An Australian perspective on talent identification and development in soccer

A thesis submitted for the degree of Doctor of Philosophy (Sport and Exercise)

February, 2019

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Certificate of original authorship

I, Kyle James Madden Bennett declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy (Sport and Exercise), in the Faculty of Health 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 is indicated in the thesis. This document has not been submitted for qualifications at any other academic institution. This research is supported by the Australian Government Research Training Program.

Production Note:
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07/02/2018

Kyle James Madden Bennett

Date Submitted

Acknowledgements

There are many important people that I would like to thank for helping me with this thesis. First, a special mention to Ma, an incredible role model who was taken too soon. I dedicate this thesis to you, to show that you should never give up on your dreams; something that you taught me. I know you are watching over me and I am forever grateful for having you in my life.

To my beautiful wife, thank you for your love and unwavering support throughout this long process. Thank you for distracting me with your ridiculous, but oh so addictive, television shows. I appreciate the patience you have shown me over my many years at university. I know you have now waited eight and a half years for me to finally get a full-time job, so I guess I could start looking.

Thank you to my ever-so-supportive family. To Mum, Dad, and Pop, thank you for encouraging me to do what I love. I would not be the person I am today without you. To Emily and James, thank you for blessing me with my perfect little niece Luna. To my second family (Debbie, Colin, Kylie, Louise, Peter, Carlie, Lincoln, Decklan, and Maddison), thank you for not giving up on me. Whether this was forcing me to be excited for games nights, or teaching me useless trivia facts, our time together was invaluable.

To my incredible mentors, Job and Aaron, thank you for providing me with the opportunity to complete my research higher degree at the University of Technology Sydney. I have come a long way under your leadership and have developed considerably as a researcher. I now truly understand the importance of being approachable, hard-working, and driven; qualities that you both possess. I hope to continue this relationship for many years to come.

To Novak and Matchu, I need to thank you for so many things. Thank you for sacrificing your time on numerous occasions to travel to various testing locations so that I could collect data. Thank you for staying up to the early hours of the morning so that we could game together. Most importantly, thank you for being amazing and supportive friends.

Finally, thank you to all the research assistants, especially Rhys and Jade, who were pivotal to this thesis coming together. Without your dedication to my research, this thesis would not be possible.

Preface

The current thesis presents a collective body of studies that are published or under-review in scientific journals. Study one and two are accepted published in Science and Medicine in Football. Study three is accepted and published in Journal of Science and Medicine in Sport. Study four and five are currently in preparation for journal submission. This thesis contains a general introduction that details the state of talent identification and development research and states the key objectives for each study (chapter one). A literature review is included to provide a comprehensive overview of commonly talent identification and development measures (chapter two). The main body of research is presented in chapters' three to seven, in the form of one narrative review, and four original investigations. The general discussion provides an interpretation of the studies from a practical standpoint and details clear implications for researchers, coaches, and sporting professionals working in the talent identification and development field. The final section of this thesis is a summary of the major findings along with a guide to areas which researchers can further investigate. This thesis adopted the American Psychological Association 6th edition referencing style. All references are included in the reference list at the end of the thesis.

List of publications

Peer-reviewed journal articles

Bennett, K.J.M., Vaeyens, R., Fransen, J. (2018). Creating a framework for talent identification and development in emerging football nations. *Science and Medicine in Football*. Advanced Online Publication. doi: 10.1080/24733938.2018.1489141.

Bennett, K.J.M., Novak, A.R., Pluss, M.A., Stevens, C.J., Coutts, A.J., and Fransen, J. (2018). The use of small-sided games to assess skill proficiency in youth soccer players: A talent identification tool. *Science and Medicine in Football, 2*(3), pp. 231-236. doi: 10.1080/24733938.2017.1413246.

Bennett, K.J.M., Novak, A.R., Pluss, M.A., Coutts, A.J., and Fransen, J. (2018). Assessing the validity of a video-based decision-making assessment for talent identification in youth soccer. *Journal of Science and Medicine in Sports*. Advanced Online Publication. doi: j.jsams.2018.12.011.

Bennett, K.J.M., Pluss, M.A., Novak, A.R., Crowley-McHatten, Z., Coutts, A.J., and Fransen, J. (In Preparation). The confounding influences of sporting participation history on talent identification assessments in youth soccer.

Bennett, K.J.M., Pluss, M.A., Novak, A.R., Coutts, A.J., and Fransen, J. (In Preparation). A multifactorial comparison of Australian youth soccer players' performance characteristics.

Conference proceedings

Beavan, A., Pluss, M.A., **Bennett, K.J.M.,** Novak, A.R., and Fransen, J. (2016). The effect of small sided games bout duration on skill involvements and cognitive engagement

in youth soccer players. *Exercise and Sport Science Australia – Research to Practice*. Melbourne, Australia.

Bennett, K.J.M., Novak, A.R., Dascombe, B.J., and Fransen. J. (2016). Assessing the decision-making ability of youth soccer players during various offensive video-based situations. *Exercise and Sport Science Australia's – Research to Practice.* Melbourne, Australia.

Bennett, K.J.M. (2017). The use of small-sided games to assess skill proficiency in youth soccer players. *Australian Skill Acquisition Network Conference*. Brisbane, Australia

Bennett, K.J.M., Pluss, M.A., Novak, A.R., Coutts, A.J., and Fransen, J. (2018). The stability of youth soccer player's performance characteristics after an 18-month development period. *Exercise and Sport Science Australia's – Research to Practice*. Brisbane, Australia

Statement of author contribution

The valuable contribution of each author to the studies submitted as part of this thesis (Table I).

Table I. The valuable contribution of each author to the studies submitted as part of this thesis.

	Study one			**Study two**						**Study three**				
	Kyle Bennett	Roel Vaeyens	Job Fransen	Kyle Bennett	Andrew Novak	Matthew Pluss	Christopher Stevens	Aaron Coutts	Job Fransen	Kyle Bennett	Andrew Novak	Matthew Pluss	Aaron Coutts	Job Fransen
Research design	70%	5%	25%	50%	10%				40%	50%	20%			30%
Ethics application				80%					20%	80%				20%
Subject recruitment				100%						100%				
Data collection				60%	15%	15%	10%			70%	15%	15%		
Data analysis				100%						100%				
Statistical analysis				60%					40%	80%				20%
Manuscript preparation	80%		20%	100%						100%				
Manuscript revisions		20%	80%		15%	15%	15%	20%	35%		10%	10%	30%	50%

Table I (cont'd). The valuable contribution of each author to the studies submitted as part of this thesis.

	Study four						Study five				
	Kyle Bennett	Matthew Pluss	Andrew Novak	Zachary Crowley-McHattan	Aaron Coutts	Job Fransen	Kyle Bennett	Andrew Novak	Matthew Pluss	Aaron Coutts	Job Fransen
Research design	60%					40%	70%				30%
Ethics application	80%					20%	80%				20%
Subject recruitment	80%			20%			100%				
Data collection	55%	25%	5%	15%			60%	15%	25%		
Data analysis	60%	40%					90%		10%		
Statistical analysis	70%					30%	30%				70%
Manuscript preparation	100%						100%				
Manuscript revisions		15%	15%	5%	20%	45%		10%	10%	30%	50%

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List of abbreviations and symbols

&	And
Δ	Change in
=	Equals
>	Greater than
<	Less than
×	Multiplied by
%	Percentage
±	Plus-minus sign
AUD	Australian dollars
cm	Centimetres
DMGT	Differentiated Model of Giftedness and Talent
e.g.	For example
ES	Effect size
F	F statistic
FIFA	Fédération Internationale de Football Association
h	Hour(s)
ICC	Intraclass correlation coefficient
i.e.	That is
KTK	Körperkoordinationstest für Kinder
MANOVA	Multivariate analysis of variance
m	Metres
m^2	Metres squared
n	Number
NSW	New South Wales

p	P value
η_p^2	Partial eta squared effect size
RM-MANOVA	Repeated measure multivariate analysis of variance
s	Seconds
SD	Standard deviation
UEFA	Union of European Football Associations
USD	United States dollars
vs.	Versus
y	Year(s)

Abstract

Association football (soccer) is one of the most popular sports discussed in talent identification and development research. However, discrepancies exist in how researchers, coaches, and sporting professionals (i.e. scouts, recruiters, and skill acquisition specialists) define optimal practice. These discrepancies arise from several gaps in the current research. First, the different talent identification and development demands of established (e.g. Belgium, Germany, and England) and emerging (e.g. Australia, Iceland, and Panama) football nations are overlooked. Notably, nations competing for the same international success can vary in the size and depth of their talent pool, availability of financial and logistical resources for youth development, and the accessibility of systematic training environments. With a strong focus in most research placed on established football nations and limited evidence supporting the effectiveness of their approaches to talent identification, future research is needed to understand the implications of mirroring such practice in emerging football nations. Second, there is a lack of task representative assessments that measure soccer-specific and perceptual-cognitive skills. Consequently, coaches and sporting professionals' recruitment decisions are primarily based off their subjective opinions of a player's future playing potential, which biological maturation and relative age effects inherently confound. Finally, it is suggested that confounders that are difficult to operationalise with single output measures (e.g. sporting participation history) may have a significant impact on talent identification.

The present thesis aimed to address these issues through a series of five studies. Study one was a narrative review that analysed the current trends in talent identification and development research. Selection biases were apparent in established football nations,

with high-level development programs favouring players who were either more biologically mature, relatively older, or possessed early performance superiorities. Due to a lack of data on the benefits of the current approaches to talent identification, it was difficult to evaluate whether emerging football nations should simply adopt a similar approach to established football nations or develop their own. As a result, study one highlighted a framework that could assist emerging football nations. The three key areas that emerging football nations should focus on were: (1) preventing active deselection and dropout to maximise the size of the talent pool, (2) mitigating confounding factors, and (3) longitudinally tracking players' developmental trajectories. These strategies will likely help to reduce the talent identification demand and improve the depth of the talent pool.

Study two examined the use of small-sided games as a soccer-specific skills assessment for talent identification. Seventy-three high and low-level male youth soccer players (age = 13.3 ± 1.2 y) completed small-sided games (playing numbers = 4 vs. 4 and field dimensions = 30 × 20 m) under two conditions (condition 1 = 5 bouts of 3 min and condition 2 = 3 bouts of 5 min). Skill proficiency was measured using retrospective video analysis and recorded as the total number of completed involvements relative to the amount attempted. Small-sided games successfully discriminated playing levels ($F = 3.19$, $p < 0.01$, $\eta_p^2 = 0.98$), with high-level players displaying significantly greater passing and controlling the ball proficiency, when compared with low-level players. The high-level players also had a greater total skill proficiency than their low-level counterparts ($F = 21.51$, $p < 0.01$, $\eta_p^2 = 0.29$). These results show that small-sided games provided a task representative measure of soccer-specific skills and are a useful inclusion in talent

identification assessments. However, there practical significance still warrants further investigation.

Study three investigated the construct and discriminant validity of a practical video-based decision-making assessment for talent identification. Three-hundred and twenty-eight soccer players (age = 13.0 ± 2.1 y) and 59 youth athletes (age = 14.3 ± 1.2 y) from three developmental stages (late childhood, early adolescence, and mid-adolescence) completed a video-based decision-making assessment. Players were shown 30 attacking situations (2 vs. 1 = 4, 3 vs. 1 = 9, 3 vs. 2 = 6, 4 vs. 3 = 5, and 5 vs. 3 = 6) and were instructed to select the interactive response (i.e. dribble, pass, or shoot) that would directly lead to a goal scoring opportunity. Response accuracy and time were recorded for all situations. The video-based decision-making assessment showed some construct validity, with faster response times in early and mid-adolescent soccer players when compared with the late childhood group ($F = 4.05$, $p < 0.01$, $\eta_p^2 = 0.03$). Overall, there was a decline in decision-making performance (i.e. decrease in response accuracy and increase in response time) when the situations contained more participating players ($F = 26.16$, $p < 0.01$, $\eta_p^2 = 0.43$). The video-based decision-making assessment lacked discriminant validity for talent identification, as there were minimal differences between academies for response accuracy and response time. Only response accuracy was able to discriminate youth academy soccer players from the control group to some extent (early adolescence: $F = 5.28$, $p < 0.001$, $\eta_p^2 = 0.09$ and mid-adolescence: $F = 8.14$, $p < 0.01$, $\eta_p^2 = 0.16$). It is suggested that coaches and sporting professionals apply caution when interpreting data from practical, video-based decision-making assessments. There is currently limited evidence supporting the effectiveness of these assessments for talent identification.

Study four detailed preliminary evidence for the influence of youth soccer players' sporting participation history on their performance characteristics. One hundred and four youth soccer players (age = 13.8 ± 1.2 y) completed anthropometry (stature, sitting height, and body mass), motor competence (balancing backwards, moving sideways, and jumping sideways), and physical fitness assessments (lower body muscular power, linear speed, change of direction skill, and intermittent aerobic endurance), along with a participation history questionnaire (start age in competitive soccer, total volume of soccer-specific practice, total volume of peer-led play, number of other sports, and total hours in other sports). An association was identified for superior motor competence and an earlier start age in competitive soccer ($F = 4.17$, $p = 0.01$, $\eta_p^2 = 0.11$), a higher total volume of soccer-specific practice ($F = 3.31$, $p = 0.02$, $\eta_p^2 = 0.09$), and a higher total volume of peer-led play ($F = 3.76$, $p = 0.01$, $\eta_p^2 = 0.10$). Whereas, superior physical fitness was related to less participation in other sports ($F = 2.50$, $p = 0.04$, $\eta_p^2 = 0.17$). Study four provides preliminary evidence for the inclusion of sporting participation history as a confounder in the talent identification and development process. Specifically, coaches and sporting professionals who use motor competence and physical fitness measures to inform selection decisions should consider the implications of different developmental pathways.

Study five examined the performance characteristics that discriminate academy status in youth Australian soccer. Seventy-four early and mid-adolescent academy soccer players (age = 13.0 ± 0.6 and 15.0 ± 0.6 y, respectively) completed multifactorial assessments of anthropometry, motor competence, physical fitness, decision-making (study three's assessment), and psychological traits (Task and Ego Orientation in Sport questionnaire). A stepwise discriminant analysis successfully classified early and mid-adolescent soccer

players into their academies with an accuracy of 76.9 and 85.2%, respectively. The key indicators of a higher academy status in early adolescence were body mass, dynamic balancing ability, linear sprint speed, and change of direction skill. Whereas, in mid-adolescence the key indicators of a higher academy status were dynamic balancing ability, linear sprint speed, 3 vs. 1 response accuracy, and 3 vs. 1 response time. Study five's findings indicate a potential selection bias in the Australian youth soccer talent pool. Players in the high-level academy were grouped according to superior physical fitness measures. Whereas, players outside the high-level academy display slightly better decision-making skills in 3 vs. 1 situations. To maximise the size and the depth of the talent pool in Australia, coaches and sporting professionals should minimise any potential playing level differences that are of a physical nature.

Overall, the current thesis used Australia as a practical example of an emerging nation to create strategies that can assist with talent identification and development. It is recommended that small-sided games are included in multifactorial assessment batteries to provide a task representative measure of soccer-specific skills. However, practical perceptual-cognitive assessments that utilise a non-specific response action are advised against, as the data is not representative of the perceptual-cognitive skills required for soccer expertise. Coaches and sporting professionals should include longitudinal measures of sporting participation history alongside traditional confounders such as biological maturation and relative age effects. Adopting this approach will assist with reducing playing level differences that are based purely on physical prowess and encourage a shift towards selecting players who are gifted in other performance domains (e.g. soccer-specific skills and perceptual-cognitive skills).

Keywords: expertise; football; motor competence; perceptual-cognitive skills; physical fitness; psychological traits; soccer-specific skills; sporting participation history; team sports; youth.