Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Sydney, Australia

by Chunyan Yang

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Adjunct Professor Goran Runeson

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Certificate of Original Authorship

I, Chunyan Yang, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy in the School of Built Environment, Faculty of Design, Architecture and Building 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.

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Publications

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Abstract

The COVID-19 pandemic has significantly impacted various aspects of people's living experiences and their emotional connections to their environments. The growing concerns about increased social isolation in Australian cities have been exacerbated by the COVID-19 pandemic. There is an urgent need to rethink human-environment relationships, social wellbeing and place attachment in cities and neighbourhoods. New urbanism hypothesizes that the built environment can promote sense of community through social interaction and place attachment in neighbourhoods. However, the relationships between neighbourhood public open spaces, social interaction and place attachment are unclear in the literature. Few studies have investigated social interaction, place attachment and human-environment relationships in Master Planned Estates (MPEs) in the Australian context. There is a need to gain a deeper understanding of the effects of public open spaces on residents' health and wellbeing in neighbourhoods, particularly in MPEs in the Australian context.

This study investigated the relationships between community parks, social interaction, and place attachment in MPEs in Sydney, using case study mixed methods. Two cases were selected from the inner west area of Sydney: Breakfast Point and Liberty Grove. In the Phase I study, a resident survey was conducted to collect quantitative data from 192 residents in two selected MPEs during COVID-19 in 2021. In the Phase II study, semi-structured interviews were conducted to collect qualitative data from 16 residents in the two selected MPEs during COVID-19 in 2022.

The survey study found three factors significantly and positively associated with residents' social interaction in MPEs: frequency of community park use, satisfaction with rest spaces in parks, and parks' pedestrian connectivity with surroundings. In addition, the survey study found three factors significantly and positively associated with place attachment in MPEs: pedestrian accessibility to parks, parks' pedestrian connectivity with surroundings and satisfaction with children's playgrounds in parks. Interviews confirmed and explained these survey findings. In addition, interviews further identified two categories of park use behaviours in MPEs: individual activities (relaxation and physical activity) and social activities (weak-ties social interaction, strong-ties social interaction and community participation). Interviews also found three mechanisms of place attachment: affective, behavioural and cognitive.

This study has theoretical, empirical and practical contributions to the field. This study provides theoretical contributions by testing and extending social network theory, place attachment theory, and new urbanism theory in the Australian MPE context. This study contributes to Australian MPE research by providing empirical evidence to understand residents' daily lives and human-environment relationships in MPEs, which are unexplored in literature. This study also makes an empirical contribution by adding evidence collected in the midst of the COVID-19 pandemic to our understandings of human-environment relationships. This study provides practical implications for policymakers, urban planners and developers of MPEs in Sydney or wider regions.

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List of Abbreviations

ABS	Australian Bureau of Statistics
ANOVA	Analysis of Variance
BP	Breakfast Point
CP	Community Park
CS-MM	Case Study Mixed Methods
HMR	Hierarchical Multiple Regression
HREC	Human Research Ethics Committee
IRSAD	The Index of Relative Socio-economic Advantage and Disadvantage
LG	Liberty Grove
MPE	Master Planned Estate
NSW	New South Wales, Australia
PA	Place Attachment
PCA	Principal Component Analysis
PPP	Person–Place–Process
SEIFA	Socioeconomic Indexes for Areas
SI	Social Interaction

Chapter 1 Introduction

1.1 Background

There have been growing concerns about increased social isolation in Australia, which were exacerbated by the COVID-19 pandemic (Biddle et al., 2020). The COVID-19 pandemic has affected many aspects of people's social interaction, emotional bonds and living experiences in cities and neighbourhoods. It has led us to rethink the human-environment relationships in urban neighbourhoods (Mouratidis & Yiannakou, 2022). At the neighbourhood level, social interaction is regarded as 'an important contributor to residents' health and well-being' for residents (Warner & Andrews, 2019, p. 1). Feelings of social isolation may increase the risk of mental issues and psychological distress for residents (Hooper et al., 2020). The decline in social interaction is an increasing health and well-being issue in Australia, particularly in the inner urban areas in Australian cities (Warner & Andrews, 2019).

Another ongoing concern is that sense of community is in decline in contemporary cities in the Western world, including in Australian cities (Ross & Searle, 2019). The sense of community is regarded as one of the primary social goals of new urbanism and community sustainability (Ebrahim, 2015; Kim & Larsen, 2017). The consequences of community decline have threatened community cohesion and caused many social problems, such as social isolation and decreased levels of community engagement in neighbourhoods (Ross & Searle, 2019). Literature shows that social interaction and place attachment are two essential constructs to build a sense of community and community sustainability in urban neighbourhoods (Ebrahim, 2015; Kim & Kaplan, 2004; Talen, 2000). It is necessary to understand more about social interaction and place attachment at the neighbourhood level theoretically and empirically. In addition, the need to understand human-environment relationships in urban neighbourhoods has been magnified due to the impact of COVID-19 (Han et al., 2022; Mouratidis & Yiannakou, 2022).

In the urban planning discipline, studying how the built environment affects people's social interaction and place attachment has become of increasing interest to global academia (Lauwers et al., 2021; Ross & Searle, 2019; Zhu & Fu, 2017). Most influentially, new

urbanism hypothesizes that neighbourhood communal spaces can influence social interaction and place attachment, and in turn promote a sense of community in neighbourhoods (Kim & Kaplan, 2004; Talen, 2000). New urbanism is an urban design philosophy that is oriented to achieving social goals, such as sense of community and community social sustainability, through the design of the physical built environment (Stanislav & Chin, 2019; Talen, 2002). The increasing recent evidence has made us recognise the importance of public open space for people's mental and physical health in cities and neighbourhoods (Han et al., 2022; Larson et al., 2021). However, research in this area is still very limited. As neighbourhood social ties and place attachment differ according to place characteristics and person characteristics, more empirical studies are needed to explore social interaction and place attachment across different urban residential contexts and circumstances.

In Australia, Master Planned Estates (MPEs) have been rapidly growing and are becoming the dominant form of new large-scale housing development in large cities (Francis et al., 2014; Smith, 2019). MPEs are defined as 'large scale, integrated housing developments produced by single development entities that include the provision of physical and social infrastructure' (Francis et al., 2014, p. 186). There has been significant academic interest in MPEs in Australian academia in recent years (Cheshire, 2019; Smith, 2020). Scholars claim that more theoretical and empirical research on MPEs is needed from all aspects in the Australian context (Francis et al., 2014).

The central concept of MPE is regarded as being based on new urbanism philosophy (Thompson, 2013). MPE in Australia is aimed to offer a lifestyle and a sense of community to the market (Cheshire, 2019; Rosenblatt et al., 2009). Specifically, MPE as a sustainable residential form, provides physical and social infrastructures to build a sense of community and to address community problems, such as community decline, social isolation and safety issues (Francis et al., 2014). However, literature still knows very little about residents' lifestyles, daily activities, and human-environment interactions in MPEs in the Australian context (Maller et al., 2016). Few studies have explored the relationship between social interaction and place attachment alongside physical environment attributes in MPEs in the Australian context.

It is also noted that social and economic features are different in different regions in Sydney. Hence it is crucial to examine MPEs from a submarket perspective (Bangura & Lee, 2022). Bangura and Lee (2022) argued that there are some significant divergences in the social-economic features and housing submarkets across five regions in Sydney: 'western region, inner-west region, southern region, eastern region, northern region' (p. 147). They pointed out that 'the local government areas in western, inner-west and southern regions of Greater Sydney generally have an index of relative socio-economic advantage and disadvantage[1] below the average index for the city, while in contrast, the northern and eastern regions reveal the opposite results' (Bangura & Lee, 2022, p. 147). This study considers MPEs in the inner west region of Sydney. The findings could be generalised to similar submarkets in Sydney but may also have wider applicability.

This study explores the relationship between community park use, social interaction, and place attachment in MPEs. It provides empirical evidence to help understand the complex human-environment relationships, neighbourhood social ties and place attachment in MPEs which are still unexplored in literature.

1.2 Research Problem

Although previous research supports that there is a link between built environment and social interaction as well as place attachment in neighbourhoods (Centers & Gómez, 2019), the relationship between people and physical features in MPEs is unexplored in literature. Community parks are important and the most frequently used communal spaces in which MPE residents maintain their social lives (Maller et al., 2016). The main problem is that the relationship between community parks and social interaction as well as place attachment in MPEs is not clear. There are several specific research problems discussed as follows.

Firstly, there is a very limited number of studies investigating the association between public open space, social interaction and place attachment at the neighbourhood level. Previous studies have found that public spaces have a significant impact on social interaction and place

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[1] The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) summarises 'information about the economic and social conditions of people and households within an area, including both relative advantage and disadvantage measures.' Website of Australian Bureau of Statistics: https://www.abs.gov.au/.

attachment in neighbourhoods; and have identified some physical park factors that may generate more social interaction and place attachment in neighbourhoods (Abass & Tucker, 2018; Zhu & Fu, 2017). However, this type of studies and empirical evidence are still quite limited in literature. We still know very little about which types of places may generate more positive social interaction and place attachment, and the characteristics of those places in neighbourhoods. The translating mechanisms of the relationship between neighbourhood public open space and social interaction as well as place attachment are not fully understood.

Secondly, scholars pointed out that the central concept of MPEs is based on new urbanism philosophy (Thompson, 2013). MPE as a sustainable residential form, aims to promote a sense of community (via social interaction and place attachment) by offering design, layout and physical and social infrastructure. However, there is a lack of theorical and empirical research in the Australian MPE literature. We know very little about residents' living experience, daily activities, social interaction, place attachment and human-environment interactions in MPEs in the Australian context. There have been few studies which test the claims of new urbanism of neighbourhood public spaces from the social interaction and place attachment perspectives in MPEs in the Australian context. In addition, most MPE studies have focused on outer suburban greenfield MPEs in Australian cities. It is noted that inner urban MPEs in Australia are significantly under explored in research (Thompson, 2013).

This study aims to fill these research gaps by focusing on social interaction and place attachment in parallel with the physical aspects of community parks in MPEs.

1.3 Conceptual Framework

This research is built primarily on social interaction, place attachment and new urbanism theories to address the problems discussed above. New urbanism presents a theoretical linkage between physical built environment and sense of community (Hooper et al., 2020; Talen, 2000). Talen proposed that the concept of community consists of different dimensions, hence the concept of sense of community should be broken down in terms of the underlying components of social interaction component and affective place attachment which refers to people's psychological ties to a place (Talen, 2000). This viewpoint was followed by other scholars (Ebrahim, 2015; Kim & Kaplan, 2004; Rosenblatt et al., 2009).

Based on the theories of new urbanism, Talen (2000) presented a translating model depicting the relationship between public open space and sense of community through social interaction (p. 348). The model consists of three interrelated components: 1) physical dimensions of the public space, 2) factors that affect public space use, and 3) social interaction which in turn impact building a sense of community (Talen, 2000). Talen's linear progression model illustrates the translating process from public space to sense of community, through public space use and social interaction factors. This model was used as a basis of this research to investigate the relationship between community park use, social interaction and place attachment, which in turn influences building a sense of community in neighbourhoods.

This study expands Talen's theoretical model by adding an affective component of place attachment. Literature shows that there is a positive link between public space and sense of community through not only the process of social interaction, but also place attachment (Ebrahim, 2015; Kim & Kaplan, 2004). Specifically, Kim and Kaplan (2004) identified two psychological domains of sense of community: social interaction and place attachment. Social interaction is an activity-based process, and place attachment is a meaning-based process for building sense of community (Kim & Kaplan, 2004). The conceptual framework of this study expands Talen's (2000) translating model by adding place attachment as a new construct to explore the relationship between neighbourhood public open space and social interaction and place attachment.

This study narrows down the focus of the physical dimension from public space to community parks in MPEs. This is because community parks are recognised as the most essential and most frequently used communal spaces in MPEs (Maller et al., 2016). Literature shows that parks are one of the most important public places in neighbourhoods and are where the community-building process occurs, community identities form and social connections are made (Chitrakar, 2016).

Neighbourhood social interaction and place attachment are often considered within a socio-ecological framework which associated with social interaction and place attachment (Van Holle et al., 2016). From a socio-ecological perspective, previous studies have recognised a range of factors which could directly or indirectly affect neighbourhood social interaction and place attachment, including personal factors (such as age, gender and education), social

factors (such as neighbourhood safety and group participation) and physical factors (such as neighbourhood parks) (Francis et al., 2012; Lauwers et al., 2021).

Based on new urbanism, social interaction and place attachment theories, this study developed a conceptual framework to investigate associations between the demographic, individual and social factors, community park use factors, social interaction and place attachment (see Figure 1.1).
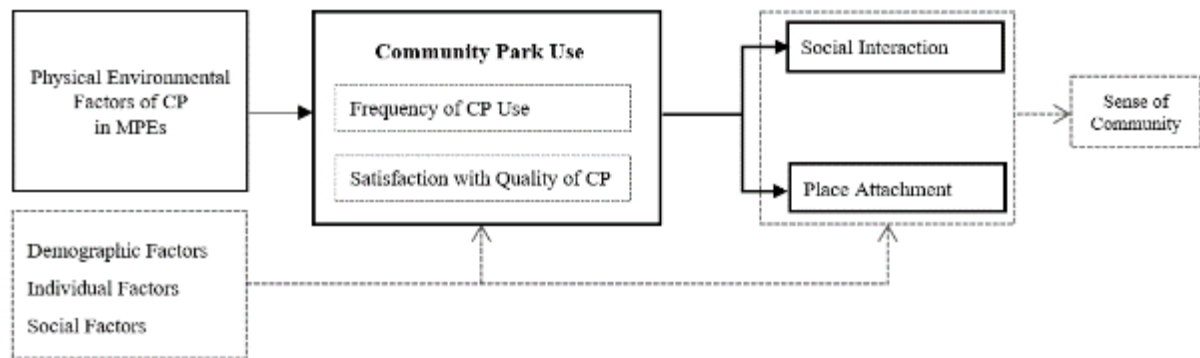
Note. MPE = Master Planned Estate; CP = Community Park

Figure 1.1   Conceptual framework

The overall assumption of the conceptual model is that a community park is a place-based factor which plays an important role in facilitating residents' social interaction and place attachment in MPEs. The conceptual framework of this study has four interrelated components: 1) the physical dimensions of community parks in MPEs, 4) demographic, individual and social factors, 3) community park use factors, and 4) social interaction and place attachment, . This study emphasises examining the relationship between community park use factors and two outcome variables: social interaction and place attachment. Taken together, the conceptual framework guides the development of the study design.

1.4 Research Objectives

Based on the conceptual framework, this study aims to investigate the relationships between community park use, social interaction and place attachment in MPEs in Sydney. There are three main objectives of this study:

1. To investigate which factors of community park use are significantly associated with residents' social interaction and place attachment, and how these factors influence residents' social interaction and place attachment in MPEs in the Sydney context.

2. To understand residents' living experience, daily activities, social interaction and place attachment in relation to community parks in MPEs in the Sydney context.

3. To test the claims of new urbanism regarding public space design at the neighbourhood level in MPEs in the Sydney context: 'a range of parks should be distributed within neighbourhoods'; 'Open lands should be used to define and connect different neighbourhoods and districts'; 'Many activities of daily living should occur within walking distance'; and 'Neighbourhoods should be pedestrian friendly' (Congress for the new urbanism, 2000, p. 340).

1.5 Research Questions

The research's aim and objectives lead to the following research questions, which guide the analysis in this study.

Main research question:

What is the relationship between community park use, residents' social interaction and place attachment in MPEs in the Sydney context?

Sub-questions:

RQ1. How do residents use community parks in MPEs?

RQ2. Which factors of community park use are significantly and positively associated with residents' social interaction in MPEs?

RQ3. How do community park use factors affect residents' social interaction in MPEs?

RQ4. What are the psychological processes of place attachment to community parks in MPEs?

RQ5.   Which factors of community park use are significantly and positively associated with residents' place attachment in MPEs?

RQ6.   How do community park use factors affect residents' place attachment in MPEs?

During the study, due to the outbreak of the COVID-19 pandemic and the subsequent long periods of isolation, an additional question suggested itself: to what extent did the COVID-19 pandemic affect the community park use behaviour of people in MPEs? This was not included in the survey, which was well underway when the effects had materialised, but it was beginning to be felt during the time of the interviews. With this background, the findings of 'how' and 'what' research questions reflect the characteristics of COVID-19 circumstances based on the qualitative evidence collected during the COVID-19 pandemic in 2022. Where possible, this study identifies the characteristics of residents' behaviours of community park use in MPEs in the COVID-19 context. Moreover, the COVID-19 impacts on residents' behaviours preferences and habits of community park use, social interaction and place attachment in MPEs have been analysed and discussed.

1.6 Research Hypotheses

Based on the relevant theories and previous research, the overall assumption of this study is that the community park is one of the most significant environmental factors associated with residents' social interaction and place attachment. Literature supports that community parks exert indirect effects on residents' social interaction and place attachment via factors in two dimensions: frequency of communal space use and satisfaction with quality of communal space (Francis et al., 2012; Zhu & Fu, 2017), which are further discussed in Section 2.5.1 and Section 2.5.2. To address the research questions, the following hypotheses are proposed to guide the quantitative study:

Hypothesis 1: The frequency of community park use is significantly and positively associated with social interaction between residents in MPEs.

Hypothesis 2: The frequency of community park use is significantly and positively associated with residents' place attachment in MPEs.

Hypothesis 3: The satisfaction with community park quality is significantly and positively associated with social interaction between residents in MPEs.

Hypothesis 4: The satisfaction with community park quality is significantly and positively associated with residents' place attachment in MPEs.

1.7 Research Significance

This thesis investigates associations between community parks and social interaction as well as place attachment in MPEs. To the author's knowledge, this is the first study to investigate the relationship between community park use, social interaction and place attachment in MPEs Sydney, especially in the COVID-19 context. There are existing significant theoretical and empirical gaps in understanding how neighbourhood physical features impact social interaction and place attachment in MPEs (Maller et al., 2016). This study helps to fill these knowledge gaps and makes several important theoretical, empirical and practical contributions to the field of MPEs, social interaction, place attachment and new urbanism research.

First, from the theoretical perspective, the importance and originality of this study are that it tests social network theory, place attachment theory and new urbanism theory in the Sydney MPE context which is different from most previous social interaction and place attachment research' settings and contexts in the literature. This study aims to contribute to this area of research by supporting these theories by adding evidence from the Sydney MPE perspective.

Second, the findings of this study make an important theoretical contribution to the field by providing new insights into the theories discussed above, as well as suggesting extensions to the related social network, place attachment and new urbanism theoretical models from the Sydney MPE perspective. This study also provides empirical support for these new insights to the theories.

Third, this study aims to contribute to the growing area of MPE research by exploring the relationship between people and physical features in MPEs. MPEs have had a significant increase in Australian cities and aim to promote a sense of community (via social interaction and place attachment) by providing physical and social infrastructure. However, there are

significant knowledge gaps regarding human–environment interactions in current MPE research. We still know very little about residents' lifestyles, daily activities, social interaction and place attachment in MPEs in the Australian context. This research provides an important opportunity to advance the understanding of the complex relationships in human–environment interactions within MPEs. This study also provides empirical evidence to applications of MPEs in Sydney and helps to guide further research of MPEs in different residential contexts.

Fourth, this study makes unique contributions to literature by adding specific evidence collected during the COVID-19 pandemic. Both the survey and interview data of this study were collected during the COVID-19 pandemic in 2021 and 2022. The data and results reflect the characteristics of residents' park use, daily activities, social interaction and perceptions of place attachment in MPEs in the COVID-19 context. This generates fresh insight in the field of social interaction, place attachment and MPE research.

Last, this study provides practical implications for MPE development in Sydney for the profession of urban planners. With MPEs becoming increasingly important in Australian cities (Smith, 2019), it is necessary to understand more about living experience and human–environment interactions in MPEs in the practical aspects. The result of this study provides empirical insights for policymakers, urban planners and developers about MPE development in Sydney. It provides practical implications for policymakers and developers about the community park factors that should be considered and carefully designed. Understanding residents' perceptions of park use, social interaction and place attachment assists urban planners to design residential areas that promote residents' sense of community and healthy living.

1.8 Thesis Structure

The thesis has seven chapters which are organised as follows.

Chapter 1 Introduction provides contextual background discussion for the study and identifies the research problems, purpose, questions, conceptual framework and significance of this study.

Chapter 2 Literature Review provides the theoretical foundation for this study and summarises relevant existing literature on neighbourhood social interaction, place attachment, new urbanism paradigm, MPEs and community parks. This chapter identifies the knowledge gaps and describes the theoretical frameworks adopted in this study.

Chapter 3 Research Methodology and Data presents the research design, including research methodology, research variables and instruments, case selection, and two-phase data collection (quantitative and qualitative). This chapter also presents techniques and procedures of quantitative and qualitative data analysis.

Chapter 4 Findings of the Quantitative Study presents the analyses and the results of the quantitative study. This chapter interprets and summarises detailed results derived from the quantitative data analysis.

Chapter 5 Findings of the Qualitative Study presents interview results and the qualitative narratives of residents about community parks, social interaction and place attachment in two selected MPEs. The last section of this chapter summarises and interprets the qualitative results.

Chapter 6 Discussion discusses the key results and findings from the survey and interview studies. This chapter also provides the interpretation and explanation of results and presents a discussion of the findings compared to relevant findings in prior studies.

Chapter 7 Summary and Conclusions presents the conclusions of this thesis, discusses the main contributions of this study and limitations, and also makes recommendations for future research.

Chapter 2   Literature Review

This chapter reviews the existing literature and the theoretical roots of the research scope for this study. The main objectives of the literature review are to summarise the existing information in the literature and to identify knowledge gaps in the research scope of this study. To achieve these aims, the literature review is structured into five key sections: 1) neighbourhood social interaction and its theoretical basis; 2) neighbourhood place attachment and its theoretical basis; 3) new urbanism and its theoretical basis; 4) master planned estates (MPEs) in Australia; and 5) community parks in MPEs, including the relationship between community parks and residents' social interaction and place attachment in MPEs.

2.1 Neighbourhood Social Interaction and It's Theoretical Basis

Neighbourhood social interaction is defined as 'social opportunity in which two or more residents attend to the quality of their relationships' (Kim & Kaplan, 2004, p. 316). Theoretically, social interaction is recognised as a source of social support, as well as a factor in the formation of social networks and a sense of community (Abass et al., 2020; Berkman et al., 2000; Talen, 2000). Unger and Wandersman (1985) pointed out that neighbourhood social interactions take the form of social support through social activities which happen in social networks within neighbourhoods. Hence, neighbourhood social interaction can be seen as a part of a support network for neighbours. The literature shows that increased positive social interactions in neighbourhoods can create greater social support and stronger social networks for neighbours, and in turn promote residents' wellbeing and community sustainability (Abass et al., 2020; Berkman et al., 2000).

2.1.1 Social Interaction Theories

There are several sets of theories that underpin the investigation of social relationships at the neighbourhood level. The essential theories are social network theory (Berkman et al., 2000), sense of community theory (McMillan & Chavis, 1986) and socio-ecological systems theory (Bronfenbrenner, 1992). The most influential conceptual development is from social network

theory (Abass et al., 2020; Berkman et al., 2000). The mix of theoretical approaches that form the foundation of research on social interaction in this study are discussed below.

Social Network Theory

The original social network concept came from anthropologists John Barnes (Barnes, 1954) and Elizabeth Bott (Bott, 1971). They developed the concept of social networks to understand social ties across groups, like kinship and residential groups, and to understand the behaviour of individuals or groups (Berkman et al., 2000). Berkman et al. (2000) defined a social network as 'the web of social relationships that surround an individual and the characteristics of those ties' (p. 847). Berkman et al. (2000) developed a social network system theoretical framework to demonstrate the characteristics of social networks and how social networks affect people's health. Berkman et al. (2000) pointed out that the social network is the extent of contacts that neighbours develop with others in neighbourhoods, including social relations, ties and social bonds. A social network is essential to provide social support through social ties and neighbourhood attachment (Abass et al., 2020). The social network theory has offered a way of understanding relationships among people in social structures like communities.

Based on the social network theory, several theoretical models of social interactions have been developed to explain how social network ties affect an individual's health and wellbeing (Berkman et al., 2000; Unger & Wandersman, 1985). Berkman et al. (2000) presented a social network system theoretical framework to understand the social network within which social interaction happens, and to demonstrate how social interaction's psychosocial mechanisms impact an individual's health (see Figure 2.1). Their social network system model developed a theoretical link starting at the macro level as social contexts, then to the micro level as psychobiological processes influencing health. In contrast to earlier studies which follow an assumption that social support is the most important pathway by which social networks may influence health (Unger & Wandersman, 1985), Berkman et al. (2000) argued that social networks influence health and wellbeing through five pathways at the micro-psychosocial level: 'social support, social influence, social engagement, social contact, and access to resources' (p. 847) (see Figure 2.1).

Berkman et al.'s (2000) social network system model shows that social networks can be analysed via network structure and characteristics of individual ties. First, the network

structure includes 'range or size (number of network members); density (the extent to which the members are connected to each other); boundedness (the degree to which they are defined on the basis of traditional group structures such as kin, work, neighbourhood); and homogeneity (the extent to which individuals are similar to each other in a network)' (Berkman et al., p. 847). Second, the characteristics of network ties include frequency of contact, multiplexity, duration and reciprocity.
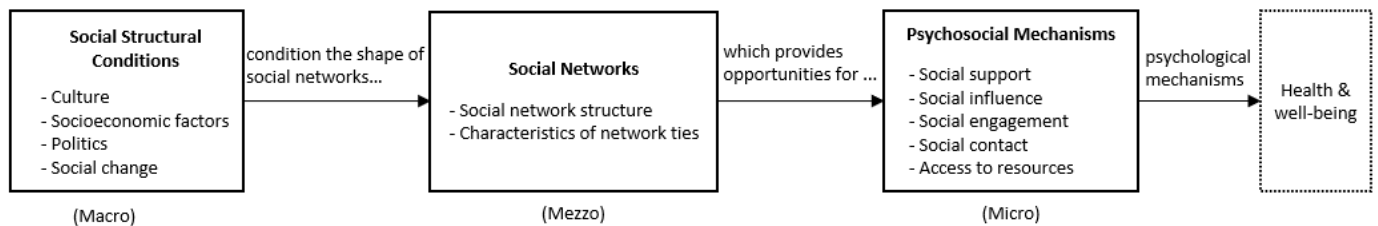
Figure 2.1 Social network system model
Source: Adapted from Berkman et al. (2000, p. 847)

Based on the social network theory, a number of studies have developed measures to estimate social networks by examining both quantity and quality of social interactions. In literature, most previous studies measure social interaction focusing on the quantity of social interaction (Weijs-Perrée et al., 2015). For example, Weijs-Perrée (2015) found that higher numbers of positive social interaction reduce loneliness. By contrast, some studies argue that quality of social interaction contributes more to wellbeing than the quantity of interactions (Delmelle et al., 2013; Weijs-Perrée et al., 2015). The quality of social interaction was often investigated by measuring the social network size (number of people in participants' social network with strong ties and weak ties) (Abass et al., 2020; Kim & Larsen, 2017).

Berkman et al.'s (2000) social network system model focused on the character of human social relations without reference to location. In their model, the macro-level context of a social network is influenced by social, cultural and politics factors, without considering the impacts of physical factors in the place-based community (like a neighbourhood) context. Many studies have shown that the physical space has a significant impact on the formation of social networks in neighbourhoods (Farahani & Lozanovska, 2014; Chitrakar, 2016). Therefore, this study argues that when explaining the social network focusing on place-based

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communities (like a neighbourhood), 'place' should be considered in the social network construct. The social network system model adds a physical factor at the macro-level dimension when investigating social interaction in the neighbourhood context. This study was based on this modified social network system model to investigate social relationships in MPEs.

Sense of Community Theory

Much of the previous research looks at social interaction as an essential localised form of sense of community in the neighbourhood context (Rosenblatt et al., 2009; Talen, 2000). McMillan and Chavis's (1986) sense of community theory is regarded as an influential theory in psychological literature (Centers & Gómez, 2019; Loomis & Wright, 2018). McMillan and Chavis's (1986) sense of community theory has identified four key components of sense of community: 1) membership, which refers to 'a feeling that one has invested part of oneself to become a member and therefore has a right to belong' (p. 9); 2) influence, which refers to a mutually connection as 'a member to be attracted to a group' and 'a group's ability to influence its members' (p. 11); 3) fulfilment of needs, which refers to the feeling that individual needs will be met via participating in group behaviours; and 4) shared emotional connection, which means that 'the interactions of members in shared events and the specific attributes of the events may facilitate or inhibit the strength of the community'(p. 13).

Literature has distinguished two types of community: 1) geographical community (place-based) which implies a sense of belonging to a certain place area, like a neighbourhood, town or city; and 2) relational community (place-less) which focuses on the character of human relationships without considering geographical location, such as workplaces, online communities, or particular groups (Mannarini & Fedi, 2009; Obst et al., 2002). According to McMillan and Chavis (1986), both sorts of communities have the same psychological mechanisms to form a sense of community. Some scholars argued that when explaining the sense of community focusing on place-based communities, 'place' should be considered in the sense of community construct (Kim & Kaplan, 2004). By contrast, there is a debate that the importance of 'place' in the creation of sense of community is generally overstated because social bonds are not limited to individuals being geographically ties. Although it is unclear how the built environment affects sense of community in neighbourhoods, past

research found that there is a significant relationship between sense of community, neighbourhood social interaction and neighbourhood attachment. Therefore, numerous studies claim that the sense of community can be regarded as specific localised forms of social interaction and place attachment in the neighbourhood context (Kim & Kaplan, 2004; Rosenblatt et al., 2009; Talen, 2000). For example, Kim and Kaplan (2004) presented a sense of community model which links sense of community to place at the neighbourhood level. In this model, Kim and Kaplan (2004) identified social interaction is an activity-based psychological mechanism of sense of community and place attachment is a meaning-based psychological domain of sense of community in the neighbourhood context. Similarly, Rosenblatt et al. (2009) treated social interaction as a localised form of sense of community in a master planned community case study in Australia. Understanding the psychological implications of sense of community is essential for understanding social interactions and social ties in the neighbourhood context.

Socio-ecological Systems Theory

The socio-ecological system is a crucial way of understanding human–environment interactions which is defined as 'a coherent system of biophysical and social factors that regularly interact in a resilient, sustained manner' (Redman et al., 2004, p. 163). Many studies of social interaction and health-related behaviour have been based on socio-ecological theory (Berkes et al., 2008). The concept of a socio-ecological system originally stemmed from Bronfenbrenner's ecological systems theory of human development (Bronfenbrenner, 1992; Lauwers et al., 2021). Bronfenbrenner (1979, 1992) presented an ecological systems theory which proposes that human behaviours are impacted by an interaction between an individual and their social and ecological environment. According to Bronfenbrenner's (1979, 1992) ecological systems theory, four hierarchical levels of individual, social, physical and policy factors are associated with each other: 1) intrapersonal factors (e.g., attitudes, personality); 2) interpersonal factors (e.g., social interactions); 3) organisational or community factors (e.g., cultural values); and 4) public policy factors (e.g., policies) (Uchendu et al., 2020).

The socio-ecological model (see Figure 2.2) presents that social interaction and social wellbeing can be affected by the interaction between multiple levels of factors, ranging from individual, interpersonal, community, social and political environments. Followed the socio-

ecological models, many recent studies rely on socio-ecological frameworks to in-depth explore the complex social relationships in neighbourhoods, like investigating the impacts of dynamic multilevel interactions of individual, social, physical and other factors on neighbourhood social interaction, or to explain associations between public space and social interaction (Francis et al., 2012; Lauwers et al., 2021; Uchendu et al., 2020).
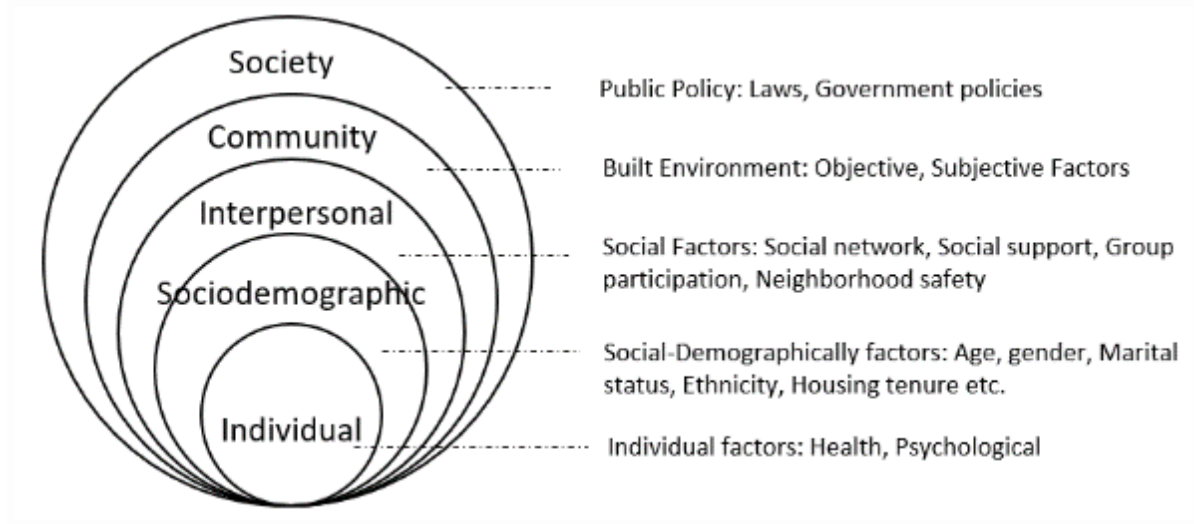
Figure 2.2   The socio-ecological framework of neighbourhood social interaction
Source: Adapted from Francis et al. (2012) and Sallis et al. (2012)

2.1.2 Types of Social Interaction in Neighbourhoods

Literature shows social relations consist of multiple layers of relations within social networks from strong social ties to weak social ties (Henning & Lieberg, 1996; Kawachi & Berkman, 2001). These social ties affect a flow of resources to residents within neighbourhood social networks. Neighbourhood social interaction consist of different types of social activities that neighbours engage in, such as borrowing things, informal visiting, and asking for help (Veeroja, 2018). For example, two types of social interactions have been identified in the literature: formal interaction and casual interaction in neighbourhoods (Kim & Kaplan, 2004). However, the different types of residents' social activities in various neighbourhood circumstances remain less understood in the literature.

Summarising previous research findings, three main types of positive social interaction have been identified which can affect wellbeing within neighbourhoods: 1) general interactions

with weak social ties (also known as weak ties social interaction); 2) deeper interactions with strong social ties (also known as strong ties social interaction); and 3) community participation (Goffman, 2008; Kim & Kaplan, 2004).

Weak Ties Social Interaction

In the neighbourhood context, weak ties social interaction refers to general, superficial or casual interactions between neighbours based on weak social ties, such as brief conversations or waving to greet others, which is usually unplanned without an intention or exchanging behaviour (Goffman, 2008).

In the neighbourhood context, weak ties are defined as the superficial interactions that occur between neighbours who know others but not too well in neighbourhoods (e.g., acquaintances, neighbours) (Henning & Lieberg, 1996; Kim, 2017). Past studies found that weak ties are often more plentiful and influential in neighbourhoods (Henning & Lieberg, 1996; Williams, 2005). In the early literature on social interaction, Granovetter (1973) pointed out that weak ties are likely to be more important than strong ties in social networks. Henning and Leiberg (1996) found that the number of weak ties (e.g., nodding, taking a parcel for another) was higher than strong tie interactions within neighbourhoods in a study in Sweden. Similarly, in a survey study in South Korea, Kim (2017) revealed that weak ties social interaction had a more significant impact on neighbourhood place attachment and residents' wellbeing. Weak ties social interactions give residents a sense of social engagement in neighbourhood life, which is beneficial for their mental health (Weijs-Perrée et al., 2015). However, although some researchers claims that weak ties social interaction is more important in neighbourhoods, little has been explored of the characteristics of weak ties social interactions across different neighbourhood contexts.

Previous studies have identified that weak ties social interaction takes place most often in communal spaces in neighbourhoods (Henning & Lieberg, 1996; Leyden, 2003). Summarising previous research findings, three main types of weak ties social interaction in neighbourhoods have been identified in the literature: 1) acknowledging contact, such as waving or saying hello to neighbours (Henning & Lieberg, 1996; Lund, 2003); 2) greeting contact, such as stopping and talking to a neighbour when meeting (Henning & Lieberg, 1996;

Weijs-Perrée et al., 2015); and 3) helping contacts, exchanging services with neighbours, such as looking after mails and gardens (Henning & Lieberg, 1996).

Some scholars also categorise weak ties social interactions into two categories: verbal social interaction and non-verbal social interaction (Oldenburg, 1989; Veeroja, 2018). Non-verbal social interaction (e.g., visual contact) refers to being 'engaged in social interaction that did not involve verbalised conversations' (Hickman, 2013, p. 228), including social contacts of seeing other people, watching children playing, watching sport or activities. Literature suggests that non-verbal social interaction can also benefit people's wellbeing (Hickman, 2013). Past studies indicated that simply seeing other people may benefit them (Francis et al., 2012; Hickman, 2013). For example, Francis et al. (2012) pointed out that watching sport is one of five key social activities undertaken in parks in MPEs in Australia. Hickman (2013) found that residents valued seeing friendly or familiar faces. In particular, in situations where people felt socially isolated, they might value simply seeing other people. Similarly, Gardner (2011) also found that some residents enjoyed just seeing others while in outside open spaces.

Overall, literature shows that the majority of social interaction in neighbourhoods is general or casual interactions between neighbours with weak ties (Williams, 2005). Weak tie social interactions are prominent types of social activities in neighbourhoods which are important for residents' social engagement and mental wellbeing (Weijs-Perrée et al., 2015).

Strong Ties Social Interaction

Strong social ties refer to a reliable social network (e.g., family members, relatives, and friends) that has been developed over time based on thick trust (Goffman, 2008; Henning & Lieberg, 1996; Putnam, 2001). Literature shows that strong ties are the key components of social networks. In general, the majority of social support comes from strong social ties (Kim, 2017).

Strong ties social interaction is usually planned with the purpose of doing things together, from knowing the neighbours well to doing things together based on thick trust in neighbourhoods (Goffman, 2008; Williams, 2005). Summarising previous research findings, strong ties social interaction in neighbourhoods consists of several main forms: 1) joint leisure activities (Henning & Lieberg, 1996; Weijs-Perrée et al., 2015); 2) sport or going out together

(Weijs-Perrée et al., 2015); 3) having a conversation with friends (Rosenblatt et al., 2009); 4) seeking advice from trusted neighbours (Du Toit et al., 2007); 5) supportive acts of neighbouring (Lund, 2003); 6) asking neighbours for help or exchanging favours with neighbours; 7) providing practical or emotional help for neighbours (Henning & Lieberg, 1996); 8) visiting a neighbour's house (Du Toit et al., 2007; Weijs-Perrée et al., 2015) or others. Among them, three types of strong ties social interactions occur in neighbourhood outdoor spaces: joint leisure activities, sport or going out together, and having a conversation.

Most previous studies measure social network size by focusing on strong ties by asking participants how many close friends they have in their neighbourhood (social network size), and to what extent they are willing to do things together (Kim, 2017; Rosenblatt et al., 2009). For example, Kaźmierczak (2013) carried out a mixed-method case study in three neighbourhoods in Greater Manchester, UK and found that respondents on average had three or four good friends in their neighbourhood, and some of them had more than nine neighbour friends. Similarly, Rosenblatt et al. (2009) conducted a mixed-method case study to investigate social interaction in a case study of MPEs in Australia and found that more than half of respondents have neighbour friends in the MPE.

It is also notable that although strong ties benefit positive interactions, they could also lead to unwanted interactions or conflicts which may generate a negative effect on wellbeing (Bramley & Power, 2009). For example, Bramley et al. (2009) found that close contacts at high density residential areas may cause annoyance. On the other hand, weak ties do not often lead to unpleasant interactions as there would be few opportunities to develop strong connections. Therefore, literature suggests that weak tie social connections in a neighbourhood are more crucial to promoting positive residents' wellbeing (Henning & Lieberg, 1996; Kim, 2017). However, the processes by which strong and weak ties affect health outcomes and whether there are distinctions between them are still unclear in the literature.

Overall, strong ties social interactions have often been used to measure social network size which is important for residents' social wellbeing (Weijs-Perrée et al., 2015). Although literature identified some forms of strong ties social interaction activities in neighbourhoods, very few studies investigate strong ties social interactions in the Australian MPE context.

Community Participation

Literature shows that community participation is an important method for residents' socialisation in neighbourhoods (Rosenblatt et al., 2009; Zhu & Fu, 2017). Community participation refers to involvement in community groups, attending community events, and doing something for the community (Rosenblatt et al., 2009; Zhu & Fu, 2017). The concept of community participation is often used to test participants' sense of community and belonging to community.

Previous research recognised that two types of community participation may influence residents' social interaction and place attachment: 1) attending events (Francis et al., 2012; Weijs-Perrée et al., 2015); and 2) being involved in groups (Rosenblatt et al., 2009). The first type of community participation (attending events) often occurs in neighbourhood open space. The second type of community participation (group participation) can be measured through asking participants if they are involved in community groups or willing to do things for their community (Francis et al., 2012). However, few studies investigated community participation in MPEs. To date, we know very little about social interaction related to community participation in the Australian MPE context.

2.1.3 Factors Influencing Social Interaction in Neighbourhoods

Based on the socio-ecological framework discussed above, previous studies identified three main categories of factors impacting neighbourhood social interaction: personal factors (e.g., age, sex, education and length of residence); social factors (e.g., health and safety); and physical characteristics of the built environment (e.g., communal space provision, pedestrian environment) (Francis et al., 2012; Lauwers et al., 2021; Williams, 2005).

Of these elements, previous research indicates that the built environment of the neighbourhood is crucial for fostering neighbour social interactions, which in turn promote a sense of community and wellbeing (French et al., 2014; Talen, 2000). For example, Kim (2017) pointed out that the neighbourhood built environment plays a crucial role in shaping and influencing social support via weak ties and strong ties social interaction within the neighbourhood. However, the relationship between social interaction and neighbourhood

physical characteristics is still unclear in literature in the built environment disciplines (Abass et al., 2020).

The literature has revealed several built environment factors associated with residents' social interaction in neighbourhoods: 1) the provision of public open space (Francis et al., 2012; Talen, 2000); 2) the quality of public space (Chitrakar, 2016; Kaźmierczak, 2013); 3) land use and density (Rogers & Sukolratanametee, 2009); 4) pedestrian access (Lund, 2002); 5) neighbourhood connectivity (Abass et al., 2020) and others. Specifically, some studies have found that neighbourhood small-scale settings like neighbourhood communal spaces can provide opportunities for social interaction (Francis et al., 2012). The provision of public and open space (e.g., playgrounds and parks with easy access to nature) brings residents together and encourages a variety of social activities (Han et al., 2022; Rogers & Sukolratanametee, 2009). Literature shows that there is a strong association between the quality of public space and social interaction (Chitrakar, 2016; Talen, 2000). Past research also reveals that a pedestrian-friendly environment improves neighbourhood attachment and creates opportunities for social contact, which ultimately improves a sense of community (Lund, 2002; Rogers & Sukolratanametee, 2009). Some scholars have presented several frameworks to explore how the physical environment affects individuals' social life and health-related behaviours in neighbourhoods (Ross & Searle, 2019; Talen, 2000). However, there are still very limited studies focused on residential public spaces in creating social interaction within neighbourhoods (Farahani & Lozanovska, 2014), especially in the Australian MPE context.

To summarise, existing research is limited in investigating the human–enviornment relationships between built environment and social interaction across diffirent neighbourhood contexts. In particular, few empirical studies have measured the impacts of neighbourhood built envionment on social interaction in MPE contexts. In the context of MPEs, social interactions have not been sufficiently studied. Based on social network theory, this study adds a physical factor at the macro-level dimension in Berkman et al.'s (2000) social network system model to understand residents' social relationships in MPEs and to investigate the relationship between neighbourhood community parks and social interaction in MPE contexts. In addition, the importance of understanding social interaction and human-environment relationships has been magnified due to the impact of COVID-19 (Manzo & Devine-Wright, 2020; Han et al., 2022). However, few studies have investigated the specific social activities

occurring in parks in urban communities during the COVID-19 pandemic. Studies regarding the impact of public open spaces on their social lives during the COVID period are quite limited in literature (Han et al., 2022).

2.2 Neighbourhood Place Attachment and It's Theoretical Basis

In recent years, interest in place attachment has increased rapidly to explore the psychological process of place attachment at the neighbourhood level. Numerous studies focus on questions like 'what are the properties of this bond, how does it contribute to the identity, and what are the related behaviours' (Hernández et al., 2020, p. 105). However, we still know little about the psychosocial mechanisms of place attachment across different types of neighbourhoods (Scannell & Gifford, 2017).

Place attachment is defined as 'the emotional bonds between people and a particular place or environment' (Seamon, 2020, p. 29). The place attachment concept consists of three spatial scales: city, neighbourhood and house levels. At the neighbourhood level, place attachment is defined for residents as 'feeling especially connected to a place that is meaningful to people' (Scannell & Gifford, 2017, p. 258).

Literature shows that place attachment is a multidimensional concept and has been investigated in many disciplines, such as architecture, urban design, built environment, psychology and sociology (Arani et al., 2021; Casakin et al., 2021; Manzo & Perkins, 2006). Different disciplines have different perspectives to understand place attachment. In the built environment discipline, studies have identified that psychological place attachment can be understood at the individual level, group level or neighbourhood level (Scannell & Gifford, 2017). Literature suggests that neighbourhood built environment plays a critical role in determining neighbourhood place attachment (Abass & Tucker, 2018). However, past studies 'pay less attention to variables related to physical context and people' at the neighbourhood level (Casakin et al., 2021, p. 316).

Scholars pointed out that the neighbourhood context might affect residents' perceptions of place attachment (Kimpton et al., 2014), therefore, different neighbourhood contexts must be considered to analyse the place attachment. MPEs have significantly increased in Australian

cities (Cheshire, 2019; Francis et al., 2014). Few studies have examined place attachment and its relationships with community parks in MPEs and other types of neighbourhoods.

2.2.1 Place Attachment Theories

There are several sets of theories that form the understanding of place attachment at the neighbourhood level. However, to date, there is still a lack of theory and empirical progress in place attachment literature (Hernández et al., 2020). Most influentially, place attachment theory is regarded as the intersection of attachment theory (Bowlby, 1969) and person–environment fit theory (Edwards & Cooper, 2013; Schneider, 1987), according to previous studies (Arani et al., 2021; Smith, 2009).

Attachment Theory

Place attachment theory originally came from attachment theory by psychoanalyst John Bowlby (Bowlby, 1969). Attachment theory indicates that 'people's experiences, over time, become internalized into internal working models' (Bosmans et al., 2020, p. 288). Bowlby asserted that the psychological process of interpersonal attachment consists of 'proximity maintenance, safe haven, secure base, and separation distress' (Scannell et al., 2020, p. 46). Attachment theory claims that attachment is a primary motivational system which 'provides an external ring of psychological protection which maintains the child's metabolism in a stable state' (Berkman et al., 2000, p. 844). As an emotional and psychological theory, Bowlby's (1969) attachment theory relates to the interpersonal attachment of an individual to their surrounding social environment. Bowlby's (1969) attachment theory has often been used as a theoretical basis in place attachment research at an individual level (Berkman et al., 2000; Scannell et al., 2020). Regarding the bonds between humans and places, place attachment shows similar psychological processes with interpersonal attachment, but it differs in how bonds are expressed across different place circumstances (Scannell & Gifford, 2010). However, there is still a lack of theoretical and empirical progress to understand psychological processes of place attachment in the literature (Hernández et al., 2020).

The person–environment fit theory is essential to understand place attachment (Arani et al., 2021; Smith, 2009). Person–environment fit is defined as the 'compatibility between individuals and their environment' (Van Vianen, 2018, p. 76). Person–environment fit theory indicates that 'the degree of fit or match between individuals and their environment and states that the coordination between an environment and a person affects his behaviour more than the characteristics of the person or the environment separately' (Arani et al., 2021, p. 186). In the early literature on interpersonal attraction, Rappaport (1977) defined person-environment fit as 'people are attracted to others whose skills or competence can benefit them in some way' (McMillan & Chavis, 1986, p. 13). Smith (2009) pointed out that a behaviour can arise from the interaction between an personal competence and environmental press. Smith (2009) argued that subjective environmental perceptions and psychological meaning aspects of place are important for person–environment fit. The term place attachment has been used to describe the positive experience of person–environment fit (Smith, 2009). Similarly, Arani et al. (2021) used the place attachment theory combining interpersonal attachment theory (Bowlby, 1969) and person–environment fit theory (Van Vianen, 2018) to explore the concept of place.

In sum, as the concept of place attachment is diverse, the key challenge for place attachment research is to integrate various definitions and viewpoints related to place attachment (Hernández et al., 2020).

2.2.2 Place Attachment Models

Following attachment theory, numerous place attachment models have been proposed to explore the psychological ties to places (Scannell & Gifford, 2010; Williams & Vaske, 2003). Most models consider place attachment is a multidimensional structure which incorporates a number of factors. For example, Williams and Vaske (2003) proposed a two-dimensional structure model of place attachment: place identity and place dependence. Place identity refers to the 'symbolic importance of place as a repository for emotions and relationships that give meaning and purpose to life' (Williams & Vaske, 2003, p. 831). Place dependence refers to a functional attachment to a place which is 'important for the fulfilment of specific goals' (Dlamini & Tesfamichael, 2021, p. 2436). Similarly, Manzo and Perkins (2006) provided an

affective–cognitive–behavioural framework for explaining the psychological process of place attachment to community: 1) affective component (or place affect) includes the feelings of pride, love, happiness, and so on (Casakin et al., 2021; Scannell & Gifford, 2010); 2) cognitive component (or place identity) comprises the items of memories, knowledge, beliefs and meaning; and 3) behavioural component (or place dependence) refers to the actions of maintaining proximity to a place and place reconstruction (Scannell & Gifford, 2010).

Most influentially, Scannell and Gifford (2010) proposed a Person–Place–Process (PPP) model (see Figure 2.3) to demonstrate the place attachment process in psychological mechanisms. Scannell and Gifford (2010) argued that the various concepts of place attachment should be managed, and then proposed a three-dimensional Person–Place–Process (PPP) model to integrate the variety of definitions in the literature. The PPP model treats place attachment as a multidimensional concept with person, place and psychological process dimensions (see Figure 2.3). Scannell and Gifford's (2010) PPP model is the most influential and well-known place attachment model in place attachment literature, which has been used in many place attachment studies (Dlamini & Tesfamichael, 2021).
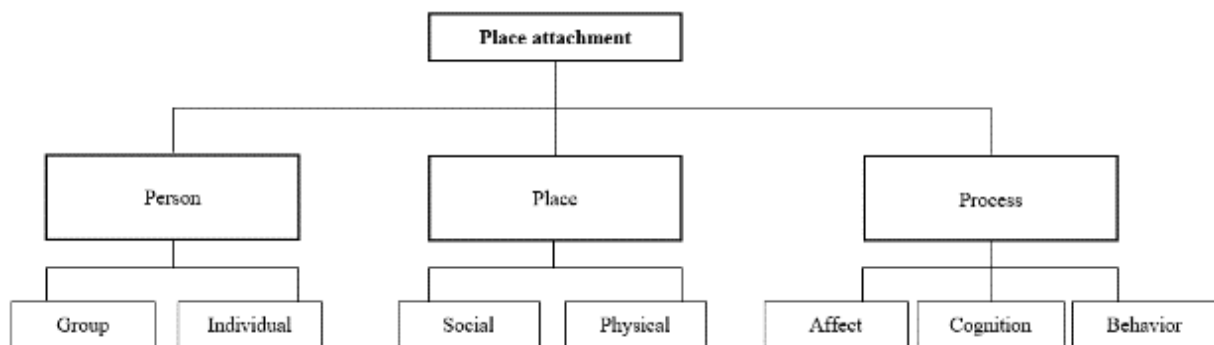
Figure 2.3 The tripartite PPP model of place attachment
Source: Adapted from Scannell and Gifford (2010, p. 2)

Scannell and Gifford's (2010) Person–Place–Process (PPP) model consists of three dimensions to understand the interaction relationship of person–environment of place attachment: person, place, and psychological process. In the PPP model, the Person-dimension focuses on who is attached to a place, at the individual or collective level. The Place-dimension includes the social and physical environment. The Process-dimension refers

to the psychological ways to develop a place attachment (Scannell & Gifford, 2010). In the Process dimension, the psychological aspects of place attachment 'are characterised by affective, cognitive, and behavioural components' (Scannell & Gifford, 2010, p. 3). This study adopted Scannell and Gifford's (2010) PPP model to understand place attachment and human–environment interactions in urban communities. Scannell and Gifford's (2010) PPP model was used in many place attachment studies, but as place attachment is a context-dependent concept, the subtheme items of each process are somewhat different across the different circumstances. The psychological process of place attachment are discussed below.

Affective Items

The affective process (or place affect) is one of the primary way to develop a sense of place attachment, including subthemes of emotional bonds (Casakin et al., 2021; Scannell et al., 2020). Scannell and Gifford's (2010) pointed out the affective process of place attachment consists of items of happiness, pride and love.

At the neighbourhood level, scholars assert that 'residential place attachments often translate into feelings of …a general sense of well-being' (Brown et al., 2003, p. 259). Most existing studies consider emotional factors such as happiness, pride and love to be the main factors in place affect (Mihaylov et al., 2020; Scannell & Gifford, 2010). Lestari and Sumabrata (2018) revealed that emotional bonds between residents and neighbourhood were not only affected by the physical environment but also affected by the social interaction with neighbours.

Cognitive Items

The cognition process of place attachment is also called place identity in literature (Manzo & Perkins, 2006). Place identity is defined as 'feel a part of place and associate their personal and group identity with the identity of that place' (Seamon, 2020, p. 29). Literature shows that place identity forms through combinations of individual, group and cultural processes (Casakin et al., 2021; Scannell et al., 2020). Previous studies have found place identity consists of various dimensions of personal emotional connection with the physical environment. For example, the PPP model's cognitive component incorporates items of memory, knowledge and meaning (Scannell & Gifford, 2010). Several further themes of cognitive items have been identified in the literature related to this research's scope, including

memory, feelings of belonging, meaning and culture significance (Kaźmierczak, 2013; Casakin et al., 2021), which are discussed below.

Memory. Previous studies found that the presence of place-based memories in neighbourhood is an important source of place identity and place attachment in neighbourhoods (Lestari & Sumabrata, 2018; Scannell & Gifford, 2017; Scannell et al., 2020).

Membership of community. In previous studies, place identity is recognised as a component of feelings of belonging to a group or community (Scannell & Gifford, 2010; Williams & Vaske, 2003). Some recent studies pointed out place attachment is developed 'not only from their personal experiences, but also from the group to which they belong' (Casakin et al., 2021, p. 318). Seamon (2020) also pointed out that place identity comes from feelings of a belonging to a place or group.

Meaning. Previous studies have found place identity consists of various dimensions of personal emotional connection with physical environment, including 'means of a pattern of beliefs, preferences, feelings, values, and goals' (Manzo & Perkins, 2006, p. 337). MPE literature shows that MPEs' lifestyle packages 'possibly afford opportunities for residents to recreate meaning and purpose in their life' (Alidoust & Bosman, 2017, p. 40).

Culture significance. Scholars argued that 'places have cultural significance, and this leads individuals to distinctly identify themselves with such spaces and express their sense of identity' (Dlamini & Tesfamichael, 2021, p. 2436). In the MPE literature, previous studies revealed that MPEs' public spaces provided important grounds for social and culture diversity via everyday activities (Cattell et al., 2008; Kaźmierczak, 2013).

Behavioural Items

In the place dimension, the behavioural component of place attachment is also called place dependent (Manzo & Perkins, 2006). Recent research claimed that scales of place attachment do not always include clear behavioural items (Casakin et al., 2021). A large effort is needed to explore the behaviour process in the place attachment process in different specific circumstances. Scannell and Gifford (2010)'s PPP model helps understand place attachment and related place-related behaviours. The PPP model's behavioural dimension illustrated a positive relationship between community participation and place attachment, but other

behaviour items are under explored in this model. For example, the role of social interaction behaviours in place attachment is still unclear.

In previous studies, as the behavioural process was not clear, the themes of behavioural components are inconsistent. In recent years, place attachment studies have begun to put more emphasis on the impact of social bonds on place attachment (Dlamini & Tesfamichael, 2021). Several themes of behavioural components have been identified in the literature related to this research's scope, including need fulfilment, community participation, and social bonds, which are discussed below.

Place-related need fulfilment. The behavioural dimension of place attachment, related to place dimension, refers to place dependence (Manzo & Perkins, 2006; Williams & Vaske, 2003). As discussed above, place dependence is a functional attachment to fulfil people's needs and behaviours (Dlamini & Tesfamichael, 2021; Williams & Vaske, 2003). Literature shows the biggest influencing factors for outdoor space on place attachment are behaviours and activities. For example, Scannell and Gifford (2017) investigated psychological benefits of place attachment through a qualitative study and found activity support is an important meaning factor of place attachment. Specifically, their study identified the specific place-related behavioural needs including relaxation, activity support, and entertainment. Of them, relaxation is the most important factor of place attachment (Scannell & Gifford, 2017). They also revealed that residents are most likely to generate place attachment from two types of places: home and outdoor space (e.g., parks). Ongoing activities help maintain closeness to a place which is the most important item in the behavioural process of place attachment (Scannell & Gifford, 2010). Overall, place-related need fulfilment is an essential behavioural item influencing place attachment (Scannell & Gifford, 2017).

Community participation. Previous research has identified community participation is another essential behavioural theme of place attachment (Scannell & Gifford, 2010). Manzo (2006) stated that the behavioural meaning of place attachment mainly refers to community participation, especially referring to participation in neighbourhood planning and improvement. Similarly, Scannell and Gifford (2010) pointed out that place reconstruction is a subtheme of behavioural process of place attachment. Yet, these general place attachment studies did not distinguish between specific neighbourhood contexts. To the author's

knowledge, few studies have investigated the association between community participation and place attachment in the Australian MPE context to date.

Social bonds. More recent attention has begun to focus on the impact of social bonds on place attachment in neighbourhoods (Dlamini & Tesfamichael, 2021; Lu et al., 2018). However, it is unclear if social engineering has influenced people's conceptions of place attachment (Dlamini & Tesfamichael, 2021). Some recent studies found that several social bond factors may affect place attachment, such as strong ties social interaction with neighbours, closeness to neighbours, and friendship among residents (Lestari & Sumabrata, 2018). Casakin et al. (2021) pointed out that neighbourhood place attachment can come from 'a general feeling of well-being that is developed through daily social interactions among neighbours' (p. 318).

To sum up, previous studies indicate that it is important and critical 'to understand the diverse meanings that a neighbourhood holds for its residents in order to create successful places' (Manzo & Perkins, 2006, p. 338). However, there is a lack of a development of a theory of place attachment (Dlamini & Tesfamichael, 2021). As place attachment is a context-dependent concept, the existing studies and theoretical models demonstrate the place attachment in a general context and do not fully and accurately reflect the characteristics of place attachment in a specific environmental context, such as the Australian MPE context. Literature shows adopting Scannell and Gifford's (2010) PPP model 'can serve as a basis to gain a better understanding of place attachment as both a physical and social process' (Casakin et al., 2021, p. 318). Therefore, this study adopted the PPP model to understand the diverse meanings and psychological processes of place attachment in the Australian MPE context.

2.2.3 Factors Influencing Place Attachment in Neighbourhoods

Literature has identified numerous factors that affect neighbourhood place attachment, such as socio-ecological factors (e.g., length of residency), neighbourhood built environment factors (e.g., public space) and social bonds in neighbourhoods (Clark et al., 2017; Lu et al., 2018; Zhu et al., 2021). Based on the socio-ecological systems framework, the influencing factors of place attachment include demographic, individual, social and physical factors.

Socio-ecological Factors

Developing a place attachment and fostering community sustainability is a necessary response to the diverse socio-economic environment (Razem, 2020). Following the socio-ecological theory discussed above (see Section 2.1.1), previous studies have identified multiple levels of factors that directly or indirectly affect place attachment, including policy, physical environment, socio-demographic, individual and social factors (Lauwers et al., 2021), such as length of residency (Dlamini & Tesfamichael, 2021), home ownership (Abass & Tucker, 2018), socio-economic indicators (Comstock et al., 2010), historical influences and cultural significance (Creţan et al., 2022; Smith, 2009). For instance, some scholars found that home ownership and length of residence have strong correlation with neighbourhood attachment (Abass & Tucker, 2018). Some studies state that the residency length is the strongest predictor of place attachment (Dlamini & Tesfamichael, 2021; Lewicka, 2010). For social factors, Francis et al. (2012) found that social factors like neighbourhood safety and group participation also impact sense of community in neighbourhoods in Australia. Previous studies found that social interaction factors (e.g., social ties and daily interactions) can influence place attachment (Lestari & Sumabrata, 2018). Australian scholars also found some socio-demographic variables, such as education, income and age, are linked with public space use, sense of community and place attachment in neighbourhoods (Francis et al., 2012; Hooper et al., 2020).

Built Environment Factors

In the physical dimension, Ebrahim's (2015) systematic literature review shows that physical designs are more important to form a sense of place attachment than to promote social interactions in neighbourhoods. Multiple studies have found that the quality of the neighbourhood physical environment is important for place attachment (Brown et al., 2003; Casakin et al., 2021; Poortinga et al., 2017). For example, one recent study by Casakin et al. (2021) found that 'people who perceived their neighbourhood as high quality showed higher levels of attachment' (p. 315). Similarly, Brown et al. (2003) also assert that the physical environment, like housing characteristics and qualities, are important for determining place attachment. Abass and Tucker (2018) examined the relationship between place attachment and physical characteristics of low-density suburbs in Australia and found several physical factors significantly predicted place attachment in neighbourhoods: 'street layout, pedestrian

environment, neighbourhood connectivity, public space provision, and dwelling form' (p. 231).

Overall, previous studies have identified a range of neighbourhood physical features can directly or indirectly influence place attachment across different residential contexts (Poortinga et al., 2017), such as location (Burholt & Naylor, 2005), pedestrian environment (Kim & Kaplan, 2004; Lund, 2003) and public spaces (Francis et al., 2012). In particular, studies found that neighbourhood communal spaces play important roles in developing place attachment in neighbourhoods, including open space and parks (Lestari & Sumabrata, 2018), green space (Kimpton et al., 2014), and sport and recreational spaces (Madgin et al., 2016).

New urbanism claims that well-designed specific elements of public open space, like park size, spatial distribution, residential grain and pedestrian environment, can strengthen residents' social interaction and place attachment (Hooper et al., 2020; Talen, 2000). Talen (1999) pointed out that place attachment is an essential psychological element to produce the experience of sense of community. Talen (2000)'s new urbanism translating model (see Figure 2.4) depicts the relationship between public open space and sense of community. However, how neighbourhood open spaces are incorporated into residents' daily behaviours and place attachment still remains underexplored. Few empirical studies have tested new urbanism claims of public open space planning at the neighbourhood level (Ebrahim, 2015).

In summary, studies have shown the importance of place attachment for residents' wellbeing and community development in neighbourhoods. However, we still know very little about how attachment develops (Bosmans et al., 2020). There is a knowledge gap about the place dimension of place attachment in literature, such as 'what types of places generate more attachment, what are the characteristics of those places, etc.' (Hernández et al., 2020, p. 105). How neighbourhood features are incorporated into daily behaviours and place attachment still remain conceptually and empirically underexplored. There is a need for more empirical studies to explore the relationship between place attachment across different neighbourhood contexts. The mix of theoretical approaches form the foundation of research on place attachment in this study.

2.3 New Urbanism Paradigm

New urbanism aims creating liveable neighbourhood environments to achieve community sustainability (Moulay et al., 2018). New urbanism is a planning paradigm which hypothesises that sustainable social goals (e.g., positive social interaction, place attachment and sense of community) can be achieved through the design of built environment in neighbourhoods (Ebrahim, 2015; Hooper et al., 2020).

New urbanism was founded by urban designers, architects, developers and planners in 1990s and has garnered consistent academic attention in many countries, such as Australia, Canada, Europe and the United States (Al-Hindi & Till, 2001; Hooper et al., 2020; Stanislav & Chin, 2019). The principles of new urbanism were introduced by the congress for the new urbanism in an official publication: Charter for the New Urbanism (Congress for the new urbanism, 2000). New urbanism is an umbrella term which encompasses a variety of concepts across three levels or scales: the region level, the neighbourhood, the district level, and the block, street and building level (Congress for the new urbanism, 2000). New urbanism is most influential and well known for its development at the neighbourhood level (Trudeau & Kaplan, 2016). At the neighbourhood level, new urbanism proposes that social goals can be achieved through physical design in the neighbourhood (Ebrahim, 2015; Hooper et al., 2020). It advocates that public spaces should be safe, comfortable, walkable, and linked to their surroundings to reinforce a sense of identity and place.

2.3.1 New Urbanism Theoretical Basis

The new urbanism philosophy is founded on combined theoretical foundations. Several social and urban theories about human-environment relationship have contributed to the new urbanism philosophy (Farahani & Lozanovska, 2014; Hooper et al., 2020; Talen, 2000), such as Jacobs' (1961) work of 'the death and life of great American cities' (Jacobs, 1961), the sense of place theory (Lynch, 1960, 1984) and Whyte's (1980) work on 'the social life of small urban spaces'. New urbanism philosophy is also founded on several sociological theories, such as sense of community (McMillan & Chavis, 1986) and attachment theory (Bowlby, 1969) discussed above.

Based on urban design theories and several sociological theories, new urbanism theory claims that public space can be used to strengthen positive social interaction, place attachment and sense of community for residents (Talen, 2000). According to Talen (2000), the public space design is 'aimed at promoting two social goals: 1) resident interaction and 2) place attachment' (p. 347). The specific design elements, such as size, spatial distribution, residential grain and pedestrian environment, are originally from early research works, such as Calthorpe (1993), Langdon (1994) and Talen (2000). Public space in the form of parks has been identified as a significant environmental factor associated with residents' social interaction and sense of community (Chitrakar, 2016; Talen, 2000). Based on new urbanism theory, Talen (2000) presented a linear translating model depicting the relationship between public space, social interaction and sense of community (see Figure 2.4). Talen (2000) argued that the concept of sense of community can be broken down in terms of the underlying social interaction component and affective place attachment component, which was also supported by some other scholars (Kim & Kaplan, 2004; Rosenblatt et al., 2009). Talen's model focuses on the social bonds between people and place which consists of three interrelated components: 1) physical dimensions of the public space, 2) factors that affect public space use, and 3) social interaction, which in turn has an impact on building a sense of community (Talen, 2000).
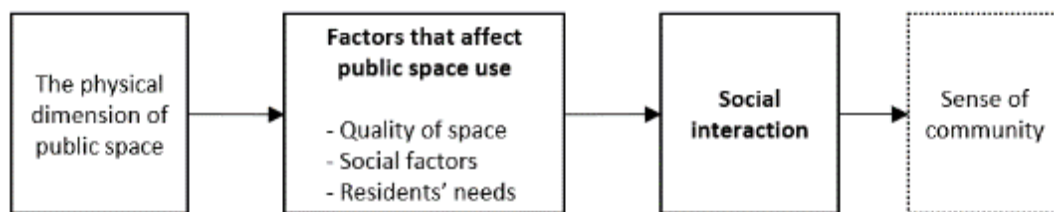
Figure 2.4   Translating model from public space into sense of community
Source: Adapted from Talen (2000, p. 348)

Following Talen's discussion, there have been some studies supporting her theoretical views (Kim & Kaplan, 2004; Rosenblatt et al., 2009; Zhu & Fu, 2017). Kim and Kaplan (2004) developed a model linking sense of community to place and identified four factors related to sense of community: place attachment, community identity, social interaction, and pedestrianism (Ebrahim, 2015). Based on Talen's theoretical views, Rosenblatt et al. (2009) conducted a case study in Brisbane, Australia, to examine social interaction, place attachment

and sense of community in MPEs. Their study supported Talen's theoretical views and claimed that community has various forms, and the sense of community should be broken down localised forms of social interaction (Rosenblatt et al., 2009). However, there are still very limited empirical studies that test the relationship between public space, social interaction and place attachment in neighbourhoods in the literature (Farahani & Lozanovska, 2014; Francis et al., 2012).

2.3.2 Claims of New Urbanism in Neighbourhoods

There are three types of social goals for new urbanism: 'community, social equity and the common good' (Talen, 2002, p. 166). To achieve these social goals, the principles of new urbanism were introduced in the charter for the new urbanism (Congress for the new urbanism, 2000). The charter for new urbanism includes 27 principles at three levels (city level, neighbourhood level and building level). Specifically, nine principles apply to the neighbourhood level. These principles draw on the new urbanism theories and aim to achieve social goals through physical built environment design (Heydari & Shojaeivand, 2017).

Previous studies summarised five key physical design dimensions of new urbanism which could promote a sense of community at the neighbourhood level: well-defined; mixed use; high density; pedestrian friendly design; and public space (see Table 2.1) (Ebrahim, 2015; Rogers & Sukolratanametee, 2009).

Table 2.1 New urbanism claims of physical design elements

Physical Design Elements	New Urbanism Characteristics
Well-defined	- Clear centre and edge
Mixed-use	- Mixed types of households Mixed land uses
Density	- Compact neighbourhood - Absence of garage on facade - Use of alley
Pedestrian-friendly design	- Presence of side walks - Tree lined and narrow street - Interconnected walkable street network
Public space	- Availability of parks - Integrated network of public parks and open spaces

Source: Adapted from Congress for the new urbanism (2000); Rogers & Sukolratanametee (2009)

Previous studies have tested the claims of new urbanism at the neighbourhood level to investigate the impacts of the physical built environment on residents' social behaviours (Lund, 2003). There is some empirical evidence to support the new urbanism claims that physical built environment can influence sense of community via social interaction and place attachment (Ebrahim, 2015; Hooper et al., 2020). Most studies were conducted from two perspectives as follows.

First, overall new urbanism claims were tested in neighbourhoods (Hooper et al., 2020; Park, 2017). For example, Hooper et al. (2020) tested the impacts of an Australian new urbanism policy on residents' sense of community and mental health in Perth, Australia. They tested the overall claims of a local new urbanism policy Liveable Neighbourhoods Community Design Guidelines in Australian (Western Australian Planning Commission, 2000), and found that higher compliance with the new urbanism policy guidelines was associated with a greater sense of community among residents (Hooper et al., 2020).

Second, some specific elements of new urbanism claims were tested (Lund, 2003; Wood et al., 2010). Several studies tested public space design claims and found there is a significant association between public space, social interaction and sense of community (Francis et al., 2012; Chitrakar, 2016). For example, Francis et al. (2012) found that quality of public open spaces are strongly associated with sense of community. Similarly, Lund (2003) tested the specific new urbanism claims and found that parks within walking distance can increase pedestrian travel and social interaction in neighbourhoods.

However, Ebrahim (2015) argued that there were limited studies empirically examining sense of community, social interaction and place attachment at the neighbourhood level from a new urbanism perspective. In particular, there are very limited empirical studies focused on the communal space within the neighbourhood in literature. As the previous findings are inconsistent in this research scope, it is still unclear what the specific impacts of the communal space attributes are on residents' social interaction and place attachment in neighbourhoods. Therefore, there is an important task and urgent need for researchers to conduct this type of study (Ebrahim, 2015; Francis et al., 2012).

To sum up, few empirical studies have tested new urbanism claims to investigate the relationship between public space, social interaction and place attachment at the

neighbourhood level. To contribute to filling this research gap, this study tests Talen's (2000) new urbanism theoretical model and related new urbanism claims at the neighbourhood level in the Australian MPE context.

2.4 Master Planned Estates in Australia

MPEs are defined as 'large scale, integrated housing developments produced by single development entities that include the provision of physical and social infrastructure' (Francis et al., 2014, p. 186). MPE is an important sustainable residential development form in Australian cities which has been rapidly growing in big cities in recent decades (Cheshire, 2019; Smith, 2019). In the last two decades, the MPE phenomenon has captured research attention in both Australian and international academia (Dowling et al., 2010; Kenna et al., 2017; Smith, 2019). Scholars claim that the rising popularity of MPEs is due to a combination of reasons, such as population growth and the encouragement of urban consolidation in state governments' metropolitan plans (Kenna et al., 2017).

Several distinct characteristics of MPEs have been recognised which can be used to differentiate between MPEs and other neighbourhoods in Australia (Gwyther, 2005; Johnson, 2010; Thompson, 2013). For example, Thompson (2013) summarised several common characteristics of MPEs: 'a consistent design and aesthetic, and some level of private infrastructure that may include social infrastructure, community facilities and residential amenities' (p. 86). Similarly, Johnson (2010) summarised ten major characteristics of MPE: '1) large scale development by a semi-public authority or a single developer; 2) physical markers of distinctiveness: boundary fences, consistent design, public services and facilities, symbols, names; 3) more public than private open space: open space, recreational options, walking tracks; 4) estate 'featurism': value added facilities built by developers: lakes, bandstands, pergolas; 5) the developer as active community-maker; 6) profitable investment for developers and residents; 7) diversity within MPEs; 8) social and spatial mobility; 9) residents' sense of culture, safety and security; and 10) freedom within set but also negotiated boundaries' (p. 381).

The concept of an MPE was originally from Anglo-American derived concepts and typologies of a gated community (Blakely & Snyder, 1997; Dowling & McGuirk, 2005).

Because Australia has unique and different socio-political and cultural conditions with other regions, scholars claimed that it is needed to apply the concepts of MPEs to the Australian context (Dowling & McGuirk, 2005). Incorporating the Australian context, literature has recognised the complexity and diversity of the MPE phenomenon in Australian cities (Dowling & McGuirk, 2005). However, the empirical or comparison research is quite limited on different types of MPEs in Australian cities (Maller et al., 2016; Thompson, 2013). Scholars claim that more theoretical and empirical research is needed on all aspects of MPEs in the Australian context (Francis et al., 2014).

2.4.1 Typology of MPEs

MPEs consist of a variety of types due to the physical environment and social structure diversity in Australia (Dowling et al., 2010; Thompson, 2013). As discussed above, the literature has recognised the complexity and diversity of MPEs in Australia (Dowling & McGuirk, 2005). Scholars indicated that a better understanding of the multidimensions of MPEs is crucial to understand the socio-spatial differentiation of MPEs (Gwyther, 2005). There is a lack of empirical and comparison research on different types of MPE in Australian cities (Thompson, 2013).

Previous studies present several typology frameworks of MPEs based on the physical environment and social diversity (Dowling et al., 2010; Dowling & McGuirk, 2005). For example, Dowling and McGuirk (2005) proposed a typology framework which demonstrates the diversity of the MPE phenomenon from the physical environment and social structure perspectives (see Table 2.2). The physical dimension includes location, size, dwelling types and density. The social structure dimension includes tenure, lifestyle, policy context and privatism.

Table 2.2 Multidimensions of MPEs

Dimensions	Subtypes
Location	Outer suburban greenfield Suburban in-fill Inner urban brownfield
Scale	Small size Medium size Large size

Tenure	Mix: owner-occupied, private renting
	Primarily owner-occupied
Dwelling types	Primarily apartments
	Townhouses and apartments
	Mixed: houses, town houses, apartments, some high rise
Land use mix	Residential and residential services
	Commercial and retail development
	Residential, connected to existing economic, social and community infrastructure
Public elements/ privatism	Communal spaces
	Collective service and infrastructure
	Institutions for community governance
Policy context	Regulation of design features

Source: Adapted from Dowling and McGuirk (2005)

MPEs can be categorised based on enclosure of built form (open, symbolically enclosed, and gated) (Dowling et al., 2010); density form (high, medium and low density) (McGuirk & Dowling, 2011); and the type of location (outer suburban greenfield MPEs and inner urban brownfield MPEs) (Dowling & McGuirk, 2005). Based on Dowling and McGuirk's (2005) typology framework, MPEs have been categorised into various types from different perspectives, which are discussed below.

Lifestyle types. As discussed above, Australian researchers have drawn the definition of MPEs originally from Anglo-American derived concepts to guide interpreting Australian MPEs. Blakely and Snyder (1997) provided three main types of gated community from the Anglo-American context: lifestyle, prestige and security zone. Based on Blakely and Snyder's (1997) categorisation, McGuirk and Dowling (2007) developed a typology framework of MPEs incorporating Australian evidence and context. Their framework has three subtypes of MPEs: 1) lifestyle type, such as suburban new town, golf/leisure estate, or retirement village; 2) prestige type, such as executive middle-class estate or rich/famous community; and 3) security communities, such as gated MPE (McGuirk & Dowling, 2007). However, there are few examples of security MPEs in Sydney because of low crime rates and few security issues in Australia (Dowling & McGuirk, 2005).

Built form types. From the perspective of enclosure of built form, MPEs can be categorised into three types: open, symbolically enclosed, and gated (Dowling et al., 2010). MPEs in Sydney are usually open or symbolically enclosed built form.

Scale types. MPEs take different forms due to their size (e.g., land area, number of households). Kenna et al. (2017) categorised the planned residential estates in Australia in three scales: 'large scale, with over 500 properties; medium scale, with 50–500 properties; and small scale, with less than 50 properties' (p. 273).

Location types. Based on locations, MPEs were categorised in three types: outer suburban greenfield, suburban in-fill and inner urban brownfield MPE (Dowling & McGuirk, 2005). Inner urban MPEs are located in the inner urban brownfield sites, often with higher density than outer suburban MPEs. Most inner urban MPEs are 'prestige' or 'security' MPEs, but most outer suburban MPEs are the lifestyle type of MPEs, such as golf/leisure or retirement estates (McGuirk & Dowling, 2007). It is notable that most existing MPE studies focused on the outer suburban greenfield type in Australia. Few studies have drawn attention to inner urban MPEs. Dowling et al. (2010) took into account inner urban MPE case studies in their research, but they did not identify specific characteristics of inner city MPEs.

In inner urban communities, it seems that place-based built environment factors play a more important role in promoting residents' place attachment (Warner & Andrews, 2019). However, few research studies focus on MPEs in inner urban areas (Thompson, 2013). Some scholars pointed out that community in inner urban MPEs is portrayed differently than in outer suburban MPEs (Cheshire et al., 2010; Thompson, 2013). Inner urban MPEs often target middle class residents. For these residents, who may be busy working parents raising young children or are elderly, social support is more important and needed in inner city MPEs (Warner & Andrews, 2019). Place-based factors appear to play an important role in facilitating social support for residents in inner urban communities (Warner & Andrews, 2019). For example, Cheshire et al. (2010) focused on an inner urban MPE case study in Brisbane and noted that 'higher density and inner-city developments, community is portrayed differently to its cosmopolitan residents' (p. 362).

In addition, as social and economic features in different regions are segmented in Sydney, it is critical to examine MPEs from a submarket perspective (Bangura & Lee, 2022; McGuirk

& Dowling, 2007). According to Bangura and Lee (2022), due to the significant divergences in social-economic features, there are five housing submarkets in Sydney: 'western region, inner-west region, southern region, eastern region, northern region' (p. 147). This study focuses on MPEs in the inner west region of Sydney.

Overall, the lack of research focusing on inner urban MPEs is notable in literature. In-depth investigations and empirical research on the existence of inner urban MPEs in Australia are very limited, with a lack of in-depth quantitative and qualitative work in this field.

2.4.2 Theoretical Framework of MPEs

Numerous studies have focused on a range of issues of MPEs in Australia, such as privatisation, housing markets, and social sustainability (McGuirk & Dowling, 2007; Smith, 2019; Thompson, 2013). Overall, the MPE literature consists of a wide range of themes and dimensions. Scholars have proposed several frameworks to understand the complexity and diversity of the MPE phenomenon. For example, McGuirk and Dowling (2007) provided a theoretical framework for analysing MPEs, which highlights the complexity of MPEs. Their framework included three analytical themes: governance; housing market; and community (McGuirk & Dowling, 2007). Likewise, Thompson (2013) identified a framework of MPEs incorporating three themes: privatisation; social distinction; and community. Similarly, Smith (2019) highlighted four themes associated with MPE research: privatisation; socio-spatial polarisation; community; and aesthetic uniformity. These frameworks provide important insights for analysing MPEs. Based on McGuirk and Dowling's (2007) framework, three themes of MPE research are discussed as follows.

Nature of Community

Community has been an important and consistent theme in the MPE literature (Rosenblatt et al., 2009; Thompson, 2013). The construction of community in MPEs is complex. An MPE is regarded as a sustainable residential form to promote social cohesion and address community sustainable issues such as declining sense of community, social and spatial segregation. McGuirk and Dowling (2007) claimed that MPEs are likely to 'sustain diverse, complex and dynamic forms of sociability, interaction and community dynamics' (p. 34).

Scholars pointed out that market logics behind MPEs are in two main domains: community creation and social distinction (Alidoust & Bosman, 2017; McGuirk & Dowling, 2007). The question of how a sense of community is facilitated by residents in MPEs is a major theme in the literature (Goodman et al., 2010; Thompson, 2013).

The central concept of the MPE is developed based on new urbanism philosophy to achieve social goals which hypothesised that the physical features of the residential environment can influence residents' social interaction and place attachment (Abass & Tucker, 2018; Ebrahim, 2015; Thompson, 2013). MPEs aim to meet residents' social and behavioural needs via providing the environments to support them, such as walkability, mixed density, mixed land use to build a people-friendly urban community from a new urbanism perspective (Thompson, 2013). Several studies in Australia have examined residents' living experience, social interaction or sense of community in MPEs (Francis et al., 2014; Maller et al., 2016; Rosenblatt et al., 2009). For example, Walters and Rosenblatt (2008) found that residents have a desire to establish social relationships within the MPE community in a case study of an MPE in Brisbane, Australia. They asserted that the sense of community plays an important role to create a subjective sense of security for residents (Walters & Rosenblatt, 2008). However, the process to develop a sense of community in MPEs is quite complex and unclear to date. We still know very little about residents' lifestyles, social activities, and human–environment interactions in MPEs in the Australian context (Dowling et al., 2010; Maller et al., 2016).

Housing Market

Market logics are the dominant driving forces for MPE development. Therefore, quite a few studies have investigated MPEs from a housing market perspective. Previous studies show that developers often use the discourse of community as a marketing tool to add value to estates and to attract residents in housing market (Alidoust & Bosman, 2017; Kenna et al., 2017; Rosenblatt et al., 2009).

There are several key points to investigate MPEs from a housing market perspective in the literature. First, MPEs are promoted as offering an increased sense of community, greater security and a resort lifestyle (Alidoust & Bosman, 2017; Rosenblatt et al., 2009). Second, MPEs are regarded as a form of social distinction which particularly appeal to the middle or

upper middle classes or young couples who look to increase their social status, by creating places of exclusivity (Thompson, 2013). Third, literature suggests that it is critical to examine MPEs from a submarket perspective (Bangura & Lee, 2022). McGuirk and Dowling (2007) claimed that MPEs have socio-spatial outcomes derived from different submarket dimensions, including 'locational context, scale and uniformity of housing stock and overall land use mix, and diversity of tenure' (p. 33). As social and economic features in different regions are segmented in Sydney, scholars pointed out MPE research needs to distinguish different submarket contexts (Bangura & Lee, 2022; McGuirk & Dowling, 2007).

Governance Mechanisms

There has been another increasing academic interest in governance of MPEs (Cheshire, 2019; McGuirk & Dowling, 2007; Thompson, 2013). This dimension usually focuses on two dimensions: 1) 'public regulation under which MPEs are produced', and 2) 'community governance mechanisms within the MPE', such community title (McGuirk & Dowling, 2007, p. 31). For example, Kenna at al. (2017) discussed private residential governance mechanisms and community title legislation within the MPE based on an investigation of private residential estates in Sydney, Australia. Cheshire (2019) pointed out that 'previous research on the governance of MPEs has examined the formal and informal arrangements through which certain features of MPEs are governed, such as the use of shared space, the management of communal property, appropriate building design and the conduct of residents or pets' (p. 93).

Scholars have also discussed the impact of governance and privatism on MPEs' social and spatial segregation issues (Goodman & Douglas, 2008; Kenna et al., 2017). Scholars found that the provision of privatisation of facilities 'has a number of implications relating to exclusivity, separation from the wider community' (Goodman & Douglas, 2008, p. 521). Their view is also reported by some other scholars (Francis et al., 2014; Kenna et al., 2017). Kenna (2017) pointed out that the social and spatial segregation issue could be exacerbated by private residential governance of the residential estates.

2.4.3 Social Interaction and Place Attachment in MPEs

MPEs aim to create social interaction, place attachment and sense of community for residents through the design of the physical built environment such as well-planned parks and facilities (Tewari & Beynon, 2018). MPEs were found to be 'successful examples of the importance of place in encouraging social interaction and establishing social ties among neighbours' (Alidoust & Bosman, 2017, p. 45). Tewari and Beynon (2018) asserted that MPEs' 'neighbourhood character of a place is a complex mechanism' (p. 456) , which involves an understanding of the relationship between the physical built environment and the social aspects of MPEs. There are limited studies investigating human–environment interactions, including social interaction, place attachment and healthy outcomes in MPEs. For instance, Rosenblatt et al. (2009) found that residents had higher levels of place attachment and sense of community but lower social interaction in MPEs via a case study in Brisbane, Australia. Similarly, Maller et al. (2016) discussed the human–environment relationships between built form and residents' daily activities in a qualitative case study of an MPE in Melbourne, Australia. Francis et al. (2014) found several built environment characteristics of MPEs which can contribute to mental health through a focus groups study in Perth, Western Australia. However, as MPEs have rarely been explored in Australia, scholars suggested that there is a need for more empirical research into all aspects of MPEs, especially in social and health aspects (Francis et al., 2014).

Past studies have identified several physical factors can impact residents' social interaction (Francis et al., 2012; Maller et al., 2016) and place attachment (Abass & Tucker, 2018) in MPEs , such as frequency of community park use, satisfaction with quality of public space and pedestrian environment, which are further discussed in Section 2.5. However, to date, what factors might lead residents to develop social interaction and place attachment in MPEs is still unclear in the literature. We still know very little about residents' daily experiences and human–environment interactions in MPEs.

It is notable that there is a lack of studies investigating place attachment in MPEs in the Australian context. Although some previous studies have investigated characteristics of MPEs that contribute to sense of community (Francis et al., 2012), social relationships (Rosenblatt et al., 2009) and health outcomes (Francis et al., 2014), place attachment

implications of MPEs in the Australian context have rarely been explored in the literature. In particular, few studies explore how the physical built environment is experienced in residents' daily activities and place attachment in MPEs (Maller et al., 2016). In addition, there has been little research focus on the behavioural process of place attachment in MPEs. We still know very little about people's daily behaviours and social activities in MPEs.

Another notable sustainability issue of MPEs is the social and spatial segregation issue. In Australia, gated MPEs are less common than in North America or Asia (Dowling & McGuirk, 2005). Australian academics are more focused on MPEs' social and spatial segregation issues than on safety concerns (Dowling & McGuirk, 2005; Francis et al., 2014; Kenna et al., 2017). Previous studies shows that most MPEs in Australia are exclusive external and separating from their surroundings (Goodman & Douglas, 2008; Thompson, 2013). Some studies found that most neighbours' social interaction is internally within the MPE with less social interaction in surrounding areas (Alidoust & Bosman, 2017; Maller et al., 2016). For example, Thomas (2013) pointed out the MPE community as 'homogenous internally and exclusive externally, separating and distinguishing estates from their surrounding areas' (p. 89) . Scholars noted that Australian MPEs have a characteristic of exclusion by 'emphasising separation and difference from surrounding areas to generate a positive sense of exclusivity' (Francis et al., 2014, p. 190). In a qualitative study in the Gold Coast in Australia, Alidoust and Bosman (2017) revealed that 'the social networks of most residents were largely concentrated within the physical boundaries' of the MPE (p. 44). The absence of external pedestrian connectivity with surroundings meant that most individual and social activities were contained within MPEs which could limit residents' individual and social activities (Maller et al., 2016).

Regarding neighbourhood connectivity, research findings are inconsistent in Australian urban community literature. For example, Abass and Tucker (2018) found that neighbourhood walking connectivity significantly and positively impacted neighbourhood attachment in Australian cities and claimed that neighbourhood connectivity provides 'residents' physical connectivity and accessibility to local services and community facilities via walking' (p. 234). Maller et al. (2016) found that less pedestrian connectivity with surroundings and concerns of danger on outside roads of MPEs could have negative impacts on residents' social interaction and place attachment in a case study in Melbourne, Australia. By contrast, some

scholars argued that gated communities' physical boundaries have no negative effects on neighbourhood place attachment, but might instead foster a feeling of security and the ensuing social interactions within neighbourhoods (Lewicka, 2010). This gated process was also regarded as crime prevention through environmental design (Newman, 1972; Poortinga et al., 2017). There is a lack of empirical study to test the impact of built form (gated or non-gated) on place attachment in urban communities.

To conclude, in all the studies reviewed here, there are still some knowledge gaps. First, there is a significant knowledge gap in understanding the complex nature of human–environment interactions like social interaction and place attachment in MPEs. MPEs are developed to achieve community sustainability, but there is a lack of studies investigating how neighbourhood built environment impacts social interaction and place attachment in MPEs. Second, few studies have investigated place attachment in MPEs in the Australian context. Questions about what built environment factors could impact place attachment in MPEs in Australia and the characteristics of these places are unclear in literature. Third, very little previous research is on inner urban MPEs in Australia. All of these research gaps indicate an urgent need for further research.

2.5 Community Parks within MPEs

Communal space has been identified as a built environmental factor associated with residents' social interaction and place attachment in neighbourhoods (Chitrakar, 2016; Talen, 2000). Previous studies found that neighbourhood communal open spaces, such as playgrounds and parks, provide venues and a variety of opportunities for residents' social interaction (Centers & Gómez, 2019; Zhu & Fu, 2017).

Based on early Newman's (1972) defensible space theory, neighbourhood communal space can be defined as 'a public or semi-public space located within a neighbourhood for shared use by local residents'(Zhu & Fu, 2017, p. 169). Community park is defined as a gathering open space to meet the need for various individual and social activities in the neighbourhood, which 'consist of open spaces that can exist in the form of parks, athletic fields, and playgrounds.' (Dewi et al., 2017, p. 84). This thesis study treats community park as a type of

neighbourhood communal open space which serves as a platform for residents to conduct recreational and social activities in a community (Centers & Gómez, 2019; Dewi et al., 2017).

Literature shows that there are several main functional spaces in parks connected with residents' wellbeing in neighbourhoods. Zhu and Fu (2017) categorised neighbourhood communal spaces in several types, including 'streets/sidewalks, clubhouses, consumer sites (e.g., shops, cafes, restaurants), fitness amenities (e.g., basketball courts, tennis courts, swimming pools), and open space (e.g., parks, gardens, lakes, squares)' (p. 169).

The Australian planning model of 'Classification Framework for Public Open Space' claims that community parks contain three main functional spaces: recreation spaces; sport spaces; and nature spaces (Rutherford et al., 2013). In these essential spaces in parks, the community-building process occurs, community identities form and social connections are made.

Parks play the significant role for residents' individual and social activities in neighbourhoods (Centers & Gómez, 2019; Swierad & Huang, 2018). Centre and Gómez (2019) found that parks offer both individual benefits and social benefits for people. Past studies categorised behaviours in public space in three types: necessary, optional and social activities (Gehl, 2011; Kaźmierczak, 2013). However, how people use community parks in MPEs is unclear in literature, especially under the COVID-19 pandemic context (Han er al., 2022). The COVID-19 pandemic has made people realised the importance of green infrastructure on people's wellbeing, but research in this area has just begun. It is necessary to increase our knowledge on what specific neighbourhood open space features are important for residents' social activities and place attachment (Schmidt et al., 2019). The following sections discuss the existing literature on the associations between community parks and social interaction and place attachment.

2.5.1 Association between Community Parks and Social Interaction

Community parks are important communal spaces in which residents maintain their social lives in MPEs (Abass et al., 2020; Kim, 2017). However, there are significant gaps in understanding how the neighbourhood physical features affect residents' everyday activities, social interaction and wellbeing outcomes (Abass et al., 2020). What types of physical

features of community parks affect positive social interaction? What are the characteristics of these spaces? Answers to these questions are uncertain, particularly in MPEs in the context of Australia.

Talen's (2000) new urbanism translating model (see Figure 2.4) proposed that the quality of park space and the need of park use can influence residents' social interaction in neighbourhoods. Following Talen's model, several studies have examined the relationship between communal open space and social interaction in neighbourhoods (Centers & Gómez, 2019; Francis et al., 2012; Zhu & Fu, 2017). Overall, two key themes emerge in this field from previous studies: frequency of park use, and satisfaction with quality of parks (Centers & Gómez, 2019; Zhu & Fu, 2017), which are highlighted below.

(1) Frequency of Community Park Use

Several studies have recognised that frequency of community park use is associated with social interaction. But previous research findings on the impact of frequency of park use on social interaction have been inconsistent (Gómez et al., 2015; Zhu & Fu, 2017).

On the one hand, Zhu and Fu (2017) found that frequency of park use attribute has a significant and positive impact on community social capital and neighbourhood attachment. Kaźmierczak (2013) also found that regular and longer visits to local parks may help to develop social ties in neighbourhoods. By contrast, some other studies found the frequency of public space use has less or no impact on sense of community or social interaction (Centers & Gómez, 2019; Francis et al., 2012; Gómez et al., 2015). For example, Francis et al. (2012)identified that frequency of public space use has less impact on sense of community in a survey study in Perth, Australia. Centers and Gómez (2019) revealed that there was no significant correlation between frequency of park use and sense of community in a case study in Virginia, USA. In addition, recent studies show that the COVID-19 lockdowns possibly have had an impact on the frequency of park use in different cities, hence the findings on the frequency of park use are inconsistent and uncertain in literature (Pandit et al., 2021). Taken together, the association between the frequency of park use and social interaction in MPEs is inconsistent in the literature. It is unclear whether frequency of park use is a significant

predictor of social interaction in neighbourhoods. Further empirical research is suggested to explore the role of frequency of park use in fostering social interaction in the MPE context.

(2) Satisfaction with Quality of Community Parks

Previous studies have identified that satisfaction with quality of public space has a significant impact on social interaction and sense of community (Centers & Gómez, 2019; Francis et al., 2012). For example, Zhu and Fu (2017) found that residents who had a higher level of satisfaction with the quality of communal space had a higher level of social capital and community attachment. Overall, the satisfaction with quality of community park consists of two main dimensions in the literature: functional spaces in parks, and parks' pedestrian integration.

Functional spaces in parks

Several studies have highlighted the quality of functional spaces in communal spaces is associated with social interaction (Kaźmierczak, 2013; Schmidt et al., 2019), such as nature space (Abass et al., 2020), rest space (Schmidt et al., 2019), children's facilities, and recreational facilities (Kaźmierczak, 2013). For instance, Kaźmierczak (2013) carried out a mixed method case study in the UK and found that children's playgrounds, activity spots, natural spaces and recreational facilities positively impact residents' social interaction in neighbourhoods. Schmidt et al.'s (2019)study indicated the importance of rest space in parks to promote social interactions. They investigated the association between neighbourhood open space and social interaction in Copenhagen in a mixed method study and found that older residents tend to sit down in parks when engaging in social interactions with neighbours in neighbourhoods (Schmidt et al., 2019). Centers and Gómez (2019) stated that community parks provide residents the opportunity to engage in recreational activities within the neighbourhood.

Pedestrian environment factors of parks

Previous studies have recognised that parks' pedestrian integration environment is associated with social interaction, such as parks' pedestrian integration (Abass et al., 2020), quality of walking paths (Schmidt et al., 2019), and neighbourhood connectivity (Abass et al., 2020).

First, some studies have found that the pedestrian accessibility to parks positively impacts neighbourhood social interaction (Lund, 2002; Sugiyama et al., 2010). For example, Sugiyama et al. (2010)pointed out that community parks 'provide destinations to which people can walk and are ideal settings for leisure-time physical activity' in a survey study in Perth, Australia (p. 1752). Second, some studies found that neighbourhood pedestrian connectivity is positively correlated with social interaction in urban communities (Abass et al., 2020; Maller et al., 2016). For instance, Abass et al. (2020) found that enhanced walking connection with surrounding areas was positively associated with social interactions in the neighbourhood in a mixed method study in Australia. Similarly, Abass and Tucker (2018) found that neighbourhood walking connectivity significantly and positively impacted neighbourhood attachment in Australian cities.

On the other hand, some scholars argued that gated MPEs with physical boundaries can provide a sense of safety and foster social interaction for residents (Lewicka, 2010). This process was also regarded as crime prevention through environmental design (Newman, 1972; Poortinga et al., 2017). These viewpoints primarily apply to North America or other similar regions. By contrast, in Australia, gated MPEs are less common than in the North America or Asian regions (Dowling & McGuirk, 2005; Francis et al., 2014). Australian academics are more focused on the MPEs' social and spatial segregation issues rather than on safety concerns (Francis et al., 2014; Kenna et al., 2017). As discussed above, social and spatial segregation is a sustainability issue of MPE research in Australia (see Section 2.4.3). There is a lack of studies investigating pedestrian connectivity of MPEs. The majority of studies demonstrated Australian MPEs have a characteristic of exclusion with non-gated built forms (open or symbolically enclosed) (Goodman & Douglas, 2008; Thompson, 2013). Australian MPEs provide an opportunity to test the association between neighbourhood connectivity and social wellbeing in urban neighbourhoods.

Taken together, several community park factors have been recognised as influences on social interaction in the literature. However, the findings are inconsistent in the literature. It is still not quite clear what factors of community park quality have significant impacts on residents' social interaction in MPEs in the Australia context.

2.5.2 Association between Community Parks and Place Attachment

Public open space such as community parks is identified as important in promoting place attachment and community sustainability in neighbourhoods (Abass & Tucker, 2018; Lestari & Sumabrata, 2018).

However, how community parks contribute to place attachment, and the related behaviours in MPEs, are still unclear in literature. There is a lack of studies examining the relationships between neighbourhood parks and place attachment across different types of neighbourhood context (Kimpton et al., 2014). In particular, few empirical studies have investigated place attachment focusing on MPEs in the Australian context (Francis et al., 2014; Maller et al., 2016).

Previous studies have found parks and open space can directly or indirectly influence place attachment to neighbourhoods (Abass & Tucker, 2018; Lestari & Sumabrata, 2018). Neighbourhood public open space provision may promote neighbourhood attachment by affecting 'people's thoughts, feelings, and beliefs about a local neighbourhood through daily contacts and experience with (semi) public spaces, cultivating people–place emotional bonding' (Zhu & Fu, 2017, p. 166).

In the Australian context, some studies recognised that community parks are the most frequently used communal spaces in MPEs (Francis et al., 2014). Abass and Tucker (2018) carried out a quantitative study in three Australian suburbs and found significant associations between public space provision and neighbourhood attachment. However, little is known about residents' emotional attachment to green spaces in neighbourhood literature (Zhang et al., 2015).

Past studies have identified several factors of community park use can influence place attachment in neighbourhoods (Centers & Gómez, 2019; Zhu & Fu, 2017). Some studies investigated the relationship between park use and place attachment by measuring frequency of park use and residents' satisfaction with parks' environment (Centers & Gómez, 2019; Francis et al., 2012). Zhu and Fu (2017) found that the frequency of communal space use and appraisal of six aspects of communal space positively impacted residents' neighbourhood attachment and community participation. Centers and Gómez (2019) investigated the

relationship between neighbourhood park and psychological sense of community, and found that frequency of communal space use and perceptions of the park can impact residents' sense of community. However, the relationships between residents' emotional attachment to green spaces is still unclear in the neighbourhood literature (Zhang et al., 2015). Taken together, two important themes emerge from the previous studies so far: frequency of park use, and satisfaction with quality of parks (Francis et al., 2012; Zhu & Fu, 2017), which are highlighted below.

(1) Frequency of Community Park Use

Some scholars found that frequency of communal open space use attribute has a significant impact on neighbourhood place attachment, particularly in some dense cities (Zhu & Fu, 2017). By contrast, some other studies found that the frequency of public space use has less impact on sense of community, a concept including place attachment (Centers & Gómez, 2019; Francis et al., 2012; Gómez et al., 2015). For example, Gómez et al. (2015) found that there is no significant direct relationship between frequency of park use and overall sense of community. Centers and Gómez's (2019) study also shows that frequency of park use is not a significant predictor of sense of community, including place attachment. The findings on the frequency of park use are inconsistent in literature.

(2) Satisfaction with Quality of Community Parks

Literature shows that satisfaction with quality of public spaces is important to place attachment (Karacor & Parlar, 2017). For example, Casakin et al. (2021) found that residents' perceptions of neighbourhood quality are associated with the processes to build a sense of place attachment to the neighbourhood. Similarly, Karacor and Parlar (2017) revealed that quality of neighbourhood open space was an important predictor of neighbourhood place attachment. Zhu and Fu (2017) demonstrated that residents' appraisal of communal space quality has a significant impact on neighbourhood place attachment. Zhu and Fu (2017) also found that residents who were more satisfied with the quality of communal space had a higher level of social capital and place attachment to their neighbourhood.

Functional spaces in parks

Previous studies reveal that some objective physical features can affect residents' sense of community or place attachment, such as parks' size, accessibility and pedestrian environment (Centers & Gómez, 2019; Kim & Kaplan, 2004). Specifically, green open space, such as parks, as the most important physical feature may play an important role in promoting residents' place attachment (Abass & Tucker, 2018; Kimpton et al., 2014). However, the studies in this research scope are limited, hence it is still not quite clear what physical factors of parks have significant influence on residents' place attachment, particularly in the Australian MPE context.

Taken together, the existing studies have identified several physical factors of community parks influencing place attachment in neighbourhoods so far, including children's playgrounds, nature spaces, recreation spaces, rest spaces, sport spaces, pedestrian accessibility to parks, and pedestrian connectivity with surroundings, which are discussed below.

First, previous studies found that children's play spaces provide some opportunities for socialising which may help develop neighbourhood cohesion between adults (Warner & Andrews, 2019; Wood et al., 2013). For example, Wood et al. (2013) found that walking with children precipitated more pedestrian movement and casual social interaction in the neighbourhood.

Second, past studies found that there is a significant link between parks' natural space and place attachment (Brown et al., 2012; Kimpton et al., 2014; Zhang et al., 2015). Literature shows that nature provides ecological services for residents in cities, hence parks and green spaces are important for physical activity and improved mental health in urban communities (Grahn & Stigsdotter, 2010; Kimpton et al., 2014). Kimpton et al. (2014) pointed out that green space is the greatest impact environmental factor on residents' place attachment. Similarly, Brown et al. (2012) found that connecting with nature can help to facilitate bonds with places (Brown et al., 2012). Zhang et al. (2015) confirmed that more green spaces facilitated greater attachment in the neighbourhood through a resident survey study. Much of the previous research evidence suggested that natural elements provide opportunities and benefits for mental restoration and recreation (Grahn & Stigsdotter, 2010; Poortinga et al.,

2017).

Third, past studies showed that recreation space plays an important role in promoting residents' wellbeing and place attachment (Madgin et al., 2016; Wood et al., 2017). For example, Madgin et al. (2016) found a positive relationship between recreational spaces associated with place attachment based on qualitative evidence. Wood et al. (2017) presented that recreation space provides a place for 'informal play and physical activity, relaxation and social interaction' (p. 67), which may enhance residents' physical and mental health through relaxation activity. Lestari and Sumabrata (2018) pointed out that recreational facilities is an influencing physical factor on place attachment in neighbourhoods. Madgin et al. (2016) found that neighbourhood recreational facilities can provide opportunities for social contacts and in turn promote community involvement.

Fourth, past studies found that rest spaces in parks may help to enhance place attachment by fulfilling residents' needs, strengthening social ties, and generating memories from them. Schmidt et al. (2019) pointed out that residents 'tend to sit down when engaging in social activities' (p. 1), especially elderly residents. However, studies examining the impact of specific factors (e.g., rest space) on place attachment are quite limited in literature.

Last, some studies indicated that the quantity and quality of sporting facilities can influence place attachment in neighbourhoods. Madgin et al. (2016) revealed that 'sporting spaces provide an opportunity to examine the ways in which physical aspects of spaces can affect the ways in which people's attachments to place develop' (p. 679).

Pedestrian environment factors of parks

Previous studies revealed that two pedestrian environment factors of parks can affect residents' place attachment in neighbourhoods: pedestrian accessibility to parks and pedestrian connectivity with surroundings.

First, past studies found that pedestrian accessibility to parks had a significant association with place attachment (Abass & Tucker, 2018; Centers & Gómez, 2019; Gómez et al., 2015). Abass and Tucker (2018) found that connectivity by walking in open spaces has the strongest correlations with neighbourhood attachment. Gómez et al. (2015) and Centers and Gómez (2019) found that walking distance to the park significantly impacted overall psychological

sense of community and wellbeing. Smith (Smith, 2009) (2009) found that access to services and amenities might impact place attachment,. Kimpton et al.'s (2014) study indicates that closer to the park, residents may obtain more interactions. Similarly, Alidoust and Bosman (2017) suggested that accessibility of parks was important for promoting elderly residents' social health and wellbeing in MPEs.

Second, literature indicates the importance of pedestrian connectivity with surroundings for facilitating place attachment in neighbourhoods, particularly in MPEs. The previous studies identified neighbourhood connectivity may directly or indirectly influence residents' place attachment to the neighbourhood (Abass & Tucker, 2018; Poortinga et al., 2017). New urbanism also claims that pedestrian connectivity with surroundings may benefit a neighbourhood sense of community (Congress for the new urbanism, 2000). However, the relationship between gating and place attachment is still unclear, as empirical studies have not tested this specific new urbanism claim about neighbourhood connectivity. In Australia, Alidoust and Bosman (2017) found that a low level of access to surrounding public open places outside MPEs may 'lead to degrees of segregation in the physical and social landscapes from the places/people outside the residential development'(p. 44). Yet some scholars argued that gating may not affect, or may reduce neighbourhood place attachment, but might instead foster a feeling of security (Lewicka, 2010). Abass and Tucker (2018) found that neighbourhood walking connectivity significantly and positively impacted neighbourhood attachment in Australian cities and claimed that neighbourhood connectivity provides residents' physical connectivity and accessibility to local services and community facilities via walking (p. 234).

Together, there are several important factors of community park use identified in the literature that can influence place attachment. However, most previous studies remain narrow in focusing only on specific neighbourhood contexts. Few studies have investigated place attachment focusing on MPEs in the Australian context. Some findings are inconsistent in the literature. It is not clear what factors of quality of community parks have more significant impacts on residents' place attachment in MPEs in the Australian context.

Additionally, it is notable that the need to understand human-environment relationships in urban communities has been magnified due to the impact of the COVID-19 pandemic

(Marcelo et al., 2022; Yang et al., 2023). Some studies focused on the impacts of the COVID-19 pandemic on cities and well-being, and suggested strategies for urban planning (Mouratidis & Yiannakou, 2022; Sharifi & Khavarian-Garmsir, 2020). Specifically, since the outbreak of COVID-19, some studies have increasingly emphasized the importance of public open spaces for people's well-being and health in cities (Han et al., 2022; Larson et al., 2021; Marcelo et al., 2022). Urban parks have been recognised as a special source of community resilience across different countries during the COVID-19 period (Larson et al., 2021; Yang et al,. 2023). Some studies compared the differences between data collected before and after the COVID-19 outbreak (Mouratidis & Yiannakou, 2022). For example, Han et al. (2022) discussed the changes of behaviours of park use due to the impact of COVID-19 pandemic. They pointed out that outdoor individual and social activities have become more important than before due to the impact of the COVID-19 (Han et al., 2022). However, research investigating outdoor behaviours of park use during the pandemic is limited and has yielded inconsistent results. Larson et al.'s (2021) research shows that 'urban park use declined during the pandemic residents' (p.1) in a mixed study across North Carolina, USA, but Marcelo et al. (2022) found that the demand for public open space has strongly increased during the COVID -19 pandemic in a recent study in Switzerland. Han et al. (2022) also found that 'the need for outdoor physical activity and social activity has greatly increased' in COVID-19 pandemic (p. 14) via a systematic literature review. In sum, research in this area has only recently begun. 'Few studies have explored the impacts of COVID-19 on park use across diverse neighbourhoods' (Larson et al., 2021, p. 1). Few studies have identified specific individual and social activities of park use, social interaction and place attachment in MPEs in Australia under the COVID-19 pandemic context (Yang et. al., 2023).

2.6 Summary

To conclude, this chapter has summarised the existing theories, studies in literature and identified knowledge gaps in the research scope of this study. Several knowledge gaps have been recognised in this research scope.

First, there is a lack of understanding of human–environment interactions urban communities, particularly in MPEs in Australia. What factors might facilitate residents' social interaction and place attachment in MPEs are still unclear in the literature. We know very little about

residents' life experiences and human–environment interactions in MPEs and urban communities in contemporary cities.

Second, there is still a lack of progress in theory on neighbourhood social interaction and place attachment research. The concept of place attachment is diverse, hence there is an important challenge for place attachment research to integrate different definitions and viewpoints across different neighbourhood contexts. Very few studies have investigated the relationship between community parks and place attachment in the Australian MPE context. We know very little about how attachment develops and how the built environment influences social activities and place attachment in neighbourhood contexts. To fill these gaps, this study incorporates social network system theory and place attachment theory into new urbanism theory to test neighbourhood social interaction and place attachment in the Australian MPE context. This study also contributes to literature by testing Berkman's (2010) social network system model and Scannell and Gifford's (2010) People–Place–Process place attachment model in the Australian MPE context.

Third, there is little empirical progress in neighbourhood social interaction and place attachment across different residential contexts in literature. Social interactions and place attachment have not been explored in sufficient depth in the Australian MPE context. Most existing research on neighbourhood social interaction and place attachment is based on gated communities in North America or Asia. There is limited related research focusing on non-gated communities in other areas. Australian MPEs are good examples of open urban communities which provide an opportunity to test neighbourhood connectivity impacts on neighbourhood social interaction and place attachment. The findings contribute to filling these gaps by providing evidence and new insights to research on place attachment in non-gated urban communities.

Fourth, new urbanism presents claims of public space planning to achieve social and sustainability goals, but few studies have tested new urbanism claims regarding neighbourhood social interaction and place attachment across different neighbourhood contexts. This study contributes to filling these gaps by testing new urban claims of public space planning and testing Talen's (2000) new urbanism theoretical model in an Australian MPE context.

Fifth, there is a lack of comparative and empirical studies of MPEs in Australia. In particular, most previous studies focused on outer suburban greenfield MPEs in Australia. Very little previous research explored MPEs in inner urban areas of big cities in Australia.

Finally, the COVID-19 pandemic has made people realised the importance of green infrastructure on people's wellbeing, but research in this area has just begun. How people use community parks, how behaviours of park use changes in urban communities during COVID-19 is unclear. Few studies and limited evidence exploring how community parks influence people's social interaction and place attachment in urban communities during the COVID-19 pandemic in the literature.

Taken together, all of these research gaps indicate an urgent need for further research in this area. The following chapter presents the research methodology and data for the thesis study.

Chapter 3   Research Methodology and Data

This chapter describes the research design, case selection, research variables and instruments, data collection, and data analysis methods. This study investigates the relationship between community park use, social interaction and place attachment in MPEs in Sydney. This study uses the case study mixed methods design to achieve the research aim. The methods of data collection include a resident survey and semi-structured interviews with residents of the two selected cases.

3.1 Case Study Mixed Methods Design

This study uses a case study-mixed methods (CS-MM) design for an in-depth understanding of the research issues. Case study is defined as 'a strategy of inquiry in that the researcher explores in depth a program, event, activity, process, or one or more individuals' (Creswell, 2009, p. 13). Case studies are often used to collect a combination of both qualitative and quantitative data, aiming to achieve a comprehensive understanding of the particular case (Guetterman & Fetters, 2018).

CS-MM design provides logical and clear methodological procedures to conduct complex social research. There are several key specific reasons to choose the CS-MM design for this study. First, CS-MM methodology allows addressing all research questions. Various data collection methods can yield different results to address all research questions comprehensively and efficiently. Neither the single quantitative nor qualitative method could adequately address all the 'which', 'what', and 'how' research questions comprehensively. In this study, the quantitative study aims to address the 'which' research questions, while the qualitative study focuses on addressing the 'what' and 'how' research questions.

Second, CS-MM methodology helps to understand the complex behavioural and psychological issues in social research. It is difficult to understand the behavioural or emotional significance of people's feelings with survey data alone. Survey questionnaires are very structured and do not generate enough detailed qualitative data (McGuirk & O'Neill,

2016). The qualitative method helps to obtain deeper narrative information and to minimise the limitations of quantitative data. Interview participants were given time to think about their answers before deeper discussions.

Third, a mixed methods approach can improve a comprehensive understanding of behavioural and psycho-environmental processes of social interaction and place attachment in MPEs (Hernández et al., 2020). Combining mixed data provides a chain of evidence for a detailed description to evaluate more precisely the manifestations of the social interaction and place attachment (Hernández et al., 2020; Yin, 2009). Mixed methods combine the strengths of both quantitative and qualitative approaches which help the researcher to gain a more deeper understanding of research issues and hear the voices of residents in two selected MPEs.

Finally, the CS-MM methodology strengthens the reliability and validity of the research findings. The mixed methods approach is often used to check whether different methods lead to the same results, thereby enhancing the reliability and validity of the research findings. By combining multiple methods and empirical materials, the study can overcome the weaknesses or biases that come from a single method. Therefore, a mixed methods design was used in this study to collect further qualitative data for integration with quantitative findings.

In sum, CS-MM methodology was used in this study to provide in-depth views of the research issues. Following previous studies, a methodological framework (see Figure 3.1) was developed to provide a logical and clear integrated procedure to guide this study (Creswell & Creswell, 2018; Guetterman & Fetters, 2018). In the case study framework, the mixed methods approach in this study used a two-phase sequential explanatory design: Quantitative → qualitative (Creswell & Creswell, 2018). In Phase I, the quantitative data was collected by a resident survey and analysed to identify which community park use factors are significantly associated with social interaction and place attachment. In Phase II, the qualitative data were collected by semi-structured interviews to explain how certain factors identified in the quantitative study influence social interaction and place attachment. This study's primary emphasis was on the quantitative component, then the qualitative data helped explain the initial quantitative results.

Case Study-Mixed Methods Design (CS-MM)

Case Study

Mixed Methods

Explanatory Design

Quantitative Component

Quantitative Data Collection

Quantitative Data Analysis

Quantitative Data Results

A Resident Survey

Quantitative Results are further clarified and explained by qualitative data and results.

Qualitative Component

Qualitative Data Collection

Qualitative Data Analysis

Qualitative Data Results

Semi-structured Interviews

Interpretation

Figure 3.1 Methodological framework for this study

Adapted from Creswell and Creswell (2018); Guetterman and Fetters (2018)

3.2 Case Selection

Overall, to address all the research questions discussed above, this study chose two cases with significant similarities but different built forms: one case is an open MPE with good pedestrian connectivity with surrounding areas; and the second case is a symbolically enclosed or gated MPE.

3.2.1 Case Selection Criteria

There are some neighbourhood features which have been determined to be important to influence residents' social interaction and place attachment, such as neighbourhood location, built age, built form, neighbourhood size, density and residents' socio-economic status (Francis et al., 2012). These influences were aimed to be controlled to the extent possible by case selection. Specifically, cases were selected based on the criteria such as same locations, similar built age, large scale, new urbanism features and different built forms to control those influences and to address the research objectives, which are discussed below.

Same location. This study chose MPEs located in the same area to make sure the cases have a similar status on the Socioeconomic Indexes for Areas (SEIFA)[4] (Francis et al., 2012). Therefore, the study's participants could have a similar socio-economic status which might be a factor affecting social interaction and place attachment.

Similar built age. This study selected MPEs with approximately the same built age which was a base for an estimation of length of residency. The researcher considered MPEs that were built at a similar time and constructed over 10 years ago so that social networks and place attachment would have had enough time to develop in neighbourhoods.

Same scale. This study chose large scale MPEs with more than 500 properties. According to Kenna et al. (2017), the planned residential estates in Australia can be categorised into three scales: small scale with less than 50 properties; medium scale with 50–500 properties; and large scale with more than 500 properties. Large scale MPEs have more complex human–environment relationships, hence choosing large scale MPEs helps gain a deeper understanding of the complexity of the MPE phenomenon.

New urbanism features. Cases were selected with, to a certain extent, new urbanism features such as 'compact, walkable and pedestrian oriented, mix of housing types, clearly defined centre and edge, attractive public open space, attention to the public realm, quality design

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[4] Socio-Economic Indexes for Areas (SEIFA) is developed by the Australian Bureau of Statistics that 'ranks areas in Australia according to relative socio-economic advantage and disadvantage', based on information from the five-yearly Census. ABS: https://www.abs.gov.au/websitedbs/censushome.nsf/home/seifa

features, and transportation options' (Grant & Bohdanow, 2008, p. 111). This helps understand social interaction and place attachment in MPEs from a new urbanism perspective.

Different built forms. MPEs can be categorised in three types in the Sydney context based on their enclosure built form: open, symbolically enclosed, and gated (Dowling et al., 2010) (see Section 2.4.1). This study chose one open MPE and one symbolically enclosed (or gated) MPE for comparison. Case 1 was selected as a representative example of open MPEs that feature integrated parks and good pedestrian connectivity with the surrounding areas. Case 2 was selected as a symbolically enclosed MPE with relatively limited pedestrian connectivity with surroundings.

3.2.2 Two Selected Cases

Literature shows there are a very limited number of large-scale MPEs (more than 500 properties) in inner urban areas of Sydney. After reviewing literature, websites and government documents, and contacting local experts, two cases in the inner west area of Sydney were chosen: Case 1 Breakfast Point (BP) was selected as an open MPE; and Case 2 Liberty Grove (LG) was selected as a symbolically gated MPE (see Figure 3.2).
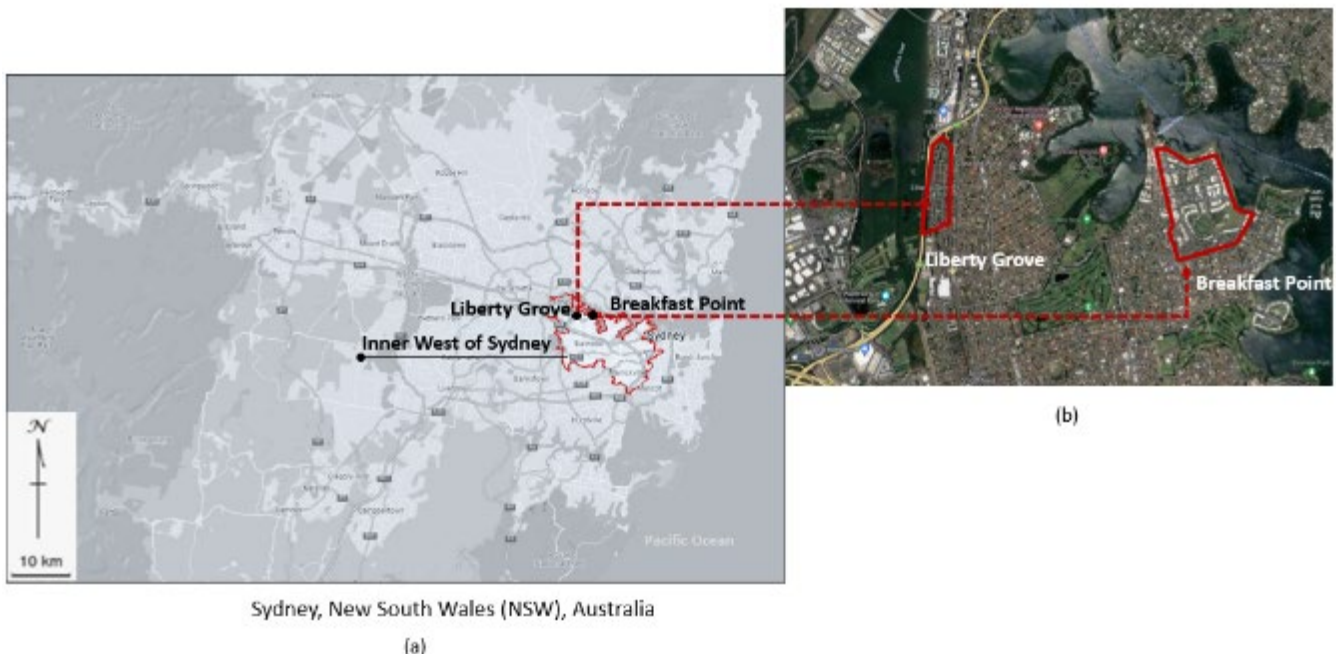
Figure 3.2   Map of study area: (a) locations of two selected MPEs in Sydney; (b) BP and LG areas
Source: Google Maps

According to the case selection criteria discussed above, the two cases have some similarities. Firstly, both MPEs are located in the same local government area of Canada Bay, in the inner west area of Sydney. Secondly, both cases have a similar score on Socioeconomic Indexes for Areas (SEIFA) (Francis et al., 2012) according to the Australian Bureau of Statistics (2016). Thirdly, both cases were completed around 2000. Fourthly, both cases are large scale MPEs with more than 500 properties (Kenna et al., 2017): BP has 99 houses (5.7%), 77 townhouses (4.4%) and 1561 apartments (89.3%); and LG has 56 houses (7.8%), 214 townhouses (29.7%) and 450 apartments (62.5%) (Australian Bureau of Statistics, 2016). Fifthly, both cases have new urbanism features, having integrated parks with high quality natural, recreational and sporting amenities (Dowling & McGuirk, 2005). Finally, on the other hand, the two cases have different built forms. The first case (BP) is an open MPE. The second case (LG) is a symbolically gated MPE with physical wall boundaries and exclusive gates (Dowling & McGuirk, 2005). The key features of two cases are discussed below.

Case 1: Breakfast Point (BP)

BP is an open MPE and documented as a new urbanism MPE by the Australian Council for New Urbanism (2006). Australian Council for New Urbanism (2006) states that BP has achieved new urbanist physical design features such as a well-defined centre and edges, mixed use land use and housing types, a compact density, being pedestrian-dominated, and having integrated parks that are connected to the surrounding areas of the MPE (Ebrahim, 2015). BP is a rare exemplar and the best representative of open new urbanism MPE in the inner urban area of Sydney.

Case 2: Liberty Grove (LG)

LG is a rare example of a symbolically gated MPE in the inner urban area of Sydney and is the preferred case matching the criteria to address the research questions of this study. Dowling and McGuirk (2005) pointed out that security is not a significant concern for Sydney communities, hence 'Sydney has relatively few fully gated communities' (p. 8). This is distinct from Blakely and Snyder's (1997) US-derived gated community concept. LG can be regarded as 'Sydney's largest gated community but, significantly, distinguishes itself as much by its elaborate array of high quality leisure and recreational amenities as it does by its gating' (Dowling & McGuirk, 2005, p. 8). Despite being originally developed as a gated community

since 1999, LG did not become a fully gated community. It has been changed to be open and publicly accessible now, but it still shows some physical features of a gated community with a high sense of enclosure and privacy, such as physical wall boundaries, exclusive gates and lack of walkable connections with surrounding areas. Therefore, LG can be regarded as a symbolically gated MPE. LG also shows some new urbanism characteristics, such as having a well-defined clear centre and edges, a compact density and mixed housing types.

Figure 3.3 Scenes from Breakfast Point
Source: Photographs taken by the author, 2020

Figure 3.4 Scenes from Liberty Grove
Source: Photographs taken by the author, 2020

To sum up, LG is a good choice as a comparable case with BP to explore the research issues. The two cases have similarities and differences. The key community features of the two cases are summarised in Table 3.1.

Table 3.1 Comparison and summary of community features of two cases

Dimensions		Case 1 – Breakfast point	Case 2 – Liberty Grove
Built complete year		The year 2000	The year 1999
Developer		Rose Corp	ANKA Property Group
Location		City of Canada Bay, Inner west of Sydney	City of Canada Bay, Inner west of Sydney
Scale		Large scale MPE 2100 households	Large scale MPE 801 households
Mixed house type		Houses Townhouses Apartments	Houses Townhouses Apartments
Mixed land use		Residential services Meeting hall Childcare centre The Village Centre Supermarket, shops	Residential services
Density		High density compact neighbourhood	High density compact neighbourhood
Public space	Integrated network of parks	Integrated network of parks	Integrated network of parks
	Connecting with surrounding areas	- Open MPE - Good pedestrian connectivity with surrounding neighbourhoods and parks	- Symbolically gated MPE - Relatively enclosed

Source: Breakfast Point and Liberty Grove websites; Census data (Australian Bureau of Statistics, 2016).

After case selection, two phases of fieldwork were conducted to collect data. In Phase I, a resident survey was conducted to collect data from residents of the two selected MPEs. Then in Phase II, semi-structured interviews were conducted to gather qualitative data from residents of the two selected MPEs. The following sections discuss the methods and data collection for the quantitative and qualitative studies.

3.3 Quantitative Study

The Phase I quantitative study investigated the relationship between residents' community park use (community park use), social interaction and place attachment in MPEs. The method of quantitative data collection was a neighbourhood-based resident survey via self-administered questionnaires. Figure 3.5 outlines the methodology design and data flow for Phase I quantitative study. The research variables and measure instruments are discussed below.
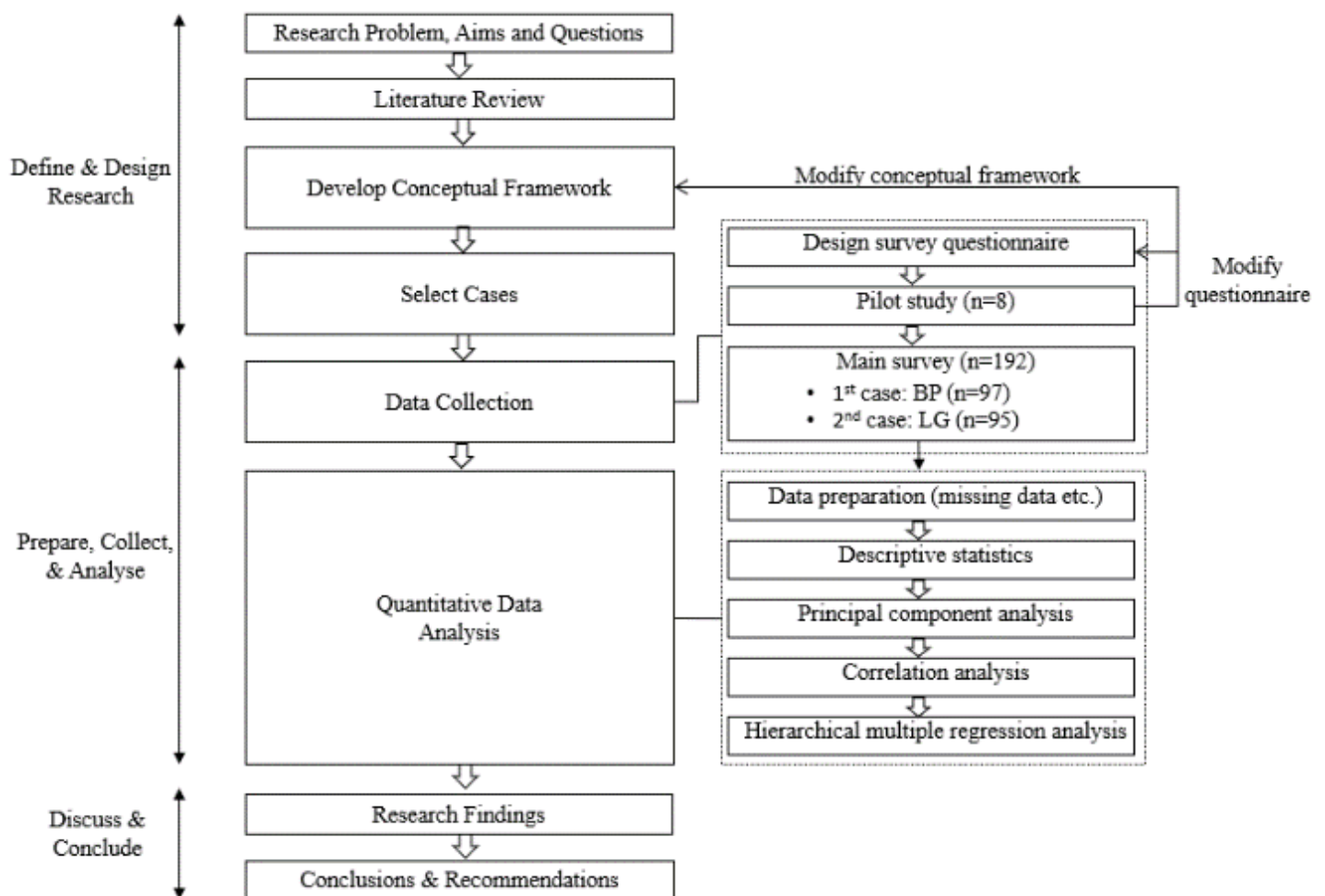
Figure 3.5   Methodology design and data flow chart for Phase I quantitative study

3.3.1 Variables and Measure Instruments

(1) Dependent Variables

The dependent variables of this study are residents' social interaction and place attachment. A five-level Likert-type social interaction scale was used to assess the quantity and quality of neighbourhood social interaction in MPEs (Abass et al., 2020; Rosenblatt et al., 2009). The quantity of social interaction was investigated by measuring how often the residents interact with neighbours via general social interaction (with weak ties) and deeper social interaction (with strong ties) (Abass et al., 2020; Rosenblatt et al., 2009). Specifically, the quantity of social interaction was evaluated using questions like 'how often do you have general interactions with your neighbours (e.g., short duration outdoor talks, greetings) in BP/LG?' (1=never, 2=less than once a month, 3=2–3 times a month, 4=1–6 times a week, 5=daily). The quality of social interaction was investigated by measuring the number of people in participants' social network with strong ties and weak ties, through questions like 'how many close neighbour friends (meaning people that you feel at ease with, can talk to about private matters, and can call on for help in the neighbourhood) do you have in BP/LG?' (1=0, 2=1–2, 3=3–5, 4=6–10, 5=≥11) (Abass et al., 2020; Kim & Larsen, 2017).

The dependent variable place attachment was measured using a five-point Likert place attachment scale mainly based on Williams and Vaske's (2003) Place Attachment Instrument (PAI). Williams and Vaske's PAI is often used to measure place attachment and shows good internal consistency and validity in previous studies (Dlamini & Tesfamichael, 2021; Hernández et al., 2020). Considering Williams and Vaske's (2003) place attachment scale only measures place dependence (behavioural dimension) and place identity (cognitive dimension), this study also used a question from Brown et al.'s (2012) place attachment scale to measure place affect (affective dimension). Overall, a total of 10 items were selected to measure place attachment: four questions to measure the cognitive dimension of place attachment (e.g., 'I feel BP/LG is a part of me'); four questions to measure the behavioural dimension (e.g., 'BP/LG is the best neighbourhood for me to live in'); and one question to measure the affective dimension of place attachment (e.g., 'I pride myself of living in BP/LG').

(2) Independent Variables

The independent variables of this study are community park use factors. Based on the theories and literature, two main underlying independent variables have been identified to measure the community park use: frequency of community park use, and satisfaction with the quality of community parks. This study used a community park use scale consisting of one item on frequency of community park use and eight items on satisfaction with quality of community parks. The items of satisfaction with the quality of community parks were investigated by measuring residents' subjective evaluation of their satisfaction with eight physical attributes of community parks from two dimensions: quality of community park space (six items) and parks' pedestrian integration (two items). The items in the community park use scale are outlined below.

Frequency of Community Park Use

Frequency of community park use was measured by asking participants how often they use community parks in BP or LG. The item was 'how often do you use the community parks in BP/LG?' (Centers & Gómez, 2019; Francis et al., 2012). This study categorizes park users by dividing them into two groups: frequent park users and infrequent park users. Frequent park users are defined as residents who use community parks at least once a week, and infrequent park users are defined as residents who use community parks less than once a week (Francis et al., 2012).

Satisfaction with Quality of Community Park Space

The satisfaction with quality of community park space items measured six aspects of quality of parks: recreation space, children's playground, rest space, shade facilities, sports space and nature space (Francis et al., 2012; Fu, 2018; Zhu & Fu, 2017). The six aspects of quality of community park space were selected based on the Australian planning model 'Classification Framework for Public Open Space' (Rutherford et al., 2013) and previous studies (Zhu & Fu, 2017).

Satisfaction with Parks' Pedestrian Integration

The satisfaction with parks' pedestrian integration items incorporate two aspects of new urbanism claims: 1) pedestrian accessibility to parks, and 2) parks' pedestrian connectivity with surroundings. The two aspects of parks' pedestrian integration were selected from new urbanism claims and previous studies (Centers & Gómez, 2019; Congress for the new urbanism, 2000).

In sum, nine items were used to determine the community park use scale: C1–Frequency of community park use, C2–Satisfaction with recreation spaces in parks, C3–Satisfaction with children's playgrounds in parks, C4–Satisfaction with rest spaces in parks, C5–Satisfaction with shade spaces in parks, C6–Satisfaction with sporting spaces in parks, C7–Satisfaction with nature spaces in parks, C8–Satisfaction with pedestrian accessibility to parks, and C9–Satisfaction with parks' pedestrian connectivity with surroundings.

(3) Control Variables

From the socio-ecological perspective, the relevant demographic, individual and social variables were selected and measured as control variables, based on past studies (Francis et al., 2012; Hooper et al., 2020). For instance, some studies found that home ownership, length of residence and age have a strong correlation with neighbourhood attachment (Abass & Tucker, 2018; Dlamini & Tesfamichael, 2021). In this study, control variables consist of three categories: demographic factors, social factors and individual factors, which are discussed as follows.

Demographic factors include certain demographic level factors with an influence on neighbourhood social interaction and place attachment in the Australian context from the literature, such as gender, age, marital status, work status, education, and homeownership (Francis et al., 2012; Hooper et al., 2020).

Social factors include neighbourhood safety (Delmelle et al., 2013; Francis et al., 2012) and group participation (Francis et al., 2012). Neighbourhood safety was measured by asking whether the participants felt safe living in BP or LG. Group participation was measured by asking how often the participant participated in neighbourhood groups and activities (e.g.,

service, cultural, sport or recreation groups) in BP/LG over the past year as a dummy variable (1=no, 2=yes, ≥1 groups).

Individual factors include two factors reflecting the methods of social interaction: frequency of online social interaction, and preference for face-to-face social interaction. This study chose these two individual control variables because the COVID-19 pandemic has changed the nature of social interaction for residents (Calbi et al., 2021). Virtual, online social interaction has quickly increased since the COVID-19 outbreak. Previous studies show that social interaction factors (e.g., social ties and daily interactions) can influence place attachment and well-being (Lestari & Sumabrata, 2018), especially including online social interaction during COVID-19 pandemic (Tibbetts et al., 2021). To control the influence of online social interaction as a confounding variable, this study measured the residents' online social interaction as a control variable by asking participants how often they interact with neighbours on online social networking and their preference of methods for social interaction as in person or online social interaction (Prazak, 2019), as 'how often do you interact with your neighbours on online social networking sites, such as Facebook?' (shown in Appendix 7).

3.3.2 Pilot Study

Before the main survey was carried out, a pilot survey was conducted in BP and LG on 13–25 April 2021. Undertaking a pilot study is often employed in social research as an initial step to test questions and responses (Thabane et al., 2010). The aim of a pilot study of this study is to test the understanding of the participants about the appropriateness of the questions, so the researcher can identify any potential problems before the main survey. Specifically, the objectives of the pilot study were 1) to test the questionnaire to make sure it is easy to understand; 2) to test the questions' type, form and sequence; 3) to obtain participants' feedback on the questionnaire; and 4) to test the likely responses, response rate and recruitment methods.

Literature shows that a pilot study should preferably be done using subjects who are representative of the population in the main study (Hassan et al., 2006). Therefore, the pilot study was conducted with residents living in BP and LG who were representative of the

population in the main study. According to Thabane et al. (2010), a form sample size calculation is not required for a pilot study. According to Stallard (2012), the pilot study's sample size 'should be approximately 0.03 times the sample size planned to be included in the definitive study' (p. 1031). As the main survey sample size of this study was 189 as discussed in Section 3.3.3, the pilot study therefore needed at least six respondents (189*0.03).

A face-to-face pilot survey was conducted using a random walk sampling strategy which was also used in the main survey. The key issues of the pilot survey's recruitment procedure and results are discussed below.

Recruitment Procedure

Face-to-face survey method. A random walk sampling approach was used in the pilot survey. Random walk sampling is widely used for resident surveys and is recognised as 'unbiased as long as the starting point along the path of travel is determined randomly' (United Nations, 2008, p. 36). The researcher started at a random geographic point and follow a specified path of travel in the two MPEs to select the residents to do the face-to-face pilot survey.

Pilot study information and consent form. The researcher prepared a paper-based invitation letter which briefly introduced the project, an information sheet and a pilot study consent form for each participant [5] (shown in Appendix 3). The title, invitation letter, information sheet and consent form indicated that the survey was a pilot. The pilot information sheet and consent form demonstrated the background for the main study and an explanation of the rationale for assessing feasibility through piloting to participants. If the residents were willing to participate in the pilot survey, they signed the consent form then filled out the questionnaire.

Results of Pilot Study

As a result, eight residents living in BP and LG participated in the pilot survey and provided their feedback on the questionnaire. Using the random walk sampling strategy, ten people in BP and LG were invited to participate in the pilot survey and eight of them agreed to participate in the pilot survey (response rate = 80%). The participants filled in the paper-based questionnaires on the way or in the parks in BP or LG. Then they provided their feedback and

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[5] Approved by the UTS' Human Research Ethics Committee (UTS HREC REF NO. ETH20-5480).

comments on the questionnaire. Table 3.2 summarises the characteristics of the participants of the pilot study in April 2021.

On average, most participants took about 10–15 minutes to complete the questionnaire. Some participants (No. 3, 5, 8) liked to talk about their neighbourhood and to explain why they chose the answers (see Table 3.2). As a result, those participants (No. 3, 5, 8) took 20–25 minutes in total to fill out the questionnaire with talking and explanations. Some participants (No. 1, 2, 5, 8) showed interest in this research and were willing to participate in the further interview of this research. These participants left their email addresses for further contact.

Overall, the pilot study demonstrated that the survey questionnaire is feasible with only some minor modifications to the wording of some questions. The survey questionnaire and method were acceptable for resident participants. It was not difficult for the researcher to ask for participants' opinions about the questionnaire. The key results of pilot survey are outlined as follows: 1) First, the pilot survey was very successful in testing the questionnaire. The pilot study showed that the questionnaire was well designed, and the questions flowed comfortably for the participants to answer. Participants' suggestions were helpful in refining and improving the questions. 2) Second, the pilot study had a high response rate (80%). After the pilot study, the researcher felt confident that most invited residents would be willing to participate in the survey. 3) Third, the pilot study provided a better understanding of how to implement the main survey by using the same sampling and recruitment strategies. 4) Lastly, based on pilot study participant feedback, a few minor modifications were made into the wording of some questions.

Table 3.2 Summary of characteristics of participants in pilot survey

MPE	Participant Case No.	Gender	Age	Interested in participating in an interview
Breakfast Point	1	Male	30+	Yes
	2	Female	40+	Yes
	3	Female	50+	No
	4	Male	20+	No
Liberty Grove	5	Female	20+	Yes
	6	Female	20+	No
	7	Male	40+	No
	8	Male	50+	Yes

3.3.3 Survey Data Collection

The main survey was conducted to collect data from residents in BP and LG from May to December 2021. To represent the population in the two cases, representative sampling was used to collect data, which is a commonly used approach in social study (Fincham, 2008). The survey gathered data from a sample of individuals intended to represent the population of two MPEs based on the Australian Bureau of Statistics (2016). To be eligible, participants needed to be at least 20 years old, live in BP or LG, and able to understand English.

(1) Sample Size

Sample size determination is based on population size, confidence level and confidence interval (Cowles & Nelson, 2015). In this study, the total number of participants was adjusted according to the total population in BP and LG. In 2016, the population of BP was 4188 and the population of LG was 2254 (Australian Bureau of Statistics, 2016). The targeted population of this research was adult residents (20 years and older) in BP and LG. According to the age category criteria in Australian Bureau of Statistics (2016) and Domain real estate website [7], people aged under 20 years were categorised in one group which was excluded from the population size calculation. There were 713 people aged under 20 years in BP and 589 people aged under 20 years in LG (Australian Bureau of Statistics, 2016). Therefore, the targeted adult population of Breakfast Point was 3475 (4188 minus 713) and the total targeted adult population of Liberty Grove was 1665 (2254 minus 589) (Australian Bureau of Statistics, 2016). Taken together, the total targeted population was 5140 in the two cases. Sampling was at the 95% confidence level, with a 7% acceptable sampling error (which is commonly used in social research) (De Vaus, 2013). An online sampling size calculator provided by Creative Research Systems [8] was used to calculate the sample size for the survey (Cowles & Nelson, 2015). Providing the related information, the online sampling calculator gave the total sample size as 189 for two cases (see Table 3.3).

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[7] Domain real estate website, available at: https://www.domain.com.au/
[8] Online sample size calculator by Creative Research Systems at https://www.surveysystem.com/sscalc.htm

Table 3.3 Sample size calculation

MPE Cases	Targeted Adult Population	Confidence Level	Confidence Interval	Total Number of Participants
Breakfast Point	3475	-	-	-
Liberty Grove	1665	-	-	-
Total	5140	95%	7%	189

Data Source: Census data (Australian Bureau of Statistics, 2016).

(2) Sample Collection Methods

The survey used mixed distribution approaches to collect data in person and by online distribution methods [9]. Due to COVID-19 impacts, the ratio of in person and online responses was determined by COVID-19 restrictions, which are discussed below.

Face-to-face Distribution

This study used a face-to-face intercept (FTFI) survey method via random walk sampling to collect survey data. Face-to-face intercept survey is widely applied in public health and development studies as the method allows the researcher 'to collect in-person survey responses in a public or private area from people who are in, or passing by, the same area at the time the data collection takes place' (Buschmann, 2019, p. 858). This study used this method because it can offer many advantages for valid data collection. First, FTFI has higher response rates to survey questions than other types of survey (Buschmann, 2019). Second, potential respondents can be quickly identified via their visual characteristics, such as gender and age. Third, the participants are more likely to give honest answers in face-to-face conversation with the researcher (Gideon, 2012).

Random walk sampling. Random walk sampling was used, starting at a random geographic point and following a specified path of travel in BP and LG to select the resident participants

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[9] The survey was approved by the University of Technology Sydney's Human Research Ethics Committee (UTS HREC REF NO. ETH20-5480) (see Appendix 1).

to do the face-to-face survey. Random walk sampling is regarded as unbiased because the starting point along the path of travel is determined randomly (United Nations, 2008).

Recruitment procedure. A map of the outline of BP and LG was used to allocate a number of starting points, then one starting point was chosen at random to conduct the survey. From the starting point, the researcher selected each participant along the path of travel to ascertain the presence of a target population by gender and age. Then potential participants were asked if they were willing to complete a survey in this research. Those interested in participating were asked to read the information sheet and sign the consent form. Then they filled in the questionnaire. The majority of the approached participants were likely to participate, but a few respondents in a hurry lacked the time to complete the survey on the way. For safety reasons, all surveys were completed in public areas without entering any participant's house when delivering the survey questionnaires.

The survey time periods were established on both weekdays and weekends to ensure access to a reasonable cross section of the target population. Survey questionnaires were delivered at various times and days, in an attempt to reach as many residents as possible. In this study, all FTFI surveys were conducted outdoors usually between 9 am and 5:30 pm, during the winter months of May and June in 2021. The surveys were not conducted after 5.30 pm at night. The surveys were conducted in two intervals: 9 am–1 pm or 1.30 pm–5.30 pm. The afternoon timeframe (1.30 pm–5.30 pm) was developed to try to reach residents between the time after school and around dinner time. As a result, from May to June 2021, before the extensive COVID-19 lockdown in Sydney, a total of nine valid responses (not including pilot data) were collected via FTFI surveys (response rate=75%) in BP and LG. However, due to the COVID-19 lockdown and restrictions in Sydney implemented from mid-June 2021, it was not possible to conduct face-to-face surveys from June in 2021.

Online Distribution

Alternatively, after the start of the COVID-19 lockdown in June 2021 in Sydney, the survey was distributed by an online method using the Qualtrics internet survey platform. The online survey invitation was distributed in two ways: social media groups and mailboxes. 1) For social media groups, the survey invitation letters with the survey link and QR code were posted to closed neighbourhood social media groups (e.g., Facebook, WeChat). 2) For

mailboxes, to reach as many residents as possible, the researcher delivered survey letters to residents' mailboxes in BP and LG. The residents' mailboxes were selected using the random walk sampling (United Nations, 2008). Specifically, the researcher distributed the survey letters at a random geographic point and followed a specified path in the neighbourhood to select the household addresses and to distribute the survey letter to the mailboxes. A total of 160 survey letters were delivered to residents' mailboxes. Each letter included an explanation of the purpose of the study, a link to the online survey, and a QR code to the survey.

From both distribution approaches, 183 valid responses were collected from the online survey by Qualtrics. With 9 face-to-face survey responses (not including the pilot data), a total of 192 valid responses were collected: 97 responses from BP and 95 responses from LG. The sample size was justified by Draugalis et al.'s (2008) 'criteria for survey research reports' (p. 6) to ensure that the sample well represented the population to be studied. The survey sample was roughly compared with key socio-demographic characteristics of the population of BP and LG to consolidate a sample that reflected the census population statistics of the two selected MPEs (Australian Bureau of Statistics, 2016), including gender, age and dwelling type. The sample collected in the survey closely approximates the full target population of the two MPEs.

3.3.4 Quantitative Data Analysis Methods

Before the main data analysis, the researcher first checked the accuracy of data input. The quantitative data was coded and dealt with missing data using Statistical Package for Social Sciences (SPSS) version 23, then analysed using SPSS. The quantitative data analysis methods were used as follows.

First, descriptive statistics were used to provide an overall picture of the data and to describe the demographic characteristics of the participants. Second, an analysis of variance (ANOVA) was run to compare if there were any differences between the two selected MPEs regarding residents' community park use frequency, satisfaction with quality of community park, social interaction and place attachment. Third, a principal component analysis (PCA) was performed on the scales to summarise the factors in each scale and to test the validity of the scales. In addition, Cronbach's alpha (α) was used to test the reliability of the scales. Fourth, a Pearson

correlation analysis was conducted to investigate whether there were significant relationships among the following variables: control variables (demographic, individual and social factors), independent variables (community park use), and dependent variables (social interaction and place attachment). Correlation analysis was primarily used to choose the independent variables for future regression analysis. Fifth, a hierarchical multiple regression (HMR) analysis was conducted to examine the associations of the community park use factors and social interaction and place attachment in MPEs. Two dependent variables (social interaction and place attachment) were analysed separately. Finally, another ANOVA was conducted to see if there were differences between frequent use and infrequent park use groups regarding satisfaction with quality of community park spaces, satisfaction with pedestrian integration of parks, social interaction and place attachment.

3.4 Qualitative Study

Following the Phase I quantitative study, the Phase II qualitative study was conducted in 2022 to gain a deeper understanding of residents' perceptions of community park use, social interaction and place attachment in MPEs [10]. Survey results led to interview participant selection and interview question design. Interviews findings aimed to further clarify and explain survey results. There were three main objectives for the qualitative study: 1) to further elaborate and explain the survey study findings, 2) to investigate possible new insights of people's feelings, options, attitudes, behaviours and social relationships in MPEs, which are difficult to measure by other methods, and 3) to understand residents' living experience, daily activities, social interaction and place attachment related to community parks in MPEs, particularly in the context of COVID-19 pandemic. The qualitative study used the semi-structured interview method to collect qualitative data from residents in BP and LG, as discussed as follows.

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[10] The interview study was approved by the University of Technology Sydney's Human Research Ethics Committee (UTS HREC REF NO. ETH21-6087 and amendment approval ETH21-6736) (shown in Appendix 1).

3.4.1 Semi-structured Interview Method

Interviews was used to obtain multiple perspectives on reality in this research issue. Through interviews, the residents were able to provide a unique form of feelings about their daily experiences of living in the MPEs. Interviews used a semi-structured method to seek perceptions from multiple participants. A semi-structured interview is defined as a type of interview with the 'same open-ended questions asked in same sequence, but with varied follow-up questions and probes' (Salmons, 2016, p. 21). According to Bryman (2012), semi-structured interviews primarily consist of a list of questions, but the researcher has the flexibility to modify the sequence and content based on what seems most appropriate at any point during the interview.

The main reason to use the semi-structured interview method is its flexibility. Among the common interview types, the semi-structured interview method allows for the expansion of questions based on issues raised in the respondent's reply. Therefore, semi-structured interviews are particularly useful to investigate residents' behaviours, experiences, feelings and opinions (Longhurst, 2003). The flexibility of semi-structured interviews is helpful to untangle possibly hidden factors of behaviours, attitudes, perceptions and relationships between community park use and social interaction and place attachment in MPEs. The semi-structured interviews consisted of an open discussion following a list of research issues with a prepared guide of questions (shown in Appendix 8).

3.4.2 Interview Protocol

Interview questions are developed based on the related theories, conceptual framework and research questions. Survey results also led to interview question design. This study first identified the key themes to address research questions from theoretical orientations, literature and the researcher's values. Then after key themes were identified, interview questions were designed in five sections: community park use, social interaction, place attachment, neighbourhood connectivity and resident background information. The first four sections were related to thematic areas of inquiry, and the last section gathered general information of participants. Interview questions were developed as simple, easy to understand,

and intended to focus on the interests of interviewees (Tracy, 2019). The interview question justification is discussed as follows.

Section 1: Community Park Use

The questions in this section were developed to address research question 1: 'how do residents use community parks in MPEs?'. Literature reveals that residents' needs and behaviour patterns of community park use have significant impact on residents' social life (Franciset al., 2012; Zhu & Fu, 2017). The questions were intended to understand the characteristics of residents' activities, behaviour patterns, motivations and needs of community park use.

Section 2: Social Interaction

Section 2 focused on the relationship between community park use and social interaction. The interview questions aimed to understand the characteristics of residents' social interaction with social ties related to community parks in MPEs, and also to explore the relationship between community parks' physical factors and social interaction in MPEs.

To address these aims, the questions in this section were broadly divided into two dimensions of social interaction: a social dimension and a human–environment interaction dimension. For the social dimension of social interaction, the questions were developed based on the social network system theory (Berkman et al., 2000) to evaluate the characteristics of social behaviours in community parks and to further address research question 1: 'how do residents use community parks in MPEs?' from a social activities perspective. Literature suggests that both quantity and quality of social interaction impact residents' wellbeing. The survey study measured the quantity and quality of social interaction but did not generate enough in-depth qualitative information about social interaction and social ties among residents. Therefore, the interview questions were developed to obtain qualitative information about quantity and quality of social interaction in MPEs and to go deeper to understand the subjective perceptions of residents' social interaction with social ties in MPEs.

For the human–environment interaction dimension of social interaction, the questions were designed based on new urbanism theory (Talen, 2000) to address research question 3: 'how do community park use factors affect residents' social interaction in MPEs?'. The survey found several physical factors of community parks were significantly and positively

associated with social interaction in MPEs. The interview questions in this section aimed to further explain the survey findings about how those community park features influence residents' social interaction. The questions also aimed to untangle possible new insights of people's feelings and social relationships related to community park use in MPEs, which are difficult to measure by quantitative methods.

Section 3: Place Attachment

Section 3 explored the relationship between community park use and place attachment, based on the Scannell and Gifford's (2010) PPP place attachment model. The interview questions aimed to further supplement and to explain survey findings into two sections: an emotional dimension and a human–environment interaction dimension of place attachment, which are discussed below.

First, in the emotional dimension, the questions aim to address research question 4: 'what are the psychological processes of place attachment to community parks in MPEs?'. Three key themes have been previously identified from a theoretical basis: affective, behavioural and cognitive (Manzo & Perkins, 2006; Scannell & Gifford, 2017). Interview questions in this section further investigated residents' feelings and experiences of these three themes of place attachment. The information in these themes is important to determine the meaning of the place to residents and the source of place attachment.

Second, in the human–environment interaction dimension, the questions aim to address research question 6: 'how do the community park use factors affect residents' place attachment in MPEs?'. The survey study found several community park use factors were significantly and positively associated with place attachment, but the survey results did not generate enough qualitative information about how the physical factors of community parks impact place attachment. The interview questions aimed to understand how certain community park physical factors impact on place attachment, and also to develop possible new insights on residents' emotional feelings to community parks in MPEs, which are difficult to measure by quantitative methods.

Section 4: Neighbourhood Connectivity

One claim of new urbanism is that integrated parks with good connectivity to surroundings

have positive impacts on residents' social interaction and place attachment at the neighbourhood level. There have also been ongoing concerns that MPEs may cause potential issues for socio-spatial segregation, especially concerning the lack of social and spatial connectivity with urban landscapes and neighbourhoods 'outside' the MPEs (Kenna et al., 2017). To test this new urbanism claim in the MPE context, the theme of 'surrounding connectivity' was identified and explored in the qualitative study. Based on the survey findings, the interview questions aimed to go deeper to understand the MPE community parks' socio-spatial connectivity with surrounding areas and to explore the characteristics of residents' activities, behavioural needs, social interaction and place attachment connecting with surrounding areas. The interview questions in this section help to further in-depth understand research question 4 'what are the psychological processes of place attachment to community parks in MPEs?', and research question 6 'how do the community park use factors affect residents' place attachment in MPEs?' from a neighbourhood connectivity perspective.

Section 5: Resident Background Information

The last section of interview questions gathered general information of participants, including age, gender, marital status, work status, education, house type, and length of residency. These questions helped the researcher to justify if the interview participants were selected appropriately matching the selection criteria and also helped analyse the descriptive characteristics of the participants.

In summary, nine semi-structured interview questions were developed for the Phase II interview study (shown in Appendix 8).

3.4.3 Interview Data Collection

During the data collection of this study, the COVID-19 pandemic outbreak affected scholars' working experience of qualitative research around the world. Face-to-face interview data collection became very challenging due to social distancing constraints during the COVID-19 pandemic. Consequently, in the past few years, the use of virtual methods for qualitative research has grown significantly (Roberts et al., 2021).

The qualitative interview data of this study was collected in the midst of the COVID-19 pandemic between February and June 2022. Considering a virtual method can reduce the risk of potential contact with the COVID-19 virus for the researcher and participants, interviews were conducted online using Zoom. Salmons's (Salmons, 2016) 'E-Interview Research Framework' was used as a tool to design the qualitative research and the online interview data collection. The key issues of qualitative data collection are discussed as follows.

(1) Sampling

The sampling methods of selecting interview participants were purposive sampling and snowball sampling, which are discussed below.

Purposive Sampling

The main method of sampling for interviews in this study was purposive sampling which is a very common sampling technique in case studies. Using purposive sampling helps the researcher to purposively select a wide range of residents for the inquiry to obtain multiple perspectives to understand the complexity of the research issues. Following Arani et al. (2021), through purposive sampling, samples of the population can be selected based on the judgement of the researcher. To achieve a wide range of sampling variation, this study selected adult participants from different socio-demographic groups in BP and LG via purposive sampling. The samples included a variation in several socio-economic status groups to obtain different perspectives from the population of BP and LG. The participants who were willing to participate in the interviews and were identified as having the key characteristics in different groups were selected for the interviews.

The inclusion criteria for interview participants are discussed as follows. Overall, the interview participants were selected to represent all socio-demographic factors associated with social interaction or place attachment in the Australian MPE context, including age, gender, marital status, work status, education, dwelling type, family composition and length of residency (Francis et al., 2012; French et al., 2014; Hooper et al., 2020). This variation of sampling was applied to represent the population of the two selected MPEs. Knowing the characteristics of participants can help to establish how different groups use community parks

in MPEs. The groups were classified according to Australian Bureau of Statistics (2016), *Domain* real estate platform[11] or literature. The classifications are outlined below.

Age. The targeted population of this research was the adult residents in two selected MPEs. According to the *Domain* real estate website [14], adult people can be categorised in three age groups: 20–39, 40–59 and 60+. Therefore, interview participants were selected from three age groups: 20–39 years old; 40–59 years old; and 60+ years old.

Gender. Males and females were selected.

Marital status. Interview participants were selected from two categories: married (registered marriage/de facto marriage) residents, and single (not married/de facto) residents.

Education. Interview participants were selected from five levels of education: high school graduate or below; diploma, advanced diploma, certificate level; bachelor's degree; master's degree; and doctoral degree.

Employment status. Interview participants were selected from four employment groups: worked full-time; worked part-time; worked in self-employment; and away from work (housewife/retired etc), according to Australian Bureau of Statistics (2016).

Family composition. Interview participants were selected from two family types: family with children (under 15 years old); and family without children (under 15 years old), according to Australian Bureau of Statistics (2016).

Dwelling type. Interview participants were selected from three dwelling types: house; townhouse; and apartment, classified according to Australian Bureau of Statistics (2016) and literature (Poortinga et al., 2017).

Length of residency. Interview participants were selected from five length of residency groups: < 1 year; 1–3 years; 3–5 years; 5–10 years; and > 10 years, according to previous literature (Lee & Lin, 2021; Lestari & Sumabrata, 2018).

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[11] Domain real estate website, available at: https://www.domain.com.au/

Snowball Sampling

In addition, snowball sampling was also used for interviews. As a nonprobability sampling technique, snowball sampling refers to recruiting participants from existing participants' nominated acquaintances (Goodman, 1961; Taherdoost, 2016). Snowball sampling 'uses a few cases to help encourage other cases to take part in the study' (Taherdoost, 2016, p. 22). Nomination by key participants is often used to select participants who are appropriate to the research issues in social research. Snowball sampling helps to estimate the characteristics of participants and increase sample size. In this qualitative study, after each interview, a participant was asked to nominate people who have the key characteristics for an interview and have experience in the research topic area. Following that chain of contact, the researcher invited potential participants to arrange interviews.

(2) Sample Size

Literature shows that the standard for a qualitative sample size is to interview to saturation. Saturation is regarded as a gold standard, which refers to 'a point in data collection and analysis when new information produces little or no changes to emerging findings and themes.'(Tracy, 2019, p. 174). Regarding the specific sample size, Creswell and Clark (2011) indicated that the required number of interview respondents in each case ranges from four to ten. Hagaman and Wutich (2017) stated that most themes emerge with ten in-depth qualitative interviews and saturation usually takes place between 15 to 20 interviews. As a result, this study's qualitative data saturation occurred after analysing 16 interviews.

(3) Recruitment

Interviews were conducted via Zoom which were audio or Zoom recorded. Preparing a sample for the interview included five key steps: access participants; obtain consent; schedule the interview; conduct the interview; and send thank-you email to participant.

Access Participants

To minimise the risks of COVID-19 and comply with Australian and NSW Health guidelines, a COVID Safe Research Activity Risk Assessment (shown in Appendix 2) was completed

before access to participants for interviews in 2021. Then, the researcher selected and accessed participants through three main ways: survey data, closed social media groups, and face-to-face distributions.

First, participants were selected through survey data. In the survey study, there was a question that asked participants whether they were willing to participate in the interviews. If the survey participants were willing to do the interview, they could click the answer option of 'Yes, I am interested in participating in the interview', and leave their email address via the Qualtrics platform. The researcher filtered the survey data to select the respondents who were willing to participate in the interview study. The participants who were willing to participate in the interview and identified as having the key characteristics were then invited into the interview via email by the researcher.

Second, participants were accessed through closed social media groups. The interview invitation letters (including the Qualtrics link and QR code) were posted to the closed neighbourhood Facebook groups. If the residents were willing to do the interview, they could click the Qualtrics link or scan the QR code to read the information sheet and e-sign the consent form; and to leave their email address via the Qualtrics platform. The potential participants who were identified as having the key characteristics were then contacted by email or Facebook messenger by the researcher.

Third, participants were accessed through face-to-face distribution. During the pilot study and Phase I face-to-face survey, the researcher distributed the interview invitation in-person to some residents in BP and LG. Paper-based invitation letters, each including a brief description of the research, research information and consent form, were distributed to the participants face-to-face. If the residents were willing to do the interview, they could read the information sheet and sign the consent form; and leave their email address or phone number on the paper-based invitation letter. Based on the researcher's judgement, the potential respondents who were identified as having key demographic characteristics were invited to the interview.

Obtain Consent

For online distribution, when a participant was interested to participate in the interview, a Qualtrics link with the participant information sheet and consent form was then sent to the

participant for their digital signature (shown in Appendix 6). This study used the Qualtrics platform to obtain digital consent from participants because it is an appropriate and practical consenting method for participants' e-signatures. Qualtrics allows participants to electronically sign the consent form on multiple devices (e.g., smart phone, laptop, or desktop) which is technologically easy for participants to read and e-sign. Collecting the consent via Qualtrics allowed the researcher to verify that the participant had agreed to participate and had provided a signature, as well as agreed to some separate questions, such as to be audio recorded or Zoom recorded in the interview.

Schedule the Interview

Once the participants signed the consent form, another contact was made to arrange the interview time. Then a Zoom meeting invitation was sent to the participant by email or Facebook messenger by the researcher.

Conduct the Interview

Interviews were conducted through Zoom. The detailed interview procedure is discussed below in Section 3.4.3 (5).

Send Thank-you Email to Participant

After the interview, a follow up email was sent to the participants immediately with a $30 Woolworths e-Gift Card as a thank-you gift as shown in the participation information sheet (shown in Appendix 6).

(4) Characteristics of Interview Participants

Residents living in BP or LG were recruited from different respondent groups and interviewed to obtain different perspectives of living experiences in MPEs. The interviews lasted from approximately 25 minutes to 1 hour and 10 minutes, depending on participants' living experiences and communication styles. After 16 interviews, saturation was reached. Of the 16 participants of the qualitative study, 8 were living in BP, and 8 were living in LG. The sample distribution matches the selection criteria discussed above. Specifically, the sample distribution and justification are discussed below.

Age. Of the 16 participants, 5 were aged 20–39 years, 7 were aged 40–59 years, and 4 were aged over 60 years.

Gender. Of the 16 participants, 11 were women (68.75%), and 5 were men (31.25%). The gender imbalance was not recognised as an issue because the survey results indicated that gender was not significantly correlated with social interaction and place attachment. In addition, literature indicates that women may interact more with people and carried out more duties for childcare (Bould, 2003).

Marital status. Of the 16 participants, 13 self-reported as being married, with 12 married and one de facto, and 3 participants reported they were single status.

Education. Of the 16 participants, 4 had a high school or diploma (25%), 7 had a bachelor degree (43.75%); 4 had a master's degree (25%) and 1 had a doctoral degree (6.25%).

Employment status. Of the 16 participants, 8 worked full-time, 5 worked part-time, 1 was self-employed, 1 self-reported as a housewife, and 1 was retired.

Children at home. Of the 16 participants, 11 were living with children at home and 5 were living without children at home.

Dwelling type. Most of the participants (13, 81.25%) lived in an apartment, and 3 participants (18.75%) lived in a house or townhouse. Specifically, 7 BP participants lived in an apartment (87.5%) which was roughly comparable to the census data (Australian Bureau of Statistics, 2016) as 89.3% of the dwellings in BP are apartments. And 6 LG participants lived in an apartment (75%) which was roughly comparable with the census data (Australian Bureau of Statistics, 2016) of 62.5% apartments in LG.

Length of residency. Participants' residency length varied in a wide range from three months to 21 years. The majority of the participants have lived in BP or LG for more than 5 years (11, 68.75%) and 4 of them have lived there over 10 years (25%). Three participants have lived in BP or LG for 1–5 years and 2 have lived in BP or LG for less than one year.

Homeownership. As homeownership did not find significant association with social interaction and place attachment in the Phase I survey data analysis, homeownership was not

recognised as an issue in this study. The majority of the interview participants reported that they are owners, which helped in understanding owners' experience in MPEs.

Language. The study included residents who were able to understand and speak English. It would be impossible to ignore the importance of immigrant residents to understand the research issues in this study. According to Australian Bureau of Statistics, 46% of people in BP and 40.2% of people in LG speak a language other than English at home (Australian Bureau of Statistics, 2016). To recognise and understand the complexity of residents' experiences in MPEs, the researcher tried to interview residents from different language and culture backgrounds. Of 16 interview participants, 3 self-reported a Chinese culture background, 3 reported an Indian culture background, and 1 reported a Brazilian culture background.

All participants indicated that they could understand English well or very well. Two BP respondents showed strong preference for speaking Mandarin in interviews. According to Australian Bureau of Statistics, the proportion of residents in BP who speak Chinese at home is 16% (Australian Bureau of Statistics, 2016). Therefore, the two BP participants (25%) were interviewed in Mandarin. During the two interviews, the researcher showed the information and questions in English and explained all questions in Mandarin. When possible, the researcher typed the respondent's answers in English while the respondent spoke in Mandarin. The Mandarin interviews were audio recorded. Then the audio recordings and transcripts were translated into English verbatim by the researcher. All the other 14 interviews were conducted in English.

Table 3.4 summarises the demographic characteristics of the interview participants. The results show that the participants match the selection criteria well and can represent the population of the two selected MPEs.

Table 3.4 Summary of the demographic profile of the interview participants

MPE	Case No.	Gender	Age (y)	Work status	Marital status	Education	House type	Children at home	Length of residency (y)	Interview date (2022)
BP	01	Male	20-39	Full-time	Married	Bachelor	Apartment	Yes	5-10	13-04
	02	Female	20-39	Full-time	Married	Bachelor	Apartment	Yes	5-10	30-04
	03	Female	40-59	Housewife	Married	Master	Apartment	Yes	5-10	23-02
	04	Female	40-59	Part-time	Married	Diploma	Apartment	Yes	5-10	12-03
	05	Female	40-59	Full-time	Married	Doctor	House	No	>10	08-04
	06	Female	40-59	Self-employed	Married	Diploma	Apartment	Yes	1-3	28-04
	07	Male	40-59	Part-time	Married	Bachelor	Apartment	Yes	>10	01-06
	08	Female	60+	Retired	Single	Master	Apartment	No	5-10	13-04
LG	09	Female	20-39	Part-time	Married	Bachelor	Apartment	Yes	<1	18-05
	10	Female	20-39	Full-time	Married	Highschool	Apartment	Yes	5-10	20-05
	11	Male	20-39	Full-time	Single	Bachelor	Apartment	Yes	1-3	20-06
	12	Male	40-59	Full-time	Married	Master	Apartment	Yes	>10	14-03
	13	Female	40-59	Full-time	Married	Bachelor	Apartment	Yes	5-10	13-05
	14	Female	60+	Part-time	Single	Bachelor	Townhous	No	<1	16-05
	15	Female	60+	Part-time	Married	Highschool	House	No	>10 (21)	16-05
	16	Male	60+	Full-time	De facto	Master	Apartment	No	3-5	15-06

Note. Proper names and other details of participants have been edited by number to protect the identity of participants.

(5) Interview Procedure

In interviews, the safety of participants and the researcher was of utmost importance. The researcher took several steps to protect participants' and the researcher's safety and to reduce potential risks in online interviews. Before interviews, a pilot interview with a scholar was conducted to test the online interview's technology, safety and procedure. After ensuring the online interview's technology, safety and procedure are feasible, interviews were conducted with residents from BP and LG between February to June in 2022. To conduct interviews appropriately and safely, the online interview procedure was structured in several steps as follows.

Before the Zoom meeting. The researcher checked the Qualtrics platform to ensure the participant clicked 'yes' agreeing to participate in the interview before the Zoom meeting.

The researcher also confirmed the participants signed the consent form by the Qualtrics link. Additionally, before the Zoom meeting, the researcher checked audio and video for good connection.

Waiting room for Zoom meeting. To protect participants' privacy during Zoom interviews, the researcher used the waiting room feature to prevent uninvited persons from joining.

Virtual background. When the Zoom meeting started, the researcher suggested participants using a virtual background to protect their confidentiality and privacy. The researcher also reminded them that they could shut down their camera during the interview.

Zoom/Audio recording. With the participants' permission, interviews were Zoom or audio-only recorded. This study provided two ways for interview recording: 1) Zoom meeting recorder for video recording, and 2) 'EaseUs RecExperts' recorder for audio-only recording. Participants chose the interview recording way in the consent form: Zoom recorded or audio-only recorded. Firstly, if the participants agreed to be Zoom recorded, the interview was visual and audio recorded via Zoom. The researcher reminded the participants that only audio data of the Zoom meeting would be used in this study. Secondly, if the participants only agreed to be audio-only recorded, the researcher captured interview audio alone using an audio recording program 'EaseUs RecExperts' because it has an audio-only recording function. After the participants joined the Zoom meeting, they were told that the researcher was starting the recorder. Then after obtaining participants' permission, the researcher started the recorders at the beginning of the interview. The researcher checked the technology to ensure the recorders were recording in the whole interview.

During the interview. When the interview started, after the ice-breaker questions, participants were required to answer a series of questions following the interview protocol. An interview lasted on average 25–70 minutes, using the structure as follows:

Step 1 Opening and Providing Information: 2–3 minutes. Including a brief introduction about the researcher and a description and explanation of the purpose of the research.

Step 2 Gathering Information: 20–35 minutes. The interview protocol was used as guidance for the interview process (shown in Appendix 8). Information was gathered using a series of questions from the interview protocol. Participants were encouraged to discuss relevant issues.

The sequence and contents of questions might change in response to the logical flow of participants' responses. As a result, the length of this section varied from approximately 20 to 60 minutes, largely depending on respondents' experience in the topic area and their communication styles.

Step 3 Closing: 2–3 minutes.

Data save. The audio recordings were later transcribed for recurring themes. The recording data was saved as password-protected files in the STASH data system provided by the University of Technology Sydney.

3.4.4 Qualitative Data Analysis Method

The qualitative data was analysed by thematic analysis method (Braun & Clarke, 2006). Thematic analysis is well-suited for exploring the subjective perceptions and experiences of participants (Swierad & Huang, 2018). Thematic analysis highlights how people make sense of their experiences within the context of their social and environmental backgrounds (Braun & Clarke, 2006). Hence, thematic analysis was used to analyse the common themes related to research questions in this study.

The interview data were analysed in the following steps in thematic analysis: 1) step 1 cleaned the raw data; 2) step 2 transcribed interview data; 3) step 3 read through the transcript data to gain an overall understanding; 4) step 4 generated codes. This study developed two types of initial coding: theory-driven and data-driven. Theory-driven coding was developed from the literature review. Data-driven coding was generated when a new code emerged; 5) step 5 developed code frames to identify important themes and subthemes; 6) step 6 investigated the themes for how they related to each other; and 7) step 7 interpreted the meaning of the themes (Braun & Clarke, 2006; Creswell, 2009).

3.5 Research Ethics

This research involves human participants in data collection. This research complies fully with the Australian Code for the Responsible Conduct of Research (2018) and National

Statement on Ethical Conduct in Human Research (2007) (updated 2018). The research complies fully with the University of Technology Sydney guidelines and policies for human research ethics. This research complies fully with NSW Health guidelines and University of Technology Sydney COVID-19 ethics policies. This study completed COVID-Safe Research Activity Risk Assessments (shown in Appendix 2) before conducting the survey and interviews.

- The survey study was approved by the University of Technology Sydney's Human Research Ethics Committee (UTS HREC REF NO. ETH20-5480) (shown in Appendix 1).

- The interview study was approved by the University of Technology Sydney's Human Research Ethics Committee (UTS HREC REF NO. ETH21-6087 and amendment approval ETH21-6736) (shown in Appendix 1).

All participants were informed of the purpose of the study and told that their responses would be kept confidential and that the results of the study would be used only for the purposes of this study. The participants were also given the option to withdraw from the study at any time. For the face-to-face survey, the survey provided respondents a participant information sheet and consent form (shown in Appendix 5) prior to starting the survey. Signed consent forms were obtained from the participants after a full explanation of the process. For the online survey, the survey provided an information sheet and consent form for online surveys (shown in Appendix 4) via Qualtrics before starting the questionnaire. Participants needed to click consent agreement to start the questionnaire. For the online interviews, the participant information sheet and consent form (shown in Appendix 6) were digitally signed via Qualtrics before starting the interviews.

All data for this research was saved as password-protected files in the STASH system provided by the University of Technology Sydney. The data management strictly follows the Australian Code for the Responsible Conduct of Research (2018) and University of Technology Sydney Research Data Management Policy.

Chapter 4   Findings of the Quantitative Study

This chapter describes the data analyses and findings from the Phase I survey study. The quantitative survey study aims to answer the 'which' research questions as follows: (RQ2) 'which factors of community park use are significantly and positively associated with residents' social interaction in MPEs?'; and (RQ5) 'which factors of community park use are significantly and positively associated with residents' place attachment in MPEs?'. This chapter has five subsections: a) descriptive statistics and neighbourhood analysis, b) principal component analysis, c) correlation analyses, d) hierarchical multiple regression analysis, and e) ANOVA analyses of mean differences between frequent and infrequent park user groups.

4.1 Descriptive Statistics

This section discusses the descriptive statistics to describe an overall picture of the data and identify the characteristics of the survey participants. A total of 192 valid responses were collected (not including pilot data) through a resident survey in BP and LG in 2021. The first step of data analysis is data preparation. First, the questionnaires and data were proofread and verified after completing the survey. Then the valid data was entered into the computer for analysis using SPSS version 23. Second, missing data was checked using SPSS. Overall, the proportion of missing data of all items was less than 10%. The item 'children's playground satisfaction' had 17 missing responses (missing at 8.9%); 'income' had 14 missing responses (missing at 7.3%); 'work status' had 6 missing responses (missing at 3.1%); 'rest space satisfaction', 'sporting space satisfaction', and 'education' all had 2 missing responses (missing at 1%); and 'shade space satisfaction' had one missing response (missing at 0.5%). A Little's MCAR test showed that the data was missing at random (Chi-squared=20.554, DF=27, Sig.=0.807) (Little, 1988). According to Cheema (2014), the imputation by item mean value technique can be used to handle missing data less than 10% at random (Cheema, 2014). Therefore, missing data in items of 'children's playground satisfaction' (missing at 8.9%); 'income' (missing at 7.3%); 'work status' (missing at 3.1%); 'rest space satisfaction', 'sporting space satisfaction', 'education' (missing at 1%); and 'shade space satisfaction'

(missing at 0.5%) were replaced by the mean value of the available answers on these items (Cheema, 2014). The descriptive statistics results are discussed as follows.

Demographic, Individual and Social Factors

Of the 192 respondents surveyed, 50.5% were from BP (n=97) and 49.5% from LG (n=95). Around half of the respondents were female (57.3%), and over half of them were married (64.1%). The majority of the respondents (90.6%) were under the age of 60: respondents aged 20–39 years old (54.2%) were the largest group, while 36.5% of respondents were aged 40–59 years old. Most of the respondents were employed full-time (63.5%), and two-thirds of the respondents (66.7%) owned their homes in the two MPEs. Educationally, almost half the respondents had a bachelor's degree (42.7%), with the next largest proportion having a master's degree (19.8%). Most residents (60.9%) had an annual individual income in the range of AUD$50,000–AUD$199,999. Over half of the respondents (55.2%) indicated that they had participated in one or more neighbourhood groups. Half of the respondents (50%) stated that they had lived in their neighbourhood for 3–10 years, and 30.2% of respondents had lived there for more than 10 years. In summary, the sample represented mostly owner residents and under the age of 60. These overall demographics varied slightly by estate.

Independent Variables (Community Park Use)

The independent variable 'community park use' includes two subdimensions: frequency of community park use (1 item), and satisfaction with quality of community parks (8 items). The data showed that most people (62%) use the community parks at least once a week.

Taken together, the descriptive statistics of the sample of demographic, individual, social factors and community park use factors are summarised in Table 4.1.

Table 4.1 Descriptive statistics of demographic, individual, social factors and community park use factors

Item	%	n	Mean	Std. Deviation
Demographic, individual, social factors				
MPE (*Liberty Grove*)	49.5	95		
Gender (*Female*)	57.3	110		
Age				
Age 20–39	54.2	104		
Age 40–59	36.4	70		
Age 60–79	8.9	17		
Over 80	0.5	1		
Marital status (*Married*)	64.1	123		
Work status				
Full-time employed	65.1	125		
Part-time employed	19.8	38		
Self-employed	4.7	9		
Unemployed	2.1	4		
Retired	8.3	16		
Education				
High school	4.2	8		
Diploma	15.6	30		
Bachelor	42.7	82		
Master	20.8	40		
Doctor	16.7	32		
Homeownership (*Owning*)	66.7	128		
House type				
House	30.7	59		
Townhouse	18.2	35		
Apartment	51.1	98		
Groups participation (≥ *1 Group*)	55.2	106		
Family size			3.10	1.243
How many children at home			1.80	0.907
Income			3.20	0.935
Length of residency			3.65	1.184
Online interaction frequency			3.27	1.341
Face-to-face social interaction			3.46	1.087
Neighbourhood safety			3.90	1.097

Community park use factors		
C1: Frequency of community park use [a]	3.67	1.029
C2: Recreation space satisfaction [b]	3.77	1.038
C3: Children's playground satisfaction [b]	3.35	1.232
C4: Rest space satisfaction [b]	3.32	1.234
C5: Shade space satisfaction [b]	3.66	1.137
C6: Sporting space satisfaction [b]	3.59	1.180
C7: Nature space satisfaction [b]	3.91	1.201
C8: Pedestrian accessibility to parks [b]	3.70	1.237
C9: Pedestrian connectivity with surroundings [b]	3.70	1.141

[a] *Frequency questions, Likert-scale coded from 1=never to 5=daily.*

[b] *Satisfaction questions, Likert-scale coded from 1=very dissatisfied to 5=very satisfied.*

Dependent Variables (Social Interaction and Place Attachment)

An average of composite scores was computed by summing mean scores of the items for the two dependent variables social interaction and place attachment. Specifically, the mean value of social interaction scores for the sample of data (n=192) was 3.04 (SD=0.86). The mean value of place attachment scores was 3.69 (SD=0.78). Table 4.2 summarises the mean values of all factors of the social interaction and place attachment scales.

Table 4.2 Summary of composite scores of dependent variables

Dependent Variables	Total Sample		BP		LG	
	M	SD	M	SD	M	SD
Social Interaction	3.04	0.86	2.89	0.86	3.15	0.83
Frequency of general SI [a]	3.48	0.07	3.41	1.17	3.53	1.06
How many general friends [b]	3.02	0.07	3.10	1.14	2.95	1.04
How many close neighbour friends [b]	2.67	0.08	2.48	1.12	2.81	1.12
Frequency of together activities [a]	3.04	0.08	2.73	1.31	3.28	1.17
Frequency of community activities [a]	3.00	0.09	2.76	1.33	3.18	1.19
Place Attachment	3.69	0.78	3.6	0.80	3.6	0.76
I pride myself of living in BP/LG [d]	3.74	1.08	3.78	1.23	3.70	0.93
I am attached to BP/LG [d]	3.68	1.09	3.70	1.16	3.66	1.02
BP/ LG is special to me [d]	3.71	1.02	3.70	1.08	3.71	0.96
I identify strongly with BP/LG [d]	3.64	0.97	3.57	1.02	3.70	0.93
If I can, I will remain a resident of BP/LG for several years [d]	3.70	1.06	3.71	1.18	3.69	0.97
If, for any reason, you had to move to another neighbourhood would you be unhappy [c]	3.76	1.02	3.64	1.05	3.86	0.98
BP/LG is the best neighbourhood for me to live in [d]	3.73	1.01	3.82	1.09	3.66	0.94
I feel BP/LG is a part of me [d]	3.54	1.05	3.48	1.03	3.58	1.07
No other place can compare to BP/LG [d]	3.38	1.03	3.38	1.09	3.37	1.00

[a] *Frequency questions are Likert-scale coded from 1=never to 5=daily.*

[b] *How many questions are Likert-scale coded as 1=0, 2=1–2, 3= 3–5, 4=6–10, 5=≥11.*

[c] *Happy/unhappy questions are Likert-scale coded from 1=very happy to 5=very unhappy.*

[d] *Agree/disagree questions are Likert-scale coded from 1=strongly disagree to 5=strongly agree.*

4.2 Neighbourhood Comparison

An ANOVA was run to compare if there were any differences between the two MPEs regarding residents' community park use frequency, satisfaction with quality of community park spaces, satisfaction with parks' pedestrian integration, overall social interaction and place attachment. Table 4.3 presents the summary for each variable in the neighbourhood analysis.

The ANOVA analysis showed there is no significant difference between the two MPEs in frequency of community park use, satisfaction with quality of community park space, overall social interaction and place attachment. ANOVA analysis only found that BP and LG

residents had different levels of satisfaction with parks' pedestrian integration. BP residents reported greater satisfaction with pedestrian accessibility to parks than residents in LG. The ANOVA test showed that BP residents (M=3.54, SD=0.73) had significantly higher satisfaction with parks' pedestrian connectivity with surrounding areas, which differed significantly ($p<0.01$) from LG residents (M=3.74, SD=0.72).

Table 4.3 Summary of ANOVAs for neighbourhood group analysis

		Sum of Squares	df	Mean Square	F	Sig.
			ANOVA			
SI	Between	.320	1	0.320	0.425	0.515
	Within Groups	143.067	190	0.753		
	Total	143.387	191			
PA	Between	.564	1	0.564	1.001	0.318
	Within Groups	107.037	190	0.563		
	Total	107.601	191			
Frequency of CP use	Between	.070	1	0.070	0.065	0.798
	Within Groups	202.258	190	1.065		
	Total	202.328	191			
Satisfaction with quality of CP space	Between	.068	1	0.068	.110	0.740
	Within Groups	117.935	190	0.621		
	Total	118.003	191			
Pedestrian accessibility to community parks	Between	6.599	1	6.599	4.392	**0.037 ****
	Within Groups	285.479	190	1.503		
	Total	292.078	191			
Pedestrian connectivity with surroundings	Between	4.262	1	4.262	3.316	**0.070 ***
	Within Groups	244.217	190	1.285		
	Total	248.479	191			

*$p<0.1$, ** $p<0.05$, *** $p<0.01$.

As ANOVA did not find significant difference between the two MPEs in quality of community park space and overall social interaction and place attachment. This study therefore treated the two MPE groups together and analysed them as one group to investigate how community park use factors impact social interaction and place attachment.

4.3 Principal Component Analysis

Before the principal component analysis, the reliability was estimated using Cronbach alphas on social interaction, place attachment and community park use scales respectively. The Cronbach's coefficient value (α) of the social interaction scale was 0.741. The Cronbach's coefficient value (α) of place attachment scale was 0.878; and the Cronbach's coefficient value (α) for the community park use scale was 0.720. The Cronbach's coefficients of the three scales were all larger than 0.7, meaning that the three scales used in this study are reliable (Cheema, 2014).

This section discusses the factor analysis for dependent variable scales: social interaction and place attachment. Prior to assessing relationships and further data analyses, exploratory factor analysis was used to uncover the underlying structures of social interaction and place attachment scales. Principal component analysis (PCA) via SPSS was used as the factor analysis extraction method implemented to test the underlying dimensions of the social interaction and place attachment scales. PCA has widespread applications in social studies (Jolliffe & Cadima, 2016). A main benefit of PCA is to identify the most meaningful basis components to represent a data set (Fabrigar & Wegener, 2011). The purposes of using PCA in this study were to summarise the components of social interaction and place attachment for further analysis and interpretation, and to test the validity of social interaction and place attachment scales (Jolliffe & Cadima, 2016).

4.3.1 Criterion for Choosing Principal Components

An important issue of PCA is the choice of the amount (k) of the extracted principal components. Several methods have been proposed for determining the number of principal components. Three criteria are often used for choosing the number of principal components: percentage of variance, scree plot and eigenvalue (Jolliffe & Cadima, 2016).

Criterion of Percentage of Variance. One often-used criterion for choosing k is to select a percentage of total variation which one desires that the selected principal components contribute. Some criteria claim that the total variance explained by all components should be

70% to 80% variance (Jolliffe & Cadima, 2016). The required number of principal components is then the smallest value of *k* for which this chosen percentage is exceeded.

Criterion of Eigenvalue. Eigenvalue has often been used for choosing *k* (Jolliffe, 2002). The number of principal components is equal to the number of eigenvalues ≥1, which is called *Kaiser's rule* (Jolliffe, 2002; Kaiser, 1960). The eigenvalue is the measure of the importance of principal components.

Criterion of a Scree Plot. Another criterion for choosing *k* is the scree plot graph (Cattell, 1966). The scree plot graph visually displays the successive eigenvalues in descending order from largest to smallest, which is widely used in PCA. According to Jolliffe (2002), the scree plot graph involves 'a plot of *l* (right) against *k* (left) and deciding at which value of *k* the slopes of lines joining the plotted points are 'steep' to the left of *k*, and 'not steep' to the right. This value of *k*, defining an 'elbow' in the graph with eigenvalues > 1, is then taken to be the number of components to be retained' (p. 116).

Because each of the above criteria may suggest a different number of components, the final decision about the numbers was taken in this study by analysing all the criteria and considering the theoretical basis. By analysing all the criteria for selecting the principal components presented above, the principal components were selected to represent the analysed variables in two outcome scales of this study (Gniazdowski, 2017).

4.3.2 Testing Assumptions for Principal Component Analysis

According to Jeong and Jung (2016), there are several key assumptions to be checked before applying the PCA: sampling adequacy, linearity, reliable correlations and normality, which are discussed as follows.

Sampling Adequacy. There is an assumption that the data should have sampling adequacy for PCA (Pallant, 2020). Scholars suggest that a minimum sample size over 150, and the ratio of cases to variables over 5 can work adequately and accurately for factor analysis (Pallant, 2020). The social interaction scale has 5 variables and 192 respondents (n=192), the ratio of cases to variables was 38.4 (192/5=38.4). The place attachment scale has 9 variables, and the ratio of cases to variables is 21.3 (192/9=21.3). As the number of respondents is over 150 and

the ratio of cases to variables for these two scales is larger than 5, the assumption for sampling adequacy was satisfactory for factor analysis.

Reliable Correlations. Another assumption is that the data have adequate correlations between the variables that can be reduced to a smaller number of components (Pallant, 2020). Kaiser-Meyer-Olkin and Bartlett's tests were used to test the reliable correlations for three scales. Literature shows that if Bartlett's test of Sphericity is significant $p<0.05$ and the Kaiser-Meyer-Olkin (KMO) value ≥0.6, the data has adequate correlations for PCA (Pallant, 2020). As is shown in Table 4.4, based on the current data (n=192), the KMO and Bartlett's tests show the community park use scale's KMO value=0.855 and is significant at $p=0.000$; the social interaction scale's KMO value=0.758 and is significant at $p=0.000$; and the place attachment scale's KMO value=0.917 and is significant at $p=0.00$. The output from SPSS analysis showed that the KMO value a of the three scales was >0.6 and $p<0.05$ (see Table 4.4). It means the data was suitable for further factor analysis.

Table 4.4 SPSS KMO and Bartlett's tests for the community park use, social interaction and place attachment scales

KMO and Bartlett's Tests		CP-use	SI	PA
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.855	0.758	0.917
Bartlett's Test of Sphericity	Approx. Chi-Square	481.697	257.053	956.201
	Df	28	10	45
	Sig.	0.000	0.000	0.000

Linearity. PCA can work more accurately in revealing linear relationships in data (Jolliffe, 2002). Scholars suggest the primary way to detect linearity is examination of residual plots (Jeong & Jung, 2016). To meet the criteria for linearity, the plot of standardised residuals to standardised estimates of the dependent variable should display a random pattern (Jeong & Jung, 2016). In this study, linearity was tested through SPSS scatter plot graph analysis of pairs of variables. The residual plots of social interaction and place attachment scales showed random patterns and no evidence of curvilinearity was found.

Normality. For PCA, it is expected that the distribution of residuals is normally distributed (Jolliffe, 2002). Normality was tested by the graphical method P–P plot (probability plot) in this study. The normal P–P is a graphical technique for assessing whether a data set is

normally distributed (Jeong & Jung, 2016). If normality is met, the points on the plot remain close to the diagonal line (Jeong & Jung, 2016). In this study, the output from SPSS P–P plot analysis shows the points are close to the diagonal line in three scales (see Figure 4.1). The assumption of normality was considered satisfactory.

| CP use scale | SI scale | PA scale |
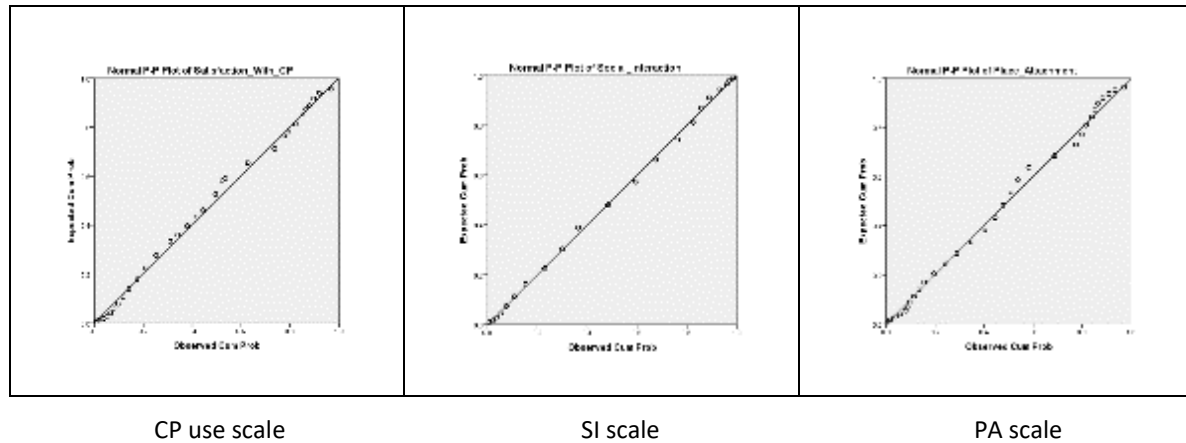
Figure 4.1 P–P Plot analysis in SPSS

4.3.3 Principal Components of Social Interaction Scale

The social interaction scale includes five items. Several methods have been used for determining the number of components for PCA on the social interaction scale. The first varimax rotation and scree plot analysis showed that there was one principal component with eigenvalue >1 but it only accounted for 53.2% cumulative. To preserve more variance of data in combination with the analysis of the theoretical basis, varimax rotation was performed again, forcing SPSS to extract three factors. Three principal components were extracted and interpreted from the social interaction scale which explained 79.67% of the variance in social interaction. The literature suggests that the total variance that could be explained by all of the principal components ranges from 70% to 80% (Jolliffe & Cadima, 2016). In the social sciences, the total variance explained by all components needs to be at least 60% (Hair et al., 2013). The number of principal components was then the k smallest value (k=3) that this chosen percentage exceeded 60%. The presence of three principal components explains 49.18%, 16.98% and 13.51% of the variance, respectively. Principal component analysis confirmed the social interaction scale showed a satisfactory validity.

Table 4.5 summarises the results of items' component loadings (λ), mean and standard deviation values, and percent of variance. The rotated component matrix results shows that all the standardised factor loadings (λ) exceed 0.5 as shown in Table 4.5. Each component and the variables contributing at least 0.5 to the component variance are classified, which means the scale has a high convergent validity (Chen et al., 2019). Item 5 'general interaction frequency' shows high positive loading on the second component (λ=0.957); items 1–4 show high positive loading on the first component (ranging from 0.726 to 0.881) (see Table 4.5).

Table 4.5 Principal components extracted for social interaction scale

Component Labels	Items	Component		
		1 (λ)	2(λ)	3(λ)
Quantity of strong tie SI	1. Community activities frequency	0.859		
	2. Together activities frequency	0.822		
Social network size	3. How many general friends		0.881	
	4. How many close neighbours		0.726	
Quantity of weak tie SI	5. General interaction frequency			0.957
Eigenvalues		2.459	0.849	0.676
% of variance (%)		49.178	16.987	13.510
Cumulative variance (%)		49.178	66.165	79.675

Rotation Method: Varimax with Kaiser Normalisation.

Component Labels. Literature suggests that social interaction can be categorised into weak ties social interaction and strong ties social interaction (Henning & Lieberg, 1996; Kim, 2017). In combination with the analysis of the theoretical basis (Berkman et al., 2000), the three principal components can be interpreted in quantity and quality of social interaction as follows: quantity of strong ties social interaction; social network size (quality of social interaction); and quantity of weak ties social interaction.

Component 1 was labelled as 'quantity of strong ties social interaction'. Two items loaded most heavily on component 1: community activities frequency and together activities frequency. The two items of community activities and together activities measure how often the residents have deeper interactions among neighbours. Deeper interactions refer to doing things together with others through meeting or spending time with them with an intention which are based on strong social ties (Kim, 2017). Component 1 contributed 49.18% of total variance of social interaction.

Component 2 was labelled as 'social network size', which refers to the quality of social interaction. The items of how many general friends and close friends measure the quality of social interaction via social network size among neighbours based on the social ties. Component 2 contributed 16.99% of total variance of social interaction.

Component 3 was labelled as 'quantity of weak ties social interaction'. The item general interaction frequency that loads most strongly on component 3 explicitly dealt with general interaction frequency. This item measures quantity of general social interaction with neighbours based on weak ties. General interaction refers to some general and transient interactions without an intention, such as smiling at each other, greeting, and brief talking (Henning & Lieberg, 1996). Based on literature, component 3 was labelled 'quantity of weak ties social interaction' which contributed to 13.51% of total variance of social interaction.

4.3.4 Principal Components of Place Attachment Scale

The place attachment scale includes nine items. The factors of the place attachment scale were extracted using principal component analysis with the varimax rotation method. Several methods have been used to determine the number of components for the place attachment scale. The first varimax rotation and scree plot analysis showed that there was one principal component with eigenvalue >1 but it only accounts for 48.89%. To preserve more variance of data, three factors are taken into consideration based on place attachment theory (Scannell & Gifford, 2010). Varimax rotation was performed again, forcing SPSS to extract three factors. The three-factor solution explained a total of 66.47% of the variance. The variation of 66.47% is an adequate amount of variation explained in the data (>60%) (Hair et al., 2013). The number of principal components was then the k smallest value (k=3) that this chosen percentage exceeded 60%. Then the first three principal components are extracted which explain 48.89%, 9.14% and 8.44%. Principal component analysis confirmed the place attachment scale showed a satisfactory validity.

Table 4.6 summarises the results of items' component loadings (λ), mean and standard deviation values, and percent of variance of the place attachment scale. To preserve more variance of data, this analysis uses a cut-off of 0.50 for inclusion of a variable in the loading of a factor for the place attachment scale (Costello & Osborne, 2005). Each component and

the variables contributing at least 0.5 to the component variance are classified. This means that the scale has a high convergent validity (Costello & Osborne, 2005). Items 1–4 show high positive loading on the first component (ranging from 0.60 to 0.76). Items 5–7 have high loading on the second component (ranging from 0.57 to 0.78). Items 8–9 have high loading on the third component (ranging from 0.73 to 0.78).

Table 4.6 Principal components extracted for place attachment scale

Component Label	Items	Component		
		1 (λ)	2(λ)	3(λ)
Cognitive Process	1. If I can, I will remain a resident of BP/LG for several years. [b]	0.758		
	2. I identify strongly with BP/LG. [b]	0.701		
	3. BP/LG is special to me. [b]	0.641		
	4. I am attached to BP/LG. [b]	0.597		
Behavioural Process	5. If, for any reason, you had to move to another neighbourhood would you be unhappy/happy. [a]		0.780	
	6. BP/LG is the best neighbourhood for me to live in. [b]		0.682	
	7. No other place can compare to BP/LG. [b]		0.568	
Affective Process	8. I pride myself on living in BP/LG. [b]			0.780
	9. I feel BP/LG is a part of me. [b]			0.732
Eigenvalues		4.400	0.823	0.759
% of variance explained (%)		48.889	9.141	8.435
Cumulative variance (%)		48.889	58.031	66.466

Rotation Method: Varimax with Kaiser Normalization.

[a] *Likert-scale coded from 1=very happy to 5=very unhappy.*

[b] *Likert-scale coded from 1=strongly disagree to 5=strongly agree.*

According to Scannell and Gifford's (2010) PPP place attachment theoretical model, three themes of the place attachment process have been previously identified: affective, behavioural and cognitive items (Manzo & Perkins, 2006; Scannell & Gifford, 2017). Therefore, three principal components were labelled as cognitive component, behavioural component, and affective component, based on the theoretical consideration (see Table 4.6).

Component 1 was labelled the cognitive component, also in terms of place identity. Scanning the items that loaded most strongly on component 1, items 1–4 explicitly dealt with component 1 of place attachment: 'remain living here for years', 'identity', 'special to me'

and 'attached'. According to literature, these items can therefore be labelled the cognitive component of place attachment (Scannell & Gifford, 2017; Williams & Vaske, 2003). Component 1 cognitive component is the most important component of place attachment, contributing 48.89% of total variance.

Component 2 was labelled the behavioural component, also in terms of place dependence. Items 5–7 loaded most strongly on component 2: 'unhappy to move', 'best neighbourhood', and 'no other place can compare'. Based on literature, it can be seen that the three items deal with the behavioural component of place attachment (Scannell & Gifford, 2017; Williams & Vaske, 2003). Component 2 behavioural component contributed 9.141% of total variance.

Component 3 was labelled affective component, also in terms of place affect. Items 8 and 9 loaded most heavily on component 3, with the two items related to the affective component of place attachment: 'a sense of pride' and 'feeling a part of me'. Based on place attachment theory, component 3 reflected the affective and emotional factors of place attachment and therefore can be labelled affective component (Brown et al., 2012; Scannell & Gifford, 2017). Component 3 affective component contributed 8.435% of total variance.

In summary, PCA was run separately on the social interaction and place attachment scales. Three components were extracted for the social interaction scale and three components were extracted for the place attachment scale. The analysis confirmed the social interaction and place attachment scales had good reliability and satisfactory validity. The extracted components were used for further modelling analysis and interpretation.

4.4 Correlation Analysis

Based on current data and theoretical reasoning, a Pearson correlation was carried out to investigate whether there were significant relationships among the following variables: control variables (demographic, social and individual factors), independent variables (community park use), and dependent variables (social interaction and place attachment). Correlation analysis was primarily used to carefully choose the independent variables for future regression analysis.

Correlation is a statistical relationship between two variables, which is defined as 'when one variable is higher, the other variable tends to be higher (a positive correlation) or lower (a negative correlation)' (Arkes, 2019, p. 32). Previous studies also defined small correlations as Pearson correlation (r) ranging from 0.10 to 0.29, medium correlations as from 0.30 to 0.49 and large correlations as from 0.50 to 1.0 (Vaske, 2019). In addition, correlation analysis shows there are small to medium correlations between all community park use independent variables, which indicated a high discriminant validity in the community park use scale.

For correlation and regression analyses, several categorical variables were created as dummy variables to improve the model. The categorical variables (e.g., gender, marital status, homeownership, groups participation) are created as dummy variables. Gender was dummy coded 1 for females; 0 for males and other options (female=1; male, prefer to self-describe or other=0). Marital status indicator was coded 1 for married or living with a partner and 0 for single (living with a partner=1; single=0). For homeownership variable, the decision rule was if a property was owner-occupied, it was assigned a 1 while renting was assigned a 0 (owning=1; renting=0). The groups participation dummy variable was created: groups participation=1, non-group participation=0. Similarly, the categorical variable 'age' was created as a dummy variable. The age variable includes four categories, using the most frequent category '20–39 years old' group as the reference category. If an age fell within a category range, it was assigned a 1; if an age fell outside of the range, it was assigned a 0. Housing type dummy variable was also created using the most frequent category 'apartment' as the reference category. If a housing type fell within a category range, it was assigned a 1. If a type fell outside of the range, it was assigned a 0. For neighbourhood comparison, the categorical variable of MPE type was also generated as a dummy variable: Breakfast Point (BP) was coded 1, and Liberty Grove (LG) was coded 0 (BP=1; LG=0).

4.4.1 Correlation Analysis with Social Interaction

A Pearson correlation (r) was computed to assess the relationship between control variables and independent variables with social interaction. All variables with $p \leq 0.05$ in the correlation model were bolded and examined in a further regression analysis. As shown in Table 4.7, the correlation analysis results showed significant correlations between the demographic level

factors, community park use factors, and social interaction variable which are discussed below.

(1) Correlations of Control Variables with Social Interaction

Based on the conceptual framework from the socio-ecological perspective, the control variables were first examined in terms of their bivariate correlation with social interaction, including demographic, social and individual factors. To identify the significant correlates of social interaction accurately, a Pearson correlation was computed via SPSS to examine the bivariate correlations between demographic, individual and social factors and social interaction. Table 4.7 shows the significant correlations between the social interaction factors and all control variables.

Correlation analysis found that several demographic, individual and social factors were significantly and positively correlated with social interaction: online interaction frequency ($r=0.500$, $p<0.001$), group participation ($r=0.406$, $p<0.001$), length of residency ($r=0.390$, $p<0.001$), living in house ($r=0.237$, $p=0.001$), preferring face-to-face interaction ($r=0.230$, $p=0.001$), retired ($r=0.198$, $p=0.006$), single ($r=0.198$, $p=0.006$), and homeowning ($r=0.166$, $p=0.021$), and being over the age of 80 ($r=0.161$, $p=0.025$). By contrast, whether the participant was unemployed showed a significantly negative correlation with social interaction ($r=-0.206$, $p=0.004$). As a result, these control factors were then individually assessed via general linear regression models. Given the impact of these demographic, social and individual factors on social interaction, the following hierarchical multiple regression models incorporated them as control variables into regression analysis. The correlations of control variables with social interaction are summarised in Table 4.7.

(2) Correlations of Community Park Use Variables with Social Interaction

Correlation analysis identified that five community park use factors were positively correlated with social interaction. All variables with $p \leq 0.05$ in the correlation model were bolded in Table 4.7 and examined in a further regression analysis.

Table 4.7 Correlations of demographic, individual and social factors and community park use factors with social interaction

Factors	Social Interaction
	Pearson Correlation (*r*)
Demographic, individual and social factors	
Age (*80+*)	0.161*
Work status (*unemployed*)	-0.206**
Work status (*retired*)	0.198**
Marriage (*single*)	0.198**
House type (*house*)	0.237**
Homeownership (*Owning*)	0.166*
Face-to-face social interaction	0.230**
Online social interaction frequency	0.500**
Length of residency	0.390**
Groups participation (≥*1 Groups*)	0.406**
Community park use factors	
Frequency of community park use	0.229**
Children's playground satisfaction	0.151*
Rest space satisfaction	0.229**
Shade space satisfaction	0.226**
Pedestrian connectivity with surroundings	0.214**

Note. Table only displays control and independent variables that were significantly associated with social interaction.

* *p< 0.05*, ***p< 0.01*.

The strongest associations with social interaction came from 'frequency of community park use' (r=0.229, p=0.001) and 'rest space satisfaction' (r=0.229, p=0.001), followed by 'shade space satisfaction' (r=0.226, p=0.002), 'pedestrian connectivity with surroundings' (r=0.214, p=0.003), and 'children's playground satisfaction' (r=0.151, p=0.036). As a result, these factors that were determined to be significantly correlated with social interaction were entered as independent variables in a further regression analysis. On the other side, education, family size, income and number of children showed no correlations with social interaction. Hence, these variables (education, family size, income, number of children) were not examined in the hierarchical regression models.

4.4.2 Correlation Analysis with Place Attachment

To investigate if there were significant relationships between control, independent and dependent variables, a Pearson correlation analysis was conducted between demographic, individual and social factors, community park use factors and place attachment. All variables with $p \leq 0.05$ in the correlation model were bolded in Table 4.8 and examined in a further regression analysis.

(1) Correlations of Control Variables with Place Attachment

The control variables (demographic, social and individual factors) were examined in terms of their bivariate correlation with place attachment. Table 4.8 illustrates the correlations between control variables and place attachment. Correlation analysis shows that several demographic factors were significantly correlated with place attachment with $p \leq 0.05$. The factors of age 60–79, homeowning, face-to-face interaction, neighbourhood safety and group participation were strongly positively correlated with place attachment. Other factors like age 40–59, part-time employment, family size, living in a townhouse and children at home showed significantly negative correlations with place attachment. As a result, these demographic factors were included in a regression for selecting variables analysis.

On the other hand, several variables showed no correlations with place attachment, including gender, marital status, income, length of residency and frequency of online interaction. Due to the lack of significant correlations with place attachment, these variables (gender, marital status, income, length of residency, and frequency of online interaction) were excluded in further regression analysis.

(2) Correlations of Community Park Use Variables with Place Attachment

A Pearson correlation was computed to assess the relationship between community park use variables and place attachment. The Pearson correlation analysis showed that all nine community park use factors had significant correlations with place attachment. Regarding community park use factors, the strongest associations with place attachment came from pedestrian accessibility to parks (r=0.536, p=0.000), followed by nature space (r=0.480,

p=0.000) and children's playground satisfaction (r=0.473, p=0.000). Table 4.8 shows the results of significant correlations that were found ($p \leq 0.05$).

Table 4.8 Correlations of demographic, individual and social factors and community park use factors with place attachment

Factors	Place Attachment
	Pearson Correlation (*r*)
Demographic, individual and social factors	
Family size	**-0.310****
Age (40–59)	**-0.212 ****
Age (60–79)	**0.148***
Work status (part-time employment)	**-0.267****
Education (Doctoral degree)	**-0.154***
House type (townhouse)	**-0.180***
Children at home	**-0.179***
Homeownership (owning)	**0.215****
Face-to-face social interaction	**0.409****
Neighbourhood safety	**0.527****
Groups participation (≥1 Groups)	**0.147***
Community park use factors	
Frequency of community park use	**0.275****
Recreation space satisfaction	**0.453****
Children's playground satisfaction	**0.473****
Rest space satisfaction	**0.390****
Shade space satisfaction	**0.372****
Sporting space satisfaction	**0.388*****
Nature space satisfaction	**0.480****
Pedestrian accessibility to parks	**0.536****
Pedestrian connectivity with surroundings	**0.391****

*Note. Table only displays control and independent variables that were significantly associated with place attachment. * $p<0.05$, ** $p<0.01$.*

To sum up, the correlation analysis found several significant relationships between demographic, social and individual factors, community park use factors and social interaction as well as place attachment. Given the impact of those demographic, social and individual factors on social interaction and place attachment, the following regression models incorporated them as control variables. Community park use variables which were identified

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as significantly associated with social interaction and place attachment were entered as independent variables in the regression analysis.

4.5 Hierarchical Multiple Regression Analyses and Results

This study used a hierarchical multiple regression (HMR) analysis approach to examine the associations of the community park use factors and social interaction and place attachment in MPEs. Based on the correlation analysis, regressions were conducted separately for the social interaction and place attachment scales using SPSS.

Definition of regression model. Regression analysis is defined as 'a statistical technique for investigating and modelling the relationship between variables' (Montgomery et al., 2021, p. 1). Regression can be used 'to analyse the influence of the covariates on the mean value of the response variable' (Fahrmeir et al., 2022, p. 23). The general linear regression model represents a relationship between the response Y variable and the independent x variables ($x^1 \ldots x^k$) (Rogers & Sukolratanametee, 2009). This study takes the regression equation as follows:

$$Y = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k + \varepsilon \qquad \text{(Equation 1)}$$

where Y is each dependent variable (social interaction and place attachment); x_k is the independent variable. K is the total number of explanatory variables. β_0 is the intercept with the Y axis where all independent variables equal their mean value. β_k is the regression coefficient for the kth independent variable. ε refers to the random error or that part of the variance in Y that is not accounted for by the model.

Definition of hierarchical multiple regression. Hierarchical multiple regression is defined as 'a form of multiple linear regression in which the variables are entered into regression on the basis of a predetermined logical scheme (theory)' (Lu, 2019, p. 246). The multiple regression model has two or more explanatory variables.

HMR is an important tool and has been popularly used in social research to predict a dependent variable by testing multiple independent variables based on the theory (Arkes, 2019; Jeong & Jung, 2016). A strength of HMR is that the researcher can select the order of

entering variables based on a logical or theoretical background (Jeong & Jung, 2016). Unlike standard multiple regression where all independent variables are entered at one time, HMR allows the researcher to examine the variation in the dependent variable with each addition of a particular independent variable. In this study, using HMR allows the researcher to choose the order of the variables to be entered into regression models based on the theoretical considerations (Lu, 2019). In the HMR models, the degree of a specific factor contributing to social interaction and place attachment could be seen by the change in the R^2 value (Chen et al., 2019). Another reason to use HMR was because a hierarchical relationship exists among the factors that affect resident social interaction and place attachment. At first, the socio-demographic and individual factors (e.g., gender, age and work status) affect residents' community park use frequency. Following that, community park use frequency could have an influence on how satisfied residents are with the quality of the community parks and could in turn impact social interaction and place attachment.

Overall, based on the theoretical framework and research hypotheses, this study formulated a three-level hierarchical regression model for social interaction and place attachment analysis separately to examine what factors of community park use could predict social interaction and place attachment. Through the three-level HMR process, the researcher can accurately model the effects of level 1 (control variables) on social interaction and place attachment outcomes, in turn to investigate the effects of level 2 (independent variables-1) and level 3 (independent variables-2) variables on the social interaction and place attachment outcomes. This process allows the researcher to examine the variation in social interaction and place attachment with each subsequent addition of each community park use variable.

4.5.1 Testing Assumptions of Hierarchical Multiple Regression

Before performing HMR, the assumptions for multiple regression need to be met (Arkes, 2019). This study tested four key assumptions for multiple regression analysis: linearity, homoscedasticity, normality and multicollinearity (Osborne & Waters, 2002). Failure to meet these assumptions could generate biased results, hence the assumptions should be met to complete multiple regression analysis (Jeong & Jung, 2016).

Linearity. Literature shows that only linear relationships between dependent and independent variables can be accurately estimated by standard multiple regression (Osborne & Waters, 2002). If the relationship between independent variables and the dependent variable is not linear, the results of the regression analysis will be biased.

Scholars suggest the primary way to detect linearity is examination of residual plots (Jeong & Jung, 2016; Osborne & Waters, 2002). To meet the criteria for linearity, the plot of standardised residuals to standardised estimates of the dependent variable needs to present a random pattern (Jeong & Jung, 2016). In this study, linearity was checked through SPSS scatterplot graphs (see Figure 4.2). The residual plots showed a random pattern and no curvilinear component in the social interaction and place attachment scales. The relationships between dependent and independent variables were linear.

(a) SI Scale   (b) PA Scale
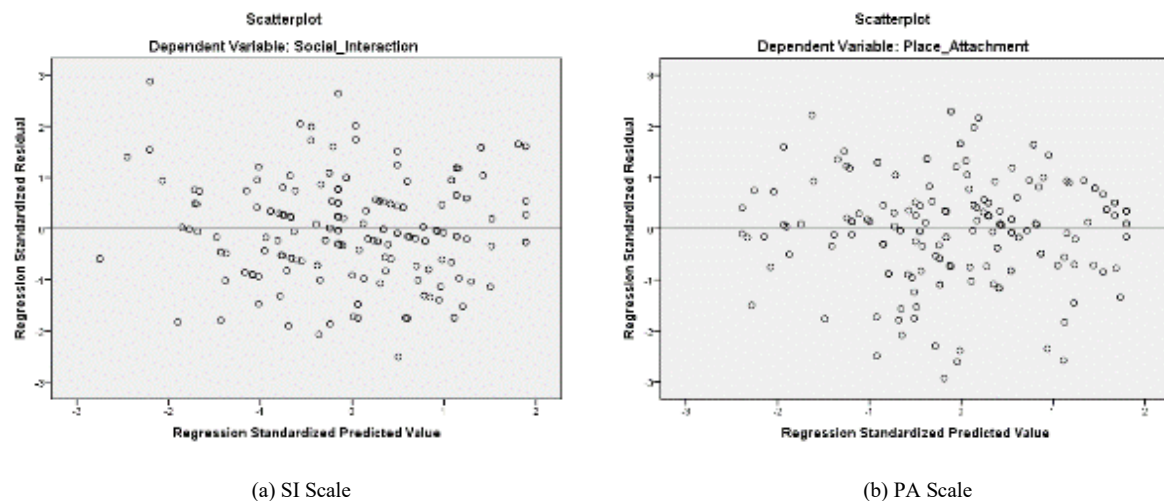
Figure 4.2 Scatterplot by SPSS analysis

Homoscedasticity. Heteroscedasticity influences significance tests and can lead to serious distortion of findings (Osborne & Waters, 2002). Homoscedasticity indicates that the error variance remains consistent across all levels of the independent variables (Osborne & Waters, 2002). Homoscedasticity can be checked by examining the scatterplot of residuals in SPSS. In this study, the scatterplot results showed that the residuals were randomly scattered around the zero point on the horizontal line, which met the assumption of equal variance of homoscedasticity for HMR analysis (see Figure 4.3).

Normality. Normality is expected such that the distribution of residuals is normally distributed (Osborne & Waters, 2002). This can be tested by graphical method P–P plot. If normality is met, the points on the plot remain close to the diagonal line. Figure 4.3 shows the distribution of residuals was normally distributed for social interaction and place attachment scales in this study.

(a) SI scale   (b) PA scale
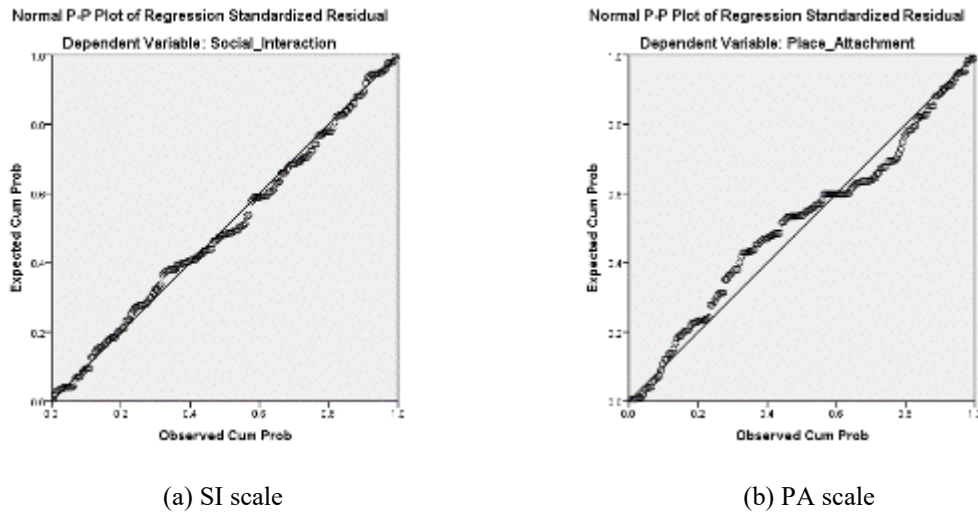
Figure 4.3 P–P Plot by SPSS analysis

Multicollinearity. Multicollinearity between independent variables can affect model performance (Alin, 2010; Jeong & Jung, 2016). The variance inflation factor (VIF) of each variable can be used to diagnose multicollinearity (Alin, 2010). According to O'Brien (2007), if a VIF score is equal or close to 1, then there is no correlation between the variable and other variables in the model; a VIF score from 1 to 5 is considered minimally correlated; a score of 5 up to 10 is considered moderately correlated and a VIF of greater than 10 is considered highly correlated (O'brien, 2007). This study used VIF score to examine the multicollinearity assumption. All VIFs were from 1 to 4 in social interaction and place attachment scales which indicated that all of the variables in the social interaction and place attachment regression models were considered minimally or moderately correlated. VIF analysis showed that the assumptions of multicollinearity were satisfactory in this study.

In summary, all assumptions for running multiple regression models were met, and the data did not have to be adjusted for HMR analysis.

4.5.2 Hierarchical Regression Analysis on Social Interaction

This section investigates the associations between community park use and social interaction using HMR. A series of multivariate models were fitted to examine the relationships between the selected independent variables of community park use and social interaction. The logical background on the decision regarding the order of variables entering into the HMR was based on the conceptual framework (see Figure 1.1) from a socio-ecological perspective (Bronfenbrenner, 1992; Francis et al., 2012).

In this study, the theoretical model consists of three parts: control variables (demographic, individual and social factors), independent variables (community park use) and dependent variables (social interaction and place attachment). The logic on the decision regarding the order of variables into the HMR was that selected control variables were entered first, followed by independent variables. By selecting the order of entering variables, the HMR analysis examined the variation on social interaction variables with each subsequent addition of a specific independent variable.

(1) Selecting Variables

Based on the correlation analysis discussed above, control variables and independent variables with significant correlations with social interaction were systematically examined further via general linear regression analysis. Finally, the significant control variables and independent variables were entered in the HMR models.

Selecting Control Variables

Selected demographic, individual and social variables were individually assessed in univariate models. To identify the significant correlates of social interaction, general linear regression models were used to examine the demographic-level factors. The results are summarised in Table 4.9. The categorical variables were set as dummy variables to ensure the accuracy of the study. The selected demographic, individual and social variables and the MPE (BP/LG) were then individually assessed via general linear regression models. A backwards stepwise elimination procedure ($p \leq 0.05$) was used to identify the significant correlates of place attachment. The general linear regression models found that several

demographic, individual and social factors were significantly correlated with social interaction, including online interaction frequency ($p<0.001$), retired ($p=0.005$), preferring face-to-face interaction ($p=0.013$), groups participation ($p=0.014$), length of residency ($p=0.018$), married ($p=0.028$), and aged 60–79 ($p=0.037$). Given the impact of these seven demographic-level factors on social interaction (bolded in Table 4.9), the HMR models incorporated them as control variables.

Table 4.9 Regression coefficients of demographic, individual and social factors and social interaction

Item	Standardised Coefficients (B)	Sig.
Age (years) (*ref=20–39*)		
60–79	**−0.203 ***	0.037
Married (ref=single)	**−0.146 ***	0.028
Work status (*ref=unemployed*)		
Retired	**0.366 ****	0.005
Groups participation (*ref=no group participation*)	**0.165 ***	0.014
Length of residency	**0.167 ***	0.018
Online interaction frequency	**0.455 ****	0.000
Prefer face-to-face interaction	**0.182 ***	0.013

Table only displays variables that were significantly associated with place attachment.
Dependent Variable: Social Interaction.
*p<0.05, **p<0.01.

Selecting Independent Variables

The previous correlation analysis found five community park use factors were significantly and positively correlated with social interaction, including frequency of community park use, rest space satisfaction, shade space satisfaction, pedestrian connectivity with surroundings, and children's playground satisfaction. Based on the correlation results, all significant community park use variables were individually assessed after adjustment for potential confounding by control variables. These variables with $p\leq0.1$ in the single factor models were then entered into HMR models that also included forced entry of selected demographic variables.

(2) HMR Models on Social Interaction

In this study, the logical background on the order of variables into the models is based on the conceptual framework (see Figure 1.1). According to the conceptual framework and research hypotheses, a three-level HMR was performed by adding the independent variables into the models: selected demographic, social and individual factors were entered first; then, the 'frequency of community park use' was entered to examine how it varied in terms of social interaction to test the Hypothesis 1, after the factors in Model 1 had been adjusted; and finally, the correlated 'satisfaction' items in the community park use scale were entered to test the Hypothesis 3, after the factors in Model 1 and Model 2 were adjusted.
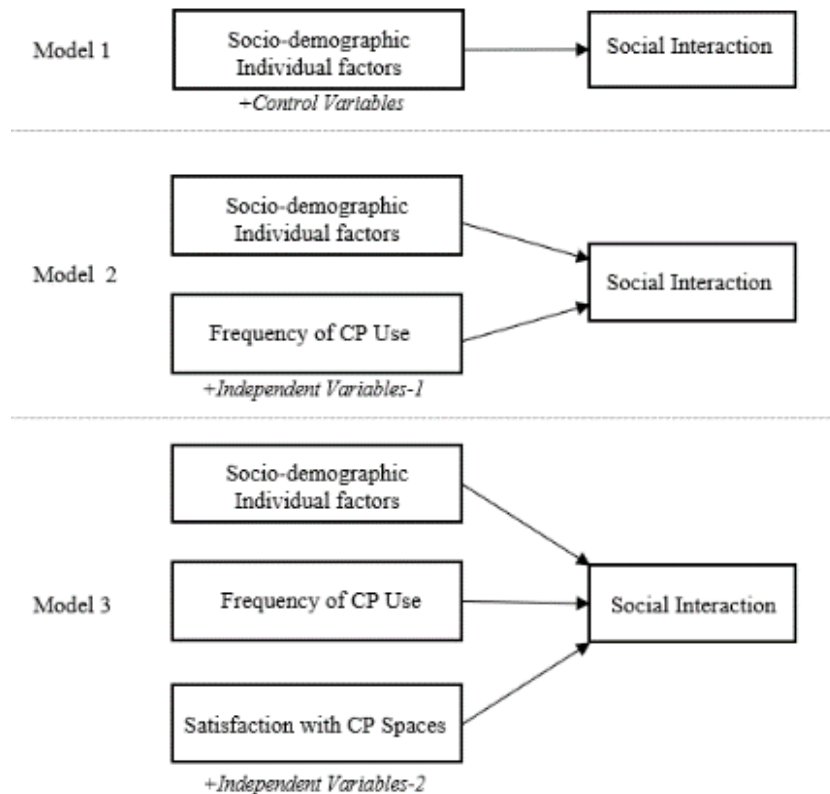
Note. CP = Community Park

Figure 4.4 Three-level HMR models on social interaction analysis

The three-level HMR models are summarised in Table 4.10. R^2 data indicated the model had a relatively good fit to the data. The R^2 value indicates how much variation of the outcome variable can be explained by the regression model's predictors (Arkes, 2019).

First, several selected demographic, individual and social variables were entered first to control for any variance in social interaction in Model 1. The control factors which are significantly correlated with social interaction were included in the regression analysis. Their order of inclusion was determined by the prevalence with which the control predictors have been examined in previous univariate general linear regression models (see Table 4.10). That is, the demographic variables were entered first followed by the individual and social variables. The MPE type was regarded as a physical environmental factor that had been included in Model 1. MPE type was treated as a dummy variable: BP was assigned 1, LG was assigned 0. This neighbourhood factor was included in the first model after adjustment for socio-demographic and individual variables. Table 4.10 with the HMR model summary shows that Model 1 was significantly related to social interaction, and 46.8% variation of the social interaction variable can be explained by the predictors in Model 1 (R^2=0.468, p<0.001).

Second, to test the Hypothesis 1: the frequency of community park use positively influences residents' social interaction, the independent factor of 'frequency of community park use' was measured separately in Model 2. The second model adjusted for the control variables to examine the variation in the social interaction variable with the addition of this variable separately. In Model 2, when the 'frequency of community park use' determinant was added to the HMR model, the increase in R^2 was statistically significant and this key determinant explained the additional 2.0% in the variance in social interaction (R^2 change=0.020, p=0.009) (see Table 4.10).

Third, to test the Hypothesis 3: the satisfaction with community park quality is significantly and positively associated with social interaction between residents in MPEs, four selected community park use variables were entered in Model 3 in a separate step. The factors in Model 3 were adjusted by the socio-demographic and individual variables in Model 1 and the variable of frequency of community park use in Model 2. Those four community park use variables that were significantly correlated with indices of social interaction were entered in the HMR model (see Table 4.10), including children's playground satisfaction, rest space satisfaction, shade space satisfaction, and pedestrian connectivity with surroundings. Other community park use variables without significant correlations with social interaction were excluded from the regression models. In Model 3, when four community park use determinants were added to the equation, the increase in R^2 was statistically significant and

the satisfaction of quality of community parks determinants explained the additional 4.3% in the variance in social interaction (R^2 change=0.043, p=0.003) (see Table 4.10).

Table 4.10 HMR model summary

Model Summary									
				Std. Error		Change Statistics			
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.684[a]	.468	.445	.64536	.468	20.160	8	183	**.000 *****
2	.699[b]	.488	.463	.63493	.020	7.059	1	182	**.009 *****
3	.729[c]	.532	.498	.61418	.043	4.126	4	178	**.003 *****

[a] Model 1   Predictors: (Constant), LG, Online interaction frequency, Retired, Married, Prefer face-to-face interaction, Length of residency, Group participation, Age 60–79.

[b] Model 2   Predictors: (Constant), LG, Online interaction frequency, Retired, Married, Prefer face-to-face interaction, Length of residency, Group participation, Age 60–79, Frequency of CP use.

[c] Model 3   Predictors: (Constant), LG, Online interaction frequency, Retired, Married, Prefer face-to-face interaction, Length of residency, Group participation, Age 60–79, Frequency of CP use, Rest space satisfaction, Pedestrian connectivity with surroundings, Children's playground satisfaction, Shade space satisfaction.

Dependent Variable: Social Interaction.

*p<0.1, **p<.05, ***p<.01.

Overall, the results of the three-level HMR model analysis on social interaction are summarised in Table 4.10. The R^2 values show that, when the three models were added to the HMR model, the increases in the R^2 values were significant. It means the models had relatively good fits to the data for HMR analysis.

(3) Regression Findings on Social Interaction

The regression findings on social interaction via HMR model analysis are discussed as follows. The standardised beta weights (β) in the HMR tables indicate the significance of each independent variable's importance in predicting the dependent variable (Punch, 2003) (see Table 4.11, Table 4.14).

Model 1

In Model 1 HMR revealed that several demographic factors were significantly associated with social interaction, including dummy variables retired and married, length of residency, online interaction frequency, prefer face-to-face interaction and group participation. The factors of online interaction frequency (β=0.430, p<0.001) showed the strongest positive influence on social interaction, followed by prefer face-to-face interaction (β=0.239, p=0.005) and dummy variable retired work status (β=0.218, p=0.025). On the other hand, dummy variable married showed a significantly negative influence on social interaction (β=-0.131, p=0.004).

Model 2

To test the Hypothesis 1: the frequency of community park use is significantly and positively associated with social interaction between residents, the independent factor of 'frequency of community park use' was added to Model 2. The second model was adjusted for the demographic-level variables to examine the variation of 'frequency of community park use' on social interaction. This step allowed the research to see the degree of the 'frequency of community park use' factor contributing to social interaction by changing the R^2 in the HMR models. The standardised beta weights (β=0.146) in the HMR model indicate relative 14.6% influence of 'frequency of community park use' predictor on social interaction and have adjusted for the factors in Model 1.

Model 3

To test the Hypothesis 3: the satisfaction with quality of community parks is significantly associated with social interaction between residents, four significant community park use factors were entered into Model 3 in a separate step. The four factors include rest space satisfaction, children's playground satisfaction, shade space satisfaction and pedestrian connectivity with surroundings. The Model 3 factors were adjusted by the demographic, individual and social variables in Model 1 and the frequency of community park use factor in Model 2. The HMR results showed that three community park use factors were significantly associated with social interaction: frequency of community park use (β=0.136, p=0.012); rest space satisfaction (β=0.128, p=0.035); and pedestrian connectivity with surroundings (β=0.093, p=0.095) which are summarised in Table 4.11 below.

Table 4.11 HMR models of the association between independent variables and social interaction [a]

Item	Model 1 [b]			Model 2 [c]			Model 3 [d]		
	B	SE	β	B	SE	β	B	SE	β
Demographic, Individual and Social Factors									
Married (*ref=single*)	−0.237	0.098	−0.131 **	−0.231	0.096	−0.128 **	−0.242	0.094	**−0.134 ****
Age (years) 60–79 (dummy variable [e])	−0.302	0.258	−0.099	−0.360	0.255	−0.118	−0.293	0.248	−0.096
Retired (dummy variable [f])	0.682	0.267	0.218 **	0.702	0.263	0.224 ***	0.604	0.256	**0.193 ****
Length of residency	0.135	0.044	0.185 ***	0.143	0.043	0.195 ***	0.133	0.042	**0.182 *****
Online interaction frequency	0.278	0.039	0.430 ***	0.266	0.039	0.412 ***	0.279	0.038	**0.433 *****
Prefer face-to-face interaction	0.191	0.046	0.239 ***	0.166	0.046	0.209 ***	0.130	0.046	**0.163 *****
Groups participation (*ref=no group participation*)	0.286	0.105	0.165 ***	0.288	0.104	0.165 ***	0.217	0.103	**0.125 ****
Liberty Grove (*ref=BP*)	0.091	0.097	0.052	0.092	0.095	0.053	0.099	0.093	0.057
Community Park Use Factor									
Frequency of community park use				0.123	0.046	0.146 ***	0.115	0.045	**0.136 ****
Children's playground satisfaction							0.027	0.040	0.038
Rest space satisfaction							0.090	0.042	**0.128 ****
Shade space satisfaction							0.048	0.046	0.063
Pedestrian connectivity with surroundings							0.071	0.042	**0.093 ***
Model R²		0.468			0.488			0.532	
ΔR²		0.468 ***			0.020 ***			0.043 ***	
ΔF		20.160			7.059			4.126	

[a] Dependent Variable: Social Interaction;

 B=unstandardised coefficients, SE=Std. Error, β=standardised coefficients.

[b] Model 1 Predictors: (Constant), LG, Online interaction frequency, Retired, Married, Prefer face-to-face interaction, Length of residency, Group participation, Age 60–79.

[c] Model 2 Predictors: (Constant), LG, Online interaction frequency, Retired, Married, Prefer face-to-face interaction, Length of residency, Group participation, Age 60–79, Frequency of community park use.

[d] Model 3 Predictors: (Constant), LG, Online interaction frequency, Retired, Married, Prefer face-to-face interaction, Length of residency, Group participation, Age 60–79, Frequency of community park use, Rest space satisfaction, Pedestrian connectivity with surroundings, Children's playground satisfaction, Shade space satisfaction.

[e] Age (60–79) is a dummy variable, where 1 represents age is 60–79 years group, and 0 represents age is in other age groups.

[f] Work status (retired) is a dummy variable, where 1 represents the participant is retired, and 0 represents other work status groups.

 *p<0.1, **p<0.05, ***p<0.01.

In summary, the HMR findings revealed that three community park use factors were significantly and positively associated with residents' social interaction in MPEs: frequency of community park use, rest space satisfaction, and pedestrian connectivity with surroundings.

4.5.3 Hierarchical Regression Analysis on Place Attachment

This section investigates the associations between community park use and place attachment using HMR analysis. A series of multivariate models were fitted to examine the relationships between the selected independent variables of community park use and place attachment. The logic on the decision on the order of variables into the HMR was that selected control variables were entered first, followed by independent variables. By selecting the order of entering variables, the HMR analysis can examine the variation on the place attachment variable with each subsequent addition of a specific independent variable.

(1) Selecting Variables

Based on the correlation analysis discussed above, control variables and independent variables with significant correlations with place attachment were systematically examined further via general linear regression analysis. Finally, the significant control variables and independent variables were entered in the HMR models.

Selecting Control Variables

First, the demographic, individual and social factors were individually assessed in univariate models. The demographic level factors were assessed in general linear models via a backwards stepwise elimination procedure ($p \leq 0.05$) to remove the redundant variables. Three demographic-level factors were significantly and positively correlated with place attachment: neighbourhood safety ($\beta=0.352$, $p=0.000$); face-to-face social interaction ($\beta=0.196$, $p=0.004$) and homeownership ($\beta=0.136$, $p=0.025$). On the other hand, one factor has a significantly negative influence on place attachment: family size ($\beta=-0.178$, $p=0.004$). Finally, these four significant control variables were entered in the place attachment regression models. The significant demographic, individual and social factors are summarised in Table 4.12.

Table 4.12 Associations between socio-demographic and individual factors and place attachment

Item	Standardised Coefficients (β)	Sig.
Neighbourhood safety	0.352 **	0.000
Prefer face-to-face interaction	0.196 **	0.004
Homeownership (Owning)	0.136 *	0.025
Family size	-0.178 **	0.004

Table only displays variables that were significantly associated with place attachment.
Dependent Variable: Place Attachment.
*p<0.05, **p<0.01.

Selecting Independent Variables

The Pearson correlation analysis showed that all community park use factors had significant correlations with place attachment (see Table 4.8). Regarding community park use factors, the strongest associations with place attachment came from 'pedestrian accessibility to parks' factor (r=0.536, p=0.000). Given that the variables were significantly associated with place attachment, they were entered as independent variables in the regression analysis. Based on the correlation results, all significant community park use variables were individually assessed after adjustment for potential confounding by control variables. As a result, all nine community park use factors showed significant correlates of the place attachment variable with $p \leq 0.1$. All these community park use variables were then entered into HMR models that also included forced entry of selected demographic variables.

(2) HMR Models on Place Attachment

A hierarchical regression model was conducted to evaluate the impact of the independent variables on place attachment. Based on the theoretical framework and research hypotheses of this study, a three-level HMR was performed by adding independent variables with each iteration of the model (see Figure 4.5).
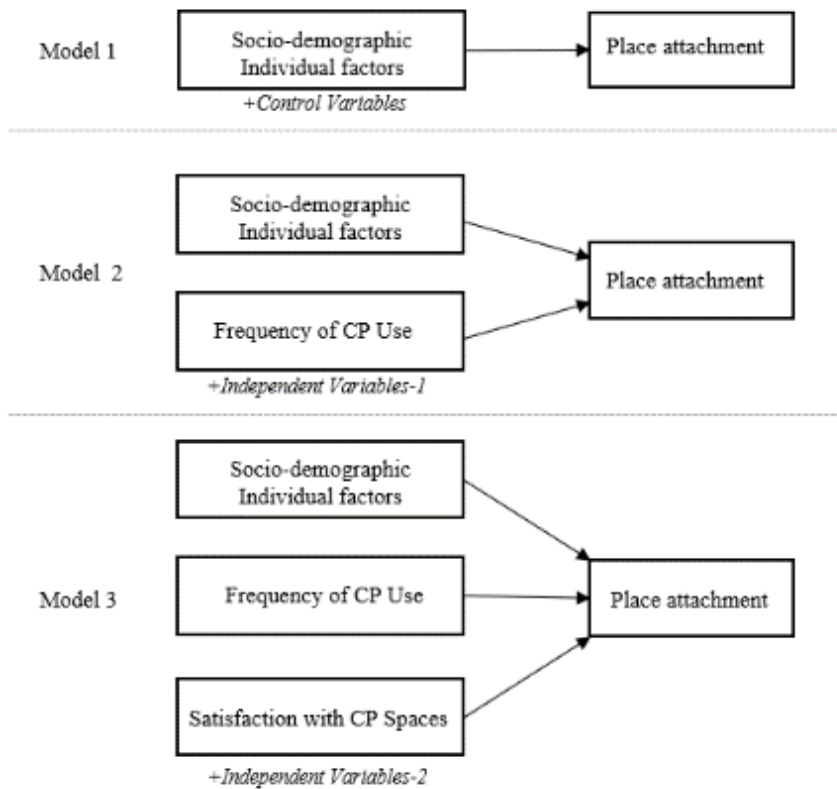
Note. CP = Community Park

Figure 4.5 Three-level HMR models on place attachment analysis

The three-level HMR models are summarised below and in Table 4.13. Three models are summarised below.

First, in Model 1, the significant correlated demographic, individual and social variables in Table 4.13 were entered first in the HMR regression model, then MPE type (BP) had been included as a physical environmental factor. The order of inclusion was determined by the prevalence with which the control predictors have been examined in previous general linear models. The SPSS model summary in Table 4.13 shows that Model 1 was significantly related to place attachment. The control variables explained a significant amount of the variance in place attachment (35.1%) in Model 1 (R^2=0.351, p=0.000).

Second, to test the Hypothesis 2: frequency of community park use positively influences residents' place attachment, the independent factor of 'frequency of community park use' was measured separately in Model 2. The second model adjusted for the control variables to

examine the variation in the place attachment variable with the addition of this variable separately. After adding the factor of 'frequency of community park use', Model 2 improved R^2 by 1.8% over Model 1 (p=0.025).

Third, to test the Hypothesis 4: the satisfaction with quality of community park positively influences residents' place attachment, eight significant community park use factors were entered in Model 3 in a separate step, adjusted by Model 1 and Model 2. All eight satisfaction factors in Model 3 showed significant associations with place attachment in Model 3, after adjusting by the factors in Model 1 and Model 2. In Model 3, when eight community park use factors were added to the HMR models, the increase in R^2 was statistically significant and these determinants explained an additional 21.4% in the variance on place attachment (R^2 change=0.214, p=0.000) (see Table 4.13).

Table 4.13 HMR model summary of place attachment

Model Summary									
				Std. Error of the Estimate	Change Statistics				
Model	R	R Square	Adjusted R Square		R Square Change	F Change	df1	df2	Sig. F Change
1	.592[a]	.351	.333	.61293	.351	20.083	5	186	**.000 ***
2	.607[b]	.368	.348	.60623	.018	5.134	1	185	**.025 **
3	.763[c]	.582	.549	.50400	.214	11.333	8	177	**.000***

[a] Model 1 Predictors: (Constant), BP, Prefer face-to-face interaction, Owning, Family size, Safety.

[b] Model 2 Predictors: (Constant), BP, Prefer face-to-face interaction, Owning, Family size, Safety, Frequency of community park use.

[c] Model 3 Predictors: (Constant), BP, Prefer face-to-face interaction, Owning, Family size, Safety, Frequency of community park use, Recreation space satisfaction, Rest space satisfaction, Children's playground satisfaction, Nature space satisfaction, Shade space satisfaction, Sporting space satisfaction, Pedestrian accessibility to parks, Pedestrian connectivity with surroundings.

Dependent Variable: Place Attachment.

*p<0.1, **p<0.05, ***p<0.01.*

Overall, the results of the place attachment three-level HMR model analysis shows that when the three models were added to the HMR model, the increases in the R^2 values were significant. It means the models had relatively good fits to the data for HMR analysis.

(3) Regression Findings on Place Attachment

The HMR results in the three models are presented in Table 4.14 and summarised below.

Model 1

Model 1 explained 35.1% of the variance of place attachment. Model 1 revealed that at the demographic level, neighbourhood safety, face-to-face social interaction, home owning and family size were significantly associated with place attachment. Specifically, the factors of neighbourhood safety (β= 0.353, p<0.001) showed the strongest positive influence on place attachment, followed by face-to-face social interaction (β=0.195, p=0.005) and home owning (β=0.137, p=0.025). On the other hand, family size (β=-0.181, p=0.004) showed a significantly negative influence on place attachment.

Model 2

Model 2 added in the independent factor of 'frequency of community park use' and showed Model 2 improved R^2 by 1.8% over Model 1. At this step, the estimate for frequency of community park use suggested that frequency of community park use has significant and positive impacts on residents' place attachment. The standardised beta weights (β=0.137) indicate relative 13.7% influence of frequency of community park use predictor on place attachment after adjusting for the correlated factors in Model 1 (see Table 4.14).

Model 3

Model 3 had an R^2 of 0.214 adjusted by Model 1 and Model 2. When eight community park use factors were added to the HMR models, Model 3 explained an additional 21.4% of the variance, which was strongly significant. Specifically, three factors were found to have strong significant associations with place attachment. Pedestrian accessibility to parks (β=0.253, p=0.000) shows the highest correlation with place attachment, contributing 25.3% of the influence of predictors on place attachment, followed by children's playground satisfaction

(β=0.17, p=0.000). Pedestrian connectivity with surroundings (β=0.127, p=0.001) contributed 12.7% of the positive influence of predictors on place attachment.

Table 4.14 HMR models of the association between independent variables and place attachment [a]

Item	Model 1 [b]			Model 2 [c]			Model 3 [d]		
	B	SE	β	B	SE	B	B	SE	β
Demographic, Individual and Social Factors									
Safety	0.242	0.049	0.353***	0.235	0.049	0.344 ***	0.123	0.043	**0.179 *****
Prefer face-to-face interaction	0.135	0.047	0.195***	0.121	0.047	0.175 **	0.075	0.040	**0.109 ***
Owning (ref=renting)	0.218	0.096	0.137**	0.201	0.095	0.127 **	0.078	0.082	0.049
Family size	-0.109	0.038	-0.181***	-0.100	0.038	-0.165 ***	-0.069	0.032	**-0.114 *****
BP (ref=LG)	-0.026	0.091	-0.018	-0.022	0.090	-0.015 ***	-0.022	0.078	-0.015
Community Park Use Factor									
Frequency of community park use				0.100	0.044	0.137 **	0.056	0.038	0.076
Recreation space satisfaction							0.058	0.043	0.081
Rest space satisfaction							0.056	0.035	0.092
Children's playground satisfaction							0.099	0.035	**0.162 *****
Nature space satisfaction							0.057	0.038	0.091
Shade space satisfaction							0.019	0.038	0.029
Sporting space satisfaction							0.039	0.037	0.061
Pedestrian accessibility to parks							0.107	0.037	**0.177 *****
Pedestrian connectivity with surroundings							0.093	0.036	**0.141 *****
Model R^2	0.351			0.368			0.549		
ΔR^2	0.351 ***			0.018 **			0.214 ***		
ΔF	20.083			5.134			11.333		

a.   Dependent Variable: Place attachment;
    B=unstandardised coefficients, SE=Std. Error, β=standardised coefficients.
b.   Model 1 Predictors: (Constant), BP, Prefer face-to-face interaction, Owning, Family size, Safety.
c.   Model 2 Predictors: (Constant), BP, Prefer face-to-face interaction, Owning, Family size, Safety, Frequency of community park use.
d.   Model 3 Predictors: (Constant), BP, Prefer face-to-face interaction, Owning, Family size, Safety, Frequency of community park use, Recreation space satisfaction, Rest space satisfaction, Children's playground satisfaction, Nature space satisfaction, Shade space satisfaction, Sporting space satisfaction, Pedestrian accessibility to parks, Pedestrian connectivity with surroundings.

*p<0.1, **p<0.05, ***p<0.01.

In summary, HMR findings were that pedestrian accessibility to parks, pedestrian connectivity with surroundings, and satisfaction with children's playgrounds in parks were significantly and positively associated with place attachment.

4.6 Frequent and Infrequent Park Use Group Analyses

The HMR analysis found several community park use factors were significantly associated with social interaction and place attachment. To further understand in which ways community park use influences social interaction and place attachment, one-way between-group ANOVA was conducted with frequent and infrequent park use groups. The participants were divided into frequent park use and infrequent park use groups for comparison. Frequent park use is defined as using parks at least once a week; and infrequent park use is defined as using parks less than once a week (Francis et al., 2012). Frequent and infrequent park use groups were compared to see if there were differences between the two groups regarding residents' satisfaction with quality of community park space, satisfaction with parks' pedestrian integration, social interaction (including its underlying components: quantity of strong ties social interaction, quantity of weak ties social interaction and social network size), and place attachment (including its underlying components: cognitive component, behavioural component, affective component).

ANOVA analysis revealed several key differences between frequent park use and infrequent park use groups: 1) frequent park users had higher level social interaction, especially having more weak ties social interaction frequency and more neighbour friends; 2) frequent park users had higher place attachment; and 3) frequent park users had higher satisfaction with parks' pedestrian accessibility to parks. The results are discussed below specifically.

First, using parks more than once a week had higher level social interaction, especially having more weak ties social interaction frequency and more neighbour friends. The ANOVA test found that frequent park users had significantly higher social interaction (M=3.69, SD=0.82) than infrequent park users (M=2.98, SD=0.98) (see Table 4.15). Specifically, the frequency of weak ties social interaction was significantly different between the two groups with $p<0.001$. Frequent park users perceived significantly more weak ties social interaction (M=3.71, SD=1.07) than infrequent park users (M=3.48, SD=0.68). In addition, the ANOVA

test found that frequent park users had a significantly wider neighbourhood social network (M=3.71, SD=1.07) than infrequent park users (M=3.48, SD=0.68).

Second, using parks more than once a week had higher place attachment. The ANOVA test found that frequent park users perceived higher place attachment (M=3.71, SD=1.07) than infrequent park users (M=3.48, SD=0.68) significantly with $p<0.001$. Specifically, ANOVA results found that frequent park users had significantly higher level of behavioural items (M=3.71, SD=0.74) than infrequent park users (M=3.46, SD=0.88) significant at $p=0.048$. Frequent park users had much higher place identity (cognitive items) (M=3.73, SD=0.74) than infrequent park users (M=3.43, SD=0.84) significant at $p=0.005$. Frequent park users had much higher place affect (affective items) (M=3.71, SD=0.74) than infrequent park users (M=3.46, SD=0.88) significant at $p=0.048$.

Third, the ANOVA test found that frequent park users had significantly higher satisfaction with pedestrian accessibility to parks (M=3.71, SD=1.07) than infrequent park users (M=3.48, SD=0.68).

Table 4.15 summarises the ANOVA results for the frequent and infrequent park user groups analysis, and Table 4.16 presents the descriptive statistics of the two groups.

Table 4.15 Summary of ANOVA for frequent vs infrequent park use group analysis

		Sum of Squares	df	Mean Square	F	Sig.
ANOVA						
SI	Between	5.651	1	5.651	7.796	**.006 *****
	Within Groups	137.736	190	.725		
	Total	143.387	191			
Quantity of strong tie SI	Between	2.546	1	2.546	1.871	.173
	Within Groups	258.505	190	1.361		
	Total	261.051	191			
Quantity of weak tie SI	Between	21.580	1	21.580	17.46	**.000 *****
	Within Groups	233.478	189	1.235		
	Total	255.058	190			
SI network size	Between	3.753	1	3.753	3.960	**.048****
	Within Groups	180.060	190	.948		
	Total	183.812	191			
PA	Between	6.726	1	6.726	12.66	**.000*****
	Within Groups	100.875	190	.531		
	Total	107.601	191			
Behavioural component	Between	5.727	1	5.727	8.015	**.005*****
	Within Groups	135.759	190	.715		
	Total	141.486	191			
Cognitive component	Between	6.504	1	6.504	9.554	**.002*****
	Within Groups	129.338	190	.681		
	Total	135.842	191			
Affective component	Between	8.958	1	8.958	10.36	**.002*****
	Within Groups	164.166	190	.864		
	Total	173.124	191			
Satisfaction with CP space	Between	1.211	1	1.211	1.970	.162
	Within Groups	116.793	190	.615		
	Total	118.003	191			
Pedestrian accessibility to parks	Between	7.135	1	7.135	4.758	**.030 ****
	Within Groups	284.943	190	1.500		
	Total	292.078	191			
Pedestrian connectivity with surroundings	Between	1.656	1	1.656	1.275	.260
	Within Groups	246.823	190	1.299		
	Total	248.479	191			

*$p<0.1$, **$p<0.05$, ***$p<0.01$.

Table 4.16 Descriptive statistics of frequent and infrequent park use groups

		Mean	Std. Deviation	Std. Error
SI	Infrequent park-use	2.6617	.80483	.09172
	Frequent park-use	3.0117	.88112	.08216
Quantity of strong tie SI	Infrequent park-use	2.5390	1.06303	.12114
	Frequent park-use	2.7739	1.23054	.11475
SI network size	Infrequent park-use	2.6104	.90548	.10319
	Frequent park-use	2.8957	1.01630	.09477
Quantity of weak tie SI	Infrequent park-use	3.03	1.119	.128
	Frequent park-use	3.71	1.106	.103
PA	Infrequent park-use	3.3799	.67449	.07687
	Frequent park-use	3.7618	.76261	.07111
Behavioural	Infrequent park-use	3.3810	.82134	.09360
	Frequent park-use	3.7333	.86089	.08028
Cognitive	Infrequent park-use	3.4535	.77132	.08790
	Frequent park-use	3.8290	.85902	.08010
Affective	Infrequent park-use	3.3636	.93413	.10645
	Frequent park-use	3.8043	.92645	.08639
Satisfaction with CP space	Infrequent park-use	3.5158	.67201	.07658
	Frequent park-use	3.6778	.85055	.07931
Pedestrian accessibility to parks	Infrequent park-use	3.47	1.209	.138
	Frequent park-use	3.86	1.235	.115
Pedestrian connectivity with surroundings	Infrequent park-use	3.58	1.104	.126
	Frequent park-use	3.77	1.163	.108

In summary, ANOVA analysis found that frequent park use (more than once a week) was significantly associated with social interaction, especially for weak ties social interaction. In addition, frequent park use was significantly associated with place attachment. Frequent park users had higher satisfaction with pedestrian accessibility to parks. Significant differences of satisfaction with community park space were not found between the two groups.

4.7 Summary

The quantitative study investigated the associations between community park use, social interaction and place attachment in MPEs through a survey of 192 residents in BP and LG. The principal component analysis extracted three components for the social interaction scale: quantity of strong ties social interaction, quantity of weak ties social interaction and social network size. Principal component analysis extracted three components for the place attachment scale: cognitive, behavioural and affective components. The hierarchical multiple regression analysis found that three community park use factors are significantly and positively associated with residents' social interaction in MPEs: frequency of community park use, rest space satisfaction, and parks' pedestrian connectivity with surroundings. The hierarchical multiple regression also found three community park use factors are significantly and positively associated with place attachment in MPEs: children's playground satisfaction, pedestrian accessibility to parks and parks' pedestrian connectivity with surroundings. ANOVA analysis found that frequent park users (more than once a week) had a significantly higher level of social interaction and place attachment and had significantly more weak ties social interaction than infrequent park users in MPEs. The quantitative results are further clarified and explained by the qualitative data discussed in the following chapters.

Chapter 5   Findings of the Qualitative Study

This chapter presents the analyses and findings from the semi-structured interviews. The qualitative interview study provided additional information on the research questions and further explained the survey findings in depth. The 'how' and 'what' research questions are more appropriate for qualitative inquiry to obtain a comprehensive understanding of behavioural, psycho-environmental process and manifestations of social interaction and place attachment in MPEs. The qualitative study aims to answer the 'how' and 'what' research questions as follows: (RQ1) 'how do residents use community parks in MPEs?'; (RQ3) 'how do the community park use factors affect residents' social interaction in MPEs?'; (RQ4) 'what are the psychological processes of place attachment to community parks in MPEs?'; and (RQ6) 'how do the community park use factors affect residents' place attachment in MPEs?'.

All interviews were recorded and transcribed verbatim. Interview transcripts were then analysed using NVivo 12 software by thematic analysis method. The following sections present key findings related to the research questions (RQ1, RQ3, RQ4, RQ6) from 16 semi-structured interviews with BP and LG residents in 2022. Participants have been identified by code number (P01–P16) to protect their identity (see Table 3.4).

5.1 Behavioural Patterns of Community Park Use

This section aims to answer research question 1 (RQ1) 'how residents use community parks in MPEs?'. Before discussing the relationship between community park use and social interaction and place attachment, this study first explored the residents' behavioural patterns and characteristics of community park use. McClelland's (1961) needs theory recognised that need is essential of motivation 'rooted in a desire to shape circumstances and influence others' (Nowell & Boyd, 2010, p. 833). Therefore, understanding residents' behaviour needs and patterns of community park use are essential to explore how they cultivate social ties and emotional bonds in neighbourhoods (Han et al., 2022; Kaźmierczak, 2013). When asked 'what do you like to do in the parks in BP/LG?', the participants reported various activities occurring in community parks in MPEs, including the activities of community park use during

the COVID-19 period. Interviews found that residents' behaviours in community parks consist of two main categories: individual activities and social activities. Figure 5.1 presents the themes and subthemes of behavioural patterns of community park use identified throughout the interviews. The themes and subthemes are further discussed as follows.
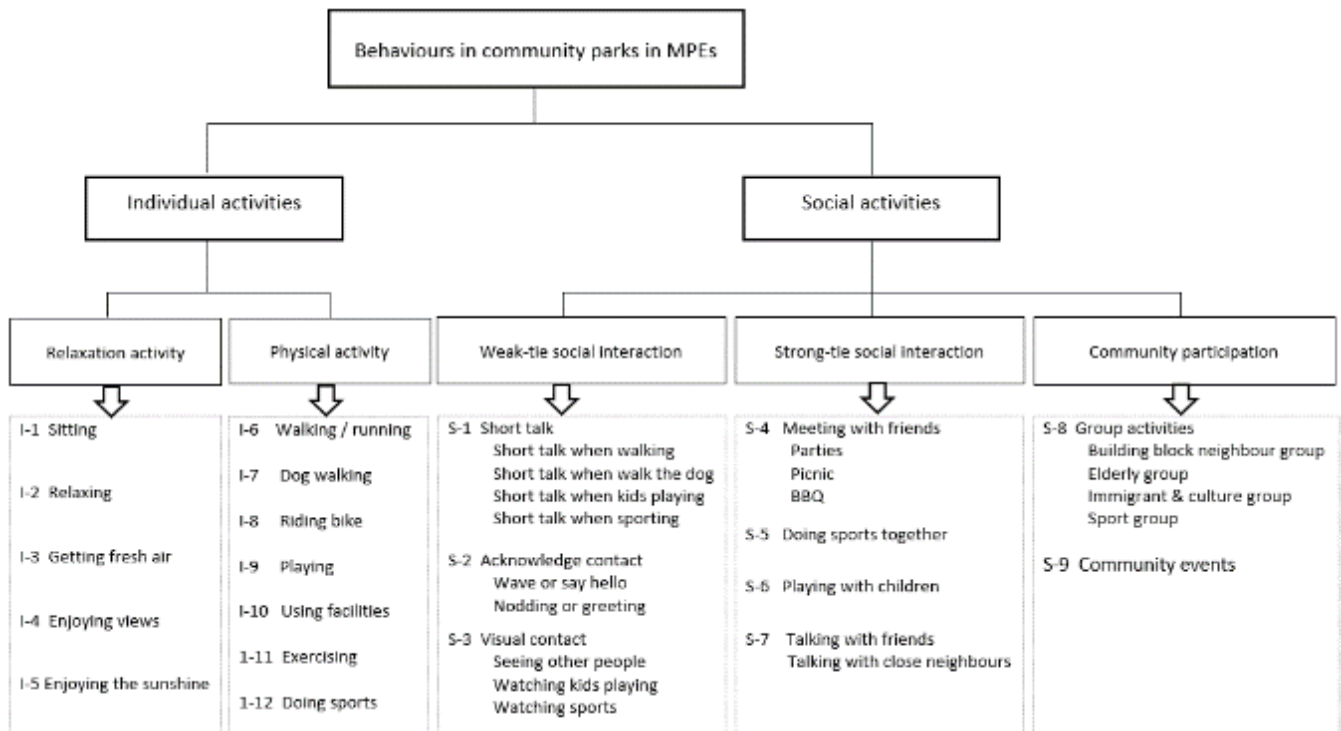
Figure 5.1 Behavioural patterns of community park use in MPEs

Source: Based on interviews in 2022 during the COVID-19 pandemic

5.1.1 Individual Activities

Individual activity was the first main dimension of community park use behaviours that emerged from the analysis of interview data. Residents' individual activities mainly consisted of two themes: relaxation activity and physical activities. In addition, there were sporadic necessary behaviours mentioned in interviews, such as 'passing through'. For the theme of relaxation, five subthemes were identified: sitting, relaxing, getting fresh air, enjoying views, and enjoying the sunshine. Two participants noted:

> P16: 'I just go for a walk, relax and spend some time there sitting on a bench, get some fresh.' (LG, age 20–39).

> P05: 'We would get out to the community parks every day to get some fresh air and exercises during the COVID pandemic.' (BP, age 20–39).

For the theme of physical activities, seven activities were mostly mentioned by participants, including walk or run, walk the dog, do sports, do exercises, ride bike, play, and use facilities. Significantly, the most popular individual activity in community parks was walking, as almost all participants stated that they regularly take a walk in the parks. During the COVID-19 pandemic, walking has become the prominent individual behaviour for park use. As several participants stated:

> P15: 'Just walking, just enjoy there. It's just quite a bit of place I like it. (…) That's probably several times a day. Since COVID, it's same, because we have dogs, so we have to walk dogs every day.' (LG, age 60+).

> P12: 'I walk, mostly for walk, and relax, sometimes doing some activities. While I walk with my (baby) son, I think it is very relaxed.' (LG, age 20–39).

> P08: 'I think we did a lot of walking (in parks) during lock down.' (BP, age 20–39).

5.1.2 Social Activities

When asked about social activities, the participants were unanimous in the view that social activities and social interaction were important needs and motivations for them to visit community parks in MPEs. Based on the social network system theory and qualitative data, this section analysed residents' characteristics of social interaction with or from social ties. Three main themes emerged from analysis of interview data: weak ties social interaction, strong ties social interaction, and community participation social interaction. The term weak tie refers to friendly bonding with not close or unfamiliar neighbours. The term strong tie was defined by the residents as having a relationship with family, relatives, friends or close neighbours with interpersonal familiarity. Community participation means communication with the community or neighbourhood groups.

These themes were further specified in the subthemes identified from qualitative data (see Figure 5.1). First, three subthemes were identified for weak ties social interaction: short talk (e.g., stop and short talk when walking, short talk when walking the dog, short talk when kids playing, short talk when playing sport); acknowledge contact (e.g., greeting); and visual contact (e.g., see other people). Second, four subthemes were identified for strong ties social

interaction: meet friends (e.g., BBQ/picnic); do sports together, play with children and their friends at parties; and talk with friends or close neighbours. Third, two subthemes were identified for community participation social interaction: group activities, and community events. Among these subcategories, playing with children was the most common indicator of social community activities, followed by meeting friends and participating in group activities. The following sections discuss the characteristics of social activities identified from interview data.

(1) Strong Ties Social Interaction

Strong ties social interaction was the most prominent dimension of social interaction that emerged from interview data. Most participants mentioned that they have some close neighbour friends in their neighbourhood. Interview data indicates that the number of neighbour friends seems related to the length of residence. When asked 'how many close neighbour friends do you have in BP/LG?' participants who have lived there for more than 5 years had an average of 5–6 close neighbour friends. By contrast, participants who have lived there less than one year reported an average of 0–2 close neighbour friends. Interviews suggested that there is a correlation between residence length and strong ties social network size.

Benefits of strong ties social interaction for wellbeing

Interviews revealed that park-related strong ties social interaction could bring physical and mental benefits to residents. Participants expressed that strong ties social interaction benefits residents' wellbeing by providing a sense of social support, social influence and social engagement for them. First, strong ties social interaction can help residents' social engagement. Most people mentioned that meeting friends in parks was good for their physical and mental benefits, especially during the COVID-19 pandemic (e.g., P03, P15). Commenting on park-related strong ties social interaction, one interviewee said:

> P15: 'I think because I could just get out, and just all people living there could interact with you. That was good to everyone.' (LG, age 60+).

Second, strong ties social interaction facilitates social support. Strong ties social interaction can provide help or emotional bonds with neighbours. For example, P04 (BP) said she got social support from her relatives living in BP and next-door neighbours. Similarly, P05 (BP) and P09 (LG) mentioned that they provided some help and social supports when their close neighbours got COVID-19. When asked 'do you think you can get some social support from the community?', the majority of participants agreed with the statement that strong ties social interaction facilitated social support to residents. One participant stated:

> P15: 'Yes, because I am also on the strata committee, so I already do little things like that. Yes, we do. We talk about the building, of course, because we all live there and some things.' (LG, age 60+).

Third, strong ties social interaction has benefits for social influence. The majority of participants mentioned that for close neighbours, they might have some social impact on each other. For example, some participants mentioned that they would like to give some inner thoughts and suggestions to close neighbours (e.g., P04) and share information with them (e.g., P09). One participant stated:

> P05: 'We have friends that live within Breakfast Point at different ages. (…) We are going to actually quite closer and talk about things in terms of very close.' (BP, 20–39).

It is notable that strong social ties social interaction seems more important for vulnerable people, such as children and the elderly. Strong ties social interaction may provide support, help and influence for them. Talking about this issue, one immigrant resident stated social ties social interaction is very important for some immigrant elderly people in the neighbourhood, and said:

> P02: 'For elderly migrants like my mum, they don't often go out, most of their activities are within the neighbourhood. So elderly people often gather together in the parks with friends with similar culture backgrounds. We know quite a few Chinese migrants in this community. (…) These social ties benefit the elderly's physical and mental health, particularly during the COVID pandemic.' (BP, age 40–50).

Types of strong ties strong interaction occurring in community parks

Regarding the types of strong ties social interaction occurring in community parks, four subthemes emerged from the interview data analysis: meet friends, do sports together, play with children and friends, and talk with friends. The key findings were highlighted below.

Meet with friends. Meeting with friends was the most important subcategory of park-related strong ties social interaction which was mentioned by almost all participants. The majority of participants talked about how they used the community parks to meet their friends, such as having parties, picnics or BBQs. Two participants stated:

> P14: 'Sometimes we have barbecues, sometimes we have picnics, sometimes when it's the kids' birthdays, we celebrate there.' (BP, age 40–59).

> P13: 'We used to celebrate all the birthday parties in the parks and have picnics.' (LG, age 20–39).

Talking about the issue of social life in the neighbourhood during COVID-19, some participants pointed out they appreciated having outside parks in BP and LG to meet with friends during COVID-19, as an interviewee said:

> P03: 'I think there are some really nice parks, good for sort of picnics. It was good in the COVID lockdown time, because it was places to go that were really close by. (…) The barbecue facilities are really good for getting together with friends.' (BP, age 40–59).

Play with children. Playing with children's friends was another most frequently mentioned activity of strong ties social interaction. Quite a few participants reported they have friends who have kids at the same age living within the community. They used parks for playdates to meet their kids' friends. They use children's facilities for playing together, such as children's playgrounds. Interviews conveyed the importance of children's play facilities for residents' social wellbeing in MPEs. Two participants stated:

> P01: 'We have some kids' friends at the same age in Breakfast Point. (…) We may often play there with children or other parents. (…) We use the facilities in the parks with friends or other parents choosing together.' (BP, age 40–59).

> P02: 'We take children out to play with neighbours' kids together because children could have more fun. (…) There is a park next to us that is newly open, the children's playground there is also very good. (…) Because it is convenient to

get the surrounding parks by walking, we can have more social interactions with neighbours and their kids together.' (BP, age 40–50).

Do sports together. Another subtheme from the interview data was doing activities or sport together with friends or close neighbours, such as taking a walk with neighbours, or playing tennis with neighbour friends. For example, one retired woman mentioned she sometimes goes out walking with her next-door neighbour, even during the COVID-19 pandemic:

> P04: 'Like this morning, announcement released to the next-door neighbour while I was walking, she was walking too. (…) During COVID, we used to stand further and initially we were wearing masks, but we still chat and walk with the people we already know.' (P04, age 60+).

Talk with friends/close neighbours. Most of the participants said they would like to talk with familiar neighbours, even after COVID-19 happened. Some residents still talk with close neighbours during COVID-19, with some behavioural changes such as wearing masks and standing further apart. To illustrate this point, consider the following quotes from participants which expressed residents would have a longer chat with familiar and close neighbours, even during the COVID-19 pandemic:

> P04: 'I would be more walking around, not driving, walking. So, when you're walking around in this area, you have some social interactions with other people, such as some, are familiar neighbours... you do make people to say hello to and make inner passing comments… and I keep leading the same people who you might have a few words with and try to.' (BP, 60+).

> P05: 'We see the same people every morning, and after seeing them every day for a little while, we then stopped to chat. We would say hello to familiar faces. Even after COVID happened, during restriction times, we would then stop and have a longer chat with those people. (…) We were stopping and talking to people, so any doubt neighbours that we know if they live in the building…especially during COVID and stop by that... We go for a walk in the mornings with the same sort of faces.' (BP, age 20–39).

> P14: 'I only talk with the ones we already know, with the familiar neighbours. (…) we have some talks with neighbours when we meet them, such as talk about somethings about COVID and sometimes we chat about the kids, studies, shopping and everything like that.' (BP, age 40–59).

Most respondents said they still see their friends regularly even since the COVID-19 outbreak, except for the lockdown period (e.g., P03, P16). However, the method of strong ties social

interaction has changed to more outdoor interactions in the communal open space in the neighbourhood. Community parks therefore seem to be more important for social interaction now than before the COVID-19 outbreak.

(2) Weak Ties Social Interaction

Weak ties social interaction was the second most common dimension of social interaction that emerged from interview data. Respondents mentioned various forms of general social activities that take place in the parks.

Benefits of weak ties social interaction for wellbeing

Participants expressed that weak ties social interaction is important for their wellbeing and health, especially during the COVID-19 pandemic. Respondents mentioned that weak ties social interaction give them opportunities for social engagement, especially for elderly people (e.g., P04, P10). Moreover, quite a few participants stated the importance of weak ties social interaction for their mental health during the COVID-19 pandemic. Participants mentioned that during the lockdown weak ties social interaction is one of the few ways for them to get social engagement and to reduce the sense of social isolation, which was important for their mental health. As several participants stated:

> P05: 'During the COVID pandemic lockdown, you can't speak, but going out for a short social interaction is actually needed.' (BP, age 20–39).

> P02: 'We can go out for some short social interactions in the neighbourhood, which is really needed during the pandemic. I feel comfortable for that. I think that's one of the benefits of living in a neighbourhood like Breakfast Point.' (BP, age 40–59).

The majority of participants stated that they had some outdoor weak ties social interaction during COVID-19 that even increased more than before the COVID-19 outbreak. This is an interesting finding. Respondents stated they needed outdoor weak ties social interaction during COVID-19, which is beneficial for gaining a sense of social engagement, and reducing stress and isolation during the pandemic. Talking about the benefits of weak ties social interaction during COVID-19, some interviewees said:

P03: 'It's good to have a place like community parks. You need to go outside, and with all the people, particularly during COVID'. (BP, age 40–59).

P13: 'We went out a lot and got interactions during the COVID time. We used to have those (friends) get together, and suddenly it has dropped in limited interaction. (…) It (the park) in fact impacted mental health a lot.' (LG, age 40–59).

P15: 'I think so because I could just get out, and just all people living there could interact with you. That was good to everyone.' (LG, age 60+).

Types of weak ties social interaction occurring in community parks

Regarding the types of weak ties social interaction occurring in community parks, interview data shows three prominent types of weak ties social activities: short talk (e.g., stop and short talk when walking, short talk when walking the dog, short talk when kids playing, and short talk when playing sport); acknowledge contact (e.g., greeting); and visual contact (e.g., see other people). The subthemes were discussed below.

Stop and talk. Most participants stated that they often stop and have a short chat with the people they know but are unfamiliar when walking in parks. Some participants stated they still stop to chat even during the COVID-19 pandemic, but wearing masks (e.g., P04). As two participants stated:

P14: 'During COVID, sometimes we kept the distance with the neighbours, we still talk. (….) When we met them, like sometimes we go shopping, sometimes we go to parks, if we met the neighbours, we would just chat for a couple of minutes.' (BP, age 40–59).

Short talk when walking the dog. It is noticeable some participants stated that they met people through dogs. Therefore, weak ties social interaction may occur when they are out walking with their dogs. As one retired elderly person stated:

P04: 'We use community parks pretty much because we walk a dog through them. (…) I think the community parks are very nice places to walk that probably do encourage social interaction when you're out walking, especially have a short talk with people who have dogs. I've met people through that, the dog.' (BP, age 70+).

Short talk when kids playing. Having short talks when children are playing was another way for weak ties social interaction with neighbours, especially for young residents with children at home. As two participants stated:

> P05: 'There are playgrounds or anything like that for the kids in parks, which provide enough space for the people to sort of play around and interact, such as a short talk with other parents.' (BP, age 20–39).

> P12: 'Before and after COVID, we have some social interactions, but not a lot, because we are new here. But I have my son so that we walk and talk a little bit with others.' (LG, age 20–39).

Short talk when playing sport. Participants stated that they often have a short chat with neighbours while doing sports, exercising, or watching sports.

> P15: 'It's sometimes (for social interaction). We do sometimes based on a couple of sports, but a couple of neighbours we used to bump into.' (LG, age 60+).

In addition, participants also mentioned that a short talk with neighbours may positively impact their feelings, especially during the COVID-19 pandemic. For example, one resident stated:

> P05: 'You can go out for a walk. You may say hello to most people. It's glad that the small stuff of people can chat for a bit. It's just got a very good positive. (…) I think Breakfast Point attracts young families because of the older demographic. Everyone seems to be really friendly, like you can walk out for a walk and most people will say 'hi' like this small stuff. It's glad to chat for a bit when you walk around. It's just got a very good positive.' (BP, age 20–39).

Greet. Most participants said they would greet and say 'hello' to people in parks, including familiar or unfamiliar neighbours. Greeting was the most prominent social activity for weak ties social interaction identified from interviews. As three participants stated:

> P02: 'When we are walking in the parks in the morning, almost everyone would greet and say hello with us, whether you know them or not.' (BP, age 40–59).

> P10: 'I always say hello, although I didn't really know a lot of the neighbours.' (LG, age 60+).

> P13: 'We usually stop by to interact with others for people we know that are in the building or not in the same building. Yes, definitely, it's very common. (…) It's not just the people we know or are friends with.' (LG, age 20–39).

Seeing people. Another type of weak ties social interaction identified from data was just visual contacts by seeing other people. Some participants felt the relationship among neighbours may grow through just visual contacts in parks. Some participants noted that they visit the parks simply to see and hear others, such as seeing friendly faces, seeing kids playing, and seeing parties. For instance, two older participants stated:

> P10: 'I think sometimes we have seen lots of kids and people enjoying themselves in parks. Some people sit and watch the parties there. I have seen a couple of parties in parks.' (LG, age 60+).

> P04: 'It is lovely seeing kids playing. (…) you stop and have conversations.' (BP, age 70+).

In particular, some participants mentioned that these visual contacts might positively impact their feelings during COVID-19. Some residents mentioned seeing other people might give them a sense of social engagement, which was emotionally needed during the lockdown. As two participants stated:

> P04: 'When we walked through, there is always someone in the park. It encourages me to get out if there are pleasant places to go.' (BP, age 70+).

> P12: 'During COVID-19, because I am at home all day, so it's good to go out for walks and see some other people and babies.' (LG, age 20–39).

The interviews also showed the needs of different age groups for socialising. Overall, elderly respondents expressed more social needs, especially paying more attention to weak ties social interaction. The most common activity for older people is walking in parks. The pedestrian park network may facilitate social activities for older people. Young families socialise more around children and sports. Interviews suggested that sports facilities should take into account the needs of children of different ages.

(3) Community Participation

Community participation was the third common dimension of social interaction that emerged from the interviews.

Benefits of community participation for wellbeing

Most respondents mentioned that community activities can be helpful for their physical and mental health. Participants expressed that community participation can provide opportunities for them for both weak ties social interaction and strong ties social interaction, and also give them a sense of social engagement, social influence and support for them which are discussed below. First, community participation benefits their social engagement. It was suggested that participating in community activities allows residents to get more opportunities to participate in this social engagement and to meet some familiar or unfamiliar neighbours. Some residents said they met some unfamiliar neighbours in community activities and may slowly develop these relationships into strong social relationships (e.g., P06, P12). As one interviewee reported:

> P06: 'There were some community activities there. It was a good opportunity for you to know other neighbours. (…) It would bring closer for each other, even just know each other. You can say 'hi' or something like that when you were there.' (LG, age 40–59).

Second, community participation helps social support and influence. Participating in community activities can bring them some social influence and support or get some emotional communication with others (e.g., P02). Some participants stated that community activities are great opportunities for them to integrate into the social role of the community (e.g., P04, P09, P11). For example, talking about this issue about how the community group gave a sense of social support, one community group mentioned by participants was the WatchOut group in LG which refers to a community-based group built by local neighbourhood watch volunteers to help each other stay safe, as an elderly interviewee said:

> P11: 'The WatchOut group organised by residents aims to help each other.' (LG, age 60+).

Types of community activities occurring in community parks

Regarding the types of community activities in MPEs, two inductive subthemes emerged from the analysis of interview data: group activities and community events. These results reflect MPEs' features. Two subthemes were demonstrated below.

Group activities. Various group activities occurred in parks. Four types of specific group activities were most commonly mentioned by participants in interviews: building block group; elderly group; immigrant and cultural group; and sport group activities. Some other organised group activities were also sparsely mentioned.

Building Block Neighbour Group

The most commonly mentioned group activity was building block group activities in MPEs. Participants noted that they attended some building block group activities which were usually organised by the MPE strata, community committee or residents. Participants stated the MPE strata or residents 'often organise some activities in parks' (e.g., P01, P04). As one participant stated:

> P04: 'We recently had an invitation to all residents in our block to gather in the green space, have a drink and get together. (…) We are planning to do maybe once a month. I think it's a very good opportunity for social interaction all along the neighbours in our block. (…) I would normally take a picnic or something in parks when we meet all the people in our unit's block.' (BP, age 60+).

Elderly Group

The second most common dimension of group activity in interviews was elderly group activities in MPEs. Participants expressed that, for the elderly residents, group activities may benefit their mental health (e.g., P02, P04). As one participant stated:

> P02: 'During the COVID pandemic, going out for general social interaction was actually needed for us, especially for the elderly residents. (…) Elder people gathering together with neighbour friends may provide a support.' (BP, age 40–59).

Immigrant and Cultural Group

Some participants talked about the diversity of the MPE community and self-identified their culture backgrounds (e.g., P02, P07, P09, P12). They mentioned that there were some specific immigrant or cultural group activities which may provide various social benefits for them. For example, one participant with an Indian cultural background said:

P13: 'Because we have cultural festivals, like Indian community here, we come together and celebrate our Indian festivals. That was not organised by strata, but ourselves.' (LG, age 40–59).

Similarly, talking about this issue of diversity, an interviewee with a Chinese immigrant background stated:

P02: 'There are quite a few elderly Chinese immigrant residents in Breakfast Point who don't often go out. They often gathered in parks, which may benefit their physical and mental health by providing a kind of social support for each other, especially during COVID pandemic.' (BP, 40–59).

Sport Group

Another common view amongst interviewees was that sport or exercise groups were regularly held in parks which provide social opportunities for residents to increase their neighbourhood social ties. Participants reported that there are some regular exercise groups activities in parks such as yoga or tai chi in MPEs. As some participants said:

P02: 'The community has a yoga group. A group of people often do yoga together in the central park of the community.' (BP, age 40–59).

P16: 'There are some other activities going on (in parks), like yoga, tai chi and others. So, it is pretty good.' (LG, age 20–39).

Besides the group activities discussed above, there were also other group activities mentioned, such as a men's party, and children's play group. As one retired participant said: 'You can see other groups in parks that they've met for something' (P04). For example, one participant stated:

P02: 'Our community often organises some activities, for example, sometimes they have a men's party.' (BP, age 40–59).

Community events. Another subtheme of community participation is community events in MPEs. This is a remarkable outcome of MPEs. Community events were usually organised by the MPE strata, residents or third parties, such as a Spring Festival, Easter hunts or cricket arrival in BP (e.g., P01, P04, P05, P08), or a music festival or Christmas party in LG (e.g., P12, P15, P16). Most events occurred in the centre park. Interviews indicated that the parks

provide places for community events accessible for most residents which people from different backgrounds and different age groups can participate in.

> P12: 'I participated in (an event) which was music, live music, like free hot dogs. It was really nice. (…) That's a way we met some neighbours. The kids can meet some other kids as well, it was really good. (…) I think many people there, maybe 60 to 100 people and the line for the barbecue was really long. It was really big'. (LG, age 20–39).
>
> P13: 'They organised something for Christmas BBQ night that is something that we've done almost every year.' (LG, age 40–59).

The majority of participants mentioned that they attended some of these organised community events before COVID-19. However, since COVID-19 happened, most of the events have been cancelled or suspended in the past two years. As one participant stated:

> P04: 'I'd normally go out to the Spring Festival or something like that in the parks before the COVID, because it is not far away at all. (…) But the events stopped since COVID happened.' (BP, age 60+).

5.1.3 Behavioural Patterns of Community Park Use in COVID-19

To summarise, the interviews found that residents' behavioural patterns of community park use consist of two main categories: individual activities and social activities. Interviews also identified several key characteristics of community park use behaviours due to COVID-19 impacts.

First, residents' individual activities in community parks have increased since before the COVID-19 pandemic. During the COVID-19 pandemic, walking was the prominent individual behaviour for park use, especially during the lockdown period. Almost all participants stated that they regularly took a walk in the parks during COVID-19.

Second, strong ties social interaction occurring in parks remains similar or almost at the same level since the COVID-19 outbreak. Talking about the issue of strong ties social interaction in the neighbourhood, most people reported they still see their friends regularly even since the COVID-19 outbreak, except for the lockdown period. However, the method of strong ties social interaction has changed, and they now meet friends in outdoor neighbourhood space (e.g., parks) more than before COVID-19. Community parks therefore seem to be more

important for neighbourhood strong ties social interaction than before the COVID-19 outbreak. Some participants pointed out they appreciated having outside parks in BP/LG to meet with friends during COVID-19.

Third, weak ties social interaction that occurred in parks has increased compared to other forms of social interaction and has become an important form of social engagement in MPEs since the COVID-19 outbreak. The majority of participants expressed that weak ties social interaction is important for their mental health and wellbeing, especially during the COVID-19 lockdown periods.

Lastly, interviews showed that community participation social interaction has significantly reduced due to the impact of COVID-19. It is notable that some new types of community participation social interaction emerged in the response to COVID-19, like the WatchOut group. COVID-19 has significantly negatively affected community participation social interaction, including group activities and events. By the time of the end of the interview data collection in June 2022, the impact of COVID-19 was gradually decreasing, and community activities were gradually returning to normal.

5.2 Associations between Community Park Use and Social Interaction

This section aims to address research question 3 (RQ3) 'how community park use factors affect residents' social interaction in MPEs?'. The survey found that residents' community park use, and social interaction were influenced by many individual and social factors, such as age, work status, house type and length of residency. In addition, the survey identified some community parks' physical factors were significantly associated with residents' community park use and social interaction. Interviews confirmed these findings. Overall, two key themes associated with RQ3 emerged in interviews: quality of community park space (e.g., rest space, BBQ/picnic space, children's playground, sport space, and nature space); and parks' pedestrian integration factors (e.g., pedestrian connection with surroundings). Among them, rest space in parks was the most commonly mentioned by the participants which attracted them to visit parks and encouraged them to have social contacts in MPEs which are discussed as follows.

5.2.1 Quality of Community Park Space and Social Interaction

(1) Rest Spaces in Community Parks

The interview data showed that much social interaction occurs in rest spaces in parks, including weak ties social interaction, strong ties social interaction and group activities. These findings indicated the importance of rest facilities in community parks for social interaction.

First, weak ties social interaction (e.g., greeting, short talks) often happens in rest spaces in parks. More than half of the respondents mentioned that they used the parks to sit in (e.g., P05, P07, P10), along with some other general social interaction activities, such as greeting, short talk (e.g., P09) or seeing other people playing (e.g., P10, P11). This is one of the most significant park activities repeated by most participants in interviews. For example, some of the participants stated:

> P10: 'Sometimes I will just go to the park and sit for a few minutes. (…) Some people sit and watch the parties there.' (LG, age 60s).

> P11: 'My favourite part about parks is just sitting there and watching the kids playing.' (LG, age 60s).

> P08: 'There are a lot of chairs and tables that can be used in the parks. Obviously, it makes people sit down and actually have a conversation with each other.' (BP, age 20–39).

Second, strong ties social interaction often happens in rest spaces in community parks. Some participants mentioned they use rest facilities for meeting friends. Participants said they often sit and talk, gather with friends or hold parties in rest areas in parks. For example, when asked 'what do you like to do together with your family or friends in the community parks?', one participant stated:

> P09: 'We like to sit in the park and talk.' (LG, age 40–59).

Third, community participation social interaction often happens in rest spaces in community parks. Some participants noted that they use the rest area for some community social activities, such as group activities. One participant stated:

P02: 'We may use rest facilities for social interactions, mainly in pavilions. (…) If there is a group gathering, they would choose a pavilion or similar places with shade and better-quality rest facilities.' (BP, age 40–59).

However, both BP and LG participants argued that they need more seating in the parks because the seating facilities are always needed for residents (e.g., P02, P12). As one BP participant and one LG participant stated:

P04: 'We can suggest one thing that they can put more seats around here. Because in Breakfast Point, we didn't have much seating around the walking paths. So, I would say that by putting more seats.' (BP, age 60+).

P09: 'But I think they can have probably more seating, maybe in the barbecue area.' (LG, age 20–39).

In addition, it is notable that both BP and LG participants argued that there was a lack of shade or shelter for the seating. Lack of shade might have a negative impact on people's park use and thereby a negative impact on social interaction. Quite a few participants from both MPEs said they need more seating with cover in the park (e.g., P01, P02, P12).

P01: 'They should get maybe more shelter since some summertimes are quite hot, and the sunlight is too strong. They need more shelters.' (BP, age 40–59).

P06: 'Maybe there's a couple of exposed areas on (the rest area). So, it can be very hot during the summer.' (LG, age 40–59).

P02: 'People would like use more shaded rest facilities.' (BP, age 40–59).

(2) BBQ and Picnic Space in Community Parks

Interviews found that social interactions often occurred in BBQ and picnic spaces in parks, especially for strong ties social interaction and community participation social interaction. Most participants stated that they often use BBQ and picnic facilities for gathering with family or friends (e.g., P01, P03, P07, P08). BBQ and picnic outdoor spaces in parks provide places for them to meet friends or for family gatherings, as three participants stated:

P02: 'We make social interactions mainly through BBQs.' (BP, age 40–59).

P08: 'We use parks for picnic and parties. (…) we may have some picnics with friends or families there.' (BP, age 20–39).'

> P11: '(BBQ) that would be one of the major attractions to me, because I got a very big family. Now my children are grown-up and have children. I've got ten grandkids. When they come to visit me, we use all the benefits out there in the barbecue. We go (to the parks) and have the barbecue and spend time there.' (LG, age 60+).

Talking about the issue of COVID-19 impact, most interviewees said they still use BBQs and picnics for social interaction with family or friends during COVID-19. As two participants noted:

> P03: 'It was good, in the COVID lockdown time, because you can go to the parks to have a BBQ with friends.' (BP, age 40–59).

> P08: 'During COVID-19, we would just like grab food from IGA [a supermarket], and then sit down in a park, not so much a big picnic'. (BP, age 20–39).

Moreover, some participants mentioned that group events or parties were often held in BBQ and picnic areas in parks as well, such as building block group parties and immigrant group activities. During COVID-19, parks' BBQ and picnic spaces provided outdoor places for gathering which would benefit residents' mental health. One participant in BP stated:

> P03: 'I think there are some really nice parks in Breakfast Point. (…) They are good for sort of picnic. It was good in the COVID lockdown time, because we can go there. It was places to go that were really close by. (…) We meet with friends and have picnic or something there. During the COVID lockdown, it was nice to be able to catch up with friends.' (BP, age 40–59).

However, both BP and LG participants argued that the BBQ and picnic facilities in the parks are not enough because they are needed for residents. For example, in LG, the few picnic tables were often occupied as they are frequently used. One respondent mentioned that there was no spare place every time she wanted to have a BBQ (P13). As two participants argued:

> P14: 'There is not many BBQ facilities in Breakfast Point. I think only one or two spots in the whole neighbourhood. If you have a big group barbecue, you need to go to the parks in surrounding area near BP.' (BP, age 50–69).

> P12: 'It is really good, but I think if they would have more tables around these areas, because it's a big community and we have many people living around here. Most of the time there is already people there (at picnic areas). (…) When we walk around, there are some picnics or some parties. Normally they're already full, so you need to go there really early to take one, because that is only two or three (picnic tables).' (LG, age 20–39).

Participants also argued that the BBQ facilities in parks may create noise disturbances to surrounding residents when they use the BBQ for gathering with friends. Respondents mentioned that because the BBQ facility is too close to the apartment building, it may cause noise annoying neighbours. Noise from using the BBQ facility may affect residents, which in turn affects social interaction. As an apartment-living resident mentioned:

> P15: 'In Breakfast Point, as far as I know, It's only one or two spots for barbecue. But it is within or between the buildings. So, if you have BBQ parties, it may be too loud and create too many noises for neighbours.' (BP, age 40–59).

(3) Children's Playgrounds in Community Parks

Participants reported that they often interact with neighbours when using children's facilities in parks, especially for young family respondents. Playgrounds and children's play facilities were considered attractive features for the residents living with children to visit and be active for social interaction in parks. As one resident said:

> P09: 'Community park is so important because I think my son can interact with other people from the community there. (…) for our growing kids, they need the interaction; they need people; they need friends. (…) My son plays every day in the parks.' (LG, age 40–59).

Regarding weak ties social interaction, some respondents mentioned that they often had short conversations with other parents while the children were playing in parks. This is one of their main ways of socialising, in particular for young residents. For example, a young mother said she goes to the parks' children's playground almost every day with her three-month-old baby and she likes to talk with other parents at the children's playground when babies were playing there. She said this socialisation is the main form of support for her, especially during the COVID-19 period (P12). Also, as other two participants stated:

> P08: 'We get to talking sometimes the kids play for a little bit in parks.' (BP, age 20–39).

> P06: 'If we know the children and parents or see them every time, we may have some short talks. It's a good opportunity for the neighbours in LG to have some social interactions.' (LG, age 40–59).

Regarding strong ties social interaction, many respondents mentioned that their children have neighbours and friends of the same age in the community. They often ask these friends to play together, which is much more fun than bringing their own children to the park alone. Playing with children's friends in the community has become one of the main ways of socialising in the community (e.g., P01, P02, P05). Some community or group activities are also often held in the children's play areas in parks, such as parent group gatherings, and children's birthday parties. As one woman said:

> P01: 'We have some friends and kids' friends at the same age in Breakfast Point. (…) We often play there with children or other parents in the community parks. (…) We use the facility with friends or other parents choosing together.' (BP, age 40–59).

During COVID-19, the children's play spaces provided social interaction opportunities for children and their parents, which was very helpful and important for children's physical and mental health. As a young mother stated:

> P08: 'We would meet up with some of my daughter's friends and their parents. (…) We were really going out about with my daughter's friend living in Breakfast Point and then eventually we would actually organise the time to get together. (…) During COVID-19, people may have a mental issue. At that sometimes, we would like going out for a walk and getting to see if my daughter's friends were going for a walk at the same time. If she was able to see her friends, it really helped her because you couldn't be together during the COVID-19 lockdown, but they may be out at the same time. It like really brightened my daughter's day.' (BP, age 20–39).

(4) Sport Space in Community Parks

Interview results revealed that sport spaces in community parks are important to encourage physical activities and social interactions, especially for strong ties social interaction. Interviews found that the sports facilities in MPEs can be categorised into 'public open use' and 'only for residents use'. Participants reported that the public open use sports facilities in parks consist of football, basketball, cricket pitches, bicycle paths and other facilities. Participants also stated that MPEs provide some sports facilities only for residents' use which need their swipe cards to access and use, such as the swimming pool, tennis court and gym. Overall, the facilities are maintained and governed by community strata. The sports facilities give them opportunities and it is convenient to have some social activities, such as strong ties

social interaction, weak ties social interaction and community participation social interaction in the neighbourhood (e.g., P05, P09, P12), which are discussed as follows.

For strong ties social interaction, many respondents mentioned that they would like do sport activities with friends and close neighbours in parks, such as playing football or tennis (e.g., P05, P06). For example, a young resident mentioned that he would like to play tennis with his neighbours every week. Over time, they went from unfamiliar neighbours to being friends. This was an important way for him to build a neighbourhood social network in the community. This man stated:

> P05: 'I play tennis with a lot of older people within the community every week. I think the space is pretty good.' (BP, age 20–39).

For community participation social interaction, respondents reported that there were some sports group activities organised by residents that take place in parks, such as a yoga group and tai chi group (e.g., P07, P11). Some respondents mentioned some neighbourhood sports competitions held in parks (e.g., P08). Moreover, some respondents reported some sports parties in parks, using the sport facilities such as the basketball court. Participating in these community activities and using the park's sport facilities is an effective way to promote their acquaintance with their neighbours and participate in social interactions in the community (e.g., P06, P08). The sport based social activities seem to be beneficial to people's physical and mental health, especially for young people. As a teenager's mother stated:

> P09: 'My son and friends around him made the best use of the parks by having sports parties. We are several professional sports persons to come with kids like soccer or stuff like that.' (LG, age 40–59).

For weak ties social interaction, respondents stated that they sometimes had short conversations with others when exercising or watching sports. This type of general social interaction often happens in sporting space in parks. In some circumstances, watching other people playing sport also makes them feel a sense of social engagement. As two older women reported:

> P11: 'There are some groups doing exercises together in parks. I have seen all that going. Sometimes, I watch them, they do that, I get there.' (LG, age 60+).

> P10: 'I would like basically just sitting in parks, watching any activities in community parks.' (LG, age 60+).

However, some participants argued that there is lack of adequate sport facilities, especially for children and young people. One resident argued:

> P06: 'I used to play with the sports facilities there. But I haven't been playing basketball because there are always people there'. (LG, age 40–59).

Some residents argued that sports facilities should consider the needs of different age children. For instance, one resident stated that he has two children, a teenage girl and an 8-year-old boy. Two children had different needs for sports facilities. As he said:

> P14: 'If we can have some basketball courts, volleyball courts, or other multi-function sporting courts, it would be much better for the young kids. (…) The kids can play there, then the parents can communicate. I think that would be a good place for social interaction. (…) Breakfast Point doesn't have too many facilities for kids.' (BP, age 40–59).

(5) Nature Space in Community Parks

Participants stated that nature facilities (e.g., green space, trees, grass and waterside facilities) are essential for community park use and social interaction. Residents expressed that they need to go out into nature and to relax. As one participant stated:

> P08: 'There is a good balance between having nature around and also having space to enjoy (in Breakfast Point), I think it is well balanced.' (BP, age 20–39).

Interviews found that parks' natural environment is very important for residents' social life for weak ties social interaction and strong ties social interaction. First, for weak ties social interaction, many people expressed that they like walking in nature and green space which adds more opportunities for general social interaction when walking. Some participants stated that they would go out to enjoy the nature, to see the views, and simultaneously, to see people in parks, and greet neighbours (e.g., P04, P07). These general social interactions give them a sense of social engagement and in turn benefit their health. In particular, interviews showed the importance of nature facilities for vulnerable people, such as the elderly, children, pregnant women, or people recovering from COVID-19 (e.g., P04, P12). An elderly participant illustrated this point:

P04: 'I think the community parks are helpful for social interaction, because they are grass that you can walk on and walk your dog. Probably, that is the fact that you get to meet people. (...) I expect that parks are very nice places to walk that probably does encourage social interaction when you've got to walk at once or twice every day.' (BP, age 70+).

Many respondents mentioned that they were using more nature and green facilities for weak ties social interaction during COVID-19. For example, a person recovering from COVID-19 could not have many social interactions at some times. Hence, going into nature and green spaces is one way to see other people. To illustrate this point, one participant shared her story. She said when she was pregnant and had just recovered from COVID-19, she went out for a walk in the natural and green spaces in parks every day. Going outside into the natural environment was one of the few ways for her to relax at that moment during the COVID-19 pandemic. As she narrated:

P12: 'When we got COVID, and we had to isolate for two weeks when I was pregnant, it was a really really bad time for me. When we were free, we walked around and have these green areas and parks to walk in. It's a really good place to be during COVID. And at least we have some people that we can talk to and walk around.' (LG, age 20–39).

Another participant also stated the natural and green facilities are important for her social needs during the COVID-19 period.

P07: 'During COVID, it is helpful to go out to nature. It makes me feel relaxed to see beautiful sceneries, to walk and chat with neighbours in open greens that are helpful for my physical and mental health. It is a good way to reduce stress rather than being locked in the room in COVID.' (BP, age 40–59).

Second, for strong ties social interaction, many respondents mentioned that they would walk with close neighbours or friends along green spaces or waterside parks, especially during the COVID-19 pandemic. They said they feel happy and safe to meet with friends in that way in open green spaces (e.g., P03, P12). For community participation social interaction, quite a few community activities, such as yoga group activities, were also held in green areas. As one participant stated:

P12: 'While I walk with my son (in the parks), I think it is very relaxed. I really like gathering with friends as well in the green area.' (LG, age 20–39).

It is noticed that some apartment residents expressed that natural facilities play an important role for their social life in the neighbourhood. Parks and green spaces provide more space for activities for apartment living. As one participant noted:

> P05: 'There's a lot of good green spaces in Breakfast Point…it's so much green spaces and it's so wide in Breakfast Point. I guess people went around about quite relaxed. (…) having that spaces that have helped for social interaction for apartment living.' (BP, age 20–39).

5.2.2 Parks' Pedestrian Integration and Social Interaction

(1) Parks' Pedestrian Integration

Interviews revealed that the friendly parks' pedestrian environment encourages community park use and social interaction. Two themes related to pedestrian environment emerged from interviews: parks' pedestrian integration and parks' pedestrian connectivity with surroundings. The integrated park network provides connected places for residents to do walking activities, such as walking, walking a dog or riding bicycles. Park integration means people can walk between parks which is very helpful for residents to generate some weak social interactions. As one participant stated:

> P07: 'I like to walk along the waterside end of which is a park as well. In fact, the parks and the green spaces are connected anyway in the neighbourhood.' (BP, age 40–59).

Two themes of community parks were identified that can promote parks' pedestrian integration: a clear central park and well-dispersed small parks.

Clear central park. Interviews showed that a clear central park may increases residents' community activities engagement. Participants explained that well-known centrally located parks are easier to identify to meet up with friends and to participate in events there. Almost all participants in BP and LG indicated that the walkability of the central park was important for community park use and social interaction in MPEs. This is because most organised events were held in the central park in the neighbourhood. Accessibility to the central park makes it easy for all residents to attend community activities. An elderly participant said the annual

community festival was usually held in the central park. Because the central park is close to her house, she was willing to participate in those events, as she stated:

> P04: 'Yeah, I would normally go out to it (spring festival) because it is not far away at all. So, I normally go up to it'. (BP, age 60+).

Well-dispersed small parks. Most participants mentioned that they would also often use some small parks dispersed between the block buildings because these parks are more easily accessible. Well-dispersed small parks between buildings enhance accessibility to parks and in turn encourage community park use and social interaction. It is notable that a well-dispersed distribution of parks is important for the apartment residents to access the community parks. The dispersed park system was advocated by the new urbanism which was reflected in the interviews from both BP and LG residents (e.g., P01, P05, P11). Participants expressed that their neighbourhood provides a spatial arrangement of well-dispersed parks between buildings which enhances their accessibility to the parks and in turn encouraged more social interaction. As some participants stated:

> P01: 'There is a big park in the centre and there are still a lot of small parks between the buildings. We can always get there, like very easy to do access there.' (BP, age 40–59).

> P05: 'The park spaces that we have in Breakfast Point are pretty nice. There's quite a lot of open sorts of green spaces in between. For example, where we were going to walk out of the apartment, between our apartment into the one opposite us, there's like a big wild green space. (…) we are really close to that park. I think there's a lot of good green spaces.' (BP, age 20–39).

Some residents mentioned that the dispersed parks mean the community has a good balance for community park use (e.g., P03, P04, P05, P08), as two participants stated:

> P08: 'Breakfast Point has a good balance between the parks and the amount of apartments.' (BP, age 20–39).

> P11: 'There are a lot of parks including a bigger one and some smaller ones in the neighbourhood.' (LG, age 60+).

(2) Parks' Pedestrian Connectivity with Surroundings

Interviews indicated that the pedestrian connection with the surrounding area was important for residents' community park use and social interaction. As an extension of the community park network, surrounding parks can provide richer choices for residents' activities, resulting in more social interactions. Respondents reported that they would extend their activities such as walking, dog walking, having BBQs, children playing and so on to surrounding parks. Most respondents expressed that walkability to the surrounding parks can increase their social interaction, especially with friends or close neighbours. Many respondents mentioned that they would go for a walk with friends in the surrounding parks, which is a common exercise and a way for social interaction (e.g., P01, P03, P04). Some BP participants mentioned that they used facilities like BBQs and had parties with friends in surrounding parks (e.g., P03). Respondents also mentioned that they met with their children's friends to play in the surrounding parks, where the children's facilities provided them more activity options and increased the probability of social interaction (e.g., P01, P03, P08). As one participant stated:

> P14: 'There are two big surrounding parks connected together with Breakfast Point. We go there to have a BBQ with friends sometimes.' (BP, 40–59).

Some differences between the two MPEs about the surrounding pedestrian connections were noticed in the interview data. Almost all BP respondents mentioned BP has a good pedestrian connection with surrounding parks so that they extended their activities to surrounding parks. Because most surrounding parks' users came from BP, residents can still feel a bond of community relations there, which is helpful for their social interaction. As one resident said:

> P07: 'The parks connected together in inside and outside the community. The surrounding parks are also connected together. There is not any fence and blocks with Breakfast Point. We walk around in the surroundings.' (BP, 40–59).

Compared with BP, LG respondents mentioned that they need to cross traffic roads to walk to the surrounding parks, which makes them feel not very safe, especially for children. This may affect their use of surrounding parks and social interaction. Some participants expressed that because there is a lack of neighbourly ties in surrounding parks, they have less social interaction in surrounding parks than inside LG, as one participant stated:

P09: 'I maybe just walk, talk, and have some social interactions there (in parks). But not outside parks of Liberty Grove, as I don't know people outside.' (LG, age 40–59).

Overall, in the two cases in this study, BP is an open MPE connecting with the surrounding public parks by walking, while LG is a symbolically gated MPE which is relatively enclosed and separated from the surrounding parks and neighbourhoods by traffic roads. Interviews showed that an open MPE with good pedestrian connectivity with surroundings could help the extent of residents' activities with the surrounding areas and facilitate more positive residents' social interaction. In contrast, for LG residents, social interaction in the surrounding areas is significantly less.

5.3 Psychological Mechanisms of Place Attachment in MPEs

This section aims to address research question 4 (RQ4) 'what are the psychological processes of place attachment to community parks in MPEs?'. Interview data was coded based on specific aspects that respondents relate to their community place attachment sentiment. Based on theory-driven and data-driven initial coding, interview data analysis found three themes regarding the process of place attachment on community parks in MPEs: affective, behavioural and cognitive components. The themes were further used to frame the thematic analysis of place attachment in MPEs. Themes and subthemes of meanings of place attachment identified from interviews are summarised in Table 5.1 as below.

Table 5.1 Themes and subthemes of meanings of place attachment identified from interviews

Main Themes	Subthemes
Affective component	Emotional bonding
	Memory
Behavioural component	Fulfilment of needs
	Better neighbourhood
Cognitive component	Membership of community
	Social ties
	Social distinction

5.3.1 Affective Process

Affective process was the first main dimension of meanings of place attachment that emerged from the analysis of interview data. This theme included two subcategories: emotional bonding and memory.

Emotional Bonding

A consistent narrative was evident across the interviews which highlighted emotional bonding associated with place attachment. Emotional bonding here refers to emotional connections with place or community, which is the primary source or meaning of place attachment. Almost all respondents mentioned the importance of the emotional impact which the community parks have on them. Many people feel that the park makes them feel positive emotionally. The interview participants reported several emotional feelings about the community parks in their neighbourhood, including happy (e.g., P01, P02, P06), a sense of home, comfortable (e.g., P02, P07, P11), grateful (e.g., P05), enjoyable (e.g., P05, P10), quiet (e.g., P02, P04), feel beautiful (e.g., P01, P03, P08, P09), lovely (e.g., P08, P09) and relaxed (e.g., P05, P12). As one participant stated:

> P03: 'Breakfast Point is nice. It's a nice location. It's combination of green spaces. It's open. It feels very clean and tidy place. When you think of it, always, it's a nice place.' (BP, age 40–59).
>
> P10: 'Community parks, (…) they are enjoyable.' (LG, age 60+).
>
> P08: 'We just fell in love with the way Breakfast Point looked, it was beautiful. It was perfect. (…) I would describe the community parks really well and just a lot of space.' (BP, age 20–39).

In addition, some participants expressed that visiting parks helped to reduce their mental stress during the COVID-19 period (e.g., P05, P12, P16). Some participants said they have no other options for activities during the pandemic, so they need more surrounding open space for activities, and they needed more opportunities for social engagement during COVID-19. Many residents expressed being grateful to live in such a neighbourhood with many parks and facilities for using and general socialising during COVID-19. In short, most respondents believe that they use parks more and the sense of place attachment has been strengthened during the pandemic. As two participants stated:

P10: 'During the COVID pandemic, I would come to parks quite a lot. I would probably use it more, because this was my very local area. It was more because of COVID and it will be the more outside spaces.' (LG, age 60+).

P16: 'I have been using parks more than before (COVID), because it's just good to be out and get out some pressure. Even so, we are working from home, just take a rest to visit the park and come back here.' (LG, age 20–39).

Memory

The second identified process of place attachment from interview data was memory. Many people mentioned that they have some impressive memories and experiences about community parks. For some participants, these memories became motivations for them to move back into the community years later (e.g., P05, P11). In parks, the places of sports, children's playgrounds, BBQs and party areas were most commonly mentioned in terms of their memory, also including some landmarks (e.g., P08). Of these, the most commonly mentioned were about family-time memories, especially about the growth of children. For example, some respondents mentioned that they had had some parties for children in community parks which left many precious memories for them. As two participants stated:

P05: 'One of the things that we noticed before we moved to Breakfast Point was the parks. For example, Silkstone Park, we spent time there and move up to the photo shoot there. So we went there, and it was just such a nice place to be.' (BP, age 20–39).

P11: 'Because we have lived here for a long time, we have a lot of memories here and the feelings in good experiments here.' (LG, age 60s).

5.3.2 Behavioural Process

Behavioural process was the second main dimension of meanings of place attachment that emerged from the interview data. Two subthemes identified from the qualitative data are discussed below: fulfilment of needs, and better neighbourhood.

Fulfilment of Needs

Many residents mentioned that the MPE provides many conveniences and facilities to meet their living needs in the community. In terms of parks, they can use facilities for various activities, including individual activities and social-community activities. Some participants

expressed that it was convenient for them to live in the MPE which in turn generated a sense of attachment (e.g., P04, P10, P11).

> P10: 'You can get some social support there. Liberty Grove has been getting most residents' needs. (…) I wouldn't have any problem in getting some help.' (LG, age 60+).

Better Neighbourhood

Some respondents expressed that an MPE is a better type of neighbourhood for living at their current life stage (e.g., P02, P05, P06, P10, P11), compared with some apartment buildings blocks or traditional house suburbs. MPEs provide quite a few parks with natural, sports and recreation facilities which is valuable. Interviews revealed that these value-added facilities were one of the attractors and motivations for residents to live there (e.g., P04, P05). Also, some respondents stated that the MPEs' parks can offer more social interaction opportunities and place dependence for them compared with other types of neighbourhoods. As one parent resident stated:

> P09: 'I think community parks are so important because when we go down to parks, my son can interact with other people from the community. But if you live in a suburb in an independent house, there could be nothing around you. So, we may not have anything to do on the interactions for our growing kids. They need the interaction, they need people, they need friends.' (LG, age 40–59).

Similarly, as another older person stated that living in an MPE can mean a larger social network than living in suburban house or apartment:

> P10: 'In my view, living in this type of neighbourhood maybe could help you to be more social network, certainly than living in a house or just an apartment somewhere, definitely much more. (…) I feel it's a really companionable place. I think I consider Liberty Grove is my home considering other places. I think there is a feeling of that.' (LG, age 60+).

Another apartment resident compared BP with other types of apartment blocks. He explained how the MPE parks help them with more social interaction and place attachment. As he stated:

> P05: 'I guess the parks are the important point for social life in Breakfast Point. (…) It compares to living in like the city apartment block, for example, in there is not a lot of greenery, and their people sort are rushing to enforce that. Having the spaces like community parks that have helped. (…) For another example,

there are a lot of apartments in Rhodes as well, but there's not as much green spaces as there are in Breakfast Point or even the surrounding suburbs, like, even if we looked outside of Breakfast Point, and there are three or four parks that I can easily walk to there. It's just got that completely different feel.' (BP, age 20–39).

In addition, it was noticeable from interviews that place dependence has been greatly strengthened during COVID-19, especially for people living in apartments, residents with young children or older people. Interview analysis showed that parks meet residents' needs for most individual activities or weak ties social interaction as usual during COVID-19. As one participant stated:

> P05: 'During the COVID restrictions, when we tried working from home and having kids at home, what we would do is take advantage of the green spaces that we had. (…) we would get out every day, get some fresh air, and exercise as well.' (BP, age 20–39).

5.3.3 Cognitive Process

The third dimension of meanings of place attachment identified from the interview data was cognitive process, also in term of place identity. Three subthemes identified from the qualitative data are discussed below: membership of community, social ties, and social distinction.

Membership of Community

Most respondents considered themselves to be a member of the community also in terms of a sense of belonging to community. Interviews suggested that community participation and social interactions can form a sense of belonging which is one of the main sources of place attachment. Most respondents expressed that they could feel some similarities with community members which generated a feeling of emotional safety and in turn builds a sense of belonging. As one participant marked:

> P10: 'Liberty Grove, it's referred to as a community. There might be a little bit more of a feeling of safety, and people who are walking around 95% of the time are the residents, not strangers. Whereas out in the street, anyone walking by could be just a stranger I don't know. The people feel safer and similar in all of that. Maybe it's the proximity or even just the word 'community'. (LG, age 60+).

Social Distinction

Most participants interpreted a sense of social distinction for socio-economic or cultural backgrounds. Interviews showed that the diversity adds complexity to the concept of the MPE. For example, out of 16 participants, three participants self-reported they have Chinese cultural backgrounds, three participants self-identified they have Indian cultural backgrounds, and one self-reported a Brazilian background. Interviews indicated that place identity can be built through participating in group activities, such as an immigrant group, cultural group or seniors group. Residents mentioned that most of these group activities were held in parks. For example, there are some Indian cultural festivals in LG in parks. These cultural festivals in parks made opportunities for social interaction to know similar background people and created a sense of belonging to the community. As an Indian background resident stated:

> P09: 'There are some Indian festivals in the community. The kids actually played Indian festival of colours. (…) Everyone gets together and has dinner. I'm sure the other Asian countries also have similar festivals. (…) there are a lot of events in the community like that for multiple cultures. It's wonderful.' (LG, age 40–59).

Similarly, some residents with a non-Australian cultural background stated that they regularly participated in some culture-based group activities in parks. These sorts of social activities could provide social support for them. For example, there was an immigrant elderly group, as one participant stated:

> P02: 'The Chinese elderly often get together in parks, which provides a kind of social support and benefits their physical and mental health, especially during the COVID pandemic.' (BP, age 40–59).

Social Ties

Another subtheme related to place identity identified is social ties and social network in the neighbourhood as discussed above. Participants mentioned social interactions and social ties give them a feeling of acceptance, a feeling of being welcome or a sense of belonging. These feelings help to build place identity, as two participants stated:

> P03: 'I think Breakfast Point is nice. Some people know your name when you go to the shop. They recognise you which let you feel part of a community.' (BP, age 40–59).

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P04: 'I consider Breakfast Point as my home. It is kind of a social place to live.' (BP, age 70s).

5.4 Associations between Community Park Use and Place Attachment

This section aims to address research question 6 (RQ6) 'how the community park use factors affect residents' place attachment in MPEs?'. Based on the qualitative evidence, overall, seven key themes emerged from the interview data: the quality of children's playgrounds, nature space, recreation space, BBQ and picnic space, sport space, pedestrian accessibility to parks, and pedestrian connectivity with surroundings. The quality of children's playgrounds was the most common mentioned theme by the participants which impacted place attachment in MPEs, followed by pedestrian accessibility to parks and pedestrian connectivity with surroundings.

5.4.1 Quality of Community Park Space and Place Attachment

(1) Children's Playgrounds in Community Parks

Interview data showed that quantity and quality of children's playgrounds was related to residents' place attachment. This finding confirmed the survey result which shows children's playgrounds were significantly associated with place attachment in MPEs. Children's spaces were considered attractive features for residents to visit parks and be active for social interaction (e.g., P06, P08, P09, P12). Most importantly, memory of children's spaces was identified as one of the attractions that generated place attachment with parks. Some residents mentioned that children's playing facilities are associated with neighbourhood memories (e.g., P03, P05). For example, as one participant mentioned, the scenes of his children playing in the park were unforgettable and gave them a sense of belonging. Because of these sorts of life memories, they moved back to BP after leaving for a few years (P05). Similarly, one elderly LG resident mentioned she has lived in LG for 21 years and raised several children here. After her children grew up, worked and started a family, her children and grandchildren would often come back, and every time they would go to the park to play, just like when they were kids. This memory and meaning are very valuable to her family and life, as she narrated:

P11: 'We have some memories with the children there because of a long-time following kids grow up here. Because we've been here for twenty years. My son used to live here, and now he's married, and he's got three boys. And then, when they all come to visit me, they'll go to the park, they play soccer, they play in the parks. And all that, it takes a lot of connection. (…) sometimes I sit on the swing or have a little bit of a swing and feel like a little girl again.' (LG, age 60s).

(2) Nature Space in Community Parks

Interviews indicated that nature space is associated with residents' place attachment. Nature space was the one common theme related to place attachment in interviews. The majority of respondents stated that the natural environment is a strong emotional bond to facilitate place attachment to the neighbourhood. First, most participants express positive emotional feelings from nature facilities. The individual and social activities in green area left memories of the community (e.g., P04, P07). Second, various sorts of individual activities create an intrinsic demand for natural space. Participants stated their individual activities often take place in green and natural spaces in parks, such as walking, doing exercise, sitting, enjoying the sunshine, getting fresh air and relaxing. Most of these activities take place in green areas and waterside areas, which in turn generate emotional bonds with community parks or the neighbourhood. Third, respondents reported that group activities and social interaction gatherings are often held in green areas with beautiful natural views (e.g., P08). Unique natural landscapes also add to the place identity for people, such as water features. As two participants stated:

P04: 'I think we are lucky because all the parks or a lot of the parks are also beside the water, apart from the nice screens. So I think that makes it a very special place to live'. (BP, 70s)

P05: 'I think having green space is really important, as well as a fact that it's close to the water, and there's a lot of green space next to the water as well, like a pathway along the water as a lot of green area. (…) It feels very open, especially when you live in an apartment'. (BP, age 20–39).

It is noticeable that most respondents mentioned that the green and natural facilities have become more important for them since the COVID-19 outbreak. People expressed that they would use green spaces more to reduce stress during the lockdown period. Especially for residents living in apartments with young children or older people, the importance of natural

facilities to their emotional needs is particularly emphasised. As two apartment residents stated:

> P05: 'During the COVID pandemic, you can do some relaxing or exercising in green space. Definitely being out walking was huge. We would literally spend time for walks every day. And it was good for my physical and mental health as well. It definitely is a big plus.' (BP, age 20–39).

> P08: 'We actually use parks because obviously living an apartment we don't have a lot of space to entertain. We use the village green. The space is beautiful, and it's cleaned, tidy. We really enjoyed that facility to be able to entertain our family and friends. (…) We would get walks, because obviously, during the pandemic, walking is the only way you can get out of a small apartment. So, during the pandemic, we would do a bit of a walk so very much use green during COVID than before COVID.' (BP, age 20–39).

> P05: 'During the COVID restrictions, what we would do is take advantage of the green spaces that we had. We would go out to get some fresh air, to sit for a little bit and then to go back home. It was nice to have that available and so close green spaces as well. …I feel the green spaces are important and we would use in every day to get out and exercise as well during the restriction time.' (BP, age 20–39).

In the MPE context, residents mentioned that one of the benefits of living in an MPE is that all the natural environments can be well maintained by strata governance. The maintenance of natural facilities is important for the quality of parks. Many respondents mentioned that MPE management provides good maintenance for natural facilities and greens. Residents expressed that the design of their neighbourhood provides a balanced and beautiful nature landscape, which is also well maintained. Good maintenance of green space increases the possibility for them to visit the parks and have social interaction with others. Some respondents believed that the good maintenance of natural facilities and greens is also one of the motivations for them to move into the MPE. As the participants reported:

> P08: 'I would describe the green parks as clean, well maintained. It is kept very well, clean and tidy. (…) like that would be very rare occasions that I have seen in this area.' (BP, age 20–39).

> P07: 'In Breakfast Point, I think the parks are managed very well. This greenery is well managed and clean.' (BP, age 40–59).

> P10: 'It seems like the green and trees are very well kept, just a trim very regularly. I think they are quite well kept'. (LG, age 60+).

P11: 'I am very happy with greens and how all the extra things they have done within the last ten years that really improved everything. It's good to say that they're putting a lot of extraordinary effort everywhere.' (LG, age 60+, LG resident for over 25 years).

(3) Rest Space in Community Parks

The parks' rest spaces and facilities include seating, tables, pavilions and so on for people's leisure use. Most participants stated that they often use rest facilities for individual or social activities. Individual activities include sitting, enjoying the sunshine, relaxing and so on. social interaction activities include short talks, gatherings with friends and so on. The rest spaces and facilities enhance place attachment by fulfilling needs, strengthening social ties, and having memories of when they gathered there. For example, some participants said they feel comfortable and relaxed when they sit in the park.

P02: 'There is a relatively large pavilion in one park in Breakfast Point, which has a lot of tables and chairs there. Usually quite a few people sit there and chat or have a birthday party. For example, a lot of kids are hosting birthday parties over there. (…) It seems that these facilities can greatly promote some social activities between neighbours. (…) then we knew each other, along with that, children grow up'. (BP, age 40–59).

However, both MPEs' participants mentioned that existing outdoor leisure facilities in their communities are not enough. Interviews indicated that lack of rest facilities may have negative impact on residents' place attachment. For example, LG residents stated that the seats and tables are quite busy and highly used in LG. (e.g., P09, P10, P12), which was also mentioned by BP residents (e.g., P04). As two participants stated:

P04: 'We can suggest they put more seating around here. Because in Breakfast Point, we didn't have much seating around the walking paths.' (BP, age 70s).

P09: 'I think they can have probably more seating, maybe in the barbecue area.' (LG, age 40–59).

In addition, most of the respondents in both MPEs mentioned that the shade of the rest area affected their park use and place attachment. As one participant stated:

P02: 'The seating facilities, including the seating with shade, were not enough in Breakfast Point. (…) Neighbour interactions often occurred in the rest space.

People mainly go to the kind of rest place such as a pavilion or some rest facilities with shade for gathering. If it is a party, it mostly will be inside the pavilion, or somewhere with shade.' (BP, age 40–59).

(4) BBQ and Picnic Space in Community Parks

Another reported factor influencing place attachment was BBQ and picnic space. The impact of BBQ and picnic facilities on place attachment was mainly providing a place for entertaining and social interaction, such as parties or group activities. For example, some respondents mentioned that recreation facilities would be 'one of the major attractions' to them for living here (P11). Respondents living in both MPEs said that most leisure facilities are open as 'anyone can come in and use those' (P10), except for BBQ facilities which need a key to get access (P10, P12). Interviews indicated that the quantity and quality of recreational facilities are both important for forming an emotional connection to their place attachment. Overall, three key recreation spaces were identified from interviews which may impact place attachment: rest space, BBQ and picnic space, and children's play space.

Interviews indicated that residents most probably have memories of BBQ or picnic spaces in parks which in turn impact on their place attachment. This is because most parties and events were held in these areas (e.g., P10). Interviews showed that BBQ and picnic spaces importantly impact on neighbourhood social interactions (e.g., P02, P05). Participants stated that they are more likely to choose BBQ or picnic spaces for outdoor gathering, especially during COVID-19. For example, one participant said:

> P10: 'When I look back at the time when the children are growing up, they think more about the scenes where they use the sports facilities and the scene where the whole family uses the BBQ facilities together in parks.' (LG, age 60s).

> P05: 'We have friends that live locally within Breakfast Point. During COVID and even now, sometimes what we like to do is some dinner, barbecue or picnic. There are barbecue facilities and impact this point of social interaction. We just have picnic and bring a ball that we can kick around and play in the parks, we often do that'. (BP, age 20–39).

For BBQ and picnic activities, it is worth noting that many of the residents mentioned that they would like to buy a coffee, or some simple food close by the parks (e.g., P05, P08). Participants expressed that cafes, small restaurants, or shops close by the parks are needed.

which may help with creating their sense of place attachment for parks. For example, one LG respondent mentioned how important it was to set up a coffee shop near the park for social life in the neighbourhood, as she stated:

> P10: 'It was about three years ago (before COVID), there was a cafe in the park. I think that would make it absolutely perfect if that cafe was back. (…) I think the cafe in the neighbourhood is very important for social interaction with neighbours' health.' (LG, age 60s).

(5) Sport Space in Community Parks

Interviews indicated that the quantity and quality of sporting spaces are very important for place attachment. The parks' sports facilities help to fulfill residents' essential needs and emotional connections with community, thus positively affecting place attachment.

First, sports spaces and facilities are the most essential needs for residents and in turn affect residents' place dependence, especially for families with young children or teenagers. The majority of participants mentioned that their neighbourhood provides various sports facilities, such as football, cricket, tennis or swimming. Some sport facilities in parks are open for all people. Interviews showed that MPEs also provide some sport facilities which are only for residents' use. Residents using sports facilities need a special key or card for access, such as the swimming pool or tennis court (e.g., P05, P06, P09, P11). Residents using sports facilities may help form a sense of identity and a sense of belonging to the community (e.g., P05, P09, P12). These sports facilities give them convenience for their sports and social activities in the neighbourhood.

It is noticeable that most respondents expressed that they used parks more for sports activities during the COVID-19 pandemic, such as playing football in the green space, playing tennis or cycling. Sporting activities could reduce their stress of the pandemic and therefore are beneficial to their physical and mental health, as the following quotes demonstrated:

> P02: 'We often take our kids to do sports in parks. During the pandemic, we use parks more for sports, such as walking or other sports. What we usually use these parks for are mainly doing some sports during COVID.' (BP, age 40–59).

> P07: 'Do the activities benefit my mental health during COVID? Yes, in somewhere. We visit there (parks) during the COVID pandemic. We do sports with the kids, riding bikes or do some football there.' (LG, age 40–59).

Second, sporting spaces are important for socialisation including weak ties social interaction, strong ties social interaction and community activities, such as watching sports in parks (e.g., P01, P10, P11), playing tennis with close neighbours (e.g., P05) or sport parties (e.g., P09). These sport-based social activities reinforce neighbours' social ties and in turn create a sense of belonging, such as feeling they are members of a neighbourhood social network.

Third, sports facilities are a very important factor related to residents' living memories in the neighbourhood. Interviews showed that some residents' community memories were associated with parks' sporting spaces, which enhances the emotional attachment of parks. For example, some participants said they had sports parties with children's friends which were impressive (e.g., P09). As one elderly participant said, when her grown-up children come back to LG, they use the sports facilities which remind them of their childhood time:

> P11: 'We have some memories with the children there because a long time ago the kids grow up here. (…) when my children and grandchildren all come to visit me, they'll go to the park, they play soccer. (…) It takes a lot of connection. (…) We played tennis and basketball, and we do that when the kids are here.' (LG, age 60s).

Similarly, another participant mentioned the sport parties in parks:

> P09: 'I used to with my son to have their parties in the park. They made the best use of the park by having a sports party. (…) I think that was the best use of the park which could get a beautiful and nice memory.' (LG, age 40–59).

However, some residents argued that there is a lack of sports facilities, especially for teenagers. Some LG residents mentioned that the basketball courts are often quite busy and occupied because a small number of basketball courts are open for people outside the community as 'anyone can come in and use those' (e.g., P06, P10). Some BP participants stated because of the lack of basketball courts in BP, they only can use basketball courts outside the community (e.g., P08, P14). The lack of sports facilities affects residents' park use and attachment to the community. As one teenager's parent narrated:

P14: 'I have two kids: one is thirteen and the younger one is eight. (…) They play basketball, they play volleyball, but BP doesn't have too many sporting facilities for those kids' sports.' (BP, age 40–59).

Similarly, one LG participant said residents need more basketball courts in or close by parks:

P06: 'I used to use sports facilities in parks. But I haven't played basketball, because there are always people there. (…) All of the facilities are residents accessible and open to other people around. I think it should be residents only because we pay strata.' (LG, age 40–59).

5.4.2 Parks' Pedestrian Integration and Place Attachment

Interviews revealed that the impacts of pedestrian environment on place attachment are mainly reflected in two aspects: pedestrian accessibility to parks and parks' pedestrian connectivity with surroundings.

(1) Pedestrian Accessibility to Parks

Interviews revealed that pedestrian accessibility to parks affected residents' place attachment to their neighbourhood. The parks' accessibility can increase the probability of various individual and social activities in parks. Interviews indicated that these daily activities and neighbourhood interactions enhance place attachment, especially during COVID-19. As three participants stated:

P03: 'I think there are some really nice parks. It was good in the COVID lockdown time, because it was places you can go that were really close by.' (BP, age 50s).

P05: 'I think it's nice because parks are close enough to access and sit here during the COVID pandemic. We can do some relaxed exercising there, being able to exercise and being out of work and stuff like that during COVID was huge. It was good for my physical and mental health as well. It definitely is a big plus.' (BP, age 20–39).

P12: 'It is (accessible), for example, I have a baby pram, and I think it was very accessible to that place (parks).' (LG, age 20–39).

In addition, interviews revealed that clear central and well-dispersed parks contributed to promote pedestrian accessibility to parks and parks' pedestrian integration in MPEs.

Clear central park

Interviews found the importance of central parks to promote parks' integration which in turn enhanced park use and place attachment. Participants mentioned that most community events are held in the central park or larger node parks. The accessibility of the central parks can promote greater community participation (e.g., P04, P06). To illustrate this point, one interviewee said:

> P06: 'It is important to access the central parks. Central parks exactly give us some place to play, which is close to us. We can go easily, rather than walk a long way to the other parks.' (LG, age 40–59).

Well-dispersed distribution

Dispersed small parks may help increase park visiting and thus increase place attachment. Some residents, especially residents of apartments, mentioned that they might use the close parks. Some apartment residents said they often do some individual activities in the small parks near the apartment building, such as relaxing and playing with children (e.g., P05, P08). As two apartment residents stated:

> P11: 'I think they're quite special. There are a lot of parks including a bigger one, and smaller ones in the neighbourhood. It is easy for all of the residents to reach the parks by walking.' (LG, age 60s).

> P07: 'Parks are not far, so it is easy to walk around (…) just walking next to these apartment buildings.' (BP, age 40–59).

Some neighbours' group activities, such as block parties, were also held in the parks nearest to the apartment building, because easy access would attract more people to participate (e.g., P04). Some participants expressed that the integrated parks' pedestrian network gives them a sense of safety (e.g., P06). LG is a neighbourhood where people and cars are mixed. One respondent said that the park network provides a sense of safety for him, as he noted:

> P06: 'Between the parks, there are very easy to access each other, and there are paths accessible between the parks. (…) There are the parks inside the residential area, which is not the vehicle to go, so kids can go through that easily. Because I think there are some cars in the neighbourhood, a lot around, we normally go through the residential area which is in the middle paths between parks.' (LG, age 40–59).

(2) Pedestrian Connectivity with Surroundings

Interviews indicated that parks' pedestrian connectivity with surrounding parks may affect residents' place attachment. Interviews recognised four main dimensions of impacts of surrounding connectivity on place attachment. First, the surrounding parks and sceneries help to create a richer positive emotional bond with community (e.g., P07). Second, individual and social activities in surrounding parks could help increase community memories (e.g., P14). Third, a range of activities includes individual and social interaction activities that could be extended to the surrounding areas (e.g., P04, P08). Fourth, being well connected with surroundings may attract more MPE residents to use parks and help increase a sense of community identity (e.g., P14). Thus, the pedestrian connection with the surrounding park is very important for residents' daily and social activities and to build a sense of place attachment.

> P14: 'The Cabarita Park is a major surrounding park. Breakfast Point residents often go there. You don't need to cross traffic, just walk along the river that you can go to Cabarita Park which is a major park in the surroundings. The other is the Mortlake riverside park. (…) (I go there) with friends or with neighbours. Most people come from Breakfast Point. When I met them, we will just a chat for couple of minutes.' (BP, age 40–59).

5.5 Summary

The qualitative study answered four research questions (RQ1, RQ3, RQ4, RQ6) based on the qualitative evidence from 16 semi-structured interviews with BP and LG residents collected during the COVID-19 pandemic. The qualitative results indicated several physical features of community parks possibly engage residents' park use and thereby promote their social interaction and place attachment. These findings confirmed and further explained the survey findings. The key findings of the qualitative study are summarized as follows.

Social interaction. Interviews found that residents have two types of activities in the park: individual activities and social activities. The study found that social interaction activities include three types: weak ties social interaction, strong ties social interaction, and community participation. Social interaction benefits residents' social wellbeing by the psychosocial mechanisms as social engagement, social support and social influence. In addition, several

factors of community park use have been identified in interviews that could impact on social interaction: rest spaces, BBQ and picnic spaces, children's playgrounds, sport spaces, nature spaces, parks' pedestrian integration, and pedestrian connection with surroundings.

Place attachment. The interviews found that the main psychological mechanisms for residents to develop a sense of place attachment come from three aspects: affective, behavioural and cognitive components. In total seven subthemes were identified in interviews to form place attachment: emotional bonding, memory, fulfilment of needs, better neighbourhood, membership of community, social ties and social distinction. These factors work together to form place attachment and thus increase residents' wellbeing. Seven themes of community park use were identified in interviews that are associated with place attachment: the quality of children's playgrounds, nature space, recreation space, BBQ and picnic space, sport space, pedestrian accessibility to parks and pedestrian connectivity with surroundings.

COVID-19 impact. Overall, the majority of participants responded that COVID-19 impacted their community park use behaviours, social interaction and place attachment. Interviews found most participants used community parks more for individual activities and weak ties social interaction than they did before COVID-19 happened. By contrast, interviews found most participants had somewhat the same or less strong ties social interaction since the COVID-19 outbreak, especially during the lockdown period. In addition, interviews found that, since COVID-19 happened, community participation was significantly reduced, and even almost suspended during the lockdown period. The interview findings reflect the characteristics of residents' park-related behaviours, daily activities, social interaction and perception of place attachment in MPEs in the COVID-19 context.

Chapter 6 Discussion

This study aims to investigate the relationship among community park use, social interaction and place attachment in MPEs to address six research questions (see Section 1.5) and test four research hypotheses (see Section 1.6). To better understand the results and the human–environment relationships between community park use, social interaction and place attachment, this chapter discusses key findings to answer the research questions and compares the results with previous findings. This chapter also offers potential explanations for the findings, and comments on the findings as follows.

6.1 Behavioural Patterns of Community Park Use

To answer research question 1 (RQ1) 'how do residents use community parks in MPEs?', interviews found that residents' behaviours consist of two main categories: individual activities and social activities (see Figure 5.1). First, interviews found that the main individual activities are relaxation and physical activities. Second, interviews found three types of social activities occurring in community parks in MPEs based on social ties: weak ties social interaction, strong ties social interaction and community participation. It is notable that the interview data of this study was collected during the COVID-19 pandemic from February to June in 2022. The interview findings therefore reflect the characteristics of residents' community park use behaviours, daily activities, and social interaction in MPEs in the COVID-19 context.

These findings agree with previous findings that the characteristics of behaviours of community park use are important to understand psychological and recreational benefits of residential parks (Kaźmierczak, 2013). This study confirms the previous findings that urban park plays a significant role as the most important common open place for residents' individual and social activities in neighbourhoods (Centers & Gómez, 2019; Swierad & Huang, 2018). These results reflect those of Svendsen et al. (2016) who found that urban parks support people's a variety of activities undertaken in parks which 'reflect personal desires to connect with nature and a larger reality, as well as via a broader set of practices focused on connecting with self and with others' (p. 881). This finding is also consistent with

Centers and Gómez's (2019) study which found that parks offer both individual benefits and social-community benefits for people.

The findings are generally supported by Jan Gehl's behaviour classification in public space: necessary, optional and social activities (Gehl, 2011; Kaźmierczak, 2013). These activities were categorised depending on general urban public space but are not fully applicable to community parks in the Australian MPE context. In contrast to Gehl's (2011) views of three types of activities, this study recognised individual (optional) and social activities of community park use. The findings agree with some previous findings that the main activities of urban park use are recreational individual activities and social activities (Centers & Gómez, 2019; Kaźmierczak, 2013; Peterson et al., 2008), also in terms of physical/leisure activity and social activity (Han et al., 2022).

Compared with most past studies that focus on the community level rather than on individuals and their behaviours in neighbourhoods (Manzo & Perkins, 2006), the findings of this study narrow focus on individual behaviours in MPEs. In contrast to earlier studies that mainly focus on recreational or physical activities, this study put more emphasis on social behaviours of park use, which is significantly less understood in the literature (Han et al., 2022; Peters et al., 2010). In contrast to previous studies, this study identified specific items of both individual and social activities of community park use in MPEs based on the evidence collected during the COVID-19 pandemic. The following sections discuss the characteristics of individual and social activities of community park use specifically.

Individual Activities

Interviews found that the main individual activities are relaxation and physical activities. Interviews identified five main relaxation activities: sitting, relaxing, getting fresh air, enjoying views, and enjoying the sunshine; and seven main physical activities: walking or running, walking the dog, doing sports, doing exercise, riding a bike, playing, and using facilities. These results reflect those of Han et al. (2022), Kaźmierczak (2013) and Francis et al. (2012) who also found that some specific individual activities of park use. For example, the findings are in agreement with Kaźmierczak's (2013) findings that the main optional activities included relaxing, enjoying the surroundings, getting fresh air, walking or running, and riding bike. Similarly, the findings are consistent with Francis et al. (2012) who identified

five activities in public open space in Australian MPEs: 'watch or play sport, attend an event, walk or jog, relax and other activities' (Francis et al., 2012, p. 403).

The qualitative study found that optional activities were the most frequent activity in community parks, and in contrast, necessary activities were only rarely mentioned by respondents. This finding was also reported by Kaźmierczak (2013). The findings are consistent with Francis et al. (2012) who found that public open space encourages' quality 'may be more important for those people undertaking personal recreational activities, rather than obligatory activities (e.g., exercising a dog) within the public open space' in MPEs in Australia (p. 407). The results corroborate the ideas of Gehl (2011) who suggested a possible explanation for this finding: 'place and situation now invite people to stop, sit, eat, play, and so on' (p. 11).

Comparing the results with previous findings, this study identified more specific types of individual activities of community park use in MPEs. This has not been done previously. This study found that sitting is the most predominant form of individual activity. A possible explanation for this might be the impacts of COVID-19. After the COVID-19 outbreak, residents were more likely to go to the park to sit down and rest alone or have some casual social interactions when sitting there. This study also hints at residents' needs for more good quality rest seating facilities. In contrast to Kaźmierczak (2013) who considered walking the dog as a necessary activity of park use, this study regards 'walking the dog' as an important optional recreational activity which is a main source to promote weak ties social interaction activities. This also could potentially be a change in behaviours since the COVID-19 outbreak. This study therefore argues that MPE planning needs to consider the quality of park spaces for such behaviours in parks, such as providing dog off leash park in neighbourhoods. In addition, interviews found that residents use facilities to perform personal outdoor exercise activities. This may be because MPEs offer more facilities in parks which are different from other residential areas. Therefore, they may provide more outdoor exercise opportunities for residents.

Social Activities

The qualitative study found that social activity is one of the predominant types of activities in community parks in MPEs, and also found social activities may benefit residents'

wellbeing. Interviews found that residents' social activities consist of three themes: weak ties social interaction; strong ties social interaction and community participation (see Figure 5.1). This study also identified specific items of three types of social interaction occurring in community parks in MPEs. This has not been done previously in the Australian context.

Comparing the results with previous findings, these findings are broadly consistent with the earlier statement that social relations consist of multiple layers of relations within social networks from strong ties to weak ties (Henning & Lieberg, 1996; Kim, 2017). For example, these results reflect those of Kim and Kaplan (2004) who found two types of social interaction in neighbourhoods: formal interaction (based on strong ties) and casual interaction (based on weak ties) (Kim & Kaplan, 2004). This finding is also consistent with Kim's viewpoint that recognising the differences between weak ties and strong ties social interaction is extremely important for understanding the neighbourhood social interaction (Kim, 2017). This study found that community participation plays an important role in social interaction in MPEs. The importance of community participation has also been reported in previous studies, for example, some studies found that community participation is an important method for residents' socialization in neighbourhoods (Kawachi & Berkman, 2001; Zhu & Fu, 2017).

These results are related to characteristics of social life in MPEs. MPEs aim to facilitate residents' social interaction by providing neighbourhood design and facilities. But the specific patterns of social interaction behaviours in MPEs are unclear. This study helps to fill this gap by identifying specific social activities based on social ties in the context of MPEs. These findings are in agreement with the findings of Alidoust and Bosman (2017) which showed MPEs are 'successful examples of the importance of place in encouraging social interaction and establishing social ties among neighbours' (p. 44). The following sections discuss the characteristics of the three forms of social interaction occurring in community parks in MPEs.

Weak ties social interaction. In accordance with the present results, previous studies have demonstrated that weak ties are more important for residents' wellbeing in neighbourhoods (Henning & Lieberg, 1996; Kim, 2017). This study found three types of general social interaction from or with weak ties: short talks, acknowledging contact and visual contact. The findings of this study also accord with some past studies which found three descriptions of

weak ties in the neighbourhood: acknowledging contact, such as waving or saying hello to neighbours (Du Toit et al., 2007; Henning & Lieberg, 1996; Lund, 2003); greeting contact, such as stopping and talking to a neighbour when meeting (Du Toit et al., 2007; Henning & Lieberg, 1996; Weijs-Perrée et al., 2015); and helping contact, by exchanging services with neighbours like 'taking care of the mail or looking after the flowers' (Henning & Lieberg, 1996, p. 18).

The findings of this study are consistent with previous studies discussed above with some new complements and extensions. First, this study identifies more forms of greeting contact. Interviews identified residents may have some short conversations when walking, walking the dog, watching kids playing, or watching or doing sports. This finding supports some previous research findings that walking activity can facilitate social interactions with neighbours (Cauwenberg et al., 2012; Weijs-Perrée et al., 2015). These findings indicated the importance of children's spaces, dog spaces, and sport spaces and related pedestrian facilities for social interaction in MPEs. This study did not find helping contact was a dominant type of weak ties social interaction in outdoor parks in MPEs, as such practical help interactions rarely occur in park spaces in MPEs.

By contrast, this study argues visual contact is also one of the important types of weak ties social interaction. Visual contact refers to being 'engaged in social interaction that did not involve verbalised conversations' (Hickman, 2013, p. 228), including seeing other people, watching children playing, or watching sport or activities. This finding means neighbourhood social ties may grow through repeated visual contacts which is consistent with some previous studies (Francis et al., 2012; Hickman, 2013). Francis et al. (2012) outlined that watching sport is one of five key activities undertaken in parks in MPEs in Australia. Interviews indicated that visual contact, like seeing a friendly face or child playing in the park, might bring positive emotional benefits for residents, especially for some more socially isolated residents. Similarly, some past studies found that simply seeing other people may benefit them (Hickman, 2013). Based on the classification of weak ties social interaction in previous studies, this study took into account visual contact as a major form of weak ties social interaction in parks, replacing helping contact. This may be because visual contact is a more common and more important form of weak ties social interaction in outdoor parks in MPEs.

It is also noticed from the qualitative data that the importance of visual contact might have been magnified by COVID-19.

Strong ties social interaction. Interviews found four types of strong ties social interaction: meeting friends, doing sports together, playing with children and their friends, and talking with friends and close neighbours. This study measured residents' social network size by asking people to report on how many neighbour friends they have in the MPE in both the survey and qualitative interviews.

A few previous studies specified the types of strong ties socialization with neighbours in community parks in urban communities. In accordance with the present results, some previous studies have demonstrated that the main strong ties social interactions occurring in neighbourhood outdoor spaces are joint leisure activities, sport or going out together and having a conversation (Rosenblatt et al., 2009; Weijs-Perrée et al., 2015). Similar to previous research, this study found that doing sports together and having a conversation with neighbours are two main types of outdoor strong ties social interaction in the context of MPEs.

However, the specific form of joint leisure social interaction activities has not previously been described. This study contributes to fill this gap by finding that specific forms of leisure social interaction activities include meeting friends for a BBQ or picnic, having parties, and playing with children and their friends. These specific joint leisure social interaction activities reflect the characteristics of social interaction occurring in MPEs which seem to some extent to differ from other neighbourhoods' strong ties social interaction. This may be because the MPE provides specific facilities, such as BBQ and picnic areas, rest areas and children's play spaces, which facilitate the strong ties social interaction activities occurring in community parks in MPEs.

Community participation. This study found two types of community participation social interaction activities: group activities and community events in MPEs. The finding confirms that community participation is an important pathway for facilitating residents' social interaction in neighbourhoods (Kawachi & Berkman, 2001; Rosenblatt et al., 2009; Zhu & Fu, 2017).

These results match the findings in some earlier studies which recognised two categories of community participation may influence residents' social interaction and place attachment: attending events (Weijs-Perrée et al., 2015), and involvement in groups (Rosenblatt et al., 2009). However, the result of specific types of attending community events in MPEs has not previously been described. This study found that attending community events is the most important type of park-related community participation in MPEs which added new insights to the literature. Specifically, this study found that park-related community participation includes group activities and community events in MPEs. Additionally, several major types of group activities were found in MPEs: building block neighbour group, elderly group, immigrant and cultural group, and sport group. These group activities often occur in community parks in MPEs, especially after the COVID-19 outbreak. People seem to prefer outdoor social interaction more than before COVID-19. This differs from the previous findings. These findings of group activities reflect the characteristics of social issues in MPEs, such as diversity, governance, and socialisations.

6.2 Associations between Community Park Use and Social Interaction

For research question 2 (RQ2) 'which factors of community park use are significantly and positively associated with residents' social interaction in MPEs?', the survey study found that three community park use factors are significantly and positively associated with social interaction in MPEs: frequency of community park use, rest space satisfaction, and pedestrian connectivity with surroundings. These findings are confirmed by interviews. In addition, interviews found four new factors of community park use associated with social interaction in MPEs. Interviews further explained the survey results and answered research question 3 (RQ3) 'how do community park use factors affect residents' social interaction in MPEs?'.

These findings are consistent with previous studies which have acknowledged the importance of neighbourhood public places for social interaction and residents' wellbeing. It is necessary to increase our knowledge on what specific neighbourhood open space features are important for residents' social activities and social interactions (Kaźmierczak, 2013; Schmidt et al., 2019). However, few studies considered the impact of frequency of community park use and what type of park spaces impact social interaction in MPEs in the built environment

disciplines. This study's findings contribute to fill this gap, combining quantitative methods with a qualitative approach, as discussed below.

Frequency of Community Park Use

The survey study found a significant and positive association between the frequency of community park use and social interaction in MPEs. Interviews confirmed this survey result of a positive association between the frequency of community park use and social interaction. Interviews were also conducted in an attempt to understand how frequency of community park use impacts social interaction.

Few studies have investigated the impact of frequency of community park use on social interaction. The findings of the correlation of frequency of community park use on social interaction are inconsistent in the literature. This finding of this study is in line with those of previous studies that found that frequency of park use has a significant impact on social wellbeing (Kaźmierczak, 2013; Zhu & Fu, 2017). This result is in agreement with Zhu and Fu (2017) who found that the frequency of park use attribute has a significant and positive impact on community social capital and neighbourhood attachment. This result also reflects that of Kaźmierczak (2013) who found that regular and longer visits to local parks help to develop social ties in neighbourhoods. One possible explanation for this result is that visiting community parks may create more opportunities for more social contacts, for weak ties social interaction, strong ties social interaction and community participation.

By contrast, on the other hand, this finding is contrary to some previous studies which have suggested that frequency of public space use has less or no impact on sense of community or social interaction (Centers & Gómez, 2019; Francis et al., 2012; Gómez et al., 2015). This differs from the findings presented in this study. The association between the frequency of community park use and social interaction in MPEs is still less understood in the literature.

This study argues that the frequency of community park use has a greater impact on weak ties social interaction. The results of the survey data's ANOVA analysis showed that using community parks at least once a week significantly affects the frequency of weak ties social interaction. This result was also confirmed by interviews. Interviews indicated that community park use could help to develop weak social ties with neighbours by providing

opportunities for weak ties social interaction, such as greetings, short talks with neighbours and visual contacts. For example, people may value and enjoy seeing friendly faces when they felt socially isolated, which is also reported by Hickman (2013). Hence, by increasing the frequency of park use, the weak ties social interaction may increase significantly. This finding from interviews is consistent with that of Weijs-Perrée (2015) who found the general weak tie social interactions are important for residents' social engagement and mental wellbeing.

It is also noticed the finding of this study differs with some previous studies before the COVID-19 outbreak which found the frequency of public space use has less or no impact on sense of community or social interaction (Centers & Gómez, 2019; Francis et al., 2012; Gómez et al., 2015). One possible explanation is that people have been using and appreciating neighbourhood green spaces more than before COVID-19. This is supported by some recent studies that found that, due to the impact of COVID-19, outdoor social activity has become more important than before (Han et al., 2022). The survey and interviews were conducted in the midst of the COVID-19 pandemic. Many people were experiencing feelings of isolation due to the COVID-19 outbreak, which was also reported in Australia by Edwards et al. (2020). Lockdowns may have reinforced the social interactions that take place in community park spaces and made them stronger, especially for weak ties social interaction. However, there is no evidence that these interactions have resulted in significant changes in people's general attitude. This finding thus highlights the importance of community park use to facilitate social interaction in MPEs by combined quantitative and qualitative empirical evidence.

Rest Space in Community Parks

This survey finding agrees with those of previous studies which found rest and seating areas are significantly associated with social interaction in neighbourhoods (Kaźmierczak, 2013; Schmidt et al., 2019). This finding is consistent with that of Schmidt et al. (2019) who revealed that older residents tend to sit down in parks when engaging in social activities in neighbourhoods, but the results seem to be contradictory to the previous findings of Huang (2006) who found that seating areas are not a significant factor to facilitate social interaction in high-rise housing neighbourhoods in the context of Taipei.

Interviews of this study confirmed this finding in the survey study. Interviews also revealed residents' behavioural patterns in rest spaces in community parks and explained how rest space impacts on residents' social interaction in MPEs. The rest spaces in community parks provide spaces for residents to engage in various weak ties social interaction, strong ties social interaction and community participation activities. Interviews showed that three types of social interactions often occur in the rest spaces in parks. Therefore, rest spaces can be regarded as one of the main types of social meeting places of community parks.

First, the interviews found that weak ties social interaction often occur in rest areas in community parks, such as sitting in the park to see other people, waving to greet others, or having brief conversations in the sitting areas. This type of casual interaction allows residents to feel that they are engaging in neighbourhood life and, in turn, benefitting their mental wellbeing. This finding is also reported by Hickman (2013). Second, the interviews indicated that residents often use rest facilities for strong ties social interaction and community activities, such as to sit and have a conversation with close neighbours, to gather with friends, and to hold parties or group gathering activities.

Interviews implied that the rest spaces' layout (e.g., quantity, location, shade) needs to take into account different types of social activities' needs. For example, rest facilities should be located close to the children's play area, sports area, dog parks and so on, which may be helpful for promoting social interaction, in particular weak ties social interactions. Interviews also found that the quality of rest space may affect people visiting parks and social interaction. Interviews found shade in rest areas significantly influences people's community park use and social interactions. This may be related to the sunny weather and high summer temperatures in Australia. Therefore, this study argues that MPEs' planning should carefully consider the quantity and quality (e.g., location, shading) of rest facilities which is important to promote MPEs' social sustainability.

Pedestrian Connectivity with Surroundings

The survey study found that the pedestrian connectivity with surrounding areas was significantly associated with social interaction between neighbours. Interviews confirmed this survey result and explored the possible reasons. This finding is consistent with that of Abass et al. (2020) who found that neighbourhood connectivity positively correlates with social

interaction in Australian suburbs. Interviews of this study indicated a possible explanation for this might be that well-connected surrounding parks provide residents opportunities to extend their activities to surrounding spaces or parks and therefore make them feel a bond of community connections, which is helpful to their social interaction.

On the other hand, some previous studies showed that gated MPEs with physical or symbolic boundaries can provide a sense of safety and the resulting social interaction for crime prevention through environmental design (Newman, 1972; Lu et al., 2018). This differs from the findings presented in this study. This is because these viewpoints of crime prevention primarily apply to North America or other regions, but safety concern is not a big issue in Australian cities. Gated MPEs are less common than in the USA or other regions (Francis et al., 2014). This result differs from previous studies focusing on safety concern, but it is broadly consistent with some Australian studies which found that neighbourhood connectivity is more focused on the MPEs' social and spatial segregation issues (Francis et al., 2014; Kenna et al., 2017) rather than on safety concerns (Dowling & McGuirk, 2005).

This finding reflects those of previous studies which found MPEs were exclusive externally, separating and distinguishing estates from their surrounding areas (Kenna et al., 2017; Maller et al., 2016; Thompson, 2013). The interview results are consistent with those of Maller et al. (2016), who found that the lack of pedestrian connectivity with surroundings meant that most individual and social activities were contained within the MPEs, which potentially limit residents' behaviours and social interactions, in a study in Melbourne, Australia. This is also reported by Goodman and Douglas (2008) who noted that MPEs' open space and recreational facilities often seem 'relating to exclusivity, separation from the wider community' (p. 521). This study argues that walking connectivity to surrounding places might be one way to address the MPE issue of spatial and social separation which needs further attention.

Other Community Park Use Factors

It is worth noting that interviews also found other four new insights of community park use which had impacts on residents' social interaction. Specifically, interviews found that the parks' recreation (e.g., BBQ, picnic), sport, nature and children's playground facilities also had impacts on residents' social interaction, while survey data did not find significant associations between these factors and social interaction. This finding is consistent with that

of Kaźmierczak (2013) who found children, activity spots, natural settings and recreational facilities positively impact social interaction. These findings are also in line with those of previous studies which revealed several neighbourhood factors associated with social interaction: nature (Comstock et al., 2010), quality of walking paths (Schmidt et al., 2019), and integrated pedestrian network (Talen, 2000).

On the other hand, interviews also showed that the BBQ, sport, and children's play facilities in both cases were inadequate, and had not been able to meet the needs of people of different ages. Hence the effects of these facilities on social interaction were not sufficiently shown in this study, which may also be the reason why the survey results did not show significant results. The findings of interviews have highlighted the importance of these facilities for social interaction, but at the same time we should strengthen our understanding of the specific needs of people of different ages. The influence of these factors on social interaction has been poorly explored and requires further exploration, especially focusing on the MPE context.

To sum up, for social interaction study, the findings supported the Hypothesis 1: the frequency of community park use is significantly and positively associated with social interaction between residents in MPEs, and the Hypothesis 3: the satisfaction with community park quality is significantly and positively associated with social interaction between residents in MPEs. Both the survey study and interviews found three factors of community park use are significantly and positively associated with social interaction in MPEs: frequency of community park use, rest space satisfaction, and pedestrian connectivity with surroundings. Interviews confirmed these findings and provided explanations of these findings.

6.3 Psychological Process of Place Attachment in MPEs

For research question 4 (RQ4) 'what are the psychological processes of place attachment to community parks in MPEs?', the survey data's principal component analysis identified three principal components of neighbourhood place attachment: affect, cognition and behaviour. This finding was confirmed by interviews. Interviews revealed three themes and seven underlying subthemes of psychological processes of place attachment to community parks, including 1) affect items: emotional bonds, place memory; 2) behaviour items: place-related

need fulfilment, social interaction with social ties; and 3) cognition items: membership of community, meanings and culture significance.

The findings of the survey and interviews support affective–cognitive–behavioural place attachment theory (Scannell & Gifford, 2010) and add new insights to Scannell and Gifford's (2010) PPP theoretical model under Australian MPE circumstances. Scannell and Gifford's (2010) PPP theoretical model demonstrates the place attachment process in a general context and does not fully and accurately reflect the characteristics of place attachment in a specific Australian MPE context. The specific underlying subthemes of psychological processes of place attachment to community parks are unclear in the literature. Therefore, the findings of this study differ from the PPP model and other previous place attachment studies. These findings based on the evidence from the COVID-19 context add some modifications to the subthemes in three dimensions in the PPP model, thus it reflects specific characteristics of MPE community parks in the COVID-19 context, which are discussed as follows.

Affective Process

This study found the most significant elements of place attachment are affective items. This is consistent with most previous studies (Casakin et al., 2021). This study found the subthemes of place affect include emotional bonds and place memory, which is related to recent studies such as Mihaylov et al. (2020) and Scannell et al. (2020).

Emotional bonds. This study confirms that emotional bonds are associated with place attachment. This result corroborates the findings of previous work which found emotional factors such as happiness, pride and love to be the main factors in place affect (Mihaylov et al., 2020; Scannell & Gifford, 2010). This result also reflects that of Lestari and Sumabrata (Lestari & Sumabrata, 2018) who found that emotional bonds between residents and neighbourhood were not only affected by the physical environment but also affected by the social interaction with neighbours.

Place memory. Interviews found that the presence of place-based memories in community parks is a significant factor associated with place attachment in MPEs. This finding is consistent with quite a few previous studies (Lestari & Sumabrata, 2018; Scannell & Gifford, 2017; Scannell et al., 2020). Interviews of this study indicated that park-related memory

facilitates positive emotions such as happiness, enjoyment and love to promote place attachment in MPEs. Hence, this study argues that memory is a subtheme of place affect because it reflects existing associations between emotional bonds and place memory, which need further qualitative studies to explore.

Behavioural Process

This study explored the characteristics of residents' behaviours in MPEs and found that behavioural items influencing place attachment consist of three dimensions: place-related need fulfilment; community participation; and place social bonds. These findings focused on a specific MPE community park circumstance, which differs from the behaviour items of previous place attachment models in the literature. This finding differs from Scannell and Gifford's (2010) PPP theoretical model which illustrates a positive relationship between community participation and place attachment. However, other behaviour items in the PPP model are underexplored in the literature to date. In particular, social interaction behaviours to place attachment were not included in the PPP model. The findings of this study added the behaviour items to the PPP model in the MPE community park context.

Place-related need fulfilment. This study's interview found that place-related need fulfilment is an essential behavioural item influencing place attachment. This result corroborates the findings of a great deal of the previous work in the place attachment behavioural component (Manzo & Perkins, 2006; Scannell & Gifford, 2017; Williams & Vaske, 2003). Scannell and Gifford (2017) investigated psychological benefits of place attachment through a qualitative study and found activity support is an important meaning of place attachment. Specifically, their study identified the specific place-related behavioural needs including relaxation, activity support, and entertainment. Of them, relaxation is the most important place attachment influencer (Scannell & Gifford, 2017). This result is in agreement with Scannell and Gifford's (2010) findings which showed that continuous engagement in activities plays a crucial role in preserving a sense of closeness to a place, which is the most important factor in the behavioural dimension of place attachment. They revealed that residents are most likely to develop a sense of place attachment towards two specific types of places: home and outdoor space (e.g., parks). This study is consistent with these previous findings and confirmed that meeting needs is one of the main behavioural

processes to form place attachment in MPEs. As discussed above, place attachment studies have not included clear behavioural items to date (Casakin et al., 2021). Interviews of this study found that residents' behaviours in community parks consist of various individual activities and social activities. These findings contribute to fill this knowledge gap of place attachment behavioural items.

Community participation. This study's interviews found that community participation is another behavioural item influencing place attachment. This finding is consistent with some previous research which also found community participation is an essential item of the behavioural theme to form place attachment, in particular on participation related to place reconstruction (Scannell & Gifford, 2010). This result reflects those of Scannell and Gifford (2010) who found that the behavioural level of place attachment includes two items: 'desire to remain close to a place', and 'reconstruction of place' (p. 4). These findings are also in line with Manzo (2006) who stated that the behavioural meaning of place attachment mainly refers to community participation, such as engagement in activities related to neighbourhood planning and improvement.

In the Australian MPE literature, few studies have investigated the behavioural meanings of place attachment related to community participation. The findings of this study help to fill this gap in two new insights. First, interviews found that MPEs provide a variety of community-based participation which may contribute to neighbourhood improvement. For example, the MPE residents committee may contribute to self-government by residents (Francis et al., 2014; Thompson, 2013). Second, interviews indicated that MPEs may offer more organised community activities and events than other neighbourhoods. These community activities may be organised by MPE strata, a residents committee, or resident groups. Most community activities and events were conducted in community parks within the MPEs. Interviews also hinted that these community activities could have a significant impact on place attachment at the behaviour level. More research is needed to explore the impact of community activities on place attachment in the MPE context.

Place social bonds. This study found that social activities influence place attachment in MPEs, including weak ties social interaction and strong ties social interaction. These findings are in line with those previous studies which found that social bonds may affect place

attachment, such as strong ties social interaction with neighbours, closeness to the neighbours, daily interactions among residents (Alawadi, 2017; Lestari & Sumabrata, 2018). In the literature, to date, it is unclear if social engineering has influenced people's perceptions of place attachment (Dlamini & Tesfamichael, 2021). This finding is consistent with some scholars who stated that neighbourhood attachment reflects a general feeling of wellbeing via social bonds with the residential area (Casakin et al., 2021; Dlamini & Tesfamichael, 2021). For example, this result is in agreement with Casakin et al. (2021) who pointed out that neighbourhood place attachment can come from 'a general feeling of well-being that is developed through daily social interactions among neighbours' (p. 318). This finding is consistent with some recent studies which found the importance of social bonds to place attachment in urban neighbourhoods (Dlamini & Tesfamichael, 2021; Hesari et al., 2019).

Based on the qualitative evidence, this study analyzed the connections of weak ties, strong ties and community participation to place attachment in the MPE context. Interviews implied that fulfilment of residents' social needs would help promote the sense of place attachment. One possible explanation is that MPE community parks provide facilities and venues which may help facilitate the occurrence of social activities and in turn build place attachment. Because of the MPEs' characteristics such as diversity, this study argues that MPE planning should fully consider the needs for different types of social activities.

To sum up, this study found that residents' individual activities (relaxation and physical activities) and social activities (weak ties social interaction, strong ties social interaction, community participation) are possible sources of place attachment. This supports and expands the previous literature on the impact of behavioural levels on place attachment (Lestari & Sumabrata, 2018; Scannell & Gifford, 2010). This research has provided important insights into the relationship between individuals' everyday practices and bonds with outdoor spaces in MPEs. Further studies are needed to understand the behaviours and diverse meanings of place attachment in order to create successful places for residents (Manzo & Perkins, 2006). In particular, the COVID-19 pandemic let people rethink the human–environment relationships and residents' behavioural needs in urban neighbourhoods.

Cognitive Process

In the MPE context, this study identified there are three cognitive items of place attachment which are discussed below: membership of community, meaning, and cultural significance.

Membership of community. This study found that residents' place attachment may come from a sense of membership of community, or in terms of a sense of belonging. This is also consistent with some recent studies which pointed out place attachment is developed 'not only from their personal experiences, but also from the group to which they belong' (Casakin et al., 2021, p. 318). These findings are in line with those of Seamon (2020) who found that place identity comes to 'feel a part of place and associate their personal and group identity with the identity of that place' (p. 29). This finding reflects the characteristics of Australian MPEs which show a characteristic of social distinction. These findings are in line with some researchers who assert that MPEs are often highly homogenous (Francis et al., 2014; Kenna et al., 2017). For example, this finding is consistent with Francis et al. (2014) who noted that Australian MPEs show a characteristic of exclusion by 'emphasising separation and difference from surrounding areas to generate a positive sense of exclusivity' (p. 190). This study argues that the social distinction may create a social segregation issue, but on the other hand, it may also help to create a sense of identity which is a resource to form place attachment in MPEs. MPEs' homogenous and social distinction characteristics may help residents form a social identity, which in turn strengthens place attachment in MPEs.

Meaning. Interviews in this study found 'meaning' is an important item to form place identity. These findings are in line with Manzo and Perkins (2006) who assert that place identity consists of various dimensions of personal emotional connection with the physical environment, including 'means of a pattern of beliefs, preferences, feelings, values, and goals' (p. 337). In the context of MPEs, this study's interviews found that residents may create place-related meanings in recognition of the MPE lifestyle, values and goals. This is consistent with the MPE literature which shows that MPEs' lifestyle packages provide people with opportunity to rediscover meaning and purpose in their lives (Alidoust & Bosman, 2017). This may be one of the cognitive items to form place attachment in MPEs which distinguishes them from other neighbourhood contexts.

Cultural significance. Another new finding from the interviews of this study is that cultural significance is regarded as one of the sources of place attachment in the Australian MPE context. This is probably because of the multicultural backgrounds and diversity characteristics of MPEs in the Australian context. This finding is related to a recent place attachment study by Dlamini and Tesfamichael (2021) that found that 'places have cultural significance, and this leads individuals to distinctly identify themselves with such spaces and express their sense of identity' (p. 2436). This finding reflects some previous studies which revealed that MPEs' public spaces provided important grounds for social and cultural diversity in everyday activities (Cattell et al., 2008; Kaźmierczak, 2013). In sum, this study expands Scannell and Gifford's PPP model (2010), by adding a new subcategory of cultural significance at the cognition dimension in the Australian MPE context.

To conclude, this study identified some new insights of psychosocial mechanisms of place attachment and expanded Scannell and Gifford's (2010) PPP place attachment model, by adding several new subcategories of place attachment dimensions for the Australian MPE context. The findings therefore differ from previous place attachment studies in other neighbourhood contexts (Hesari et al., 2019; Scannell & Gifford, 2010). However, to date, few studies have examined relationships between community parks and place attachment across different types of neighbourhoods. Therefore, this study helps to fill these knowledge gaps by providing empirical evidence under the Australian MPE context from the built environment discipline perspective.

6.4 Associations between Community Park Use and Place Attachment

For research question 5 (RQ5) 'which factors of community park use are significantly and positively associated with residents' place attachment in MPEs?', the survey found three identified key factors that are significantly and positively associated with place attachment in MPEs: pedestrian accessibility to parks, pedestrian connectivity with surroundings, and satisfaction with children's playgrounds in parks. These results were confirmed by the interviews. Moreover, interviews found four new factors of community park use which are associated with residents' place attachment: nature space, recreation space, rest space and sport space in parks. In addition, interviews further explained the survey results and answered

research question 6 (RQ6) 'how do community park use factors affect residents' place attachment in MPEs?'.

The findings indicate the importance of community parks to place attachment. The findings are in line with Karacor and Parlar (2017) who revealed that quality of neighbourhood open space was a significant predictor of neighbourhood place attachment, also reported by Zhu and Fu (2017). The findings suggest that strengthening the integration of park pedestrian networks and improving the quality of children's spaces in community parks would become more crucial to improving place attachment and community resilience for future MPEs and urban communities.

Pedestrian Accessibility to Parks

The survey found two factors of parks' pedestrian environment were significantly associated with residents' place attachment: pedestrian accessibility to parks; and pedestrian connectivity with surroundings. These findings were confirmed by interviews. This finding generally supports the precepts of new urbanism regarding pedestrian design at the neighbourhood level: designed neighbourhoods for pedestrian, and integrated parks as networks (Ebrahim, 2015).

Most importantly, this study found pedestrian accessibility to parks had the strongest significant and positive association with place attachment in MPEs. This finding is consistent with some previous studies about place attachment (Abass & Tucker, 2018; Centers & Gómez, 2019; Gómez et al., 2015). For example, it is consistent with Kim and Miller's (2019) findings that the distance to green infrastructure is positively associated with place attachment. Similarly, it relates to Abass and Tucker's (2018) findings that walking connectivity in open spaces has the strongest correlation with place attachment in neighbourhoods, which was also reported by Kimpton et al. (2014). A possible explanation for this might be that residents have more opportunities for interactions if they live closer to parks. Good walking accessibility to parks can promote more walking and outdoor activities in parks. In addition, the importance of community pedestrian spaces might have been amplified by COVID-19, because residents' walking activities in outdoor parks have had a significant increase since the COVID-19 outbreak (Marcelo et al., 2022). Another possible reason is that accessibility of parks can promote community participation for residents, like community activities and events in MPEs.

This is supported by Alidoust and Bosman (2017) who suggested that accessibility of parks was important to promote residents' community participation in neighbourhoods. This finding also supports new urbanism's claim that a pedestrian-friendly integrated park network would benefit the promotion of place attachment and sense of community (Kim & Kaplan, 2004). The findings of this study support the new urbanism's claim that a network of well-dispersed small parks can help to increase pedestrian accessibility to parks (Talen, 2000). Hence, this thesis argues that a well-dispersed small parks network layout should be more encouraged, rather than a large, centralised central park layout, to promote place attachment in MPEs and future urban communities.

Pedestrian Connectivity with Surroundings

Both the survey and interviews of this study found that the parks' pedestrian connectivity with surroundings was significantly associated with neighbourhood place attachment. This finding reflects some previous studies' findings which identified several built environment features may directly or indirectly influence neighbourhood place attachment, including neighbourhood physical and symbolic boundaries (Abass & Tucker, 2018; Lu et al., 2018; Maller et al., 2016). This finding provides enlightenment for open (or non-gated) MPE and urban neighbourhoods' research. Although new urbanism claims that parks' pedestrian connectivity with surroundings can help to promote a sense of community (Congress for the new urbanism, 2000), few studies tested the relationship between parks' pedestrian connectivity with surroundings and place attachment in urban communities globally. The relationship between gating and place attachment is still unclear, as a lack of empirical studies have tested this specific new urbanism claim (Lewicka, 2010). To the author's knowledge, this is the first study to test this new urbanism claim about the association with parks' pedestrian connectivity with place attachment in the Australian MPE context. This finding confirms the importance of pedestrian connectivity with surroundings to form place attachment in urban communities.

As discussed above, social and spatial segregation is a significant sustainability issue in MPE development. There is a lack of empirical study to test the impact of built form (gated or non-gated) and neighbourhood connectivity on place attachment in urban communities. Because previous findings are inconsistent in the literature, neighbourhood connectivity on place

attachment is unclear. On the one hand, the finding of this study is consistent with Abass and Tucker's (2018) findings that neighbourhood walking connectivity significantly and positively impacts neighbourhood attachment in Australian cities. On the other hand, this finding is contrary to some previous studies which found that the 'gating' form does not affect neighbourhood place attachment (Lewicka, 2010).

This finding is consistent with Abass and Tucker (2018) who claimed that 'neighbourhood connectivity' provide residents' physical connectivity and accessibility to local services and community facilities via walking' (p. 234). This finding is also in line with Alidoust and Bosman (2017) who found a low level of access to surrounding open spaces outside MPEs may 'lead to degrees of segregation in the physical and social landscapes from the places/people outside the residential development' (p. 44). A main possible explanation for this might be that parks' pedestrian connectivity with surroundings can provide richer choices for residents' activities, resulting in more social interactions and in turn promoting a higher sense of place attachment. Particularly during COVID-19, connecting to the surrounding areas may extend residents' individual and social activities in outdoor spaces.

The survey ANOVA results found a significant difference between BP and LP residents' satisfaction with pedestrian accessibility to parks and pedestrian connectivity with surrounding areas. Interviews also confirmed the differences between two MPEs regarding parks' pedestrian connectivity factors. The survey study revealed that BP residents had higher satisfaction with pedestrian connectivity with surrounding areas, which differed significantly from LG residents. The survey showed a significant positive correlation between pedestrian connectivity with surrounding areas and the frequency of weak ties social interaction. This also hints that being well connected with surroundings can facilitate weak ties social interaction. This finding was also confirmed and supported by interviews. Interviews also found that weak ties social interaction seems to play a more important role for neighbourhood place attachment and the social wellbeing of residents, which is in line with previous studies, such as Kim (2017).

Interviews showed that BP has a good pedestrian connection with surrounding parks so that residents extended their social activities to surrounding parks. Pedestrian access to surrounding parks provides more opportunities for residents to engage in social behaviours,

such as walking through the parks with friends, and seeing and greeting neighbours while travelling between parks. This is probably because there are many BP neighbours in the surrounding parks, and they continue the weak ties social interaction there. In contrast, interviews found that LG residents had less social interaction in surrounding parks than inside LG. LG's built form is regarded as a symbolically gated form (Dowling et al., 2010), with physical boundaries like walls and gates. Although LG is administratively open, residents need to cross traffic roads to the surrounding area. The interviews of this study indicate that the lack of a walking connection with surrounding open spaces may affect residents' weak ties social interaction with neighbours. Interviews showed that the most neighbour social interaction in LG is internally concentrated within LG: there is less social interaction in surrounding parks than inside LG with neighbours. This is consistent with some previous Australian MPE studies (Alidoust & Bosman, 2017; Maller et al., 2016). This finding is consistent with Alidoust and Bosman (2017) who revealed that due to a lack of enough access to the open spaces outside the MPEs, 'the social networks of most residents were largely concentrated within the physical boundaries' of the MPE in a qualitative study in Gold Coast in Australia (p. 44). This finding also reflects Maller et al.'s (2016) findings that little pedestrian connectivity with surroundings and concerns of danger on roads beyond MPEs could limit residents' daily activities and social interactions in MPEs, in a study in Melbourne. Thus, this study supported the precepts of new urbanism that enhanced walking connection with surrounding areas positively correlates with social interactions in the neighbourhood, which is also supported by Abass et al. (2020). Links to the surrounding areas extend residents' personal and social activities, and therefore also help increase the place attachment of the community.

Overall, this study argues that enhancing walking connection with surroundings may help develop place attachment and help address MPEs' social and spatial segregation issues in the Australian context. This finding suggests that open built forms of MPE with good walking connection with surrounding areas should be encouraged to promote place attachment to build communities' sustainability and resilience in a post-COVID era.

Satisfaction with Children's Playgrounds in Parks

Both the survey and interviews found the strongest association between the quality of parks' children's play space and place attachment. The survey found a significant and positive association between satisfaction with children's playgrounds in parks and place attachment in MPEs. This is in line with several previous studies which found that children's play facilities provide more opportunities for socialising and help develop neighbourhood cohesion (Warner & Andrews, 2019; Wood et al., 2013).

Interviews confirmed this finding and explained the possible psychological mechanisms by which children's space can affect place attachment through affective and behavioural processes in four ways. First, a possible explanation for this result is that children's playgrounds help to promote social interaction, like having a short talk with parents when children are playing. This is related to Wood et al.'s (2013) findings that travelling with children precipitated more pedestrian movement and casual social interaction in the neighbourhood. Children's play spaces are often associated with weak ties and strong ties social activities, such as playing with children, parents' short talk when children are playing, or gatherings with children's friends. These social activities may enhance the sense of place attachment. Second, another possible explanation is that children's space may help to form place-based memories for residents which is an important cognitive psychological process of place attachment. Children's spaces are often associated with place memory for family activities. Third, children's spaces may provide emotional values, like stimulating feelings of comfort, happiness or enjoyment for children and their families. Fourth, seeing children playing in parks also creates visual contact weak tie social interaction and a sense of social engagement for residents, which helps to promote a sense of place attachment. These are all likely reasons to explain why the parks' children's playgrounds are important in forming place attachment.

In addition, children's facilities in parks have probably become more important for developing place attachment in MPEs than before the COVID-19 pandemic. This is probably because children's and young people's outdoor activities have significantly increased during the pandemic, as reported by a recent study (Marcelo et al., 2022). As a result, the weak ties social interaction that occurred in children's playgrounds has also increased in MPEs since the COVID-19 outbreak. This finding indicates the importance of children's playgrounds for

facilitating place attachment and community sustainability for urban communities, especially in the post-COVID-19 era.

Other Community Park Use Factors

It is notable that interviews found four other features of community park use which are associated with residents' place attachment: nature space, recreation space, rest space and sport space in parks.

Nature space. Interviews found there is a significant link between parks' natural space and place attachment. This finding is consistent with several previous studies (Brown et al., 2012; Kimpton et al., 2014; Zhang et al., 2015). Specifically, this finding is consistent with Kimpton et al. (2014) who asserted that green space is the greatest impact environmental factor on residents' place attachment. Similarly, this finding is in line with Brown et al. (2012) who found that connecting with nature can help to facilitate an emotional bond with places. This finding also reflects Zhang et al.'s (2015) findings that more green spaces facilitated greater attachment in the neighbourhood, in a survey study in the Netherlands. In addition, this finding agrees with previous studies which suggested that natural elements can provide opportunities and benefits for mental restoration and recreation (Lee & Maheswaran, 2011; Poortinga et al., 2017).

This study discusses one important possible reason is that most individual relaxation activities could be occurring in the natural and green areas in neighbourhoods. Interviews identified several types of individual relaxation activities: sitting, relaxing, getting fresh air, enjoying views and enjoying the sunshine (see Section 5.1.1). Most of these activities occur in green spaces and natural environments. In addition, activities in nature increase the chances of residents' weak ties social interaction, such as short talks with neighbours when walking in green and natural spaces. This is consistent with Grahn and Stigsdotter's (2010) findings that most stressed residents preferred rest activities and walking activities in green spaces. In addition, it is worth noting that since COVID-19, people tend to do more individual activities or weak ties social interaction in the neighbourhood, hence the natural environment seems to have had a greater impact on place attachment. This requires further comparative studies. Overall, this study confirmed that the green and natural spaces have a significant impact on place attachment in MPEs.

Recreation space. Interviews found that parks' recreation space (e.g., BBQ, picnic areas, tables) has a positive impact on place attachment. This finding is consistent with some previous studies (Madgin et al., 2016; Wood et al., 2017). This finding reflects Wood et al. (2017) who found that recreation space plays an important role in promoting residents' wellbeing which facilitates place attachment. Similarly, this finding is in line with Madgin et al.'s (2016) finding that a positive relationship between recreational spaces associated with place attachment based on qualitative evidence. This finding is also reported by Lestari and Sumabrata (2018) who pointed out that recreational facilities is an influencing factor on place attachment in neighbourhoods.

Interviews found one possible reason is that social interactions often occurred in parks' BBQ and picnic spaces, especially for strong ties social interaction and community activities. This related to Madgin et al.'s (2016) findings that neighbourhood recreational facilities can provide opportunities for social contacts and in turn promote community involvement. Interviews also found that MPEs offer various organised group activities, most of which take place in the parks' recreation spaces, such as building block group parties and immigrant group activities.

This study argues that residents have a relatively high demand for recreational facilities in parks. The findings suggest that MPE planning should carefully consider the quantity and quality of recreational facilities in community parks. Interviews also suggested that the quality of recreational facilities, such as locations in parks, shade and noise prevention, may have impacts on place attachment which should be taken into account in MPE planning.

Rest space. Interviews found the rest space and facilities may enhance place attachment by fulfilling needs, strengthening social ties, and creating memories when people are gathered there. This is in line with Schmidt et al. (2019) who pointed out residents 'tend to sit down when engaging in social activities' in the neighbourhood, especially older people (p. 1). However, studies examining the impact of specific factors (e.g., rest space) on place attachment are quite limited in the literature. Further studies are needed to explore people's behavioural needs of community park use and the impact of rest space on place attachment.

Sports space. Interviews indicated that the quantity and quality of sporting facilities both influence sense of place attachment. This finding was related to Madgin et al.'s (2016) study

which revealed that 'sporting spaces provide an opportunity to examine the ways in which physical aspects of spaces can affect the ways in which people's attachments to place develop' (p. 679). This study argues that the reasons for this association are probably because parks' sports functional spaces help to fulfill residents' essential needs, especially for children, teenagers or youth. Interviews found sporting spaces are important for socialisation and are related to residents' living memories in the neighbourhood. It is also worth noting that COVID-19 seems to have amplified the needs of sport spaces. The park's outdoor sports facilities seem to have become more important than before COVID-19. This needs further before and after studies for comparison. However, interviews showed the insufficiency of rest and sports facilities in two selected MPEs which may negatively affect residents' park use and place attachment. This could be a possible reason why the survey study did not find a significant association between rest and sports facilities and place attachment.

This study did not find significant associations between frequency of community park use and residents' place attachment in MPEs. The result does not support some studies which found that frequency of communal open space use attribute has a significant impact on neighbourhood place attachment (Zhang et al., 2015; Zhu & Fu, 2017). By contrast, this result related to Gómez et al. (2015) and Centers and Gómez's (2019) findings that frequency of park use is not a significant predictor of sense of community and wellbeing. It is still uncertain whether frequency of park use is a significant predictor of place attachment in the neighbourhood literature. In addition, it is notable that the COVID-19 lockdowns possibly had impacts on the frequency of community park use at different periods and in different cities. Hence the findings on the frequency of park use are inconsistent in recent studies (Pandit et al., 2021). Further empirical research is suggested to explore the role of frequency of park use in fostering place attachment in MPEs and other neighbourhood circumstances.

To sum up, for place attachment study, the findings of this study supported the Hypothesis 4: the satisfaction with quality of community parks positively influences residents' place attachment but did not support the Hypothesis 2: the frequency of community park use positively influences residents' place attachment. The survey study found three factors of community park use are significantly and positively associated with place attachment in MPEs: children's playgrounds, pedestrian accessibility to parks, and pedestrian connectivity with surroundings. Interviews confirmed and explained these findings.

Overall, there are still significant conceptual and empirical gaps in understanding human-environment interaction and how neighbourhood open spaces impact residents' everyday activities, social interaction and place attachment in MPEs the Australian context and globally. This study contributes to fill these gaps. In addition, it is noted that due to the outbreak of the COVID-19 pandemic and the subsequent long periods of lockdowns during the survey and interviews, the findings of this study possibly reflect to some characteristics of the COVID-19 circumstances. Because the impacts of COVID-19 did not completely manifest at the start of the survey, the COVID-19 impacts on park use behaviours and place attachment in MPEs were mainly analysed and commented on in the interview study.

Chapter 7   Summary and Conclusions

This chapter summarises the research process, key findings and contributions of this study, and discusses the limitations of the research as well as recommendations for further research on human–environment relationship in MPEs and urban communities.

7.1 Summary of the Study

The main aim of this study was to investigate the relationships between community park use, social interaction and place attachment in MPEs in the Sydney context. This study was built on several theories, mainly social network theory (Barnes, 1954; Berkman et al., 2000), attachment theory (Bowlby, 1984; Scannell & Gifford, 2010), and new urbanism theory (Talen, 2000). This study is based on three specific theoretical models: Talen's new urbanism translating model between public space and sense of community (Talen, 2000); Berkman et al.'s social network system theoretical model (Berkman et al., 2000); and Scannell and Gifford's PPP tripartite place attachment model (Scannell & Gifford, 2010). Integrating these related theories and theoretical models, this study developed a conceptual framework (see Figure 1.1) which guided the research design theoretically.

This study used a case study mixed methods design. Within the case study framework, the mixed methods approach used a two-phase design: a quantitative analysis (Phase I) then a qualitative analysis (Phase II). Two selected MPEs in inner west Sydney, BP and LG, were investigated using mixed methods with a survey and interviews to explore the residents' perceptions of their community park use, social interaction and place attachment in MPEs.

In Phase I, a resident survey was conducted to collect quantitative data from 192 residents in BP and LG. After descriptive statistics and neighbourhood analysis, the quantitative data was analysed through several key quantitative data analysis methods (see Figure 3.5). First, principal component analysis was performed to reduce and summarise the factors and to test the validity of the scales. Then, Pearson correlation was used to assess the relationships between control variables (demographic, individual and social factors), independent variables (community park use) and dependent variables (social interaction and place attachment). Hierarchical multiple regression was then conducted to analyse the influence of community

park use variables on social interaction and place attachment in MPEs. Lastly, ANOVA was conducted to investigate the differences in social interaction and place attachment between frequent and infrequent park use groups.

Overall, the findings of the survey study supported the Hypothesis 1: the frequency of community park use is significantly and positively associated with social interaction between residents in MPEs. The findings also supported the Hypothesis 3: the satisfaction with community park quality is significantly and positively associated with social interaction between residents in MPEs. Additionally, the findings supported the Hypothesis 4: the satisfaction with the quality of community parks positively influences residents' place attachment. However, the findings did not support the Hypothesis 2: the frequency of community park use positively influences residents' place attachment, because the survey study did not find significant associations between the frequency of community park use and residents' place attachment in MPEs.

In Phase II, this study used semi-structured interviews to collect qualitative data from 16 residents in BP and LG. The qualitative data was analysed by the thematic analysis method to analyse the themes related to research questions in this study. The qualitative findings confirmed and further explained the survey findings. In addition, the interview findings reflect the characteristics of residents' park use behaviours and perceptions of daily life in MPEs in the COVID-19 context. The following sections sum up the key findings of the study and state the answers to the research questions.

7.2 Key Findings for Research Questions

The survey study found that three community park use factors were statistically significantly and positively associated with social interaction in MPEs: frequency of community park use, rest space satisfaction, and pedestrian connectivity with surroundings. For place attachment, the survey study found that three community park use factors were statistically significantly and positively associated with place attachment in MPEs: pedestrian accessibility to parks, pedestrian connectivity with surroundings, and children's playgrounds satisfaction. The qualitative results confirmed these survey findings. In addition, the qualitative study identified the characteristics of behaviours of community park use in MPEs and developed a

behavioural pattern framework of community park use in MPEs in the Sydney context. Interviews also identified psychological processes of place attachment on community parks and MPEs, which expanded Scannell and Gifford's (2010) PPP model by adding some new items in the Sydney MPE context based on qualitative evidence.

Overall, the findings support the claims of new urbanism regarding public space design at the neighbourhood level: 'a range of parks should be distributed within neighbourhoods', 'Open lands should be used to define and connect different neighbourhoods and districts', 'Neighbourhoods should be pedestrian friendly', 'Many activities of daily living should occur within walking distance' (Congress for the new urbanism, 2000, p. 340). The following sections summarise the key findings for each of the six research questions.

(1) Answers to RQ1: How do residents use community parks in MPEs?

Interviews identified residents' behavioural patterns and characteristics of community park use in MPEs during the COVID-19 period. Overall, interviews found that residents' behaviours of community park use consisted of two categories in MPEs: individual activities and social activities. This study presents a framework of behavioural patterns of community park use identified throughout the interviews (see Figure 5.1). Two types of individual activities (relaxation and physical activity), and three types of social activities (weak ties social interaction, strong ties social interaction and community participation) were originally identified in the literature review and verified in the interviews of this study. The key findings of community park use behavioural pattern are summarised below:

First, this study found that the main individual activities are relaxation and physical activities. Five main relaxation activities were identified: sitting, relaxing, getting fresh air, enjoying views, and enjoying the sunshine. Seven main physical activities were identified: walking or running, walking the dog, doing sports, doing exercise (e.g., yoga), riding a bike, playing, and using facilities.

Second, this study found that residents' social activities consist of three themes based on social ties: weak ties social interaction; strong ties social interaction and community participation. Three types of general weak ties social interaction were identified: short talking, acknowledging contact and visual contact. Four subthemes were identified for strong ties

social interaction: meeting friends, doing sports together, playing with children and their friends, and talking with friends and close neighbours. Two subthemes were identified for community participation: group activities and community events.

All the interview material was collected during the COVID-19 pandemic from February to June in 2022, which means that the interview findings may reflect some characteristics of residents' daily activities and social interactions in parks in MPEs in the COVID-19 context. Interviews found several changes of community park use behaviours due to the COVID-19 impact. First, residents use community parks for individual activities more than before COVID-19. During the COVID-19 pandemic, walking has become the prominent individual behaviour for park use, especially during the lockdown period. Second, most respondents reported a similar quantity of strong ties social interaction since the COVID-19 outbreak, except for the lockdown period. But the type of strong ties social interaction has changed, with residents using more outdoor neighbourhood space (e.g., parks) than before COVID-19. Third, weak ties social interactions occurring in parks have increased compared to other forms of social interaction and have become an important form of social engagement in MPEs since the COVID-19 outbreak. Lastly, interviews showed that community participation social interaction has significantly reduced due to the impact of COVID-19 pandemic.

(2) Answers to RQ2: Which factors of community park use are significantly and positively associated with residents' social interaction in MPEs?

The survey study found that three community park use factors were significantly and positively associated with social interaction in MPEs: frequency of community park use, rest space satisfaction, and pedestrian connectivity with surroundings (Yang et al., 2022). The factor of frequency of community park use had the strongest correlation with social interaction, followed by rest space satisfaction and then pedestrian connectivity with surroundings. The findings indicate the importance of visiting community parks in creating social interaction in MPEs. ANOVA analysis found that frequent park users (using more than once a week) had significantly higher levels of social interaction than infrequent park users.

Interview data and results confirmed the survey findings discussed above and provided further explanations for these findings. Additionally, the interviews also found four new

community park use factors for social interaction in MPEs: recreation space satisfaction, sport space satisfaction, nature space satisfaction and parks' pedestrian integration. These four factors have also been identified from the residents' narratives to impact social interaction to an extent.

(3) Answers to RQ3: How do the community park use factors affect residents' social interaction in MPEs?

As discussed above, the survey study identified three community park use factors associated with social interaction: frequency of community park use, rest space satisfaction, and pedestrian connectivity with surroundings. The interviews further confirmed these findings and explained how these factors affect social interaction. The following sections summarise the key findings of this question.

First, the survey study found that frequency of community park use is significantly associated with social interaction. The quantitative ANOVA analysis found that, on average, frequent park users (using parks at least once a week) have significantly higher frequency of weak ties social interaction than infrequent park users. This survey finding was further explained by interview findings. Interviews found that community parks provide venues and opportunities for a variety of neighbourhood social interaction. Therefore, if residents visit community parks more, they can get more opportunities for social interactions (weak tie, strong ties social interaction, and community participation). Particularly, visiting community parks can help to get more opportunities for weak ties general social interactions with neighbours. Interviews also found that social interaction is important motivation for residents to visit community parks in MPEs.

Second, the survey study found that satisfaction with rest spaces in parks are significantly associated with social interaction. Interviews confirmed this finding. Interviews further explained this finding by showing that social interaction often occurs in rest spaces in parks, including weak ties social interaction, strong ties social interaction and community activities. Interviews also found that a lack of shade in rest spaces could have a negative impact on people's park use and could thereby negatively affect social interaction between neighbours.

Third, the survey study found that pedestrian connection with surroundings is significantly associated with social interaction. ANOVA found that residents in BP, an open MPE, have significantly higher satisfaction with the parks' pedestrian connectivity with surroundings than residents in LG, a symbolically gated MPE. ANOVA also found that the residents with higher satisfaction with parks' pedestrian connectivity have a significantly higher level of social interaction, especially weak ties social interaction. Interviews confirmed these findings and provided further explanations for these survey results. Interviews found that the main reason is that pedestrian connection with surroundings can provide richer choices for residents' activities, resulting in more social interaction with neighbours, especially for weak ties social interaction. This finding supports the claim of new urbanism: 'open lands should be used to define and connect different neighbourhoods and districts' (Congress for the new urbanism, 2000, p. 340).

Fourth, interviews also found four new community park use factors associated with social interaction in MPEs: parks' recreation spaces, children's playgrounds, sports space, and nature/green space. Interviews found that the quantity and quality (e.g., location and noise) of recreation spaces (e.g., BBQ and picnics) in parks can affect residents' community park use and social interaction. Interviews found that children's playgrounds provide opportunities for children and their parents for weak ties and strong ties social interaction with neighbours. Interviews found that sport spaces and facilities give residents opportunities for strong ties social interaction to have activities together with friends or close neighbours. Weak ties social interaction also often happens in sporting space in parks, such as short talks and watching sports. Interviews found that nature and green space add opportunities for weak ties general social interaction, such as short talks when walking in green areas.

(4) Answers to RQ4: What are the psychological processes of place attachment to community parks in MPEs?

Based on the qualitative evidence, this study identified three psychosocial components of place attachment on community parks and MPEs: affective, cognitive and behavioural components. These findings are consistent with previous studies' affective–cognitive–behavioural theoretical proposition of place attachment in literature (Manzo & Perkins, 2006; Scannell & Gifford, 2010). Based on interview data and results, this study adds some new

insights into Scannell and Gifford's (2010) PPP place attachment model by modifying the underlying subthemes at affective–cognitive–behavioural levels in the MPE context: at the affective level, subthemes include emotional bonds and place memory; at the behavioural level, subthemes include place-related need fulfilment and social interaction; and at the cognitive level, subthemes include membership of community, meanings and cultural significance. These findings add some new insights to the place attachment literature.

(5) Answers to RQ5: Which factors of community park use are significantly and positively associated with residents' place attachment in MPEs?

The survey results showed that pedestrian accessibility to parks, pedestrian connectivity with surroundings, and satisfaction with children's playgrounds in parks were significantly and positively associated with place attachment in MPEs (Yang et al., 2023). Specifically, the survey found that pedestrian accessibility to parks had the strongest correlation with place attachment. This survey study did not find a significant correlation between frequency of community park use and place attachment in MPEs. These findings were verified by interviews. Additionally, interviews found that two new features of community park use may impact residents' place attachment to some extent: satisfaction with parks' rest space and sport space.

(6) Answers to RQ6: How do the community park use factors affect residents' place attachment in MPEs?

As discussed above, the survey found that pedestrian accessibility to parks, pedestrian connectivity with surroundings and children's playgrounds satisfaction were significantly and positively associated with place attachment in MPEs. Interviews explained how these community park use factors affect place attachment in MPEs, which are summarised as follows.

First, the quantitative study found that the factor of pedestrian accessibility to parks was the most important factor significantly and positively associated with place attachment in MPEs. Interviews found that pedestrian accessibility of parks encourages residents to use parks more and in turn to generate more social interaction and place attachment when walking there. Interviews also found that a well-defined central park and a well-dispersed distribution of

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parks are helpful for promoting parks' pedestrian integration and in turn generating more social interaction and place attachment, which supports Talen's (2000) new urbanism theory. This finding generally supports the new urbanism claims that 'neighbourhoods should be pedestrian friendly' and 'many activities of daily living should occur within walking distance' (Congress for the new urbanism, 2000, p. 340).

Second, both the quantitative and qualitative studies found that residents' satisfaction with children's playgrounds in parks was significantly and positively associated with their place attachment in MPEs. Interviews revealed that children's space affects place attachment through affective and behavioural processes in four ways: social activities, emotional value, place-based memory, and visual contact weak ties social interaction.

Third, the survey study found that residents' satisfaction with parks' pedestrian connectivity with surroundings was significantly and positively associated with their place attachment in MPEs. ANOVA also found that the residents with higher satisfaction with parks' pedestrian connectivity have a significantly higher level of social interaction. Interviews confirmed these findings and provided further explanation of these findings. Interviews indicated that surrounding walking connectivity provides an extension of the community park network to surrounding parks which can provide richer choices for residents' activities, weak ties social interaction and strong ties social interaction which may in turn promote their place attachment. This study's findings support the claim of new urbanism regarding public space design at the neighbourhood level: 'open lands should be used to define and connect different neighbourhoods and districts' (Congress for the new urbanism, 2000, p. 340).

Besides the quantitative findings, the qualitative study also revealed four new community park use factors that may impact on place attachment: satisfaction with parks' nature space, recreation space, rest space and sport space. First, interviews found that residents' satisfaction with nature space in parks was positively associated with place attachment in MPEs. Interview results showed that most individual relaxation activities occur in natural and green spaces, including sitting, relaxing, getting fresh air, enjoying views and enjoying the sunshine. Interviews indicate that activities in nature increase the chances for weak ties social interaction which is associated with place attachment. Second, interview results show that residents' satisfaction with 'recreation space' (e.g., BBQ, picnic areas, tables) in parks was

positively associated with place attachment in MPEs. Interviews identified that the main possible reason is that social interactions often occurred in parks' BBQ and picnic spaces, especially for strong ties social interaction and community activities. Additionally, the interview data showed that there are various organised community activities (e.g., building block parties, immigrant group activities) in MPEs, most of which take place in the parks' recreation spaces. Interviews indicated that residents have a relatively high demand for recreational facilities in parks. Interviews also found that the quality of recreational facilities such as their location, shade and noise may affect community park use and place attachment.

The qualitative study found that the rest and sport spaces in parks may enhance place attachment via fulfilling needs, place-based memories and social interaction. Interviews also found that the rest and sports facilities are insufficient in both selected MPEs, which may negatively affect residents' park use and place attachment.

7.3 Contributions

To the author's knowledge, this is the first study to investigate the relationship between community park use and social interaction and place attachment in MPEs in Sydney. The results of this study support that community parks are important for promoting neighbourhood social interaction and place attachment in MPEs. This study has several original theoretical, empirical and practical contributions to the field, including 1) testing and incorporating theories, 2) contributions to Australian MPE research, 3) adding evidence from the COVID-19 context to literature, and 4) practical implications for the profession regarding MPE development in Sydney. The main contributions are discussed below.

7.3.1 Theoretical Contributions

This study has several theoretical contributions to existing theories by testing theories and incorporating theories. This study tested new urbanism theory, social network theory and place attachment theory in the Australian MPE context and found support for these theories. This is a contribution as this has not been done previously. This study found support for these theories and suggests some modifications to the related theoretical model by providing empirical evidence support. This study suggests incorporating social network theory and

place attachment theory into new urbanism theory to gain more in-depth understanding of the complex human–environment relationships between neighbourhood built environment and social interaction and place attachment, which are discussed as follows.

(1) Testing Theories and Extensions

New Urbanism Theory

This study tested new urbanism theory in the Australian MPE context and found support for it. Specifically, this study tested Talen's (2000) new urbanism theoretical model in the Australian MPE context and made two main theoretical contributions to new urbanism theory.

The new urbanism theory has been used in the Australian MPE context in the present study to explore the relationship between public space and neighbourhood social interaction and place attachment which has not been done previously. The findings support the new urbanism theoretical statement that public space can be used to strengthen residents' social interaction and place attachment in the MPE context.

Another theoretical contribution is extending new urbanism theory. This study expands Talen's (2000) new urbanism theoretical model by adding place attachment as a new construct to explore the relationship between public space and social interaction as well as place attachment at the neighbourhood level, narrowing down the focus on community parks in MPEs. Although both social interaction and place attachment are essential psychological domains of sense of community, social interaction is an activity-based process and place attachment is a meaning-based process for building sense of community in neighbourhoods (Ebrahim, 2015; Kim & Kaplan, 2004), few studies test the relationship between public space and sense of community from a place attachment perspective. This study adds new insights to new urbanism theory. This study's findings support the theoretical statement that public space can be used to strengthen both social interaction and place attachment in the MPE context.

Social Network Theory

This study tested social network theory in the Australian MPE context. Specifically, this study tested Berkman et al.'s (2010) social network system model which presents a causal process

from social structural conditions to social networks and psychosocial mechanisms on health and found support for it.

Another theoretical contribution is extending social network theory. This study suggests expanding Berkman et al.'s (2010) social network system model by adding a physical factor at the macro level when investigating social interaction in the neighbourhood context. In Berkman et al.'s model, the macro-level context within which social networks form only includes social, cultural and politics factors, but does not include physical factors at the macro level. The literature suggests that physical factors play an essential role in social interaction and social ties in neighbourhoods (Farahani & Lozanovska, 2014). Therefore, this study adds the physical factor into social network theory and provides empirical support for it in the Australian MPE context. In addition, this research provides new insights and data regarding people's individual and social behaviours and perceptions of park use in MPEs. This is not clear in literate but crucial to understand the intricate relationships in Berkman et al.'s (2010) social network system model.

Place Attachment Theory

This study tested place attachment theory in an Australian MPE context and found support for it. Specifically, this study tested Scannell and Gifford's (2010) PPP model. The PPP model consists of the person, place and psychological process of place attachment and emphasises the affective–cognitive–behavioural psychological process of place attachment. This study made two main theoretical contributions to place attachment theory as follows.

One contribution is testing place attachment theory in the Australian MPE context. This study narrows down the focus of the physical environment to community parks to investigate place attachment in the MPE context. This has not been done previously. Place attachment is a multidimensional concept which differs according to different residential contexts. It is therefore necessary to understand more about neighbourhood place attachment in different residential circumstances (Dlamini & Tesfamichael, 2021; Lestari & Sumabrata, 2018). To the author's knowledge, this is the first study to investigate the relationship between community park use and place attachment in MPEs in Sydney. This study uses place attachment theory in the Australian MPE context and adds empirical evidence to place attachment theory.

Another theoretical contribution is extending place attachment theory. This study found the residents' individual and social behavioural items related to community park use in MPEs, which theoretically contribute to understanding of place attachment's psychological process. This study suggests expanding Scannell and Gifford's (2010) PPP model by adding behavioural factors and social bond factors to the affective–cognitive–behavioural process of place attachment. There is a lack of research focusing on the behavioural process of place attachment (Casakin et al., 2021). This study found the residents' individual and social behavioural items related to community park use in MPEs, which may theoretically complement the understanding of place attachment's psychological process. In addition, there is lack of studies adding social bonds to place attachment theory (Hesari et al., 2019). The relationship between social interaction and place attachment has been insufficiently studied in the literature. This study added social interaction factors under the Australian MPE context into Scannell and Gifford's (2010) PPP model, which supplements place attachment theory in literature.

(2) Incorporating Theories

This study suggests incorporating social network theory and place attachment theory into new urbanism theory to understand the complex human–environment relationships between neighbourhood built environment and social interaction and place attachment. In addition, this study also suggests incorporating ecological theory into new urbanism theory, by adding socio-ecological factors to Talen's (2000) new urbanism theoretical model when investigating the relationships between public space, social interaction and place attachment in neighbourhoods. This is because literature shows that multilevel interactions of individual, social and physical factors can influence social interaction and place attachment in neighbourhoods (Lauwers et al., 2021), but the related models do not include these socio-ecological factors to investigate human–environment relationships. Therefore, this study incorporates ecological theory into new urbanism theory, including Talen's (2000) new urbanism model, Berkman et al.'s (2000) social network system model, and Scannell and Gifford's (2010) PPP place attachment model.

Taken together, incorporating these theories discussed above, this study has introduced a conceptual and theoretical framework to literature for studying the complex relationships

between community park and social interaction as well as place attachment in the MPE context (see Figure 1.1). Moreover, incorporating social network theory and place attachment theory into new urbanism theory, the findings of this study support the new urbanism claims in the Australian MPE context as follows: 'a range of parks should be distributed within neighbourhoods'; 'open lands should be used to define and connect different neighbourhoods and districts'; 'neighbourhood should be pedestrian friendly.'; 'many activities of daily living should occur within walking distance' (Congress for the new urbanism, 2000, p. 340).

In addition, the findings extend the claims of new urbanism regarding pedestrian integration at the neighbourhood level. The research revealed that *pedestrian accessibility to parks* and *pedestrian connectivity with surroundings* are two essential factors for promoting social interaction and fostering place attachment in neighbourhoods. First, this study found that the clear central park and well-dispersed distribution of small parks can improve the pedestrian accessibility to parks, which in turn can promote social interaction and place attachment in neighbourhoods. Second, this study provides new insights for open (or non-gated) urban neighbourhoods research. The findings showed that pedestrian connectivity has a significant and positive impact on social interaction and place attachment in MPEs. This study also provided the possible explanations for this finding. Neighbourhood connectivity's impact on social interaction, place attachment, and social-spatial segregation issues is unclear in the literature. The findings of this study contribute to addressing this knowledge gap.

7.3.2 Empirical Contributions

(1) Contributions to Australian MPE Research

There are some knowledge gaps in existing MPE research. There is a knowledge gap in understanding the complex nature of human–environment interactions including social interaction and place attachment in MPEs. There are limited studies empirically examining new urbanism claims in the MPE context. Very little previous research is known about inner urban MPEs in Australia. Scholars argue that more theoretical and empirical research is needed on MPEs from various aspects in the Australian context (Francis et al., 2014). The

findings of this study contribute to filling the knowledge gaps in MPE research by providing empirical evidence to literature, which are discussed as follows.

First, the findings contribute to understanding the complex relationships between neighbourhood built environment and social interaction as well as place attachment in MPEs. Up to date, we still know very little about the complex nature of human–environment interactions in MPEs. MPEs aim to promote a sense of community (via social interaction and place attachment) by offering design, layout and physical and social infrastructure. However, the relationship between people and physical features in MPEs is still unexplored in literature (Maller et al., 2016). Few studies have investigated social interaction and place attachment in MPEs in the Australian context. This study helps us to understand residents' living experience, daily activities, social interaction and place attachment in MPEs. This study found that several specific community park use factors are significantly and positively associated with social interaction and place attachment in the MPE context, which adds new insights and evidence to MPE and human–environment relationship literature.

Second, this study contributes to MPE literature empirically by examining the relationship between physical built environment, social interaction and place attachment from the new urbanism perspective. MPE is regarded as a sustainable residential form based on new urbanism philosophy, which presents a hypothesis that physical features of the residential environment can influence residents' sense of community (Ebrahim, 2015). However, there are limited studies empirically examining new urbanism claims in the MPE context. The findings of this study theoretically and empirically contribute to new urbanism literature.

Third, in Australian MPE literature, most previous studies focused on outer-suburban green field MPEs, but very little previous research explored the MPEs in inner urban areas in big cities. This study contributes to Australian MPE research by providing empirical evidence focusing on the inner west region submarket of Sydney.

(2) Adding Evidence from the COVID-19 Context to Literature

This study makes unique contributions to literature by adding specific evidence collected during the COVID-19 pandemic. The survey data was collected during the COVID-19 pandemic in 2021 when Sydney was experiencing a lengthy lockdown period. All interviews

were collected in February to June in 2022 when lockdowns had been lifted, but COVID concerns remained.

The survey and interview data reflect residents' current perceptions of the relationship between community park use, social interaction and place attachment in MPEs under the COVID-19 context. The interview findings reflect the characteristics of residents' community park use, daily activities and social interaction in MPEs in the COVID-19 context. The data can be used for future before-and-after pandemic comparative studies. The data and findings can also help understand connections between places and public health in neighbourhoods in times of crisis or uncertainty.

7.3.3 Practical Contributions

This study provides practical implications for MPE development in Sydney and international urban communities. MPEs have become increasingly important and the dominant form of residential housing in major Australian cities in recent decades (Smith, 2019). Therefore, it is necessary to understand residents' living experience and the complex relationship in human–environment interactions in MPEs in depth, especially in practical aspects. The results of this study provide empirical insights for policymakers, urban planners and developers for MPE development in Sydney and international urban communities.

Firstly, for policymakers, this study indicates that:

1) MPEs are an excellent and sustainable form to enhance social interaction and place attachment for residents. A well-designed MPE with an integrated community park system can provide a physical environment to facilitate positive social interaction, place attachment and in turn promote community sustainability in urban communities.

2) This study suggests that open built forms of urban communities with good walking connection with surrounding areas should be encouraged to promote place attachment and social sustainability in urban communities in the post-COVID era.

3) The findings indicate the importance of community parks to residents' wellbeing. This study provide empirical evidence that using more community parks can enhance residents' social bonds and emotional well-being in urban communities.

4) The findings offer evidence that parks' children's playgrounds are vital to promote residents' social and emotional well-being. The findings also suggest that the quantity and quality of a park's rest facilities and spaces should be promoted. It provides practical implications that parks' children's playgrounds and rest facilities should be priorly and carefully designed.

5) The findings indicate the significance of the pedestrian environment in community parks for building a sustainable community. Pedestrian-friendly parks in MPEs should be encouraged and carefully planned.

Secondly, for urban planners and developers, these findings have several specifical practical implications:

1) The findings imply that MPEs should be built in an open form to promote good pedestrian connectivity with the surrounding areas and facilitate social interaction between residents. An open built form benefits developing social interaction and place attachment and reducing social segmentation issues for MPEs and similar urban communities.

2) Because of the importance of community parks' pedestrian environment for building a sustainable community, pedestrian accessbility and connectivity of community pakrs should be priorly and carefully planned.

3) Regarding parks' layout, a well-defined central park and well-dispersed parks are encouraged for promoting pedestrian accessibility to parks and in turn generate more positive social interaction and place attachment. In particular, a well-dispersed small park system is recommended to develop positive social interaction, place attachment and community sustainability rather than a big central park.

4) The parks' rest spaces and children's playgrounds should be carefully designed with priority. In particular, the quantity and quality (e.g., facilities, shade, location, noise avoiding) of rest spaces, children's spaces, recreation spaces and sport spaces need to be taken into account carefully in future MPE and urban community planning.

7.4 Limitations

This study has several limitations which are discussed as follows.

First, due to the COVID-19 pandemic, the data response rate was lower than expected. The COVID-19 pandemic and associated lockdowns in 2021 significantly impacted the data collection of this study, especially the interview data collection. The in-person survey and interview data collection were very challenged by the constraints of social distancing and the participants' and researcher's safety considerations after the COVID-19 outbreak. To overcome this issue, this study complied with NSW Health guidelines and completed a COVIDSafe Research Activity Risk Assessment Checklist (shown in Appendix 2) to minimise the risks of COVID-19 before conducting face-to-face research. The online data collection also faced challenges of technology issues and ethics, safety, and privacy considerations, especially for online interviews. Thus, the data collection process was slower, and the response rate was lower than expected. Although there were enough respondents to perform the necessary data analyses, the response rate was lower than desired.

Second, this study only considered MPEs in the inner west region submarket of Sydney. There are some significant divergences in the socio-economic features and housing submarkets across the five regions in Sydney (Bangura & Lee, 2022). There is limited applicability of the findings to other MPE submarkets of Sydney. This study only focused on two MPEs in Sydney. There is a range of MPEs in Australia, with differing built forms and socio-demographic compositions. The findings are limited to being applicable to other MPE residential contexts.

Third, this study only focused on subjective measures of community park use, without including objective measures of park quality. People's feelings and perceptions may differ according to different situations, thus there could be some self-report biases. Although literature indicated some objective features of community parks may be associated with social interaction and place attachment, the subjective factors of people's perceptions and feelings seem more important and complex to understand social interaction and place attachment in neighbourhoods. Hence, this study did not include the objective measures of physical factors of parks, only focusing on the subjective measures. As the survey measurements were self-

reported, the results could be subject to some self-report biases. In addition, due to the data being collected during the COVID-19 pandemic, the unprecedented COVID-19 situation could have influenced individuals' feelings and responses which may have caused self-reported biases. This study combined mixed methods data to overcome this issue.

Fourth, there could be two inter-related relationships between the two factors of satisfaction with community park quality and frequency of community park use, but the internal relationships between these independent variables were not included in this study and need to be addressed in future research.

Lastly, this study used the mean imputation technique to handle the missing data in the quantitative analyses, a method critiqued in the literature. If missing values are not random, the mean imputation method may lead to inconsistent bias. This study used a Little's MCAR test to make sure the values were missing at random and focused on associations rather than a causal effect between variables. The mean imputation technique is acceptable to handle the missing data, but it is still a research design limitation.

7.5 Implications for Future Research

The relationship between neighbourhood physical features and social interaction and place attachment in MPEs and urban communities is not clear in the literature. We still know very little about people's lifestyle and daily activities in MPEs. There is a need for more empirical research into various aspects of MPEs. This study therefore suggests that more comparative and empirical studies need to be conducted to explore social interaction and place attachment in the Australian MPE context. Further work is needed to fully understand the implications of the relationship between neighbourhood built environment and social interaction and place attachment in MPEs in Australia and other sustainable urban communities globally. Specifically, this study recommends several directions for future research as follows.

Neighbourhood Social Interaction Research

Although literature suggests that the neighbourhood built environment is significantly associated with social interaction, there is very limited empirical evidence in this research scope, particularly across different neighbourhood contexts. Few empirical studies have

measured the impacts of neighbourhood design features on social interaction in MPE contexts. Future studies should be undertaken to explore how neighbourhood built environments influence residents' social interaction and social ties, which are discussed below.

First, the mechanisms of how social interaction with social ties influence individuals' health and wellbeing remain to be elucidated. Due to this study only focusing on a limited number of cases, the findings can only be generalised to similar submarkets in Sydney. Further studies are needed across different residential settings and housing markets to generalise for a wider applicability in this research scope.

Second, the intrinsic interaction between social interaction and individual daily activities is still unclear. Further work needs to be done to establish whether they can influence each other, especially through in-depth qualitative studies. For example, according to Schmidt et al. (2019), it is not clear whether walking activities can influence social interaction. Interviews in this study found that children playing and sports activities both affect weak ties social interaction. But this study only focuses on a limited number of cases. Therefore, this study suggests more research to determine the intrinsic effects of social interaction and other daily activities to help understand social interaction more clearly.

Third, further investigation into social interaction about community participation in MPEs is strongly recommended. This study found that community participation is a very important form of social interaction in MPE and found multiple types of community participation in MPEs. However, few studies have investigated community participation in MPEs in existing literature. Therefore, more future studies on MPEs' community parks are strongly recommended which would help establish a greater in-depth understanding of residents' social life and the process to build a neighbourhood social network in MPEs.

Neighbourhood Place Attachment Research

Few empirical studies have measured the impacts of neighbourhood design features on social interaction in MPE contexts. More studies are needed to estimate how neighbourhood design features influence place attachment in MPEs.

First, how the neighbourhood built environment impacts peoples' daily behaviours and place attachment still remains conceptually and empirically underexplored. This study suggests that

more research is needed to determine what types of places generate more attachment and what are the characteristics of those places in MPEs or similar sustainable urban communities.

Second, we still know very little about how attachment develops, especially in the built environment discipline (Bosmans et al., 2020). This study has identified some affective, cognitive and behavioural components of place attachment in the MPEs context, but it only focuses on a limited number of cases in Sydney. Further work is needed to fully understand the implications of the psychological process of place attachment across different neighbourhood contexts.

Third, existing place attachment literature has not identified clear behavioural items at the neighbourhood level (Casakin et al., 2021). This study suggests that a large effort is needed to explore the behaviour process of place attachment at the neighbourhood level, especially for more in-depth qualitative studies in this research scope.

Fourth, literature shows that place attachment in neighbourhoods differs according to place characteristics and person characteristics. Therefore, this study suggests that there is a need for more empirical studies to explore the relationship between neighbourhood features and place attachment across different residential circumstances and neighbourhood context.

Lastly, the internal relationships between social interaction and place attachment were not included in this study because the internal relationships between social interaction and place attachment and sense of community involve complex relationships (Talen, 2000). Understanding the relationship between social interaction and place attachment can help to build a sense of community and social cohesion. Therefore, this study suggests that more in-depth quantitative or qualitative studies should be conducted to explore and deeply understand the internal relationships between social interaction, place attachment and sense of community in the MPE context.

Exploring Human–Environment Relationships in Neighbourhoods

At the neighbourhood level, the issue of the impact of neighbourhood built environment (e.g., communal space) on wellbeing (e.g., social interaction, place attachment, sense of community) remains less understood. Most past studies have focused on the overall characteristics of neighbourhood built environments, but very limited empirical studies have focused on the

communal space within the neighbourhood to investigate the impacts of neighbourhood features on residents' wellbeing. This study recommends that further studies should focus more on specific attributes within neighbourhood communal space at the micro level to explore their impacts on neighbourhood social interaction and place attachment in different residential contexts. Specifically, considerably more research is needed to determine what specific communal space features are important for residents' daily activities, social interaction and place attachment in different neighbourhood contexts. Some suggestions for exploring how community park use influences social interaction and place attachment are highlighted as follows.

First, future research is recommended to improve the measurements of community park quality by including more items of physical aspects of community parks according to specific residential circumstances. This study measured eight physical aspects of community parks in MPE based on literature. Specific research is needed to determine how and under what conditions residents are encouraged to use community parks and get more positive social interactions in MPEs. In particular, future studies are recommended to compare the built form (gated or open) impact on social interaction and place attachment and community sustainability in MPEs and across different residential contexts.

Second, further investigation into the association between frequency of public space use, social interaction and place attachment is strongly recommended as few studies have investigated this association. Due to previous findings being inconsistent in this research scope, the impacts of frequency of public space use on residents' social interaction and place attachment in neighbourhoods are still unclear.

Third, further research is suggested to involve objective factors of community parks, like park size, ratio of park land, walking distance (via GIS etc.) when examining the relationship between community parks, social interaction and place attachment. Literature shows that both MPE cases have sufficient parks, high quality leisure and recreational amenities, hence this study only used subjective measures of community park use and its association with social interaction and place attachment in the Australian MPE context. The objective factors are controlled by case selection by literature review. Future studies could involve the objective factors to also measure the impacts of objective factors of community parks (e.g., quantity of

neighbourhood open space, walking distance to parks) on social interaction and place attachment.

Lastly, less attention has been paid to the methodological aspects of social interaction and place attachment research in academia. Most existing research exploring how community parks influence social interaction and place attachment has been based on quantitative methods. The existing literature lacks qualitative studies to understand the complex human–environment relationships and psychological process of social interaction and place attachment. In recent years, academia has started to pay more attention to the importance of qualitative research for social interaction and place attachment study (Manzo & de Carvalho, 2020). Therefore, further qualitative investigation into social interaction and place attachment is strongly recommended.

Testing New Urbanism Claims

There are limited studies empirically examining sense of community (via social interaction and place attachment) at the neighbourhood level from the new urbanism perspective (Ebrahim, 2015). Most past studies have tested overall new urbanism claims in neighbourhoods, but very few empirical studies have focused on testing specific elements of new urbanism claims. This study tested the specific claims of new urbanism, narrowing down the focus on community parks in MPEs. Further research is needed to test overall new urbanism claims from multiple angles in order to fully understand how neighbourhood physical design elements affect social interaction, place attachment and other social goals. Specifically, future studies are strongly recommended to explore how neighbourhood spatial design, mixed land use, high density, pedestrian environment, public space and neighbourhood connectivity impact social interaction and place attachment, in particular focusing on MPEs.

MPE Research

MPEs have had a significant increase in Australian cities, but there are some significant knowledge gaps in MPE research. Further work is needed to fully understand the implications of the diversity and complexity of MPEs.

First, there is a significant knowledge gap in understanding the complex nature of human–environment interactions including social interaction and place attachment in MPEs. Due to the few studies that have investigated social interaction and place attachment in MPEs, we still know very little about residents' living experience, everyday activities, social behaviours and how neighbourhood features are incorporated into residents' daily routines in MPEs in the Australian context. Therefore, further work is needed to fully understand the implications of residents' living experience, everyday activities, social interaction and health outcomes in MPEs, especially for qualitative studies at this scope.

Second, inner urban MPEs in Australia are neglected in research. This study focused on two MPEs in the inner west region of Sydney, but several questions remain to be answered including whether the characteristics of neighbourhood design are different between inner urban MPEs and outer urban MPEs, whether the residents' lifestyles and social interaction features are different between inner urban MPEs and outer urban MPEs, and whether some inner city planning features like high density, mixed land use and traffic environment have impacts on residents' social interaction and place attachment. Therefore, considering the complexity and diversity of MPEs, future studies could address comparisons within and between MPEs across inner urban and outer urban MPEs. Further work is needed to fully understand the implications of how neighbourhood design impacts residents' living experience and wellbeing in the inner-city context.

Third, MPE research needs to distinguish between different submarket contexts because there are significant divergences in socio-economic features and housing submarkets across different regions in Sydney. As social interaction and place attachment in neighbourhoods differ according to place characteristics and person characteristics, further research is needed across different submarket contexts, considering their socio-economic features and the diversity of housing submarkets.

Lastly, it is notable that there is lack of qualitative study in MPE research. More in-depth qualitative evidence is needed to study the association between neighbourhood built environment, social interaction and place attachment.

The COVID-19 outbreak has drawn an increasing amount of attention from scholars, and there has been much investigation on many aspects of the COVID-19 pandemic in 2021 and 2022. It is recognised that COVID-19 changed many aspects of urban planning and community building in neighbourhoods. For example, some studies have discussed the changes of behaviours of park use due to the impact of COVID-19 pandemic (Han et al., 2022). Some studies have focused on the impacts of the COVID-19 pandemic on cities and suggested strategies for urban planning (Sharifi & Khavarian-Garmsir, 2020). Aside from these recent studies, research in this area has only recently begun and is very limited.

Therefore, this study strongly recommends further studies to investigate the effects of COVID-19 on social interaction. Since the COVID-19 outbreak, discussion on community sustainability and resilience in neighbourhoods has become a critical topic in urban planning research in recent years. Community sustainability is the main social goal of new urbanism, including factors of social interaction and place attachment. Several topics are recommended for future study in this scope, such as 'what has changed due to the COVID-19 pandemic at the neighbourhood level, especially in MPEs in the Australian context?', 'how these changes might impact residents' life experience, social interaction and place attachment?', and 'what are the impacts of COVID-19 on built environment planning in MPEs?'. This study provides empirical evidence of residents' living experiences in MPEs in the COVID-19 context, which can offer data to support further research on the impacts of COVID-19.

In summary, there are still many unanswered questions about social interaction and place attachment and human–environment relationships in MPEs. We still know very little about people's living experiences, daily activities, and perceptions of the environment in MPEs, such as 'how people use common spaces in MPEs?', 'how social ties and attachment are formed?', 'what factors of the built environment contribute to generating more positive social interaction and place attachment to community in MPEs?' and 'how COVID-19 affected residents' park use behaviours in MPEs?'. There is a need for more empirical research into MPEs from various perspectives. Considering the complexity and diversity of MPEs and urban communities, future studies should examine different types of MPEs and urban communities for comparison in Australia and wider global contexts. Taken together, further work is needed to fully understand the complex nature of human–environment relationships

in MPEs in Australia and urban communities in wider global contexts to build more sustainable and resilient urban communities in the post-COVID era.

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Appendices

Your ethics application has been approved as low risk - ETH20-5480

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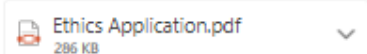ⓘ Flag for follow up.

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286 KB

Dear Applicant,

Re: ETH20-5480 - "Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism."

Your local research office has reviewed your application and agreed that it now meets the requirements of the National Statement on Ethical Conduct in Human Research (2007) and has been approved on that basis. You are therefore authorised to commence activities as outlined in your application, subject to any conditions detailed in this document. You are reminded that this letter constitutes ethics approval only. This research project must also be undertaken in accordance with all UTS policies and guidelines including the Research Management Policy.
Your approval number is UTS HREC REF NO. ETH20-5480
Approval will be for a period of five (5) years from the date of this correspondence subject to the submission of annual progress reports.
The following standard conditions apply to your approval:

- Your approval number must be included in all participant material and advertisements.
- Any advertisements on Staff Connect without an approval number will be removed.
- The Principal Investigator will immediately report anything that might warrant review of ethical approval of the project to the Ethics Secretariat (Research.Ethics@uts.edu.au).
- The Principal Investigator will notify the UTS HREC of any event that requires a modification to the protocol or other project documents, and submit any required amendments prior to implementation. Instructions on how to submit an amendment application can be found here.
- The Principal Investigator will promptly report adverse events to the Ethics Secretariat. An adverse event is any event (anticipated or otherwise) that has a negative impact on participants, researchers or the reputation of the University. Adverse events can also include privacy breaches, loss of data and damage to property.
- The Principal Investigator will report to the UTS HREC annually and notify the HREC when the project is completed at all sites.
- The Principal Investigator will notify the UTS HREC of any plan to extend the duration of the project past the approval period listed above through the progress report.
- The Principal Investigator will obtain any additional approvals or authorisations as required (e.g. from other ethics committees, collaborating institutions, supporting organisations).
- The Principal Investigator will notify the UTS HREC of his or her inability to continue as Principal Investigator including the name of and contact information for a replacement.

This research must be undertaken in compliance with the Australian Code for the Responsible Conduct of Research and National Statement on Ethical Conduct in Human Research.

You should consider this your official letter of approval.

If you have any queries about this approval, or require any amendments to your approval in future, please do not hesitate to contact your local research office or the Ethics Secretariat.

Your ethics application has been approved as low risk - ETH21-6087

ⓘ Flag for follow up.

R research.ethics@uts.edu.au
To: Song Shi; Chunyan Yang

Tue 13/07/2021 2:17 PM

Ethics Application.pdf
293 KB

Dear Applicant,

Re: ETH21-6087 - "Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism"

Your local research office has reviewed your application and agreed that it now meets the requirements of the National Statement on Ethical Conduct in Human

Research (2007) and has been approved on that basis. You are therefore authorised to commence activities as outlined in your application, subject to any conditions detailed in this document.

You are reminded that this letter constitutes ethics approval only. This research project must also be undertaken in accordance with all UTS policies and guidelines including the Research Management Policy.

Your approval number is UTS HREC REF NO. ETH21-6087

Approval will be for a period of five (5) years from the date of this correspondence subject to the submission of annual progress reports.

The following standard conditions apply to your approval:

- Your approval number must be included in all participant material and advertisements. Any advertisements on Staff Connect without an approval number will be removed.

- The Principal Investigator will immediately report anything that might warrant review of ethical approval of the project to the Ethics Secretariat.

- The Principal Investigator will notify the Committee of any event that requires a modification to the protocol or other project documents, and submit any required amendments prior to implementation. Instructions on how to submit an amendment application can be found here.

- The Principal Investigator will promptly report adverse events to the Ethics Secretariat. An adverse event is any event (anticipated or otherwise) that has a negative impact on participants, researchers or the reputation of the University. Adverse events can also include privacy breaches, loss of data and damage to property.

- The Principal Investigator will report to the UTS HREC or UTS MREC annually and notify the Committee when the project is completed at all sites. The Principal Investigator will notify the Committee of any plan to extend the duration of the project past the approval period listed above.

- The Principal Investigator will obtain any additional approvals or authorisations as required (e.g. from other ethics committees, collaborating institutions, supporting organisations).

- The Principal Investigator will notify the Committee of his or her inability to continue as Principal Investigator including the name of and contact information for a replacement.

Your ethics application has been approved as low risk - ETH21-6736

R research.ethics@uts.edu.au
To: Research Ethics; Chunyan Yang; Song Shi
Cc: Eva Garcia; Georgina Donovan; Mikhaela Rodwell

Tue 14/12/2021 3:33 PM

📄 Ethics Application.pdf ⌄
244 KB

Dear Applicant

Re: UTS HREC Ref. No. ETH21-6736 - "Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism"

Your local research office has reviewed the amendment application for your above-named project and agreed that the amendments meet the requirements of the National Statement on Ethical Conduct In Human Research (2007). I am pleased to inform you that your amendment has been approved as follows:

1. Adding an online interview method (via Zoom, Google Meet, Microsoft Teams, etc.) and telephone method for interview data collection, still retaining the face-to-face interview method as proposed in the original application. 2. Changing the incentive from a small physical gift in the original application (e.g., a drink voucher, a small chocolate box) to a $30 Woolworth digital gift card which can be used online.

This amendment is subject to the standard conditions outlined in your original letter of approval.

You are reminded that this letter constitutes ethics approval only. This research project must also be undertaken in accordance with all UTS policies and guidelines including the Research Management Policy.

You should consider this your official letter of approval. If you require a hardcopy please contact your local research office.

To access this application, please click here. A copy of your application has also been attached to this email.

If you have any queries about this approval, or require any amendments to your approval in the future, please do not hesitate to contact your local research office or the Ethics Secretariat (Research.Ethics@uts.edu.au).

Ref: 12e

COVIDSafe Research Activity Risk Assessment Checklist

UTS researchers are required to complete a COVIDSafe Research Activity Risk Assessment Checklist before conducting face-to-face research to help protect themselves and participants. This checklist has been designed to help you conduct your research project to minimise the risks of COVID-19 and comply with NSW Health guidelines.

You are required to submit a risk assessment if you:

- Have ethics approval to undertake face-to-face research activities, but have been using remote methods and now wish to revert to face-to-face; or
- Are planning to undertake physical face-to-face research activities in future (once ethics approval is obtained)

Where the checklist identifies that further action is needed, the physical face-to-face activities will not be able to proceed until the accompanying action plan (including required actions) are approved as below.

If you have any questions about this form or your research, in the first instance please review the Research Managements FAQs or speak to your faculty delegate.

Instructions

1. Complete the checklist and/or accompanying action plan
2. The action plan must be completed where additional actions are required AND/OR there are any specific risks and requirements not captured by the checklist (such as domestic travel)
3. Completed checklists (and action plans) should be sent to your faculty delegate for review. These documents will be returned as 'Approved' or 'Further action required'.
4. Once approved, a copy of these documents should be sent to Research.Ethics@uts.edu.au for record keeping and all members of the research team, who must be informed of any special requirements
5. Physical face-to-face activities can then proceed. Travel approvals will still be required in accordance with normal procedures.

Recommendations

- Research team leaders/lead investigators should determine which research physical face-to-face activities can be undertaken, and who needs to be there to do it. They should consider the requirements of the research, expertise of researchers and capacity for appropriate supervision.
- Participants and researchers who have any cold or flu symptoms (no matter how mild) should be advised not to participate in the research until they are well.
- Participants who are in an "at-risk" group may themselves still choose to participate in physical face-to-face activities but every precaution must be taken to ensure they are protected against COVID-19 transmission. This requires that appropriate personal protective equipment (PPE) is used/procedures followed, as per the checklist/action plan below. Please follow official health advice based on the level of risk of the activity.

1

- Please insert the following (or similar) wording into your invitation letter, participant information sheet or verbal scripts when contacting participants, including those who have already consented to participate: "We encourage everyone participating in research involving physical face-to-face contact to maintain good hand hygiene and to practice physical distancing (maintaining 1.5 metres or more between yourself and others) at all times. Please take your own measures to respond to COVID-19 in line with Australian Government COVID-19 guidelines and consider downloading the COVIDSafe app. For your safety and for others, if you are feeling unwell, please notify [*insert name*] and do not attend any physical face-to-face activities."
- In a setting where UTS researchers (staff or students) may be in contact with COVID-19 patients, or patients undergoing testing for COVID-19 (such as in a hospital), researchers must – at all times – adhere to site-specific PPE procedures. General guidance on the use of PPE in a hospital setting can be sourced here.

Delegates

Faculty Deans have delegated responsibility for reviewing research risk assessment/checklists:

Faculty/Unit	Delegate	Position
Business	Michelle Baddeley	Associate Dean (Research)
DAB	Charles Rice	Associate Dean (Research)
FASS	Saba Bebawi	Professor, School of Communications
FEIT	Michael Blumenstein	Associate Dean (Research)
Health	Debra Anderson	Associate Dean (Research)
IPPG	George Argyrous	Manager, Education and Research
ISF	Cynthia Mitchell	Deputy Director
Law	Anita Stuhmcke	Associate Dean (Research)
Science	Alaina Ammit	Associate Dean (Research)
TDi	Martin Bliemel	Associate Dean (Research)

FACULTY/UNIT:	Faculty of Design, Architecture and Building (DAB)		
PREPARED BY:	Chunyan Yang	DATE:	09/07/2021
PROJECT TITLE:	Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism	HREC APRPOVAL NUMBER:	ETH21-6087

1. PLANNING AND RECORD-KEEPING	Yes, already in place	Not yet, further action required*	N/A
I have considered alternates to physical face-to-face contact with participants and believe that face-to-face contact is necessary to achieve the required research outputs.	☒	☐	☐
I have put in place a process to ask participants *before* each face-to-face encounter: a. To the best of their knowledge, whether have they been in contact with a confirmed COVID-19 case in the last 14 days b. Confirm whether they have any symptoms suggestive of COVID-19[1] c. Confirm whether they have been to recent COVID-19 case locations in NSW or VIC.	☒	☐	☐
I have put in place a process to record the details[2] of all participants, which are to be kept securely for 28 days	☒	☐	☐
I am following the direction from NSW Health	☒	☐	☐
I have a continuity plan in place in case I need to stop my research or revert to non-physical face-to-face methods of data collection	☒	☐	☐

*where further action is required, researchers must complete the Action Plan at the end of this checklist and re-submit for review

2. PHYSICAL DISTANCING There is general guidance to maintain a 4 square metres per person capacity limitation based on the room size[3]. This means in a room of 40m² you can have a maximum of 10 people, noting that you still need to exercise social distancing of 1.5m in this scenario.	Yes, already in place	Not yet, further action required*	N/A
I have plans in place to ensure physical distancing: • 1.5 m/4m² rule is able to be observed at all times OR	☒	☐	☐

[1] Symptoms include: fever (≥37.5°C) or history of fever (e.g. night sweats, chills) or acute respiratory infection (e.g. cough, shortness of breath, sore throat) or a combination of other non-specific symptoms (headache, tiredness, muscle pain, runny nose, loss of sense of taste or smell, diarrhoea, nausea/vomiting or loss of appetite)

[2] At a minimum, a record should be kept of: 1) Arrival time to location/facility, 2) Rooms used for research activity and other rooms used, 3) Persons you have interacted with including name, mobile number or email address, and length of time for interaction, 5) Exit time from location/facility. Records must be kept for a period of at least 28 days. Records are only to be used for tracing COVID-19 infections and must be stored confidentially and securely.

[3] You can do a walk-through of the workspace with a tape measure and write down the dimensions of all enclosed spaces, calculate the area of each enclosed space by multiplying the length of the space in metres by its width in metres and divide this number by 4. The result is the number of people you can have in a space to allow for at least 4m² of space per person. E.g. Length = 5 metres, Width = 10 metres, Area in square metres: 5 x 10 = 50, Maximum number of people: 50 ÷ 4 = 12.5. Round it down to 12.

3

	Yes, already in place	Not yet, further action required*	N/A
• I have an action plan to ensure physical barriers are in place[4]			
I have developed a plan for the flow of people for the full cycle of the research activity, from entry to exit, in consideration of other activities and people in the area or facility to avoid participants queuing or congregating	☒	☐	☐
I will ensure only one person will use a piece of equipment at a time unless the equipment or facility layout allows 1.5m separation between users.	☒	☐	☐

*where further action is required, researchers must complete the Action Plan at the end of this checklist and re-submit for review

3. HYGIENE	Yes, already in place	Not yet, further action required*	N/A
I have put in place appropriate ways to minimise the personal risk to me, in light of my own unique health circumstances (e.g. wearing a face mask, gloves, downloading the COVIDSafe app)	☒	☐	☐
I will have hand sanitiser available and will ensure frequently used areas are cleaned between each participant (e.g. tables, chairs, keyboards, equipment)[5]	☒	☐	☐
I will have detergent/disinfectant and/or surface wipes available to clean workstations and equipment such as monitor, phone, keyboard and mouse, VR equipment, physiological monitors (e.g. heart rate, EEG), etc.	☒	☐	☐
Appropriate PPE is available for use (e.g. face masks)[6]	☒	☐	☐
Opportunities to optimise air flow have been implemented in naturally ventilated facilities (e.g. opening windows or doors). *Not applicable to mechanically ventilated or air-conditioned spaces.*	☒	☐	☐

*where further action is required, researchers must complete the Action Plan at the end of this checklist and re-submit for review

4. SIGNAGE	Yes, already in place	Not yet, further action required*	N/A
In areas or activities where queuing or congestion is expected, I will ensure that physical barriers or floor markings will be used to indicate circulation and movement of people, and to facilitate distancing requirements, e.g. move or walk this way signs or arrows, 'Let's stay 1.5m away' reminders.	☐	☐	☒
Physical distancing and hygiene posters[7] and/or electronic signage will be displayed in prominent locations inside and outside of facilities used during	☐	☐	☒

[4] If a 1.5m separate cannot be maintained for specific activities, physical barriers (e.g. Perspex shields/sneeze screens) or other risk controls have been considered e.g. P2 face masks, time reduced to below 15 minutes.
[5] Researchers and participants are reminded to wash hands or use hand sanitiser including on arrival (and regularly during the day for extended periods) via signage and/or procedures.
[6] Appropriate PPE is available to use where social distancing is not possible, and in high-risk situations (e.g. hospitals) and for "at-risk" participants. For all other scenarios, PPE use should be encouraged where feasible and appropriate.
[7] The following posters are available for download: Simple steps to help stop the spread, How to hand wash, How to hand rub

research processes (not required for one-on-one meetings)			

*where further action is required, researchers must complete the Action Plan at the end of this checklist and re-submit for review

5. EXTERNAL LOCATIONS / THIRD PARTY FACILITIES (including participants' homes, hospitals clinics, laboratories and other facilities)	Yes, already in place	Not yet, further action required*	N/A
I am following the direction from NSW Health (clinical/visitor guidelines)/ other agency and will comply with their conditions of entry	☒	☐	☐
I have confirmed that my research activities in third party facilities are in line with those organisation's safety controls and protocols and have been endorsed by the relevant authority in the third-party organisation.	☒	☐	☐
I have considered how to access the external facility/site safely including determining what form of transport is appropriate and parking availability.	☒	☐	☐
If visiting a research participant's home OR community sites, maximum visitors will not exceed public health requirements	☒	☐	☐
Travel to and from research site enables 1.5 m distance between persons or 50% capacity of the vehicle	☒	☐	☐

*where further action is required, researchers must complete the Action Plan at the end of this checklist and re-submit for review

6. LAB-BASED WORK	Yes, already in place	Not yet, further action required*	N/A
Attendance of research staff has been rostered to ensure that the facility does not exceed the adjusted maximum occupancy at any time. Staggered start and finish times have also been considered to assist with travel via public transport.	☐	☐	☒
On-site staffing levels allow for adequate support and supervision of research students and junior researchers	☐	☐	☒
Procedures have been established for the decontamination of shared equipment and PPE between users (e.g. wipe down of control touch panels with disinfectant wipes, shared PPE is laundered between use), lab coats not stored close together.	☐	☐	☒
Safety and wellbeing staff/representatives have been involved in the review of the planned work arrangements/ procedures and their feedback has been considered in the development of the plan to control risks associated with COVID-19.	☐	☐	☒

*where further action is required, researchers must complete the Action Plan at the end of this checklist and re-submit for review

5

7. ETHICS The implementation of COVID-19 safe research practices as outlined in the above checklist and action plan does not require submission of an amendment application unless changes are being made to research methods or procedures due to COVID-19 restrictions (e.g. changing from face-to-face workshops to Zoom or online survey). 9 instructions here.	Yes, already in place	Not yet, further action required*	N/A
I confirm I have received approval for any changes to my previously approved procedures/protocols via an amendment to the Ethics Secretariat in relation to this checklist and accompanying action plan.	☒	☐	☐

*where further action is required, researchers must complete the Action Plan at the end of this checklist and re-submit for review

RESEARCHER COMMENTS (Insert comments if required)

APPROVAL BY DEAN/ADR/DIRECTOR	Yes	Not yet, action required	Not approved
I confirm the completed checklist (and below action plan, if applicable) are appropriate and endorse this research activity to commence as outlined below.	☒	☐	☐
Comments:			
Name of Dean/ADR/Director: Heather MacDonald (Acting Dean & Acting ADR)			
Signature: Production Note: Signature removed prior to publication.	Date: 14/12/2021		

6

Pilot Study

PARTICIPANT INFORMATION SHEET

Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism

(UTS HREC REF NO. ETH20-5480)

WHO IS DOING THE RESEARCH?

My name is Chunyan Yang and I am a doctoral student at UTS. My supervisor is associate professor Song Shi (Song.Shi@uts.edu.au) and Dr. Goran Runeson (Karl.Runeson@uts.edu.au) in the School of Built Environment, Faculty of Design, Architecture and Building, University of Technology Sydney.

WHAT IS THIS RESEARCH ABOUT?

The purpose of this study is to investigate the relationship between community park, social interaction and place attachment within Master Planned Estates in Sydney. This study will investigate how community park factors influence residents' social interaction and place attachment and to test the claim of New Urbanism in master planned estates. Two cases are selected in this study for comparison: Breakfast Point and Liberty Grove.

WHY HAVE I BEEN ASKED?

You have been invited to participate in this survey study because you are the resident living in Breakfast Point or Liberty Grove and your opinion is very important and valuable for this research.

IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, I will invite you to answer a questionnaire that will take approximately 10 to15 minutes to complete.

ARE THERE ANY RISKS/INCONVENIENCE?

We don't expect this questionnaire survey to cause any harm or discomfort to you, however there may be some minor possible risks, including the slight likelihood of inconvenience.

If you decide to participate in this study, then you may face a risk of loss of confidentiality. The researcher will try to reduce this possible risk by not asking for personally identifying data. You will be assured that your name and information will not be identifiable in all publications of this study. All data will be anonymous and confidential in this study.

If you decide to participate in the online survey, you may experience slight inconvenience when filling in an online questionnaire because you may involve some technical issues. You also may face a risk of internet security, such as loss of anonymity and confidentiality on websites. To minimize these risks of online survey, this study will provide a guideline to you which highlights the technical issues involved in online survey. The researcher can assure you that your responses to this survey will be kept strictly anonymous and confidential and all data will be stored in UTS 'Stash' data management system safely and confidentially.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting the researcher Chunyan Yang by email at Chunyan.Yang@student.uts.edu.au or her mobile [redacted].

If you withdraw from the study, your samples will be destroyed. However, it may not be possible to withdraw your data from the study results if these have already had your identifying details removed.

If you decide to leave the research project, we will not collect additional personal information from you, although personal information already collected will be retained to ensure that the results of the research project can be measured properly and to comply with law. You should be aware that data collected up to the time you withdraw will form part of the research project results. If you do not want them to do this, you must tell them before you join the research project.

CONFIDENTIALITY

By signing the consent form you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially. The Data will be stored in UTS 'Stash' data management system and kept confidentially for 5 years. This research data security classification is UTS Internal, which means only my supervisors and myself will have access. Your responses and information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law.

We would like to store your information for future use in research projects that are an extension of this research project. In all instances your information will be treated confidentially. In any publication, information will be provided in such a way that you cannot be identified. In all instances your information will be treated confidentially.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think I or my supervisor can help you with, please feel free to contact me on my email at Chunyan.Yang@student.uts.edu.au or my supervisor at Song.Shi@uts.edu.au.

You will be given a copy of this form to keep.

NOTE:
This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au and quote the UTS HREC reference number. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

CONSENT FORM

Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism

(UTS HREC REF NO. ETH20-5480)

I _____ agree to participate in the research project *Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism* (UTS HREC REF NO. ETH20-5480) being conducted by Chunyan Yang (mobile ▇▇▇▇▇▇, email: Chunyan.Yang@student.uts.edu.au) of the University of Technology Sydney for her degree of Doctor of Education.

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research as described in the Participant Information Sheet.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or the University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep.

I agree that the research data gathered from this project may be published in a form that:
☐ Does not identify me in any way
☐ May be used for future research purposes

I am aware that I can contact Chunyan Yang at Chunyan.Yang@student.uts.edu.au or her supervisor at Song.Shi@uts.edu.au if I have any concerns about the research.

_____   ____/____/____
Name and Signature [participant]   Date

_____   ____/____/____
Name and Signature [researcher or delegate]   Date

_____   ____/____/____
Name and Signature [witness*]   Date

* Witness to the consent process
If the participant, or if their legally acceptable representative, is not able to read this document, this form must be witnessed by an independent person over the age of 18. In the event that an interpreter is used, the interpreter may not act as a witness to the consent process. By signing the consent form, the witness attests that the information in the consent form and any other written information was accurately explained to, and apparently understood by, the participant (or representative) and that informed consent was freely given by the participant (or representative) *(delete this section and the "Signature of witness" section above if this form does not need to be signed by a witness to the consent process).*

INFORMATION SHEET AND CONSENT FORM FOR ONLINE SURVEYS

Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Sydney

(UTS HREC REF NO. ETH20-5480)

What is the research study about?

The purpose of this survey study is to investigate the relationship between community park, social interaction and place attachment within Master Planned Estates in Sydney. This study will investigate how community park factors influence residents' social interaction and place attachment and to test the claim of New Urbanism in master planned estates. Two cases are selected in this study for comparison: Breakfast Point and Liberty Grove.

You have been invited to participate in this survey study because you are the resident living in Breakfast Point or Liberty Grove, and your opinion is very important and valuable for this research.

Who is conducting this research?

My name is Chunyan Yang and I am a doctoral student at UTS. My supervisor is associate professor Song Shi (Song.Shi@uts.edu.au) and Dr. Goran Runeson (Karl.Runeson@uts.edu.au) in the School of Built Environment, Faculty of Design, Architecture and Building, University of Technology Sydney.

Inclusion/Exclusion Criteria

Before you decide to participate in this research study, we need to ensure that it is ok for you to take part. The survey will be conducted to collect data from residents in Breakfast Point and Liberty Grove. Only adult resident living in Breakfast Point and Liberty Grove will be included to participate in this survey.

Do I have to take part in this research study?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part. If you decide to participate, I will invite you to read the information carefully (ask questions if necessary) and complete an online questionnaire that will take approximately 10-15 minutes.

You can change your mind at any time and stop completing the surveys without consequences.

Are there any risks/inconvenience?

We don't expect this questionnaire survey to cause any harm or discomfort to you, however there may be some minor possible risks, including the slight likelihood of inconvenience.

If you decide to participate in this online survey, you may experience slight inconvenience when filling in an online questionnaire because you may involve some technical issues. You also may face a risk of internet security, such as loss of anonymity and confidentiality on websites. To minimize these risks of online survey, this study will provide guidelines to you which highlight the technical issues involved in online survey. The researcher can assure you that your responses to this survey will be kept strictly anonymous and confidential. The Data will be stored in UTS 'Stash' data management system confidentially.

What will happen to information about me?

Access to the online questionnaire is via the website of SurveyMonkey. Submission of the online questionnaire is an indication of your consent. By clicking the link as https://www.surveymonkey.com. you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially. Data will be stored in UTS 'Stash' data management system confidentially for 5 years. This research data security classification is UTS Internal, which means only my supervisors and myself will have access. Your information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law. We would like to store your information for future use in research projects that are an extension of this research project. In all instances your information will be treated confidentially.

In any publication, information will be provided in such a way that you cannot be identified.

What if I have concerns or a complaint?

If you have concerns about the research that you think I or my supervisor can help you with, please feel free to contact me on my email at Chunyan.Yang@student.uts.edu.au or my supervisor at Song.Shi@uts.edu.au.

If you would like to talk to someone who is not connected with the research, you may contact the Research Ethics Officer on 02 9514 9772 or Research.ethics@uts.edu.au and quote this number (UTS HREC REF NO. ETH20-5480).

PARTICIPANT INFORMATION SHEET

Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism

(UTS HREC REF NO. ETH20-5480)

WHO IS DOING THE RESEARCH?

My name is Chunyan Yang and I am a doctoral student at UTS. My supervisor is associate professor Song Shi (Song.Shi@uts.edu.au) and Dr. Goran Runeson (Karl.Runeson@uts.edu.au) in the School of Built Environment, Faculty of Design, Architecture and Building, University of Technology Sydney.

WHAT IS THIS RESEARCH ABOUT?

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WHY HAVE I BEEN ASKED?

You have been invited to participate in this survey study because you are the resident living in Breakfast Point or Liberty Grove and your opinion is very important and valuable for this research.

IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, I will invite you to answer a questionnaire that will take approximately 10 to15 minutes to complete.

ARE THERE ANY RISKS/INCONVENIENCE?

We don't expect this questionnaire survey to cause any harm or discomfort to you, however there may be some slight potential risks, such as a minor inconvenience.

If you decide to participate in this study, then you may face a slight risk of loss of confidentiality of personal data. The researcher will try to reduce this slight risk by not asking for personally identifying data in the survey questionnaire. You are assured that all data will be anonymous and confidential in this study. Your name and information will not be identifiable in all publications of this study.

If you decide to participate in the online survey, you may experience slight inconvenience when filling in an online questionnaire because you may involve some technical issues. You also may face a risk of internet security, such as loss of anonymity and confidentiality on websites. To minimize these risks of online survey, the researcher will provide a guideline to you which highlights the key technical issues involved in the online survey. The researcher can assure you that your responses to this online survey will be kept strictly anonymous and confidential, and all data will be stored in UTS 'Stash' data management system safely and confidentially.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting the researcher Chunyan Yang by email at Chunyan.Yang@student.uts.edu.au or her mobile ████████.

If you withdraw from the study, your samples will be destroyed. However, it may not be possible to withdraw your data from the study results if these have already had your identifying details removed.

If you decide to leave the research project, we will not collect additional personal information from you, although personal information already collected will be retained to ensure that the results of the research project can be measured properly and to comply with law. You should be aware that data collected up to the time you withdraw will form part of the research project results. If you do not want them to do this, you must tell them before you join the research project.

CONFIDENTIALITY

By signing the consent form you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially. The Data will be stored in UTS 'Stash' data management system and kept confidentially. This research data security classification is UTS Internal, which means only my supervisors and myself will have access. Your responses and information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law.

We would like to store your information for future use in research projects that are an extension of this research project. In all instances your information will be treated confidentally. In any publication, information will be provided in such a way that you cannot be identified. In all instances your information will be treated confidentially.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think I or my supervisor can help you with, please feel free to contact me on my email at Chunyan.Yang@student.uts.edu.au or my supervisor at Song.Shi@uts.edu.au.

You will be given a copy of this form to keep.

NOTE:
This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au, and quote the UTS HREC reference number. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

CONSENT FORM

Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism

(UTS HREC REF NO. ETH20-5480)

I _____ agree to participate in the research project *Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Australia: Insights into the Claims of New Urbanism* (UTS HREC REF NO. ETH20-5480) being conducted by Chunyan Yang (email: Chunyan.Yang@student.uts.edu.au) at the School of Built Environment, Faculty of Design, Architecture and Building, UTS.

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research as described in the Participant Information Sheet.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or the University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep.

I agree that the research data gathered from this project may be published in a form that:

☐ Identifies me
☐ Does not identify me in any way
☐ May be used for future research purposes.

I am aware that I can contact Chunyan Yang at Chunyan.Yang@student.uts.edu.au or her supervisor at Song.Shi@uts.edu.au if I have any concerns about the research.

_____   ____/____/____
Name and Signature [participant]   Date

_____   ____/____/____
Name and Signature [researcher or delegate]   Date

* Witness to the consent process
If the participant, or if their legally acceptable representative, is not able to read this document, this form must be witnessed by an independent person over the age of 18. In the event that an interpreter is used, the interpreter may not act as a witness to the consent process. By signing the consent form, the witness attests that the information in the consent form and any other written information was accurately explained to, and apparently understood by, the participant (or representative) and that informed consent was freely given by the participant (or representative).

PARTICIPANT INFORMATION SHEET

Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Sydney

(UTS HREC REF NO. ETH21-6087; NO. ETH21-6736)

WHO IS DOING THE RESEARCH?

My name is Chunyan Yang and I am a PhD candidate at UTS. My supervisor is associate professor Song Shi (Song.Shi@uts.edu.au) and Dr. Goran Runeson (Karl.Runeson@uts.edu.au) in the School of Built Environment, Faculty of Design, Architecture and Building, University of Technology Sydney.

WHAT IS THIS RESEARCH ABOUT?

This research aims to investigate the relationships between community parks, social interaction and place attachment within Master Planned Estates in Sydney. Two neighbourhoods are selected for case studies in this research: Breakfast Point and Liberty Grove. This research will involve semi-structured interviews with residents living in Breakfast Point or Liberty Grove to investigate and understand how community parks influence residents' social interaction and place attachment in Master Planned Estates.

WHY HAVE I BEEN ASKED?

You have been invited to participate in this interview study because you are a resident living in Breakfast Point or Liberty Grove and your opinion is very important and valuable for this research.

IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, I will invite you to participate in a semi-structured interview that will be audio-recorded and transcribed. The interview will take approximately 30 to 60 minutes and be held at a public space in your neighbourhood. The interview will be treated anonymously and confidentially.

ARE THERE ANY RISKS/INCONVENIENCE?

This interview study has been carefully designed, but there might be some potential minor inconveniences.

If you decide to participate in this study, you might be concerned about the confidentiality of your information. You should be aware that all data will be anonymous and confidential in this study. I can assure you that your name and information will not be identifiable in the transcript and all publications of this study. Your responses to this interview will be kept in UTS Stash data management system safely and confidentially.

If you decide to participate in this interview, you may experience slight inconvenience or embarrassment to talk about your opinions or feelings with the researcher during the face-to-face interview. You should be aware that you are not obliged to answer any questions that you don't feel comfortable to do so. You have the right to withdraw at any time if you feel any discomfort.

You might probably feel uncomfortable about being recorded in the interview in which case I can pause or turn-off the recording.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting the researcher Chunyan Yang on her email: Chunyan.Yang@student.uts.edu.au or mobile: ▬▬▬▬▬▬

If you withdraw from the study, your interview recordings and transcripts will be destroyed.

If you decide to leave the research project, we will not collect additional personal information from you, although personal information already collected will be retained to ensure that the results of the research project can be measured properly and to comply with law. You should be aware that data collected up to the time you withdraw will form part of the research project results. If you do not want them to do this, you must tell them before you join the research project.

CONFIDENTIALITY

By signing the consent form, you consent to the research team collecting and using personal information about you for the research project. All this information will be treated anonymously and confidentially. This research is undertaken in accordance with all UTS policies and guidelines including the Research Data Governance Policy. The Data will be stored in UTS 'Stash' data management system and kept confidentially. This research data security classification is UTS Internal, which means only my supervisors and myself will have access. Your information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law.

We would like to store your information for future use in research projects that are an extension of this research project. In all instances your information will be treated anonymously and confidentially.

In any publication, information will be provided in such a way that you cannot be identified.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?
If you have concerns about the research that you think I or my supervisor can help you with, please feel free to contact me on my email at Chunyan.Yang@student.uts.edu.au or my supervisor on his email at Song.Shi@uts.edu.au

You will be given a copy of this form to keep

NOTE:
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CONSENT FORM

Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Sydney
UTS HREC REF NO. ETH21-6087; NO. ETH21-6736)

I _____ agree to participate in the research project *Community Parks, Social Interaction and Place Attachment in Master Planned Estates in Sydney* (UTS HREC REF NO. ETH21-6087; NO.ETH21-6736) being conducted by Chunyan Yang (email: Chunyan.Yang@student.uts.edu.au) of the University of Technology Sydney for her PhD research.

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research as described in the Participant Information Sheet.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or the University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep.

I agree to be:

☐ Audio recorded during the interview.

☐ Zoom recorded during the interview.

I agree that the research data gathered from this project may be published in a form that:

☐ Identifies me.

☐ Does not identify me in any way.

☐ May be used for future research purposes.

I am aware that I can contact Chunyan Yang at Chunyan.Yang@student.uts.edu.au or her supervisor at Song.Shi@uts.edu.au if I have any concerns about the research.

_____   ___/___/___
Name and Signature [participant]   Date

_____   ___/___/___
Name and Signature [researcher or delegate]   Date

(UTS HREC REF NO. ETH20-5480)

Section 1: General Questions about Community Parks

Directions: In this section, I would like to ask you questions about community parks in your neighbourhood. 'Community park' below refers to the parks in Breakfast Point / Liberty Grove, such as Village Green Park, Silkstone Park, Waterfront Walkway, Community Hall Park in Breakfast Point and Village Green Park, Brewers Park, Brunswick Park and Cole Reserve, Eliza Park in Liberty Grove.

1. Are you currently living in Breakfast Point or Liberty Grove?

   ○   Breakfast Point
   ○   Liberty Grove
   ○   I am not living in Breakfast Point or Liberty Grove

2. How often do you use the community parks in Breakfast Point / Liberty Grove?

   ○   Never
   ○   Once a month or less
   ○   2-3 times a month
   ○   1-6 times a week
   ○   Daily

3. How satisfied or dissatisfied are you with pedestrian accessibility of the community parks in Breakfast Point / Liberty Grove?

   ○   Very satisfied
   ○   Somewhat satisfied
   ○   Neither satisfied nor dissatisfied
   ○   Somewhat dissatisfied
   ○   Very dissatisfied
   ○   Not applicable

4. How satisfied or dissatisfied are you with the quality of recreation facilities (e.g., BBQ, picnic areas, aesthetic features) in the community parks in Breakfast Point / Liberty Grove?

   ○   Very satisfied
   ○   Somewhat satisfied
   ○   Neither satisfied nor dissatisfied
   ○   Somewhat dissatisfied
   ○   Very dissatisfied
   ○   Not applicable

5. How satisfied or dissatisfied are you with the quality of children's playgrounds in the community parks in Breakfast Point / Liberty Grove?

   ○   Very satisfied

○ Somewhat satisfied
○ Neither satisfied nor dissatisfied
○ Somewhat dissatisfied
○ Very dissatisfied
○ Not applicable

6. How satisfied or dissatisfied are you with the comfort of the rest areas (e.g., seatings, restrooms) in the community parks in Breakfast Point / Liberty Grove?

○ Very satisfied
○ Somewhat satisfied
○ Neither satisfied nor dissatisfied
○ Somewhat dissatisfied
○ Very dissatisfied
○ Not applicable

7. How satisfied or dissatisfied are you with the amount and quality of shade (e.g., green space shade, walking path shade) in the community parks in Breakfast Point / Liberty Grove?

○ Very satisfied
○ Somewhat satisfied
○ Neither satisfied nor dissatisfied
○ Somewhat dissatisfied
○ Very dissatisfied
○ Not applicable

8. How satisfied or dissatisfied are you with the quality of the sporting facilities (e.g., tennis, basketball courts) in the community parks in Breakfast Point / Liberty Grove?

○ Very satisfied
○ Somewhat satisfied
○ Neither satisfied nor dissatisfied
○ Somewhat dissatisfied
○ Very dissatisfied
○ Not applicable

9. How satisfied or dissatisfied are you with the quality of the nature spaces (e.g., gardening, green space) in the community parks in Breakfast Point / Liberty Grove?

○ Very satisfied
○ Somewhat satisfied
○ Neither satisfied nor dissatisfied
○ Somewhat dissatisfied
○ Very dissatisfied
○ Not applicable

10. How satisfied or dissatisfied are you with the community parks' pedestrian connectivity (e.g., walking or cycling paths) with surrounding neighbourhoods and public districts?

○ Very satisfied
○ Somewhat satisfied
○ Neither satisfied nor dissatisfied

○ Somewhat dissatisfied
○ Very dissatisfied
○ Not applicable

Section 2: Social Interaction Questions

Directions: This section contains questions about your neighbours.

11. How often do you have general interactions with your neighbours (e.g., short-duration outdoor talks, greetings) in Breakfast Point / Liberty Grove?

    ○ Never
    ○ Once a month or less
    ○ 2-3 times a month
    ○ 1-6 times a week
    ○ Daily

12. How many of your neighbours do you like to stop and chat with when you run into them in the neighbourhood?

    ○ None
    ○ 1-2
    ○ 3-5
    ○ 6-10
    ○ 11 and over

13. How many close neighbour friends (meaning people that you feel at ease with, can talk to about private matters, and can call on for help in the neighbourhood) do you have in Breakfast Point / Liberty Grove?

    ○ None
    ○ 1-2
    ○ 3-5
    ○ 6-10
    ○ 11 and over

14. How often do you and your neighbours do activities together (e.g., walking, running, shopping or playing football)?

    ○ Never
    ○ Once a month or less
    ○ 2-3 times a month
    ○ 1-6 times a week
    ○ Daily

15. How often do you participate in community social activities with your neighbours (e.g., local group discussions, community events, or cultural/sport/recreation activities) in Breakfast Point / Liberty Grove?

    ○ Never
    ○ Once a month or less
    ○ 2-3 times a month

○ 1-6 times a week
○ Daily

Section 3: Place Attachment Questions

Directions: This section contains questions about how you feel towards your neighbourhood.

To what extent do you agree or disagree with the following statements?

16. I pride myself of living in Breakfast Point / Liberty Grove.

   ○ Strongly agree
   ○ Agree
   ○ Neither agree nor disagree
   ○ Disagree
   ○ Strongly disagree

17. I feel attached to this neighbourhood.

   ○ Strongly agree
   ○ Agree
   ○ Neither agree nor disagree
   ○ Disagree
   ○ Strongly disagree

18. I feel Breakfast Point / Liberty Grove is a part of me.

   ○ Strongly agree
   ○ Agree
   ○ Neither agree nor disagree
   ○ Disagree
   ○ Strongly disagree

19. I identify strongly with Breakfast Point / Liberty Grove.

   ○ Strongly agree
   ○ Agree
   ○ Neither agree nor disagree
   ○ Disagree
   ○ Strongly disagree

20. Living in Breakfast Point / Liberty Grove says a lot about who I am.

   ○ Strongly agree
   ○ Agree
   ○ Neither agree nor disagree
   ○ Disagree
   ○ Strongly disagree

21. Community parks in Breakfast Point / Liberty Grove are special to me.

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

22. Breakfast Point / Liberty Grove is the best neighbourhood for me to live in.

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

23. No other place can compare to Breakfast Point / Liberty Grove.

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

24. If I can, I will remain a resident of Breakfast Point / Liberty Grove for several years.

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

25. If, for any reason, you had to move to another neighbourhood would you be:

○ Very unhappy
○ Somewhat unhappy
○ Doesn't make any difference
○ Somewhat happy
○ Very happy

Section 4: Basic Information

Directions: In this section, I would like to ask you questions about yourself. The confidentiality of your response is assured.

26. What is your gender?

○ Male
○ Female
○ Prefer to self-describe: _____
○ Prefer not to answer

27. What is your age?

    ○   Under 20
    ○   20-39
    ○   40-59
    ○   60-79
    ○   80 and over

28. What is your marital status?

    ○   Single (Separated, divorced, widowed, or never married)
    ○   Married or living with a partner

29. Including yourself, how many people currently live in your household?

    ○   1
    ○   2
    ○   3
    ○   4
    ○   5 and over

30. How many children under 18 years old are living with you?

    ○   0
    ○   1
    ○   2
    ○   3
    ○   4 and over

31. What is your current work status?

    ○   Full-time employment (including working from home)
    ○   Part-time employment (including working from home)
    ○   Self-employed
    ○   Unemployed
    ○   Retired
    ○   Other, please specify: _____

32. What is your highest level of educational attainment?

    ○   High school graduate or below
    ○   Diploma, Advanced diploma, Certificate level
    ○   Bachelor's degree
    ○   Master's degree
    ○   Doctoral degree
    ○   Other, please specify: _____

33. What was your approximate individual income before tax in the last year?

    ○   Less than $ 20,000

○ $ 20,000 to $ 49,999
○ $ 50,000 to $ 99,999
○ $ 100,000 to $ 199,999
○ $ 200,000 and over
○ Prefer not to answer

34. What is your homeownership status in Breakfast Point / Liberty Grove?

○ Owning
○ Renting
○ Other, please specify: _____

35. Do you live in a?

○ House
○ Townhouse, semi-detached or terrace house
○ Apartment or flat

36. How long have you lived in Breakfast Point / Liberty Grove?

○ Less than a year
○ 1-3 years
○ 3-5 years
○ 5-10 years
○ 10 years and over

37. How often do you interact with your neighbours on online social networking sites, such as Facebook?

○ Never
○ Once a month or less
○ 2-3 times a month
○ 1-6 times a week
○ Daily

38. To what extent do you agree or disagree with this statement: 'I prefer communicating with neighbours face-to-face rather than online when I feel isolated'?

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

39. To what extent do you agree or disagree with this statement: 'I feel safe living in Breakfast Point / Liberty Grove'?

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree

○   Strongly disagree

40. Have you ever participated in any neighbourhood groups (e.g., service, cultural, sport or recreation groups) in Breakfast Point / Liberty Grove in the past year?

○   No
○   Yes (1 or more)

Thank you for completing the survey!

(UTS Ethics NO. ETH21-6087)

Date: ....   No.   ....

Start time: ....   Finish time: ....

General information

The housing type are you living in: ....

How long have you lived in Breakfast Point / Liberty Grove?   ....

Section 1: Community Park Use

Theme 1: CP Use Behaviours

Q1: How often do you use community parks? What do you like to do in community parks?

Section 2: Social Interaction (SI)

Theme 2: Frequency of Social Interaction

Q2: How often do you usually have social interactions with neighbours in community parks? How satisfied are you with the frequency of social interactions that occur for you in community parks?

Theme 3: Quality of Social Interaction

Q3: Could you please describe what types of social interactions that occur in community parks that are you involved with (*e.g., general face-to-face contact with*

neighbours, doing things together with friends, participating in community activities or online social interaction)? Are you satisfied with the various types of social interactions that occur in community parks? Why do you feel that way?

Theme 4: Community Park Use and Social Interaction

Q4: What features of community parks encourage you to get various types of social interaction with others? Why do you feel that way?

Theme 5: SI and Sense of Community

Q5: Which type of social interaction that occurs in community parks give you a sense of social support, or a sense of community? Why do you feel that way?

Section 3: Place Attachment

Theme 6: Place Identity

Q6: How would you describe community parks in your neighbourhood? Could you please describe your favourite community park in your neighbourhood?

Theme 7: Place Dependence

Q7: What do you like about the community parks in your neighbourhood? Which types of behaviours or social activities that occur in the community parks gives you a sense of attachment? Why do you feel that way?

Theme 8: Place Affect

Q8: What features of community parks in the neighbourhood make you feel more of a sense of belonging to the community? Why do you feel that way?

Section 4: Neighbourhood Connectivity

Theme 9: Connectivity

Q9: How would you describe the surrounding areas of your neighbourhood? What do you like to do in the parks in the surrounding areas (if have)?