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The Coaches' Eye: Exploring coach decision-making during talent identification

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The Coaches' Eye:

Exploring coach decision-making during talent identification

This thesis is presented for the degree of

Doctor of Philosophy

Alexandra Hannah Roberts

Edith Cowan University

School of Medical and Health Sciences

2021

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Abstract

For decades, researchers and practitioners interested in talent identification have discussed the *coaches' eye*: the elusive ability that allows some coaches to 'see' qualities in an athlete that point to their talent or future potential. While there is significant anecdotal evidence of coaches who possess this ability, there is little empirical research supporting the validity or reliability of the *coaches' eye*. Guided by ecological dynamics, this thesis employs mixed methodologies to explore the decision-making that underpins how high-level coaches identify talent in Olympic combat sports. These four studies captured the processes of thirty-four coaches during the talent identification process, exploring and identifying the factors that impact on a coach's ability to perform this integral task.

A systematic review and meta-synthesis revealed that 'instinct' is a primary contributor to coach decision-making during talent identification (TID), allowing coaches to 'know it when they see it'. Semi-structured interviews with international coaches explored this 'instinct' during TID and revealed that coaches require experience, time and knowledge of context in order to identify talent. An instrumental case study corroborated these results, and also found that there is a significant conceptual difference between talent *identification* and talent *selection*, in the eyes of this coach. Both studies indicated that coaches likely select athletes based on their capabilities as a coach, not purely on athlete ability or potential. The final study found that nine national-level coaches did not agree on the rankings of talented youth judo athletes after four days. This finding indicates that the *coaches' eye* is subjective and confirms the novel findings of the prior studies; namely that coaches require time to get to know athletes, their opinions of the athletes' talent changed over time, and coaches vary in who they 'see' as talented. Finally, two new models are presented: the *Coach-Informed Talent Identification Process* and a novel model of the *Coaches' Eye in Talent Identification*.

The experiential coach knowledge gathered in this thesis informed the creation of these models.

This thesis indicates that the *coaches' eye* is the lens through which coaches view athletes, using their expertise and experience to interpret the athlete's raw potential, and the time spent with the athlete and the context of their identification to determine whom they will select into their team. It appears that coaches perceive talent with reference to what they can develop in an athlete; thus, coaches must be involved in the identification and selection of talented athletes. These results indicate that National Sporting Organisations should ensure that coaches are provided with the necessary time, education and guidance to ensure that athlete outcomes are optimised.

This thesis provides an understanding of how the *coaches' eye* works during TID and a new understanding of this term. These findings have implications for the ongoing practice and research of talent identification in combat sports, and this work contains recommendations for both coaches and national sporting organisations to improve the confidence, accuracy and reliability of the *coaches'* eye when forecasting talent.

Signed Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

i)   Incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education

ii) Contain any material previously published or written by another person except where due reference is made in the text of this thesis; or

iii) Contain any defamatory material

Signed: ███████████
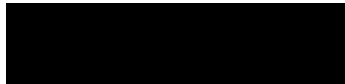
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Acknowledgements

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List of Publications and Conferences

The following articles and conference presentations arose from this thesis.

Peer-reviewed journal articles

Roberts, A.H., Greenwood, D., Stanley, M., Humberstone, C., Iredale, F., & Raynor, A. (2019). Coach knowledge in talent identification: A systematic review and meta-synthesis. *Journal of Science and Medicine in Sport*. *22*(10): 1163-1172. https://doi.org/10.1016/j.jsams.2019.05.008

Roberts, A.H., Greenwood, D., Humberstone, C., Iredale, F., Stanley, M., & Raynor, A. (2020). Understanding the 'gut instinct' of expert coaches during talent identification. *Journal of Sports Sciences*. Advance online publication. https://doi.org/10.1080/02640414.2020.1823083

Roberts, A.H., Humberstone, C., Greenwood, D., Stanley, M., & Raynor, A. *The Coach's Eye: An elite coach's decision-making process during talent identification.* [Manuscript Under Review].

Roberts, A.H., Humberstone, C., Greenwood, D., & Raynor, A.J. (2020). Pilot study on the reliability of the coach's eye: Identifying talent throughout a 4-day cadet judo camp. *Frontiers in Sports and Active Living.* 2:596369 https://doi.org/10.3389/fspor.2020.596369

Conference presentations

Roberts, A.H., Raynor, A., Greenwood, D. (2020, March). *A new conceptualisation of sporting talent: The role of the coach*. [Poster presentation]. Exercise and Sports Science Australia (ESSA) Conference, Perth, Australia. (Delayed due to COVID-19).

Roberts, A.H., Raynor, A., Greenwood, D., Humberstone, C., Iredale, F. (2019, November). *Proposition of a new conceptualisation of the longitudinal talent identification process.* [Conference presentation]. 3rd Scientific Conference on Motor Skill Acquisition, Lohja, Finland.

Roberts, A. H., Greenwood, D., Humberstone, C., Iredale, F., & Raynor, A. (2018, November). *A case study in talent identification.* [Conference presentation]. Australasian Skill Acquisition Network (ASAN) Conference, Sydney, Australia.

Roberts, A.H., Greenwood, D., Humberstone, C., Iredale, F., & Raynor, A. (2018, March). *A constraints-based approach to talent identification of future athletes*. [Poster presentation]. Exercise and Sports Science Australia (ESSA) Conference – Research to Practice, Brisbane, Australia.

Roberts, A. H., Greenwood, D., Humberstone, C., Iredale, F., & Raynor, A. (2017, November). *'Talent doesn't make a champion – but it helps': The coaches' eye in talent identification*. [Conference presentation]. Australasian Skill Acquisition Network (ASAN) Conference, Brisbane, Australia.

Roberts, A. H., Greenwood, D., Humberstone, C., Iredale, F., & Raynor, A. (2017, November*). How do coaches identify talent? An examination of international perspectives in combat sports.* [Conference Presentation]. Scientific Conference on Motor Skill Acquisition, Lohja, Finland.

Statement of Author Contributions to Publications

This thesis, and the publications arising from the work, would not have been possible without contributions from many people.

Chapter Three: AHR led the development and writing of this review and provided an overall contribution greater than that of all co-authors. AHR designed and executed the search criteria; performed the screening, appraisal and analysis of included articles, and drafted the initial manuscript. DG independently screened articles for inclusion. MS independently appraised a subset of articles and consulted during the analysis stages. All listed authors contributed to the conceptualisation of the study and revisions of the manuscript.

Chapter Four: AHR led the development and writing of this paper and provided an overall contribution greater than that of all co-authors. AHR designed the study, collected and analysed the data, and drafted the initial manuscript. AJR and DG contributed to creation of the interview guide. MS supported AHR during data analysis. All listed authors contributed to the conceptualisation of the study and revisions of the manuscript.

Chapter Five: AHR led the development and writing of this paper and provided an overall contribution greater than that of all co-authors. AHR designed the study, collected and analysed the data, and drafted the initial manuscript. MS and AJR assisted with data analysis. All listed authors contributed to the conceptualisation of the study and revisions of the manuscript.

Chapter Six: AHR led the development and writing of this paper and provided an overall contribution greater than that of all co-authors. AHR designed the study, collected and analysed the data, and drafted the initial manuscript. AJR assisted with data collection; AJR and DG assisted with data analysis. All listed authors contributed to the conceptualisation of the study and revisions of the manuscript.

Abbreviated Terminology

AIS   Australian Institute of Sport

HPC   High-Performance Centre

NFL   National Football League

NSO   National Sporting Organisation

PRISMA   Preferred Reporting Items for

                             Systematic Reviews and Meta-Analyses

TID   Talent Identification

It is our choices that show what we truly are, far more than our abilities

- *Albus Dumbledore*

JK Rowling, *Harry Potter and the Chamber of Secrets*

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CHAPTER ONE

Introduction

Using the theoretical framework of ecological dynamics, this program of work will explore the *coaches' eye* – the decision-making process of elite sports coaches during the athlete talent identification process. This thesis was completed within the context of three Australian national sporting organisations (NSOs) and uses combat sports as a task vehicle. This introductory chapter will present the background, research problem, context, and provide an overview of this thesis. This research will add to the body of knowledge in talent identification by exploring the role of the coach in this process.

Background of Talent Identification

Many domains use the word 'talent', yet the term does not have a standard definition. It has been used to describe innate abilities, biological predispositions, current skill level and perceived capacity to improve, among other definitions of the term (Till & Baker, 2020). Talent identification occurs when participants within a given domain or activity are recognised as having the potential to become successful elite performers (Abbott, Button, Pepping, & Collins, 2005; Bompa, 1985; Till & Baker, 2020). The opportunity to increase success while reducing resource expenditure is appealing in many settings including business, education, leadership and medicine (see Mcdonnell 2011; Putallaz, Baldwin & Selph 2005; Rhodes, Brundrett & Nevill 2008; Bell et al. 2011 respectively for examples). As such, talent identification has been a focus of research in these, and other domains for decades. Suppose those with the potential to be champions can be recognised early in sport. In that case, stakeholders such as coaches and national governing bodies can ensure that they invest appropriate resources into those athletes. Appropriate resource investment and development opportunities will ideally produce a larger number of elite performers by reducing time to peak performance and inappropriate financial investments, increasing

coach effectiveness, and increasing chances of international success (Abbott, Collins, Martindale, & Sowerby, 2002; Bompa, 1985; Ford et al., 2020; Johnston & Baker, 2020). Ostensibly, talent identification aims to recognise those who will succeed in the future. However, an existing limitation in the field is the propensity to focus on anthropometric and physiological measures (Bompa, 1985; Pearson, Naughton, & Torode, 2006; Vaeyens, Lenoir, Williams, & Philippaerts, 2008) or results at junior competition levels (Boxing Canada, 2016; McCarthy & Collins, 2014), rather than encompassing a holistic view of the athlete (Unnithan, White, Georgiou, Iga, & Drust, 2012). This focus on 'measurable' traits has led to a tendency within current sporting contexts to identify *current ability* to perform, rather than the *potential* to perform (Abbott et al., 2005; Till & Baker, 2020).

Many existing talent identification approaches rely on short term 'snapshots' of an athlete's current ability. These methods provide practitioners and coaches with a "static, one-dimensional concept of talent" (Mahon, 2004, p. 17) which frequently fails to predict performance due to the dynamic complexities of talent (Davids & Araújo, 2010; Lloyd et al., 2015). A growing body of scientific work is demonstrating that talent is multidimensional and dynamic, explaining the difficulties in accurately identifying talented athletes before they reach high-performance levels. Talent identification is inextricably linked with talent development (i.e. a recognised, structured environment or system designed to enhance athlete development; see Martindale et al. [2005] for a full description). Neither identification nor development can succeed to their fullest potential without the other component.

Current conceptualisations of talent identification contain many stages (Figure 1). Briefly, detection is the process through which potentially talented athletes are directed toward a specific sport, typically based on their existing qualities (height, aerobic capacity, strength). Once detected into a sport, the athlete begins on their developmental pathway within a deliberate talent development environment. Identification is the stage when current

participants are deemed to have the potential to be elite. During confirmation, athletes spend a defined period of in a high-performance environment, after which they are (de)selected for a specific competition or squad. The cyclical, multidimensional model represents the non-linearity of talent. Once athletes are involved in sport, they will move through these stages at many times during their career.

Figure 1

Key Stages in Talent Identification and Development (from Vaeyens et al., 2008)
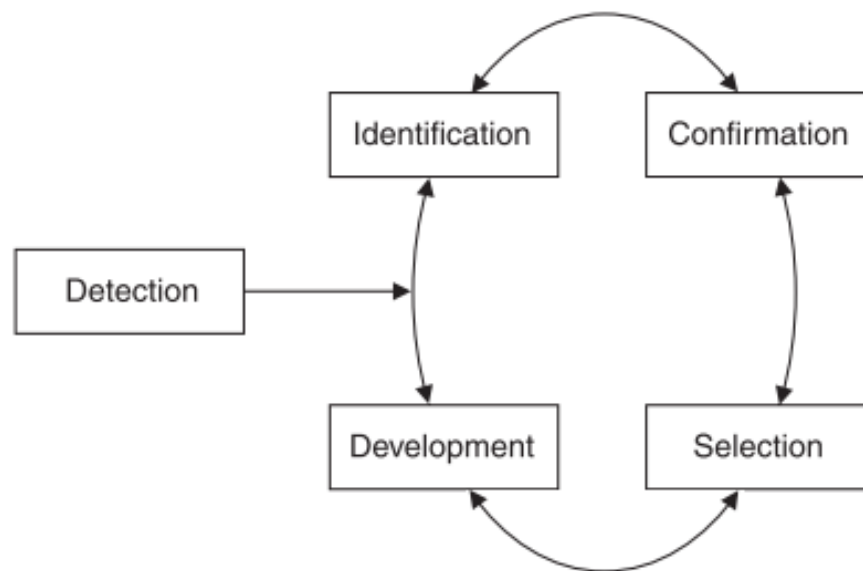
Reproduced with permission from Springer Nature.

The talent lexicon, particularly within sport, has many different terms. The usage of these terms can be incredibly nuanced in some cases and used interchangeably in others. For example, there are many different definitions and conceptualisations of the word 'talent', even within sport. Gray and Plucker (2010) argue that athletic talent ought to be defined as the "exceptional natural ability of an individual to perform a sports-related task or activity" (p. 364); while Cobley, Schorer and Baker (2012) define talent as "the quality (or qualities) identified at an earlier time that promotes (or predicts) exceptionality at a future

time" (p. 3). One significant difference between these two definitions is the distinction between *current* and *future* ability or skill levels.

For this thesis, the operational definition of the term 'talent' has been developed by incorporating definitions from previous research in this field, specifically the works of Cobley and colleagues (2012), Issurin (2017) and Till and Baker (2020). Thus, talent will be defined as the capacity for future high-level performance, specifically the presence (or absence) or particular skills, traits or qualities (and combinations thereof) that may predict future elite-level performance. Differentiation in the nuances of terms and their usage both in research and practice has led to debates and disagreements among scholars about semantics in word choices (Coutinho, Mesquita, Fonesca, & Fonseca, 2016; Till & Baker, 2020) which can arguably delay the progression of research on the topic as a whole. Additionally, our current understanding of in situ language use in this field may be insufficient to tease apart many of the subtleties of the talent identification process. To avoid confusion, relevant terms have been operationally defined in Table 1.

Two broad theoretical approaches have been used to describe talent identification: natural and scientific. 'Natural' talent identification occurs when an athlete chooses to participate in a sport (typically due to social factors such as parents, peers or school programs), and coincidentally demonstrates talent in said sport, subsequently achieving high-performance outcomes (Bompa, 1985; Malina, 2003). The success of this approach relies on large numbers of participants at a junior level, the most successful of whom rise to the top through natural selection processes. Conversely, 'scientific' identification (sometimes referred to as detection) is a more structured process through which individuals are funnelled into a given sport based on discrete physiological, anthropometric, and/or psychological traits (Bompa, 1985; Crespo & McInery, 2006; Tranckle & Cushion, 2006). These methods can succeed with a smaller participation base but rely heavily on the predictive validity of the characteristics measured. Historically, the two systems have been

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viewed as orthogonal, or not aligned, however more recent work is beginning to appreciate the potential value of combining the two models into a more modern and holistic understanding of the talent identification process. In practice, talent identification in sport has had varied success rates using either the natural or scientific methods of selection, across a variety of sports (for examples see Barreiros & Fonseca, 2012; Brouwers, De Bosscher, & Sotiriadou, 2012; Kovalchik, Bane, & Reid, 2017; Koz, Fraser-Thomas, & Baker, 2012; Reid, Crespo, Santilli, Miley, & Dimmock, 2007).

In one of the few studies examining the long-term predictive validity of applied talent identification, Schorer and colleagues (2017) investigated the ten-year predictive ability of national-level coaches. The European Handball coaches in the study were able to predict athletes' future performance level in 79.3% of cases compared to the 85.2% accuracy of the post-hoc testing of motor test data. These findings indicate that coaches are similar in accuracy to empirical testing when predicting talent; however, it is essential to emphasise that this is a single study, and the only one of its kind, therefore the results cannot be considered conclusive. Similarly, Cripps, Hopper and Joyce (2019) demonstrated that coaches could correctly predict career outcomes of Australian Football players over four years in 63% of cases. These studies have begun to capture the efficacy of the *coaches' eye* during talent identification; however, neither have investigated the underpinning mechanisms enabling coaches to make these predictions.

Much of the existing research focuses on objective measurement of many athlete qualities, despite in situ talent identification being primarily subjective and performed on a day-to-day basis by coaches (Lyle & Cushion, 2017). In reality, although many organisations use scientific selection methods to direct potential athletes to their sport of 'best fit' (Güllich & Emrich, 2014; Western Australian Institute of Sport, 2019), coaches are responsible for the majority of talent identification decisions.

Table 1

Operational Definitions of Thesis Terminology

Term	Definition
Confirmation	The extended period of training and assessment in which coaches evaluate an athlete's adaptation to talent development environments before making selection decisions (Rynne, Crudgington, Dickinson, & Mallett, 2017).
Detection	The (usually scientific) process of determining an athlete's suitability for a given sport. Typically refers to athletes from outside the target sport; also referred to as 'promotion' (Vaeyens et al., 2008).
Development	The recognised, structured environment that is most appropriate for athletes to accelerate their learning and performance potential (Abbott & Collins, 2004; Unnithan et al., 2012). Typically incorporates performance support services outside of coaching (e.g. strength and conditioning, nutrition, psychology, etc.).
Identification	Recognising participants within an activity (using natural and/or scientific methods) who have the *potential* to become elite performers (Cobley et al., 2012).
Natural identification/ selection	When an athlete participates in a sport in which they coincidentally demonstrate talent and are subsequently identified as a future champion based on competition results at a young age (Bompa, 1985).
Potential	Latent qualities or abilities that, if developed appropriately, may lead to future success; having or showing the capacity to develop into something in the future.
Scientific identification/ selection	When an athlete is identified/selected based on the results of scientific testing (Bompa, 1985).

Selection	The active decision of choosing athlete/s for a team/squad/event, typically based on prerequisite levels of performance factors (Till & Baker, 2020).
Talent	The capacity for future high-level performance; or more specifically, the presence (or absence) of particular skills, traits or qualities (or a combination) that may predict future elite-level performance (Cobley et al., 2012; Issurin, 2017; Till & Baker, 2020).

Statement of the Problem: The Coach as a Critical Decision-Maker

The multifaceted nature of sport and coaching means that the coach's primary role is arguably that of a decision-maker (Abraham & Collins, 2011; Lyle & Cushion, 2017). Talent identification is one such scenario in which the coach must make decisions, determining which athletes will be (de)selected for training squads, teams and competitions. Recent work has highlighted the need to consider the complexities of talent in conjunction with non-linear long-term athletic development when forecasting future elite athletes (Baker, Wattie, & Schorer, 2019). Coaches appear to have an inherent understanding of the interactions between different components of athletic performance and how they can change over time and under different circumstances. They appear to identify talent using many information sources, drawing from both tangible (testing scores, competition results, times) and intangible ('gut', 'coachability', resilience) components (Johnston & Baker, 2020; Williams, Ford, & Drust, 2020). However, little is known about *how* coaches identify athletes and *why* they choose the athletes they do – that is, how coaches' use their *eye* to predict talent.

This thesis aims to address the current gap in knowledge related to the *coaches' eye* by exploring experiential coach knowledge of talent identification using the Olympic combat sports as a task vehicle. Specifically, this thesis addresses the following questions:

1) What is currently known about how coaches identify talent?

2) How do elite combat sport coaches identify talented athletes?

3) How does an elite combat sport coach make identification and selection decisions in situ?

4) How reliable are coach perceptions of talent?

To date, methodology in the area of coach knowledge and decision-making (particularly in talent identification) is limited. There are many difficulties in collecting data about decision-making and the underpinning (often tacit) knowledge used to make the decision. However, Lyle and Vergeer note that despite difficulties in capturing this information, even flawed methodologies are "an important stage in understanding the decision-making process" (2013, p. 127). They also note that researchers typically assume that coaches use existing knowledge structures, pattern recognition and mental models to make in situ decisions. However, research has yet to confirm or refute this theory.

Context of this Thesis

This thesis was completed in conjunction with the Australian Institute of Sport's (AIS) Combat Centre with the support of Boxing Australia, Judo Australia, and Australian Taekwondo. Combat sports represent an ideal task vehicle for exploring talent identification due to the technical and physical qualities required for success. Combat sports are those activities in which the competitive essence of the sport consists of direct physical combat between two athletes (Noh et al., 2015). They are categorised based on the technical demands of the sport into striking (boxing, taekwondo, karate, fencing), grappling (judo, wrestling, Brazilian jiu-jitsu) or combined (mixed-martial arts) (James, Haff, Kelly, & Beckman, 2016). The open skill, individual and opponent-based nature of these sports makes them distinct from many other types of sport (Lidor, Melnik, Bilkevitz, Arnon, & Falk, 2005) and increases the complexity of identifying talented athletes.

Accurate talent identification is vital in these sports, as the different combat disciplines (boxing, fencing, judo, taekwondo and wrestling) represent a significant portion of the medal opportunities at the Olympic, Paralympic, and Commonwealth Games. At the 2016 Olympics, there were 65 medal sets (248 medals) to be won, representing over one-fifth of the medals available (International Olympic Committee, 2019). This number will increase at the next Olympic Games, with the inclusion of a mixed team judo event and the sport of karate for the Tokyo Games (74 medal sets from an available 339 sets) (The Tokyo Organising Committee of the Olympic and Paralympic Games, 2019). From an Australian perspective, the importance of this research becomes more apparent when one considers that in Australia's 123-year history of Olympic competition there have only been 12 combat sport medals won, representing approximately two per cent of Australia's all-time medal tally (Australian Olympic Committee, 2019).

According to the latest data from Sport Australia's AusPlay survey, 1.4% of Australian adults (age 15 or older) participate in boxing, and 0.2% participate in taekwondo, with 1.3% of Australian children participating in taekwondo. Data for adult participation in judo and children's participation across all three combat sports were unavailable as the participating population was too small to be accurately captured by the survey (Sport Australia, 2020a, 2020b). With a limited talent pool from which to draw the next generation of champions, it is essential to establish a thorough, evidence-based method to identify potential elite athletes in these sports. The national sporting organisations (NSOs) for these sports have recognised the need for improved talent identification procedures as the integral first step in improving these sports' talent development pathways (Australian Taekwondo, 2018; Boxing Australia Limited & Australian Institute of Sport, 2014; Judo Australia, 2019). Given Australia's limited international success in these sports, international coaches must be included in the investigation. Sport scientists need to support and educate combat sport coaches and their NSOs in best-practice for talent identification and provide information

about the current strengths and weaknesses of the process globally. The findings will assist coaches at all levels to better identify youth athletes with the potential for future success, and assist NSOs in creating equitable, evidence-based talent identification policies.

Myself as the Researcher

Having been 'identified' myself by the AIS at age 13, I came to this research as a coach and exercise physiologist with a long-standing interest in talent identification. I participated in a Talent Search program conducted by the AIS and, based on my results, I was directed into rowing. Within two years, I was winning state championships above my age group and selected for representative squads. This piqued my interest in the field – how could measuring a 13-year-old be so accurate as to know what I would be good at – and continue to excel at for the next ten years? This interest grew as I continued to be successful at rowing, more so than in other sports that I tried my hand at.

As I transitioned into a coaching role, I became more interested in the concept of identifying talent, particularly as I worked with high- athletes in the United States and Australia, aiming to get them university scholarships. How did college coaches identify talented athletes, especially those they were only able to see on video? What factors were they looking for, and why was it necessary for my 16-year-old field hockey goal-keeper to record her 100m sprint time? Having been identified myself, and now the one to identify and to help these athletes develop and demonstrate their talent, I began to reflect on my own practices as both a coach and sport scientist.

I drew on my coaching experience to drive my quantitative master's thesis research (Roberts, 2016; later published as Roberts, Walden, Carter, & Symons, 2019c), in which I answered an applied question raised by myself, other coaches, and athletes. In doing so, I realised the value of coach questions and insights, which I brought with me into the current project. During my early stages of exploring the methodological options to approach this research, it quickly became apparent that a qualitative approach would be most appropriate

to answer the questions that I had. Although my background was limited to quantitative methods, I value the knowledge and experiences of the coaches at the coalface. Therefore, the majority of this thesis is based on qualitative methods.

Before I began this research, I had little to no interest in or knowledge of combat sports. While varying across many sports, my own playing and coaching experience was limited to team ball sports and closed-skill, individual sports. I entered this study as an 'insider' to high-performance sport (as a coach, athlete and physiologist), but as a cultural 'outsider' to combat sports (Thorpe & Olive, 2019; Tinker & Armstrong, 2008). I differed from the coaches who participated in this research in a variety of ways, not the least being our age, cultural backgrounds, primary language spoken, sporting backgrounds and education levels. I viewed these differences as an advantage when completing this research. My 'insider knowledge' of coaching helped to establish rapport with the coaches (Thorpe & Olive, 2019) while my naivety of the sports in question went some way towards restoring any perceived power imbalances.

I used this naivety to establish a rapport with the coaches, allowing for the co-creation of new knowledge. This enabled me to understand the participants on their terms, encouraging them to explain their experiences to me in detail rather than assuming that I had understood 'what they meant' (Tinker & Armstrong, 2008). My position as an outsider in combat sports gave me critical distance from the topics, allowing me to appropriately analyse the respondents' views while still understanding the greater context of their perspectives (Thorpe & Olive, 2019; Wheaton, 2002). Having positioned myself in relation to the research topic and approach, I will now provide an overview of what the reader will find in the coming chapters.

Thesis Overview

This research uses the theoretical framework of ecological dynamics to examine coach decision-making during talent identification, using combat sports as a task vehicle. The series of studies in this thesis employ a range of methods to explore facets of the phenomenon commonly referred to as the *coaches' eye.* Colloquially, the *coaches' eye* refers to sport coaches' apparent ability to 'see' talent in athletes before they have begun to perform at a high level. This thesis explores extant research and experiential coach knowledge to understand how coaches identify talented athletes within their sporting contexts; investigating how the constraints of a coach affect their perception of talent and subsequent forecasts and selection decisions. This thesis is presented in eight chapters, briefly outlined below (Figure 1-2).

Figure 2

Flow Diagram of Research Stages with Chapters and Brief Methods

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┌─────────────────────────────────┐
│   Development of the Research    │
│            Problem:              │
│      Chapters One and Two        │
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│   Establish Existing Knowledge:  │
│          Chapter Three           │
│   (Systematic Review and Meta-   │
│            Synthesis)            │
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│     Elicit Expert Knowledge:     │
│           Chapter Four           │
│    (Semi-Structured Interviews)  │
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│ Exploring Experience,│  │ Exploring Experience,│
│ Time, Context        │  │ Time, Context        │
│ and Ability:         │  │ and Ability:         │
│ Chapter Five         │  │ Chapter Six          │
│ (Case Study)         │  │ (Coach Reliability)  │
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│  Synthesis of Results and Model  │
│            Creation:             │
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│   Summary and Future Directions  │
│          Chapter Eight           │
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Chapter One provides an introduction to and contextualisation of this thesis, detailing the aims and significance of this research. Chapter Two synthesises and critiques extant background literature to frame this work program, providing the background knowledge necessary to examine the concepts of ecological dynamics, decision-making and talent identification. This chapter highlights some of the limitations in current talent identification research and indicates the need for a greater understanding of how

experiential coach knowledge can enhance the field. Chapter Three presents the results of a systematic literature review and meta-synthesis on the use of coach knowledge in talent identification research to date. The findings from this meta-synthesis provided the direction for the subsequent investigation. Chapter Four uses semi-structured interviews with twenty-four expert coaches to examine the thought processes underpinning their decision-making during talent identification. Findings showed that the key influences on coaches' decision-making are their experience, abilities, time available, and decision context.

Chapters Five and Six examine coaches during the talent identification process, with a single coach over 18 months and a group of nine coaches over a four-day camp. The expert coach who participated in the case study detailed in Chapter Five demonstrated that coach forecasts of athlete potential change over time and supported the findings of Chapter Four. Chapter Six tracked the changes in coach perceptions of athlete talent over a four-day youth camp. This quantitative study indicated that coaches require time to attune to a group of athletes; in four days, a group of nine junior national judo coaches could not agree on individual athletes' potential. Chapters Three and Four have been published in peer-reviewed journals, and Chapters Five and Six are currently under review. They have been reformatted in APA (7th) style in order to maintain a consistent thesis style.

Chapter Seven presents a synthesis of the results of this thesis through the creation of two new models: the *Coach-Informed Talent Identification Process* and the novel mode of the *Coaches' Eye in Talent Identification*. These models and their practical and theoretical outcomes are discussed in detail. Finally, Chapter Eight provides a summary of each chapter and contains recommendations for future research.

Significance of the Research

Through modelling the coach as the performer, this thesis investigates how the individual experiences, knowledge and abilities of a coach interact with the specific task and environmental constraints to shape coach decisions during talent identification. This thesis is novel in its use of ecological dynamics to explore coach decision-making during the talent identification process.

The results of this thesis provide evidence that the use of subjective coach judgments is an integral part in successful talent identification, allowing Australian coaches, practitioners and NSOs to make informed decisions regarding the use, inclusion and weighting of coach judgments during the talent identification process. In addition to contributing to the long-term development and sustainability of Australian combat sports, the inclusion of international-calibre coach participants in this research ensures that the findings may be applicable globally. Combat sports are among the most popular sports in the world (Kordi, Maffulli, Wroble, & Wallance, 2009), and the international reach of the data collected for this thesis ensures that the results apply to a wide range of contexts and countries.

This research also has implications for talent identification programs, many high-performance sporting pathways, as the use of the coach to identify future talent is widespread. As coaches are present in all levels of all sports, the findings of this investigation may apply to many open-skill sports in which the coach is an integral part of talent identification procedures. The knowledge gained from this research may also be used in coach education and development, allowing younger or less experienced coaches to better understand *how* to identify talent effectively.

By better understanding the value and best-practice applications of coaches in the talent identification process, NSOs can utilise the coaches they already employ to greater effect. By increasing coach knowledge about talent identification, athletes may be able to be brought into the sport earlier or through new channels, and coaches may encourage more athletes to stay involved in the sports for longer. This thesis shows that while the *coaches' eye* may not be 'reliable' in the word's statistical sense, the processes that coaches follow and influences on their decision-making are consistent across coaches.

CHAPTER TWO

Literature Review

Foreword

This five-section literature review addresses content relevant to the coach's role during talent identification with a specific focus on combat sports. The first section reviews the theoretical framework of ecological dynamics, which underpins this thesis. This framework links ecological concepts to behaviours demonstrated in dynamic sporting environments, such as identification decisions. The second section will review the latest work on decision-making, highlighting the current gaps in this research related to coaching. The third section will discuss an ecological approach to decision-making, tying the underpinning theoretical framework with coaches' decision-making process. The fourth section provides an overview of talent identification as it currently stands, highlighting some of the current limitations in this space and how the knowledge of expert coaches can fill some of these gaps. This section will also cover the current methods of talent identification used in combat sports. Finally, the fifth section will examine expertise and experiential knowledge in sport coaches, discussing the role of experiential knowledge in empirical research.

Theoretical Framework: Ecological Dynamics

An ecological approach is particularly relevant to scaffold this discussion of talent identification, as an understanding of the nonlinear nature of athlete development and adaptive patterns of human behaviour is imperative when exploring talent identification. Incorporating the concepts of ecological psychology and dynamical systems theory, ecological dynamics presents human movement as a series of complex, interrelated systems (Davids, Button, & Bennett, 2008). Specifically, ecological dynamics emphasises the performer-environment relationship, highlighting that a performer's actions are highly

contextual, and influenced by information from the environment (Araújo, Davids, & Hristovski, 2006). A key tenet of ecological dynamics is the "complementarity" (Gibson, 1979, p. 127) of the performer and their environment. Actions are interrelated with perceptual information from the environment, so neither the performer nor the performance environment should be examined in isolation.

Complex and dynamic systems are synonymous with the sport environment and problem-solving behaviour in this context. Both the athlete and the sport itself are dynamic and continually changing, with changes in one affecting the stability of the other. A key feature of dynamic systems with multiple interacting constraints is that the rate of change is highly dependent on the changes in other areas of the systems (Kauffman, 1993). In the search for stability within multiple, interacting constraints, the relationship between an individual and their environment is (relatively) stable. Therefore, this is an appropriate level at which to analyse how constantly changing and adapting systems can stabilise to afford elite performance.

If the coach is the performer during talent identification (i.e. the performance is the act of identifying talent), then the application of ecological dynamics becomes even more relevant. In this context, the athlete forms part of the environment in which the coach is performing. During talent identification, a coach perceives information about the athletes within their environment whilst moving within and interacting with the environment to facilitate information gathering, which in turn shapes further behaviours and decisions.

Ecological Psychology

When sporting talent is expressed, an individual must possess a complementary combination of innate physical and mental traits, as well as an appropriate environment to stimulate and nurture this potential. The ecological dynamics framework appreciates that these aspects shift dynamically throughout an athlete's life (Ackerman, 2014; Davids & Araújo, 2010; Davids et al., 2008), and is, therefore, a useful method for examining this phenomenon. A component of ecological dynamics, ecological psychology emphasises the importance of a performer's interaction with their environment when attempting to understand behaviour (Barker, 1968; Brunswik, 1956; Gibson, 1979). An individual performer processes information from their environment, shaping their behaviour, which shapes their future perception of the environment. This relationship creates a symbiotic and continuous relationship between perception of the environment and behaviours within it – referred to in the literature as a perception-action coupling (See Figure 3) (Bruineberg & Rietveld, 2014; Davids et al., 2008).

Despite growing evidence that sporting performance is highly contextual, sport science and talent identification research tend to disproportionately focus of the 'individual' side of the equation (Davids & Araújo, 2010). This limitation is particularly relevant in opponent-based, dynamic sports, such as combat sports, in which the environment and context of performance can change dramatically between or even within matches. In combat sports, athletes continuously adapt their actions based on the most recent information available to them about their opponent, who in turn is adapting their own behaviours, creating continual variability and a unique scenario in each match (Inui, 2018; Maloney, 2018).

Figure 3

Relationship Between the Individual and their Environment (Based on Gibson 1979)
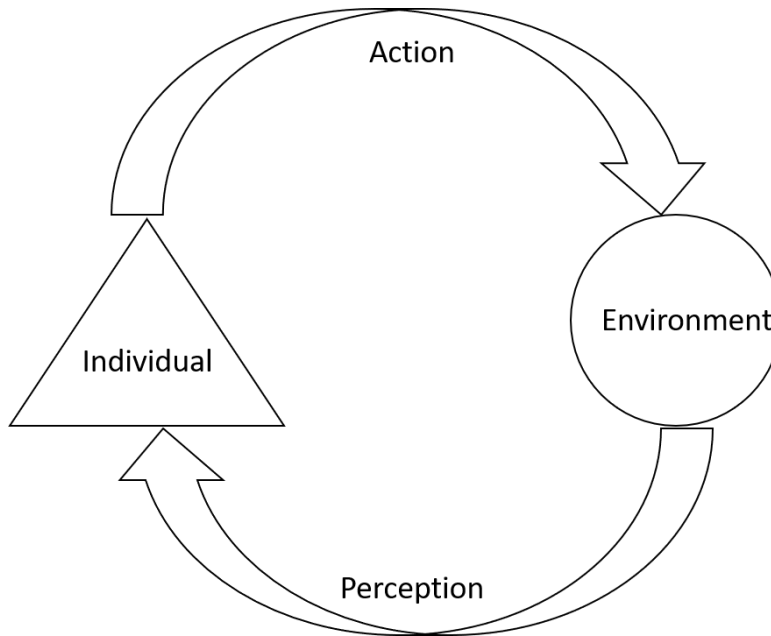
Dynamical Systems Theory

Dynamical systems theory positions individuals as complex, nonlinear systems consisting of several interrelated but independent parts and systems (Araújo et al., 2006; Clarke & Crossland, 1985; Kelso, 1995; Newell, 1985). These independent systems, or constraints, shape behaviours and performances. Coaches work "collectively in *dynamic* and often *non-linear* ways within a *complex* adaptive system" (Bowes & Jones, 2006, p. 236) [emphasis added]. Complexity and non-linearity are key features that define a dynamic system (Davids et al., 2008; Rein, Davids, & Button, 2010; Seifert, Komar, Araújo, & Davids, 2016). Sport is a dynamic environment, and it is well established that both human behaviour and human sporting development are nonlinear (Abbott et al., 2005; Button, Seifert, Chow, Araújo, & Davids, 2020). In practice, non-linear behaviour allows a system (i.e. performer) to demonstrate both stable and unstable behaviours and explains how the sub-parts of a system (i.e. constraints) interact to influence or compensate for the other components in the

system (Chow, Davids, Hristovski, Araújo, & Passos, 2011; Davids et al., 2008; Rein et al., 2010). The lack of consistency in talent identification research is evidence of its complexity. This complexity is due primarily to the interacting constraints on both athlete and coach behaviour. These complex interactions, present on many levels, indicate that dynamical systems theory is an empirically valid method to explore both sport as a whole and the coach's role within it.

Summary. Ecological dynamics emphasises that an individual's behaviour is emergent, co-created by the interaction of the individual and their dynamic environment. Ecological dynamics has been used to analyse the interplay between perception and action in athletes (Pinder, 2012); however, the link between a coach's perceptions and their actions (i.e. behaviours or decisions) has not yet been investigated. By applying the framework of ecological dynamics to talent identification, we can structure and improve understanding of the strengths and limitations of existing methods of talent identification. Within the context of combat sports, this framework can provide a lens through which to explore the identification of talent in open-skill sports. As athletes are required to adapt and change according to the dynamic environments within which they train and compete, it is necessary to forecast these changes and their interactions if we wish to predict the long-term potential of athletes. Ecological dynamics also provides a robust framework through which we can begin to explore and explain coach behaviours (i.e. decisions) during the process of talent identification. Specifically, an ecological dynamics approach to decision-making can help develop the body of knowledge relating to coach-environment (athlete) relationships that are essential for talent identification.

Decision-Making

Making decisions is an inherent and integral part of a coach's role and is identified as one of a coach's critical function (Abraham & Collins, 2011; Lyle & Cushion, 2017; Nash & Collins, 2006). From deciding which training exercises are appropriate, to deciding whether an injured athlete play; coaches spend most of their time making decisions that range from automatic to routine and repetitive to decisions in which there is no clarity about the outcomes (Lyle, 2010). Despite the expectation that coaches will make the right decisions, and at the right time, it is still unknown how and why coaches make the decisions they do. By understanding the processes underlying decision-making, we can begin to "explain why people choose one option instead of another from a set of alternatives when they do not know the outcome" (Marasso, Laborde, Bardaglio, & Raab, 2014).

The Decision-Making Continuum

Decision-making is conceptualised in several ways, one of the most common being that of two cognitive processes: System 1, or intuitive; and System 2, or analytical (Dhami & Thomson, 2012; Kahneman, 1991, 2011). Intuition, a hallmark of expertise, is a term used to describe decisions made by experts when they cannot articulate how they arrived at a decision. It is the primary differentiation between expert and novice decision-makers – both the number of 'gut decisions' and the confidence to trust those instincts increase with expertise (Schempp & McCullick, 2010). Intuitive decisions are made quickly and are can often be described as 'naturalistic', occurring in dynamic, uncertain, real-world environments (Hoffman & Yates, 2005). It has been shown that deliberation can lead to a decrease in the accuracy of decisions that were otherwise made intuitively (Plessner & Haar, 2006).

Comparatively, in System 2, or analytical decisions, the decision is broken down into smaller units (possible consequences; the probability of events; pros and cons; etc.). In a purely analytical approach, these smaller units are analysed in turn, attempting to objectively measure or calculate each aspect to reach a point at which the decision can be made based on the balance of the calculations (Hoffrage & Marewski, 2015).

Another interpretation of cognition views decision-making on a continuum, with decision modes dependent on the specific context in which the decision is made. The cognitive continuum theory (Figure 4) positions naturalistic, or more intuitive decisions at one end and analytic cognitions at the other, with what Hammond has termed 'quasirationality' found between the two (Dhami & Thomson, 2012; Hammond, 2000). According to the cognitive continuum theory, decisions are made by combining intuition and analysis; depending on the nature of the decision, the time available to make it, and the information available to the decision-maker.

As coaches must make decisions in many different contexts requiring different timescales, coaches must operate on all levels of this continuum. Some decisions must be made in seconds, as during a game, others have more extended timelines that take place over months (e.g. annual planning). Coaches make decisions affecting athletes' performance/development at multiple time points, and the differing timescales, environments and consequences of the decisions will affect where on the cognitive continuum they fall. Interestingly, talent identification could arguably fall anywhere on this continuum, depending, as previously stated, on the context in which identification occurs and the time available to the coach.

Figure 4

The Cognitive Continuum (from Dhami and Thomson, 2012)
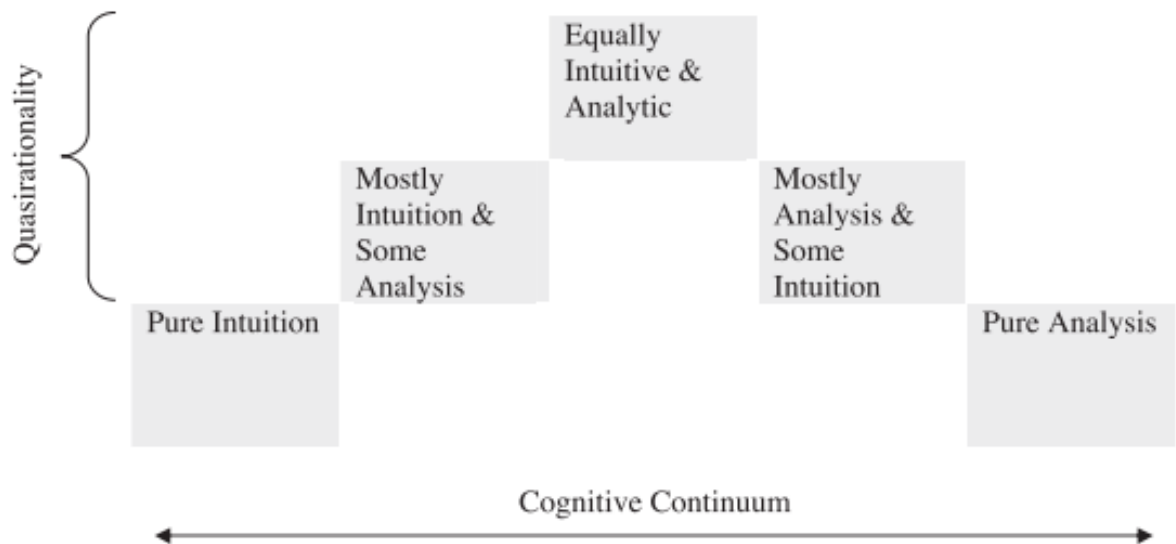
Coach Decision-Making

Decision-making in sport has been a topic of research for decades in pursuit of a better understanding of athletic excellence and, by extension, how to train future athletes to make decisions in the same way as current elite competitors. Within sport, decisions are naturalistic; that is, the decision-maker encounters the decision in context and with a degree of familiarity with the task (Johnson, 2006; Kaya, 2014). Likewise, it has been established that their knowledge and experiences shape their judgments and decisions as they recognise and interpret situations (Hoffman & Yates, 2005; Lyle & Cushion, 2017). However, there is a dearth of research into coach decision-making, with the majority of existing work in sporting contexts focused on athlete decision-making (Cropley, Thelwell, Mallett, & Dieffenbach, 2019; Lyle & Vergeer, 2013).

Investigations into coach decision-making are typically divorced from real-world situations. Using questionnaires and surveys or simulations of fictional scenarios for data collection simplicity and methodological comparison, which while increasing the comparative nature of collected data, decreased the context within which the decision is made, changing the relevance and implications for the involved coaches (Dennis & Carron, 1999; Giske, Benestad, Haraldstad, & Hoigaard, 2013; Lyle & Vergeer, 2013). More recently, in-depth interviewing methodologies have been used to better capture the information which underpins coach decision-making. These techniques have explored how experiences and values impact coaching decisions (Callary, Werthner, & Trudel, 2013; Collins, Collins, & Carson, 2016; Morris et al., 2019; Potrac, Jones, & Armour, 2002) and factors that impact selection decisions (Bradbury & Forsyth, 2012; Hill & Sotiriadou, 2016). Interview methods are coming closer to capturing the contextual factors that are inherently important in decision-making in sport.

It is apparent that coaching decisions are dynamic, involving serial decision points rather than a single decision; using information gathered and processed over time. However, the reflective nature of interviews influences coach perceptions of their processes, including their justification for prior decisions, presenting a limitation in these methods. Moving away from a reliance on recall or 'what would you do' hypothetical questioning, to capturing the decision-making in real-time is an important step forward. Capturing the intuition and analysis involved in both small and large decisions within dynamic sports contexts remains a challenge.

An Ecological Approach to Decision-Making

The ecological approach conceptualises decision-making as an ongoing process through which the behaviours of the performer are emergent based on the coordination of environmental perceptions and related actions (Raab, Bar-Eli, Plessner, & Araújo, 2019). Ecological approaches have been used to study decision-making in athletes (Araújo et al.,

2015; Hristovski, Davids, & Araújo, 2006; Maloney, Renshaw, Headrick, Martin, & Farrow, 2018) and how this process occurs (Marasso et al., 2014). The ecological approach is an appropriate lens through which to approach coach decision-making, as decision-making in sport is "a complex, temporally extended process expressed by actions at the ecological scale" (Araújo, Davids, Chow, & Passos, 2009, p. 160).

From an ecological perspective, decision-making is grounded in the interaction between the performer and their environment. If decisions are emergent in this fashion, it follows that they are probabilistic and subject to noise or interference within the performer-environment dyad (Balagué, Hristovski, & Vazquez, 2008). Decisions (or goal-directed actions/behaviours) are made to progress towards a goal, with each choice narrowing the possible future decisions along the path to a goal (Araújo et al., 2009). As such, decisions are emergent – appearing based on the current context and available information, rather than being pre-determined. If decisions are emergent, this implies that there is no such thing as a 'correct' decision (Balagué et al., 2008). Instead, there is only the most appropriate decision based on the available task, environmental and individual constraints at the time, and the performer's perception of these constraints. It has been proposed that individuals perceive environmental information differently based on their goals, and their ability to act on these goals (Cañal-Bruland & van der Kamp, 2009; Dicks, Araújo, & van der Kamp, 2019; Hristovski, Davids, Araújo, & Button, 2006). Dynamical systems theory uses the concept of constraints to conceptualise behaviour as the outcome of interactions between bounded system components (Davids et al., 2008; Newell, 1986). Within dynamical systems theory, the term 'constraint' is not used as in traditional English terminology, as a limitation or restriction; rather, it is scientific terminology that describes unique environmental properties (i.e. constraints) that guide participants' behaviours during the performance of a task. By understanding constraints as they exist for an individual in a given context and how they interact with one another, we can better understand and explain an individual's behaviour,

especially in dynamic sporting contexts. There are three categories of constraints that guide movement through invitation, discouragement, and movements or behaviours (Kelso, 1995; Newell, 1986; Newell & Valvano, 1998; Newell & Jordan, 2007). The behaviour, decisions and/or movements of a performer are directly influenced by the interactions of the individual, task and environmental constraints.

Individual constraints are characteristic of the person (Davids et al., 2008; Newell, 1986). These include physical factors, psychological traits and cognitive features which are unique to each person. Some individual constraints are inherent and cannot be changed, such as height, whereas others can be improved through training or experience, such as strength or the ability to read a play (Davids & Baker, 2007; Davids et al., 2008). Individual constraints are also flexible and as a result, can be temporary, such as fatigue or stress. Individual constraints shape how a performer will find solutions to complete a given task, as when individual constraints change, so too do the movement solutions to solve practical challenges. Within the talent identification literature, a relevant individual constraint is that of experience. As each person's knowledge and experiences are unique, their response to a given situation will be similarly unique. For coaches, their playing and coaching experiences combine with their education and knowledge to create individual constraints to their coaching abilities.

Environmental constraints are those that are external to the performer and time-dependent (Glazier, 2015). These include global influences (temperature, altitude, ambient light, playing surface); local factors (sociocultural factors, access to coaching) and, more recently, any physical constraint external to the individual (implements or tools used) (Davids et al., 2008; Glazier, 2015; Newell, 1986; Renshaw & Chappel, 2010; Renshaw & Davids, 2014). Coaches must work with the environmental constraints present in a given training or competition environment, such as the weather. However, rather than adapting their *actions*, as an athlete must, a coach must adapt their decision-making process and strategies to

enable athletes to achieve the same goal for the session. For example, on a day with high temperatures, coaches may adjust training task durations to account for adjusting physical demands imposed on the group by the environmental constraints.

Task constraints are specific to the immediate performance context, particularly the goal of the activity context (Davids et al., 2008). They are influenced by the rules or conditions of a given activity, including changes in field size, game-specific conditions such as referee decisions, or instructions issued by a coach (Al-Abood, Bennett, Hernandez, Ashford, & Davids, 2002; Mellalieu, Neil, Hanton, & Fletcher, 2009; Newell & Ranganathan, 2010). Within individual, opponent-based sports such as combat sports, the opponent themselves are considered a task constraint as they differ in fighting styles and change between rounds of competition. Thus, the performer has to adapt to new task demands with each bout. In the context of coach-based decision-making, a task constraint may be the importance of performance at a major championship event. In selecting the athletes on the team, increased pressure to perform in the short term, or a focus on the long-term development of athletes may change the coach's decisions of which athletes are selected for a given team.

Constraints interact and change over time as a result of experience, maturation and shifting goals, acting in concert to create self-organised, emergent behaviours (Brymer & Davids, 2013; Davids, Araujo, & Shuttleworth, 2005; Davids et al., 2008). Each factor's relative contribution is highly contextual, based on the interaction between the individual and the specific performance (Oppici, Panchuk, Serpiello, & Farrow, 2017). Long-term success in sport is characterised by consistent adaptation to the dynamic constraints presented by athlete maturation and changes within the sport. Successful elite level performers can consistently solve the performance challenges that arise from the interactions of the dynamic constraints. According to Newell and Jordan (2007), constraints are present at multiple levels of the dynamic system, with many different "time scales of influence" (p14).

This is particularly relevant for discussions of decision-making in sport coaching, as coaches make short-, medium and long-term decisions as part of their daily responsibilities. An understanding of constraints, their interactions and their dynamic nature highlights the importance of adaptability in sport performance and, by extension, sport coaching.

Affordances

Information about the environment perceived by the performer creates an opportunity for action, known as an affordance (Fajen, 2005; Gibson, 1979). The term 'affordance' describes the relationship between a performer and their environment, in terms of the actions or behaviours available in a given context. These opportunities for action are closely linked to constraints and perception-action coupling, as a performer's actions are driven by their perception of the constraints present in their immediate environment. Skilled performances result from a perceived affordance and the selection of an action or behaviour available to the performer to achieve their task goal (Craig & Watson, 2011; Dicks et al., 2019; Fajen, 2005).

Affordances are not only features of the environment, but rather the integration of the performer's capabilities, their perceptions of environmental features, and the opportunity for actions that they allow. This includes the ability to attune and calibrate perception to key informational sources from the environment that may (dis)allow their preferred course of action (Vilar, Araújo, Davids, & Renshaw, 2012). When calibrating perception, the intended outcome must be considered as different intentions will require different specifying variables to make the most appropriate decision. In sport, performers first intend to act, and then determine whether that action is possible (afforded) or not (Craig & Watson, 2011). Performers may detect many variables that are not relevant to their intended action, and with experience, performers learn to attend to more useful information sources of the performance environment (Araújo et al., 2009; Gibson, 1966; Gibson, 1979). This process, known as perceptual attunement, allows skilled performers to perceive

different affordances than novices due to superior technical and perceptual skills. For instance, Milazzo et al. (2016) demonstrated that experienced karate athletes exhibit faster response times to sport-specific information. That is, they reacted faster than novices to simulated attack scenarios - a consequence of superior physical abilities in conjunction with being attuned to relevant higher-order environmental information. Hristovski et al. (2006) demonstrated that boxers select different punches based on their perceived efficiency for the current interpersonal distance. This finding was also demonstrated in experienced taekwondo athletes (Maloney et al., 2018). As skill increases, so too does the number of appropriate actions (affordances) available in a given situation.

Selection of the contextually optimal affordance is a hallmark of expertise, demonstrating the 'grip' that experts have on their current environment (Bruineberg & Rietveld, 2014). An experts' grip allows them to achieve more consistent outcomes regardless of potential factors constraining the task (Davids, Glazier, Araujo, & Bartlett, 2003; Fajen & Warren, 2003). Experts develop optimal grip through repeated exposures to environments similar or identical to those present during performance, allowing for the opportunity to practice attuning to and selecting appropriate specifying affordances (Headrick, Renshaw, Davids, Pinder, & Araújo, 2015). This calibration process is a necessary aspect of attuning perception and developing grip, as calibration allows performers to perceive accurately in different circumstances, such as following a growth spurt (i.e. a change in body dimensions and therefore action capabilities) (Araújo et al., 2009). Successful calibration results in appropriate decisions within changing constraints and available affordances.

Talent Identification: A Research Summary

Each year, sporting organisations and governments worldwide spend millions of dollars on talent identification (Vaeyens et al., 2008) in attempts to predict their future world champions. It is proposed that if those with talent are recognised and integrated into programs that provide proper support and coaching, a larger number of elite performers will be produced (Abbott et al., 2002; Buekers, Borry, & Rowe, 2015). In one of the earliest English-language articles on sporting talent identification, Tudor Bompa (1985) provided a list of advantages of talent identification in sport. This list included substantial reductions in the time required to reach peak performance, increases in coach effectiveness, increases in numbers of high-performance athletes, and greater chances of international success; in addition to reducing waste of time, energy and money. While the benefits of early identification and subsequent development have not changed, our inability to accurately identify talent, or its components, limits its effectiveness.

From being viewed primarily as a 'Soviet tool' (Washburn, 1956) to becoming a standard and integral everyday part of sport, the process of identifying talent has evolved significantly throughout the past seventy years. Talent identification began with evaluating athletes' somatotypes to determine whether physique was a selective factor in athletic performance (Carter, 1970; Medved, 1966). This was a natural evolution from the knowledge that athletes in different sports had different somatotypes both from each other and significantly different from that of the normative population (Kohlrausch, 1929; Sheldon, Stevens, & Tucker, 1940; Tanner, 1964). From here, the transition to using anthropometric and physical performance characteristics to guide athletes into the sport to which they are best physically suited (Aule & Loko, 1982) was a natural next step.

Over time, it has been recognised that talent identification is multidimensional, and biophysical measurements alone are insufficient to predict talent accurately, or even measure current ability levels (Johnston, Wattie, Schorer, & Baker, 2018; Vaeyens et al.,

2008). Despite this, the focus in literature remains on evaluating current abilities and capacities to predict future performance (See Bennett et al., 2018; Chiwaridzo et al., 2018; Li, De Bosscher, Pion, Weissensteiner, & Vertonghen, 2018 for examples). This limitation is likely due to psychosocial factors being notoriously difficult to measure (Anshel & Lidor, 2012; Rynne et al., 2017), rather than a lack of understanding of their importance (e.g. Johnston & Baker, 2020; Mann, Dehghansai, & Baker, 2017; Till & Baker, 2020).

Talent Identification in Combat Sports

Combat sports are an ideal task vehicle for studying the role of the coach during talent identification. The unique task constraints of combat sports, such as their dyadic interpersonal nature, offensive and defensive requirements, small distances between competitors, and weight requirements (Chen et al., 2017; Franchini, 2014; James, Robertson, Haff, Beckman, & Kelly, 2017; Krabben, Orth, & van der Kamp, 2019) emphasise the need to understand how coaches identify talent in these sports.

There is limited empirical understanding of athlete selection and identification processes within the combat sports literature. Three major studies have attempted to describe predictors of talent development in combat sports. Lidor and colleagues (2005) attempted to create a judo-specific ability test to measure talent among young judokas. This test was found not to correlate with athlete rankings either one- or eight-years post-testing. The test was declared to lack the sensitivity necessary to measure talent, suggesting that a more open-skill environment (more like that found in competition) would be able to better indicate talent in young athletes. The second and third studies related to talent identification in combat sports explored the relationship between junior and senior competition results. In youth judo, competition results accounted for only seven and five per cent of senior results in males and females, respectively (Julio et al., 2011).

In contrast, Li and colleagues (2018) found that junior performances were better predictors of success in senior boxing, taekwondo and wrestling. Sixty-one per cent of junior medallists (those that medalled at international competitions) went on to win medals at senior-level international competitions, while 90% of early achievers (those that were successful in senior-level competition while underage) could be "predicted" to win a medal at senior-level international competition. These studies highlight the limited research and inconclusiveness in existing talent identification in combat sports. By including both striking (boxing and taekwondo) and grappling (judo) sports and investigating a new area of interest within combat sports (i.e. the coach), this research has the potential to highlight similarities and differences in talent identification within these sports.

Limitations in Talent Identification

One of the major limitations in current talent identification research is that existing testing focuses on using measurements to differentiate between a-priori selected and non-selected athletes, which in turn are extrapolated into measurable factors that can identify talented athletes. For example, Keller et al. (2016) examined the technical ability of a group of youth soccer players and found that technical performance on passing drills could discriminate between players at the national elite, state elite and sub-elite levels. In a similar vein, Bennett and colleagues (2018) investigated using small-sided games to assess soccer-specific proficiency, finding that passes, touches and other skill-related measures were greater in higher-level players. What these and other similar studies do not account for is that they have drawn these conclusions from a-priori groupings – athletes were already categorised into their levels, and these tests were able to discriminate between these levels. The a-prior grouping is a significant limitation as these athletes may have had skill differences due to their training in said groups, rather than these factors being what put them on the team.

Another inconsistency in existing talent identification literature is the definition of 'success'. There is no consistency in how many athletes an identification protocol must identify to be considered a success, nor is there consistency in what level an athlete must reach to have been 'successfully' identified. For example, "only" 60% of female players that made the Women's Tennis Association Top 200 won major tournaments during their youth (Brouwers et al., 2012); while an equation for predicting Australian Football League draft status accurately classified 64% of cases was labelled a 'moderate' success (Robertson, Woods, & Gastin, 2015). Even within the same sport (in this case, volleyball), prediction success ranges widely from 38 to 98% (Stamm, Stamm, & Thomson, 2005). Conversely, research into the American National Football League (NFL) draft system has multiple definitions of success. Success has been determined through draft pick order, salary, career length, number of games played, length of time with one team, or number of championships won (Boulier, Stekler, Coburn, & Rankins, 2010; Hartman, 2011; Koz et al., 2012; Lyons, Hoffman, Michel, & Williams, 2011; Teramoto, Cross, & Willick, 2016). Inconsistencies in outcome measures and the physical-based nature of the tests have resulted in the NFL's predictive ability to combine (among other combine testing protocols), being poor.

Latest Work in Talent Identification

In recent years, there has been a resurgence of interest in identifying talent within sport. However, there have yet to be any 'breakthroughs' or significant transfer of concepts between research and practice (Collins, Macnamara, & Cruickshank, 2019). The lack of significant advances in the field may be due to the "complex interaction between genetic endowment, environmental influences and learning, technology and the vagaries of specific performances [which] make prediction of achievement very difficult" (Lyle & Cushion, 2017, p. 137). A relatively modern approach to talent identification in sport has been to measure technical and/or perceptual-motor skills (Keller et al., 2016; Woods, Keller, McKeown, & Robertson, 2016; Norjali Wazir et al., 2017) in an attempt to integrate multidimensional

measures into the process. Investigations into the multidimensional aspects of performance have determined the importance of psychological factors and 'hidden attributes' (coachability, versatility, and flair) when determining an athlete's potential (Musculus & Lobinger, 2018; Roberts, McRobert, Lewis, & Reeves, 2019). There is also a move towards attempts to measure more multifaceted aspects of performance such as coordination, as in Faber et al. (2017) – also see O'Brien-Smith et al. (2019) for a recent review.

To address the complexity of talent identification, many sporting organisations now include 'confirmation' phases in their talent identification. The confirmation period is an extended period following an initial selection into a talent development environment, during which athletes are observed for progress within the new environment and for signs of less-tangible factors (e.g. 'coachability', work ethic, etc.) which are perceived to contribute to success within the sport. The confirmation period allows coaches to observe multidimensional and more initially imperceptible factors which affect long-term potential (Rynne et al., 2017).

The Coaches' Eye in Talent Identification

The key gap in much of the existing talent identification research is in *who* is determining 'talented' and 'non-talented' athletes. Christensen (2009) indicated that the idea of talent in sport is a matter of taste and that coaches identify talented athletes based on subjective 'feelings' rather than a specific, quantitative checklist. As a result, it is hypothesised that two different coaches will identify a different subset of athletes as talented. If this is the case, *who* is performing the identification is just as important as *what* is identified. As each person identifies talent slightly differently, it is important to explore both *who* is (and should) be identifying talented athletes (Bailey & MacMahon, 2018), and how they do it. The subjectivity of coach skill ratings has been investigated (e.g. McIntosh, Kovalchik, & Robertson, 2019; Cripps, Joyce, Woods, & Hopper, 2017), but only one study

has explored coaches' subjectivity during talent identification. In Jokuschies, Gut and Conzelmann's 2017 study, they investigated coach perceptions of talent, having coaches rate players and then comparing the coaches' subjective talent criteria to the athletes they labelled as 'talented'. They found a high correlation between the two, indicating some level of reliability between coaches stated preferences and their selection decisions. Coaches make 'choice decisions' when selecting players (Lyle & Vergeer, 2013); however, these choices and how they are made have not been examined.

Despite the depth of research into talent identification, investigations into coach decisions and their formation are limited in the literature (Christensen, 2009; Gulbin, Croser, Morley, & Weissensteiner, 2013). The traditional assumption is that the combination of the coach's 'professional eye', when combined with testing, provides the most effective talent identification (Lidor, Côté, & Hackfort, 2009). Several studies use coaches for corroboration of their results, particularly when assessing the skills of an athlete (see O'Connor, Larkin, & Mark Williams, 2016; Van Yperen, 2009) or attempting to validate testing batteries (i.e. as an external criterion for determining the predictive validity of a proposed talent forecasting method) (see Falk, Lidor, Lander, & Lang, 2004; Pienaar, Spamer, & Steyn Jr, 1998 for examples). However, none have directly investigated nor applied coaches' knowledge to inform the talent identification process and overall, there is limited research available on coaches' ability to predict talent over time.

While coaches are the 'gold standard' in many talent identification studies, there is a dearth of research into *how* and *why* coaches make the decisions they do. Previous talent identification research has examined the differences between coach predictions of talent and mathematical or computerised regression models and found that while expert coaches were better than novices at predicting success, they were only slightly better than chance (Schorer et al., 2017). This may be due to the subjectivity inherent in coach identification and selection, and differences in opinion and perception of what constitutes 'skill' in a given sport

or level (Woods, Raynor, Bruce, & McDonald, 2015). Humans can only process a limited amount of information, which means that their decisions are influenced by informational stimuli they can perceive and deem most important (Plessner & Haar, 2006). Their experiential knowledge influences the information to which coaches attune their attention. It is known that visual search strategies differ between experts and novices, as experts can anticipate which information will be most relevant, and where that information is likely to come from (Plessner & Haar, 2006). By applying a framework to understand coach decision-making, we can begin to break down some of the complexity around these processes and understand how coaches identify and select the athletes they do.

Expertise and Experiential Knowledge

Talent identification decisions are dynamic, complex and occur over time, thus can be understood from an ecological decision-making perspective. During talent identification, coaches do not have a pre-selected list of talented athletes – rather, they make decisions based on the current context and the information available. Coaches need to be able to attune to the appropriate specifying variables at the appropriate time to identify talented athletes.

A growing body of literature emphasises the valuable role that the experiential knowledge of elite coaches may play in scientific research (Greenwood, Davids, & Renshaw, 2012b; Lyle & Cushion, 2017; Waters, Phillips, Panchuk, & Dawson, 2019). Expert coaches can provide information and insights into aspects of their job which are lacking in the empirical literature (e.g. Eccles, Ward, & Woodman, 2009; Waters et al., 2019). They have also been used to underpin, guide and complement research (e.g. Collins & Collins, 2013; Willmott & Collins, 2017).

Experts are required to support research in fields in which there are many paths to the 'right' answer, such as sport. Expertise is the domain-specific skill set built from experience and knowledge, where is an expert is one who can efficiently and effectively access appropriate cognitions, thought processes and informational cues, while remaining flexible and adaptable to new situations (Lyle & Cushion, 2017; Nash & Collins, 2006; Schempp & McCullick, 2010). There are eight traditional methods of identifying experts and expertise, used individually or, more commonly, in a combination of two or more (See Table 2).

Another supportive hallmark of an expert is that they have a high degree of accuracy and precision when it comes to predicting events within their field of expertise (Mccullick et al., 2006; Schempp & McCullick, 2010). When considering the talent identification literature, coaches' domain-specific experiential knowledge and discriminative ability are particularly useful as a collaborative information source to increase understanding. Interestingly, within research exploring coaching in sport, experience and certification are typically used as the hallmark of expertise and presented in methodologies to justify the classification of the coach as 'expert'.

Table 2

Traditional Approaches to Identifying Expertise (Adapted from Shanteau et al., 2002)

Expertise Criteria	Explanation of Criteria
Experience	Experts have a large number of years of job experience
Certification	Experts are certified, through a specific rank achieved (e.g. head coach) and/or accreditation (e.g. achieved through formal study)
Social acclamation	Experts are identified by those who work in the relevant field
Consistency	Expert judgments should be consistent over time. That is, they should be internally consistent
Consensus	Expert judgments should be consistent between experts
Discriminative ability	Experts should be able to discriminate between nuanced or subtle differences that non-experts often overlook
Behavioural characteristics	Experts share common behavioural traits (e.g. self-confidence, adaptability, decisiveness, perceptiveness, communication) – See Abdolmohammadi & Shanteau (1992) for a full list
Knowledge	Experts have a high level of knowledge within their domain

Expertise in Coaching

In sport, the typical criteria for defining an expert coach include being a coach of a national team (certification), the number of years coaching (experience), the development of elite performers (consistency), or nomination or selection by others (social acclamation) as being an expert (Nash, Martindale, Collins, & Martindale, 2012; Shanteau, Weiss, Thomas, & Pounds, 2002). Previous investigations into coach knowledge have demonstrated that despite a lack of 'scientific' training and vocabulary, coaches possess practical, contextualised knowledge gained through experience (Côté, Salmela, Trudel, & Baria, 1995; Greenwood, Davids, & Renshaw, 2012a; Lyle & Cushion, 2017). Coaches' intuitive understanding of sports science concepts (Christensen, 2009; Gigerenzer, 2007; Simon, 1992) is based on years of individual experience, reflection and analysis (Baars, 2011; Christensen, 2009; Greenwood, Davids, & Renshaw, 2014) and can help explore the intangible interactions of constraints that underlie successful talent identification. We must understand how coaches form and use their experiential knowledge. It can enable our understanding of how coaches perform the necessary tasks of their role, ultimately allowing detailed and sensitive measurements of coaching skill.

Despite the benefits of utilising coach knowledge in empirical sports science research, there have been relatively few investigations which take advantage of coaches' expertise. One potential reason is the inherent subjectivity found in knowledge formed through individual experiences (Lyle & Cushion, 2017). These individual experiences tend to provide insight into the differences rather than similarities in behaviour and are often limited in their transferability across sporting contexts. This may go some way to explaining the inability of existing coaching research to capture the complexities within the field (Barnson, 2014; Bowes & Jones, 2006; Cushion, Armour, & Jones, 2006).

However, these limitations are far outweighed by the potential contributions that coach knowledge can make to the scientific literature. Coaches' first-hand, practical experiences with different athletes shape their understanding of performance within their discipline. As such, they have a unique perspective on the underlying complexities of creating a champion; practitioners and researchers may be able to harness this unique perspective to drive empirical research to areas of practical significance for practitioners.

When discussing 'the eye of the coach', the term often refers to the subjective, intangible 'art' of coaching, and how coaches can perceive aspects of performance that others cannot. Coaches are continuously presented with a myriad of choices when working with their athletes, from day-to-day decisions around training sessions, game plans and interactions with athletes to more long-term choices such as how to periodise the season and team selections. It is apparent that "coaching is just as much of an inexact science as an exact science" (Pope, Penney, & Smith, 2018, p. 146) relying on opinions in equal measure with empirical data. This is particularly true when it comes to the field of talent identification.

Summary

Using the theoretical framework ecological dynamics to examine coach decision-making during talent identification will provide a holistic lens through which to examine this complex and dynamic process. Existing research utilises subjective experiential coach knowledge without investigating the basis and validity of this knowledge. Although previous work has demonstrated the value of coach knowledge in empirical research, experiential coach knowledge has yet to be explored in talent identification. As such, this thesis will focus on the application of experiential coach knowledge to supplement our understanding of talent identification in combat sports.

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CHAPTER THREE

Expert Knowledge in Talent Identification:

A Systematic Review and Meta-Synthesis

This chapter has been published in full as the following peer-reviewed journal article:

Roberts, A., Greenwood, D., Stanley, M., Humberstone, C., Iredale, F., Raynor, A. (2019a).

Coach knowledge in talent identification: A systematic review and meta-synthesis.

Journal of Science and Medicine in Sport, 22(10):1163-1172

Foreword

The following chapter presents a systematic review and meta-synthesis, which aimed to synthesise the available literature on coach knowledge as it relates to talent identification. There is an apparent dissonance between reliance on coach judgments, opinions or decisions during talent identification in both research and practice. There also appears to be a lack of empirical understanding in this area, and what does exist is disparate across sports, athlete populations and coach demographics. For this reason, it is difficult for practitioners or researchers to access this information and apply it to their own needs.

This review provides the most recent, accurate and comprehensive summary of the literature related to coach knowledge in talent identification, while critically appraising the quality of the literature. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and was first published online in May 2019.

See the Publication Update at the end of this chapter for updated results up to April 2020.

Publication Update

An updated literature search conducted in May 2020 for articles published up to April 30th 2020 revealed 183 new articles that met the search criteria (57 duplicates removed). Title and abstract screening left 32 articles for a full-text review, after which two articles remained for inclusion in this chapter. These two articles were Rosevear and Cassidy (2019) and Winter, O'Brien and Collins (2019). Including these articles did not change the findings of this investigation, so the text of this chapter remains unchanged from the published version. The new articles are included in the tables for this chapter (Table 3, Appendix 1 and Appendix 2) and are indicated by an asterisk (*).

Table 3

Results of Critical Appraisal

CITATION	Study purpose (/1)	Literature (/1)	Study Design (/3)	Sampling (/3)	Descriptive Clarity (/4)	Procedural Rigour (/1)	Analytical Rigour (/2)	Auditability (/2)	Theoretical Connection (/1)	Trustworthiness (/4)	Conclusions /Implications (/2)	Total (/24)	Quality
Christensen	1	1	3	2	2	1	2	2	1	4	2	**21**	Good
Cupples & O'Connor	1	1	1	2	0	1	2	2	1	3	2	**16**	Good
Ellingsen & Danielsen	1	1	3	2	2	1	2	1	1	4	2	**20**	Good
Ferreira Celestino *et al*	1	1	1	1	0	0	1	1	1	3	2	**12**	Moderate
Goncalves *et al*	1	0	1	1	0	1	1	1	1	2	2	**11**	Poor
Holt & Dunn	1	1	2	1	2	1	2	2	1	4	2	**19**	Good
Johansson & Fahlén	1	1	2	1	1	1	2	1	1	2	2	**15**	Moderate
Johnson *et al*	1	1	1	3	4	1	2	2	1	4	2	**22**	Good
Jokuschies *et al*	1	1	2	2	2	1	2	2	1	4	2	**20**	Good
Lund & Söderström	1	1	2	2	0	1	2	1	1	1	2	**14**	Moderate
Milistetd *et al*	1	1	0	2	2	1	0	0	1	2	2	**12**	Moderate
Miller *et al*	1	1	2	2	3	1	1	1	1	4	2	**19**	Good
Mills *et al*	1	1	2	2	1	1	2	1	1	4	2	**18**	Good
Rosevar & Cassidy*	1	1	2	2	1	1	2	1	1	4	2	**18**	Good
Vrljic & Mallett	1	1	1	1	1	1	2	1	1	4	2	**16**	Good
Winter *et al**	1	1	3	2	2	1	2	2	1	4	2	**21**	Good

*Included for thesis update

CHAPTER FOUR

Understanding 'Gut Instinct'

Foreword

In Chapter Three, it was demonstrated that there is a lack of in-depth investigations into how coaches make decisions regarding an athlete's talent. It quickly became apparent that in order to answer the main question of this thesis – namely, 'what is 'gut instinct?' – qualitative methods would be most appropriate. Given the value of experiential knowledge in co-creating empirical research questions, a constructivist approach was used in this study to allow the coaches involved to help build our understanding of the talent identification process. This chapter contains the findings from interviews with twenty-four elite coaches from fourteen different countries, across three Olympic combat sport disciplines (boxing, judo and taekwondo).

CHAPTER FIVE

A Case Study in Talent Identification

This chapter is currently under review with a peer-reviewed journal:

Roberts, A.H., Humberstone, C., Greenwood, D., Stanley, M., & Raynor, A. *The Coach's Eye:*

An elite coach's decision-making process during talent identification [Manuscript

Under Review].

Foreword

This thesis has thus far developed a theoretical understanding of how coaches
believe they identify talent. Chapter Three demonstrated that when coaches identify talent,
they are driven by implicit, instinctual factors that they struggle to articulate. Chapter Four
explored this concept of 'gut instinct' by speaking directly to coaches and unpacking the
factors that underlie their seemingly instinctual decisions. The finding that coaches rely on
their experience and ability to identify talent, and time and context in order to do so
confidently, while not appearing novel, is one that has yet to be expressed in the literature.

During Chapter Four, coaches were asked about hypothetical situations, or to reflect
on their prior experience in order to answer the interview questions. While there are many
ways in which talent identification occurs in situ, two very common methods are a single
coach making decisions, or a group of coaches attempting to reach consensus. The following
two chapters explore whether the findings from Chapter Four are applicable in both of these
real-life talent identification environments. Chapter Five contains a case study of a single
coach making identification decisions over an extended period and, consequently, in several
different contexts. Chapter Six contains an investigation of multiple coaches (therefore
different experiences and abilities) in a constrained time period (four days) in the same
context (junior talent camp). Essentially, these two chapters investigated how the

manipulation of constraints (time and context − task and environment; individual − experience and ability) affects coaches' ability to identify talent.

CHAPTER SIX

Reliability of Coach Ratings over a Four-Day Training Camp

This chapter has been published as the following peer-reviewed journal article:

Roberts, A.H., Greenwood, D., Humberstone, C., Raynor, A.J. (2020). Pilot study on the

reliability of the coach's eye: Identifying talent throughout a 4-day cadet judo camp.

Frontiers in Sports and Active Living, 2: 596369. doi: 10.3389/fspor.2020.596369

The paper formatting, grammar and headings have been modified to maintain a consistent

thesis style. References are included at the end of this thesis.

Foreword

The previous chapters in this thesis have demonstrated how both time and context

can influence the perception of talent, and that many expert coaches believe that experience

is integral to being able to identify talent appropriately. In particular, Chapter Five

highlighted how a coach's opinion of an athlete's talent can change significantly over time,

and how important context is when making these decisions. It follows that the next question

relates to the individual differences between coaches. If a group of coaches with different

amounts of experience are tasked with identifying athletic talent in a single group of athletes

over a set period of time in the same context, will they identify the same athletes as being

talented? Therefore, this chapter is an in-situ investigation into the inter-coach reliability of

coach ratings throughout a four-day judo training camp for cadet (under age 17) athletes.

CHAPTER SEVEN
Discussion: Perceiving Talent and its Identification Through the Coaches' Eye

The two models and their associated definitions presented in this chapter have been presented and accepted for presentation at the following conferences:

Roberts, A.H., Raynor, A., Greenwood, D. (2020, March). *A new conceptualisation of sporting talent: The role of the coach*. [Poster presentation]. Exercise and Sports Science Australia (ESSA) Conference, Perth, Australia. (Delayed due to COVID-19); to be presented in 2021.

Roberts, A.H., Raynor, A., Greenwood, D., Humberstone, C., Iredale, F. (2019b, November). *Proposition of a new conceptualization of the longitudinal talent identification process.* [Conference presentation]. 3rd Scientific Conference on Motor Skill Acquisition, Lohja, Finland.

The first model, the *Coach-Informed Talent Identification Process*, and the associated definitions were first presented at the Scientific Conference on Motor Skill Acquisition in 2019 to an audience of researchers and practitioners. With a clear goal to enhance the empirical understanding of coaches' practical knowledge of the talent identification process, follow-up discussions based on this presentation resulted in the incorporation of additional content and feedback to improve the model's clarity.

The second model, a novel representation of the *Coaches' Eye During Talent Identification* was created to help interpret and explore the underpinning mechanisms that lead coaches to make judgments and decisions in practical settings, specifically, how they identify talent.

This thesis aimed to explore the *coaches' eye* in talent identification, examining the decision-making process of elite coaches during this process through the use of combat sports as a task vehicle. Through the findings of this program of research, it has become evident that existing models and terminology are insufficient at capturing the nuances of how coaches perceive and perform talent identification. It also became apparent that although coaches and researchers use the term coaches' eye to describe how coaches make subjective decisions, there have been no attempts in the literature to define nor model this term and the associated processes.

This chapter draws on the findings previously presented in this thesis to introduce two new models. The first model, the *Coach-Informed Talent Identification Process,* is a diagrammatical representation of *what* coaches do as part of this process. The second model is a novel representation of the *Coaches' Eye during Talent Identification*, describing *how* coaches make forecasts and selections as part of this process. Together these unique contributions to the field will address the misalignment in terminology and provide an evidence-based perspective of the talent identification process as viewed through the coaches' eye.

A Model of Talent Identification in High-Performance Combat Sports

The literature reviewed in Chapters Two and Three indicated that talent identification is often conceptualised as a singular event, capturing a 'snapshot' of an athlete's *current* abilities. However, this interpretation is more representative of the term (talent) selection; the decision made to include or exclude an athlete from a given team, squad or competition is often based on their performance in a single event. Using 'identification' and 'selection' interchangeably in the literature has often incorrectly positioned talent identification as a singular point in an athlete's career, resulting in an over-reliance on current performance and/or discrete physical and physiological capacities when considering long-term athlete potential. A lack of clear definitions and inconsistent

terminology makes comparing and building on existing literature difficult, complicating the process of transferring this knowledge to external stakeholders.

Within existing literature, the coach has rarely been a focus during talent identification research. Instead, research tends to focus on athlete qualities, comparing identified/selected athletes with those who were not. This athlete-centric focus is not restricted to talent identification research and is a limitation in many areas of sport science (Araújo & Davids, 2011). Position talent identification as a dynamic system in which athletes are identified (rather than focusing on the athlete alone), the coach's role and impact within the process is emphasised. By better understanding how coaches perceive and perform talent identification, we can then begin developing this ability in current and future coaches while influencing organisational policies and practices to best support coaches in their judgment and decision-making process.

Recent conceptualisations of talent identification include detection, identification, confirmation, development and (de)selection as discrete stages within a larger process, often also referred to as 'identification' (see Figure 1, also Williams & Reilly, 2000). However, few, if any of these terms have been defined or used based on the understanding, knowledge and usage by coaches (see Table 1 for existing definitions). This, combined with a lack of models based on how coaches perform talent identification in situ, creates the need for a new model of talent identification to be developed.

The *Coach-Informed Talent Identification Process* (Figure 9) has been developed by drawing on the experiential knowledge of expert, high-level combat sport coaches and has been refined based on their feedback. This is in comparison to previous models, which have typically been developed for use in youth team sports and have been created without direct coach input or feedback. The new model characterises how athletes move through the talent identification process, and the role coaches play in that process, as perceived by expert high-performance coaches. A key difference between this and previous models is that the *Coach-*

Informed Talent Identification Process positions talent identification as an overarching process that continues throughout an athlete's development. The following sections describe each aspect of this new model and their key differences from previous conceptualisations of talent identification.

Figure 5

The Coach-Informed Talent Identification Process (first presented in Roberts et al., 2019b)
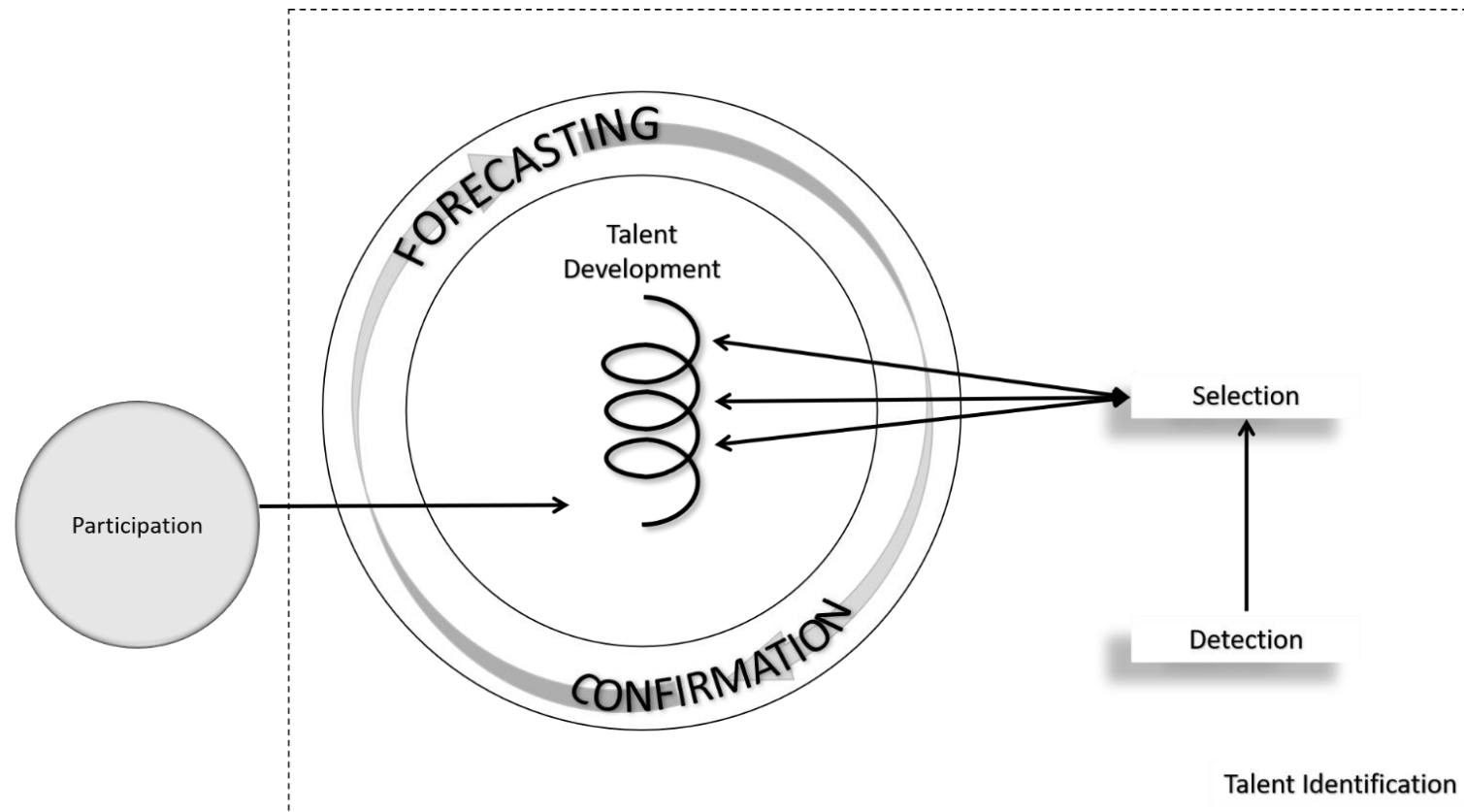
The dashed box represents the talent identification process. Directional arrows represent athlete movement through the process. The loop formed between forecasting and confirmation represents the coach judgment process, occurring in combination with athlete development. Selections are made at multiple levels and times, and both selection and detection are active decision points. Participation athletes (those who engage in the sport recreationally) can move into the talent identification process through several mechanisms. Additional detail is included in the accompanying text.

Talent, Identification, Judgment, and Decision-Making

Chapters Four and Five demonstrated that coaches perceive talent identification as the process which allows them to 'see' the skills, qualities, attributes or traits of an athlete (and relevant combinations) that indicate (or contraindicate) future high-level performance – specifically, predictors of Olympic medallist potential. This understanding aligns with the recent definition of talent put forward by Till and Baker (2020), which proposed that the purpose of talent identification is to identify the presence (or absence) of the skills, qualities, or attributes predictive of high-level performance.

Coaches view the identification of talent as an ongoing phenomenon, one which can be obscured by day-to-day events (noise) impacting on athletes such as injury, fatigue, and current performance levels. They described talent identification as a process – a series of steps repeated at different times throughout an athlete's development. Coaches make ongoing forecasts of an athlete's potential talent and confirm the accuracy of these judgments as athletes achieve, or do not achieve, the forecast outcomes. Unlike many coaching decisions in which the outcome of a decision or judgment is known very quickly, it can take years for a coach to confirm the accuracy of their forecasts and resulting selections, thus verifying or refuting their identifications.

The differentiation between 'identification', 'forecasting' and 'selection' is in response to the findings of Chapters Four and Five of this thesis. The interviews conducted in these chapters highlight the importance of terminology that is consistent in use and understanding across coaches, with all of the interviewed coaches indicating a distinction between these terms. The coach from Chapter Five articulated a significant difference in his thought processes between these three stages. He viewed forecasting an athlete's talent as "like the weather" and distinctly different from selection decisions; with the broader talent identification process drawing on the information gathered through forecasting, confirmation, and where relevant, selections (which are sometimes made by others) and

competition results. Differentiating between forecasting and selection can be articulated by describing forecasting as a *judgment* and selection as a *decision*.

The distinction between judgment and decision is important, as it captures how coaches conceptualise the difference between *forecasting* and *selection* during talent identification. Empirical literature describes *judgments* as the prediction of the likelihood of a given occurrence and the subjective value of said occurrence, formed from the combination of personal beliefs and values with one's knowledge and experiences (i.e. the coaches' individual constraints). Judgments guide decisions made in the absence of complete data or an obvious decision path. In contrast, *decisions* are deliberate actions or behaviours (with associated consequences) which are often guided by, but not beholden to, judgments (Hastie, 2001; Jacklin, Sevdalis, Darzi, & Vincent, 2009; Likierman, 2020; Tichy & Bennis, 2007). A key differentiator between a judgment and a decision, outside of 'making a choice', is context. Judgments can be, and often are, made without (much) context, particularly as they are often based on a belief or value system (i.e. that certain traits are 'good' or 'bad') (Hastie, 2001). On the other hand, decisions are (or should be) made within context, as this can provide additional information to allow scaling, or calibration, of the decision to the environment in which it is being made. Essentially, "good decisions are those that effectively choose means that are available in the given circumstances to achieve the decision-maker's goals" (Hastie, 2001). In the *Coach-Informed Talent Identification Process*, talent *forecasting* is the process of judging an athlete's long-term potential; in comparison to the singular act (decision) occurring during *selection*. In this way, selection and forecasting are both steps within the talent identification rather than outcomes.

Forecasting and Confirmation

The findings from the case study (Chapter Five) describe how an expert coach forecasts, or judges, each athlete's potential future ability, with limited information. Early in the talent identification process, the coach formed opinions of the athletes, but emphasised that their initial judgments "don't mean much yet".

The term 'forecast' implies that the prediction is informed by a limited amount of available information, with an inherent level of uncertainty as to the outcome. In fact, "uncertainty is an essential and non-negotiable part of a forecast" (Silver, 2015). Therefore, talent forecasting is the ongoing, subjective judgment of an athlete's future performance capabilities based on a coach's observations of an athlete, irrespective of the time between forecast and predicted outcome. As in weather forecasting, the closer to an event that a forecast is made, the more likely it is to be correct. Yet, as emphasised by the coach from Chapter Five, just because "all the conditions are right; it [still] may not storm".

When it comes to forecasting talent for long-term performance (e.g. four or eight years in the future), there are many uncertainties associated with the forecast which can be related to the interactions between the different aspects of the dynamic system. The further away from an event a prediction is made (e.g. performance at the Olympic Games in eight years), the greater the uncertainty; as the number of assumptions about future interacting constraints and their influence on athlete performance increases; as a result forecast accuracy decreases (Silver, 2015).

Coaches must be aware of changes to task and environmental constraints over time and the more traditional focus on changes in the individual athlete. For example, changes in demands within a sport have a relatively slow and predictable evolution as athletes and coaches adapt to competition constraints. There has been a steady increase in the number of distance strikes attempted (and landed) per minute in Ultimate Fighting Championship (professional mixed martial arts) bouts between 2000 and 2014 is a simple example (James

et al., 2019). However, sports can also exhibit more sudden changes to either their rules or scoring system, which in turn creates rapid changes in gameplay. These changes can affect the performance capacity of athletes already involved at a high level, as well as those forecast to do so. For instance, a recent rule-change in taekwondo scoring criteria removed the incentive to 'fence', a defensive manoeuvre using legs and encouraged harder kicks by competitors. This change resulted in many athletes no longer being able to compete to the same level as previously under the old rules, as both their physical attributes and skill set were no longer suited to the new competition context. As indicated by each taekwondo coach interviewed as part of Chapter Four, this rule change significantly impacted the athletes they had identified. Previously, coaches had identified the body type of 'tall, long-limbed and flexible' as the most ideal for taekwondo; however, the rule change meant that those athletes were now likely to be beaten by shorter, stronger athletes with lower centres of gravity. This kind of uncertainty is inherent in long-term forecasts and can be described as scenario uncertainty (Silver, 2015), with the accuracy of the coach's forecast decreasing over time. The closer to the event that a change occurs in the task demands or the environment, the greater the chance that these changes will significantly impact athlete performance and, subsequently, the accuracy of early forecasts.

Confirmation is the period between a forecast being made and the forecast event occurring. According to the coaches in Chapters Four and Five, this is typically an informal, ad-hoc exercise, providing coaches with the opportunity to evaluate their forecast against the outcome. The coaches who participated in this research indicated that forecasting and confirmation cycle occurs continuously throughout an athlete's career. Confirmation is an integral part of both short-term (e.g. how long it will take an athlete to master a new skill) and long-term (e.g. an athlete's medal potential several Olympic cycles into the future) forecasts. Regardless of the length of the forecast, confirmation is an essential step in the process as it allows coaches to reflect upon the information used to make the forecast and

refine their *coaches' eye* for the future. Confirmation can also be a formalised by having a set period of time used to verify selection decisions. An example is the 'apprenticeship phase' employed by UK sport in many of their talent identification programs (Vaeyens et al., 2008); where athletes detected through 'Sporting Giants' (and other similar 'talent search' programs) trained in a high-performance environment before undergoing national squad selection. In these three months, athletes were exposed to high-performance training demands and fast-tracked their skill development, while coaches were able to get to know the athletes and observe their progression before offering them a firm place on the team.

Selection

Evidence and insight gained from the coach in Chapter 5 indicated that he used his international coaching experiences to forecast the future potential of the Australian athlete. When doing this within the broader international context that he was very familiar with, he stated that "I do not believe that many of the Australian athletes belong in a high-performance training squad". However, this forecast did not mean that he did not select any athletes to join the training squad. When he was required to select athletes for the training hub and subsequent travel teams for competitions, his decisions were based not solely on his judgment of their talent. The coach emphasised that contextual factors relevant to the specific selection impacted his decision-making. Factors such as the athletes' fit within the broader squad, their existing training environment, NSO policy, and his ability to develop the athletes further all played significant roles in his selection decisions. Thus, the context forced him to select athletes, sometimes against his judgment of their talent and potential future success.

One of the key differences between the proposed model and prior iterations is the inclusion of (talent) selection as a part of, but not synonymous with, talent identification. In this context, selection can be defined as per Williams and Reilly: the "process of identifying players at various stages who demonstrate the prerequisite levels of performance for

inclusion in a given squad or team" (Williams & Reilly, 2000, p. 658; see also Table 1). It is a singular point of time when an athlete is selected (or de-selected) for involvement in a specific team, squad or competition, be it a weekly team selection or an annual selection event for a national squad. Once (de)selection has occurred, athletes continue on their developmental pathway at the appropriate level.

Development, Participation and Detection

The *Coach-Informed Talent Identification Process* includes development, participation and detection as separate but essential elements in any encompassing model of talent identification. As this thesis gathered information from high-performance coaches related explicitly to the forecasting and selecting of talented athletes, these additional stages were beyond the scope of the current research. They are described briefly in Chapter 1 (see Table 1) and are reiterated below with a rationale for their positioning within the current model.

In the proposed model, athletes enter a recognised, structured talent development environment through natural progression (continued participation and the associated improvement in the target sport) or detection (non-participants are invited into a structured development environment through testing or screening). Here, athletes develop in deliberately designed environments while coaches continually forecast and confirm predictions of their talent. Talent development is inextricably linked to talent identification, as the overall success of each process requires both the right athletes and the correct implementation of a talent development program. The distinction between talent identification and talent development was starkly highlighted by several coaches who could identify athletes despite the lack of organised developmental pathways in their respective countries. This sentiment informed the placement of talent development within this model as not a step, but a separate process that runs in parallel to talent identification, punctuated by selections of varying importance and consequence. Within the *Coach-Informed Talent*

Identification Process, the specific structured talent development environment will be different depending on the system and sport to which the model is being applied.

It could be argued that entry into a development system requires some kind of identification to occur (c.f. Williams and Reilly, 2000; Romann et al., 2017; Sieghartsleitner et al., 2019), yet there is significant anecdotal evidence of athletes 'qualifying' or otherwise entering development programs based on results (i.e. policy) rather than through selection made by a coach (i.e. a decision). For example, combat coaches, particularly in Australia, must operate within the policies of their NSO selection processes. Several of the coaches interviewed in Chapter Four lamented existing results-based selection policies which are used to place current high performing athletes into squads, camps or teams. Due to limited squad sizes in addition to the need to select training partners for the most promising athletes, these selections are often made at the expense of alternative athletes whom the coaches have forecast to be more successful. This disconnect between results and talent forecasts was evidenced in Chapter Five when the coach spoke of being 'required' to select certain athletes despite their perceived lack of talent.

In this model, participation refers to those athletes who participate in the sport at a community level. These athletes may remain in the participation space if they lack the desire, ability or opportunity to move into more formal athletic development pathways, such as high-level club teams, academies or state/regional development programs. Participation deliberately sits outside of talent identification in the *Coach-Informed Talent Identification Process*; according to the coaches who reviewed this model, many combat sport participants are 'non-competitive'. These 'non-competitive' athletes participate in the sport for fun and fitness with no desire to ever compete at a higher level; thus it is "not worth even considering identification with them" (Coach 16). However, it was deemed important to include participation in this model because it is essential to understand the various backgrounds that athletes may have when attempting to understand the entire athlete pathway. The

forecasting and subsequent selection of athletes can be influenced by the mechanism of entry to the talent identification process; therefore coaches believe it is important to know whether athletes have progressed through participation pathways (natural selection), or were detected into the sport. Talent detection refers to the mechanism through which athletes, often non-participants, are 'detected' as having the (usually physical) qualities that are advantageous within the target sport. Athletes may be detected through an official program (such as the AIS's Sports Draft program [Gul, 2016]) or unofficially, such as when a coach sees an athlete participating in another sport and invites them to join their team or squad.

Summary

The *Coach-Informed Talent Identification Process* is an updated conceptualisation of talent identification with the steps involved in the process based explicitly on the perceptions of elite coaches. This new model was developed from the results of this thesis and refined by feedback from applied practitioners, researchers and coaches. It has refined terminology, particularly around the concepts of 'forecasting' being continuous while 'selection' is a discrete event, both of which occur within the broader talent identification process. This model also captures the non-linearity of athlete development, with athletes continuously moving throughout the process at different rates as coaches repeatedly forecast and confirm their talent. An athlete's development is punctuated by selections, the point at which a coach makes an active decision to include or exclude the athlete from a specific team, squad or competition. This model can be used by researchers and practitioners alike to understand the role and impact of subjective coach judgments and decisions within talent identification.

The Coaches' Eye during Talent Identification

There has been little investigation into the decision-making process of coaches while identifying talent. Within the literature, this process and its subjectivity have been referred to as the *coaches' eye* (Romann et al., 2017; Schorer et al., 2020) and coaches are often used as the 'gold standard' within talent identification research. Despite this, there has been little investigation into coach judgment and decision-making, or whether the *coaches' eye* is reliable between coaches. Chapter Four of this thesis showed that international-calibre combat sport coaches follow the same process when identifying talent (as shown in Figure 9). However, Chapter Six demonstrated that coaches do not necessarily identify the same athlete(s) as being talented. Within a dynamic sporting context, the coach, the athlete, and their complex interactions must be understood in order to attempt to understand the organisation of the system as a whole (Rothwell et al., 2020); i.e., both athlete and coach interact with and contribute to the outcomes of talent identification.

The second part of this chapter introduces an original model and understanding of the *coaches' eye*, specifically during talent identification (Figure 10). This practical representation of coach judgment and decision-making is based on the data presented in Chapters Four, Five and Six of this thesis in conjunction with appropriate literature. The model demonstrates how a coach's constraints influence their talent forecasting judgments and selection decisions by exploring talent identification through the lens of ecological dynamics. This model's key principle is the influence of each individual coaches experience and ability, and how these shape perception of athlete talent. The process of talent identification is then viewed through this lens of coach traits in their role as the 'arbiter' of talent. It was highlighted in Chapter Five that practically this results in a matching-type process, where individual athlete capabilities and the coach capacities influence the process.

A major finding of this thesis was that coaches rely on their experience and expertise to decide which athletes they "want to see more of" when considering the process of

identifying performance potential. When probing this concept, it was determined that the *coaches' eye* is how coaches make their initial assessment of athletes ("catches my eye" – Coach 4); the lens through which the coach interpreted the available information given the context of the judgment or decision made. A coach's attunement to information is dependent on their experience, the time available, the context of the identification, and their coaching abilities when identifying talent, with each coach appearing to attune to different specifying information.

The *Coaches' Eye* is the lens through which the coach integrates their knowledge and experience to form a forecast (judgment) of an athlete's talent. When appropriate, this forecast becomes a selection decision, at which time the coach actively attunes to the context, their coaching abilities, and their knowledge of the athlete. As evidenced in the case study (Chapter Five) and earlier in this chapter, this differentiation is important as coaches do not always select the athletes they have forecast to be talented. Coaches will make their selections based on the current context, choosing the athlete that affords them the best opportunity to achieve their goal or key performance indicator for the context of the selection, for example, short-term performance outcomes, or long-term development goals.

Figure 6

A Model of the Coaches' Eye during Talent Identification
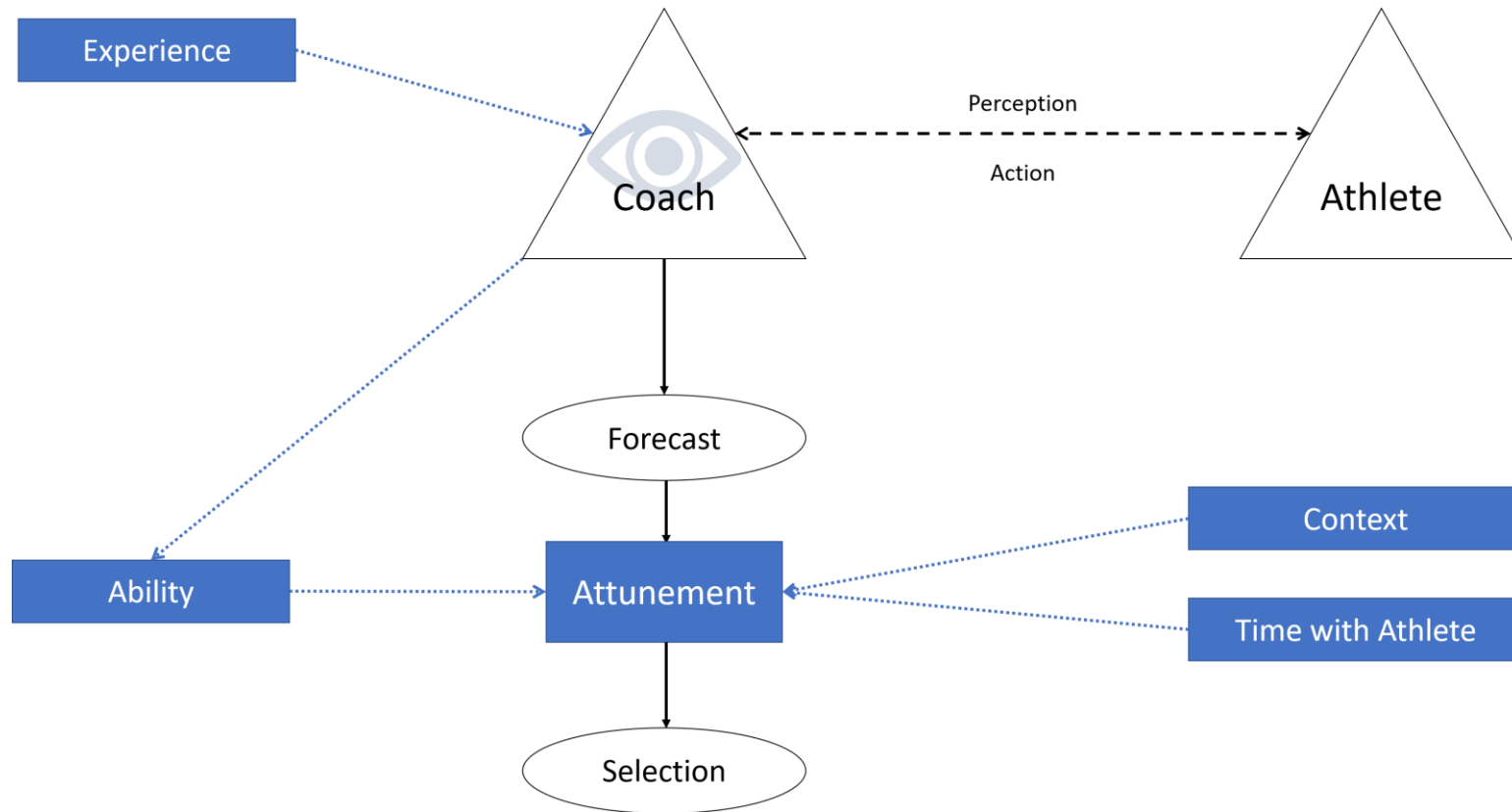
The solid arrows represent the judgment and decision-making process of coaches during talent identification. The circles indicate outcomes, with the dotted lines indicating the sources of information used to inform the *Coaches' Eye*.

Coach-Athlete Dyad

When viewing talent identification through an ecological lens, the framework highlights how the coach and the athlete interact as part of a broader dynamic system. The coach-athlete sub-system represents a critical component of the larger performance system. The constraints which affect each sub-system also affect the broader context (i.e. talent identification). The individual constraints of each coach and athlete are important as, highlighted by Chapter Five, by changing either the coach or athlete involved, the outcomes of the identification (forecasts and/or selections made) will change. The coach and athlete are represented in the model of the *Coaches' Eye during Talent Identification* as triangles to indicate the inherent interactions between the individual, environmental and task constraints and their influence on behaviours and decisions.

The double-headed arrow between the coach and the athlete indicates the symbiotic relationship between the two sub-systems within talent identification. Each is continually perceiving the other and adjusting their actions or behaviours based on these perceptions. The findings of Chapter Five demonstrate that the interrelationship between coach and athlete impacts the ongoing forecasting process. Through his continual interactions with the athletes in a variety of contexts, the coach's perception of the athletes' potential changed over time. During this time, the coach observed the athletes and their behaviour, but his interactions influenced the behaviour of the athletes, which in turn further influenced his observations and interpretations.

Coaches draw on their experience with athletes of varying ability to understand the athlete and form judgments about the athlete's current and future performance capacity. These forecasts (judgments) are heavily influenced by the coach's constraints, particularly their knowledge and experience. Their experience influences how they interpret the information they perceive about an athlete. This was evident in the findings of Chapter Six, as the coaches in this study interpreted the athlete information differently, making very

different forecasts of athlete potential. As these coaches were interacting with the same athletes under the same task and environmental constraints, the apparent difference in their interpretation of the athletes' talent lies in the coaches' individual constraints. While there are many contributions to a coach's individual constraints, the coaches interviewed in Chapters Four and Five indicated that they interpret athlete information in different ways based on their experience, as coaches who have seen a wider variety of athletes tended to be more open in their beliefs of "what it takes" (Coach 22) to be successful in the long term. Experienced coaches can see "different paths" (Coach 4) to success, viewing elite performance as a 'threshold' that athletes need to reach, regardless of the combination of traits led to their achievements.

Forecasting, Selection and Attunement

The model of *The Coaches' Eye during Talent Identification* positions forecasting and selection as outcomes of the talent identification process. The key difference between the two outcomes is the coach's attunement to specific information used to inform their context-specific selection. As the *coaches' eye* is the lens through which coaches make forecasting judgments and selection decisions, this lens is focused by the purpose of the judgment or decision. As shown in the *Coach-Informed Talent Identification Process*, forecasting occurs when a judgment is made about an athlete's future performance potential; however, there is no active (de)selection as part of this judgment. Accordingly, in the model of the *Coaches' Eye in Talent Development*, forecasts are made based on the individual coach's interpretation of the athlete's future potential with reference to the coach's experiential knowledge of athlete progression within their sport.

Aligned with the *Coach-Informed Talent Identification Process*, selection is the active decision point at which an athlete is (de)selected for a given opportunity (squad or competition). When a coach makes a selection, their initial forecast is attuned to the specifying variables that influence their decision, specifically the context of the selection,

how well they know the athlete, and the coach's perceived ability to develop the athlete within the timelines available. Attunement creates an inherent bias when identifying talent, as coaches subconsciously rate an athlete's future ability in terms of whether the coach in question can help them progress. This was demonstrated throughout the current thesis, for example when Coach 14 (Chapter 4) spoke about his prowess in developing technique and stated that he often selects athletes that are lacking technical proficiency because he "can give them that". There was an apparent connection between the traits that coaches believe are (un)important and those they are (in)capable of developing in their athletes. Coaches do not necessarily attune to information that is more or less important, or in more or less effective ways, but rather attune to different information sources based on their experience and coaching ability. The more expert coaches within the cohort interviewed in Chapter Four, and the coach in Chapter Five, appeared to be aware of their strengths and weaknesses as a coach and how this could limit and bias their identification process, and impact athlete development trajectories. The coach's expertise (rather than experience) allows them to account for these biases as and when it is appropriate during the talent identification process. For example, it was shown during Chapter Five that if the coach's task was to select athletes to win at a competition next month, he would select the current best-performing athletes, regardless of his capacity to develop them over the long-term. Conversely, when he is selecting athletes to join a development centre, his focus was on selecting those athletes he would improve in the timeframe available.

The reliability of coach judgments or forecasts was shown to be very low during the four-day camp detailed in Chapter Six. Traditionally, the disparity in perception may have been explained due to the differing levels of experience among the coaches; however, the evidence and model presented in this section provide an alternative view. The novel model of the *Coaches' Eye in Talent Identification* (Figure 10) suggests that the *coaches' eye* differs between coaches due to the different constraints of each coach-athlete dyad. The *coaches'*

eye allows for the rapid integration of various complex, interacting pieces of information. If used correctly, this skill enables coaches to identify and select athletes by matching their expertise to the athlete's capabilities, thus optimising outcomes for the athletes they can develop.

Both the coach and the athlete exist within the dynamic talent identification system. As soon as a critical component of any system is changed, the whole system changes. Therefore, the coach needs to be a critical consideration when planning and executing talent identification strategies within sport.

Practical Implications

The models and terminology discussed in this chapter and other findings in this research program will provide coaches and national sporting organisations with a greater insight into the underpinning factors that enable coaches to identify talent. The evidence indicates that creating a standardised talent identification procedure or testing battery without input from coaches, particularly those working with the identified athletes, will not deliver the desired results either empirically or practically. The following section details practical implications for NSOs in their design of talent identification programs and policies, and recommendations for coaches and coach educators to enhance the effectiveness of the *coaches' eye.*

Practical Implications for National Sporting Organisations

A key limitation identified by coaches in existing talent identification processes is the absence of coach input on athlete selection policies. The lack of coach input on athlete selection policies has, according to the coaches, resulted in negative consequences for both short- and long-term athlete development. For example, placing athletes who forecast poorly in development squads based on their current results often occurs at the expense of athletes who forecast strongly but are deselected due to their current performance level. While current performance must be a practical consideration when making selections and

cannot (nor should it be) completely discounted, NSOs should work with coaches to ensure an appropriate blend between consideration of current performance and future potential. National sporting organisations should include coaches from all levels of the pathway when developing new identification protocols. This thesis has demonstrated that different coaches will identify different athletes, so choosing the right coaches to identify talent and ensuring a variety of coaches are involved in the process is essential. The inclusion of multiple coaches is important, to limit the bias inherent in experiential knowledge and to ensure expertise from across the pathway. It is also important that there is a balance between coach and NSO input as coach contracts are typically short-term; thus, NSOs need to ensure long-term consistency for their athletes.

National sporting organisations need to ensure that they provide coaches with the necessary information to make the best possible decision. Specifically, NSOs need to ensure that the coach is explicitly aware of their key performance indicators related to the selection – is their goal to get results immediately, at the end of the next Olympic cycle or both? This will provide contextual information to inform the attunement of the decision-making process based on short- or long-term forecasts. This contextual understanding facilitates the selection balance required between short- and long-term performance goals, the time the athletes have to improve, the different skills deemed improvable by the coach, and the athlete's current capabilities. In addition, NSOs should strive to ensure that the coaches performing the selection are those who will be responsible for the athletes' development, and (where practicable) to provide the coach with sufficient time to determine the athlete's potential relative to their constraints. Talent identification camps need to run for as long as practicable (several days at least) in order for coaches to gain the fullest possible understanding of the athletes. Where possible, talent identification should occur for several months or years, keeping athletes in the system to enable the best possible forecasts to be

A final recommendation for NSOs is to consider the coach who is performing the identification with the same level of scrutiny as they do athletes they identify. This research has demonstrated that coaches' forecasts and selections are individual and based on their inherent traits, but that is not to say that coaches should not identify, forecast, and select talent. These differences are what afford the coaches the opportunity to develop specific athletes. When the career of both the coach and the athlete depends on athlete outcomes, coaches should be able to select the athletes for whom they have forecasted the highest level of success. National sporting organisations should involve coaches when planning talent identification to ensure that the coach can work with the athletes they can develop. In turn, athletes should be placed with a coach who will best develop their potential.

Practical Implications for Coaches and Coach Educators

This research has indicated that expert coaches are more aware of their own coaching limitations than their less experienced counterparts. Specifically, this allows them to compensate for their weaknesses and, as a result, they are afforded to select and subsequently develop a wider range of athletes. Coach education related to talent identification should include information about which athlete attributes are trainable, the timelines required to develop these attributes, and what resources (both professional development and sport science practitioners) can assist in this development. This will ensure that coaches are not (de)selecting athletes based on erroneous assumptions (e.g. 'mental toughness cannot be improved') or a lack of understanding of what is available within the broader development system (e.g. access to psychologists). At the same time, coaches need to feel confident in the future performance of the athletes that they select. By developing coach education that focuses on all facets of athlete development, coaches will be better able to develop and support athletes in their squads, regardless of the mechanism through which an athlete was placed in their team.

CHAPTER EIGHT
Summary and Future Directions

Traditionally, talent identification research has focused on snapshot physical and/or psychological testing to objectively measure predictors of athletic performance. Often, coaches' subjective opinions are used as the yardstick against which the efficacy of these objective measures are evaluated (Roberts et al., 2019a). When coaches contribute to talent evaluations, for example through technical and/or tactical assessment during match play, the *coaches' eye* (the lens through which athlete performance is evaluated) has been applied with little consideration of the validity or reliability of coaches' perceptions of talent (Schorer et al., 2020). Recently, Schorer and colleagues have published several articles that have longitudinally tracked coaches' predictions of athlete success in European handball, demonstrating that the *coaches' eye* may be a valid mechanism for talent identification (Schorer et al., 2020, 2017). However, there is still a limited understanding of the reliability or the underpinning processes of this useful tool. Fundamental questions exist as to *how* coaches identify talent, particularly in the combat sport disciplines in which the subjective nature of competition performance increases the uncertainty in talent evaluation processes. Basic questions include: How do coaches perceive talent identification? What factors underpin their decision-making process? How reliable are coaches in their predictions of future performance? Specifically, what is the *coaches' eye,* and how does it contribute to talent identification?

This thesis's overarching aim was to address the current gap in knowledge related to the *coaches' eye* by exploring the experiential coach knowledge of talent identification, using the Olympic combat sport disciplines of boxing, judo and taekwondo as a task vehicle. A series of four investigations explored the following questions:

1) What is currently known about how coaches identify talent? (Chapter Three)

2) How do elite combat sport coaches identify talented athletes? (Chapter Four)

3) How does an elite combat sport coach make identification and selection decisions *in situ*? (Chapter Five)

4) How reliable are coach ratings of perceived talent? (Chapter Six)

This chapter provides an overview of this thesis, summarizing the theoretical and practical outcomes with an emphasis on how this research can inform coaching practice, NSO strategies and future research.

Summary of Findings

This research has applied the theoretical framework of ecological dynamics in examining coach decision-making during talent identification in combat sports. Beginning with an in-depth examination of the existing empirical research related to talent identification, ecological dynamics, and decision-making, Chapters Two and Three provide an understanding for the reader of the current state of understanding of the *coaches' eye* during talent identification. As the first exploratory chapter of this thesis, Chapter Three presented a systematic review and meta-synthesis which examined the existing empirical knowledge of coach decision-making during talent identification. This chapter emphasised a trend for utilising experiential coach knowledge in both research and practice while highlighting the dearth of empirical understanding of this knowledge. The consensus among existing research was that coaches appear to make decisions about an athlete's talent primarily based on intuition or 'feel'. The themes of *drive and ambition*, *physical and technical skills*, and *game intelligence* emerged as important underlying factors contributing to the coach's instinctual decisions. The results from this study indicated that coaches rely on their 'gut instinct' to identify athletes, but struggle to articulate the process through which they arrive at these instinctual opinions and decisions.

Chapter Four used semi-structured interviews with elite-level, expert coaches from boxing, judo and taekwondo to explore how these coaches identify talent. This chapter provided one of the first definitions of 'talent' from coaches working in high-performance sport; it also empirically captured the coaches' 'gut instinct' related to talent identification. *Experiential knowledge* (know-how built through years of experience and reflection), *temporal factors* (e.g. the time available to get to know the athlete, the time available for the coach to decide, how far away the target competition is)*, athlete context* (athlete performing under differing individual, environmental and task constraints), and *what can be worked with* (i.e. the alignment between a coach's strengths/weaknesses and those of the athlete) were found to be the key considerations for coaches during their decision-making process.

This chapter also demonstrated that different coaches are likely to identify different athletes as being talented. Talent identification is affected by four variables: experience, ability, time and context. These findings supported recent claims from Baker and colleagues that "beliefs about talent matter" (Baker et al., 2018, p. 3), and that the lived experiences of expert coaches affect their selection of athletes (Johnston & Baker, 2020).

Chapter Five detailed an 18-month case study with a single expert, elite-level coach during a longitudinal talent identification and selection process. This allowed for exploration of the impact of two key considerations of the *coaches' eye – time* and *context*. The most significant finding of this chapter was that the context of talent identification is vital, to the point that 'identification' and 'selection' are conceptualised as two different processes with two different intended outcomes. This is an important differentiation as much of the existing talent identification literature uses identification and selection interchangeably or as a single entity ('talent identification and selection'). A lack of differentiation in the literature between 'identified' and 'selected' athletes contributes to misunderstandings among coaches, practitioners, and researchers regarding how decisions are made. The themes identified in

Chapter Four (experiential knowledge, time, context and ability) were reinforced through the findings of Chapter Five. The coach examined in the case study considered these four aspects throughout his decision-making process; however, each component's relative importance varied depending on whether the coach was *forecasting* or *selecting* athletes – that is, it was dependent on the context.

Chapter Six highlighted the differences in individual coach perceptions of athlete talent throughout a four-day elite youth judo camp. This novel chapter demonstrated that coaches are not necessarily reliable judges of talent, even when observing the same group of athletes, for the same period, under the same circumstances. Despite the athletes all being high performers for their age group (or perhaps because they were), coaches could not distinguish between those with high levels of 'potential' and those without. By the final day, all coaches agreed on the placement of only two out of the 24 athletes. This finding supports earlier findings in this thesis, which align with coach comments that a significant amount of time is required to 'get to know' athletes and get a 'true' sense of their talent. In the context of real-life talent identification, particularly in youth age groups, it is generally assumed that coaches for the same sport at the same level (i.e. judo cadets) would identify the same groups of athletes as talented. This research has shown that this assumption is incorrect. There is a need for future word investigating the inter-coach reliability of coaches, and the contributing factors to coach reliability during talent identification.

Chapter Seven synthesised the findings of this thesis by presenting two new models to interpret talent identification: *The Coach-Informed Talent Identification Process* and the model of *The Coaches' Eye during Talent Identification*. Both models were developed from elite coach experiential knowledge in high-performance combat sport settings. The *Coach-Informed Talent Identification Process* positions talent identification as an ongoing process instead of as a singular event. It demonstrates the role of the coach at different stages and the cyclical relationship with athlete development. Drawing on and synthesising the findings

of this thesis, the new model of talent identification has been developed based on the experiences and expertise of coaches involved in high-performance combat sports. This chapter also defined a new term ('forecasting') while re-defining other terms (selection; confirmation) to align with the perceptions and word usage of the coaches who operate in this space daily.

The novel description and model of *The Coaches' Eye during Talent Identification* encapsulates the difference between forecasting and selection in terms of the coach's judgment and decision-making. This model accounts for, and highlights to practitioners, the influence within talent identification of individual coach and athletes and how the coach's expertise and ability can impact the results. Coaches forecast athlete talent based on their own experience, and their own constraints influence their selections. This model explains why different coaches are afforded to select different athletes and how context influences these decisions.

The models and related terms will help guide understanding of how coaches both perceive and perform talent identification, driving coach development of their ability to identify talent and ensure that national governing bodies and coaches can collaborate to ensure that the most appropriate athletes are identified and developed. This empirical research will also benefit future studies, providing a framework to understand the coach's role and their position as variables, not constants, during talent identification processes.

Key takeaway messages from these models are that NSOs should ensure that each selection's goals are clearly stated. Where practicable, coaches should be allowed to contribute to squad selections based on their forecasts of athlete talent. Coaches also need to be aware of their own biases, related to their experience and abilities, inherent in their judgments and decisions.

Limitations of this study

This research's primary delimitation was the specificity of the target population – national level or higher coaches of three Olympic combat sports – boxing, judo and taekwondo. This delimitation potentially limits the applicability of the findings to settings other than high-performance combat sports. However, it is anticipated that these results could be applied to talent identification in lower levels of the combat athlete pathway, and it is likely that they will also be generalizable to talent identification in other individual sports. Future research is needed to explore the transferability of these findings to team sport settings.

An additional delimitation was the focus on the identification of Australian athletes in Chapters Five and Six. As mentioned in the introduction to this thesis, combat sports have very low participation rates within Australia, and Australians have not historically been successful in international competitions in these sports. Therefore, the process followed by the coach in Chapter Five may have been different had he been working with a group of athletes whom he perceived as being more talented.

A significant limitation of this program of work is the focus on coaches from Australia and Western Europe. Due to the English-language requirements placed on participation in the interview study (Chapter Four), the research failed to capture coaches' perceptions from other regions, particularly Asia. Given the traditional dominance of Asian countries in many combat sports, the inclusion of Asian coaches may alter the findings of this body of work. The geographical limitations inherent in research being performed by Australian researchers may have also limited the findings, as interviews with coaches were only able to be conducted during a short period of time when the student was physically present in Europe.

Future Directions

This research has provided a greater understanding of the *coaches' eye* in talent identification and the factors that influence the decision-making process. However, there is still significant research needed to fully understand the influence that coaches have on the talent identification process.

An overarching recommendation for future research is for researchers to provide better descriptions of the coach's demographic information, particularly concerning the experience and/or ability of the coach/es in question. This research has made it clear that the term 'expert' is not yet sufficiently defined within the coaching literature, creating research that is difficult and often unhelpful to compare or apply. This thesis has demonstrated that coach decision-making, particularly during talent identification, is subjective and heavily influenced by a coach's experience and expertise. Thus, future researchers should ensure that sufficient information about the coach is provided to contextualise the coach's decision-making.

This research has demonstrated that coaches are an integral part of the talent identification system, and future research should continue to explore the relationship between the coach and the athlete they are identifying. Based on the results of this work, it is suggested that providing coaches with some level of autonomy in athlete selection, along with more explicit goals for selections, will result in improved athlete performance outcomes throughout the next Olympic cycle. Future research should investigate this idea and examine how subjective coach decisions can best be integrated with objective policies to create the best possible outcomes for all concerned.

Many existing studies use the *coach's eye* as the standard for discriminating between athlete potential, without critical consideration of these opinions. This work has clearly shown that coaches cannot be considered as dependent variables in research due to the subjective differences in perceptions of talent. Thus, future research (and interpretation of

existing research) involving coaches in any capacity should be treated with caution, particularly when a single coach is positioned as representative of a larger group or as the standard for comparison of objective testing.

Researchers may also want to consider further investigating how coaches develop their 'eye'. As the coaches in this research viewed the *coaches' eye* as a skill that can be developed over time, it is vital to determine how it can be developed and how we might enhance the process. Ultimately, this research has demonstrated that while the *coaches' eye* is subjective, it appears that that individuality is what affords greater athlete performance outcomes.

Conclusion

This research used ecological dynamics to explore the decision-making that underpins the talent identification process for high-level Olympic combat sport coaches. Mixed methodologies were employed to explore the concept of the *coaches' eye* within talent identification, resulting in the creation of a new model of talent identification and related terminology, including a definition of the *coaches' eye*. This thesis found that while the *coaches' eye* may not be reliable in the statistical sense of the word, the process they follow and the type of information they draw is consistent. Coaches attune to the information they perceive as most relevant in allowing them to forecast an athlete's ability and select the athletes they will be best able to work within the available timeframe.

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Appendices

Appendix A

Characteristics of Included Studies

Reference (Region)	N	Sport	Sex	Age	Coach level	Years' Experience	Coach Education	Athlete age/level	Study Design	Key Findings
Christensen (2009) (Europe)	8	Soccer	M	33-64 (mean=45)	National	8-28 (mean = 15)	>Bachelor's Degree	Youth	Interview	- Visual experience and pattern recognition - Pre-eminence of hard work and dedication - Coach as arbiter of taste
Cupples & O'Connor (2011) (Oceania)	13	Rugby League	NR	NR	State / National	>10	NR	NR	Delphi	- Cognitive indicators - Game skill - Physiological
Ellingsen & Danielsen (2017) (Europe)	8 *2* *2* *2* *2*	Multi-Sport *Soccer* *Gymnastics* *Swimming* *Skiing*	7M 1F	NR	District or higher	15-40	BA, MA or HL Diploma	5-15	Interview	- Social characteristics - Personal characteristics - Bodily characteristics

Reference (Region)	N	Sport	Sex	Age	Coach Level	Years' Experience	Coach Education	Athlete Age/Level	Study Design	Key Findings
Ferreira Celestino *et al* (2015) (Europe)	10	Orienteering	M	mean = 42	National	NR	PE & Sport (7/10)	NR	Interview	- Primary influence factors (self-regulation competencies; cognitive processes; quality of practice; ten years of practice) - Secondary influence factors (family; sociocultural aspects; peers; club; sport at school; coach)
Gonçalves *et al* (2017) (Europe)	14	Basketball	NR	NR	Youth and Men's	>10	Level II or III	NR	Interview	- Environmental - Psychological - Technical tactical skills - Physical attributes - Anthropometry
Holt & Dunn (2004) (Europe)	6	Soccer	NR	35-64	Academy	>5	UEFA A license	NR	Interview	- Soccer development system - Desired player qualities - Training environment - Mental aspects
Johansson & Fahlén (2017) (Europe)	14 *8* *6*	Multi-Sport *Soccer* *Alpine Skiing*	NR	NR	International	NR	NR	NR	Interview	- Idea of selections - Criteria for selections - Selection process - Outcomes and consequences of selections

Reference (Region)	N	Sport	Sex	Age	Coach Level	Years' Experience	Coach Education	Athlete Age/Level	Study Design	Key Findings
Johnson et al (2009) (North America)	6	swimming	M	48-57	International	>20	Level 5 American Swimming Coaches Association	NR	Interview	- Intrapersonal - Interpersonal - Lifestyle - Training - Environment - Systemic interaction
Jokuschies et al (2017) (Europe)	5	Soccer	M	47-60 (M=55.6)	National	>10	UEFA licence; national soccer diploma	U15-U18	Interview	- Personality - Cognitive-perceptual skills - Motor abilities - Development - Technique - Social environment - Physical constitution - Cognitive-perceptual skills/technique - Motor abilities/technique - Personality/technique - Other
Lund & Söderström (2017) (Europe)	15	Soccer	M	NR	District / Regional	NR	NR	U15	Interview	- How districts organize TID - How coaches understand and define talent and identification - Significance activities for talent development

Reference (Region)	N	Sport	Sex	Age	Coach Level	Years' Experience	Coach Education	Athlete Age/Level	Study Design	Key Findings
Milistetd *et al* (2013) (South America)	10	Volleyball	NR	45±13.8	State / National	24.8±12.1	NR	Juniors	Interview	- Stature importance - Indicators of detection - Indicators of selection - Use of detection - Methods of selection
Miller *et al* (2015) (Europe)	6	Soccer	M	26 - 62 (mean = 45)	EPP category 1-3	>5	NR	NR	Interview	- Nature vs nurture - Psychology - Social skills
Mills *et al* (2012) (Europe)	10	Soccer	NR	47.5±10.5	Premier League	14.5±6.2	UEFA Pro / UEFA A license	16-18 years	Interview	- Awareness - Resilience - Goal-directed attributes - Intelligence - Sport-specific attributes - Environmental factors
Rosevear & Cassidy (2019) (Oceania)*	1	Rugby Union	M	NR	Provincial / National	NR	NR	17-21 years	Interview	- Character
Vrljic & Mallett (2008) (Oceania)	5	Soccer	M	42-51 (mean = 46.5)	State	mean = 20.1	Level II - III	Youth	Interview	- Defining 'elements' of talent - Importance of identified elements of talent - Capacity to evaluate the identified elements of talent - Selecting talented players for the state football team

Reference (Region)	N	Sport	Sex	Age	Coach Level	Years' Experience	Coach Education	Athlete Age/Level	Study Design	Key Findings
Winter et al. (2019) (Europe)*	12	Multi-Sport	M	31-58 $\pm$8.76 (mean = 41.25)	Academy	13.67$\pm$8.42	NR	15-18	Interview	- Characteristics of the 'ideal' athlete - Balance between performance and winning - Commitment and talent - Maturity - Drivers - Role models - Honesty
	4	Soccer								
	1	Cricket								
	2	Rugby League								
	1	Rugby Union								
	1	Badminton								
	1	Judo								
	1	Swimming								
	1	Tennis								

NR = Not reported

* Included for thesis update

Appendix B

Specific Questions from Each Article

Citation	Question/s asked
Celestino et. al (2015)	NR
Christensen (2009)	NR
Cupples & O'Connor (2011)	NR
Ellingsen & Danielsen (2017)	NR
Gonçalves et. al (2017)	NR
Holt & Dunn (2004)	- What is the structure and aim of your youth academy? - How do you try to develop players? - What are the most important qualities a player needs to make it as a professional? - What qualities do your current crop of players possess? - How do you prepare players for professional demands? What areas do you work on? - What are the mental strengths you are looking for in players? - What mental qualities are most important for professional players?
Johansson & Fahlén (2017)	- What is the position and responsibility/power of the coach? - What is the goal/purpose of the selection? - What are the basis for selections? Are selection criteria defined? - What abilities/skills are judged/measured? - Who has knowledge about selection criteria? - What factors are most important to consider, if you have to choose between two similar/equally good athletes? - Who is involved in selection? Who has the most power during selection? - How long is the selection period? - Are some selection situations more difficult? - Are there possibilities for appeal? Are there protests/discussions about selections? - Are the 'right' athletes selected? Are selections evaluated? - Are there any fairness issues? Is there the possibility for athletes to influence selections?
Johnson et. al (2008)	- What do you feel contributes to a swimmer achieving top performance (e.g. World Records) vs excellent performances (e.g., finaling [sic] at NCAAs)?

Citation	Question/s asked
Jokuschies et. al (2017)	- Thinking about all of your players, is there any player who has something that it takes to achieve peak performance in adulthood?
Lund & Söderström (2017)	NR
Milistetd et. al (2013)	- What is the importance of height factor? - How should be done [sic] the detection of talents? And the selection? - Which is the more relevant indicators for each?
Miller et. al (2015)	- - In your experience, what is talent in soccer? How do you recognise it? - What is a typical TI experience for you? - What is it like to be a coach involved in TI at your club?
Mills et. al (2012)	- Can you tell me a little about your coaching background and experience in football? - What things do you consider to influence player development? - What personal characteristics or qualities do you believe young footballers require in order to make it to the professional level? - Who do you consider to play a significant role in the overall development process?

Rosevear & Cassidy (2019)*	- Describe your role as the PDM (player development manager) at this union?
	- Explain what groups you work with?
	   o Ages; aims and ambitions; family, club and school background?
	- Identify character traits that you believe have more of a moral focus
	   o Of the traits you have just identified which do you deem more important to the talent identification and development process?
	- What has been the biggest challenge in your efforts to develop character is players?
	   o How has this been overcome when using character as a criterion in talent selection?
	   o How does a player showcase desirable character?

Citation	Question/s asked
Vrljic & Mallett (2008)	- What are the 'elements' of talented football players? - Think about the best youth player you have coached. Who was he? What position did he play? When did you coach him? When you think about this player, can you come up with any other elements associated with talent? - In your opinion, what 'elements' are most important in a player? Outline how you evaluate these elements - What is your purpose for selecting players for the state team? - Please describe in as much detail the process of how you select players for the state team
Winter et. al (2019)*	- Could you describe how hard they work - Can you give me some examples that demonstrate this - What percentage of your squad are like this? - Can you talk me through some of the methods you use to encourage commitment with your athletes?

*Included for thesis update

Appendix C

Information Form – Semi-Structured Coach Interviews

Participant Information Sheet

Understanding coaches' ideas of talent identification and forecasting

Contact details and affiliations of researchers

Ms Alexandra Roberts	Ph: +███████████ or ████████████████
Associate Professor Annette Raynor	Ph: +61 8 6304 2771 or a.raynor@ecu.edu.au
Ms Fiona Iredale	Ph: +61 8 6304 2559 or f.iredale@ecu.edu.au

School of Medical and Health Sciences

Edith Cowan University, Joondalup, Western Australia

Dr Clare Humberstone	Ph: +61 2 6214 7343 or clare.humberstone@ausport.gov.au
Dr Daniel Greenwood	Ph: +61 2 6214 1024 or daniel.greenwood@ausport.gov.au

Australian Institute of Sport

1. Introduction

We would like to invite you to take part in our research study, which will investigate the perceptions of expert combat sport coaches regarding talent identification in sport. This study will be carried out by academics from Edith Cowan University, in collaboration with colleagues from the Australian Institute of Sport. This *Information Sheet* tells you about the research project and what you will be asked to do. Knowing what is involved will help you decide if you want to take part in the research. Please take time to read this information sheet carefully. One of our team will explain anything that you do not understand and will answer any questions you may have. Please note that participation in this research is entirely voluntary – if you do not wish to take part, then you do not have to. If you decide you want to take part in the research project, you will be asked to verbally confirm your consent.

2.   What is the purpose of the study?
The aim of this study is to investigate the perceptions of coaches regarding talent identification within combat sports and to understand the knowledge and skills required to predict future ability in young athletes. We hope that the information obtained from this study will inform other coaches, sport policymakers and sports science practitioners about talent identification within combat sports, and ways to make talent identification more effective.

3.   Why have I been invited to take part in this study?
You have been invited to take part in this study as we believe you fit our inclusion criteria that are: 1) at least 10 years of coaching experience in boxing, judo or taekwondo; 2) current or recent involvement with your respective sport's national governing body; 3) working knowledge of English allowing you to answer interview questions.

4.   What does the study involve?
You will be asked to participate in a digitally recorded interview with the principal investigator (Ms Alexandra Roberts). Ms Roberts will ask you to share your knowledge and experiences on the following topics: a) understanding of talent identification and the perceived importance of talent identification; b) current talent identification practices within your sport and the specific knowledge and skills required to accurately predict performance; c) key attributes necessary for long-term performance and how they change over time; and d) commonalities in talent forecasting between sports. The interview is expected to last approximately one hour.

5.   Who is organising and funding the research?
This study is being organised and funded by Edith Cowan University in collaboration with the Australian Institute of Sport.

6.   How will my confidentiality be protected?
All information relating to this research project will be confidential and will be stored securely. All electronic data will be stored on an external hard drive in password protected files, and all hard-copy data will be stored in a locked cabinet at the Australian Institute of Sport. If you choose to withdraw from the study all data collected up to that point in time will be destroyed.

7.   What happens with the results?
The results of this study may be published in reports, journals, conference proceedings and doctoral research theses. Information collected during the project may be used in future work aimed at developing a talent prediction model for combat sports. In any publication or presentation, information will be provided in such a way that you cannot be identified.

8.   What happens when the study ends?
After the study is completed, we will analyse the data to determine themes that emerge across coaches. You will be provided with a list of these themes and asked to confirm that the results match your thoughts. If you are interested, you may be provided with a summary of the full results once the research project is completed.

9.   What are the potential benefits and/or risks in taking part in this study?
There are no expected benefits for you personally in taking part in this research; however, your voluntary participation would be greatly appreciated. Eventually, it is hoped that this research will improve your talent identification abilities and practices, so that you can better identify athletes with the potential to become world-class combat athletes.

10.   Do I have to take part in this study?

It is up to you if you want to take part in this study – participation is voluntary. If you decide to take part and later change your mind, you are free to withdraw at any stage and you do not have to give a reason for your withdrawal. If you chose to withdraw, there will be no changes in your relationship with Edith Cowan University or the Australian Institute of Sport. If you do decide to take part, we will describe the study and review this information sheet with you. You will then be asked to provide recorded verbal consent for both participation in the interview and consent for us to record the interview. If you would like to participate but decline to consent to recording, you will be asked to sign a consent form to show that you have understood the information provided, and your responses will be recorded by hand.

11.   Who should I contact if I have any questions or concerns?

If you have further questions please contact Ms Alexandra Roberts who is the chief investigator of this study at Edith Cowan University. Please find her contact details at the start of this information sheet.

12.   Ethics approval

This study has been approved by the Edith Cowan University Human Research Ethics Committee. If you have any concerns or complaints about the research project and wish to talk to an independent person, you may contact the University's Senior Research Ethics Advisor (contact details below):

Ms Kim Gifkins

Senior Research Ethics Advisor

Edith Cowan University

270 Joondalup Drive

Joondalup WA 6027

08 6304 2170

research.ethics@ecu.edu.au

Thank you for taking the time to consider this study. If you wish to take part, please sign the attached consent form. This information sheet is for you to keep.

Appendix D

Consent Form – Semi-Structured Coach Interviews

<div align="center">

CONSENT FORM – PARTICIPANT
Understanding coaches' ideas of talent identification and forecasting

</div>

Chief Investigator:
Ms Alexandra Roberts
Chief Investigator
School of Medical and Health Sciences
Edith Cowan University, Joondalup, Western Australia
Ph: +███████████████████████████████

Associate Investigators:
Associate Professor Annette Raynor (Edith Cowan University), Ms Fiona Iredale (Edith Cowan University), Dr Clare Humberstone (Australian Institute of Sport), Dr Daniel Greenwood (University of Memphis).

Declaration by Participant
- I have been provided with a copy of the Participant Information Sheet explaining the research project.
- I have read and understood this Information Sheet and I understand the purpose and aims of the research project.
- I have been given the opportunity to ask any questions and I have had any questions answered to my satisfaction.
- I am aware that if I have any further questions then I can contact a member of the research team.
- I understand that all information provided and data collected will be strictly confidential and will be stored accordingly, with access given only to people involved in this research project.
- I agree that the research data gathered may be published provided no name or other identifying information is used.
- I freely agree to participate in this research project as described and understand that I am free to withdraw at any time during the project without explanation or prejudice.
- I understand that I will be given a signed copy of this document to keep.

Name of Participant	
Signature of Participant	
Date	

Appendix E

Interview Guide

QUESTION	PROBES	STIMULI	PURPOSE
Please tell me about your coaching background – how did you get in to coaching? When did you decide you wanted to be a coach?	- Which sports? - Length of time coaching? - What levels/ages? - Formal coaching education? - School/university?	- Level of comp/results - Particular subjects studied/electives	- To place all future responses in context - Establish current performance/coaching level
Section 1: Understanding and importance of TID			
What does the term 'talent identification' mean to you?	- What are your coaching philosophies related to talent identification? - What is the 'end goal' of a talent ID program? - Do you think of talent identification as an 'immediate' (within a year) concept or more long-term? How far in advance can we realistically identify an athlete? Ages?	- Concepts - Processes - Age groups - National vs international - Why do we want to identify talented athletes? - What do we do with these talented athletes? - Can we identify talented athletes?	- Definition of talent identification

QUESTION	PROBES	STIMULI	PURPOSE
Section 1: Understanding and importance of TID			
You've just talked about what it means to you… can you think of an athlete who comes to mind? At what point would this identified athlete be 'successful'?	- Is success only about winning? - Does your definition of success change based on age group / athlete / experience level? - How would you define 'success' for talent identification?	- Improvement count as success? - National success vs international success - Elite success vs sub elite success	- Definition of athlete success - Probe for differing definitions based on age group/experience level - Definition of 'successful TID program'
Section 2: Current TID Processes			
How do *you* identify talented athletes?	- Does this change based on age/gender/weight category/athlete experience? - Do you take an athlete's progress/improvement into account? - What characterizes an athlete with the potential to become elite?	- Current TID processes within country - Typical athlete pathways - Has the process produced 'successful' athletes that otherwise might have been missed? - Drills - Performance under pressure	- Current use of TID - Perceived effectiveness of current TID methods

QUESTION	PROBES	STIMULI	PURPOSE
Section 3: Attributes necessary for long-term performance			
Think of an athlete that you believe has the potential to succeed long-term – what is it about them that makes you think that? What sets them apart from other athletes?	- Do these change with age/gender/experience/weight? - Can they be measured? - Can others be taught to see these things? - What makes the difference between a good (general) athlete and a great [sport] athlete? - Please provide examples - Can you pinpoint what it was that made you think that?	- Physical? - Psychological? - Competition scores? - Intuition/gut feeling? - Socioeconomic/upbringing?	- Specific, preferably measurable, factors or attributes that coaches use to predict talent
Of the things we've talked about, can you please rank them in order of importance for predicting future talent?	- Technical – repertoire - Technical - ability - Tactical - Mental Toughness/Resilience - Psychological skills - Competition results - OTHER (gut feeling) - Physical	- Use examples from conversation – use to probe for further insight - Is that true for everybody all the time? Gender, age, experience level, weight category… - How flexible is the list?	- Ranking order of importance - Understand fluid nature of TID processes

QUESTION	PROBES	STIMULI	PURPOSE
Section 3: Attributes necessary for long-term performance			
What are the 'non-negotiable' aspects of forecasting talent?	- Is there anything that no matter how good they are in other areas, if they don't have *x* they won't make it? - Can these be trained? - WHY is it important, WHO has it HOW do you compare it?	- Height - Strength - Correct body type - Mental toughness - 'want to fight'	- Non-negotiables
What are the "no-go's" of forecasting talent?	- Is there anything that is an absolute deal breaker – if they have this, then it's not worth the time/effort? - Can these be trained?	- Attitude problems (define?) - Weight problems (maintaining weight)	- 'deal breakers'
How much emphasis do you place on intuition/gut feelings/instinct?	- Please provide examples of an athlete who you 'just knew' was going to be good – how were they different from others?		- Role of coaches' intuition
How long do you need to observe an athlete for in order to identify them as talented?		- Settings (competition vs training) - Interaction (coach vs observation)	- Application of TID

QUESTION	PROBES	STIMULI	PURPOSE
		Section 3: Attributes necessary for long-term performance	
Is there a difference when identifying athlete's capacity to perform short-term (within a year) or long-term (five-ten years from now)?	- Why/why not? - Do you prioritize one form of identification over the other?	- Is there a difference or do you select all athletes the same way? - Is it possible to predict talent far into the future?	- Long term vs short term selection/identification methods
		Section 4: Commonalities in TID across combat sports	
Are there any talent identification/forecasting procedures that you would like to implement?	- Why/why not? - From other coaches or other sports/systems?	- Other combat sports - Racquet sports - European Soccer academies - NCAA system - Similar sporting demands (eg physicality, psychological makeup)	- Similarities between combat sports - Programs that might be useful

Appendix F

Example of Interview Coding

Example meaning unit	Example code	Example category	Theme
Now that I'm older, instinct comes into it a lot more. I trust myself more. Know to take into consideration more things, like the family environment	Time spent coaching / Instinct	Experience	Experiential Knowledge
[Instinct] comes with experience. It comes with the mistakes that you make, and that you recognise the mistakes so you get better, and the more you see the more examples you have	Recognition of examples	Experience	Experiential Knowledge
They do amazing work and you rely on sparring and drills, but in the end what counts is to have the proof in the realistic situation – the competition	Observations	Different scenarios	Context
You see, gut instinct is something that's [developed] over a period of time	Instinct	Takes time	Temporal Factors
He has to fight a certain type of fight, because of his size. He's small… so you have to give him the technical ability and tactics to be able to fight that distance	Athlete constraints	Compensation	Experiential Knowledge

Appendix G

Information Form – Coach Case Study

INFORMATION TO PARTICIPANTS

Research Title: Talent Identification by an Elite Taekwondo Coach: An Applied Case Study

Principal Researcher:
Alexandra Roberts; ▮▮▮▮▮▮▮▮ | Alexandra.roberts@ausport.gov.au

We would like to invite you to participate in this original research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

Aim:
The aim of this research project is to understand how an elite taekwondo coach develops his opinions of athletes' athletic talent over the course of a five-day camp.

Benefits:
This study will provide a baseline for future research into the use of coach judgements in talent identification.

What is involved?

Athletes: During an upcoming five-day Australian Taekwondo camp, the principal researcher (Alex Roberts) will observe your training and testing sessions and take notes about the content of these sessions. No activity outside of that required by the camp will be requested of you.

Coach: At the end of each day, Alex will interview you about your experiences from the day and your opinions regarding the athletes' potential. Twice during the camp (day 3 and day 5) you will be asked to group the athletes according to your current level of perception of their talent. You will also be asked to participated in a brief pre- and post-camp interview on the same topics. The total time of your involvement in this project is anticipated to be 5 hours.

Who we are recruiting?
We are recruiting elite, national level taekwondo coaches within Australia

Confidentiality:
All data will be kept confidential and stored on password-protected computers. It will only be seen by members of the research team and used for academic research. If published in an article or report, or presented at a conference, all identifying information will be removed. The coach will be described as 'Head Coach', and country of origin and previous employment will not be stated. You will receive a report of the results of this study six months after completion.

Ethics Approval:
This study has been approved by the Australian Institute of Sport ethics committee. If you have any concerns, you may contact the secretary of the AIS Ethics Committee on 02 6214 1577.

Further information:
For further information on any aspect of participating in this study, please contact the principal researcher (Alex Roberts).

Appendix H

Consent Form – Coach Case Study

<u>**'INFORMED CONSENT' FORM (Adult) - Coach**</u>

Project Title: Talent Identification by an Elite Taekwondo Coach: An Applied Case Study

Principal Researchers: Alexandra Roberts

This is to certify that I,   hereby agree to participate as a volunteer in a scientific investigation as an authorised part of the research program of the Australian Sports Commission under the supervision of Alexandra Roberts.

The investigation and my part in the investigation have been defined and fully explained to me by Alexandra Roberts and I understand the explanation. A copy of the procedures of this investigation and a description of any risks and discomforts has been provided to me and has been discussed in detail with me.

- I understand that I am consenting to the use of previously collected data and possibly identifiable data

- I understand that I will be described as "Head Coach", and that my country of origin and previous employment will not be stated in any published materials.

- I have been given an opportunity to ask whatever questions I may have had and all such questions and inquiries have been answered to my satisfaction.

- I understand that I am free to deny any answers to specific items or questions in interviews or questionnaires.

- I understand that I am free to withdraw consent and to discontinue participation in the project or activity at any time, without disadvantage to myself.

- I understand that I am free to withdraw my data from analysis without disadvantage to myself.

- I certify to the best of my knowledge and belief, I have no physical or mental illness or weakness that would increase the risk to me of participating in this investigation.

- I am participating in this project of my (his/her) own free will and I have not been coerced in any way to participate.

- I have read and understand the product and policy information provided to me on surrounding the use of supplements/medications within the study (where applicable)

Privacy Statement: The information submitted will be managed in accordance with the ASC Privacy Policy.

□ *I consent to the ASC keeping my personal information.*

Signature of Subject: _____   Date: ___/___/___

I, the undersigned, was present when the study was explained to the subject/s in detail and to the best of my knowledge and belief it was understood.

Signature of Researcher: _____   Date: ___/___/___

Information Form – Coach Reliability

Participant Information Sheet

Understanding coaches' ideas of talent identification and forecasting

Contact details and affiliations of researchers

Ms Alexandra Roberts	Ph: + ▇▇▇▇▇▇▇▇ or ▇▇▇▇▇▇▇▇▇
Associate Professor Annette Raynor	Ph: +61 8 6304 2771 or a.raynor@ecu.edu.au
Ms Fiona Iredale	Ph: +61 8 6304 2559 or f.iredale@ecu.edu.au

School of Medical and Health Sciences

Edith Cowan University, Joondalup, Western Australia

Dr Clare Humberstone	Ph: +61 2 6214 7343 or clare.humberstone@ausport.gov.au

Australian Institute of Sport

Dr Daniel Greenwood	daniel.greenwood@memphis.edu

University of Memphis

1. Introduction

We would like to invite you to take part in our research study, which will investigate the perceptions of expert combat sport coaches regarding talent identification in sport. This study will be carried out by academics from Edith Cowan University, in collaboration with colleagues from the Australian Institute of Sport. This *Information Sheet* tells you about the research project and what you will be asked to do. Knowing what is involved will help you decide if you want to take part in the research. Please take time to read this information sheet carefully. One of our team will explain anything that you do not understand and will answer any questions you may have. Please note that participation in this research is entirely voluntary – if you do not wish to take part, then you do not have to. If you decide you want to take part in the research project, you will be asked to verbally confirm your consent.

2.   What is the purpose of the study?

The aim of this study is to investigate how coaches' perceptions of athletic talent change over time, and how well coaches agree on an athlete's potential. We hope that the information obtained from this study will inform other coaches, sport policy-makers and sports science practitioners about talent identification with combat sports, and ways to make talent identification more effective.

3.   Why have I been invited to take part in this study?

You have been invited to take part in this study because you are a coach who has been invited to attend a state or national development and/or selection camp for athletes.

4.   What does the study involve?

You will be asked to rate athletes involved in the camp based on your subjective opinion of their potential future in the sport. The rating will occur on a scale from 1 to 11 (1 being very little potential, 11 being potential future Olympic medallist), and will occur twice a day for the duration of the camp. It is expected that the ratings will take approximately five minutes per session. The number of athletes you will be asked to rate will be no more than 25.

5.   Who is organising and funding the research?

This study is being organised and funded by Edith Cowan University in collaboration with the Australian Institute of Sport.

6.   How will my confidentiality be protected?

All information relating to this research project will be confidential and will be stored securely. All electronic data will be stored on an external hard drive in password protected files, and all hard-copy data will be stored in a locked cabinet at the Australian Institute of Sport. If you choose to withdraw from the study all data collected up to that point in time will be destroyed.

7.   What happens with the results?

The results of this study may be published in reports, journals, conference proceedings and doctoral research theses. Information collected during the project may be used in future work aimed at developing a talent prediction model for combat sports. In any publication or presentation, information will be provided in such a way that you and the athletes you are rating cannot be identified.

8.   What happens when the study ends?

After the study is completed we will analyse the data to determine the consistency of your ratings across the camp, and to examine the agreement between coaches during the course of the camp. If you are interested, you may be provided with a summary of the full results once the research project is completed.

9.   What are the potential benefits and/or risks in taking part in this study?

There are no expected benefits for you personally in taking part in this research; however your voluntary participation would be greatly appreciated. Eventually, it is hoped that this research will improve your talent identification abilities and practices, so that you can better identify athletes with the potential to become world-class athletes.

10.   Do I have to take part in this study?

It is up to you if you want to take part in this study – participation is voluntary. If you decide to take part and later change your mind, you are free to withdraw at any stage and you do not have to give a reason for your withdrawal. If you chose to withdraw, there will be no changes in your relationship with Edith Cowan University or the Australian Institute of Sport. If you do decide to take part, we will describe the study and review this information sheet with you. You will be asked to sign a written consent form to show that you have understood the information provided.

11.   Who should I contact if I have any questions or concerns?

If you have further questions please contact Ms Alexandra Roberts who is the chief investigator of this study at Edith Cowan University. Please find her contact details at the start of this information sheet.\

12.   Ethics approval

This study has been approved by the Edith Cowan University Human Research Ethics Committee. If you have any concerns or complaints about the research project and wish to talk to an independent person, you may contact the University's Senior Research Ethics Advisor (contact details below):

Ms Kim Gifkins

Senior Research Ethics Advisor

Edith Cowan University

270 Joondalup Drive

Joondalup WA 6027

08 6304 2170

research.ethics@ecu.edu.au

Thank you for taking the time to consider this study. If you wish to take part, please sign the attached consent form. This information sheet is for you to keep.

Appendix J

Consent Form – Coach Reliability

<div align="center">

CONSENT FORM – PARTICIPANT

Understanding coaches' ideas of talent identification and forecasting

</div>

Chief Investigator:
Ms Alexandra Roberts
Chief Investigator
School of Medical and Health Sciences
Edith Cowan University, Joondalup, Western Australia
Ph: ███████████ or Email: ███████████████

Associate Investigators:
Associate Professor Annette Raynor (Edith Cowan University), Ms Fiona Iredale (Edith Cowan University), Dr Clare Humberstone (Australian Institute of Sport), Dr Daniel Greenwood (University of Memphis).

Declaration by Participant
- I have been provided with a copy of the Participant Information Sheet explaining the research project.
- I have read and understood this Information Sheet and I understand the purpose and aims of the research project.
- I have been given the opportunity to ask any questions and I have had any questions answered to my satisfaction.
- I am aware that if I have any further questions then I can contact a member of the research team.
- I understand that all information provided and data collected will be strictly confidential and will be stored accordingly, with access given only to people involved in this research project.
- I agree that the research data gathered may be published provided no name or other identifying information is used.
- I freely agree to participate in this research project as described and understand that I am free to withdraw at any time during the project without explanation or prejudice.
- I understand that I will be given a signed copy of this document to keep.

Name of Participant	
Signature of Participant	
Date	