	0.18034	0.18159	0.13463	0.13212	0.10269	0.10269	0.24233	0.13212	0.29618	0.21603	0.15341	0.15216	0.05322	0.05322	0.42956	0.43018	1
048F	0.1889	0.17966	0.13342	0.12946	0.09445	0.10634	0.25363	0.13606	0.26882	0.24306	0.14399	0.14993	0.05086	0.05416	0.44518	0.45112	1

053F	0.18519	0.18519	0.11941	0.12005	0.11111	0.1092	0.24393	0.13729	0.26884	0.22286	0.14368	0.14496	0.05619	0.05172	0.47446	0.47446	1
063F	0.18401	0.18229	0.13686	0.13629	0.09201	0.09948	0.22369	0.12363	0.295	0.22024	0.13456	0.13456	0.04485	0.04313	0.48131	0.48131	1
064F	0.18234	0.18523	0.13214	0.12752	0.10271	0.09348	0.23947	0.13445	0.29371	0.21812	0.1483	0.14599	0.04501	0.04674	0.47374	0.47086	1
069F	0.17885	0.1836	0.11586	0.1224	0.10279	0.09923	0.3066	0.12775	0.28461	0.22816	0.15152	0.15389	0.05585	0.05942	0.44326	0.44266	1
071F	0.17798	0.17982	0.13211	0.12661	0.08624	0.09664	0.23731	0.1315	0.29113	0.22263	0.14557	0.14924	0.04526	0.04526	0.4685	0.46728	1
075F	0.19091	0.18846	0.11602	0.11725	0.10681	0.10866	0.23634	0.13076	0.30325	0.21486	0.15163	0.15163	0.05709	0.05402	0.46593	0.4647	1
078F	0.1788	0.18171	0.12114	0.1293	0.11066	0.10367	0.20909	0.13221	0.30868	0.20967	0.14851	0.14735	0.05125	0.05067	0.46709	0.46884	1
079F	0.17286	0.17463	0.1233	0.12271	0.10737	0.10914	0.24661	0.13569	0.29853	0.2295	0.14749	0.14513	0.05369	0.05192	0.45782	0.45428	1
080F	0.19104	0.18482	0.1201	0.12072	0.10143	0.10081	0.30803	0.13441	0.32856	0.22091	0.14935	0.14935	0.056	0.05538	0.45551	0.4524	1
087F	0.18972	0.18972	0.13652	0.13357	0.09988	0.10343	0.22518	0.13771	0.30437	0.20331	0.14894	0.14775	0.05319	0.05201	0.46336	0.46158	1
088F	0.18336	0.18276	0.13418	0.13783	0.09654	0.085	0.21676	0.12447	0.28537	0.20704	0.15422	0.1524	0.05525	0.05222	0.4742	0.47055	1
090F	0.18332	0.17842	0.13059	0.13489	0.10975	0.10055	0.21091	0.13243	0.30717	0.21275	0.1496	0.15205	0.05028	0.04598	0.46107	0.45984	1
002FD	0.17782	0.18016	0.12265	0.11796	0.08509	0.09742	0.21479	0.12265	0.28638	0.22535	0.15376	0.15493	0.05516	0.05458	0.48357	0.48415	1
005FD	0.16619	0.17426	0.13849	0.13733	0.10214	0.09752	0.21235	0.13791	0.30121	0.21754	0.16157	0.16157	0.05482	0.05655	0.47952	0.47605	1
006FD	0.17932	0.17874	0.12558	0.12734	0.09871	0.09871	0.21671	0.13259	0.29322	0.21904	0.15771	0.15829	0.05549	0.05666	0.46145	0.46612	1
007FD	0.18438	0.18144	0.13799	0.14328	0.0963	0.10217	0.20787	0.13799	0.29008	0.22548	0.15619	0.15796	0.0552	0.05696	0.49207	0.4956	1
009FD	0.18262	0.17557	0.12683	0.12096	0.10217	0.10159	0.22196	0.14034	0.27833	0.21844	0.15972	0.16031	0.05344	0.05226	0.45273	0.45214	1
017FD	0.17323	0.18019	0.12341	0.12688	0.08169	0.07995	0.20046	0.11703	0.25898	0.20915	0.14832	0.14948	0.04693	0.05214	0.48725	0.48899	1
020FD	0.17005	0.1747	0.11898	0.11898	0.10621	0.09925	0.22055	0.13001	0.27684	0.22345	0.15496	0.15612	0.0534	0.05572	0.46431	0.46373	1
021FD	0.19332	0.18981	0.13825	0.1365	0.08787	0.08612	0.2191	0.13122	0.25425	0.21207	0.1529	0.15173	0.05331	0.05331	0.50791	0.50732	1
022FD	0.1791	0.17853	0.12801	0.12572	0.09127	0.0907	0.21355	0.13433	0.25947	0.2124	0.15729	0.15557	0.05626	0.05568	0.47359	0.47015	1
023FD	0.17961	0.18424	0.13152	0.13615	0.1095	0.09618	0.21842	0.14311	0.24508	0.21553	0.1657	0.16628	0.05678	0.0591	0.4803	0.48262	1
025FD	0.17992	0.1805	0.13059	0.12536	0.08764	0.09228	0.23564	0.14161	0.29251	0.23099	0.14974	0.15148	0.05398	0.05514	0.42716	0.42832	1
026FD	0.17181	0.16832	0.12813	0.13162	0.08154	0.07863	0.22365	0.1293	0.29703	0.2219	0.15143	0.15317	0.05183	0.05183	0.43448	0.43797	1
030FD	0.17546	0.18005	0.12672	0.12385	0.08257	0.08486	0.25401	0.1336	0.28555	0.22993	0.15883	0.1594	0.05677	0.05619	0.44839	0.44782	1
031FD	0.17884	0.17943	0.13559	0.13501	0.08825	0.08475	0.21917	0.12975	0.28171	0.22911	0.15254	0.15605	0.05494	0.05377	0.48334	0.48919	1
034FD	0.16909	0.16967	0.12435	0.12551	0.08077	0.07902	0.24404	0.14062	0.27484	0.23184	0.15572	0.15747	0.05404	0.05636	0.42417	0.42824	1
035FD	0.18058	0.1788	0.13499	0.13025	0.09236	0.10006	0.22617	0.14802	0.31143	0.23327	0.15394	0.15867	0.05447	0.05565	0.47069	0.47247	1
036FD	0.17285	0.17459	0.12993	0.12877	0.08411	0.08353	0.2326	0.14211	0.2964	0.22506	0.15313	0.15487	0.05452	0.05452	0.47274	0.47158	1
038FD	0.17715	0.18638	0.13041	0.11714	0.09636	0.0981	0.22793	0.14137	0.27698	0.22504	0.15753	0.15811	0.05482	0.0577	0.46509	0.46394	1

039FD	0.17705	0.17359	0.11649	0.11246	0.07497	0.07612	0.21338	0.13841	0.27336	0.23299	0.15456	0.15398	0.05421	0.05421	0.46713	0.4677	1
040FD	0.17561	0.1867	0.12485	0.11494	0.09568	0.08926	0.22929	0.1161	0.29055	0.21937	0.14994	0.15228	0.05193	0.05309	0.46674	0.46849	1
001Mc	0.16348	0.17101	0.12638	0.12696	0.10899	0.10841	0.21101	0.14667	0.27652	0.21739	0.16174	0.15304	0.04812	0.05101	0.43072	0.43304	1
005Mc	0.1816	0.18573	0.1421	0.13915	0.09611	0.08608	0.21816	0.12972	0.28597	0.22877	0.15035	0.15566	0.04363	0.05012	0.44634	0.44929	1
007M	0.18026	0.18332	0.12876	0.12876	0.09197	0.08768	0.21337	0.14102	0.30901	0.21643	0.15389	0.15328	0.05028	0.04782	0.40466	0.40343	1
010M	0.19231	0.19349	0.12012	0.12071	0.09763	0.10178	0.25858	0.12249	0.31065	0.26509	0.15858	0.1574	0.06036	0.06095	0.39645	0.39527	1
011Mc	0.17977	0.17855	0.14138	0.13955	0.08349	0.08288	0.19317	0.13955	0.28032	0.21268	0.14199	0.14442	0.04875	0.04509	0.42779	0.42596	1
012M	0.16606	0.16545	0.12448	0.12303	0.09515	0.09939	0.2103	0.13939	0.30182	0.23515	0.14485	0.14667	0.04424	0.04	0.40424	0.40545	1
013M	0.17448	0.17329	0.1181	0.12226	0.10386	0.0997	0.21484	0.13828	0.29555	0.22018	0.14481	0.14303	0.0546	0.05223	0.42136	0.42077	1
013Mc	0.18894	0.18779	0.13767	0.13652	0.08756	0.09044	0.21198	0.14631	0.28975	0.22293	0.15323	0.15265	0.05472	0.05472	0.41763	0.41532	1
016M	0.17651	0.1802	0.12915	0.12792	0.09902	0.10209	0.21402	0.13223	0.25338	0.24231	0.14514	0.14453	0.04859	0.04797	0.41943	0.41759	1
19Mc	0.18757	0.18994	0.14379	0.1355	0.0929	0.09527	0.20533	0.13373	0.29467	0.23373	0.14734	0.14675	0.05266	0.05207	0.46036	0.45799	1
022Mc	0.18731	0.18369	0.13837	0.13958	0.09607	0.10634	0.21027	0.13837	0.2713	0.23082	0.15045	0.14985	0.05136	0.05196	0.44713	0.4429	1
025M	0.19124	0.1865	0.13499	0.13144	0.09888	0.0971	0.22617	0.13558	0.26525	0.21137	0.16341	0.16519	0.04618	0.04618	0.42747	0.42984	1
026M	0.18154	0.18154	0.13693	0.13879	0.10657	0.09851	0.21437	0.11834	0.27261	0.22615	0.1518	0.15799	0.05266	0.05514	0.42379	0.42379	1
028Mc	0.1869	0.18089	0.15144	0.14243	0.10637	0.11298	0.20373	0.15264	0.27224	0.24579	0.14904	0.14964	0.05228	0.05228	0.42368	0.42608	1
031M	0.17173	0.17173	0.12558	0.12967	0.10397	0.10397	0.20386	0.13259	0.25759	0.23598	0.14778	0.14836	0.0479	0.04614	0.41005	0.40537	1
038M	0.17433	0.17254	0.13254	0.13313	0.10209	0.10507	0.21672	0.14209	0.29134	0.2406	0.14806	0.14806	0.04358	0.04896	0.43761	0.43403	1
040M	0.1808	0.17903	0.13899	0.13899	0.10365	0.10777	0.21967	0.13369	0.31272	0.24853	0.15842	0.1596	0.06243	0.05948	0.42933	0.43051	1
041M	0.18631	0.19223	0.13825	0.12969	0.10862	0.10862	0.21791	0.1343	0.25543	0.22186	0.15207	0.15471	0.04345	0.04345	0.45556	0.45359	1
044M	0.17708	0.17249	0.13696	0.12779	0.09513	0.09971	0.20458	0.12378	0.30716	0.2235	0.15301	0.1553	0.04928	0.04527	0.42407	0.42407	1
046M	0.17192	0.17965	0.12849	0.12909	0.11124	0.11124	0.2326	0.13147	0.28971	0.24331	0.14872	0.1517	0.05116	0.05294	0.37656	0.37656	1
049M	0.17789	0.18192	0.13702	0.14047	0.08233	0.0852	0.21244	0.13126	0.28613	0.22568	0.15486	0.15256	0.0426	0.04663	0.45366	0.45481	1
050M	0.18223	0.18336	0.14261	0.14318	0.08885	0.10526	0.21505	0.13016	0.26542	0.22977	0.1562	0.15676	0.05433	0.05603	0.44256	0.44312	1
051M	0.16589	0.17169	0.13457	0.13283	0.09745	0.08759	0.19664	0.12065	0.2993	0.21346	0.15777	0.15835	0.05568	0.05394	0.41647	0.41647	1
054M	0.17931	0.18048	0.11817	0.12228	0.11346	0.1117	0.22105	0.12404	0.28571	0.23692	0.16108	0.15755	0.04762	0.05409	0.44092	0.44268	1
056M	0.17555	0.18656	0.13847	0.12978	0.09849	0.08749	0.21437	0.11703	0.29432	0.219	0.14311	0.14426	0.04983	0.04925	0.44264	0.44322	1
062M	0.19527	0.19588	0.13099	0.13645	0.08611	0.08551	0.2268	0.15343	0.32383	0.23105	0.13705	0.1413	0.05276	0.05579	0.42693	0.42632	1
066M	0.16537	0.17134	0.13493	0.13254	0.1009	0.11104	0.24	0.13433	0.27881	0.21672	0.14925	0.14985	0.04657	0.04776	0.42687	0.42448	1
068M	0.17609	0.18134	0.1277	0.12653	0.11079	0.10612	0.22332	0.13294	0.27289	0.22216	0.15277	0.15335	0.05364	0.04781	0.41749	0.41691	1

070M	0.18187	0.19852	0.11714	0.10049	0.11899	0.11282	0.24106	0.14427	0.30456	0.2312	0.15166	0.15413	0.05302	0.05549	0.41369	0.41369	1
077M	0.18835	0.19129	0.13891	0.13302	0.10124	0.10418	0.24426	0.1289	0.29076	0.22837	0.14715	0.15539	0.04532	0.04532	0.44673	0.44556	1
086M	0.17077	0.17192	0.12665	0.12378	0.09112	0.09341	0.2212	0.13066	0.26877	0.21834	0.14441	0.14441	0.04355	0.04986	0.41719	0.41777	1
091M	0.18566	0.18623	0.13476	0.13418	0.10468	0.10295	0.22152	0.13245	0.28224	0.24349	0.15905	0.15905	0.04511	0.04164	0.43088	0.43493	1
094M	0.18588	0.18394	0.13941	0.14176	0.08471	0.08706	0.20118	0.12235	0.29647	0.21059	0.15118	0.15235	0.04824	0.04529	0.42353	0.42353	1
095M	0.1897	0.19145	0.12939	0.12763	0.09485	0.08372	0.23302	0.12939	0.28864	0.2459	0.15398	0.1534	0.05152	0.05094	0.41569	0.41862	1
097M	0.17857	0.18027	0.14456	0.14172	0.10601	0.10317	0.21088	0.12868	0.31746	0.2449	0.1593	0.15703	0.04478	0.04819	0.4246	0.428	1
001MD	0.19953	0.20887	0.11027	0.10677	0.08576	0.07935	0.24154	0.13536	0.32439	0.20595	0.15986	0.16861	0.05484	0.05601	0.41424	0.41482	1
003MD	0.15587	0.15587	0.13181	0.12665	0.09112	0.09054	0.22063	0.13582	0.26762	0.25845	0.16791	0.16619	0.05616	0.05215	0.44126	0.44298	1
004MD	0.17845	0.17613	0.13557	0.13036	0.1095	0.11298	0.23754	0.12167	0.30012	0.2387	0.17323	0.17787	0.05852	0.05968	0.45539	0.45423	1
008MD	0.19103	0.18637	0.13512	0.14036	0.08328	0.08911	0.22248	0.13046	0.28829	0.22365	0.15783	0.159	0.05649	0.05358	0.45836	0.4636	1
010MD	0.17381	0.16981	0.13379	0.12521	0.08119	0.08119	0.20869	0.13551	0.27902	0.22756	0.15609	0.15495	0.05203	0.04917	0.43053	0.43053	1
011MD	0.17523	0.17352	0.12614	0.12728	0.09132	0.09189	0.22374	0.13527	0.30137	0.21918	0.15811	0.15982	0.05365	0.05479	0.40183	0.40411	1
012MD	0.17341	0.17225	0.12832	0.12948	0.07861	0.08208	0.20636	0.12486	0.25434	0.21214	0.1578	0.15838	0.04798	0.05087	0.45087	0.45145	1
013MD	0.17761	0.1694	0.12544	0.12661	0.11254	0.09965	0.21981	0.13892	0.31829	0.2245	0.16764	0.16882	0.05744	0.05744	0.40856	0.41208	1
014MD	0.17753	0.17695	0.1362	0.13388	0.1007	0.09895	0.20198	0.14203	0.26426	0.22817	0.16764	0.16705	0.05646	0.0553	0.43481	0.43364	1
015MD	0.17419	0.17188	0.13252	0.12789	0.10301	0.08507	0.20081	0.1412	0.28993	0.23553	0.15741	0.16262	0.05035	0.05498	0.45891	0.46123	1
016MD	0.17061	0.1683	0.12968	0.12795	0.083	0.08415	0.21153	0.13718	0.31816	0.22075	0.16369	0.16311	0.05764	0.05764	0.40173	0.40173	1
018MD	0.1688	0.17288	0.13679	0.13737	0.10652	0.09604	0.22701	0.14377	0.30792	0.23865	0.13038	0.14144	0.04598	0.04715	0.39988	0.39697	1
019MD	0.18605	0.19709	0.12733	0.1157	0.09535	0.09651	0.22849	0.12849	0.30349	0.21279	0.15814	0.15872	0.05291	0.05465	0.44709	0.44942	1
024MD	0.1763	0.17805	0.14302	0.14069	0.07356	0.09924	0.216	0.14244	0.29364	0.24752	0.17104	0.17104	0.05838	0.06013	0.44075	0.439	1
027MD	0.17606	0.17261	0.12428	0.12198	0.10932	0.11047	0.22842	0.13751	0.26697	0.21116	0.16398	0.16283	0.05524	0.05581	0.43556	0.43613	1
028MD	0.17164	0.16762	0.13146	0.12801	0.08668	0.0907	0.19575	0.13031	0.25029	0.22847	0.16303	0.16533	0.05454	0.05626	0.46785	0.46728	1
029MD	0.17371	0.18008	0.11754	0.11639	0.09728	0.09438	0.21367	0.1546	0.28315	0.24667	0.1575	0.16097	0.05038	0.05501	0.42444	0.42675	1
032MD	0.16193	0.16599	0.12943	0.12536	0.07313	0.08416	0.22113	0.12594	0.28671	0.25015	0.15438	0.15612	0.05398	0.05398	0.4231	0.42484	1
033MD	0.17182	0.17468	0.12371	0.12486	0.08076	0.07789	0.23253	0.13288	0.27549	0.22566	0.16438	0.16552	0.05785	0.05498	0.43242	0.43356	1
037MD	0.18166	0.18166	0.13169	0.13051	0.09465	0.08995	0.22046	0.13698	0.30629	0.2522	0.1552	0.15168	0.04409	0.04644	0.42152	0.41858	1
041MD	0.1684	0.17647	0.12745	0.11592	0.0842	0.08535	0.25087	0.16667	0.29873	0.25894	0.17013	0.17243	0.05767	0.05882	0.38927	0.39043	1
015CSM	0.184	0.18575	0.14252	0.13435	0.10923	0.11215	0.1986	0.14953	0.2722	0.22722	0.15946	0.16472	0.05841	0.05549	0.41881	0.41881	1
023CSF	0.18401	0.18459	0.13514	0.12996	0.08856	0.09833	0.21967	0.13226	0.28637	0.22657	0.15009	0.15181	0.05463	0.05578	0.46233	0.46118	1

025CSF	0.18353	0.18754	0.13265	0.11664	0.09605	0.10006	0.24014	0.16066	0.31504	0.24471	0.16695	0.16638	0.05946	0.06404	0.44082	0.43968	1
029CSM	0.17863	0.17576	0.12407	0.12636	0.08845	0.08616	0.19414	0.13441	0.28891	0.22975	0.14474	0.15164	0.04825	0.05169	0.417	0.41643	1
002SF	0.17343	0.17754	0.13639	0.13345	0.08466	0.08583	0.23045	0.14168	0.29218	0.23516	0.15991	0.15755	0.06114	0.05761	0.48383	0.48383	1
004SF	0.18315	0.18034	0.13258	0.12528	0.09775	0.1	0.21348	0.13202	0.31292	0.21517	0.16067	0.15562	0.05787	0.05562	0.45	0.45	1
005SF	0.18718	0.18662	0.12254	0.12648	0.08938	0.08713	0.21023	0.13828	0.23215	0.30185	0.15121	0.15627	0.05171	0.04441	0.44857	0.44913	1
007SF	0.18796	0.19421	0.12947	0.12436	0.0795	0.08348	0.22828	0.13345	0.28166	0.22544	0.15332	0.15162	0.05565	0.05792	0.46792	0.46848	1
012SF	0.16601	0.16431	0.12805	0.12861	0.10085	0.10368	0.22266	0.13824	0.29462	0.2085	0.15524	0.15297	0.05609	0.05552	0.43286	0.43286	1
015SM	0.18016	0.18244	0.13512	0.13227	0.09521	0.08723	0.20068	0.12372	0.30217	0.21779	0.15165	0.15792	0.05245	0.0553	0.4293	0.42987	1
017SF	0.17243	0.17357	0.11117	0.11458	0.09246	0.09416	0.25241	0.13783	0.2768	0.20533	0.15485	0.15939	0.05786	0.05786	0.43846	0.43789	1
019SF	0.1698	0.17892	0.1265	0.12536	0.09288	0.09402	0.19715	0.14644	0.29516	0.22165	0.15157	0.15043	0.049	0.05356	0.45242	0.45242	1
020SF	0.18504	0.19303	0.12736	0.12222	0.10623	0.09823	0.20103	0.13021	0.30211	0.22444	0.14506	0.15363	0.05311	0.05368	0.46088	0.46031	1
021SF	0.19815	0.19583	0.13152	0.13152	0.10834	0.10255	0.23059	0.13905	0.30823	0.22711	0.15991	0.15933	0.0562	0.05852	0.47103	0.47103	1
023SM	0.18085	0.18794	0.1247	0.12293	0.07801	0.08156	0.23877	0.14894	0.29728	0.24173	0.15957	0.16903	0.05792	0.05615	0.42317	0.41903	1
024SF	0.17309	0.17136	0.13859	0.13053	0.09776	0.09603	0.23232	0.14664	0.32375	0.23577	0.15699	0.15871	0.05865	0.05808	0.45371	0.45371	1
026SF	0.18035	0.18208	0.1341	0.13064	0.09884	0.09306	0.22775	0.13757	0.3	0.2185	0.1526	0.15954	0.05434	0.05665	0.45376	0.45491	1
041SF	0.17044	0.16761	0.11948	0.12967	0.10646	0.10079	0.20838	0.1342	0.29162	0.21914	0.15459	0.15289	0.0521	0.05266	0.46376	0.46376	1
042SF	0.19017	0.18671	0.12543	0.12832	0.08728	0.09769	0.22543	0.14335	0.2896	0.22775	0.15607	0.15665	0.05607	0.05665	0.46243	0.46127	1
044SF	0.17069	0.17471	0.12989	0.12586	0.08391	0.08851	0.21034	0.12701	0.27471	0.21149	0.15747	0.15805	0.05805	0.05747	0.4431	0.44253	1
055SF	0.17507	0.17739	0.13043	0.13507	0.09681	0.09449	0.22087	0.12348	0.31536	0.21449	0.16	0.16232	0.05681	0.05797	0.43652	0.4371	1
058SM	0.17793	0.17504	0.12825	0.12421	0.0959	0.08897	0.21953	0.14731	0.28423	0.21722	0.1554	0.16753	0.06239	0.06008	0.42172	0.41826	1
059SM	0.1955	0.18454	0.12284	0.12399	0.07843	0.07785	0.22261	0.12053	0.32007	0.23183	0.15398	0.1511	0.05652	0.05421	0.42676	0.42734	1
062SM	0.18916	0.18916	0.12341	0.12457	0.08016	0.07901	0.23818	0.15167	0.29239	0.22088	0.17186	0.17532	0.06171	0.05998	0.40081	0.40023	1
064SM	0.17749	0.17169	0.12703	0.12239	0.08875	0.09745	0.23144	0.14617	0.27726	0.2471	0.16241	0.16241	0.05626	0.05916	0.41821	0.41705	1
068SM	0.18335	0.17928	0.12631	0.12456	0.11118	0.11059	0.23283	0.13038	0.3248	0.24272	0.15832	0.15367	0.06054	0.05646	0.41735	0.41444	1
069SM	0.17883	0.18336	0.12111	0.11432	0.09225	0.09281	0.22354	0.1296	0.30843	0.22694	0.17148	0.16242	0.05829	0.05093	0.41822	0.41822	1
070SM	0.17708	0.18171	0.12674	0.11748	0.0897	0.10185	0.23032	0.12847	0.29282	0.24016	0.16782	0.16493	0.06192	0.06134	0.41435	0.41146	1
071SM	0.19953	0.19137	0.11844	0.11727	0.11435	0.11669	0.23221	0.13827	0.33256	0.23337	0.16978	0.17386	0.06418	0.06068	0.42007	0.41774	1
072SM	0.17952	0.17894	0.13464	0.13349	0.09954	0.10184	0.21692	0.13521	0.29459	0.2267	0.15823	0.16053	0.06674	0.05926	0.43096	0.42923	1
075SM	0.1695	0.16893	0.11508	0.11281	0.09807	0.10601	0.20522	0.13209	0.26927	0.21769	0.16213	0.14229	0.05952	0.06009	0.42687	0.42744	1
077SM	0.17931	0.18636	0.14286	0.12875	0.10347	0.10229	0.2328	0.13051	0.31335	0.22222	0.17284	0.17343	0.05938	0.06173	0.43034	0.42857	1

078SM	0.20609	0.20258	0.12119	0.11651	0.11651	0.12061	0.23536	0.13817	0.29625	0.2377	0.17799	0.18208	0.06382	0.06382	0.43384	0.43208	1
080SM	0.19129	0.18187	0.13714	0.13773	0.103	0.10536	0.22543	0.13243	0.28723	0.23249	0.1548	0.15715	0.05297	0.05415	0.42966	0.42613	1
081SM	0.17332	0.18301	0.12258	0.12372	0.10889	0.10832	0.23147	0.14139	0.30958	0.22748	0.16876	0.16078	0.06043	0.05986	0.39909	0.39966	1
082SM	0.18054	0.18757	0.13775	0.13189	0.09261	0.08617	0.22098	0.13365	0.30246	0.2626	0.16002	0.16882	0.06155	0.05627	0.43083	0.43025	1
083SM	0.18108	0.18224	0.12362	0.12885	0.10331	0.09983	0.2368	0.14393	0.30412	0.24202	0.16773	0.16715	0.065	0.0592	0.40801	0.40569	1
084SM	0.18798	0.18798	0.14039	0.12909	0.11065	0.12195	0.21654	0.12612	0.27365	0.21654	0.14872	0.1511	0.05949	0.0583	0.45449	0.45211	1
088SM	0.1654	0.1806	0.13735	0.11806	0.10637	0.10228	0.23086	0.14436	0.27703	0.2443	0.16072	0.16365	0.05845	0.05728	0.42373	0.42198	1
089SM	0.1914	0.18492	0.12544	0.13015	0.1013	0.09364	0.21143	0.1278	0.30094	0.21967	0.14782	0.15018	0.05948	0.05241	0.45701	0.45642	1
090SM	0.17903	0.17609	0.12544	0.12309	0.09482	0.08834	0.2391	0.13251	0.30506	0.23734	0.15724	0.1702	0.05595	0.05771	0.41402	0.41225	1
093SF	0.18261	0.18611	0.12544	0.12485	0.09918	0.08985	0.27071	0.13361	0.31214	0.22695	0.15694	0.15636	0.05834	0.05718	0.45741	0.45274	1
094SM	0.18559	0.17176	0.11758	0.12795	0.11009	0.11239	0.23573	0.1389	0.32046	0.2415	0.15447	0.17522	0.06225	0.06398	0.42594	0.42248	1
096SF	0.17555	0.17961	0.11935	0.11761	0.0956	0.09038	0.23581	0.14079	0.29548	0.20857	0.15469	0.15469	0.05504	0.05562	0.43801	0.43801	1
101SM	0.18725	0.19362	0.12986	0.12928	0.09971	0.09507	0.22377	0.12464	0.32	0.23246	0.16754	0.16986	0.06145	0.05391	0.42957	0.42551	1
104SF	0.1815	0.17803	0.11329	0.12023	0.10983	0.10405	0.25318	0.12601	0.29653	0.23584	0.16647	0.16243	0.0578	0.05954	0.42775	0.42775	1
105SF	0.17245	0.18069	0.12419	0.11418	0.10241	0.10948	0.24367	0.14067	0.31077	0.22719	0.15833	0.16363	0.05945	0.05827	0.44144	0.44144	1
106SM	0.17955	0.17955	0.11447	0.11447	0.10517	0.10052	0.22313	0.12493	0.28646	0.23068	0.17664	0.1656	0.06159	0.05927	0.41778	0.41778	1
107SM	0.17907	0.175	0.12209	0.11977	0.10058	0.10581	0.24477	0.1186	0.34884	0.2343	0.15988	0.16047	0.05756	0.05349	0.40523	0.40407	1
108SF	0.17274	0.17274	0.11222	0.11457	0.09871	0.104	0.2309	0.15335	0.29142	0.23384	0.15805	0.1604	0.05582	0.05758	0.45006	0.44947	1
109SF	0.18529	0.17412	0.12294	0.13	0.11471	0.10471	0.22706	0.13588	0.30294	0.22059	0.14235	0.15176	0.05765	0.05647	0.45235	0.45059	1
110SF	0.18857	0.18562	0.13318	0.12021	0.099	0.11137	0.24985	0.13848	0.31821	0.22098	0.16618	0.16382	0.05893	0.05952	0.44196	0.44196	1
111SM	0.19617	0.19849	0.13175	0.12304	0.0975	0.10447	0.21706	0.12768	0.28207	0.23796	0.16309	0.16367	0.05978	0.05572	0.43413	0.43529	1
112SM	0.17267	0.17791	0.12326	0.11919	0.1064	0.11163	0.20814	0.15	0.29593	0.23198	0.14302	0.15814	0.05233	0.05291	0.42209	0.42326	1
114SM	0.17014	0.18692	0.13021	0.12037	0.10995	0.09201	0.21875	0.13657	0.30787	0.23322	0.16435	0.15162	0.05671	0.0544	0.41204	0.41319	1
133SF	0.1775	0.18652	0.15042	0.14079	0.08363	0.06919	0.21841	0.14801	0.29182	0.21721	0.15824	0.16245	0.05957	0.05716	0.46631	0.46631	1
134SM	0.16494	0.16494	0.12111	0.11822	0.0917	0.08766	0.21915	0.13899	0.26817	0.21799	0.1511	0.16436	0.05882	0.05767	0.38754	0.38466	1
144SF	0.17304	0.17775	0.13125	0.13125	0.08711	0.08358	0.24132	0.1442	0.28487	0.21719	0.16304	0.16657	0.06298	0.06121	0.4226	0.42201	1
178SM	0.18622	0.18389	0.13602	0.13252	0.09866	0.10683	0.20899	0.14594	0.3596	0.2195	0.16579	0.16637	0.06188	0.06363	0.36486	0.36427	1
001CSF	0.1735	0.17743	0.12633	0.12914	0.09826	0.08759	0.21842	0.12577	0.27344	0.22066	0.14823	0.14935	0.05222	0.05615	0.46828	0.46884	1
002CSM	0.17756	0.177	0.1257	0.12627	0.09188	0.09639	0.21195	0.13867	0.29538	0.22773	0.15614	0.15445	0.05524	0.05299	0.43968	0.44138	1
003CSM	0.16723	0.16836	0.12218	0.12162	0.09178	0.09122	0.21903	0.1402	0.28266	0.24155	0.1661	0.16836	0.06194	0.06137	0.43412	0.43468	1

004CSM	0.17667	0.17782	0.13779	0.13551	0.09377	0.08233	0.21555	0.13665	0.28302	0.22127	0.15838	0.16123	0.0566	0.05775	0.45283	0.4534	1
005CSF	0.18104	0.17818	0.12222	0.1205	0.10337	0.0948	0.24272	0.14392	0.30554	0.23358	0.16162	0.16219	0.05711	0.05939	0.45688	0.45802	1
006CSM	0.17068	0.17124	0.11919	0.11919	0.09457	0.09961	0.20761	0.13151	0.33128	0.22776	0.15725	0.14326	0.05764	0.0554	0.40571	0.40683	1
007CSM	0.17306	0.17193	0.12007	0.11725	0.10316	0.10598	0.20688	0.13867	0.29312	0.21871	0.16347	0.16291	0.0575	0.05919	0.42277	0.42165	1
008CSM	0.18437	0.18662	0.12535	0.12816	0.09837	0.09949	0.24508	0.1439	0.31197	0.24115	0.14053	0.1647	0.06464	0.06521	0.41034	0.41484	1
009CSM	0.1808	0.17967	0.12858	0.12577	0.09545	0.10331	0.21056	0.13756	0.31387	0.23302	0.15272	0.1516	0.05559	0.05109	0.40427	0.40427	1
010CSM	0.17942	0.1766	0.12486	0.12823	0.08774	0.09111	0.20641	0.13273	0.29078	0.22947	0.15523	0.15917	0.05906	0.05906	0.42463	0.4252	1
011CSF	0.17853	0.18475	0.12316	0.11073	0.09492	0.0887	0.24407	0.15763	0.3096	0.21356	0.17119	0.17458	0.06328	0.06497	0.43164	0.4322	1
012CSM	0.17581	0.16909	0.11926	0.11478	0.09686	0.10078	0.20997	0.13494	0.29563	0.229	0.15845	0.15566	0.05655	0.05823	0.41265	0.41265	1
013CSF	0.19107	0.18711	0.13624	0.12606	0.09045	0.09101	0.23573	0.12889	0.28999	0.21142	0.15772	0.15319	0.05427	0.05596	0.46919	0.46863	1
014CSM	0.17416	0.17303	0.12584	0.1309	0.10674	0.10225	0.21798	0.14045	0.29494	0.2264	0.15337	0.15337	0.04944	0.05393	0.41236	0.41517	1
016CSF	0.18619	0.19015	0.1245	0.13356	0.10243	0.1013	0.23599	0.14318	0.28353	0.21279	0.16299	0.16412	0.05999	0.06112	0.47368	0.47368	1
017CSF	0.18115	0.18115	0.11512	0.11738	0.09312	0.09481	0.23533	0.14391	0.28781	0.21727	0.15971	0.15858	0.05869	0.05926	0.44752	0.44865	1
018CSF	0.18223	0.18166	0.12903	0.12733	0.09621	0.10243	0.25014	0.12847	0.2858	0.21732	0.15676	0.15563	0.05716	0.05886	0.46237	0.4618	1
019CSF	0.18346	0.19077	0.12043	0.11649	0.10974	0.11086	0.31064	0.13225	0.31964	0.2386	0.16151	0.16263	0.05853	0.06078	0.44401	0.44682	1
020CSM	0.18442	0.17545	0.11603	0.12164	0.0852	0.09361	0.2074	0.14854	0.30045	0.23543	0.16256	0.16256	0.0583	0.06054	0.4176	0.4176	1
021CSF	0.18715	0.18492	0.12514	0.12737	0.09777	0.09832	0.21788	0.1352	0.26927	0.2257	0.15866	0.16034	0.05475	0.05642	0.45587	0.45978	1
022CSF	0.18494	0.18775	0.12366	0.12142	0.09387	0.09725	0.24621	0.1276	0.31366	0.21417	0.14896	0.14784	0.05171	0.0534	0.45082	0.45306	1
024CSM	0.17384	0.17049	0.13527	0.12968	0.0967	0.10117	0.21688	0.12465	0.29011	0.22974	0.15148	0.15204	0.05925	0.05366	0.43153	0.43712	1
026CSF	0.18498	0.18666	0.11379	0.11996	0.10146	0.10258	0.27018	0.12892	0.31783	0.22197	0.16424	0.16143	0.05998	0.06054	0.44002	0.44283	1
027CSF	0.17743	0.17911	0.12296	0.12746	0.10949	0.105	0.23414	0.14093	0.2959	0.23077	0.16002	0.16395	0.05727	0.06008	0.45087	0.44806	1
028CSM	0.18694	0.183	0.13063	0.13345	0.10642	0.1036	0.22128	0.14358	0.31081	0.24268	0.15991	0.15991	0.05912	0.06025	0.42849	0.42962	1
030CSF	0.18299	0.18131	0.12703	0.12423	0.11528	0.11192	0.20761	0.13878	0.28316	0.23167	0.14829	0.15333	0.05148	0.0526	0.43928	0.43649	1
031CSF	0.18187	0.17962	0.12894	0.12331	0.08164	0.08446	0.21734	0.14189	0.27477	0.2089	0.15597	0.15597	0.05687	0.058	0.48255	0.48367	1
032CSF	0.17525	0.17413	0.12318	0.1215	0.09798	0.10134	0.21837	0.13158	0.27324	0.22676	0.16013	0.15901	0.05431	0.05375	0.45857	0.45745	1
001SF	0.18094	0.17584	0.12876	0.13159	0.11174	0.1072	0.23029	0.1333	0.30233	0.23539	0.15712	0.15598	0.05615	0.05502	0.46058	0.45718	1
003SM	0.17259	0.17879	0.1269	0.12408	0.10096	0.10321	0.20023	0.13536	0.28821	0.22955	0.15003	0.15116	0.05471	0.05415	0.42696	0.4264	1
006SF	0.1678	0.17177	0.12132	0.12188	0.09524	0.10204	0.22732	0.14909	0.29082	0.21655	0.15363	0.15703	0.05612	0.05726	0.45522	0.45522	1
008SF	0.1859	0.18874	0.13076	0.12337	0.10119	0.10802	0.22172	0.13189	0.28766	0.22229	0.15804	0.15634	0.05571	0.05628	0.47641	0.47356	1
009SM	0.19244	0.18849	0.12641	0.13036	0.08691	0.08973	0.21275	0.15858	0.2991	0.24492	0.14673	0.14391	0.0649	0.05756	0.40745	0.40688	1

010SM	0.19048	0.1922	0.13368	0.1354	0.0918	0.09007	0.20998	0.14515	0.33276	0.24039	0.16007	0.15089	0.06024	0.05852	0.4366	0.43546	1
011SF	0.17313	0.17257	0.11523	0.12029	0.10006	0.10399	0.27375	0.14221	0.31535	0.22091	0.15739	0.1647	0.06239	0.0579	0.44182	0.44295	1
013SF	0.19732	0.19844	0.12263	0.12319	0.09309	0.09142	0.22798	0.12709	0.2854	0.2107	0.13768	0.14437	0.05184	0.05184	0.48216	0.48216	1
014SF	0.17727	0.17784	0.12727	0.11705	0.0983	0.10909	0.2125	0.13977	0.28807	0.20795	0.15455	0.16705	0.05568	0.05682	0.46534	0.46534	1
016SF	0.18479	0.1769	0.12056	0.1369	0.08225	0.07831	0.21183	0.13408	0.27662	0.21803	0.15268	0.15324	0.05972	0.05859	0.46704	0.46873	1
018SF	0.18683	0.19415	0.13112	0.13393	0.09116	0.08554	0.22791	0.139	0.31851	0.20653	0.15138	0.15025	0.05796	0.05459	0.44513	0.44344	1
022SM	0.17159	0.18523	0.12443	0.11534	0.1	0.10398	0.21818	0.1267	0.30511	0.27045	0.16648	0.17045	0.0608	0.05682	0.39773	0.39432	1
025SF	0.18614	0.19416	0.12085	0.10997	0.0882	0.08591	0.24628	0.13402	0.31329	0.2268	0.15178	0.1575	0.05727	0.05613	0.42612	0.42383	1
027SM	0.1862	0.18957	0.13292	0.13348	0.08413	0.08525	0.25126	0.13629	0.33146	0.23219	0.16209	0.16377	0.06225	0.06113	0.39316	0.3954	1
028SM	0.16329	0.17286	0.11543	0.12106	0.08896	0.0839	0.25394	0.13457	0.30574	0.23029	0.14696	0.15766	0.05687	0.05687	0.42286	0.42117	1
029SM	0.15994	0.17269	0.13337	0.12009	0.09352	0.08502	0.21679	0.12912	0.28959	0.21785	0.1424	0.15303	0.0542	0.0526	0.40011	0.40011	1
030SF	0.17769	0.18274	0.13004	0.12108	0.10146	0.10146	0.25729	0.12276	0.2898	0.21917	0.15247	0.15415	0.05549	0.05269	0.46637	0.46525	1
031SF	0.17411	0.17746	0.13058	0.12388	0.09431	0.09766	0.25223	0.12612	0.30971	0.20759	0.1529	0.15513	0.05469	0.0558	0.44643	0.44308	1
032SF	0.18579	0.18523	0.13598	0.10464	0.09513	0.11584	0.24566	0.1343	0.32065	0.22608	0.15837	0.15277	0.06044	0.05708	0.43145	0.43089	1
033SF	0.17457	0.17011	0.13385	0.13385	0.08366	0.08087	0.2164	0.14501	0.30452	0.21472	0.15393	0.15505	0.05521	0.05521	0.44785	0.44674	1
034SF	0.17897	0.18289	0.11521	0.11353	0.08054	0.08166	0.29139	0.13143	0.32047	0.23266	0.16555	0.16107	0.05817	0.05537	0.44239	0.44072	1
035SM	0.17255	0.17479	0.12157	0.12213	0.10868	0.10924	0.20896	0.13782	0.22857	0.28291	0.16527	0.16415	0.05602	0.0577	0.44426	0.4437	1
036SF	0.18914	0.19138	0.12031	0.12087	0.10017	0.09569	0.25462	0.12311	0.3268	0.21265	0.1662	0.16228	0.05876	0.05708	0.44432	0.44432	1
037SM	0.17617	0.18568	0.12192	0.11689	0.0962	0.09172	0.22483	0.12864	0.30201	0.24273	0.14318	0.14989	0.05425	0.05481	0.41163	0.40996	1
038SM	0.17931	0.1765	0.13772	0.13097	0.08657	0.08094	0.20236	0.12985	0.28331	0.21079	0.15571	0.15571	0.05453	0.05396	0.45756	0.45756	1
039SF	0.17542	0.18156	0.12402	0.12235	0.09944	0.09721	0.2486	0.1352	0.2743	0.22849	0.15642	0.15587	0.05698	0.05587	0.45754	0.45754	1
040SM	0.17739	0.17963	0.14046	0.13095	0.08674	0.08898	0.22832	0.12815	0.27476	0.22999	0.15613	0.16228	0.0582	0.05932	0.43033	0.42809	1
043SF	0.18222	0.17775	0.13136	0.12745	0.09894	0.10006	0.21185	0.13639	0.26048	0.23197	0.15707	0.15707	0.05702	0.05813	0.46339	0.46395	1
046SM	0.20453	0.19943	0.11671	0.12861	0.10538	0.12861	0.11558	0.25269	0.12408	0.26516	0.15411	0.14334	0.05666	0.05439	0.4153	0.41643	1
047SM	0.17152	0.17769	0.1278	0.12612	0.1065	0.10258	0.24383	0.14518	0.29765	0.23711	0.15863	0.15527	0.06334	0.05661	0.39966	0.39854	1
048SM	0.18304	0.1981	0.1317	0.11942	0.09821	0.0971	0.23661	0.13225	0.31473	0.22433	0.17076	0.18192	0.05971	0.06194	0.40067	0.4029	1
049SF	0.18655	0.17927	0.13221	0.13389	0.08179	0.08403	0.32101	0.12101	0.32437	0.24538	0.17367	0.17815	0.06331	0.05994	0.44202	0.44314	1
050SM	0.18406	0.18013	0.12851	0.12458	0.09877	0.1055	0.20875	0.13468	0.31033	0.20314	0.1633	0.15937	0.05724	0.05612	0.41919	0.41919	1
051SF	0.17917	0.18701	0.12318	0.11814	0.1047	0.10526	0.24188	0.13102	0.31579	0.20269	0.16125	0.16013	0.05879	0.06047	0.41545	0.41713	1
052SM	0.18477	0.19037	0.13214	0.13662	0.0963	0.09518	0.23964	0.1383	0.30179	0.23684	0.15789	0.15566	0.06047	0.05935	0.43673	0.43785	1

053SM	0.18187	0.17907	0.12311	0.12815	0.09681	0.09513	0.23839	0.13262	0.31617	0.24454	0.15053	0.15165	0.05484	0.05484	0.40851	0.4113	1
054SF	0.19549	0.19662	0.13972	0.13859	0.09972	0.09239	0.22254	0.12394	0.26085	0.21915	0.14761	0.14761	0.05127	0.05352	0.48	0.47831	1
056SM	0.16695	0.16583	0.12395	0.12339	0.10441	0.10329	0.23674	0.14461	0.30821	0.25014	0.15578	0.1608	0.05974	0.05751	0.41709	0.4182	1
057SF	0.18645	0.17917	0.12542	0.12654	0.0963	0.10526	0.26484	0.13158	0.31019	0.21781	0.16013	0.16293	0.06047	0.05935	0.43673	0.43225	1
060SF	0.19093	0.19317	0.12878	0.11534	0.09854	0.0963	0.24804	0.14334	0.29731	0.22844	0.16125	0.15901	0.06047	0.06103	0.44513	0.44457	1
061SF	0.1981	0.19586	0.12199	0.12423	0.09177	0.09961	0.25014	0.1427	0.27308	0.21768	0.15501	0.15389	0.0554	0.05596	0.47006	0.46838	1
063SF	0.18872	0.18816	0.12563	0.1139	0.09994	0.09939	0.27694	0.14517	0.31379	0.23674	0.16806	0.15969	0.06421	0.05751	0.43495	0.43104	1
065SF	0.18295	0.17674	0.11801	0.11914	0.10728	0.10728	0.23038	0.13156	0.28402	0.21739	0.15302	0.15528	0.05477	0.04969	0.4489	0.44608	1
066SF	0.18855	0.18743	0.12682	0.12514	0.09708	0.09989	0.23457	0.1358	0.31201	0.22222	0.16105	0.16105	0.05668	0.06004	0.43771	0.43771	1
067SF	0.18824	0.18375	0.11933	0.11541	0.11204	0.10644	0.22913	0.12829	0.307	0.22353	0.16695	0.16807	0.05994	0.0577	0.45378	0.45378	1
073SF	0.16657	0.1649	0.13918	0.1308	0.10006	0.09111	0.25266	0.1498	0.30408	0.22694	0.15875	0.15484	0.05198	0.0531	0.42594	0.42482	1
074SF	0.18442	0.1833	0.12444	0.1222	0.11883	0.1093	0.2343	0.13509	0.2926	0.22422	0.16031	0.15863	0.05942	0.05886	0.44731	0.44675	1
076SF	0.17496	0.18726	0.12968	0.12856	0.09726	0.10006	0.24315	0.13248	0.29402	0.22191	0.15707	0.15428	0.05757	0.05757	0.43767	0.43767	1
079SM	0.18035	0.1636	0.11669	0.12954	0.11167	0.10776	0.23283	0.13345	0.30821	0.244	0.14573	0.15745	0.05528	0.05807	0.41653	0.41653	1
085SF	0.18349	0.1807	0.13608	0.12549	0.09091	0.09593	0.23536	0.13385	0.28779	0.23201	0.15561	0.15505	0.05466	0.05354	0.44674	0.4473	1
086SF	0.17255	0.1619	0.12437	0.12605	0.10252	0.10644	0.24034	0.14118	0.29076	0.22185	0.16022	0.16022	0.05826	0.05826	0.4465	0.4465	1
087SF	0.17077	0.16405	0.1215	0.12766	0.10582	0.10414	0.24916	0.13606	0.31411	0.2374	0.16237	0.16853	0.05991	0.06271	0.42049	0.42049	1
091SM	0.17673	0.18345	0.13255	0.12528	0.09955	0.10235	0.22092	0.13143	0.31432	0.23937	0.15716	0.16219	0.0604	0.05817	0.40436	0.40101	1
092SF	0.19095	0.19486	0.12284	0.12563	0.09548	0.08766	0.2507	0.13512	0.30486	0.22725	0.15634	0.16136	0.05974	0.05304	0.43663	0.43439	1
095SM	0.18248	0.18024	0.1297	0.12914	0.09377	0.10051	0.23695	0.12633	0.29029	0.2347	0.15834	0.15946	0.05446	0.05615	0.43908	0.43683	1
097SF	0.17801	0.17969	0.11886	0.12165	0.09766	0.101	0.24107	0.13114	0.28683	0.22042	0.14955	0.14118	0.05357	0.04743	0.44085	0.43806	1
098SF	0.18417	0.17967	0.12746	0.12633	0.10163	0.09994	0.24761	0.14093	0.31106	0.22852	0.15553	0.15553	0.05503	0.05559	0.42448	0.42055	1
099SM	0.1743	0.17877	0.13631	0.13743	0.11006	0.10503	0.23184	0.11732	0.2933	0.24413	0.15698	0.15419	0.0514	0.05587	0.42961	0.42682	1
100SM	0.17624	0.17289	0.13999	0.13385	0.09314	0.09202	0.1913	0.14445	0.30452	0.22867	0.15059	0.15505	0.05577	0.05521	0.40825	0.40547	1
102SF	0.18792	0.19016	0.13031	0.12528	0.09955	0.10962	0.26119	0.13367	0.29642	0.24497	0.15828	0.15996	0.05817	0.05705	0.46477	0.46477	1
103SF	0.17601	0.17769	0.12388	0.12556	0.10426	0.09978	0.23262	0.13565	0.30942	0.22926	0.15415	0.15135	0.0583	0.05661	0.44283	0.4417	1
115SF	0.19373	0.19709	0.11926	0.11702	0.10694	0.10358	0.2542	0.12598	0.27996	0.22564	0.16293	0.16461	0.05991	0.06607	0.46025	0.46081	1
116SF	0.17972	0.18254	0.13127	0.12451	0.10197	0.10028	0.23493	0.13014	0.30479	0.21408	0.16676	0.15493	0.05521	0.05014	0.43887	0.43887	1
117SF	0.18732	0.17667	0.12058	0.12675	0.10432	0.10768	0.21425	0.13741	0.29277	0.22602	0.1475	0.14975	0.05609	0.05665	0.45822	0.45766	1
118SM	0.17172	0.17508	0.12514	0.11448	0.09933	0.10213	0.1936	0.13019	0.29686	0.22222	0.16274	0.16049	0.05556	0.05499	0.43434	0.43378	1

119SM	0.18268	0.19274	0.1162	0.11006	0.09274	0.10726	0.2095	0.12402	0.29777	0.22961	0.16034	0.1581	0.05587	0.05531	0.44302	0.44246	1
120SM	0.18375	0.18936	0.13221	0.12437	0.09748	0.10308	0.22577	0.12941	0.28796	0.24314	0.16863	0.16415	0.0605	0.05882	0.43529	0.43529	1
121SM	0.18687	0.19132	0.12403	0.10623	0.10234	0.10679	0.23248	0.13682	0.26418	0.25417	0.16296	0.15962	0.05895	0.05784	0.42269	0.42436	1
122SF	0.17923	0.17141	0.12451	0.12339	0.09548	0.09604	0.23897	0.12842	0.29481	0.22948	0.14629	0.15466	0.05528	0.05583	0.43551	0.43607	1
123SF	0.2028	0.19496	0.10588	0.10924	0.10644	0.11261	0.24258	0.13894	0.30812	0.22689	0.16359	0.16134	0.05882	0.05938	0.43361	0.43417	1
124SF	0.19328	0.18543	0.12549	0.12885	0.09468	0.09804	0.23866	0.13613	0.32101	0.22185	0.17087	0.16807	0.06162	0.05826	0.4465	0.44482	1
125SM	0.18304	0.18862	0.13337	0.12333	0.08761	0.08817	0.20815	0.12946	0.29855	0.23605	0.15792	0.15569	0.06306	0.05413	0.42076	0.42188	1
126SF	0.18029	0.17581	0.1159	0.1131	0.10414	0.1019	0.22676	0.14054	0.29395	0.20885	0.15342	0.15118	0.05711	0.05599	0.45745	0.45633	1
127SF	0.18933	0.18427	0.11067	0.1191	0.08876	0.08933	0.24888	0.14382	0.30056	0.21011	0.16461	0.15618	0.05787	0.05899	0.45955	0.4618	1
128SF	0.19072	0.19239	0.11969	0.12472	0.09452	0.07494	0.26454	0.15101	0.32718	0.24497	0.1689	0.17002	0.06096	0.06208	0.42394	0.42506	1
129SF	0.18516	0.18238	0.11712	0.11824	0.11099	0.10262	0.26715	0.12047	0.33017	0.23424	0.17011	0.17959	0.06191	0.06023	0.43837	0.4367	1
130SM	0.17817	0.17483	0.13252	0.11915	0.09521	0.10468	0.21604	0.13085	0.28786	0.23107	0.15813	0.15367	0.05679	0.05735	0.44488	0.44599	1
131SM	0.18533	0.19597	0.1243	0.09966	0.1047	0.10862	0.25924	0.13494	0.31075	0.243	0.16853	0.15398	0.06215	0.05599	0.40649	0.4009	1
132SM	0.18116	0.18957	0.11946	0.11385	0.10712	0.10432	0.21425	0.12731	0.28716	0.25967	0.15592	0.15984	0.05833	0.05945	0.41167	0.41167	1
135SF	0.18035	0.18314	0.12619	0.12116	0.09604	0.09436	0.22781	0.13903	0.29369	0.21776	0.1541	0.15522	0.05528	0.05918	0.43998	0.43942	1
136SF	0.19609	0.18715	0.11285	0.11899	0.11844	0.11006	0.24525	0.13911	0.31229	0.23296	0.15642	0.15475	0.05251	0.05196	0.44413	0.44413	1
137SF	0.17871	0.17815	0.12829	0.11429	0.1042	0.10756	0.26218	0.14846	0.31821	0.25994	0.18207	0.17591	0.06387	0.06555	0.40728	0.40616	1
138SM	0.17076	0.18527	0.12054	0.10547	0.10658	0.10603	0.21875	0.10491	0.28739	0.21819	0.16518	0.15346	0.05971	0.06027	0.41853	0.41797	1
139SM	0.18248	0.18806	0.11049	0.11049	0.10435	0.10379	0.2327	0.14621	0.30469	0.22935	0.16741	0.1635	0.05915	0.06194	0.40067	0.39621	1
140SM	0.17095	0.17151	0.13296	0.1324	0.10391	0.10279	0.23296	0.14022	0.31732	0.24581	0.16313	0.16201	0.05978	0.05922	0.42067	0.42179	1
141SM	0.19106	0.18715	0.14134	0.1352	0.12011	0.11732	0.2	0.13073	0.2933	0.23687	0.16872	0.16872	0.05642	0.05922	0.43966	0.44078	1
143SF	0.16825	0.16937	0.12633	0.12577	0.10229	0.09726	0.21576	0.14869	0.27278	0.2085	0.16098	0.1621	0.05869	0.05869	0.46451	0.46227	1
145SM	0.17076	0.17801	0.12723	0.12723	0.11161	0.09989	0.21038	0.13337	0.27679	0.22098	0.16406	0.16406	0.05859	0.05748	0.44643	0.44475	1
146SM	0.16927	0.17263	0.13296	0.13128	0.09721	0.10168	0.22961	0.13408	0.31564	0.23184	0.15754	0.15698	0.05866	0.06145	0.43296	0.43352	1
147SM	0.17549	0.17716	0.11866	0.11922	0.10474	0.11198	0.24457	0.15042	0.30139	0.26462	0.16156	0.16323	0.06184	0.05905	0.38886	0.38942	1
148SM	0.17933	0.19609	0.14246	0.12235	0.09441	0.09777	0.22067	0.1324	0.27207	0.25978	0.15307	0.1581	0.05866	0.05866	0.43128	0.43017	1
149SF	0.19061	0.18893	0.11068	0.109	0.10509	0.10006	0.24483	0.13974	0.30632	0.24203	0.17552	0.17384	0.0626	0.0626	0.40973	0.40805	1
150SF	0.19451	0.20348	0.10874	0.09529	0.10818	0.1037	0.25953	0.14686	0.28195	0.21861	0.16031	0.16424	0.05942	0.05942	0.44731	0.44507	1
152SF	0.17338	0.16611	0.12081	0.13255	0.09452	0.08949	0.21868	0.13535	0.29698	0.21309	0.15213	0.15101	0.05425	0.05537	0.46085	0.46197	1
153SF	0.18151	0.18431	0.12101	0.12045	0.08571	0.07843	0.30028	0.14678	0.33501	0.23585	0.16639	0.16751	0.05994	0.06162	0.4028	0.40224	1

154SM	0.18415	0.18359	0.13839	0.13951	0.10658	0.10045	0.20424	0.12891	0.31529	0.23884	0.1635	0.16127	0.05469	0.05915	0.42243	0.42132	1
155SM	0.18025	0.1808	0.12946	0.12054	0.09431	0.09766	0.23382	0.13002	0.33371	0.23438	0.15625	0.15792	0.05748	0.0558	0.40792	0.40513	1
156SF	0.18827	0.18268	0.12179	0.11341	0.09832	0.09553	0.27933	0.16201	0.29832	0.22514	0.16872	0.16872	0.06257	0.05587	0.43966	0.43631	1
157SM	0.18914	0.18131	0.11584	0.11472	0.10409	0.10297	0.24287	0.13654	0.31337	0.24287	0.15669	0.15557	0.05932	0.061	0.41802	0.4141	1
158SF	0.17257	0.18269	0.13491	0.13097	0.1068	0.10512	0.2434	0.13884	0.29961	0.22878	0.15627	0.17088	0.06183	0.05453	0.43564	0.43564	1
159SF	0.19183	0.19519	0.11913	0.09732	0.11465	0.11577	0.26286	0.13535	0.3132	0.23546	0.15996	0.17338	0.0632	0.06264	0.42282	0.42338	1
160SM	0.19496	0.1916	0.10252	0.107	0.08964	0.08291	0.23249	0.15238	0.3098	0.24874	0.16471	0.17031	0.0605	0.05882	0.40616	0.40616	1
161SM	0.17871	0.17143	0.11877	0.12829	0.10588	0.10084	0.23754	0.11429	0.30364	0.22353	0.16303	0.16078	0.0605	0.05658	0.40784	0.40784	1
162SM	0.18462	0.18238	0.12065	0.12514	0.10718	0.09989	0.2284	0.13468	0.29125	0.23345	0.156	0.16835	0.05948	0.05892	0.4119	0.41526	1
163SM	0.19441	0.19106	0.12291	0.11844	0.08492	0.08212	0.22682	0.14469	0.2905	0.2162	0.1514	0.15084	0.05754	0.05587	0.41285	0.41508	1
164SM	0.1649	0.17216	0.12465	0.11683	0.09838	0.09335	0.22191	0.12856	0.32253	0.26383	0.16434	0.16825	0.06037	0.05981	0.42705	0.4265	1
165SM	0.17739	0.17739	0.14326	0.1427	0.0901	0.10073	0.21824	0.13262	0.30778	0.22888	0.14605	0.14717	0.05428	0.05484	0.42697	0.42641	1
166SF	0.16713	0.17496	0.13527	0.13136	0.09894	0.09055	0.24427	0.1308	0.26663	0.24036	0.15372	0.15484	0.05702	0.05534	0.47401	0.47513	1
167SM	0.17999	0.17831	0.12465	0.12856	0.09726	0.09391	0.21017	0.14925	0.29905	0.23477	0.1498	0.15316	0.05422	0.05478	0.44326	0.4455	1
168SM	0.20011	0.20235	0.13695	0.13248	0.10006	0.10173	0.22582	0.13639	0.34489	0.24818	0.16937	0.17328	0.06093	0.05757	0.41084	0.41252	1
169SM	0.16983	0.17263	0.11899	0.12123	0.10559	0.10447	0.23799	0.14246	0.29497	0.24413	0.1676	0.16369	0.06257	0.05922	0.42402	0.42458	1
170SF	0.16248	0.1675	0.13289	0.1273	0.08989	0.08654	0.2306	0.13735	0.25516	0.2239	0.14517	0.15187	0.05583	0.05528	0.46566	0.46566	1
171SF	0.20659	0.20938	0.10999	0.10609	0.09269	0.09994	0.28197	0.13456	0.31491	0.24679	0.17085	0.17197	0.0603	0.06142	0.43886	0.43886	1
172SF	0.18106	0.18329	0.12368	0.12758	0.10418	0.10028	0.24011	0.13092	0.27187	0.21894	0.15432	0.1571	0.05515	0.05571	0.45014	0.44791	1
173SF	0.17673	0.17282	0.12528	0.12864	0.10682	0.10179	0.24441	0.12472	0.31935	0.24049	0.15492	0.15548	0.05537	0.05593	0.44183	0.44128	1
174SM	0.18502	0.18614	0.13304	0.13248	0.10844	0.10565	0.2152	0.12186	0.3052	0.24315	0.16378	0.16546	0.05869	0.05757	0.45333	0.45221	1
175SM	0.18324	0.18436	0.12514	0.12458	0.08268	0.07765	0.24637	0.1352	0.30838	0.25084	0.15587	0.14302	0.05922	0.0581	0.41676	0.41564	1
176SF	0.16844	0.15725	0.12535	0.11919	0.08506	0.07834	0.20873	0.14326	0.29155	0.23447	0.16004	0.14997	0.05988	0.06156	0.45719	0.45663	1
177SM	0.17775	0.16378	0.11571	0.12018	0.10229	0.10341	0.24259	0.12409	0.30967	0.24315	0.14533	0.15875	0.05813	0.05478	0.42035	0.41923	1
179SF	0.18523	0.18299	0.12927	0.13039	0.10073	0.09793	0.22496	0.13095	0.26581	0.20705	0.15613	0.15445	0.05428	0.0526	0.48965	0.49245	1
180SF	0.17476	0.17588	0.13065	0.13121	0.09659	0.09045	0.25349	0.13177	0.27471	0.22669	0.15075	0.1502	0.05472	0.0536	0.4718	0.47292	1
181SM	0.17265	0.17096	0.12108	0.12276	0.10482	0.09081	0.21244	0.1435	0.30381	0.2343	0.15471	0.16536	0.05605	0.05325	0.42152	0.42152	1
182SM	0.17513	0.17011	0.12772	0.12716	0.10151	0.10318	0.21863	0.12772	0.32125	0.21695	0.1517	0.15505	0.058	0.05521	0.42945	0.42945	1
183SF	0.19776	0.21176	0.13782	0.12325	0.09748	0.10028	0.28179	0.12997	0.33165	0.22633	0.1591	0.1619	0.06162	0.0605	0.44034	0.44034	1
184SM	0.17588	0.1703	0.13568	0.13065	0.07314	0.07705	0.20715	0.12116	0.27582	0.21776	0.15634	0.16248	0.05974	0.05807	0.43495	0.43495	1

185SF	0.1905	0.1905	0.12793	0.12235	0.09944	0.09888	0.26704	0.13687	0.2838	0.21788	0.15419	0.15307	0.05363	0.05363	0.46872	0.46816	1
186SF	0.2019	0.19016	0.10962	0.12696	0.09955	0.10626	0.30705	0.13143	0.29698	0.2377	0.16331	0.16275	0.05649	0.05761	0.43009	0.43065	1
187SM	0.19877	0.20325	0.12934	0.11478	0.09462	0.10358	0.23404	0.10582	0.29451	0.22396	0.15677	0.15566	0.05655	0.05543	0.42553	0.42609	1
188SF	0.16629	0.16685	0.11478	0.1131	0.10974	0.10974	0.24972	0.13382	0.29339	0.21725	0.15789	0.1551	0.05655	0.05767	0.44849	0.44793	1
189SF	0.15527	0.15807	0.0667	0.07567	0.08408	0.09025	0.22814	0.13453	0.287	0.22646	0.16031	0.15751	0.05774	0.05717	0.46693	0.46749	1
190SM	0.1742	0.16806	0.12507	0.12339	0.10999	0.10832	0.2507	0.1435	0.30765	0.26466	0.14964	0.16639	0.06142	0.06309	0.38582	0.38861	1
191SF	0.1882	0.19888	0.11742	0.10955	0.10506	0.10112	0.20618	0.13764	0.29494	0.21685	0.14944	0.14888	0.05562	0.05281	0.45899	0.4573	1
192SF	0.20516	0.20291	0.13004	0.12388	0.08464	0.08576	0.22702	0.13621	0.30437	0.23206	0.13004	0.14798	0.05886	0.05605	0.44955	0.44899	1
193SM	0.19106	0.20726	0.10335	0.08547	0.1067	0.10168	0.2257	0.14022	0.28212	0.24469	0.13855	0.16536	0.06145	0.06034	0.44581	0.44581	1
194SF	0.18167	0.19061	0.13136	0.12074	0.09782	0.09894	0.29178	0.128	0.33147	0.24148	0.15819	0.16657	0.06205	0.05981	0.43879	0.436	1
195SF	0.18659	0.18994	0.13631	0.1257	0.09832	0.10559	0.25419	0.12961	0.32402	0.22737	0.16425	0.16369	0.05922	0.0581	0.42961	0.42961	1
196SM	0.19095	0.18816	0.12954	0.12339	0.08822	0.08264	0.23339	0.11669	0.31156	0.21664	0.16974	0.16918	0.05807	0.05695	0.44165	0.44109	1
197SM	0.18715	0.18492	0.13631	0.13017	0.07486	0.07039	0.21173	0.14413	0.29497	0.24302	0.16089	0.16089	0.05978	0.05922	0.40056	0.39721	1
198SF	0.16881	0.16937	0.11571	0.1213	0.07546	0.07602	0.21856	0.13527	0.27725	0.22079	0.15204	0.15651	0.05869	0.05702	0.46003	0.45947	1
002Fc	0.17433	0.17713	0.12836	0.13004	0.08464	0.08016	0.2074	0.13621	0.29204	0.21861	0.1463	0.14182	0.04821	0.04933	0.44339	0.44843	1
004Fc	0.1767	0.18227	0.13155	0.13712	0.10535	0.09197	0.21739	0.13545	0.29766	0.2068	0.13545	0.13545	0.04905	0.05017	0.45151	0.44983	1
006Mc	0.17386	0.17779	0.12339	0.12283	0.09759	0.10208	0.21761	0.13573	0.28099	0.22883	0.13741	0.14021	0.04767	0.04992	0.42176	0.42681	1
007Mc	0.16983	0.17374	0.1419	0.14134	0.09609	0.0905	0.22626	0.14358	0.29106	0.25028	0.14134	0.14246	0.0514	0.05084	0.40335	0.40168	1
008Fc	0.17117	0.17905	0.1357	0.13514	0.09797	0.09347	0.20045	0.13682	0.27646	0.21284	0.1402	0.13682	0.0473	0.04786	0.46453	0.46059	1
009Mc	0.18616	0.18448	0.14342	0.14229	0.09786	0.10461	0.21316	0.13667	0.29021	0.24522	0.14961	0.14848	0.05343	0.05681	0.4207	0.41845	1
010Mc	0.18008	0.19077	0.13393	0.13112	0.09792	0.08891	0.22679	0.13787	0.28531	0.23467	0.14519	0.14744	0.05402	0.04952	0.43163	0.42994	1
012Mc	0.18269	0.17931	0.1439	0.14784	0.09668	0.09725	0.22653	0.13547	0.26138	0.23328	0.15458	0.15571	0.0534	0.05228	0.42721	0.42327	1
014Fc	0.1735	0.17574	0.12353	0.12802	0.10387	0.09994	0.23302	0.14206	0.28243	0.20887	0.14206	0.1443	0.05559	0.05053	0.44076	0.44133	1
015Fc	0.18494	0.18494	0.14053	0.14053	0.09612	0.08769	0.22709	0.15627	0.25183	0.23159	0.1439	0.14671	0.05059	0.04947	0.45082	0.45082	1
017Mc	0.17591	0.17983	0.13501	0.13165	0.09356	0.09636	0.22185	0.14398	0.29412	0.23193	0.14734	0.1479	0.0521	0.0549	0.41737	0.41681	1
018Fc	0.17736	0.17962	0.13288	0.12782	0.09403	0.09459	0.20495	0.13964	0.2714	0.22523	0.13851	0.13626	0.05124	0.04617	0.46509	0.4634	1
020Fc	0.18386	0.1833	0.12444	0.12332	0.09641	0.09641	0.24103	0.13509	0.28812	0.23038	0.14126	0.13957	0.05269	0.04933	0.44899	0.44899	1
021Mc	0.1722	0.17558	0.13562	0.13225	0.09736	0.09848	0.22003	0.14688	0.26618	0.22566	0.1525	0.15419	0.05627	0.05459	0.435	0.43275	1
023Mc	0.18024	0.18136	0.13251	0.13588	0.09545	0.09489	0.21449	0.13812	0.26727	0.22572	0.14262	0.14542	0.05053	0.05109	0.41213	0.4082	1
026Fc	0.19285	0.19005	0.14533	0.14366	0.09726	0.08999	0.20682	0.12689	0.27446	0.21409	0.13471	0.13192	0.04751	0.04248	0.48016	0.47848	1

027Fc	0.18414	0.1847	0.14108	0.14334	0.09122	0.09575	0.22323	0.15014	0.27819	0.21813	0.14108	0.14334	0.04646	0.04589	0.45836	0.45836	1
029Fc	0.17598	0.17598	0.1257	0.12905	0.10335	0.10279	0.24078	0.14469	0.28603	0.2324	0.14302	0.14078	0.05196	0.04916	0.44078	0.43911	1
030Fc	0.16983	0.17263	0.13017	0.12849	0.1	0.09944	0.22402	0.14246	0.29385	0.22011	0.15419	0.14972	0.05251	0.05307	0.44022	0.43966	1
001M	0.16564	0.17911	0.12072	0.11454	0.10275	0.10331	0.2566	0.14149	0.29422	0.21056	0.14149	0.14374	0.05615	0.05503	0.40595	0.40371	1
002F	0.17891	0.17947	0.1217	0.1217	0.09422	0.09478	0.21873	0.13292	0.30006	0.21144	0.14021	0.13517	0.04936	0.04823	0.44924	0.44868	1
005M	0.1535	0.15798	0.13053	0.13445	0.09524	0.09916	0.21625	0.13838	0.28908	0.22409	0.15014	0.14958	0.05266	0.0521	0.43361	0.43249	1
008F	0.16742	0.17079	0.12978	0.12753	0.09551	0.1	0.22191	0.14213	0.29888	0.22472	0.15112	0.14831	0.05281	0.05112	0.43596	0.43539	1
011F	0.17687	0.17574	0.12914	0.13644	0.09264	0.09377	0.21505	0.1297	0.27007	0.21449	0.14262	0.14206	0.0466	0.05109	0.46098	0.4621	1
014F	0.1946	0.19685	0.13611	0.13723	0.10292	0.10686	0.24184	0.12655	0.27222	0.22385	0.14679	0.14623	0.04612	0.04668	0.48931	0.48875	1
018F	0.16882	0.1705	0.13741	0.13853	0.09534	0.08749	0.22658	0.1346	0.27706	0.21032	0.13965	0.1419	0.04879	0.04487	0.48177	0.48177	1
020F	0.17795	0.18075	0.12927	0.1343	0.10185	0.09961	0.20425	0.13095	0.25686	0.22048	0.14102	0.14046	0.04813	0.04645	0.47622	0.47622	1
024F	0.18151	0.18377	0.12401	0.12458	0.09639	0.09696	0.2531	0.14262	0.29087	0.22322	0.14374	0.14318	0.04622	0.0434	0.45209	0.4487	1
027M	0.18202	0.18035	0.12954	0.13456	0.10162	0.09604	0.1971	0.12116	0.27192	0.22557	0.134	0.13512	0.05416	0.05137	0.41988	0.41876	1
028F	0.18564	0.18508	0.13685	0.13629	0.10432	0.09927	0.21817	0.12787	0.2765	0.21985	0.15143	0.14863	0.04936	0.04992	0.46495	0.46607	1
029F	0.18687	0.1908	0.12346	0.12009	0.09203	0.09708	0.26094	0.12514	0.27329	0.22278	0.13468	0.1358	0.05443	0.05275	0.4697	0.4697	1
030F	0.18011	0.18182	0.12955	0.12841	0.10511	0.10398	0.22102	0.1267	0.27386	0.21307	0.14659	0.14659	0.05284	0.05398	0.49545	0.49716	1
034F	0.18533	0.1859	0.11427	0.12223	0.10915	0.10517	0.22911	0.1336	0.25583	0.23991	0.15293	0.14781	0.05401	0.05344	0.4639	0.46504	1
035F	0.1721	0.17435	0.12936	0.12092	0.08999	0.09843	0.2036	0.12655	0.26715	0.18504	0.13498	0.14117	0.05343	0.05287	0.47694	0.47694	1
036F	0.181	0.16695	0.10793	0.12142	0.10399	0.09556	0.22485	0.13491	0.28162	0.22316	0.14446	0.14671	0.05621	0.05509	0.46824	0.46768	1
037F	0.18831	0.18269	0.1321	0.13547	0.08938	0.08544	0.21304	0.12872	0.267	0.21023	0.13884	0.13997	0.05115	0.05115	0.47274	0.47442	1
039F	0.17207	0.17151	0.12849	0.12626	0.10223	0.09888	0.22235	0.13631	0.26145	0.22626	0.14749	0.14637	0.05419	0.0514	0.45642	0.45531	1
043F	0.17141	0.17867	0.13289	0.12954	0.08152	0.08152	0.22334	0.11837	0.29481	0.23395	0.15187	0.15299	0.04802	0.04243	0.46399	0.46231	1
045M	0.17199	0.17479	0.13053	0.13557	0.08459	0.07955	0.20336	0.12997	0.31036	0.23137	0.15798	0.1591	0.05602	0.0521	0.43193	0.43137	1
058F	0.18146	0.17809	0.11629	0.11461	0.09213	0.09326	0.21629	0.1309	0.28652	0.22247	0.14213	0.1427	0.05056	0.05506	0.45506	0.45506	1
059F	0.17571	0.18858	0.13374	0.13039	0.09961	0.09737	0.21097	0.12591	0.29043	0.21544	0.14773	0.14773	0.05092	0.05036	0.47006	0.4695	1
065F	0.17841	0.17506	0.12081	0.1264	0.09676	0.09787	0.22987	0.12864	0.29306	0.21477	0.13702	0.13535	0.04922	0.04474	0.46309	0.46253	1
067F	0.1838	0.17765	0.12626	0.12682	0.08771	0.09162	0.18547	0.13296	0.26313	0.21173	0.1419	0.14078	0.0486	0.04246	0.47709	0.47654	1
072M	0.17697	0.17697	0.12809	0.1309	0.10393	0.10056	0.24438	0.11461	0.30674	0.21461	0.15337	0.15225	0.04719	0.04607	0.41798	0.41629	1
076F	0.18223	0.17942	0.12936	0.12936	0.0973	0.0928	0.25366	0.13161	0.29134	0.23285	0.14061	0.14398	0.05287	0.05343	0.46682	0.46175	1
082M	0.17173	0.17005	0.13176	0.13851	0.10135	0.09797	0.19257	0.12162	0.27759	0.23086	0.14133	0.14302	0.04842	0.04842	0.43412	0.43525	1

083F	0.17228	0.17789	0.1257	0.12346	0.09035	0.08642	0.21324	0.13861	0.28507	0.21661	0.13805	0.13917	0.05051	0.04938	0.44557	0.44444	1
084M	0.17973	0.18365	0.12822	0.12598	0.09686	0.09966	0.21165	0.13326	0.30515	0.22284	0.15733	0.15789	0.05599	0.05039	0.42105	0.41825	1
089M	0.17657	0.17545	0.12444	0.12724	0.09809	0.09137	0.2315	0.13285	0.30213	0.23599	0.14742	0.14406	0.04765	0.04428	0.43722	0.43386	1
092F	0.18306	0.18761	0.1353	0.13019	0.0938	0.10119	0.20409	0.13246	0.31779	0.2257	0.13985	0.13701	0.04832	0.0506	0.47129	0.47072	1
096M	0.18421	0.18365	0.15006	0.14502	0.10974	0.1075	0.23348	0.14726	0.30347	0.229	0.15118	0.1495	0.05151	0.04647	0.46025	0.46025	1
101M	0.17265	0.17881	0.13845	0.13004	0.07904	0.07231	0.18946	0.13453	0.24608	0.22085	0.14742	0.14742	0.04484	0.0454	0.48374	0.48094	1
042FD	0.18916	0.19146	0.12341	0.12457	0.09804	0.094	0.21972	0.14072	0.297	0.21165	0.14994	0.14533	0.0421	0.04614	0.46251	0.46194	1

H.2 Likelihood Ratio Histograms

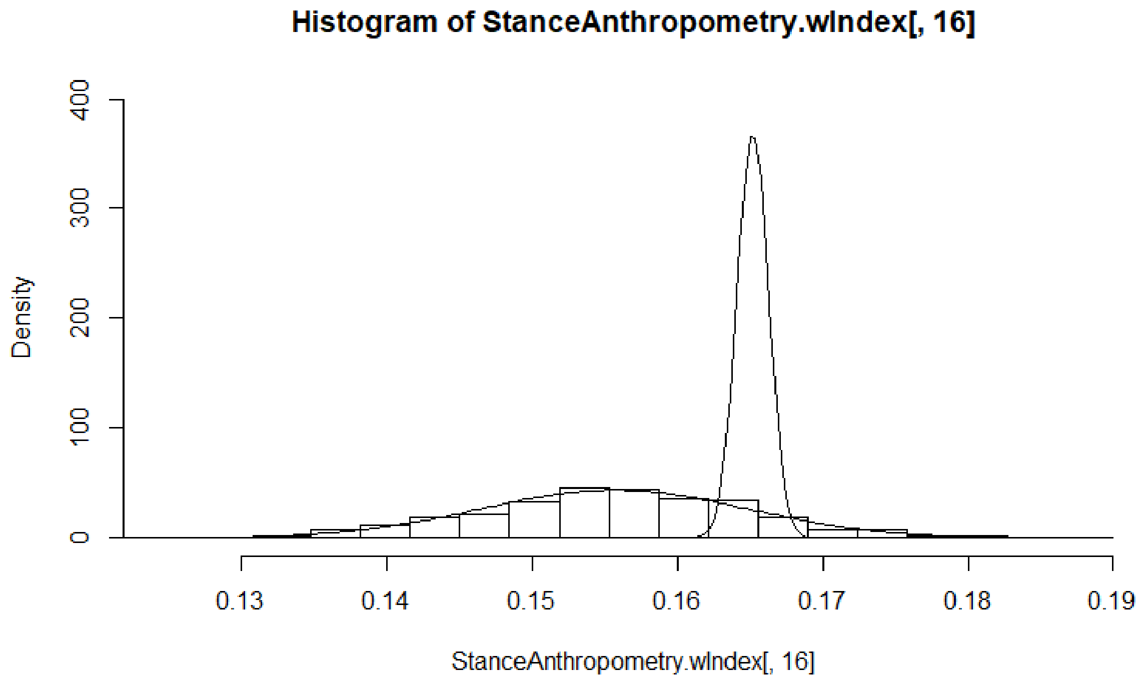

Figure 50. Left Foot Length

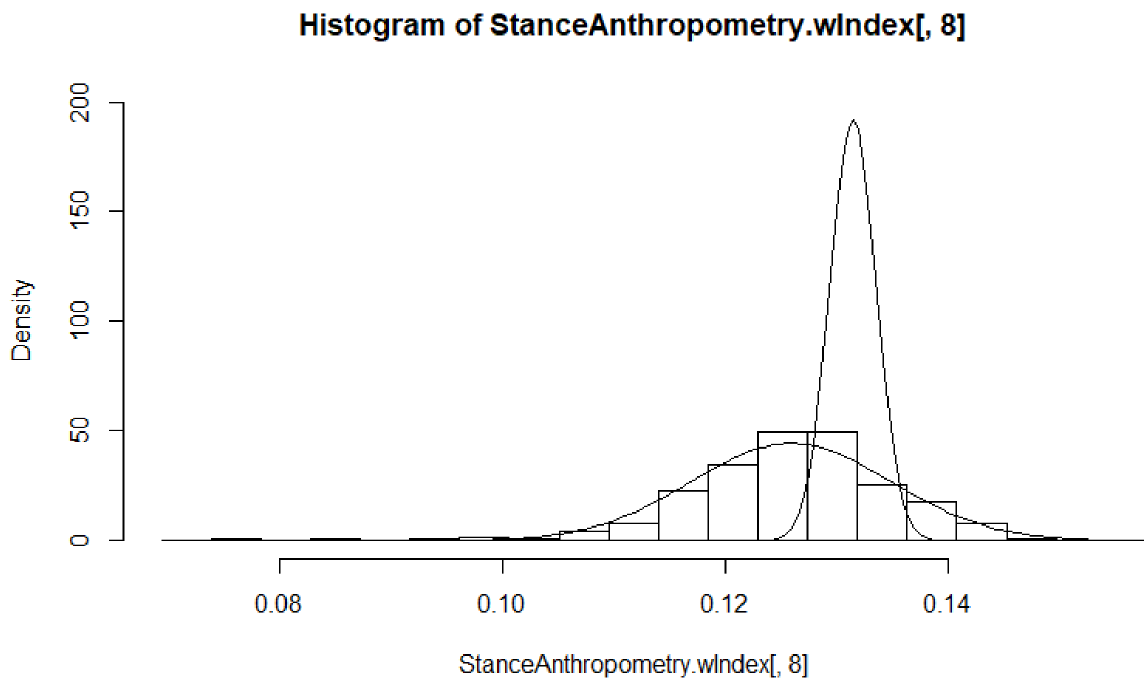

Figure 51. Left Forearm

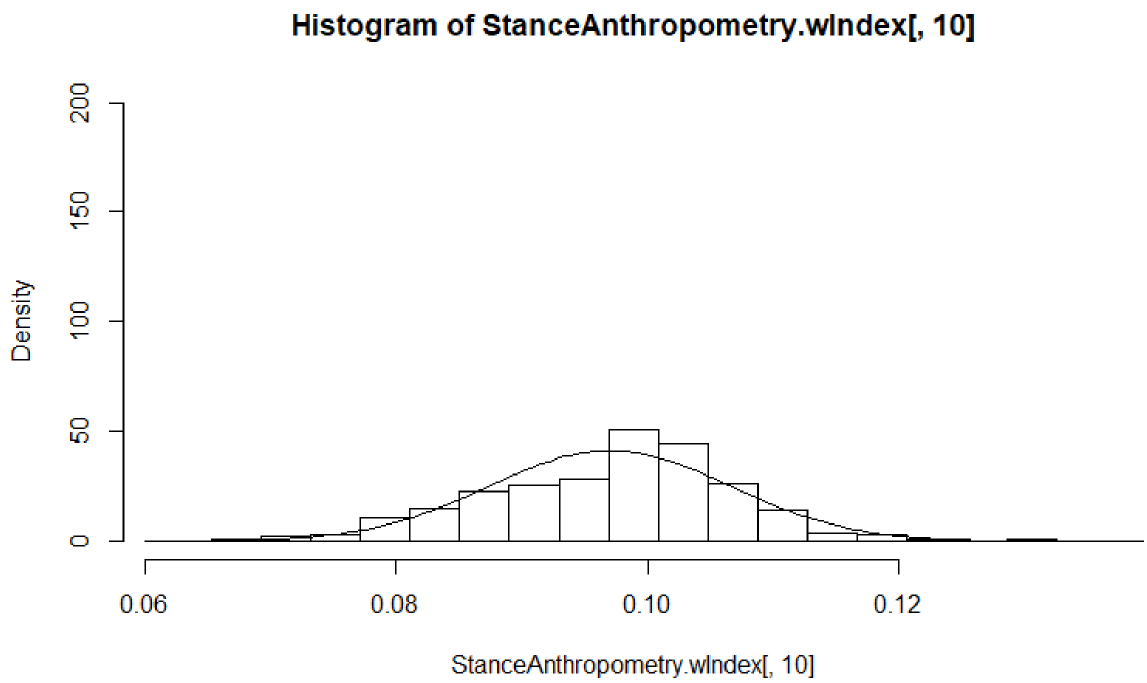

Figure 52. Left hand

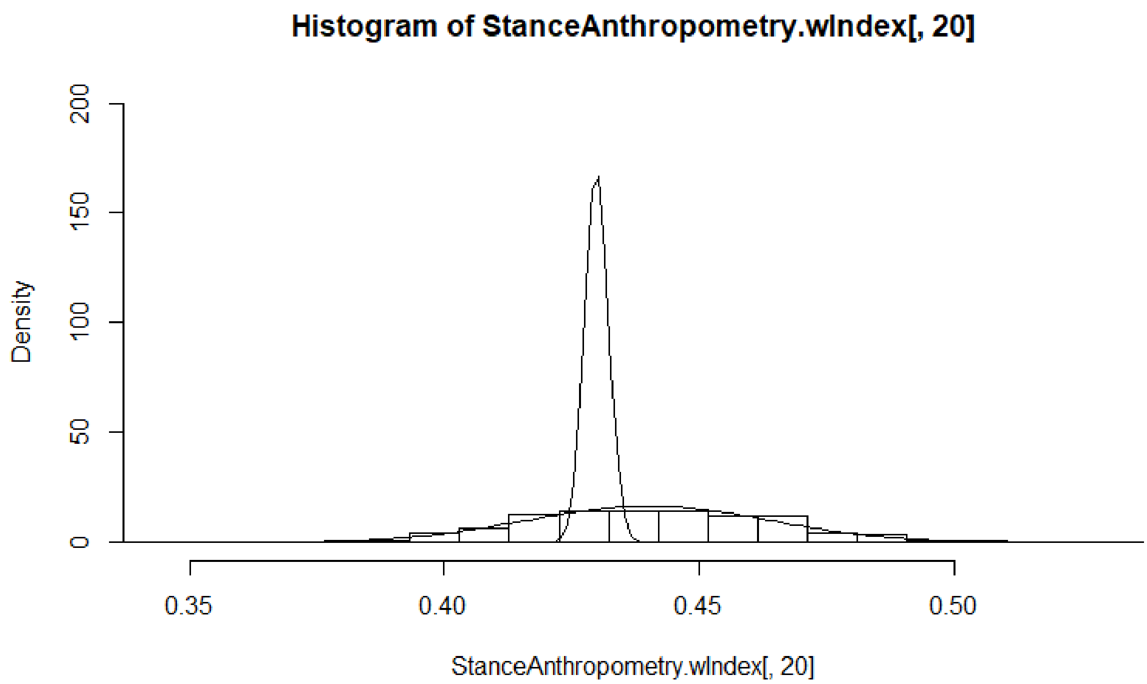

Figure 53. Left Leg Length

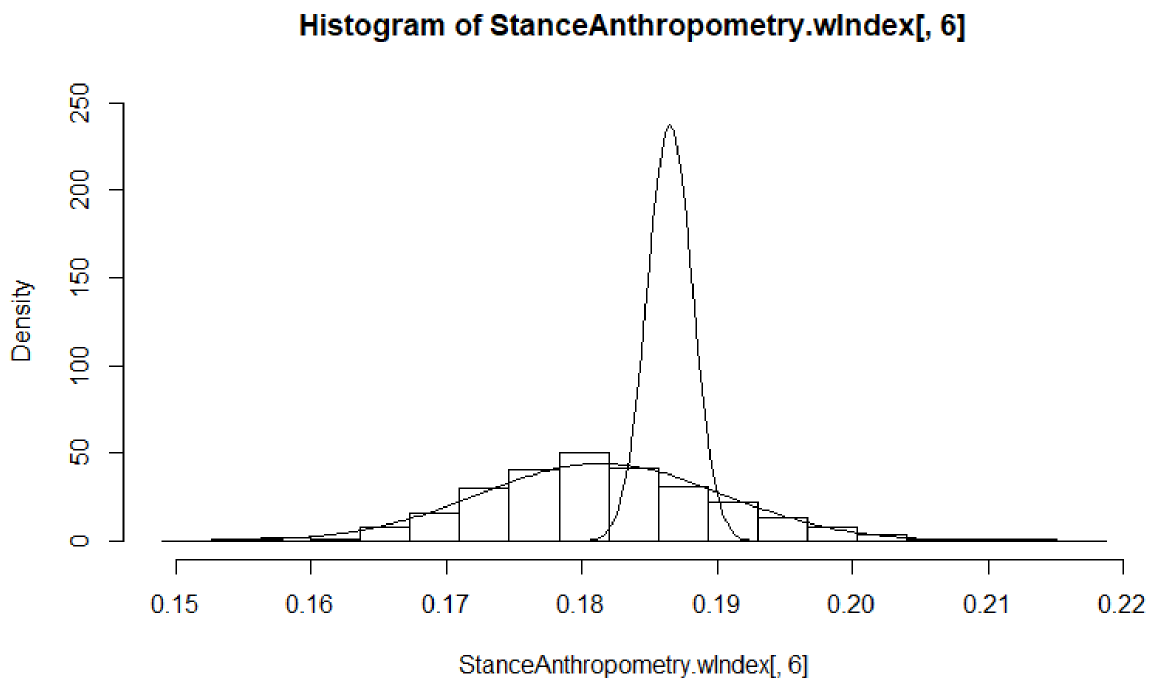

Figure 54. Left Shoulder-Elbow Length

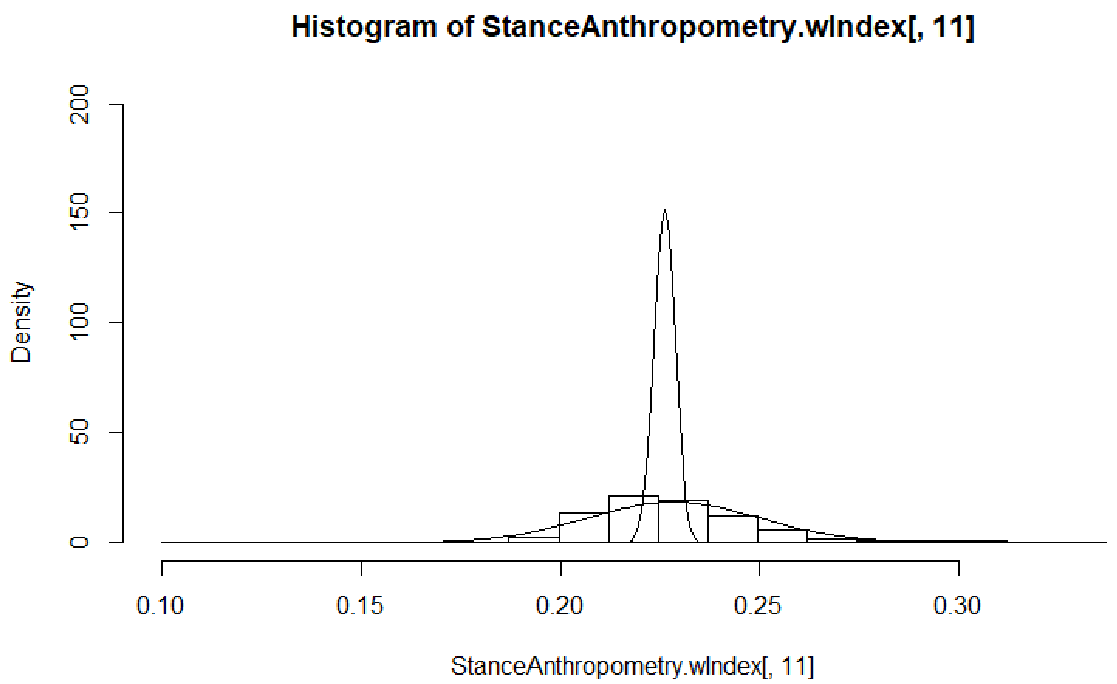

Figure 55. Maximum Hip Width

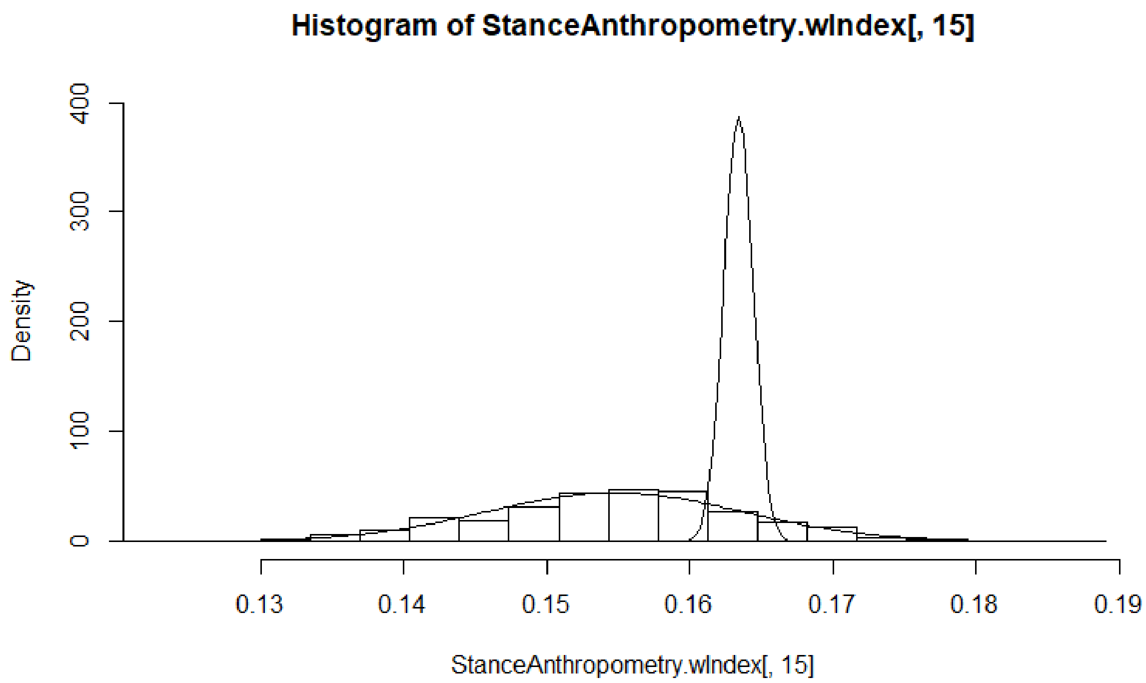

Figure 56. Right Foot Length

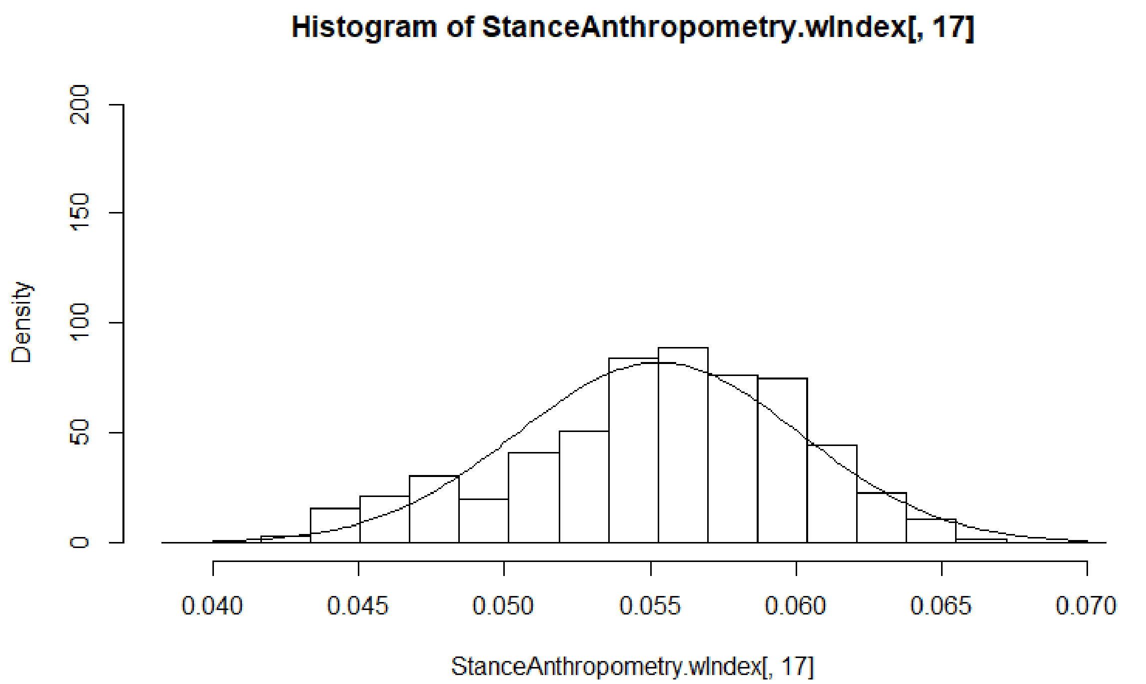

Figure 57. Right Foot Width

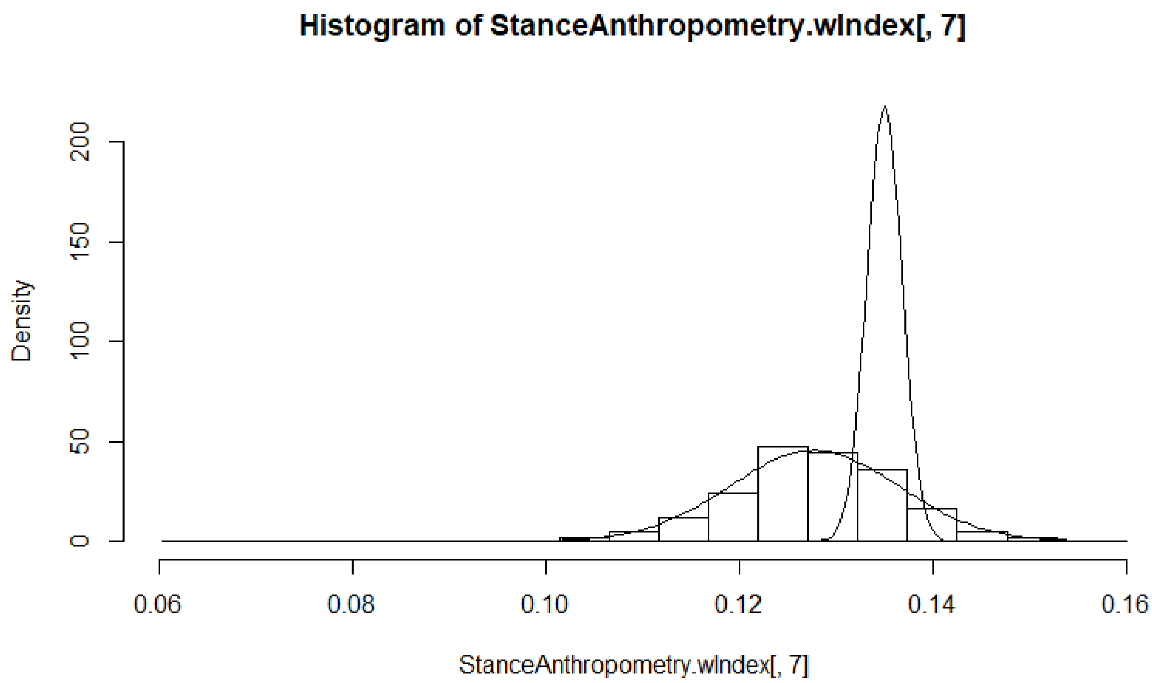

Figure 58. Right Forearm

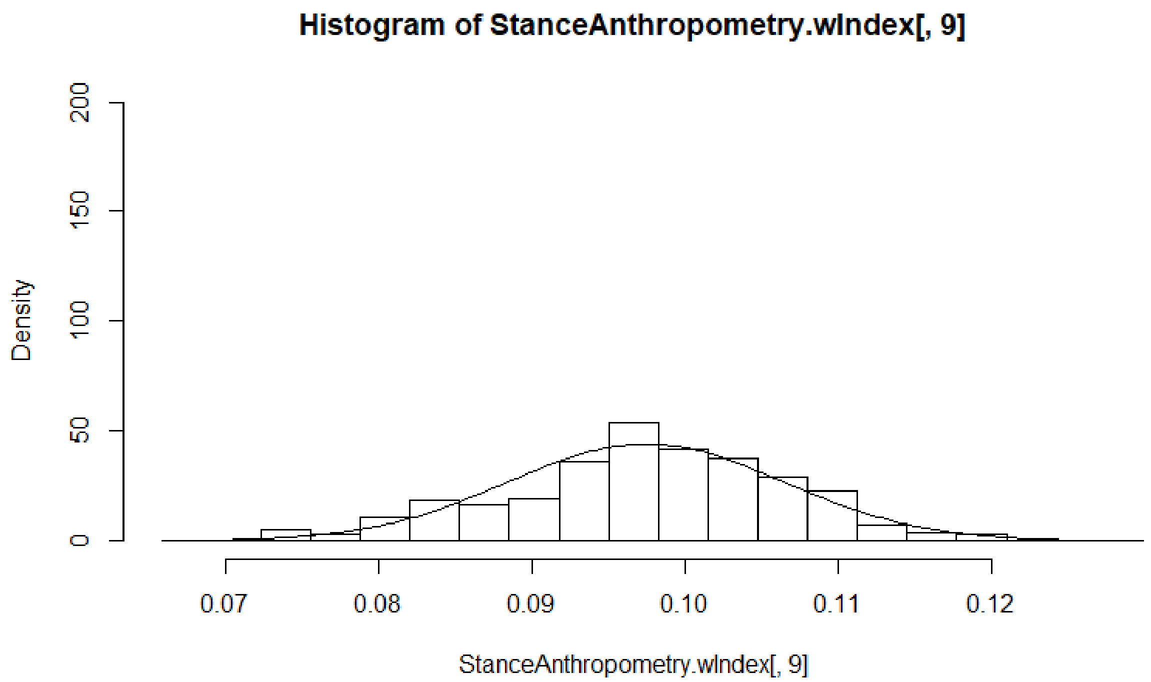

Figure 59. Right hand

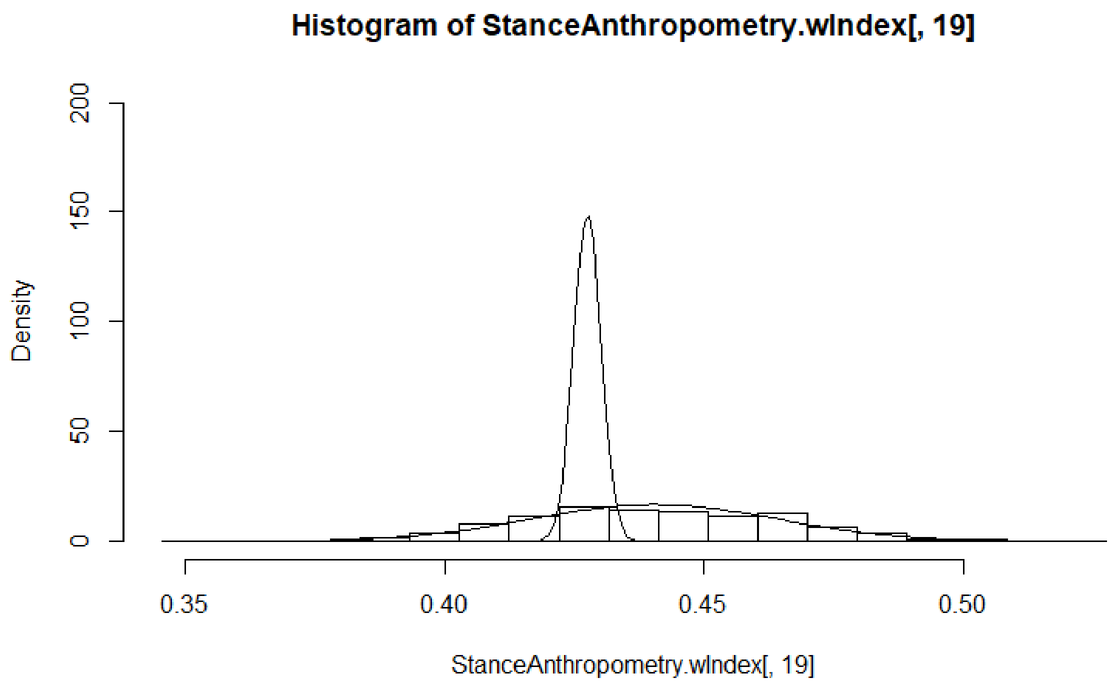

Figure 60. Right Leg Length

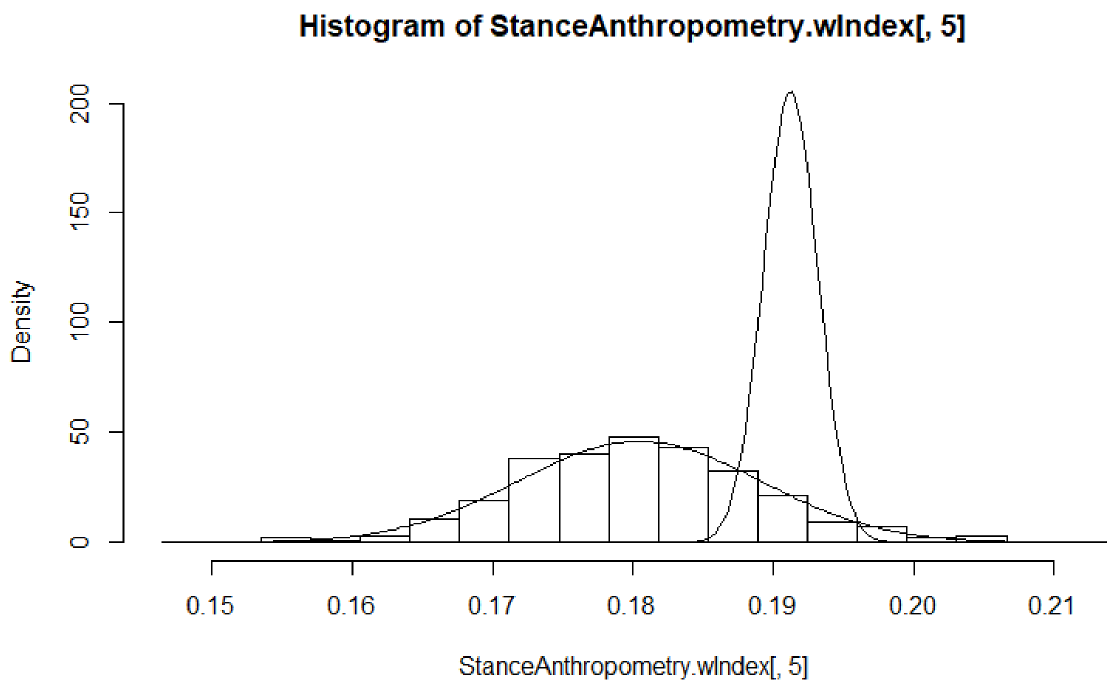

Figure 61. Right Shoulder-Elbow Length

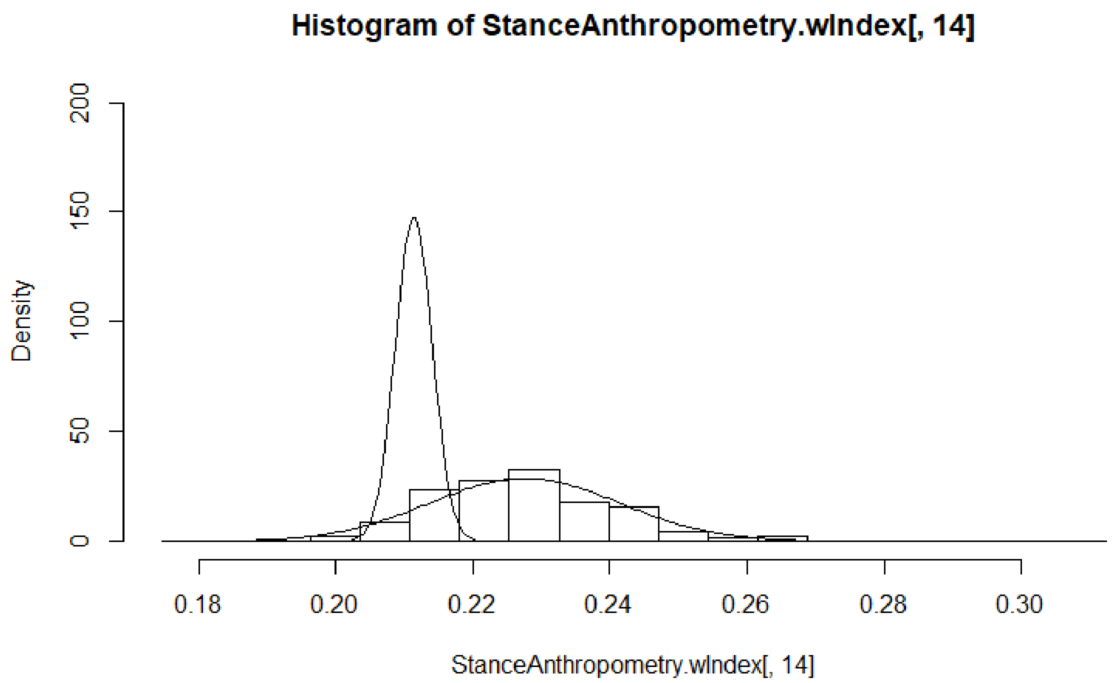

Figure 62. Shoulder Width

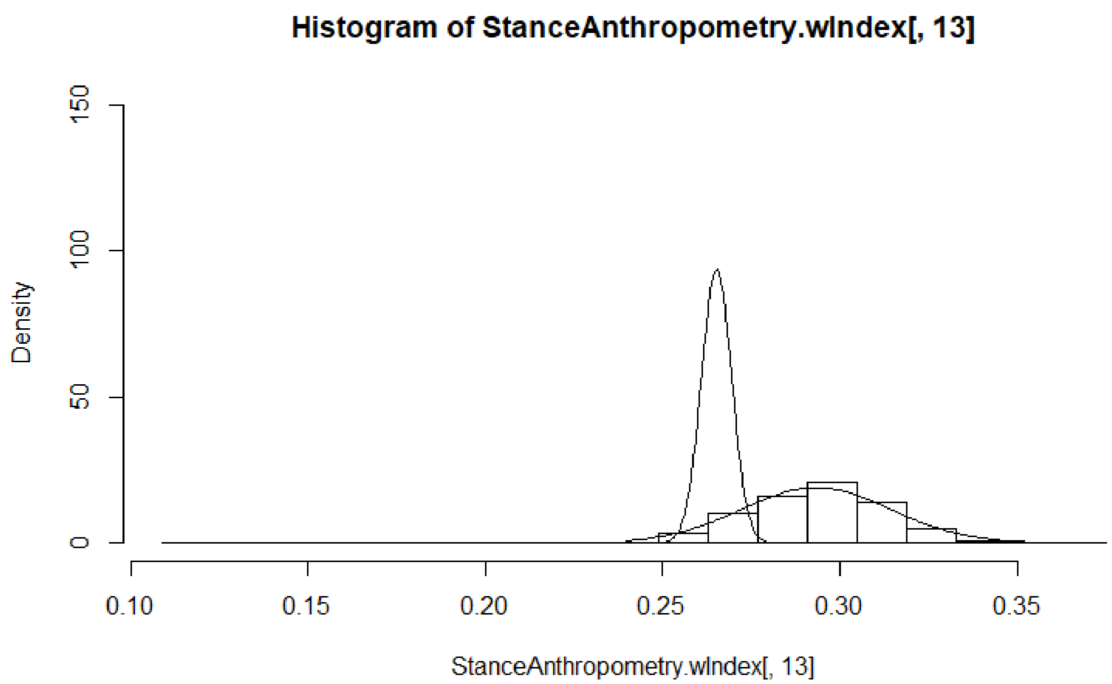

Figure 63. Torso Length

H.3 Hd True Tests

Table 28. LR for Hd True Tests Stance Anthropometry Model Two

	Subject	Sex	1. Shoulder – Elbow Length R	2. Shoulder – Elbow Length L	3. Forearm (elbow-wrist) Length R	4. Forearm (elbow-wrist) Length L	5. Hand Length R	6. Hand Length L	7. Maximum Hip Width	8. Head Height	9. Torso length	10. Shoulder width	11. Foot length R	12. Foot length L	13. Foot width R	14. Foot width L	15. Leg Length-Crotch R	16. Leg Length-Crotch L
new.HdTest	003Fc	Female	3.6782937	2.28E-14	3.90383	0.041001	NA	NA	2.59E-26	5.27E-31	1.67E-47	0.0040282	8.08E-122	1.92E-53	NA	NA	4.96E-157	2.41E-152
new.HdTest	015F	Female	0.5931606	1.3034082	1.54E-26	1.84E-15	NA	NA	8.64E-12	1.68E-60	6.59E-14	1.48E-14	1.15E-177	7.01E-106	NA	NA	6.76E-07	3.1249828
new.HdTest	016Fc	Female	1.35E-06	5.2281596	2.55E-06	3.57E-09	NA	NA	9.711983	4.68E-66	8.05E-05	0.0365095	6.10E-145	4.09E-117	NA	NA	1.17E-32	3.27E-07
new.HdTest	017F	Female	3.85E-17	1.00E-17	1.36E-48	1.09E-53	NA	NA	1.85E-45	8.64E-105	2.23E-40	1.39E-11	9.94E-195	1.28E-123	NA	NA	3.54E-10	10.692583
new.HdTest	019F	Female	0.0108029	4.37E-09	1.12E-45	1.08E-43	NA	NA	9.41E-193	6.61E-58	3.89E-11	1.32E-06	1.11E-227	1.33E-61	NA	NA	9.89E-57	1.05E-17
new.HdTest	004F	Female	3.2243486	0.0005874	3.19E-20	1.99E-22	NA	NA	2.23E-43	2.79E-107	0.6247128	1.24E-31	2.59E-152	3.21E-78	NA	NA	3.40E-90	9.67E-55
new.HdTest	006F	Female	1.25E-08	0.0262081	6.54E-22	5.70E-12	NA	NA	8.17E-21	4.13E-131	2.43E-06	6.55E-18	2.26E-213	2.21E-128	NA	NA	2.16E-74	4.12E-28
new.HdTest	009F	Female	0.0688643	5.1396467	1.67E-35	3.43E-37	NA	NA	6.31E-131	1.01E-101	0.0001432	9.37E-39	2.05E-188	1.69E-72	NA	NA	2.58E-65	1.99E-30
new.HdTest	021F	Female	1.25E-11	1.1034327	2.42E-32	4.22E-36	NA	NA	1.35E-34	2.71E-139	0.2263508	5.47E-08	8.83E-120	3.51E-56	NA	NA	2.96E-111	4.15E-65
new.HdTest	024Fc	Female	4.238799	2.26E-05	1.84E-17	3.59E-14	NA	NA	11.70742	4.85E-115	0.0649131	1.34E-69	3.15E-96	7.65E-41	NA	NA	1.01E-23	0.1830287
new.HdTest	025Fc	Female	1.6563427	1.09E-07	2.34E-30	1.77E-27	NA	NA	6.86E-16	2.67E-110	1.2766866	3.65E-45	3.16E-262	5.42E-156	NA	NA	8.27E-31	0.0015784
new.HdTest	032F	Female	1.452943	0.224178	5.09E-34	4.49E-26	NA	NA	0.073987	8.69E-93	0.0552894	8.11E-12	1.17E-212	8.01E-109	NA	NA	4.54E-36	2.00E-06
new.HdTest	033F	Female	0.0047195	0.0019928	6.85E-52	1.47E-31	NA	NA	1.58E-21	4.78E-94	1.4463306	3.34E-20	2.45E-213	3.81E-109	NA	NA	4.46E-34	1.21E-06
new.HdTest	042F	Female	0.0992441	2.07E-11	1.24E-29	8.36E-11	NA	NA	7.581796	3.59E-137	0.000451	4.35E-44	1.46E-302	3.97E-209	NA	NA	5.80E-68	1.05E-29
new.HdTest	047F	Female	4.08E-07	0.9747755	2.08E-21	7.50E-19	NA	NA	4.03E-32	3.55E-105	1.63E-06	3.26E-14	4.96E-79	1.06E-33	NA	NA	9.230782	2.18E-11
new.HdTest	048F	Female	3.6989346	0.0580914	1.84E-24	1.26E-24	NA	NA	6.00E-59	6.86E-83	5.5439792	1.0554747	1.68E-173	7.39E-46	NA	NA	2.81E-08	3.189994
new.HdTest	053F	Female	0.03836	5.5357627	1.00E-73	1.03E-50	NA	NA	1.93E-35	1.81E-76	5.5591852	1.17E-06	3.05E-177	1.01E-79	NA	NA	3.14E-64	3.05E-28

new.HdTest	063F	Female	0.0042614	1.9512405	2.98E-16	2.99E-11	NA	NA	2.13E-05	5.63E-162	7.34E-06	3.18E-09	2.17E-304	3.41E-180	NA	NA	7.34E-85	1.42E-44
new.HdTest	064F	Female	9.89E-05	5.4984088	6.55E-28	2.89E-29	NA	NA	1.32E-26	1.04E-91	3.45E-05	1.32E-11	8.40E-126	6.31E-72	NA	NA	3.00E-62	3.85E-21
new.HdTest	069F	Female	3.45E-09	4.5152997	3.11E-90	2.29E-43	NA	NA	1.90E-291	5.99E-133	0.1440361	0.0100425	3.92E-95	1.59E-25	NA	NA	1.98E-06	1.3424608
new.HdTest	071F	Female	1.65E-10	0.0771195	5.38E-28	1.34E-31	NA	NA	8.89E-23	6.06E-109	0.0005818	7.21E-07	3.61E-155	4.73E-50	NA	NA	1.27E-48	4.44E-15
new.HdTest	075F	Female	9.5254717	0.510047	1.82E-89	3.42E-60	NA	NA	3.70E-21	1.62E-113	4.10E-11	8.56E-16	3.81E-94	1.90E-36	NA	NA	1.50E-42	2.43E-11
new.HdTest	078F	Female	2.94E-09	1.1139506	2.86E-66	5.28E-25	NA	NA	10.89005	1.14E-104	1.88E-15	9.10E-24	1.34E-123	2.79E-62	NA	NA	3.00E-45	1.34E-17
new.HdTest	079F	Female	4.40E-20	7.99E-08	1.72E-57	1.99E-42	NA	NA	2.48E-41	7.13E-85	6.62E-08	0.0532229	3.86E-134	2.35E-78	NA	NA	4.94E-26	0.1618117
new.HdTest	080F	Female	9.7507233	5.7137612	1.02E-70	1.47E-48	NA	NA	3.53E-300	6.49E-92	2.27E-37	1.56E-08	2.44E-115	2.26E-49	NA	NA	4.62E-22	1.1887752
new.HdTest	087F	Female	6.1671273	0.0747576	5.50E-17	5.18E-16	NA	NA	9.97E-07	2.32E-74	5.96E-12	9.63E-36	2.22E-119	1.51E-59	NA	NA	7.04E-37	1.65E-07
new.HdTest	088F	Female	0.0010761	2.8215975	1.64E-22	7.06E-09	NA	NA	0.510709	7.35E-156	0.0856811	2.04E-28	1.25E-72	1.64E-32	NA	NA	1.69E-63	1.39E-20
new.HdTest	090F	Female	0.0009838	0.0047742	2.35E-32	1.30E-13	NA	NA	11.36639	2.54E-103	3.54E-14	7.86E-19	7.27E-113	3.06E-34	NA	NA	3.61E-32	1.06E-05
new.HdTest	002FD	Female	9.04E-11	0.1384098	4.51E-60	1.01E-57	NA	NA	2.520997	2.55E-169	0.0405369	0.0001337	2.82E-76	3.69E-21	NA	NA	2.79E-92	1.97E-52
new.HdTest	005FD	Female	4.31E-37	2.10E-08	6.69E-13	1.31E-09	NA	NA	8.381107	2.48E-73	1.16E-09	2.67E-12	1.39E-26	0.010143	NA	NA	3.53E-79	1.02E-31
new.HdTest	006FD	Female	1.68E-08	0.0095937	6.85E-49	9.77E-30	NA	NA	0.536622	2.23E-102	6.04E-05	1.55E-10	5.25E-48	9.20E-10	NA	NA	6.23E-33	2.46E-13
new.HdTest	007FD	Female	0.008816	0.8249924	6.92E-14	0.021553	NA	NA	8.09756	6.29E-73	0.0016635	0.0001678	4.40E-58	1.02E-10	NA	NA	5.07E-123	1.93E-90
new.HdTest	009FD	Female	0.0001938	1.97E-06	1.85E-44	8.54E-48	NA	NA	0.000507	1.25E-61	3.1814305	3.13E-11	4.23E-36	5.77E-05	NA	NA	1.02E-17	1.4798707
new.HdTest	017FD	Female	2.75E-19	0.1432077	4.34E-57	6.91E-31	NA	NA	0.013248	1.90E-214	0.0520201	1.21E-24	1.41E-125	1.43E-48	NA	NA	4.61E-105	2.99E-67
new.HdTest	020FD	Female	1.29E-26	1.00E-07	1.18E-75	3.00E-54	NA	NA	0.004898	3.23E-118	4.8217373	3.85E-06	5.67E-67	1.24E-16	NA	NA	6.32E-39	4.64E-10
new.HdTest	021FD	Female	7.2323702	0.0637355	2.32E-13	6.53E-11	NA	NA	0.036957	1.28E-110	0.000825	7.06E-20	3.08E-83	6.45E-36	NA	NA	5.48E-192	4.85E-140
new.HdTest	022FD	Female	8.20E-09	0.0061231	1.82E-40	6.15E-34	NA	NA	5.17154	2.20E-92	0.074539	2.28E-19	1.05E-50	1.14E-18	NA	NA	7.83E-62	7.37E-20
new.HdTest	023FD	Female	4.22E-08	5.4544986	1.15E-29	1.82E-11	NA	NA	0.085364	1.64E-49	8.02E-09	7.02E-15	2.11E-10	13.44943	NA	NA	1.22E-81	4.15E-48
new.HdTest	025FD	Female	1.13E-07	0.2334388	2.21E-32	6.80E-35	NA	NA	5.15E-20	6.81E-56	0.000134	0.2570882	1.53E-111	3.20E-37	NA	NA	9.084036	4.87E-14
new.HdTest	026FD	Female	2.03E-22	1.13E-20	4.41E-40	7.08E-20	NA	NA	2.33E-05	9.23E-123	5.29E-07	1.49E-07	6.43E-96	8.87E-29	NA	NA	0.765185	0.0031991
new.HdTest	030FD	Female	7.53E-15	0.1139581	7.40E-45	4.22E-39	NA	NA	5.42E-60	1.64E-96	0.0752007	0.0866899	3.67E-41	6.26E-07	NA	NA	7.12E-12	10.573472
new.HdTest	031FD	Female	3.40E-09	0.0380974	4.24E-19	2.13E-13	NA	NA	0.033652	7.49E-120	0.7895527	0.0334237	3.11E-86	6.72E-17	NA	NA	1.58E-91	6.89E-68
new.HdTest	034FD	Female	4.55E-29	2.08E-17	1.78E-53	1.69E-34	NA	NA	1.12E-35	2.29E-60	6.9559741	0.5486415	2.07E-61	3.56E-12	NA	NA	2.883747	3.65E-14
new.HdTest	035FD	Female	8.38E-07	0.0110216	1.59E-20	7.94E-23	NA	NA	1.08E-07	3.97E-31	6.43E-18	1.5712897	7.71E-75	9.64E-09	NA	NA	4.09E-54	3.42E-24
new.HdTest	036FD	Female	4.24E-20	6.99E-08	2.32E-34	3.10E-26	NA	NA	1.89E-15	1.01E-53	1.22E-06	7.99E-05	2.56E-81	2.17E-21	NA	NA	1.67E-59	1.77E-22
new.HdTest	038FD	Female	7.35E-12	3.5896121	6.57E-33	1.38E-60	NA	NA	1.47E-09	5.91E-57	4.6684314	7.78E-05	3.74E-49	2.76E-10	NA	NA	1.18E-40	2.50E-10
new.HdTest	039FD	Female	4.96E-12	1.58E-09	3.46E-87	3.08E-78	NA	NA	5.603613	7.40E-71	7.9149104	1.3019612	4.86E-70	3.84E-25	NA	NA	2.49E-45	9.50E-16

new.HdTest	040FD	Female	1.45E-14	2.9432046	1.43E-51	1.29E-68	NA	NA	3.93E-11	1.97E-222	0.0010475	3.60E-10	1.33E-109	4.00E-33	NA	NA	1.97E-44	5.02E-17
new.HdTest	001Mc	Male	1.89E-45	1.95E-14	4.65E-46	1.07E-30	NA	NA	11.23414	8.84E-36	5.1899875	1.75E-12	8.79E-26	2.16E-29	NA	NA	6.949039	7.77E-08
new.HdTest	005Mc	Male	1.48E-05	4.8370085	1.09E-06	5.00E-07	NA	NA	0.116368	4.70E-120	0.0555079	0.0221783	1.03E-105	2.52E-18	NA	NA	1.65E-09	7.9026426
new.HdTest	007M	Male	3.20E-07	3.9773042	4.77E-38	2.86E-26	NA	NA	5.638658	1.52E-58	9.64E-16	1.08E-13	3.47E-75	2.76E-28	NA	NA	7.11E-17	1.32E-75
new.HdTest	010M	Male	9.7916199	8.21E-06	1.24E-70	1.35E-48	NA	NA	3.27E-73	1.37E-170	3.33E-17	4.09E-22	1.20E-42	2.16E-12	NA	NA	8.72E-31	2.21E-106
new.HdTest	011Mc	Male	7.06E-08	0.006387	8.51E-08	1.66E-06	NA	NA	1.05E-08	2.46E-65	1.5122618	6.00E-19	2.92E-198	7.03E-84	NA	NA	9.857266	8.45E-18
new.HdTest	012M	Male	1.85E-37	1.65E-28	5.93E-53	1.72E-41	NA	NA	11.82318	4.50E-66	4.40E-10	4.0630996	2.20E-163	4.86E-67	NA	NA	1.75E-17	8.50E-69
new.HdTest	013M	Male	9.93E-17	4.91E-10	1.23E-79	8.35E-44	NA	NA	2.440865	1.69E-71	3.68E-06	2.72E-09	7.27E-164	2.55E-95	NA	NA	0.314154	1.37E-27
new.HdTest	013Mc	Male	3.7991246	1.1316422	1.55E-14	7.14E-11	NA	NA	9.320452	4.77E-37	0.0022813	1.34E-06	1.50E-80	2.81E-31	NA	NA	0.002955	3.82E-40
new.HdTest	016M	Male	5.87E-13	0.1458622	8.72E-37	2.77E-28	NA	NA	4.033953	1.48E-104	0.0003387	1.740754	5.29E-160	4.53E-83	NA	NA	0.036025	1.22E-34
new.HdTest	19Mc	Male	1.0993837	0.0500306	0.0002295	1.51E-12	NA	NA	2.185085	8.72E-96	1.09E-05	2.0670161	8.87E-136	1.76E-66	NA	NA	9.04E-31	0.0004876
new.HdTest	022Mc	Male	0.8183738	4.6688611	3.90E-13	1.80E-06	NA	NA	11.82987	4.71E-71	7.7467787	0.2168432	8.67E-105	2.33E-46	NA	NA	2.20E-10	1.6415638
new.HdTest	026M	Male	1.24E-05	0.9173133	4.14E-16	1.61E-07	NA	NA	3.285058	1.73E-203	8.0676961	0.0005056	1.19E-92	1.30E-10	NA	NA	2.278358	1.24E-21
new.HdTest	028Mc	Male	0.4964824	0.4084323	187.27801	0.003307	NA	NA	0.593954	1.75E-17	8.0521853	0.0892067	2.29E-118	1.33E-47	NA	NA	2.114655	1.35E-17
new.HdTest	031M	Male	1.31E-22	5.69E-13	6.85E-49	3.89E-24	NA	NA	0.668962	2.23E-102	0.0175515	5.2944942	3.95E-131	1.55E-55	NA	NA	5.65E-10	4.61E-69
new.HdTest	038M	Male	4.95E-17	2.08E-11	8.07E-27	7.62E-17	NA	NA	0.53116	8.12E-54	0.0004677	4.0662303	3.07E-128	1.60E-57	NA	NA	0.026771	9.25E-07
new.HdTest	040M	Male	1.59E-06	0.0177044	6.08E-12	3.01E-07	NA	NA	0.017236	5.07E-96	3.84E-19	0.0026721	1.34E-43	1.77E-06	NA	NA	9.539526	5.94E-11
new.HdTest	041M	Male	0.2237716	0.0003007	2.26E-13	4.27E-24	NA	NA	0.155325	1.50E-92	0.0026115	1.36E-07	3.06E-90	4.62E-22	NA	NA	3.73E-22	0.3618563
new.HdTest	044M	Male	5.57E-12	1.72E-11	4.95E-16	1.35E-28	NA	NA	1.251342	6.97E-161	3.61E-14	4.24E-06	2.45E-82	1.08E-19	NA	NA	2.710444	4.00E-21
new.HdTest	046M	Male	3.62E-22	0.0579273	6.87E-39	1.75E-25	NA	NA	1.89E-15	4.03E-109	0.002365	0.8832058	1.59E-121	4.35E-36	NA	NA	1.75E-81	1.50E-196
new.HdTest	049M	Male	1.19E-10	1.3858062	6.50E-16	2.34E-05	NA	NA	8.150164	2.14E-110	0.0493262	0.0002326	1.05E-67	1.05E-31	NA	NA	4.10E-19	0.0822383
new.HdTest	050M	Male	7.46E-05	4.0545127	6.10E-06	0.01758	NA	NA	2.100924	3.24E-117	2.018183	0.0723369	4.54E-58	1.99E-14	NA	NA	8.19E-06	1.964091
new.HdTest	051M	Male	5.91E-38	4.84E-13	1.51E-21	1.95E-17	NA	NA	2.15E-05	8.40E-185	2.13E-08	8.75E-18	1.30E-47	1.33E-09	NA	NA	0.000472	2.67E-37
new.HdTest	054M	Male	1.60E-08	0.2275209	2.44E-79	1.00E-43	NA	NA	0.002269	5.93E-159	0.0668114	6.3685489	5.90E-29	6.60E-12	NA	NA	0.000176	1.3645075
new.HdTest	056M	Male	1.11E-14	3.2264936	6.18E-13	6.82E-24	NA	NA	3.296555	1.90E-214	1.67E-05	1.40E-10	3.16E-184	3.75E-85	NA	NA	6.93E-06	2.1176801
new.HdTest	062M	Male	1.8824666	1.94E-09	3.41E-31	5.43E-11	NA	NA	2.41E-08	1.57E-15	2.67E-31	0.2712625	2.97E-266	1.75E-110	NA	NA	8.682987	3.36E-17
new.HdTest	066M	Male	1.64E-39	9.42E-14	1.10E-20	5.13E-18	NA	NA	1.37E-27	2.20E-92	2.7170197	2.51E-13	3.01E-116	2.39E-46	NA	NA	8.573891	2.21E-20
new.HdTest	068M	Male	1.09E-13	0.7297103	1.60E-41	8.54E-32	NA	NA	4.34E-05	2.58E-100	8.0396135	2.62E-07	2.54E-84	5.96E-28	NA	NA	0.002411	3.01E-36
new.HdTest	070M	Male	3.01E-05	1.77E-14	4.10E-84	2.52E-133	NA	NA	1.31E-29	8.38E-45	4.28E-12	0.3111206	8.22E-94	1.75E-24	NA	NA	2.60E-06	2.29E-44
new.HdTest	077M	Male	2.35444	0.0030866	4.26E-12	4.56E-17	NA	NA	3.87E-36	2.49E-125	0.0008487	0.0131949	8.12E-138	2.28E-19	NA	NA	6.14E-10	7.717129

new.HdTest	086M	Male	7.49E-25	1.36E-12	4.14E-45	2.64E-39	NA	NA	0.001769	4.10E-114	5.480293	2.39E-11	1.76E-168	5.69E-84	NA	NA	0.001513	3.14E-34
new.HdTest	091M	Male	0.0838141	3.8905957	4.38E-21	7.10E-15	NA	NA	0.001068	3.01E-103	0.5968177	0.7664119	7.17E-40	8.85E-08	NA	NA	6.584768	7.67E-06
new.HdTest	094M	Male	0.1193924	5.0832731	3.76E-11	0.000681	NA	NA	0.034684	1.36E-171	1.12E-06	3.10E-22	3.66E-98	9.75E-33	NA	NA	1.913624	4.01E-22
new.HdTest	095M	Male	6.1003804	0.0021103	4.96E-36	5.44E-29	NA	NA	4.75E-16	3.83E-122	0.0062911	0.0791689	1.71E-74	9.40E-28	NA	NA	0.000122	2.84E-32
new.HdTest	097M	Male	1.34E-09	0.1644842	0.00199	0.000615	NA	NA	11.4018	9.84E-127	5.76E-24	0.224771	1.84E-38	1.49E-13	NA	NA	3.676052	1.61E-14
new.HdTest	001MD	Male	0.0029732	1.69E-44	1.39E-119	1.21E-102	NA	NA	1.51E-30	1.06E-86	5.53E-32	1.79E-30	2.54E-35	0.413533	NA	NA	7.89E-06	2.02E-41
new.HdTest	003MD	Male	1.96E-73	7.15E-64	7.54E-29	1.72E-31	NA	NA	0.004311	3.29E-84	4.1720977	1.34E-12	0.0001279	14.01984	NA	NA	9.53E-05	1.7516594
new.HdTest	004MD	Male	8.68E-10	1.14E-05	3.81E-19	1.35E-22	NA	NA	3.53E-23	7.65E-177	6.33E-09	6.4704734	71.740547	4.31E-27	NA	NA	7.24E-22	0.171583
new.HdTest	008MD	Male	9.736729	3.611037	3.23E-20	1.72E-05	NA	NA	0.000205	2.35E-115	0.0085407	5.71E-06	3.15E-47	6.52E-08	NA	NA	5.22E-27	6.73E-10
new.HdTest	010MD	Male	4.49E-18	4.43E-17	1.66E-23	2.69E-35	NA	NA	10.12667	6.94E-86	2.5228754	0.0043457	8.04E-59	4.29E-21	NA	NA	7.379022	6.41E-11
new.HdTest	011MD	Male	2.78E-15	1.19E-09	6.85E-47	7.17E-30	NA	NA	1.93E-05	3.80E-87	9.02E-10	2.20E-10	1.55E-45	5.44E-06	NA	NA	3.27E-21	2.72E-73
new.HdTest	012MD	Male	6.52E-19	6.06E-12	1.90E-39	1.41E-24	NA	NA	4.163752	4.59E-153	0.0009012	9.08E-20	2.04E-47	1.60E-09	NA	NA	4.57E-15	2.5542645
new.HdTest	013MD	Male	4.18E-11	4.97E-18	2.04E-49	1.39E-31	NA	NA	0.014156	2.40E-68	7.28E-25	2.92E-05	3.30E-05	0.243928	NA	NA	1.05E-11	9.88E-49
new.HdTest	014MD	Male	3.14E-11	0.0001224	1.06E-17	1.95E-15	NA	NA	0.093856	4.30E-54	1.2356901	0.0101549	3.18E-05	7.094095	NA	NA	0.573938	3.58E-07
new.HdTest	015MD	Male	2.61E-17	1.11E-12	7.38E-27	2.37E-28	NA	NA	0.021349	1.04E-57	0.0019142	4.6425843	6.04E-50	0.259249	NA	NA	4.99E-28	4.04E-07
new.HdTest	016MD	Male	2.94E-25	1.02E-20	4.02E-35	3.34E-28	NA	NA	10.34753	4.56E-77	1.02E-24	1.07E-08	2.06E-17	0.869334	NA	NA	2.27E-21	1.35E-81
new.HdTest	018MD	Male	8.09E-30	8.77E-11	2.06E-16	1.48E-09	NA	NA	1.47E-08	8.81E-47	8.45E-15	6.5082393	0	3.67E-109	NA	NA	1.81E-24	1.62E-99
new.HdTest	019MD	Male	0.1530933	1.26E-11	8.93E-43	8.76E-66	NA	NA	3.42E-10	5.03E-128	2.75E-11	8.96E-19	2.54E-45	1.28E-08	NA	NA	2.42E-10	7.5690033
new.HdTest	024MD	Male	2.53E-13	0.0020474	2.27E-05	4.22E-05	NA	NA	1.012807	2.60E-52	3.76E-05	0.0109927	7.8894207	7.56E-05	NA	NA	0.000236	0.016748
new.HdTest	027MD	Male	9.67E-14	2.87E-11	1.00E-53	1.21E-44	NA	NA	4.07E-10	2.46E-75	3.4630192	2.64E-21	2.74E-16	0.449342	NA	NA	0.281566	0.0001013
new.HdTest	028MD	Male	8.29E-23	1.86E-22	7.79E-30	4.68E-28	NA	NA	3.62E-06	2.69E-116	9.98E-06	0.0151028	4.62E-20	14.58839	NA	NA	4.70E-47	4.42E-15
new.HdTest	029MD	Male	2.77E-18	0.1207963	3.27E-82	2.85E-63	NA	NA	4.87733	8.76E-13	0.3592164	0.032396	2.34E-49	0.001049	NA	NA	3.355164	1.72E-16
new.HdTest	032MD	Male	1.28E-50	5.98E-27	6.35E-36	6.80E-35	NA	NA	0.002001	2.45E-145	0.0315561	0.0002063	2.25E-71	1.24E-16	NA	NA	1.407968	9.83E-20
new.HdTest	033MD	Male	2.14E-22	9.68E-08	6.62E-56	2.81E-36	NA	NA	2.35E-15	1.01E-100	6.3306374	0.0002257	7.83E-15	15.28457	NA	NA	3.281965	2.92E-07
new.HdTest	037MD	Male	1.71E-05	1.0501262	3.50E-29	2.93E-22	NA	NA	0.005578	4.36E-78	1.87E-13	4.69E-06	3.44E-65	3.42E-36	NA	NA	0.364299	2.29E-32
new.HdTest	041MD	Male	6.84E-31	3.14E-05	2.38E-42	5.59E-65	NA	NA	1.22E-51	606.73987	4.92E-08	3.31E-13	0.8157441	5.71E-08	NA	NA	2.64E-46	4.40E-127
new.HdTest	015CSM	Male	0.0041043	4.8093917	4.52E-06	1.41E-14	NA	NA	0.000755	2.90E-26	8.0469341	0.0026592	1.59E-37	10.23024	NA	NA	0.015963	7.60E-32
new.HdTest	023CSF	Female	0.0042614	5.6886479	3.52E-20	1.74E-23	NA	NA	0.017324	2.34E-104	0.0409566	0.0009878	3.13E-108	1.74E-35	NA	NA	9.76E-35	4.49E-07
new.HdTest	025CSF	Female	0.0015581	1.4654133	1.60E-26	2.29E-62	NA	NA	7.58E-28	0.0269246	1.97E-21	0.2687632	7.03E-07	12.74356	NA	NA	0.000207	0.0456057

new.HdTest	029CSM	Male	1.66E-09	3.61E-06	1.54E-54	3.15E-32	NA	NA	1.05E-07	5.97E-92	0.0049282	0.0711342	1.36E-164	2.15E-36	NA	NA	0.001119	2.07E-37
new.HdTest	002SF	Female	7.08E-19	0.0005887	2.77E-17	3.08E-16	NA	NA	1.43E-12	1.35E-55	0.0001925	4.0696377	4.52E-35	6.60E-12	NA	NA	3.59E-93	1.64E-51
new.HdTest	004SF	Female	0.0006621	0.1821565	1.08E-26	4.08E-35	NA	NA	5.335744	8.91E-106	2.46E-19	2.30E-15	5.19E-31	1.75E-18	NA	NA	6.63E-14	5.978481
new.HdTest	005SF	Female	0.7046289	3.0973688	1.61E-60	6.14E-32	NA	NA	11.83622	1.71E-71	2.69E-19	1.03E-122	7.13E-98	4.02E-16	NA	NA	4.39E-12	8.3219953
new.HdTest	007SF	Female	1.643117	8.25E-07	8.87E-36	1.17E-37	NA	NA	5.94E-10	2.13E-97	0.8090943	0.0001556	9.11E-80	1.72E-36	NA	NA	3.32E-47	5.23E-17
new.HdTest	012SF	Female	1.27E-37	5.23E-32	2.31E-40	1.30E-26	NA	NA	0.000148	1.13E-71	1.17E-05	8.68E-26	6.55E-65	1.02E-29	NA	NA	2.521978	4.82E-08
new.HdTest	015SM	Male	2.38E-07	2.2173803	3.24E-20	1.49E-18	NA	NA	0.017985	2.31E-161	2.50E-10	5.31E-12	6.54E-94	8.28E-11	NA	NA	9.568972	8.30E-12
new.HdTest	017SF	Female	5.09E-21	1.47E-09	1.47E-114	5.71E-70	NA	NA	1.16E-55	1.01E-73	4.8697466	1.14E-31	8.13E-68	5.73E-07	NA	NA	0.008562	0.0027727
new.HdTest	019SF	Female	3.02E-27	0.0139523	1.22E-45	6.53E-35	NA	NA	5.78E-05	1.35E-36	6.02E-06	8.61E-08	1.13E-94	5.27E-43	NA	NA	2.90E-17	1.1616252
new.HdTest	020SF	Female	0.0296457	3.25E-05	1.13E-42	6.35E-44	NA	NA	0.028557	6.43E-117	2.73E-10	2.62E-05	6.11E-161	1.05E-26	NA	NA	8.48E-32	3.66E-06
new.HdTest	021SF	Female	0.0411296	2.34E-09	1.15E-29	4.23E-20	NA	NA	9.50E-13	1.00E-67	4.60E-15	0.0022769	4.60E-35	4.15E-07	NA	NA	5.47E-55	1.86E-21
new.HdTest	023SM	Male	1.84E-06	0.9545285	3.96E-52	8.78E-42	NA	NA	2.46E-25	3.93E-28	3.76E-07	2.4356433	6.74E-37	0.134808	NA	NA	1.481154	2.39E-31
new.HdTest	024SF	Female	1.35E-19	1.03E-13	1.03E-12	3.30E-22	NA	NA	4.69E-15	6.87E-36	3.38E-31	4.9908691	1.06E-52	1.21E-08	NA	NA	3.39E-19	0.3160918
new.HdTest	026SF	Female	4.19E-07	1.6159637	1.04E-22	5.49E-22	NA	NA	2.35E-09	4.83E-75	7.54E-09	3.67E-11	9.76E-86	1.28E-06	NA	NA	2.86E-19	0.071374
new.HdTest	041SF	Female	1.17E-25	1.72E-22	1.98E-73	3.87E-24	NA	NA	9.414923	4.26E-93	0.0003505	1.99E-10	8.33E-70	3.95E-30	NA	NA	9.67E-38	4.21E-10
new.HdTest	042SF	Female	7.6133615	2.9282684	1.94E-49	2.65E-27	NA	NA	5.69E-07	1.72E-48	0.0026314	0.0056599	5.83E-59	8.18E-15	NA	NA	6.27E-35	3.61E-07
new.HdTest	044SF	Female	4.70E-25	1.07E-07	1.68E-34	1.49E-33	NA	NA	11.8116	6.13E-138	7.0672134	8.92E-21	1.56E-49	1.85E-10	NA	NA	2.72E-06	1.1944322
new.HdTest	055SF	Female	1.40E-15	0.0003989	7.81E-33	2.76E-13	NA	NA	0.00299	3.92E-163	9.16E-22	2.67E-16	1.46E-34	0.113686	NA	NA	0.100477	0.0006722
new.HdTest	058SM	Male	1.38E-10	3.38E-07	1.09E-39	4.25E-38	NA	NA	0.020973	1.64E-33	0.1850091	1.06E-12	9.82E-64	3.694581	NA	NA	0.442612	4.25E-33
new.HdTest	059SM	Male	1.5000271	5.6716521	2.47E-59	1.04E-38	NA	NA	0.000164	9.61E-186	7.50E-27	0.544973	1.65E-74	2.77E-39	NA	NA	8.371945	1.48E-15
new.HdTest	062SM	Male	4.4233057	0.1878892	4.63E-57	4.41E-37	NA	NA	2.79E-24	4.71E-20	0.0001538	1.45E-08	30.294934	9.55E-17	NA	NA	6.84E-23	4.72E-87
new.HdTest	064SM	Male	2.73E-11	4.84E-13	8.73E-44	2.13E-43	NA	NA	7.39E-14	1.46E-37	4.3423061	0.0189854	1.03E-22	0.148865	NA	NA	0.006997	6.64E-36
new.HdTest	068SM	Male	0.0010504	0.0286761	2.70E-46	4.30E-37	NA	NA	8.94E-16	7.86E-116	1.71E-32	1.3367193	3.40E-44	1.60E-26	NA	NA	0.001923	2.08E-42
new.HdTest	069SM	Male	3.30E-09	4.0545127	2.09E-66	5.88E-71	NA	NA	2.85E-05	8.18E-121	3.07E-15	0.0017479	17.441158	0.152773	NA	NA	0.007093	3.58E-33
new.HdTest	070SM	Male	5.70E-12	1.1147574	8.41E-45	2.15E-59	NA	NA	2.08E-12	3.94E-128	9.49E-05	4.7266882	8.37E-05	11.99427	NA	NA	9.92E-06	1.87E-50
new.HdTest	071SM	Male	0.0029732	0.0025868	4.19E-78	4.01E-60	NA	NA	6.70E-15	1.58E-71	6.54E-43	1.6712973	0.2799483	6.24E-12	NA	NA	0.077871	2.69E-34
new.HdTest	072SM	Male	3.17E-08	0.0146559	2.20E-21	3.61E-16	NA	NA	0.43841	1.76E-87	1.21E-05	0.0012095	8.85E-45	0.000159	NA	NA	6.423963	1.03E-12
new.HdTest	075SM	Male	5.27E-28	3.79E-19	4.17E-94	8.02E-77	NA	NA	2.021605	2.15E-105	6.0414317	4.01E-12	5.67E-24	1.21E-101	NA	NA	8.583275	2.14E-15
new.HdTest	077SM	Male	1.60E-08	3.6328535	1.34E-05	2.74E-26	NA	NA	9.69E-16	4.93E-115	9.54E-20	3.02E-07	67.262379	1.21E-10	NA	NA	7.802739	1.14E-13
new.HdTest	078SM	Male	1.23E-11	2.74E-24	4.77E-66	7.96E-63	NA	NA	1.40E-19	5.06E-72	1.49E-06	6.7698827	0.0015528	1.66E-49	NA	NA	1.279605	5.91E-09

new.HdTest	080SM	Male	10.093039	1.3160809	1.18E-15	5.06E-09	NA	NA	5.78E-07	2.43E-103	0.0208889	0.9145601	3.26E-68	3.67E-13	NA	NA	9.062561	1.65E-17
new.HdTest	081SM	Male	4.17E-19	3.3369084	2.25E-60	1.72E-39	NA	NA	6.69E-14	7.08E-57	3.07E-16	0.0038836	0.006314	0.000463	NA	NA	7.21E-26	3.49E-89
new.HdTest	082SM	Male	7.43E-07	1.4121352	2.22E-14	2.48E-19	NA	NA	0.002499	2.96E-96	1.54E-10	3.06E-18	1.96E-34	0.243928	NA	NA	6.704708	2.66E-11
new.HdTest	083SM	Male	3.52E-06	1.8699429	2.97E-56	4.66E-26	NA	NA	6.52E-22	4.00E-46	9.27E-12	2.0706114	5.19E-05	6.325657	NA	NA	2.24E-12	4.95E-68
new.HdTest	084SM	Male	1.6789699	0.9122303	2.05E-09	1.75E-25	NA	NA	0.627636	3.94E-144	7.7914144	1.48E-13	1.59E-121	2.94E-39	NA	NA	2.03E-20	1.5195616
new.HdTest	088SM	Male	1.98E-39	0.2696127	3.24E-15	2.27E-57	NA	NA	4.28E-13	1.96E-44	4.6058589	0.3911919	9.41E-31	2.524203	NA	NA	2.186814	3.94E-25
new.HdTest	089SM	Male	10.196077	5.6895638	2.08E-49	4.72E-23	NA	NA	10.55032	1.28E-132	1.77E-09	7.72E-10	1.04E-130	1.92E-44	NA	NA	1.32E-24	0.007682
new.HdTest	090SM	Male	6.49E-09	1.00E-05	2.08E-49	2.51E-41	NA	NA	6.14E-26	7.05E-103	1.75E-12	6.6495472	5.23E-51	0.002666	NA	NA	5.09E-06	3.01E-48
new.HdTest	093SF	Female	0.0001914	4.1320744	2.01E-49	2.76E-36	NA	NA	1.08E-114	1.74E-96	1.39E-18	0.0017911	5.42E-53	8.42E-16	NA	NA	2.62E-25	0.8639542
new.HdTest	094SM	Male	0.0754306	6.50E-13	4.74E-82	3.34E-28	NA	NA	3.57E-20	1.99E-68	2.68E-27	2.738816	1.01E-70	2.19E-16	NA	NA	6.604358	3.89E-24
new.HdTest	096SF	Female	1.11E-14	0.0530204	5.37E-74	6.42E-59	NA	NA	2.75E-20	1.39E-59	4.01E-06	1.18E-25	5.34E-69	4.05E-22	NA	NA	0.015911	0.0033889
new.HdTest	101SM	Male	0.758785	5.45E-06	1.36E-34	4.74E-25	NA	NA	1.84E-05	1.23E-154	8.99E-27	0.8970396	1.87E-05	0.009588	NA	NA	9.216171	1.43E-18
new.HdTest	104SF	Female	1.13E-05	0.0019734	3.30E-103	3.96E-50	NA	NA	1.02E-57	7.39E-145	1.03E-06	5.0925973	3.76E-08	0.155182	NA	NA	9.820001	6.44E-15
new.HdTest	105SF	Female	5.66E-21	0.3109705	4.57E-54	1.82E-71	NA	NA	6.86E-35	4.08E-60	2.59E-17	0.0025549	3.64E-44	2.430492	NA	NA	6.94E-05	0.405917
new.HdTest	106SM	Male	3.49E-08	0.0475789	3.55E-97	2.20E-70	NA	NA	6.30E-05	1.51E-152	0.0382345	0.189685	0.2804368	15.43577	NA	NA	0.003721	3.41E-34
new.HdTest	107SM	Male	7.31E-09	2.91E-07	2.48E-62	1.23E-51	NA	NA	3.14E-37	2.67E-201	1.88E-69	2.8081793	3.42E-35	0.00012	NA	NA	4.67E-16	1.99E-73
new.HdTest	108SF	Female	2.37E-20	4.91E-11	6.97E-109	5.40E-70	NA	NA	3.73E-13	1.02E-15	0.000431	2.2054748	7.02E-46	8.89E-05	NA	NA	5.55E-14	7.4277698
new.HdTest	109SF	Female	0.0461965	1.22E-08	6.37E-59	2.14E-23	NA	NA	1.30E-08	7.40E-84	6.94E-11	7.33E-09	1.31E-193	9.98E-36	NA	NA	3.65E-17	4.4258131
new.HdTest	110SF	Female	2.8463371	5.0116873	4.18E-25	3.44E-50	NA	NA	4.38E-49	1.66E-70	8.90E-25	1.84E-08	5.43E-09	3.373576	NA	NA	2.63E-05	0.6970885
new.HdTest	111SM	Male	0.7203401	2.04E-14	5.17E-29	1.85E-41	NA	NA	0.379121	2.23E-133	0.6558996	6.7803396	7.93E-20	2.619146	NA	NA	1.023555	1.69E-05
new.HdTest	112SM	Male	1.72E-20	0.0014536	1.11E-57	1.48E-53	NA	NA	8.811666	7.65E-25	2.26E-06	0.6131178	3.06E-185	3.40E-10	NA	NA	0.620731	1.22E-22
new.HdTest	114SM	Male	2.11E-26	2.5035474	1.63E-33	1.11E-49	NA	NA	0.057406	3.43E-80	9.24E-15	1.5154833	6.41E-15	1.76E-36	NA	NA	7.15E-08	1.12E-45
new.HdTest	133SF	Female	2.76E-11	3.3009052	83.6448	5.61E-05	NA	NA	0.086651	3.91E-31	0.0002844	1.04E-12	1.10E-44	0.167423	NA	NA	2.06E-43	1.32E-13
new.HdTest	134SM	Male	7.63E-41	4.61E-30	2.05E-66	8.31E-57	NA	NA	0.034701	4.87E-68	4.7920761	9.35E-12	6.84E-99	7.14181	NA	NA	1.63E-50	3.79E-154
new.HdTest	144SF	Female	1.08E-19	0.0009944	2.01E-30	1.17E-20	NA	NA	4.11E-30	4.68E-45	0.1206994	9.76E-13	4.89E-20	11.25666	NA	NA	0.955772	4.68E-25
new.HdTest	178SM	Male	0.1984222	5.0034027	4.04E-18	4.65E-18	NA	NA	10.7224	2.12E-38	1.75E-90	4.99E-10	3.96E-10	12.78785	NA	NA	1.44E-122	1.06E-270
new.HdTest	001CSF	Female	9.95E-19	0.0004392	3.28E-46	2.31E-25	NA	NA	0.086129	1.54E-146	7.8821312	8.75E-09	1.76E-126	2.52E-49	NA	NA	4.48E-48	1.35E-17
new.HdTest	002CSM	Male	3.55E-11	0.0001409	1.87E-48	1.77E-32	NA	NA	9.39651	1.42E-69	4.56E-06	0.0055677	1.95E-58	4.10E-23	NA	NA	0.001369	0.379881
new.HdTest	003CSM	Male	4.29E-34	1.42E-20	5.85E-62	9.69E-46	NA	NA	0.040247	2.87E-62	0.4760074	2.6632052	3.36E-09	0.760513	NA	NA	1.027582	4.35E-06

new.HdTest	004CSM	Male	1.14E-12	0.0011647	2.73E-14	1.53E-12	NA	NA	1.451264	8.51E-80	0.3876854	3.61E-08	7.11E-44	0.002952	NA	NA	7.24E-18	0.443032
new.HdTest	005CSF	Female	3.14E-06	0.0028002	7.83E-62	2.95E-49	NA	NA	6.53E-33	3.41E-46	7.42E-13	1.8971886	2.46E-26	0.078361	NA	NA	2.19E-24	0.0004555
new.HdTest	006CSM	Male	4.38E-25	5.68E-14	1.08E-74	1.58E-53	NA	NA	7.398526	6.67E-109	4.22E-41	0.0057425	5.47E-51	2.19E-93	NA	NA	2.15E-15	2.35E-64
new.HdTest	007CSM	Male	1.15E-19	1.41E-12	7.45E-71	3.40E-60	NA	NA	5.430637	1.42E-69	6.78E-05	6.55E-11	2.90E-18	0.542962	NA	NA	1.09686	8.58E-26
new.HdTest	008CSM	Male	0.008693	3.0973688	9.73E-50	1.07E-27	NA	NA	6.48E-38	2.92E-46	1.98E-18	3.2385295	2.55E-217	10.05405	NA	NA	1.20E-09	2.28E-41
new.HdTest	009CSM	Male	1.58E-06	0.0599789	1.29E-38	8.60E-34	NA	NA	11.70807	4.34E-75	2.92E-20	1.3266086	1.03E-84	1.38E-36	NA	NA	1.91E-17	9.29E-73
new.HdTest	010CSM	Male	2.28E-08	4.61E-05	1.50E-51	1.61E-27	NA	NA	4.286681	1.49E-101	0.0008344	0.0515702	5.51E-65	1.71E-07	NA	NA	3.737505	4.16E-19
new.HdTest	011CSF	Female	1.16E-09	5.717122	4.84E-58	2.77E-85	NA	NA	1.00E-35	8.73E-07	2.91E-16	1.23E-17	10.429503	3.39E-14	NA	NA	4.871376	8.21E-09
new.HdTest	012CSM	Male	3.37E-14	9.15E-19	2.14E-74	3.38E-69	NA	NA	11.8077	5.47E-89	3.31E-06	0.0295012	2.12E-43	2.41E-18	NA	NA	2.87E-07	3.86E-47
new.HdTest	013CSF	Female	9.7984773	2.1517144	1.24E-17	5.00E-33	NA	NA	3.68E-20	2.05E-125	0.0018004	6.77E-21	5.73E-48	1.10E-28	NA	NA	2.54E-50	3.04E-17
new.HdTest	014CSM	Male	2.25E-17	1.69E-10	5.87E-48	2.04E-21	NA	NA	0.143407	3.95E-61	7.84E-06	0.0007649	2.27E-79	7.22E-28	NA	NA	1.49E-07	1.56E-40
new.HdTest	016CSF	Female	0.1895018	0.0336878	7.05E-53	4.96E-16	NA	NA	1.37E-20	3.36E-49	0.2861859	8.94E-19	3.06E-20	5.28381	NA	NA	4.41E-62	1.25E-26
new.HdTest	017CSF	Female	4.30E-06	0.5767889	6.96E-94	9.94E-60	NA	NA	1.59E-19	3.04E-46	0.0129106	1.23E-12	3.65E-36	5.39E-09	NA	NA	7.87E-11	9.424287
new.HdTest	018CSF	Female	7.46E-05	1.0570183	3.66E-37	9.66E-30	NA	NA	8.31E-50	3.60E-128	0.0629887	1.42E-12	3.39E-54	1.95E-18	NA	NA	8.42E-35	9.46E-08
new.HdTest	019CSF	Female	0.0013151	0.0097111	2.67E-69	6.63E-63	NA	NA	2.057725e-316	1.92E-104	2.30E-26	6.5388671	7.07E-27	0.27181	NA	NA	4.00E-07	10.31193
new.HdTest	020CSM	Male	0.0094597	1.32E-06	2.02E-89	1.08E-45	NA	NA	6.821741	2.14E-29	3.81E-09	4.4818946	4.37E-22	0.220995	NA	NA	0.002842	1.30E-34
new.HdTest	021CSF	Female	0.6773786	5.6919222	1.63E-50	1.22E-29	NA	NA	0.160514	1.41E-87	6.0407485	0.0002413	3.57E-42	6.63E-05	NA	NA	1.17E-22	1.22E-05
new.HdTest	022CSF	Female	0.0247502	1.1833577	4.38E-56	2.24E-46	NA	NA	2.03E-40	6.03E-134	4.70E-20	9.22E-17	3.83E-119	5.29E-59	NA	NA	5.38E-15	0.6301817
new.HdTest	024CSM	Male	5.09E-18	1.43E-15	7.42E-20	4.07E-24	NA	NA	0.453629	1.53E-154	0.0016161	0.0698881	1.96E-95	2.60E-34	NA	NA	5.121215	0.0006904
new.HdTest	026CSF	Female	0.0266836	3.0211832	1.21E-100	5.05E-51	NA	NA	1.11E-112	3.59E-125	2.33E-24	1.75E-07	2.46E-15	0.006245	NA	NA	0.000796	1.5423588
new.HdTest	027CSF	Female	2.13E-11	0.0207305	7.90E-59	1.95E-29	NA	NA	1.08E-17	6.24E-59	2.34E-06	0.2072007	1.93E-34	4.16004	NA	NA	4.52E-15	10.353371
new.HdTest	028CSM	Male	0.5208083	3.3065489	3.00E-32	3.02E-16	NA	NA	0.001556	1.48E-47	2.38E-17	1.376451	4.75E-35	8.65E-06	NA	NA	10.11992	3.65E-12
new.HdTest	030CSF	Female	0.0004619	0.7022769	8.62E-44	4.99E-38	NA	NA	7.398526	4.93E-69	0.3579238	0.4757041	7.55E-126	4.67E-28	NA	NA	0.002549	0.0002057
new.HdTest	031CSF	Female	2.98E-05	0.0540987	1.88E-37	1.14E-40	NA	NA	0.285404	1.13E-54	7.0135984	4.32E-25	1.14E-59	3.44E-17	NA	NA	7.04E-89	4.74E-51
new.HdTest	032CSF	Female	3.08E-15	1.29E-08	5.61E-58	4.09E-46	NA	NA	0.091575	1.87E-108	7.9557901	0.0013397	7.72E-34	7.16E-08	NA	NA	2.16E-27	0.0013276
new.HdTest	001SF	Female	2.38E-06	4.59E-06	4.85E-38	6.10E-20	NA	NA	2.30E-12	2.84E-98	1.93E-10	4.4336186	7.89E-52	3.92E-17	NA	NA	3.31E-31	0.0021507

new.HdTest	003SM	Male	1.12E-20	0.0107693	3.20E-44	1.91E-38	NA	NA	0.009454	1.17E-86	0.0091652	0.0567682	8.82E-109	5.90E-39	NA	NA	8.744713	4.51E-17
new.HdTest	006SF	Female	1.65E-32	6.83E-13	1.53E-65	6.12E-45	NA	NA	6.78E-09	1.23E-27	0.0008013	1.55E-13	2.70E-77	1.49E-13	NA	NA	1.39E-21	0.0471607
new.HdTest	008SF	Female	0.1228716	0.3468325	7.06E-32	1.65E-40	NA	NA	0.000765	1.49E-106	0.0146021	3.46E-07	6.54E-46	7.14E-16	NA	NA	8.28E-70	2.19E-26
new.HdTest	009SM	Male	9.5624738	0.4914045	6.13E-46	1.37E-22	NA	NA	7.286263	3.25E-05	2.89E-08	0.2197949	2.58E-142	4.82E-88	NA	NA	4.42E-13	3.59E-64
new.HdTest	010SM	Male	8.4909432	0.0003291	8.49E-24	1.01E-12	NA	NA	11.81293	2.31E-41	3.33E-43	4.3822436	3.44E-34	2.04E-40	NA	NA	0.09151	2.44E-05
new.HdTest	011SF	Female	1.67E-19	2.39E-11	2.43E-93	6.23E-50	NA	NA	1.59E-126	2.81E-53	9.53E-22	1.57E-08	4.79E-50	10.05405	NA	NA	3.40E-05	1.7033718
new.HdTest	013SF	Female	0.1532987	2.62E-14	3.70E-60	5.01E-41	NA	NA	1.28E-09	2.12E-137	0.0839732	4.76E-22	4.86E-257	2.62E-84	NA	NA	1.27E-87	7.33E-47
new.HdTest	014SF	Female	1.18E-11	0.0012382	5.90E-43	6.48E-61	NA	NA	7.97616	2.81E-64	0.0103727	9.35E-27	4.04E-70	7.170326	NA	NA	3.23E-41	3.22E-12
new.HdTest	016SF	Female	0.0189911	0.0001071	1.02E-68	2.84E-10	NA	NA	9.681065	9.30E-94	5.0777438	1.03E-11	4.16E-85	1.79E-28	NA	NA	3.96E-45	2.03E-17
new.HdTest	018SF	Female	0.4556241	1.01E-06	8.23E-31	2.48E-15	NA	NA	1.54E-09	5.65E-68	4.11E-25	2.23E-29	2.39E-96	5.31E-44	NA	NA	3.13E-08	2.4994358
new.HdTest	022SM	Male	6.32E-23	5.4990067	3.74E-53	4.20E-67	NA	NA	0.113516	4.80E-140	1.60E-12	9.67E-32	3.84E-08	0.000973	NA	NA	2.37E-28	2.71E-110
new.HdTest	025SF	Female	0.175754	9.73E-07	1.65E-67	1.59E-88	NA	NA	1.40E-40	4.05E-94	1.09E-19	0.0014253	7.75E-93	4.60E-12	NA	NA	7.01335	1.43E-21
new.HdTest	027SM	Male	0.1927631	0.0965013	8.81E-26	3.54E-16	NA	NA	1.17E-52	1.06E-81	2.34E-41	0.7288912	3.54E-24	3.110333	NA	NA	1.62E-37	7.84E-106
new.HdTest	028SM	Male	4.54E-46	8.23E-11	2.23E-92	1.71E-47	NA	NA	8.57E-60	5.09E-91	5.12E-13	0.1277677	8.32E-140	1.35E-11	NA	NA	1.174155	9.22E-27
new.HdTest	029SM	Male	1.17E-57	3.98E-11	1.34E-24	1.33E-50	NA	NA	0.494901	6.57E-124	0.0026558	6.36E-12	5.39E-193	1.84E-29	NA	NA	4.39E-24	1.63E-87
new.HdTest	030SF	Female	5.67E-11	2.7796658	5.18E-34	1.94E-47	NA	NA	2.45E-69	1.59E-168	0.0021721	2.16E-10	7.07E-87	2.07E-24	NA	NA	1.48E-43	4.36E-12
new.HdTest	031SF	Female	1.78E-17	0.0004708	2.13E-32	5.16E-39	NA	NA	3.45E-55	3.98E-144	2.35E-16	2.05E-27	3.20E-83	2.40E-20	NA	NA	1.33E-09	1.8979607
new.HdTest	032SF	Female	0.1028759	5.4995858	3.33E-18	1.39E-112	NA	NA	3.36E-39	1.59E-92	1.63E-27	0.000452	6.16E-44	1.07E-30	NA	NA	5.293449	1.89E-10
new.HdTest	033SF	Female	1.47E-16	2.06E-16	2.40E-23	1.77E-15	NA	NA	0.713471	6.53E-42	4.63E-12	5.62E-16	7.01E-75	1.09E-20	NA	NA	3.18E-11	10.207177
new.HdTest	034SF	Female	5.24E-09	3.0822873	1.92E-93	5.59E-74	NA	NA	1.14E-206	2.38E-109	2.62E-27	1.0376826	7.06E-11	0.001574	NA	NA	1.13E-05	0.1771381
new.HdTest	035SM	Male	9.15E-21	1.40E-07	1.73E-64	3.46E-44	NA	NA	10.67388	8.16E-74	6.60E-23	9.37E-61	8.89E-12	5.469922	NA	NA	2.30E-07	2.9857159
new.HdTest	036SF	Female	4.3813568	0.0024863	8.60E-70	4.44E-48	NA	NA	1.16E-61	7.22E-166	4.73E-35	5.43E-19	6.40E-09	0.102439	NA	NA	2.00E-07	4.3987691
new.HdTest	037SM	Male	1.52E-13	4.9167036	5.04E-63	1.82E-61	NA	NA	2.09E-06	4.66E-127	3.21E-10	1.3320603	2.38E-183	3.97E-46	NA	NA	2.80E-08	8.79E-55
new.HdTest	038SM	Male	1.64E-08	3.46E-05	1.91E-14	2.94E-21	NA	NA	0.145868	3.23E-119	0.3277924	6.68E-22	1.54E-61	3.71E-18	NA	NA	1.41E-25	0.0010806
new.HdTest	039SF	Female	6.34E-15	0.9465043	1.04E-54	1.57E-43	NA	NA	5.06E-46	1.41E-87	7.3926507	0.0154719	1.70E-56	1.45E-17	NA	NA	1.53E-25	0.0011177
new.HdTest	040SM	Male	1.86E-11	0.0554424	2.66E-09	2.58E-21	NA	NA	5.40E-10	2.80E-130	7.0245621	0.0928927	1.49E-58	0.102439	NA	NA	7.813135	2.18E-14
new.HdTest	043SF	Female	7.37E-05	0.0009976	4.03E-30	1.83E-29	NA	NA	9.636053	3.65E-81	0.1495827	0.6113335	3.83E-52	2.03E-13	NA	NA	6.06E-37	2.42E-10
new.HdTest	046SM	Male	3.36E-09	1.82E-16	3.92E-86	1.30E-26	NA	NA	2.41E-280	0	3.17E-263	3.18E-22	1.68E-73	1.14E-92	NA	NA	6.00E-05	2.11E-37
new.HdTest	047SM	Male	4.44E-23	0.0008546	3.61E-41	7.25E-33	NA	NA	3.14E-35	2.94E-41	2.28E-07	6.5128434	2.47E-42	8.10E-20	NA	NA	7.49E-25	2.08E-93
new.HdTest	048SM	Male	0.0005151	1.30E-13	3.72E-29	8.84E-53	NA	NA	1.35E-21	2.17E-104	4.01E-21	2.12E-05	4.2363727	1.65E-48	NA	NA	4.01E-23	1.89E-77

new.HdTest	049SF	Female	0.3158953	0.0283167	1.04E-27	2.09E-15	NA	NA	0	5.58E-182	5.82E-32	0.1388239	64.971698	2.17E-28	NA	NA	2.35E-05	1.9846168
new.HdTest	050SM	Male	0.0047063	0.1318997	7.53E-39	4.75E-37	NA	NA	10.26135	2.03E-90	6.58E-17	4.33E-36	5.86E-19	5.26E-07	NA	NA	0.026459	5.44E-31
new.HdTest	051SF	Female	1.02E-08	2.336265	5.61E-58	4.32E-57	NA	NA	3.19E-31	6.99E-112	3.33E-22	4.81E-37	4.17E-28	2.58E-05	NA	NA	7.97E-05	1.03E-35
new.HdTest	052SM	Male	0.0183664	0.0221172	6.47E-28	1.02E-10	NA	NA	6.37E-27	2.10E-71	4.59E-10	6.3012137	7.64E-47	2.41E-18	NA	NA	0.079043	0.0025873
new.HdTest	053SM	Male	2.97E-05	0.0190695	3.00E-58	9.92E-28	NA	NA	1.18E-24	3.40E-102	1.33E-22	0.3141751	4.65E-104	2.54E-36	NA	NA	9.09E-12	6.83E-51
new.HdTest	054SF	Female	1.5133627	9.53E-11	1.35E-10	8.69E-08	NA	NA	0.000186	1.08E-159	0.1897364	2.07E-10	5.93E-133	1.52E-60	NA	NA	1.08E-80	5.71E-37
new.HdTest	056SM	Male	6.75E-35	2.06E-27	5.65E-55	2.00E-40	NA	NA	8.11E-22	1.91E-43	4.78E-15	0.0002082	5.15E-61	0.000522	NA	NA	0.001279	3.21E-33
new.HdTest	057SF	Female	0.2737134	0.0232763	1.73E-49	9.02E-32	NA	NA	1.87E-93	1.87E-108	8.71E-17	5.57E-12	7.72E-34	0.576695	NA	NA	0.079043	9.35E-09
new.HdTest	060SF	Female	9.5539815	2.18E-05	5.69E-38	4.22E-67	NA	NA	1.13E-44	1.49E-48	3.61E-07	0.0145328	4.17E-28	7.16E-08	NA	NA	3.16E-08	5.0359664
new.HdTest	061SF	Female	0.0446825	2.07E-09	9.59E-63	4.99E-38	NA	NA	8.39E-50	3.20E-51	7.9989353	3.97E-12	1.25E-66	1.55E-25	NA	NA	1.67E-52	7.67E-17
new.HdTest	063SF	Female	3.2202775	0.7393135	9.88E-49	1.50E-72	NA	NA	1.41E-139	2.72E-41	3.48E-20	6.2048325	0.0002732	2.80E-06	NA	NA	0.50339	2.99E-10
new.HdTest	065SF	Female	0.0004204	6.74E-05	4.81E-80	1.06E-53	NA	NA	1.77E-12	1.52E-108	0.2113683	1.75E-12	3.10E-82	8.89E-20	NA	NA	1.70E-12	9.0018136
new.HdTest	066SF	Female	2.8091978	1.6224293	1.69E-44	1.69E-35	NA	NA	2.41E-18	2.76E-84	1.83E-18	3.02E-07	4.35E-29	0.00146	NA	NA	0.023561	0.0020281
new.HdTest	067SF	Female	2.1312859	4.7860264	4.23E-74	7.33E-67	NA	NA	6.05E-11	2.51E-129	4.90E-14	4.54E-06	6.80E-07	1.414695	NA	NA	2.62E-19	0.2911569
new.HdTest	073SF	Female	5.79E-36	3.49E-30	1.42E-11	1.24E-21	NA	NA	2.60E-56	1.96E-25	9.94E-12	0.0017587	1.20E-41	1.54E-21	NA	NA	6.603622	8.98E-20
new.HdTest	074SF	Female	0.0094597	3.9225293	4.00E-53	5.58E-44	NA	NA	6.07E-18	3.72E-88	0.0001216	1.71E-05	6.94E-33	7.50E-09	NA	NA	1.37E-10	10.222445
new.HdTest	076SF	Female	8.48E-16	1.9021115	3.97E-35	9.98E-27	NA	NA	8.35E-34	4.52E-103	2.40E-05	1.53E-07	3.83E-52	7.33E-24	NA	NA	0.024683	0.0019042
new.HdTest	079SM	Male	4.18E-07	2.85E-34	3.17E-86	1.90E-24	NA	NA	8.89E-16	2.08E-97	4.78E-15	0.5090696	2.48E-153	3.25E-12	NA	NA	0.000516	3.61E-37
new.HdTest	085SF	Female	0.0014225	0.3146459	5.70E-18	1.48E-34	NA	NA	1.41E-19	4.57E-95	0.01318	0.6316448	2.93E-62	1.09E-20	NA	NA	6.08E-10	10.672732
new.HdTest	086SF	Female	9.15E-21	5.67E-40	2.18E-53	4.72E-33	NA	NA	3.19E-28	7.83E-58	0.0008512	1.33E-07	2.32E-33	3.95E-05	NA	NA	1.12E-09	9.8439518
new.HdTest	087SF	Female	7.45E-25	8.39E-33	9.03E-65	6.27E-29	NA	NA	2.25E-47	6.44E-83	1.68E-20	6.6793102	6.93E-23	0.501492	NA	NA	0.125988	3.55E-28
new.HdTest	091SM	Male	1.45E-12	4.2196131	8.75E-27	4.05E-35	NA	NA	0.002777	2.38E-109	1.04E-20	5.8089255	1.45E-51	0.07821	NA	NA	2.63E-17	3.32E-84
new.HdTest	092SF	Female	9.6017363	8.60E-08	2.44E-59	3.54E-34	NA	NA	3.27E-51	5.46E-88	2.53E-12	0.0027699	4.26E-57	0.004776	NA	NA	0.089016	2.21E-06
new.HdTest	095SM	Male	0.0001391	0.1552706	4.61E-35	2.31E-25	NA	NA	3.66E-22	1.30E-142	0.0013562	3.3796184	4.17E-44	8.52E-07	NA	NA	0.003471	0.0004047
new.HdTest	097SF	Female	1.85E-10	0.0614092	3.51E-76	1.20E-45	NA	NA	1.24E-29	3.80E-111	0.0286951	4.94E-09	2.50E-113	1.58E-111	NA	NA	0.000198	0.0036964
new.HdTest	098SF	Female	0.0057895	0.0599789	2.48E-42	2.62E-32	NA	NA	1.15E-43	6.24E-59	1.40E-17	0.0161195	8.50E-63	8.17E-19	NA	NA	3.440088	4.69E-28
new.HdTest	099SM	Male	4.38E-17	0.01028	1.86E-17	1.83E-09	NA	NA	2.10E-14	4.94E-212	5.56E-05	0.4530434	1.01E-52	3.14E-24	NA	NA	9.14977	2.18E-16
new.HdTest	100SM	Male	2.00E-13	9.50E-11	4.09E-10	1.77E-15	NA	NA	8.12E-11	4.47E-44	4.63E-12	0.0193819	1.47E-103	1.09E-20	NA	NA	4.49E-12	9.25E-69
new.HdTest	102SF	Female	1.5762189	0.0334451	3.37E-33	4.05E-35	NA	NA	2.42E-81	4.01E-96	1.19E-06	0.2102518	1.78E-44	1.08E-05	NA	NA	6.21E-40	2.00E-11
new.HdTest	103SF	Female	7.69E-14	0.0008546	2.93E-55	2.33E-34	NA	NA	1.75E-15	4.18E-85	4.26E-16	0.040229	3.46E-73	6.15E-38	NA	NA	4.80E-06	0.5395324

new.HdTest	115SF	Female	5.9310473	1.29E-11	2.14E-74	5.32E-61	NA	NA	1.67E-60	4.43E-145	1.7599828	0.0002201	1.81E-20	9.309451	NA	NA	1.47E-30	1.13E-06
new.HdTest	116SF	Female	6.03E-08	2.3927672	2.21E-30	2.99E-37	NA	NA	6.68E-19	2.31E-117	2.86E-12	7.07E-17	2.23E-07	3.69E-21	NA	NA	0.004709	0.0138691
new.HdTest	117SF	Female	0.8313018	5.56E-05	1.24E-68	3.20E-31	NA	NA	3.548246	7.12E-76	0.0001014	0.000414	5.12E-134	5.85E-47	NA	NA	9.42E-27	0.0009078
new.HdTest	118SM	Male	1.24E-22	3.89E-07	1.64E-50	2.40E-70	NA	NA	2.95E-08	4.77E-117	6.67E-07	3.02E-07	2.68E-21	0.000136	NA	NA	0.857424	5.05E-07
new.HdTest	119SM	Male	0.0002251	7.58E-05	1.35E-88	3.84E-88	NA	NA	11.46854	4.06E-159	1.93E-07	0.0604274	8.98E-33	2.64E-10	NA	NA	3.25E-06	1.1212077
new.HdTest	120SM	Male	0.0024892	0.1372813	1.04E-27	1.23E-37	NA	NA	2.68E-07	5.20E-122	0.0114223	1.0016252	0.0036364	5.469922	NA	NA	0.365024	1.71E-05
new.HdTest	121SM	Male	0.481124	0.0028488	1.08E-54	4.01E-105	NA	NA	2.77E-15	6.49E-79	1.192259	7.31E-08	2.31E-20	1.99E-06	NA	NA	1.02805	1.36E-20
new.HdTest	122SF	Female	1.24E-08	1.31E-13	7.47E-53	2.00E-40	NA	NA	1.07E-25	1.78E-128	9.27E-06	0.0521372	4.05E-147	3.03E-22	NA	NA	0.295161	8.88E-05
new.HdTest	123SF	Female	8.15E-07	6.13E-08	2.01E-145	1.27E-91	NA	NA	1.27E-32	2.81E-68	5.64E-15	0.0016264	8.13E-18	0.004469	NA	NA	1.51584	1.31E-06
new.HdTest	124SF	Female	7.3705443	5.273698	3.12E-49	4.83E-26	NA	NA	3.96E-25	1.64E-82	6.27E-28	1.33E-07	5.4231963	1.414695	NA	NA	1.12E-09	5.7022269
new.HdTest	125SM	Male	0.0005151	0.413764	1.35E-24	1.26E-40	NA	NA	8.831699	1.13E-121	6.39E-08	5.387559	1.17E-46	3.30E-18	NA	NA	0.168399	2.48E-25
new.HdTest	126SF	Female	3.54E-07	4.24E-06	4.72E-90	1.13E-75	NA	NA	2.66E-08	1.00E-60	2.59E-05	3.54E-25	5.23E-79	7.53E-39	NA	NA	2.25E-25	0.0089112
new.HdTest	127SF	Female	4.9306252	5.4822439	2.55E-117	7.73E-54	NA	NA	1.11E-46	1.38E-46	3.20E-09	5.07E-23	5.22E-14	1.97E-16	NA	NA	3.16E-29	9.51E-08
new.HdTest	128SF	Female	9.0989053	0.0001952	1.62E-72	1.18E-36	NA	NA	1.93E-92	6.65E-22	1.53E-35	0.2102518	0.0115631	0.005222	NA	NA	2.499407	2.36E-19
new.HdTest	129SF	Female	0.0370183	2.1024298	3.40E-84	9.27E-57	NA	NA	1.48E-101	3.10E-186	1.47E-39	2.7282195	0.7675332	1.97E-35	NA	NA	0.009655	0.0003119
new.HdTest	130SM	Male	3.30E-10	1.63E-07	7.09E-27	1.16E-53	NA	NA	0.978859	5.98E-113	0.0123616	0.2764001	2.19E-45	1.73E-26	NA	NA	5.66E-08	8.8081074
new.HdTest	131SM	Male	0.0491084	1.35E-09	1.19E-53	1.13E-137	NA	NA	3.16E-75	5.47E-89	2.70E-17	1.1044208	0.0024091	3.70E-25	NA	NA	2.52E-14	1.31E-84
new.HdTest	132SM	Male	4.35E-06	0.0965013	1.66E-73	9.62E-73	NA	NA	3.548246	6.99E-136	0.0221275	3.74E-14	4.93E-60	6.19E-06	NA	NA	3.02E-08	7.15E-50
new.HdTest	135SF	Female	4.18E-07	3.5996835	9.89E-47	3.59E-47	NA	NA	2.02E-09	7.91E-68	3.53E-05	4.85E-12	1.57E-73	5.24E-20	NA	NA	0.000856	0.0314504
new.HdTest	136SF	Female	0.7914982	2.081758	1.52E-105	3.40E-54	NA	NA	2.74E-38	1.87E-67	9.90E-19	1.2788752	1.70E-56	6.84E-22	NA	NA	3.03E-07	3.9467124
new.HdTest	137SF	Female	2.17E-09	0.0025957	1.49E-39	4.43E-71	NA	NA	1.42E-84	1.15E-29	8.93E-25	1.66E-14	6.19E-15	6.17E-19	NA	NA	2.71E-13	1.73E-66
new.HdTest	138SM	Male	6.90E-25	5.4605622	7.74E-69	1.13E-108	NA	NA	0.057406	0	0.0183281	1.61E-11	4.60E-12	1.84E-27	NA	NA	0.01087	9.31E-34
new.HdTest	139SM	Male	0.0001377	0.8370764	2.44E-118	2.64E-86	NA	NA	1.36E-15	1.94E-37	3.43E-12	0.0448898	9.49E-06	1.945858	NA	NA	4.01E-23	1.41E-102
new.HdTest	140SM	Male	1.98E-24	2.05E-13	1.12E-25	2.75E-18	NA	NA	5.80E-16	3.58E-62	8.17E-24	0.0875816	1.17E-19	0.044676	NA	NA	0.153077	1.66E-25
new.HdTest	141SM	Male	9.7872928	2.081758	7.45E-08	4.50E-13	NA	NA	0.006813	1.08E-113	5.56E-05	6.3273406	0.0052889	0.317885	NA	NA	0.001412	0.1919235
new.HdTest	143SF	Female	2.77E-31	4.14E-18	3.12E-46	8.42E-34	NA	NA	1.227125	6.23E-29	8.0547081	8.61E-26	1.92E-29	0.05931	NA	NA	2.32E-39	2.75E-08
new.HdTest	145SM	Male	6.90E-25	0.0018761	4.29E-43	5.34E-30	NA	NA	11.79975	7.72E-98	4.8871949	1.86E-08	5.52E-16	4.879878	NA	NA	1.33E-09	5.5303895
new.HdTest	146SM	Male	1.38E-28	3.04E-11	1.12E-25	1.37E-20	NA	NA	1.61E-11	8.57E-94	4.72E-22	0.5493842	4.44E-49	1.06E-13	NA	NA	2.368195	2.62E-07
new.HdTest	147SM	Male	8.51E-15	0.0002159	4.47E-77	1.92E-53	NA	NA	8.47E-37	1.33E-23	8.69E-10	2.31E-21	1.25E-26	1.125298	NA	NA	2.68E-47	1.21E-131
new.HdTest	148SM	Male	1.72E-08	8.34E-10	3.65E-06	1.57E-43	NA	NA	0.004057	1.65E-103	8.024886	2.75E-14	8.28E-82	2.64E-10	NA	NA	5.667062	2.09E-11

new.HdTest	149SF	Female	8.8398986	0.2643157	2.62E-117	1.10E-92	NA	NA	2.30E-37	2.03E-64	1.78E-13	2.0529604	5.8541363	7.29E-12	NA	NA	2.46E-10	1.59E-60
new.HdTest	150SF	Female	3.5948967	8.33E-27	2.80E-128	9.48E-162	NA	NA	3.99E-76	4.31E-35	0.6966989	4.96E-11	6.94E-33	6.16351	NA	NA	1.37E-10	6.3855743
new.HdTest	152SF	Female	5.57E-19	1.30E-26	1.09E-67	5.44E-18	NA	NA	0.062587	9.47E-87	5.66E-07	2.49E-18	8.54E-90	9.04E-40	NA	NA	9.70E-32	6.10E-08
new.HdTest	153SF	Female	1.16E-05	5.52208	7.88E-67	1.97E-49	NA	NA	1.76E-254	2.21E-35	1.64E-46	5.115767	2.15E-08	3.848539	NA	NA	1.15E-19	8.96E-80
new.HdTest	154SM	Male	0.0056256	4.5024501	4.35E-13	1.47E-06	NA	NA	0.940734	2.76E-125	1.09E-21	6.3616537	3.89E-18	0.003404	NA	NA	0.831735	1.84E-26
new.HdTest	155SM	Male	3.09E-07	0.3628122	8.39E-36	3.76E-49	NA	NA	3.28E-17	4.11E-118	1.41E-44	2.9096985	1.06E-57	8.25E-11	NA	NA	1.75E-12	7.43E-70
new.HdTest	156SF	Female	2.1959186	2.6735315	1.39E-63	1.79E-74	NA	NA	9.04E-150	0.8523224	8.82E-08	9.23E-05	0.0052889	0.317885	NA	NA	0.001412	0.0001457
new.HdTest	157SM	Male	4.3813568	0.7022769	2.27E-90	1.93E-69	NA	NA	3.27E-33	2.32E-80	8.93E-20	1.2145242	1.05E-54	1.13E-18	NA	NA	0.005287	2.83E-43
new.HdTest	158SF	Female	1.01E-20	2.6839901	9.98E-21	2.94E-21	NA	NA	2.62E-34	9.87E-69	1.36E-08	0.0223639	1.40E-57	0.000157	NA	NA	0.259793	3.60E-05
new.HdTest	159SF	Female	10.275661	2.63E-08	5.45E-75	2.29E-150	NA	NA	8.36E-87	9.47E-87	1.32E-19	4.5312882	8.37E-35	1.67E-10	NA	NA	1.136703	2.08E-22
new.HdTest	160SM	Male	2.4982708	0.0014942	6.55E-167	1.43E-101	NA	NA	2.66E-15	3.65E-18	1.93E-16	0.0019503	1.16E-13	0.00175	NA	NA	9.00E-15	1.73E-66
new.HdTest	161SM	Male	2.17E-09	1.41E-13	1.32E-76	2.21E-27	NA	NA	3.65E-23	1.97E-238	2.12E-11	4.54E-06	4.37E-20	0.000481	NA	NA	1.39E-12	3.67E-61
new.HdTest	162SM	Male	0.0140082	2.108515	2.40E-68	1.69E-35	NA	NA	4.38E-10	2.03E-90	0.0005173	1.7486763	2.04E-59	0.770403	NA	NA	5.18E-08	2.72E-40
new.HdTest	163SM	Male	3.8498946	0.0051665	4.58E-59	4.40E-56	NA	NA	2.35E-08	3.95E-43	0.001096	5.45E-14	3.46E-96	1.06E-40	NA	NA	4.40E-07	9.53E-41
new.HdTest	164SM	Male	5.75E-41	4.05E-12	2.49E-52	1.07E-61	NA	NA	0.000551	1.57E-127	1.02E-29	4.10E-20	5.70E-15	0.961996	NA	NA	8.907809	6.56E-17
new.HdTest	165SM	Male	1.86E-11	0.0003999	4.68E-05	0.006104	NA	NA	0.105734	3.40E-102	1.10E-14	0.0251839	1.09E-149	1.72E-63	NA	NA	8.767015	4.81E-17
new.HdTest	166SF	Female	2.28E-34	2.52E-07	7.42E-20	1.95E-20	NA	NA	3.70E-36	3.06E-113	3.1076025	4.4315229	1.39E-76	1.54E-21	NA	NA	5.62E-63	1.13E-29
new.HdTest	167SM	Male	1.41E-07	0.0037571	2.49E-52	9.98E-27	NA	NA	11.84015	3.71E-27	3.10E-08	3.481493	6.49E-111	7.47E-29	NA	NA	1.95E-06	7.5682426
new.HdTest	168SM	Male	0.0008552	1.14E-23	4.60E-16	3.87E-18	NA	NA	2.38E-07	3.65E-81	1.99E-62	0.0043994	0.0687466	3.15E-10	NA	NA	4.20E-09	1.67E-47
new.HdTest	169SM	Male	3.64E-27	3.04E-11	1.38E-75	5.85E-47	NA	NA	5.97E-24	3.10E-52	7.57E-06	0.4530434	2.59E-05	2.707712	NA	NA	2.634659	3.39E-20
new.HdTest	170SF	Female	9.50E-49	9.03E-23	7.09E-26	8.06E-30	NA	NA	9.32E-13	3.71E-76	0.0020285	9.32E-06	1.13E-159	3.52E-35	NA	NA	6.10E-42	1.13E-12
new.HdTest	171SF	Female	1.77E-12	2.08E-46	3.99E-121	8.70E-106	NA	NA	1.98E-161	4.46E-91	2.66E-21	0.0280075	5.2569201	7.52E-07	NA	NA	0.004794	0.013608
new.HdTest	172SF	Female	3.32E-06	3.9042016	4.87E-56	3.90E-29	NA	NA	8.47E-28	1.69E-112	7.9761982	1.19E-10	7.18E-72	2.58E-13	NA	NA	4.35E-14	10.504136
new.HdTest	173SF	Female	1.45E-12	6.91E-11	5.32E-50	1.48E-26	NA	NA	1.88E-36	4.87E-154	4.85E-26	4.2265472	2.82E-67	5.30E-19	NA	NA	3.32E-05	0.3399993
new.HdTest	174SM	Male	0.0287424	4.0861476	1.77E-25	3.87E-18	NA	NA	1.886127	2.12E-175	1.38E-12	0.990497	4.60E-17	15.09984	NA	NA	1.31E-18	1.4006804
new.HdTest	175SM	Male	0.0008182	5.5582044	1.63E-50	4.81E-37	NA	NA	8.69E-41	1.41E-87	3.40E-15	6.16E-05	2.14E-60	2.10E-95	NA	NA	0.000757	2.42E-39
new.HdTest	176SF	Female	8.86E-31	6.09E-58	9.61E-50	1.58E-53	NA	NA	10.20992	6.94E-49	0.000377	3.0462984	2.55E-34	1.24E-45	NA	NA	6.34E-25	0.0054326
new.HdTest	177SM	Male	7.15E-11	1.11E-33	5.29E-91	2.68E-50	NA	NA	1.17E-32	1.31E-158	2.54E-16	0.990497	8.13E-158	1.50E-08	NA	NA	0.106982	6.56E-31
new.HdTest	179SF	Female	0.0411869	3.291658	2.02E-36	1.55E-22	NA	NA	1.60E-06	2.47E-112	2.3378979	2.11E-28	1.49E-58	3.93E-23	NA	NA	8.32E-114	5.95E-79
new.HdTest	180SF	Female	3.55E-16	5.24E-06	3.50E-32	9.55E-21	NA	NA	1.47E-58	2.69E-107	7.0721421	0.001194	5.22E-102	2.47E-44	NA	NA	5.21E-57	4.39E-25

new.HdTest	181SM	Male	1.49E-20	1.53E-14	1.52E-66	2.68E-42	NA	NA	8.126823	6.77E-48	1.58E-11	2.8117947	7.01E-69	14.73169	NA	NA	0.367089	4.87E-26
new.HdTest	182SM	Male	1.77E-15	2.06E-16	1.90E-41	3.53E-30	NA	NA	0.066718	3.82E-133	3.29E-28	5.01E-13	1.72E-93	1.09E-20	NA	NA	9.384373	2.11E-12
new.HdTest	183SF	Female	0.078144	7.71E-56	3.03E-14	7.55E-41	NA	NA	1.19E-160	1.97E-118	1.26E-41	0.00068	1.44E-39	0.031737	NA	NA	0.000475	0.1101741
new.HdTest	184SM	Male	4.48E-14	5.47E-16	6.68E-19	5.99E-22	NA	NA	6.139963	8.77E-181	5.9728856	4.85E-12	4.26E-57	0.179054	NA	NA	0.50339	8.00E-06
new.HdTest	185SF	Female	8.562786	0.0169359	9.80E-41	1.57E-43	NA	NA	3.67E-101	1.22E-78	0.2428606	6.80E-12	7.35E-73	2.96E-29	NA	NA	3.81E-49	1.79E-16
new.HdTest	186SF	Female	1.03E-05	0.0334451	3.00E-123	1.07E-30	NA	NA	3.46E-294	2.38E-109	5.66E-07	6.7683824	6.52E-19	0.368701	NA	NA	8.302917	9.16E-11
new.HdTest	187SM	Male	0.0134835	3.71E-26	3.41E-36	3.38E-69	NA	NA	1.51E-17	3.3967013 e-320	1.33E-05	1.06E-05	4.08E-54	2.41E-18	NA	NA	5.67597	1.41E-17
new.HdTest	188SF	Female	8.90E-37	1.60E-24	1.35E-95	1.13E-75	NA	NA	9.37E-49	2.87E-95	4.98E-05	1.15E-12	7.64E-47	1.69E-20	NA	NA	5.47E-12	10.488925
new.HdTest	189SF	Female	6.02E-76	1.62E-54	0	2.35E-293	NA	NA	8.56E-10	2.93E-91	0.0251745	0.0008317	6.94E-33	4.87E-12	NA	NA	7.34E-45	2.08E-15
new.HdTest	190SM	Male	2.79E-17	2.56E-21	9.00E-51	2.00E-40	NA	NA	3.27E-51	6.62E-48	1.42E-14	2.05E-21	1.60E-112	12.69384	NA	NA	6.79E-55	2.49E-135
new.HdTest	191SF	Female	2.0676123	3.07E-15	8.16E-83	2.67E-90	NA	NA	3.765779	1.07E-74	7.84E-06	3.74E-13	1.90E-114	2.80E-52	NA	NA	3.59E-28	0.0017158
new.HdTest	192SF	Female	3.82E-10	3.19E-25	5.18E-34	5.00E-39	NA	NA	1.44E-08	4.16E-82	5.97E-12	0.6573167	0	4.93E-58	NA	NA	2.54E-13	8.6593717
new.HdTest	193SM	Male	9.7872928	9.16E-39	1.84E-161	8.84E-223	NA	NA	3.16E-07	3.58E-62	0.6365676	0.2735011	1.33E-244	14.75073	NA	NA	6.19E-09	8.3709801
new.HdTest	194SF	Female	1.74E-05	0.0136212	4.03E-30	1.66E-48	NA	NA	1.08E-208	3.12E-131	2.29E-41	2.7702601	5.11E-45	11.21545	NA	NA	0.005297	7.66E-05
new.HdTest	195SF	Female	0.3323669	0.049729	1.86E-17	5.46E-34	NA	NA	1.77E-60	9.58E-121	1.56E-31	0.0033338	2.63E-15	2.707712	NA	NA	9.14977	3.55E-12
new.HdTest	196SM	Male	9.6017363	0.7393135	1.41E-35	2.00E-40	NA	NA	1.39E-16	2.44E-217	4.85E-18	2.00E-13	0.2452321	0.08742	NA	NA	4.66E-05	0.2770864
new.HdTest	197SM	Male	0.6773786	5.6919222	1.86E-17	5.08E-23	NA	NA	9.908337	2.50E-45	7.57E-06	1.0922363	6.79E-30	0.000759	NA	NA	2.60E-23	1.35E-98
new.HdTest	198SF	Female	8.52E-30	4.14E-18	5.29E-91	9.51E-47	NA	NA	0.072671	3.66E-87	4.3562857	1.19E-08	1.57E-90	2.83E-15	NA	NA	3.78E-30	2.38E-05
new.HdTest	002Fc	Female	4.92E-17	0.0001999	2.56E-39	2.70E-23	NA	NA	6.821741	4.16E-82	0.0002241	4.96E-11	5.69E-147	8.07E-106	NA	NA	1.51E-06	9.8269475
new.HdTest	004Fc	Female	1.27E-12	1.9268123	1.42E-29	6.26E-10	NA	NA	0.27122	3.51E-86	2.24E-07	7.22E-29	1.85E-290	5.33E-170	NA	NA	5.96E-16	6.4382798
new.HdTest	006Mc	Male	5.70E-18	0.0010937	3.65E-57	4.30E-42	NA	NA	0.214902	1.07E-84	1.1201431	0.0237389	5.17E-261	1.46E-120	NA	NA	0.459253	2.13E-16
new.HdTest	007Mc	Male	3.64E-27	2.91E-09	5.46E-07	0.000235	NA	NA	8.80E-08	1.41E-47	0.000625	0.0001641	1.36E-206	3.49E-100	NA	NA	8.14E-19	8.69E-82
new.HdTest	008Fc	Female	6.62E-24	0.0184287	7.43E-19	3.54E-13	NA	NA	0.013008	6.94E-79	5.2560313	1.05E-18	1.07E-221	7.02E-155	NA	NA	2.08E-39	1.91E-06
new.HdTest	009Mc	Male	0.1821716	5.6384333	7.69E-05	0.002427	NA	NA	6.181792	1.09E-79	0.0014559	0.1633823	8.10E-113	8.77E-55	NA	NA	0.157617	1.17E-32
new.HdTest	010Mc	Male	1.86E-07	0.0097111	3.84E-23	6.09E-21	NA	NA	2.52E-08	1.59E-73	0.0890737	3.3286558	1.83E-159	1.14E-61	NA	NA	4.898044	1.01E-11
new.HdTest	012Mc	Male	0.000228	0.0307349	0.000319	29.62493	NA	NA	4.62E-08	4.39E-86	0.2659256	1.5742837	7.57E-70	3.71E-18	NA	NA	9.153314	1.31E-22
new.HdTest	014Fc	Female	9.95E-19	3.42E-06	1.27E-56	4.79E-28	NA	NA	4.85E-16	5.76E-54	0.5410419	3.91E-25	2.18E-197	7.37E-85	NA	NA	0.000229	0.3593905
new.HdTest	015Fc	Female	0.0247502	5.6854539	3.49E-09	2.73E-05	NA	NA	1.20E-08	2.71E-09	6.15E-05	0.4430585	1.47E-174	1.01E-66	NA	NA	5.38E-15	3.8760809
new.HdTest	017Mc	Male	5.10E-14	0.0792168	1.81E-20	8.09E-20	NA	NA	0.000613	5.93E-46	2.13E-05	0.5914556	9.24E-136	1.39E-58	NA	NA	0.001987	1.71E-36
new.HdTest	018Fc	Female	1.67E-11	0.0540987	6.92E-26	1.52E-28	NA	NA	1.670008	6.61E-65	7.7954661	0.0001072	4.38E-245	5.37E-161	NA	NA	1.18E-40	1.19E-09

new.HdTest	020Fc	Female	0.003086	3.9225293	4.00E-53	1.20E-40	NA	NA	1.49E-29	3.72E-88	0.0099509	0.1400866	1.05E-207	1.04E-126	NA	NA	1.31E-12	8.6593717
new.HdTest	021Mc	Male	1.54E-21	2.00E-06	4.94E-19	1.33E-18	NA	NA	0.01036	4.90E-35	2.67047	0.0002267	1.48E-86	3.22E-24	NA	NA	0.480625	3.61E-08
new.HdTest	023Mc	Male	3.00E-07	0.7453831	6.79E-27	6.45E-12	NA	NA	3.065745	2.90E-72	3.7769877	0.0002485	2.69E-190	3.85E-76	NA	NA	8.80E-08	4.57E-60
new.HdTest	026Fc	Female	8.6263803	0.040868	0.014641	0.04719	NA	NA	5.282762	8.55E-139	7.2774266	7.11E-17	5.43E-302	3.73E-212	NA	NA	3.48E-81	2.21E-37
new.HdTest	027Fc	Female	0.0054508	5.7142164	2.81E-08	0.024774	NA	NA	5.19E-05	2.03E-24	3.3310653	1.36E-11	4.70E-210	1.14E-92	NA	NA	5.23E-27	0.0002391
new.HdTest	029Fc	Female	6.75E-14	7.12E-06	1.77E-48	1.42E-25	NA	NA	4.50E-29	3.95E-43	0.052833	0.8564781	2.54E-185	3.21E-115	NA	NA	0.000222	0.0197953
new.HdTest	030Fc	Female	3.64E-27	3.04E-11	1.22E-33	6.72E-27	NA	NA	1.11E-05	3.10E-52	2.91E-05	2.31E-09	7.35E-73	4.05E-47	NA	NA	0.000572	0.0446542
new.HdTest	001M	Male	1.02E-38	0.0207305	4.67E-68	4.20E-70	NA	NA	2.60E-67	2.01E-56	1.90E-05	2.74E-22	1.31E-204	2.15E-89	NA	NA	4.65E-15	1.14E-74
new.HdTest	002F	Female	4.30E-09	0.0414899	6.34E-64	1.75E-45	NA	NA	0.058667	1.91E-100	6.93E-09	7.35E-21	1.49E-221	3.07E-173	NA	NA	6.29E-13	9.3500811
new.HdTest	005M	Male	1.58E-83	7.03E-55	1.53E-32	2.21E-14	NA	NA	0.815823	5.08E-71	0.0042577	1.35E-05	1.01E-107	5.82E-48	NA	NA	1.51584	1.81E-08
new.HdTest	008F	Female	1.42E-33	6.40E-15	7.74E-35	2.95E-29	NA	NA	0.000553	1.27E-53	3.99E-08	4.35E-05	1.22E-98	7.37E-56	NA	NA	0.187102	2.13E-05
new.HdTest	011F	Female	2.45E-12	3.42E-06	8.09E-37	5.31E-11	NA	NA	2.109905	3.80E-120	6.8460026	2.62E-16	2.69E-190	1.05E-103	NA	NA	5.44E-32	4.32E-08
new.HdTest	014F	Female	3.3474322	3.59E-11	6.43E-18	9.18E-10	NA	NA	3.77E-31	3.91E-141	8.049652	8.45E-06	1.38E-141	3.69E-70	NA	NA	1.44E-112	1.80E-66
new.HdTest	018F	Female	8.90E-30	1.53E-15	4.38E-15	7.15E-08	NA	NA	4.08E-08	7.73E-91	4.5713586	1.12E-22	3.45E-229	4.10E-105	NA	NA	2.37E-86	8.33E-46
new.HdTest	020F	Female	1.48E-10	0.3364545	2.02E-36	1.18E-14	NA	NA	0.950324	2.47E-112	0.0094259	5.67E-09	8.11E-211	3.06E-118	NA	NA	2.96E-69	4.38E-32
new.HdTest	024F	Female	1.15E-05	4.8062883	9.63E-55	4.70E-37	NA	NA	1.66E-57	1.45E-51	0.0007606	2.46E-06	1.85E-176	4.90E-94	NA	NA	8.90E-17	9.3054826
new.HdTest	027M	Male	4.40E-05	0.184756	1.41E-35	3.46E-14	NA	NA	5.22E-05	8.77E-181	7.9896469	0.000195	2.98e-313	9.35E-174	NA	NA	0.062007	5.93E-32
new.HdTest	028F	Female	0.0819241	5.6124965	2.80E-16	3.01E-11	NA	NA	0.114865	4.21E-132	5.2145318	1.22E-09	6.88E-96	7.34E-54	NA	NA	2.46E-40	2.94E-13
new.HdTest	029F	Female	0.4776916	0.009191	6.80E-57	1.38E-50	NA	NA	1.44E-80	5.06E-151	7.9387882	9.95E-07	1.70E-302	4.56E-166	NA	NA	1.39E-51	4.61E-19
new.HdTest	030F	Female	2.07E-07	1.2456838	1.50E-35	4.26E-27	NA	NA	0.002355	4.80E-140	7.6770473	2.33E-18	8.61E-144	1.41E-67	NA	NA	1.81E-136	1.98E-96
new.HdTest	034F	Female	0.0492929	4.5395804	3.47E-98	6.94E-44	NA	NA	6.47E-11	1.59E-96	0.0037738	5.0974519	5.26E-83	3.63E-59	NA	NA	4.83E-38	8.50E-12
new.HdTest	035F	Female	9.33E-22	2.92E-08	3.93E-36	6.36E-48	NA	NA	0.527469	3.91E-141	3.6559446	1.18E-83	9.71E-298	1.20E-111	NA	NA	2.25E-71	9.82E-34
new.HdTest	036F	Female	2.82E-06	2.89E-24	4.49E-133	2.24E-46	NA	NA	2.03E-06	3.68E-89	0.8252041	2.16E-06	6.94E-168	1.01E-66	NA	NA	5.47E-48	1.05E-15
new.HdTest	037F	Female	2.2761212	2.6839901	4.94E-28	1.33E-12	NA	NA	6.504531	1.78E-126	3.4952123	7.97E-23	1.91E-240	6.43E-123	NA	NA	1.68E-59	3.59E-28
new.HdTest	039F	Female	7.72E-22	2.05E-13	6.70E-39	1.65E-32	NA	NA	0.00026	1.45E-81	0.2774989	0.0006045	3.29E-134	3.61E-69	NA	NA	1.34E-23	0.0414435
new.HdTest	043F	Female	2.44E-23	0.0083117	7.09E-26	1.90E-24	NA	NA	4.22E-05	3.06E-203	9.27E-06	2.336551	5.25E-92	1.17E-29	NA	NA	3.14E-38	2.46E-08
new.HdTest	045M	Male	5.14E-22	1.40E-07	1.53E-32	2.00E-12	NA	NA	0.419104	1.97E-118	6.07E-17	0.3653705	2.73E-46	1.19E-07	NA	NA	4.237777	7.84E-10
new.HdTest	058F	Female	1.01E-05	0.0022483	3.71E-88	7.38E-70	NA	NA	0.783617	1.27E-112	0.0366368	5.16E-07	2.26E-196	3.96E-98	NA	NA	2.52E-21	0.0587925
new.HdTest	059F	Female	2.23E-14	0.4320195	1.26E-23	1.55E-22	NA	NA	11.29679	1.42E-145	0.0011767	5.44E-15	1.29E-131	1.10E-59	NA	NA	1.67E-52	1.00E-18
new.HdTest	065F	Female	7.66E-10	3.53E-07	1.09E-67	3.86E-32	NA	NA	7.78E-12	4.66E-127	7.24E-05	6.41E-16	1.14E-266	3.50E-171	NA	NA	2.62E-36	1.37E-08

new.HdTest	067F	Female	0.0027374	0.0007792	1.76E-46	4.65E-31	NA	NA	8.92E-19	3.22E-100	0.7129567	2.11E-20	2.24E-199	3.21E-115	NA	NA	7.85E-72	8.30E-33
new.HdTest	072M	Male	3.62E-12	0.0001281	3.24E-40	2.04E-21	NA	NA	2.13E-36	1.45E-235	8.02E-14	3.86E-16	2.27E-79	2.89E-33	NA	NA	0.004977	9.69E-38
new.HdTest	076F	Female	7.42E-05	0.0372351	3.93E-36	7.40E-25	NA	NA	5.19E-59	2.83E-108	0.00047	1.1817297	2.90E-216	2.02E-87	NA	NA	1.34E-44	1.06E-07
new.HdTest	082M	Male	1.35E-22	1.50E-16	5.51E-29	6.77E-08	NA	NA	2.29E-09	3.32E-177	3.9740663	0.2254781	9.47E-207	2.15E-95	NA	NA	1.027582	1.55E-05
new.HdTest	083F	Female	2.30E-21	0.0013952	1.82E-48	3.04E-40	NA	NA	5.961231	7.13E-70	0.1052672	1.84E-13	9.50E-252	1.12E-130	NA	NA	1.12E-08	4.7130791
new.HdTest	084M	Male	6.28E-08	4.6061645	8.66E-40	3.07E-33	NA	NA	10.09754	1.74E-98	1.50E-12	1.13E-06	2.05E-50	6.78E-11	NA	NA	0.229279	4.19E-33
new.HdTest	089M	Male	7.55E-13	1.32E-06	4.00E-53	5.66E-30	NA	NA	6.07E-14	6.98E-101	2.65E-10	5.3017475	6.89E-135	8.36E-87	NA	NA	0.043917	6.06E-07
new.HdTest	092F	Female	0.0005427	1.3658923	8.88E-20	5.63E-23	NA	NA	0.827661	3.71E-103	2.51E-24	0.0002405	1.88E-226	6.82E-153	NA	NA	1.16E-55	6.87E-21
new.HdTest	096M	Male	0.0063219	4.6061645	58.14070	0.598556	NA	NA	1.02E-16	1.04E-33	2.83E-11	0.0295012	3.62E-98	1.82E-48	NA	NA	1.47E-30	4.23E-06
new.HdTest	101M	Male	1.49E-20	0.0111996	5.71E-13	2.70E-23	NA	NA	4.25E-13	2.93E-91	3.54E-08	1.37E-08	6.89E-135	8.58E-62	NA	NA	7.14E-93	1.34E-43
new.HdTest	042FD	Female	4.4233057	0.0020473	4.63E-57	4.41E-37	NA	NA	0.016022	6.48E-60	5.50E-07	1.57E-20	1.35E-109	7.33E-77	NA	NA	4.14E-35	6.61E-08

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