THE PSYCHOLOGY OF ATHLETE SELECTION: PERCEPTIONS AND PROCESSES

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Abstract

The objectives of this dissertation were to explore the factors influencing talent wastage within sport and to illuminate areas of improvement for athlete selection practices. To accomplish these objectives the research program used both qualitative and quantitative approaches. Chapter 2 involved a narrative review of the literature to identify factors affecting selection accuracy within and beyond the sport domain. In Chapter 3, a PRISMA-based systematic review was conducted on the literature examining the accuracy of the professional sport draft system in North America. The next two chapters utilized a qualitative design, where the research question, data collection, and data analysis were all guided by a pragmatistic paradigm. More specifically, these chapters explored a group of expert distance running coaches' subjective beliefs about 'talent' (Chapter 4) and talent selection practices (Chapter 5). Finally, in Chapter 6, a tool was developed, and a pilot experiment was conducted to examine the decision-making-behaviour of a group of rugby coaches. Several key findings were revealed through this program of work. Chapter 2 highlighted athlete selection is affected by a complex interaction of various factors. Such factors may include confusing or conflicting beliefs about talent, political and system-wide pressures, and cognitive biases and other decision-making fallibilities. Chapter 3 revealed inefficiencies within the North American draft systems and provided insight into some of the selection challenges at even the most resource-rich stages of the sport pathway. The qualitative analyses showed distance running coaches perceived talent to be complex, nuanced, and easily confused with other closely related terms (Chapter 4) and that coaches made selections using both formal and informal selection strategies that were influenced by their personal and systemic constraints (Chapter 5). Finally, findings presented in Chapter 6 emphasized the difficulties in designing a tool to assess decision-making and selection behaviour in the context of sport. These difficulties

are believed to be connected to the individual differences in how ‘success’ is measured and how ‘talent’ is defined and assessed. In summary, findings of this research program suggest talent is a prevalent and pervasive construct that influences the way coaches think about and select athletes.

Dedication

To my mom, dad and Geoff. Words will not truly express my gratitude for your love, support, care, and guidance. You have all gone above and beyond when it comes to providing a foundation for me to grow and pursue my goals. Thank you for teaching me the value of hard work, and to appreciate the work worth doing. Mom, you have checked for spelling and grammar on an outstanding number of my papers. I am hopeful the number of requests for editing will continue to decrease with time, but please do expect multiple calls asking for clarifications on plural and possessive nouns. Thank you for allowing me to direct conversations at the dinner table to explore and unpack theories and definitions, and I am sorry for pointing out the word 'talent' whenever we hear it, and for asking you to provide your interpretation of it. Thank you for continuing to be a teacher and mentor in my life. Dad, I am deeply saddened by the fact that you could not see me graduate either Masters or PhD work, as you were one of my strongest influences for pursuing higher education. You instilled in me, that education has the power to make the world a better place. I couldn't agree more. I promise to continue to learn and grow for as long as I possibly can (just as you did). Miss you dearly. To Geoff. How lucky I feel to have embarked on this journey with you by my side. You truly are my better half, not to mention the half that is calm, cool, and collected when I need it the most. Thank you for being my voice of reason and logic, for listening to so many audio books and podcasts with me on car rides and subway trips about decision-making. You have a beautiful way of seeing the world. Thank you for being wonderful you. I like you and I love you.

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Chapter One: General Introduction

Introduction

With the increasingly professionalized nature of youth sport, it is becoming more common for athletes to be streamlined into formalized and competitive sport pathways. This streamlining typically involves the early identification (i.e., the act of recognizing athletes through assessment) and selection (i.e., the act of choosing an athlete to a team) of 'talented' athletes. Despite the pervasiveness of talent identification, talent selection, and talent development (i.e., the act of nurturing an athlete in a sport program), the debate about what talent is, where it comes from, and whether it should be 'identified' and 'selected' is ongoing (Till & Baker, 2020).

Defining Talent

A combination of factors drives this persistent debate. Arguably, one of the most influential factors is the lack of a universally accepted definition of talent (Reilly et al., 2000; Till & Baker, 2020). Numerous definitions exist, each one rooted in varying perspectives regarding talent's origin (nature, nurture, or a combination of the two). For example, Gagné (2000) described talent as "the superior mastery of systematically developed abilities (or skills) and knowledge in at least one field of human activity, to a degree that places an individual within the top 10% of age peers who are (or have been) active in that field" (p. 67). Talent has also been defined as "any innate capacity that enables an individual to display exceptionally high performance in a domain that requires special skills and training" (Simonton, 1999; p. 436). In a similar sense, Gray and Plucker (2010) argued talent is the "exceptional natural ability of an individual to perform a sports-related task or activity" (p. 364). These are just three of the definitions amongst a broad range proposed formally by researchers, and it is likely practitioners

use many more ‘working’ definitions, giving the construct of talent a confusing, nebulous, and abstract existence (Baker & Wattie, 2018).

In a broader sense, talent has been defined as “the quality or qualities identified at an earlier time that promotes or predicts exceptionality at a future time” (Cobley et al., 2013; p. 3). While this definition likely captures how practitioners use talent in identification and selection initiatives (i.e., as prediction exercises), it does not, however, frame how talent might differ from similar terms such as ‘skills’, which could be developed through experience. In a more focused and specific sense, Howe and colleagues (1998) defined innate talent as a) based on genetic structures and therefore partly innate, b) having full effects that may not be apparent until later in life, c) having early indicators that can be used for predictive purposes, d) possessed by a minority of children, and e) domain specific, meaning it is likely unique to a particular domain (i.e., a single sport or even similar-natured sports). A definition such as this provides a deeper understanding of what talent is/might be, its origin, along with some of the criteria for assessing its ‘presence’.

To strengthen this area of exploration and help uncover clues in relation to the question ‘*what makes a person talented?*’, Till and Baker (2020) proposed a list of characteristics. Specifically, talent was suggested to be a) emergent (can grow and develop), b) influenced by environmental factors (e.g., impacted by resources and relationships with others), and c) person-specific whereby athletes require unique developmental approaches. While these criteria have broad applications spanning different types of sport, in different locations, for various ages and competitive levels, other researchers have sought to explore the specific criteria for certain groups. For example, in the sport of gymnastics, Pion and colleagues (2015) studied 243 young gymnasts’ performance levels over the span of five years and found the most ‘talented’ gymnasts

(participating in clubs at the highest competitive level for the area) scored highly in ‘basic motor skills’, ‘shoulder strength’, ‘leg strength’, and ‘gross motor coordination’. In rowing, Nurjaya and colleagues (2020) developed a model that can be used to identify rowing ‘talent’ (e.g., competed at the international level) and included measures such as ‘body height’, ‘length of legs’, ‘leg strength’ and ‘muscle power’, ‘self-confidence and motivation’, ‘aerobic and anaerobic power’, and ‘recovery and drive’. These investigations (among others examining closely related concepts like ‘expertise’; Di Cagno et al., 2009; Faber et al., 2012; 2015; Gray & Jenkins, 2010, Schorer et al., 2020), advance our understanding of what ‘talent’ might be, but a predominant finding is that a recipe card for ‘talent’ and ‘talent development’ remains elusive (Johnston et al., 2018; Johnston et al., 2021a).

This elusive nature of talent is likely influenced by many factors, perhaps most notably, for factors relating to talent’s immense complexity. Take, for example, the influence of genes, which are positioned as a primary factor influencing sporting expertise (Baker & Horton, 2004). Although scientific advancements have allowed a deeper understanding of the role of genetics in sport performance (e.g., genetic differences have been found to exist between athletes and non-athletes; Hruskovicova et al., 2006; Scanavini et al., 2002; Tucker & Collins, 2012), at this time, there may be too many variations of those genes to be used as effective testing strategies. This makes the ‘silver bullet approach’, with a single gene or even a couple hundred genes explaining and predicting elite athletic performance, oversimplified and unlikely (Davids & Baker, 2007; Jacques et al., 2019; Landen et al., 2019). Moreover, a coach or athlete has limited control over

his/her/their[1] genetics, which limits the applicability of this information for coaches and other athlete identifiers and selectors - especially at younger levels of sport participation.

In contrast, an athlete's quantity and quality of practice are factors recognized to be much more 'controllable'. Practice has been a substantial, and well-documented, piece of the puzzle for the development of 'expertise'[2] (Baker et al., 2003; Ericsson et al., 1993; Ward et al., 2007). Fairly consistently, individuals who are described as 'expert' or who have 'expertise' have accumulated a greater number of sport-specific practice hours compared to non-experts (Baker & Young, 2014; Bruce et al., 2013; Eccles, 2020). In many cases, experts have invested at least 10 years (or 10,000 hours)[3] of practice in their sport (Ericsson et al., 1993); however, in a similar way that genes affect development, the number of hours necessary to reach expert status also holds a high degree of variability (Abernethy et al., 2003; Baker & Young, 2014; Eccles, 2020; Ericsson, 2013).

In addition to the challenges relating to inter-person variability, another factor relating to talent's complexity is its dynamic nature. Simply put, not everyone who is 'talented' early in life is 'talented' later in life, and vise versa. For example, Durandt (2011) noted only 24 percent of athletes who competed nationally (who were considered to be both 'expert' and 'talented') at the under 13 level continued on to the national under 18 level. This 'emergent' quality of talent often disrupts long-held perceptions of talent, which typically see it as static (Jones et al., 2020). These beliefs about talent's static nature are often manifested through selection practices occurring at

[1] His/her/their or he/she/they has been used throughout the dissertation to represent a singular, hypothetical person. In the chapters that had been previously published, the use of his/her/their or he/she have been updated to reflect this change in the interest of staying consistent throughout the document.
[2] "Expertise" is a closely related concept to talent, and is sometimes used interchangeably; in this case, expertise can be defined as someone who "…has gained special skills or knowledge representing mastery of a particular subject through experience and instruction, we call this person an expert" (Ericsson, 2000; p. 187).
[3] The 10,000 hour benchmark has been recognized in many sports, but it should be noted that its generalizable nature ignores most aspects of individual variability (Gulbin et al., 2013).

very early stages in the sport pathway. For example, it has been reported that selection decisions have been made for children at the age of five in some sports in certain nations (Vaeyens et al., 2008; 2009; see also ITV News (2022) for a specific example). These deeply held beliefs regarding either the stability or variability of sporting talent, have important implications for both research and practice. Specifically, they have the potential to shape perceptions regarding athletes' present ability and future potential, developmental strategies, and philosophies, and by extension, the ways in which athletes are nurtured. For this reason, understanding these subjective beliefs is a critical first step in understanding talent, talent selection, and talent identification.

Study Rationale

The aforementioned aspects of talent (i.e., that it is dynamic and complex), along with many other influential factors, make it difficult to assess and measure. This is observed through low accuracy rates for athlete selection along with other inefficiencies along the development pathway (Brustio et al., 2021; Farah & Baker, 2021; Johnston et al., 2021a; Koz et al., 2012). For example, Farah and Baker (2021) discovered the National Hockey League has substantial inaccuracies in draft selections beyond the first two rounds of the draft. Similarly, in one of the few studies examining the long-term accuracy of talent identification, Schorer and colleagues (2017) investigated the ten-year predictive ability of national-level European Handball coaches. Coaches' predictions of athletes' future performance-levels were less-accurate than a post-hoc model based on motor test data (Schorer et al., 2017).

Perhaps unsurprisingly, indicators for potential inefficiencies have also been found in lower levels of competitive sport. Güllich (2014), for example, found an average annual turnover rate (i.e., the number of athletes who progress from one level to the next) of 24.5 percent in

German youth elite football academies. Moreover, a significant portion (70 percent) of athletes who started in the programmes, were not in the programmes five years later. Similarly, Brustio and colleagues (2021) found a 'low conversation rate' in the European Swimming Federation, suggesting most elite junior athletes do not sustain elite performance into adulthood. More specifically, the average conversion rates ranged from 10 to 26 percent in males and from 23 to 33 percent in females and this changed based on swim distance and age category. Collectively, these studies highlight several areas where more work is required, such as understanding gaps in the decision-making process and the potential actions that can be taken to fill these gaps.

One way forward in helping coaches/selectors increase their accuracy and decease inefficiencies is to better understand selection practices at both macro (what tests are used) and micro levels (why those tests are used and how that information informs final decisions). Currently, this is an under-researched area given the importance of the topic. Jokuschies and colleagues (2017) helped to fill this void with their work investigating Swiss soccer coaches' talent criteria and the ratings of those athletes following a selection. Their work highlighted a strong correlation between coaches' stated preferences and their selection decisions, suggesting the use of some type of 'mental model' when assessing athletes for selection. In contrast to this mental modelling approach, Lyle and Vergeer (2013) recognized that some coaches make 'choice decisions' when it comes to selections, which were described as decisions that are situationally-dependent, fluid, and not necessarily criteria-driven. In a similar sense, Christensen's (2009) study of Danish soccer coaches and Roberts et al's (2021) examination of judo, boxing, and taekwondo coaches, identified that coaches made decisions about whether an athlete is talented and whether he/she/they should be selected to the team 'without conscious thought' and classified this type of approach as using 'intuition' and 'gut feeling'.

The use of ‘intuition’ and ‘gut feeling’ appear to be critical strategies for identifying and selecting talent, and, as a result, these are important areas of exploration. Specifically, determining what these beliefs are comprised of and how they affect selection practices may hold insight into the personal, sport, and system preferences when selecting ‘talent’. In a recent review of studies examining the ‘coach’s eye’ in sport (i.e., the process coaches use when assessing/observing athletes), Lath and colleagues (2021) identified ‘intuition’ as one of the four main characteristics of the ‘eye’ (the others being; ‘subjective’, ‘experience-based’, and ‘holistic’). One of the articles highlighted in their review by Roberts and colleagues (2019) recognized ‘intuition’, ‘gut feeling’ or ‘coach instinct’ were used as a way to make selection decisions. To explore this further, Roberts and colleagues’ (2021) investigated the types of information influencing a coach’s ‘intuition’ and found a) experimental knowledge, b) temporal factors, c) seeing athletes in a particular context, and d) what can be worked with (i.e., the belief around a coach’s ability to develop an athlete) to be the driving factors. These findings suggest coaches’ ‘intuition’ may hold many different meanings, serve various purposes, and be person- and situationally-dependent.

Interestingly, ‘intuition’ and ‘gut feeling’ are recognized to some in the psychological and decision-making fields as being potentially problematic for decision-making accuracy (Silver, 2012; Tetlock & Gardner, 2015). This is mainly because, compared to other more logic-driving approaches, ‘intuition’ and ‘gut feeling’ are believed to have a greater reliance on fast- and frugal-thinking strategies (i.e., heuristics) and a greater reliance on preconceived opinions towards or against something or someone (i.e., biases). On the one hand, these quick judgements can be helpful for making energy- and time-efficient decisions as coaches and selectors are not always given the luxury of having unlimited time and data for decision-making. On the other

hand, these biases can lead to systematic and predictable errors in judgement and selection (Cripps et al., 2019; Gigerenzer et al., 2012; Gilovich et al., 2002; Kahneman & Tversky, 1979; Mann, & van Ginneken, 2017; Tversky & Kahneman, 1974).

In sport science, one bias in particular has received considerable attention. The 'relative age effect' reflects the increased likelihood of a coach or selector to select a relatively older athlete (i.e., born earlier in the calendar year used to group children into age groups) than a relatively younger counterpart because he/she/they appears to be bigger and stronger at that point in time (see Dixon et al., 2020; Kelly et al., 2021; Turnnidge & Kelly, 2021; Wattie et al, 2015 for further readings). Entire texts have been devoted to understanding this persistent bias). Other documented biases in sport as noted by Putrino and colleagues (2021) include a racial stacking bias (i.e., increased likelihood for scouts to select certain races to certain playing positions) and tacit knowledge bias (i.e., the increased likelihood for a scout to judge positions more harshly if he/she/they played in that position). Except for a relatively few studies in the area, little is known about the prevalence of such biases, and whether any of these strategies (i.e., using heuristics, biases, intuition, or gut-feeling) are helpful or hurtful when crafting judgements and making selection decisions.

For these reasons and more, few would dispute the difficulties in making athlete selection decisions (Putrino et al., 2021). It has been reported as one of the most challenging and disliked elements of being a coach (Capstick & Trudel, 2010a, 2010b). Perhaps part of this reason is because the act of 'selecting' often means removing or limiting an athlete (i.e., deselecting), which comes at an emotional and social price for both the athlete and coach. In some cases, deselection can reduce the likelihood of an athlete reaching professional level sport, and can also decrease feelings of self-confidence, athletic identity, and connection to sport (Brown & Potrac,

2009). Despite these challenges, talent selection will continue to be a regular practice within sport, at least for the foreseeable future, due to inherent resource limitations of sport systems (i.e., there are not enough resources to keep everyone within the system).

Crudely, there are two potential ways to improve athlete selection, a) increasing the accuracy of selection, and/or b) decreasing the impact of selection decisions (e.g., have stronger parallel systems in place to support an athlete after being removed; Galetti et al., 2016; Vaeyens et al., 2008). In this dissertation, the primary focus for exploration is on understanding how to improve accuracy. To this end, investigating questions like 'who is responsible for selecting athletes?', 'how does the athlete selector make selection decisions?', 'what are the beliefs grounding those decisions?', 'what information is used in forming judgements?', 'what environment(s) do these selections occur within?', and 'how stable are those decisions?' will be critical steps to improving selection accuracy.

Research Objectives

The purpose of this dissertation was to address some of the limitations noted in the preceding sections. The goal of this work was not to answer questions like *what is talent*, *how is talent selected*, or *do biases help or hurt selection accuracy?* Rather, the purpose was to build a foundation for future work to explore those questions. Specifically, the research objectives of this dissertation were to explore the factors influencing talent wastage within sport and illuminate areas of improvement for athlete selection practices.

In alignment with these objectives, this program of research is described in the following seven chapters. The dissertation begins with two reviews, one narrative review (Chapter 2) and one systematic review (Chapter 3) on talent and talent selection in sport. Chapters 4 and 5 describe a qualitative case study design of elite distance running coaches, where the rich

description of sport coaches' perceptions and subjective beliefs of what talent is (Chapter 4) and how it is selected for (Chapter 5) were investigated. Finally, Chapter 6 explores the design of a tool to assess coaches' selection behaviours. A more detailed description of each chapter is provided below.

Chapter 2 employed a narrative review strategy to identify and map the available evidence on why decision-making errors might exist within sport. This approach was chosen to determine the breadth and depth of literature on decision-making accuracy for selection that extended beyond the context of sport science as very little evidence exists within sport directly. More specifically, this review draws from research focusing on decision-making in the context of social science, humanities, and natural sciences.

Chapter 3 utilized a systematic review, using the Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA) guidelines, to scan, analyze, and summarize literature on the professional sport draft system in North America. This approach was chosen to better understand the available evidence on the strengths and the weaknesses of the draft. The highest level of competitive sport in North America (for men's teams in those particular sports) was chosen as the draft is a highly scrutinized selection process, and one that receives considerable resources (time, energy, and money). An assumption was made, that if selection inefficiencies and errors were occurring at the highest level of competition for those four sports, this could reflect broader inaccuracies that may occur earlier in the selection pathway. For example, compared to selection decisions at younger ages, selections at the professional draft often mean athletes have been tracked and monitored for their abilities, development, and progression over a significant period of time (sometimes years) and have accumulated hundreds if not thousands of datapoints over those years. As well, these athletes are typically older (18-

23), which can be viewed as being a time of greater 'variable stability' over the developmental pathway. Additionally, selections at the draft usually occur with ample resources (time, energy, and money) compared to those at the earlier stages of the competitive pathway.

Informed by the findings of the research syntheses in Chapters 2 and 3, the next two focused on the limitations identified within the talent identification and selection processes. Specifically, **Chapters 4 and 5** utilized a case-study approach whereby semi-structured interviews were conducted with an elite sample of distance running coaches from across Canada. Chapter 4 sought to explore whether the word 'talent' was part of the coaches' lexicon in how they interact with and think about the athletes they work with, and if so, how and when the term was used. Chapter 5 utilized the same sample as Chapter 4 (elite distance running coaches), however, the focus of the interview questions was less theoretical and more practical in nature. Specifically, the focus of these semi-structured interviews was to better understand how coaches select athletes to their team (e.g., their processes, practices, and strategies). Distance running coaches were the focus of this research as a) distance running is an individual sport (i.e., removes the nature of selecting for athletes for certain positions as a coach would for a team sport), b) athletes are typically older (i.e., when developmental characteristics are more stable), and c) is measured in terms of objective performance (i.e., time).

Findings from Chapters 2-5 directly informed the creation of **Chapter 6** (the experimental study) as there was a clear need to closely examine some of the mental processes used by coaches in selection settings. To this end, an experimental tool was created for the purposes of investigating the selection behaviour of coaches in mock selection environments. This tool was then examined through a pilot study with elite coaches to better understand its strengths and weaknesses. In contrast to chapters 4 and 5 which focussed on the individual sport

of distance running, this study focused on a team sport (i.e., rugby). This decision was based on several factors including the desire to explore a more complicated selection environment, as well as convenience since a partnership with sport practitioners had already been created.

Collectively, this dissertation makes several contributions to the field of talent identification and selection. Specifically, findings provide a) practitioners with evidence to re-consider their draft and selection strategies (Chapters 2 and 3), b) researchers and practitioners with an in-depth understanding of the characteristics of talent and selection processes from the perspective of a unique and elite sample of coaches (Chapters 4 and 5), and c) sport stakeholders with evidence regarding the selection behaviour of coaches, which may further inform coach education models (Chapter 6). The dissertation concludes (**Chapter 7**) with a list of key findings of this work, along with practical implications and future directions.

Chapter Two: Waste Reduction Strategies: Factors Affecting Talent Wastage and the Efficacy of Talent Selection in Sport

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***This manuscript has been presented in the formatting that has been accepted and published in the respective journal. References are included at the end of the dissertation starting on page 177.*

Abstract

Coaches are faced with the difficult task of identifying and selecting athletes to their team. Despite its widespread practice in sport, there is still much to learn about improving the identification and selection process. Evidence to date suggests selection decisions (at different competitive levels) can be inaccurate, bias driven, and sometimes even illogical. These mistakes are believed to contribute to 'talent wastage', the effect of a selector's wrongful selection and/or deselection of an athlete to/from a team. Errors of this scale can lead to negative repercussions for all stakeholders involved and therefore deserve further exploration. It is the purpose of this paper to shed light on the potential factors influencing talent wastage and to illuminate possible psychological pitfalls when making decisions under uncertainty.

Key Words: talent, talent selection, talent wastage, selection bias, cognitive bias, decision-making

Introduction

In an effort to predict and select the next athletic superstar, substantial resources (e.g., time, money, and energy) are invested with the hope of gaining an edge over the competition. Although there is some evidence to show improvements in the identification and selection of athletes (Tetlock, 2016), research suggests accuracy rates for predicting athlete potential remain quite low (Abbott & Collins, 2004; Johnston et al., 2018; Koz et al., 2012; Schorer et al., 2017; Vaeyens et al., 2008).

The talent selection process typically takes place early in an athlete's life and involves administrative personnel (such as a coach, scout, or talent identifier[4]), who are tasked with identifying and predicting future athletic success. Often a series of tests (primarily focused on the physical or physiological attributes of an athlete) combined with coach observations (Christensen, 2009; Schorer et al., 2017) are used to assess performance (Lidor et al., 2009). Following this assessment period, talent selectors make decisions regarding which athletes should be included (selected) or excluded (deselected) from the team. To date, there does not appear to be a 'gold standard' approach to talent selection; rather, there appears to be a high degree of variability in the techniques, protocols, and processes used for assessment and selection. Current approaches range from intuition (Christensen, 2009; Lund & Söderström, 2017; Williams & Reilly, 2000) and the use of standardized testing batteries (e.g., 40 meter sprint, vertical jump; Gabbett, 2009; Wells et al., 2009) to hypothesis-free machine-learning approaches[5] (e.g., Güllich et al., 2019). Some researchers describe the talent selection approaches to be analytical and economically rational (Slack & Parent, 2006), while others have challenged

[4] The term 'talent selector' will be used throughout the paper to capture all three classifications.
[5] In 2003 the Boston Celtics of the National Basketball Association selected Brandon Hunter based on the output of computer algorithm. He became the first player to be picked by an 'equation' (Lewis, 2016).

the assumption that talent selection can be a rational or objective process (Christensen, 2009; Cushion & Jones, 2006; Lund & Söderström, 2017), describing the process as impulsive, irrational, atheoretical, and costly (Bar-Eli et al., 2011).

It has been acknowledged by coaches that selection and deselection decisions are amongst the most challenging aspects of coaching (Capstick & Trudel, 2010). Not only does a wrongful selection or deselection decision hurt the program from a performance and resource allocation perspective, but it could also lead to serious repercussions for the athlete. Pinder et al. (2013) called this wrongful inclusion or exclusion "talent wastage[6]" and proposed that a potentially large number of talented performers are excluded from competitive sport opportunities. Perhaps this is because once an athlete is deselected, the likelihood of that athlete reaching the elite levels of sport is greatly reduced (Huijgen et al., 2014). Moreover, athletes who have been deselected from a team have reported feelings of anxiety, humiliation, anger, along with a loss of athletic identity, sense of self, and connectedness to school (Barnett, 2007; Blakelock et al., 2016; Brown & Potrac, 2009; Grove et al., 2004; Neely et al., 2016). Over the past few years, there has been increased interest in understanding talent identification and selection with the goal of improving how these processes occur and thereby reducing talent wastage. In this paper, we summarize what is known about the factors affecting the efficacy of talent identification and selection in sport and highlight several areas where this process might be improved.

It is likely much of the 'waste' is connected to the poor predictive capabilities of talent identification programs, which may be related to a number of different factors including, a) a

[6] The term 'talent wastage' refers to wastage of 'potential' throughout the athlete development system leading to system inefficiencies. The authors would like to acknowledge the baggage associated with the word 'wastage' and would like to acknowledge that we are using this term as it relates to system efficiency.

lack of understanding of what talent is and the way it manifests, b) cognitive biases affecting human judgment, and c) situational factors affecting the quality of decisions being made. With the limited research conducted directly on influences affecting talent selection in sport, this paper will explore research from other relevant domains (e.g., psychology, economics, and medicine). The present paper uses a narrative review approach to extend beyond a mere description of relevant articles and to act as a 'launch pad' for future development in the field, rather than answering a specific research question using a systematic approach (Grant & Booth, 2009). The aforementioned factors included for this narrative view were determined through mapping review exercises to better understand the extent and gaps within the literature on the topic (Evidence for Policy and Practice Information and Co-ordinating Centre, 2006).

Limited Understanding of Talent and How it Evolves over Time

Arguably, one of the most fundamental issues affecting the accuracy of talent predictions is the limited understanding about the phenomenon itself. In forecasting situations, decisions are made based on the availability of information and the combined assumptions about how that information relates to future performance (Schorer et al., 2017). Although seemingly straightforward, what information is deemed 'important' and how that information relates to future talent remains relatively unknown. A recent systematic review conducted on talent identification research from 1990 to 2015 highlighted only 20 articles (from an original list of 1,696 articles) examined the differences between highly skilled and less-skilled athletes over a period of 1 year or more (Johnston et al., 2018). Results from this review speak to a lack of comparative, longitudinal studies and expose the limited knowledge we have about talent and how it can be effectively measured. Even within this limited evidence base, there is large variation in the way talent is defined and likely an even greater degree of variation in the way it

is understood and applied in practice. Baker et al. (2018) suggested future research may benefit from improved operationalizations of talent in order to better evaluate the validity of this concept (see also Baker & Wattie, 2018; Bergkamp et al., 2018).

In addition to some of the definition-related issues, our understanding of how talent develops and evolves over time is limited. This is important to recognize because sporting organizations in many nations are increasingly tasked with the identification of talent at younger and younger ages (Abbott & Collins, 2004; Lidor et al., 2009; Mann et al., 2017; Williams & Reilly, 2000) with reports of early identification for children occurring at six years of age (Baker & Wattie, 2018). Despite the prevalence of early selection practices and how deeply rooted they are in athlete development programs, reliable and valid indicators of adult performance have yet to be found (Baker & Wattie, 2018; Ericsson & Charness, 1994, 1995; Ericsson, 1998; Nash & Collins, 2006; Wattie & Baker, 2017). This is likely related to the unsupported assumption that talent follows a predictable trajectory. Goodman (1946) called this assumption the 'riddle of induction', whereby evidence from the past leads to a rule intended to predict the future. The challenge of projecting from the past is that it creates a linear and causal model in a judge's[7] mind which may lead to problematic and restrictive ways of thinking (Taleb, 2007).

These causal relationships (between variable(s) x and talent outcome y) are difficult to justify unless they meet the criteria that variable x precedes y temporally, is reliably correlated, and has a direct correlation with y beyond random chance (Kennedy, 1979). In sport, this is rarely the conditions for decision-making, and in reality, the evidence for talent development is not strong enough to support causal claims at this point in time. As Simonton (1999) and Howe et al. (1998) noted, being talented at a young age does not necessarily lead to being talented later

[7] For the purposes of this paper, the term 'judge' will be used to represent a person crafting a judgment for decision to be made.

in life, or vice versa. Additionally, many of the qualities that distinguish top athletic performance in adults may only emerge later in development (Bloom, 1985; French & McPherson, 1999; Morris, 2000; Simonton, 1999). Moreover, some believe talent[8] emerges out of dynamic networks with multiple components and multiple interactions speaking to the "unpredictable" nature of talent (Den Hartigh et al., 2016; Phillips et al., 2010; Simonton, 1999). The literature focusing on the accuracy of predictions in other disciplines such as meteorology and stock trading has highlighted a relationship between time and accuracy of predictions, whereby time is inversely related to accuracy (Silver, 2012; Swets, 1988). Poincaré (1913) argued that projections into the future require increasing amounts of knowledge and precision about the process(es) under examination, as the rate for possible error grows rapidly.

Unfortunately, the degree of precision necessary for effective predictions for talent in sport does not match the current degree of knowledge. For example, Silver (2012) noted that performance statistics taken from high school or college level in baseball hold barely any predictive power for future performances in the minor (AA and AAA) and major leagues. There is an added challenge for forecasters, and specifically talent selectors, to make predictions using variables that are in a state of change (Elferink-Gemser et al., 2007; Pearson et al., 2006; Vaeyens et al., 2008). For example, a female athlete between the ages of 11–14 is thought to be at her "peak height velocity," a time characterized by rapid changes in height and weight (Philippaerts et al., 2006). Depending on when she is assessed, it may help or hinder her chance for selection to a team as many of her attributes and capabilities may fluctuate (Vaeyens et al., 2008). Although there are a number of tests demonstrating statistically significant associations with future sport success, such tests are questionable in their ability to accurately predict talent in

[8] Some studies use synonyms such as 'excellence' in reference to 'talent'.

sport (Bahr, 2016), especially given the unstable and dynamic nature of talent posing a potential infinite number of interactions to consider (Den Hartigh et al., 2016, 2018a). The combined effects of a limited understanding about what talent is/might be and how it changes over time, have implications for effective talent selections. It is also likely this limited understanding is amplified by the many cognitive limitations that arise during decision-making processes and procedures.

Cognitive Biases, Illusions and Perceptions Affecting Judgments about Talent

Human decision-making is beset by psychological pitfalls, something that has been more widely recognized in the last few decades. In addition to being prone to biases, humans (and therefore their decisions) have been shown to be highly influenced by emotion, fatigue, hunger, and mood (Danziger et al., 2011; Johnson & Tversky, 1983; Slovic et al., 2002; Västfjäll et al., 2014). Collectively, these studies speak to the reality of the 'human effect' and demonstrate the difficulty in avoiding or reducing biases (both consciously and subconsciously), even in the most 'objective' professions.

Put succinctly, wherever there is a requirement for human decision-making, there is potential for error. Each decision maker will have his/her/their own preferences and values, but some common habits exist when forming judgments where a) there is a tendency to rely on a relatively small number of cues (n = 3–5), b) many judgments follow a linear and predictable way of thinking, and c) there is a low degree of inter-judge agreement (Hastie & Dawes, 2001). This is not to paint all judges with the same negative brush, but rather to acknowledge that even 'expert' judges adopt similar ways of thinking. Some of the linear and predictable ways of thinking include a tendency to a) forget specifics and remember generalities, b) store memories differently depending on the way they were experienced, c) be drawn to details that confirm

personal beliefs, d) find stories and patterns in sparse data, e) fill in characteristics to fit stereotypes and prior histories, and f) project current mindsets into the past and future (Benson, 2016). In the decision-making process, from formulating judgment to executing a decision, there are many opportunities for cognitive shortcuts and biases. Some of these shortcuts (i.e., heuristics) can be helpful in the decision-making process and some can be hurtful (Simon et al., 2017). To highlight how these thinking patterns may affect judgments regarding talent, we describe a select few, specifically a) personal preferences and intuition, b) framing and the endowment effect, c) the illusion of confidence, and d) the primacy effect.

Personal Preferences, Beliefs, and Intuition

Perhaps the greatest influences affecting the selection of athletes are the preferences, beliefs and/or goals of the talent selector (Christensen, 2009; Jokuschies et al., 2017). A talent selector's lived experiences along with the education and environment he/she/they was/were exposed to (known as tacit knowledge), are likely to influence the types of athletes selected (Christensen, 2009; Cushion & Jones, 2006; Lund & Söderström, 2017). However, few researchers have attempted to study how talent selectors develop, access, and utilize, knowledge at appropriate times and how that knowledge plays a role in their decision-making (for exceptions, see Christensen, 2009; Cushion & Jones, 2006; Mills et al., 2012; Lund & Söderström, 2017; Vrljic & Mallett, 2008). Simon (1955) observed that decision makers identify a relatively small number of cues to form simplified models to evaluate complex problems. This model is believed to reflect the decision-makers' personal preferences, beliefs, or goals[9] (Lund & Söderström, 2017). In a sport-related example, Bucci et al. (2012) recognized that coaches

[9] Simon's 'administrative' model of decision-making was applied to the economics domain but may hold relevance for understanding how coaches make decisions during selection processes (Neely et al., 2016).

selected their ‘best’ athletes based on their similarity to the coaching staff and the alignment to the staff’s ideologies/values. This type of approach speaks to the importance of personal values and their role in influencing decisions.

Under conditions of uncertainty (i.e., outcome is not known), talent selectors often have incomplete information (e.g., they may not know a player very well, may not know very much about his/her/their past performances, and may be uncertain about how the athlete will perform at a higher level). As a result, decisions may be influenced by a decision-maker’s ‘intuition’ (Nash & Collins, 2006; Plessner et al., 2011). These automatic-thinking processes can be time-efficient strategies but can also lead to systematically flawed decision-making outcomes. Nash and Collins (2006) argued that as expertise grows, the decision-making process becomes less well-defined in a talent selector’s mind. Similarly, Davids and Myers (1990) proposed that with increased expertise, there is a greater reliance on intuitive feelings. It is also important to consider talent selectors may think they are using intuition to make a decision, but in reality, have a well-defined approach for selection, but difficulty articulating their thoughts (Nash & Collins, 2006).

In a study exploring the sources of information coaches used to assess talent, Christensen (2009) found coaches tended to use their visual experience to recognize patterns to help identify talent, referred to as the “coach’s eye”. What is not well known is whether this coach’s eye differs from intuition and whether it is helpful in increasing the accuracy of talent predictions. It is possible the coach’s eye is a superior selection approach as expert coaches have extensive domain specific knowledge (Côté et al., 1995; Nash & Collins, 2006), and are believed to think in different ways than non-experts (Chase & Simon, 1973; North et al., 2011). For example, it has been recognized that skilled and less-skilled individuals search for information and perceive

their environment in a very different manner (McRobert et al., 2009; Raab & Johnson, 2007[10]). Ericsson and Kintsch (1995) proposed skilled individuals have complex task-specific encoding skills and memory retrieval structures that differ from less-skilled individuals. However, further research is required to better understand what the "coach's eye" entails and its relative strengths and weaknesses in talent selection decisions (Andersson et al., 2005; Jokuschies et al., 2017; Vaeyens et al., 2008; Williams & Reilly, 2000).

Framing and the Endowment Effect

Many professional sports use a 'draft' process to select newly eligible athletes to their team. Because of the considerable cost of athlete salaries in many professional sports, draft selections come with considerable economic risk, as demonstrated by the discrepancy in salaries across draft rounds (Massey & Thaler, 2010). It has been reported that the first overall pick can sign an initial contract of up to four times the amount of the last pick even in the same round (Massey & Thaler, 2010). In their classic studies on the psychology of decision-making, Tversky and Kahneman (1981) demonstrated the outcome of a decision depends on how the scenario is framed. For example, a question framed in terms of losses, often leads to a person making 'risk adverse' decisions. In contrast, a question posed in terms of gains, often leads to more 'risk seeking' decisions (Tversky & Kahneman, 1981). Given the generality of this cognitive bias, it is possible a talent selector who is told to acquire an athlete (framed in terms of gains) may become 'risk seeking', which could lead to overvaluing the desired player. On the other hand, if the talent selector is asked to trade an athlete on the team (framed in terms of losses), they may become more 'risk adverse'. This relates to a recognized phenomenon called the 'endowment effect',

[10] The examples provided include participants who are in a temporarily constrained visual task, which challenges the transferability of findings to other domains.

where there is a tendency to overvalue things already owned and to undervalue things that are not owned (Kahneman et al., 1990, 1991).

Both ‘risk aversion’ and the ‘endowment effect’ are closely related to the ‘sunk cost bias’, whereby the investment in something (time, energy, or money) leads to the feeling that one must get a worthy return on his/her/their investment (e.g., the feeling of obligation to drive to the symphony in a horrible snow storm only because a ticket had already been purchased). Often a sunk cost is accepted in an effort to avoid social or personal disproval. In sport, a talent selector may turn down a trade that he/she/they might have otherwise made due to the influence of the ‘endowment effect’ or the ‘sunk cost bias’, which subsequently may affect the accuracy of talent selections (for examples, see Keefer, 2017; Lewis, 2016; Staw & Hoang, 1995; Staw & Ross, 1989).

The Illusion of Confidence

A relationship has been observed between perceived levels of confidence and the accuracy of predictions. In many domains, evidence suggests confidence exceeds accuracy (Keren, 1991; Lichtenstein et al., 1982; McClelland & Bolger, 1994); examples include physicians’ predictions of pneumonia (Christensen-Szalanski & Bushyhead, 1981), economist’s quarterly forecasts of recession (Braun & Yaniv, 1992), and chess players’ predictions of their opponents’ moves (Griffin &Tversky, 1992). This overconfidence is believed to correlate with making relatively systematic errors in predictions (Alpert & Raiffa, 1982; Kahneman & Tversky, 1973) as it has been suggested those with increased levels of confidence are prone to greater levels of dispositional biases and/or illusions to avoid social disproval (Tsay & Banaji, 2011). For instance, the ‘confirmation bias’ (Nickerson, 1998) is common in ‘overly confident’ judges where there is a tendency to search for, focus on, and remember information in a way that

corroborates that judge's hypothesis. In another example, overly confident forecasters fell victim to 'retrospective distortion' more frequency than their less-confident counterparts (Fischhoff & Beyth, 1975; Hertwig et al., 2003; Nickerson, 1998). Known as the 'hindsight bias', or the 'knew it all along' effect, retrospective distortion is characterized by the tendency to see past events as being more predictable than they really are (Fischhoff & Beyth, 1975; Hertwig et al., 2003).

Psychologists Robyn Dawes, Paul Meehl, and Phil Tetlock are known as the 'expert-busting' researchers (Lewis, 2016). Their studies have exposed an 'expert problem' whereby, those who have a 'bigger' reputation are often worse predictors than those who hold a less notable reputation in certain fields (Camerer & Johnson, 1997; Taleb, 2007; Tetlock, 2005, 2016;). In his book, Meehl's (1954) reviewed 20 studies showing that well-informed experts who predicted outcomes were not as accurate as a simple algorithm that aggregated objective data. In a similar sense, a study by Tetlock (2005) surveyed political pundits who were asked to make predictions for multiple major events in 1980s and 1990s. Findings revealed the experts were only slightly more successful than random chance, worse than a basic statistical model of prediction, and reported high levels of overconfidence. Schorer et al. (2017) compared regional and national coaches' predictions of the future performance of handball athletes and found there was little difference between levels of coaches and their prediction accuracy. Last, newspaper tipsters were not found to be more successful in predicting soccer matches than the simple strategy of assuming home wins (Forrest & Simmons, 2000). It is important to acknowledge that not all of these examples directly relate to coaching expertise and decision-making accuracy; however, it does raise important questions about the 'expert effect' and how it might influence the accuracy of predictions for talent. This is not to paint the picture that all experts are poor decisions makers (as there are plenty of counter examples see Tetlock, 2016), rather these

examples highlight the importance of exploring confidence as a potential factor or proxy for illogical or irrational decision-making processes for talent selection in sport.

Time to Make a Prediction and the Primacy Effect

In most cases, talent selectors have limited time to gather information about an athlete and whether he/she/they should be accepted to the team. It can be common for a talent selector to only have two or three interactions with an athlete before a judgment and subsequent decision is made. In junior ice hockey (e.g., House League), coaches draft players based on try outs over the span of a few days (Tromp et al., 2013). In the Netherlands, talent identification and development programs for soccer at the youth and adolescent levels begin after the first day of training and subsequent deselections are made on a daily basis thereafter (Huijgen et al., 2014). With such a constrained amount of time, a coach's ability to make informed assumptions about an athlete's potential is compromised. This is especially true if that athlete is not performing at his/her/their 'best' during the assessment period (i.e., injury, personal circumstances, etc.).

Additionally, Nickerson (1998) noticed that a decision maker's thoughts are often dominated by his/her/their initial impressions, known as the "primacy effect". This primacy effect may hold particular interest to decision makers because a talent selector's first impression may be the only impression that he/she/they remembers from a try-out or talent identification camp. If an athlete underperforms (compared to his/her/their standard) then that athlete may need to work even harder to impress the talent selector to overcome the primacy effect (Silver, 2012).

Situational Factors

In addition to the previously mentioned influences affecting talent selection, there are situational factors that affect a talent selector's accuracy. These factors include, a) the use of standardized testing batteries, b) the incorporation of machine-based approaches, c) politics or

policy-related issues, d) the number and personality of people in the decision-making process, and e) the limited opportunities for feedback to update decisions.

Standardized Testing Batteries

To date, much of the research on talent identification has focused on the types of testing batteries used in talent identification programs (Breitbach et al., 2014; Lidor et al., 2005). Despite the focus on testing, there is little agreement on which tests reliably predict talent; moreover, very little is known about how test results influence the decision-making process. It is likely the type of testing battery, the execution and measurement of the tests, and the way the results are used, all affect the accuracy of talent selection. Some of the most commonly used methods include physical and anthropometric testing (Gil et al., 2014), technical skill measurements (Höner et al., 2017; Vaeyens et al., 2006; Waldron & Worsfold, 2010; Williams & Reilly, 2000), assessment of tactical (Kannekens et al., 2011) and perceptual cognitive capabilities (Causer & Ford, 2014; Roca et al., 2012; Ward & Williams, 2003), as well as evaluation of psychological factors (Toering et al., 2009). In most studies, measurements have been unidimensional in nature with a focus on one area of performance (e.g., solely the physiology of the attribute). Within those unidimensional studies, there is little agreement on whether those factors reliably predict successful performance (Lidor et al., 2005; Lidor & Lavyan, 2002; Johnston et al., 2018). Moreover, the appropriate weight to give to an athlete's scores on different tests is largely unknown. For example, if an athlete tests poorly on an agility drill, but outperforms her teammates in a scrimmage, how do these scores affect the coach's evaluation of that athlete relative to selection? In essence, these issues relate to coaches' 'sensitivity' and 'specificity' when classifying athletes (Parikh et al., 2008). If a coach has a high level of sensitivity, he/she/they has/have an increased likelihood of correctly selecting athletes

who meet or exceed expectations. Similarly, a coach who has a high degree of specificity, may have an increased accuracy of deselecting athletes who would have been true under-performers. In reality, the ultimate level of sensitivity and specificity is difficult (if not impossible) to determine because there is little way of knowing if the 'correct' decision has been made (i.e., it is nearly impossible to determine whether the 'right' athletes were selected or deselected). This speaks to the importance of a coach knowing his/her/their comfort level with making a Type I or Type II error in the process. Until tests for identification and selection are sensitive enough to reflect the physical, psychological, and cognitive aspects of sport, in both elite and lower levels of competition, caution should be taken to avoid an over-reliance on testing measures to categorize or label individuals (such as 'talented' or 'untalented').

Pinder et al. (2013) proposed a driving factor affecting the low degree of reliability is related to inappropriate measurements of talent. Many talent identification programs are accused of adopting testing batteries that do not accurately represent the sport demands (Pinder et al., 2013). This is often combined with a reliance on a relatively small number of heavily weighted variables measured in isolation from the sport context (Abbott et al., 2005). It is also likely there is variability in the extent to which the same component contributes to successful performance across different sport domains, levels of competition, age of athletes, or even different playing positions within the same sport (Bergkamp et al., 2018). These non-representative, highly variable, and reductionist approaches have been recognized for limiting the ability to accurately test and identify talented athletes (for recent reviews on the fidelity of testing batteries see Bergkamp et al., 2019 and Den Hartigh et al., 2018b). A call from researchers has asked for more ecologically valid and representative designs that mirror the position-specific and context-specific demands of the sport to adequately assess athletic performance (Den Hartigh et al.,

2018b; Pinder et al., 2013). By rigorously studying an athlete's development over longer time periods (ideally more than one season if possible) and through a multidimensional lens (e.g., physiology, perceptual cognitive ability, psychology, and motor task ability, etc.), there is a greater likelihood for understanding the capabilities and limitations of measuring talent.

Machine-Based Approaches

One of the ways researchers and practitioners have tried to minimize the degree of variability due to human error and bias is by incorporating computer-based modeling. This can be done in two ways. First, many talent selectors at the professional level are turning to a blended approach to athlete selection, combining human judgment with artificial intelligence. In many professional sport leagues, the current debate is not whether statistics should be used in the decision-making process, but rather which statistics are best (Lewis, 2003; 2016). However, while this technique is starting to trickle down to lower levels of sport participation, little is known to date about the efficacy of prediction modeling for selection at younger ages of sport performance.

A second approach uses the computational power of modern technology to recognize more complex patterns of variable interaction. For instance, Güllich et al. (2019) used a machine-learning approach to identify patterns in key factors that distinguished 'super-elite' from 'elite' athletes in the United Kingdom. Conceptually, this approach considers possible patterns and interactions amongst a vastly superior number of variables than can be considered in traditional analyses. This approach among others (e.g., Maymin, 2017) may allow researchers to test more complex and dynamic models without the statistical power requirements of approaches such as Analysis of Variance or multiple regression. What is yet to be determined is whether

collecting and analyzing a greater number of variables can in fact lead to better predictions for sporting talent.

With a growing reliance on technology, more research is illuminating the relative advantages and disadvantages of using computers to help in forecasting situations. For instance, more rapid and reliable decisions are not necessarily better decisions. Poor initial input will compromise the accuracy of predictions (i.e., the ‘garbage in, garbage out’ analogy). Additionally, computers are reliant on sound and accurate models to form the basis for the coding underpinning the analysis and many scholars (for examples see, Abbott et al., 2005; Baker et al., 2018) have argued current models of sporting talent are too simplistic. Interestingly, however, with the appropriate information, simple computer models have been shown to be very good at making predictions (Bejnordi et al., 2017). Even when people claim their mental models are more complex than a simple linear equation, an overwhelming amount of empirical research suggests that a basic equation does a surprisingly good job of capturing their judgment habits and in most cases, outperforms their predictions (Cooksey, 1996; Den Hartigh et al., 2018b; Einhorn, 1972; Goldberg, 1968; Grove et al., 2000; Grove & Meehl, 1996; Libby, 1976; Meehl, 1954; Sawyer, 1966). These studies also illuminated experts correctly selected the variables that were important in making predictions, but surprisingly, the linear model that combined the variables and their associated weights, outperformed the global judgments of the same experts. In future work, it will be important to learn how computer systems can help evaluators make talent selection decisions. More specifically, it will be important to learn how they may help to overcome the constraints explored in the section below.

Political and Policy-Related Issues

The accuracy of talent selections may also be related to the politics at play. For a talented athlete, there may be many reasons he/she/they is/are not selected to the team. For example, some teams must include a certain number of domestic and international players and may be forced to make decisions to reach certain quotas (Aarons, 2018). In another example, a coach or other staff member with a child in the sport program may directly or indirectly influence the selection of his/her/their child at the expense of a more 'suitable' athlete to the team.

There is also a natural tendency to listen to others who are in positions of power, who exude confidence, and have overbearing personalities (Surowiecki, 2004). For instance, people trust more confident financial advisers over those who are less-confident, even when their track records (i.e., historical accuracy rates) were identical (Tetlock, 2016). It is possible that a talent selector will follow the advice or encouragement of a colleague or a parent because of the perception of authority or perceived confidence. Knight and Harwood (2009) noted that youth sport coaches were concerned about parents' reactions, and reported parents being a stressor in the selection process. For this reason, it is possible coaches make decisions based on the desire to appease others (i.e., parents, staff, and friends).

Number of People Involved in Decision-Making

The accuracy of predictions is thought to be influenced by the number of people involved in the decision-making process. There is strong empirical and theoretical evidence demonstrating a benefit from aggregating different forecasts (Budescu & Chen, 2014; Martire et al., 2018; Silver, 2012; Surowiecki, 2004). Across a variety of disciplines, spanning medicine to political polling, the averaging of forecasts (rather than relying solely on one forecast) has been found to reduce error (Hastie & Kameda, 2005; Surowiecki, 2004; Silver, 2012; Yaniv, 2004). The exact

number of forecasters needed to improve the accuracy of a prediction is still debated, but it appears there may be a 'goldilocks-zone' between having two few and too many forecasters. Moreover, 'crowd-sourcing' information has shown multiple advantages in the decision-making process as it can allow decision-makers to a) increase the amount of information available to craft a judgment, b) reduce the potential impact of an extreme source of information that may be unreliable (Ariely et al., 2000; Johnson et al., 2001), and c) improve the credibility and validity of the aggregation of information process (Wallsten & Diederich, 2001).

If individuals who evaluate sporting talent behave similarly to other prediction domains, selectors who include additional personnel from different perspectives in the decision-making process, may positively influence the accuracy of talent selections. This is likely dependent upon resources, program structure and situational constraints. For example, some programs may only have one coach (sometimes a parent) who is tasked with selection decisions, whereas other programs (e.g., in places like the Netherlands) have been reported to include trainers, coaches and technical staff in the selection process for adolescent soccer players (Huijgen et al., 2014). With an increased number of judges in the selection process, there is a greater likelihood of reducing bias and making a more 'rational' prediction (Surowiecki, 2004). This statistical phenomenon known as 'the wisdom of crowds' is rooted in the mathematical aggregation of individual estimates (Lorenz et al., 2011; Surowiecki, 2004). Under the right circumstances the wisdom of crowds effect can lead to surprisingly close estimations and predictions in different domains such as stock markets, political elections, and quiz shows (Surowiecki, 2004). Caution should be taken, however, as adding more people in the decision-making process does not always result in better decisions. For example, it has been demonstrated that even mild social

influences (i.e., power structures, politics, etc.) can negatively influence the wisdom of crowds effect in simple estimation tasks (Lorenz et al., 2011).

Feedback Opportunities

The nature of talent identification programs limits the ability for a talent selector to observe his/her/their accuracy in making predictions. For a prediction to be considered 'correct', a mechanism for feedback must be available to the decision maker. Many coaches (especially at lower levels of competition) may only have one season with an athlete and therefore will have limited knowledge of whether that athlete continued in competitive sport. It is possible that opportunities to receive feedback in such a long developmental pathway could be a limiting factor affecting accuracy rates. For instance, Tetlock (2016) noted police officers were not nearly as good as they thought they were at identifying subjects who were later found to be guilty from innocent ones, despite the fact they spend substantial amounts of time on such tasks as part of their duties. This is thought to relate to the fact that it often takes months or years for charges to be laid, trials to be run, and verdicts to be made. Even when there is a resolution, many factors may have influenced the outcome, and during that process, officers seldom receive clear feedback about whether their judgment was accurate (Tetlock, 2016). Although the systems they operate within hold considerable differences from law enforcement, meteorologists, in contrast, are provided relatively instant feedback and their accuracy rates continue to improve (along with technologies and other factors). Future investigations into the feedback opportunities and assessment strategies could be an important area of exploration in the context of talent selection.

Can Better Forecasts be Made?

It may be true that talent in sport cannot be studied with the rigor of chemistry or geology, but that should not necessarily mean that a reliance on quick-thinking strategies like

using ‘gut feeling’ and ‘intuition’ should be encouraged. Drawing inferences from other disciplines will only lead us so far, which is why it will be important for future research to study decision-making in the specific and varied contexts of sport. Part of the solution could be to place a greater emphasis on studying the process of decision-making for talent selection rather than the outcome of the decision itself (i.e., what are the sources of information talent selectors use when shaping their beliefs about players’ skill levels?). This may include asking talent selectors to explicitly state their perceived approaches for decision-making and to possibly even ask selectors to explain their ‘mental modelling’ if the selector believes he/she/they uses one (Musculus & Lobinger, 2018). Additionally, evidence from decision-making research encourages judges to express and quantify uncertainty in predictions by reporting a margin of error (Hastie & Dawes, 2001). This approach encourages judges to gather evidence in a meaningful way and provides a method to calibrate outcomes for feedback purposes (e.g., out of all the times you said there was a 40% chance, how often did that actually occur?). Combined with the recognition that our assumptions, biases, and illusions play a role in distorting and interpreting signals we receive (Silver, 2012; Taleb, 2007), this approach to talent selection may help selectors better understand their own processes, give context and meaning to their approaches, and provide a method for assessing accuracy.

As we enter the age of Big Data (e.g., larger and more robust datasets), with information and processing power increasing at startling rates, it is important to consider how we can incorporate computer-based modeling in a responsible way. It will be important to find a balance between combining the best of artificial intelligence and machine learning with human capabilities to create models that are detailed enough to be helpful, but also accurate enough to represent the phenomenon (Den Hartigh et al., 2018b; Silver, 2012). As noted earlier, what is

still unclear is whether the collection of more variables will in fact lead to more accurate predictions. This highlights the importance of recognizing that if you cannot make a good prediction, sometimes it can be harmful to pretend you can, especially when this involves providing feedback about athletes' 'potential' and/or removing those athletes from the developmental system.

Conclusion

To date, the available evidence of the accuracy of talent decisions by talent selectors is not compelling (Schorer et al., 2017). In this review, we have summarized a range of potential factors that may explain, at least partially, these low accuracy rates. However, it is important to note much of this research has been conducted outside of sport, meaning future work focussing on athlete selectors could help to inform our understanding of how judgments are formed and decisions are made, which in turn, has the potential to improve future predictions. With more effective decision-making procedures, it is possible to minimize talent wastage and minimize the risk of wrongfully deselecting an athlete from the sport participation pathway.

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Chapter Three: To Draft or Not to Draft? A Systematic Review of North American Sports' Entry Draft

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***This manuscript has been presented in the formatting that has been accepted and published in the respective journal. References are included at the end of the dissertation starting on page 177.*

Abstract

In theory, professional sport ‘entry drafts’ are designed to promote parity by granting poorly performing teams with early selections and winning teams with later selections. While this process has intentions to ‘level the playing field’, mixed findings exist in the literature. The aim of this review was to identify and synthesize the literature examining the efficacy of the draft for professional, North American sport leagues. A systematic review of four databases was performed according to PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines. Full-text articles containing relevant data on the draft system for the four major professional North American sports were identified. Further restrictions were made to include articles focusing on a specific outcome regarding future success (i.e., whether the draft related to a measure of future performance). The search returned 10,962 records and after screening, 18 articles were synthesized. Of the articles examined, the measures of future success with relation to draft order were a) career length and/or number of games played at the majors (n=8), b) future performance statistics at the professional level (n=5), c) change in winning percentage and/or number of wins produced (n=3), d) financial compensation (n=1), and e) a combination of measures a) to d), (n=1). Most commonly, the first/early rounds most accurately predicted future measures of success (i.e., number of games played, singing bonuses and playing statistics) across sports. The middle and late rounds were less accurate, with the degree of accuracy increasing slightly in the last rounds. This review highlights several opportunities to better understand the draft process (e.g., potential improvements in middle round picks) and emphasizes the need for more research on analyzing and scrutinizing the draft.

Key ords: amateur draft, athlete selection, talent in sport, decision-making, PRISMA, professional sport

Introduction

At many levels of sport performance, making selection decisions (deciding which players will remain in the system and which will leave) is an important part of creating a successful team. In the early stages of competitive sport participation, athletes participate in try-outs, a process of showcasing their skills in hopes of impressing the coach and resulting in their selection to the team. At higher levels of competitive sport, try-outs are conducted on a larger, more robust scale, often comprised of fitness assessments, scouting visits to meet the players, years of performance data, and video footage (Boulier et al., 2010; Kuzmits & Adams, 2008). This information, at least in principle, affords scouts and other selection personnel the opportunity to make more informed decisions about an athlete's previous performances, his/her/their current abilities, and future 'potential[11]'. Not surprisingly, the costs and benefits associated with these decisions can be quite significant. At younger levels of participation, the social and emotional price of telling an athlete that he/she/they does/do not have what it takes to be part of the team can be very detrimental (Barnett, 2007; Brown & Potrac, 2009; Grove et al., 2004; Huijgen et al., 2014; Neely et al., 2016). At higher levels, professional sports teams accept the risk of making false-positive and false-negative selection errors and wager millions of dollars on the attempt to identify and select the best athletes to their programs in an effort to win the championship title (Kuzmits & Adams, 2008).

It may come as no surprise that access to resources (money, coaches, training and playing environments) can create financial disparities for teams when trying to select athletes. At the professional level, teams with larger budgets are able to offer larger salaries to more sought-after athletes, often leading to disparity among teams in the league. In an effort to mitigate some of

[11] For the sake of the present paper, the term 'potential' is used to describe the present demonstration of abilities that are believed to translate into future athletic success.

these disparities, the 'amateur entry draft' (also known as the 'draft') was created. In North America, it was originally introduced in the sport of football in the National Football League (NFL) in 1936 as a way to prevent teams from accumulating 'too much talent' (Berri & Simmons, 2011; Boulier et al., 2010; Demmert, 1973; Weistart & Lowell, 1979). The intentions were, and continue to be, to provide weaker teams a relatively greater opportunity to improve their programs (Canes, 1974), to deter costly bidding wars for 'talented' young athletes, and to help minimize the chance a team would monopolize the best, young players (Popper, 2004).

Currently, many professional sport leagues (both men's and women's sports) hold entry drafts across many countries. Arguably the most well-known sports in North America with drafts are Major League Baseball (MLB), National Basketball Association (NBA), NFL, and National Hockey League (NHL). These leagues have collective bargaining agreements that govern their actions pertaining to the recruitment and development of athletes (Dryer, 2008). For example, MLB, the NBA, the NFL and the NHL are unable to recruit players through academies or by purchasing their rights on the transfer market (Farah & Baker, 2020). Rather, athletes are selected only once they have met the minimum league-specific age requirements and are invited to join a team through the entry draft process[12] (Farah & Baker, 2020). During the draft, teams take turns selecting (drafting) their future players in a predetermined order which is generally based on the previous year's performance standings (aka the team that comes in last, gets to pick the first athlete, the second last place team gets the second pick, etc.)[13] (Popper, 2004). After the team with the best record selects an athlete, the 'first round' of drafting is complete and the

[12] The MLB is the exception where teams are permitted to sign Latin American players as free agents at 16 years of age. It is also unique in the sense that the MLB has two main drafts and two supplementary drafts each year.
[13] There are exceptions to this rule, as well. To avoid teams purposely performing poorly to gain an advantage in the draft, a lottery system was developed. This lottery system meant that coming in last did not guarantee an earlier pick, but rather increased the odds.

processes is repeated until the number of pre-established rounds (based on the league and the year) has been reached (Boulier et al., 2010). The act of drafting a player means the team earns the rights to sign that athlete to a professional contract. However, drafted athletes typically do not enter to the professional league right away; they are often re-assigned to the teams from which they were drafted, or are asked to join other developmental leagues until the team believes they are ready for the higher level of competitive performance (for more information on the entry draft and its intricacies, please see Boulier et al., 2010; Farah & Baker, 2020).

The foundational assumption of the draft is that players selected earlier have more 'potential' than players in the same playing position selected later. Therefore, when executed effectively, there should be a relationship between the order in which players are chosen in the draft and their playing performance in the professional league (Boulier et al., 2010; Treme & Allen, 2011). However, there is both anecdotal support and peer-reviewed evidence questioning the ability of sport executives/team managers to make the most cost-effective selections of athletes to their teams (Boulier et al., 2010). For example, work by Massey and Thaler (2013) suggests the NFL draft choices are 'economically inefficient', where managers overvalue early draft choices relative to later draft choices. In a specific case, Tom Brady was chosen in the 6th round, as the 199th pick of the 2000 draft, only to become one of the most renowned NFL quarterbacks in history. Other quarterbacks, (such as Warren Moon and David Krieg) had very successful careers in the NFL but were not even selected in the draft (Boulier et al., 2010). In another example outside of football, Staw and Hoang (1995) discovered the playing time of NBA players who were drafted early, over-exceeded their playing performance. The authors speculated the managers were unwilling to admit their 'errors' and felt obligated to provide playing time to the earlier picks, irrespective of their ability. In contrast to these examples, there

are many stories of successful draft decisions. The Pittsburgh Penguins of the NHL, for example, has one of the more notable stories. In 2004, the franchise was reportedly on the verge of folding, but won the draft lottery in 2005 and was awarded the opportunity to select the first athlete in the draft. The team selected Sidney Crosby, who helped the team appear in 12 playoffs and win the championship in three of those years (Badenhausen, 2018).

To date, a systematic review using the Preferred Reporting for Information in Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) has not been conducted exploring the efficacy of the draft for the four major North American professional sports leagues. To help fill this gap in the literature, the purpose of this systematic review was to identify, summarize, and interpret the peer reviewed literature to date on the efficacy of the draft process in its ability to accurately predict the future performance[14] of draftees. This type of research synthesis is valuable for understanding general trends and conclusions from a research area and intends to fill a gap for a more robust review of the literature on peer reviewed studies according to the criteria outlined below. In addition to academic contributions, this review has practical implications as it outlines the specific areas of the draft that were found to be inefficient, thereby highlighting where more 'talent identification' resources need to be dedicated to improve selection strategies.

Methods

The present systematic review was conducted using the PRISMA guidelines outlined by Moher et al (2009). Using the databases Web Of Science™, SPORTDiscus, EconLit, and JSTOR for Economics and Business, the following search terms were used to examine the abstract and

[14]Future performance in the context of this paper captures the measurements of an athlete's subsequent playing career in the major leagues following the draft (as opposed to the minor leagues -e.g., the AHL), and considers an athlete's playing statistics (e.g., number of catches, number of goals, etc.), career length and financial compensation.

title: ‘draft’ AND ‘sport’, ‘selection’ AND ‘sport’, and ‘identification’ AND ‘sport’. Other databases (e.g., PsychInfo and Scopus) were also searched; however, a small yield of articles combined with a high degree of overlap between articles from the other databases led to the removal of the searches from those databases for the purposes of this review. Additionally, external searches were conducted to yield a greater number of articles outside of these searches (e.g., reading references lists) as per the guidelines from Moher and colleagues (Moher et al., 2009).

To determine the specific search terms used in the review, the authors first completed a brief scoping review of the research to identify common language addressing this field of research. The terms ‘draft’, ‘selection’, and ‘identification’ were the most common terms found throughout the scoping review. As the draft is a very specific and unique process, there were very few additional synonyms that existed without the use of the word ‘draft’, which was why only ‘selection’ and ‘identification’ were used as supplementary terms. Once duplicate articles were removed, the refinement process was implemented to eliminate articles with titles and abstracts that did not match the established inclusion (and exclusion) criteria which are detailed below. Articles were kept for further screening if they a) were in full-text journal article format (i.e., conference proceedings, commentaries, or abstracts were not included), b) published between January 1900 and November 2019, c) written in English, d) related to sport and e) specifically examined the draft or athlete selection or identification process. Following this initial screening, a secondary screening took place to determine whether the articles met the final inclusion criteria of a) focused on the four major, North American, men’s professional sport leagues (i.e., NBA, NFL, NHL, MLB), and b) examining the efficacy of the player draft [15] (e.g.,

[15] This review did not include articles examining re-entry draft or the salary arbitration system.

how the draft relates to some measure of success in the future). For a figure depicting the PRISMA process and the associated number of articles, please see Figure 1. It is important to mention that under these specific criteria, studies examining undrafted free agents were excluded from our analysis. This is because such players were not selected with a specific pick number; therefore, they did not fit the scope of this study which is focused on *selection number/round* as a predictor of future performance.

The articles in each league are analyzed by their measure of future success, and separated into the following categories a) length of career/number of games played and likelihood of playing in the majors, b) future performance metrics (e.g., number of passing yards, number of touch downs, number of tackles etc.), at the professional level, c) financial compensation, d) change in teams' winning percentage/number of wins produced, and e) mixed (some variation of these categories). The following sections will synthesize the articles by each professional sport as well as their respective measure of success along with their context (e.g., draft level, playing position, etc.), where applicable (please refer to Table 1 for the overview of articles by sport, measure of success, and findings).

Results

Through the data collection phase of the PRISMA, 10,804 articles were extracted from the searching of databases, another 90 were found outside these databases. After screening these articles for duplicates, 8620 articles remained and 8309 of those articles were removed based on their title and abstract. This left a total of 311 full-text articles to be examined in detail, with only 18 meeting the final inclusion criteria as the others either did not focus on professional sport and/or examined only pre-draft variables (e.g., combine scores). Three of the final 18 articles examined the MLB, seven examined the NBA, six examined the NFL, and one examined the

NHL. A separate category was made for the sole article that examined all four professional sports.

MLB

Studies examining the MLB draft were quite sparse (n=4; 3 with a MLB focus and 1 mixed-sport study), despite the statistically-based movement following the Oakland A's 'Moneyball' phenomena (Lewis, 2003). Three articles examined the measure of future success in terms of length of career/number of games played and likelihood of playing in the majors (Caporale & Collier, 2013; Koz et al., 2012; Spurr, 2000). Two of these found a significant relationship between draft pick and playing time in the majors where the earlier[16] a player was taken in the draft, the increased likelihood of playing in the major leagues[17] (Caporale & Collier, 2013; Spurr, 2000). It is important to note, however, the article by Spurr (2000) found a drop-off in the size of the effect after the 34th round out of 40, indicating the draft was more effective in earlier rounds. Conversely, in the solo, mixed-sport study by Koz et al (2012), the authors found no significant differences between the draft rounds for number of games played.

In the remaining study by Burger and Walters (2009), the relationship between draft order and financial compensation was examined. The authors discovered team managers selected lower quality athletes but did not accurately adjust the signing bonuses to reflect the quality of picks. This pattern was most prevalent in the second and third round. The authors used the term 'irrational' to describe team managers' spending approaches.

[16] In the articles examining draft order (e.g., not articles examining draft round or number of draft picks per team) it is important to note that it is treated as a continuous variable with lower values being more desirable (better) as the player is selected earlier in the draft round (Robbins, 2010).

[17] The study by Caporale and Collier (2013), only examined the players in the first round of the draft.

NBA

Among the studies of the NBA draft (n=8; 7 focused on the NBA and 1 mixed-sport study), three examined the length of career/number of games played and likelihood of playing in the majors, three examined future performance statistics at the professional level, and one examined a change in winning percentage of teams. Of the three articles studying length of career/number of games played and likelihood of playing in the majors, Coates and Oguntimein (2010) found early draftees, on average, had longer careers - however, differences were much smaller later in the draft, suggesting the teams' abilities to identify future performance is more effective earlier in the selection process. Koz et al (2012) found no significant differences between draft rounds for games played, whereas Teramoto et al (2018) found draft order was significantly correlated with playing time in the first three years of a player's NBA career.

Four studies investigated future performance statistics at the professional level. Young (2008) found the earlier draftees were selected, the more points, assists, rebounds and blocks they scored, and the fewer steals and turnovers they had. However, there were no observed effects of draft order on shooting percentage or blocks. Motomura (2016) examined the specific relationship of NBA efficiency (NBAEFF; the net accumulation of positive and negative recorded basketball 'acts' (points rebounds, assists, steals etc.), and WP (wins produced), which together were considered a measure of efficiency. With respect to draft position, when comparing international players to players who are from The USA, Motomura (2016) found international players drafted through 2001 tended to outperform their expectations (adjusted for draft positions), which led to teams subsequently drafting more international players. However, after 2001, first-round picks tended to underperform, implying that teams overcompensated. This further suggests teams have not reached optimal evaluation of international players relative to

USA-trained players. In the study by Moxley and Towne (2015), the authors found that draft order was significantly correlated with NBA win shares during the first three years of players' careers. This win share metric uses a mixture of efficiency measures (e.g., how often players are involved in plays) and while not a perfect measure of success, it is believed to be a reliable metric of 'all round' performance. In the final study in this category, Groothius et al (2009) examined the efficiency of draft picks based on an efficiency formula (combining points, rebounds, assists, steals blocks, field goal attempts, field goals made, free throws attempted, free throws made, and turnovers). They found more false positives existed than correct decisions with draft picks taken higher in the draft. That said, if 'superstar players' were found, they were usually identified early. The authors noted "the dilemma of choosing talent is not so much a winner's curse but more like a purchase of a lottery ticket. Most times you lose, but, if you are going to win, you must buy a ticket" (p. 3198).

Finally, Berri et al (2007) examined 'wins produced' finding no convincing evidence that draft order predicts future NBA wins. More specifically, they found draft order only explained less than 5% of wins produced per 48 minutes of play, and 7% of total wins produced.

NFL

In the peer-reviewed literature, the NFL tied the NBA for the greatest number of studies (n=7; 6 focused on NFL and 1 mixed-sport study). Within this sub-set of articles, three examined length of careers and or/number of games played at the professional level, (Hendricks et al., 2003; Hurley et al., 2012; Koz et al., 2012) two studies examined the change in future winning percentages (Lock & Gratz, 1983; Reynolds et al., 2015), one examined players' expected salaries (Burnett & Van Scyoc, 2013), one study examined future performance statistics (Berri &

Simmons, 2011), and one study examined multiple indicators and were therefore considered 'mixed' (Boulier et al., 2010).

Amongst the studies examining length of careers and/or number of games played, Hendricks et al (2003) and Koz et al (2012) both found significant relationships between draft order and games played. Koz and colleagues (2012) revealed earlier rounds were more significantly related to career length than later rounds, once again reinforcing the notion that the draft is more effective in the earlier rounds. Conversely, Hurley et al (2012) found a significant number of the players drafted did not play in the NFL and this fraction tended to grow with draft position.

For studies of winning percentages with relation to draft order, Lock and Gratz (1983) found a low, but statistically significant relationship between teams' positioning in the draft (i.e., how early they select) and their change in winning percentage. The authors suggested "the benefits derived from the current draft in terms of the equalization of team strengths are substantial enough to justify these heavy costs" (p. 26). Similarly, Reynolds et al (2015) found a statistically significant, moderate sized effect between draft pick value and a team's winning percentage, and a low, but statistically significant relationship between the total number of first round picks and winning percentage. The authors suggested their results indicated the draft was effective in its ability to contribute to 'competitive balance'.

In their study, Berri and Simmons (2011) found that quarterbacks selected early in the draft have better per-game metrics. However, when per-play metrics were analyzed, they found that quarterbacks selected early perform worse on a per-play basis than ones selected later. What this suggests is that early draftees simply play more, but do not perform better than their counterparts selected after them. This conclusion was based on 19 variables (e.g., passing yards

per pass attempts, touchdowns per pass attempt, touchdowns per pass attempt, etc.) across all pick positions.

Last, in the mixed-focus study by Boulier et al (2010), the authors found both quarterbacks and wide receivers taken in earlier rounds had longer careers - with those taken in the first and second rounds being significantly more successful than quarterbacks and wide receivers selected after the second round. For quarterbacks, the number of passes thrown declined significantly from the top of the second round to the top of the third round. Additionally, the earlier a quarterback was drafted, the better his quarterback rating (indicator of performance), and for this measure, there was a sharp drop from the first to the second round. Similarly, for wide receivers, an earlier draft pick was related to more passing yard receptions.

NHL

As noted, there was only one peer-reviewed study dedicated solely to examining the NHL draft (Dawson & Magee, 2001), as well as one that included the NHL in their mixed-sport approach (Koz et al., 2012). Both of these articles examined length of career/number of games played and likelihood of playing in the NHL as the measure of future success. Dawson and Magee (2001) found the number of NHL games played decreased sharply as the draft pick number increased, but the relationship flattened out in later picks. Similarly, Koz and colleagues (2012) found NHL career length significantly differed across draft rounds in a descending fashion, but stabilized in the later rounds of the draft. These findings speak, once again, to the earlier rounds of the draft showing higher accuracy than the later rounds.

Discussion

Of the 18 studies (from an initial search result of 10,804 records) examining the efficacy of the draft in predicting a future measure of success for the four, major North American

professional leagues, most (n=8) considered length of career/number of games played and likelihood of playing in the majors as their key indicator of ‘success’. Further, five others considered future performance statistics at the professional level, three examined a change in winning percentage/number of wins produced, while the remaining studies considered indicators of financial compensation (n=2) or a mixture of outcomes (n=1). Overall, the studies in this systematic review indicate the draft across all four leagues has inefficiencies. While some demonstrated the strength of the draft process (Lock & Gratz, 1983; Reynolds et al., 2015), many authors questioned the ability of the draft to accurately identify ‘talent’ and for those in decision-making positions to act in a ‘rational’ and ‘logical’ manner (Berri et al., 2011; Berri & Simmons, 2011; Burger & Walters, 2009; Groothuis et al., 2009; Koz et al., 2012). Particularly, the general findings indicate that first round draftees do, in fact, go on to outperform their peers in the future. However, the large discrepancy in future performance in subsequent rounds, which for the majority of the draft, suggests decision makers’ abilities to accurately find talent past the initial rounds is suboptimal. That said, the diversity in the study foci combined with the overall sparse number of articles make it difficult to determine clear conclusions about the efficacy of the player draft in relation to measures of success. However, in the following discussion, we will attempt to draw some inferences from the research.

Imperfect Data for Forecasting

Predicting the future, in most domains, is a highly challenging task. Even in a data-rich environment like the North American professional sport leagues, forecasting an athlete’s future performance remains a largely inaccurate practice. One plausible explanation for this inaccuracy is there is no single formula for being ‘talented’. While there are certain sports that have more uniform physical profiles for expert performers (e.g., rowing and swimming), many sports,

including the professional sports in this review, have athletes with a high degree of diversity in the genetic predispositions and developmental experiences, along with their physiological and psychological makeups. An added challenge occurs when talent scouts/coaches are required to make judgements about an athlete's potential (who to select and who to deselect) during all stages of the elite sport pathway – many of which are during stages of rapid change (e.g., maturation; Baker & Wattie, 2018).

At earlier stages of an athlete's life, there are many moving parts including physical, social, and psychological systems developing at different rates. Even at the professional level of sport, when physical and physiological changes are more stable, the ability to accurately capture an athlete's abilities and skills using standardized tests is questionable. Multiple studies have examined the validity of the college/university performance tests and have even suggested the money allocated for formal assessments (often in the structure of a 'combine') is not wisely spent (Demmert, 1973; Kuzmits & Adams, 2008). The combine is often used prior to the draft and is usually a multi-day series of tests designed to assess an athlete's physicality (and in some leagues, psychology). While these events started as data collection opportunities, they have evolved into major media events, and coverage brings a significant amount of publicity to the leagues along with ticket sales and marketing revenues (Lock & Gratz, 1983). Despite their popularity, however, multiple studies show combine-type events lack a meaningful degree of predictive validity (Kuzmits & Adams, 2008; Vescovi et al., 2006), despite being a relatively important pre-cursor for draft position[18] (Berri & Simmons, 2011).

[18] For a counterargument, see Teramoto et al (2018) on the predictive validity of National Basketball Association draft combine on future performance and Tarter et al (2009) on the use of aggregate fitness indicators to predict transition into the national hockey league

It should be noted scouts develop extensive player profiles that capture information extending beyond what is extracted from the combine data (Kuzmits & Adams, 2008). For example, scouts and other staff perform multiple player interviews to better understand the athlete on a more personal level and to gain insight into his 'soft' skills (Boulier et al., 2010). These questions may be related to the athlete's upbringing, family dynamics, sport background, leadership opportunities, times of resiliency/adversity among other factors, and may provide the team with a better picture of whether or not the player is a good 'fit' to the team. While the interview process has been questioned regarding its validity and reliability (e.g., it can be difficult to measure less-tangible skills), the role of the scout is often celebrated for its ability to glean information about an athlete (Longenhagen & McDaniel, 2020). How this information is used in the final decision-making process and how it is translated to the other departments (i.e., analytics) is not very well understood and is an important area for further exploration.

Cognitive Errors and Biases in Decision-Making

There is considerable economic risk with the drafting process as starting salaries vary dramatically between players (e.g., the first draft pick's contract could be up to four times the amount of the last pick in the first round) (Massey & Thaler, 2013). Previous research has shown, however, that managers of professional teams have significantly over-valued early draft choices over late draft choices without solid economic rationale (Koz et al., 2012; Massey & Thaler, 2013). Tied closely with imperfect data for decision-making, is the fallibility of the judge/scout when using the information they acquire. There are many steps in the decision-making process (e.g., watch games, administer physical and mental tests, and conduct personal interviews) before a draft decision is made, leaving room for error in analysis and judgment. As noted in other domains (e.g., medicine, economics, behavioral psychology), humans are prone to

many cognitive biases and errors when it comes to making decisions under uncertainty (Hastie & Dawes, 2001; Johnston & Baker, 2020). One of the more well-researched biases in the sport domain is the relative age bias, where coaches and selectors have a tendency to select relatively older athletes because of their likelihood to appear superior compared to their relatively younger counterparts (Wattie et al., 2014). In another example, people irrationally overvalue something they own (object, asset, etc.) beyond its true value, making them more likely to retain it (called the endowment effect). In the context of talent identification, the idea that a scout took the time to get to know a player on a more personal level, tracked his performance over time, met his parents, and developed a relationship with him and his family, may lead the scout to overvalue the player and blind him from seeing his faults. A related issue is the 'halo effect', which reflects the potential for a few positive qualities/characteristics to overshadow a player's negative ones, leading to a more positive view of the athlete (or vice versa). As these effects imply, there can be multiple factors at play (either consciously or subconsciously) that influence an evaluator's decision-making process. While some of these cognitive shortcuts can be time and energy saving and lead to correct outcomes, many can lead to predictable and systematic errors (for more information on the cognitive errors in decision-making, see Hastie & Dawes, 2001; Tversky & Kahneman, 1974). These errors are further complicated by the decision-making conditions where unclear motives, political agendas, and different viewpoints add to the complexity and accuracy of the decision-making process.

Social Influences

In addition to selecting a player based on his potential to improve the team, selection decisions can also be swayed by politics and other motives. This includes decisions on which athlete has a lower 'risk' in terms of liability in an effort to save public image, or which athlete is

the most marketable to fans to increase profit from ticket and merchandise sales. As viewership and other fan-related concerns are important considerations for a team, it is plausible some draft decisions could be influenced by the intention to 'please the crowd'. For instance, Treme and Allen (2011) tested whether 'talent' and 'popularity' explained the emergence of rookie wide receivers in the NFL in the 2001-2006 seasons. The authors found evidence that a player's media exposure prior to the draft helped explain the variation in both draft rank and first-year salary.

Similarly, it is plausible teams will negate their statistical models to select an athlete that has been touted by the media and other pundits. Take, for example, a team trying to make a selection decision for the draft that sees their own models rank a certain player higher than sports pundits and media. It would take courage for a team to knowingly go against the media and potentially expose themselves to backlash. It is, therefore, likely harder for a team to make a decision that aligns with the media and for it to fall short, but when a team makes decisions that go against the media and has a failing outcome, it becomes 'obvious' where the errors are, even though they may be unrelated. It is not out of the question, then, for a team to make a decision that takes the 'path of least resistance' in these situations. Whether this is conscious or subconscious, taking shortcuts in the decision-making process is a common and even probable occurrence. With the exception of Treme and Allen (2011), however, evidence (beyond anecdotal support) is quite sparse. This speaks to the need for research investigating such influences in the context of athlete selection.

Influences Related to Career and Development Trajectories

In addition to the abovementioned factors affecting accurate draft selections, there is a host of other reasons why a player later emerges as a 'non-successful pick'. One of those reasons is an early career injury that halts the athlete's development. While the field of sports medicine

has uncovered a great deal about injury types that affect career trajectories (Chahla et al., 2018; Chaker et al., 2020; Longstaffe et al., 2020; Ristolainen et al., 2012), there remains a scarcity of studies that consider injury as a confounding variable when assessing draft accuracy. Conducting more of such research, whether in the peer-review system or internally by teams, may lead to a better understanding of the factors underlying the success of draft selections.

Another factor to consider is the relative strengths of teams to which athletes are selected. Given the draft is conducted in reverse order of the previous year's standings, early draftees are typically selected into poorly performing teams that may not have a strong 'supporting cast' for the draftee to perform well. Not to mention teams in certain leagues – such as MLB – use a player rotation system wherein a draftee may not receive as many playing opportunities as his peers, leading to decreased performance over time (Koz et al., 2012).

Inherent Challenges of Chaotic Systems

Perhaps the most glaring challenge to making accurate selection predictions is the dynamical and complex nature of human performance. It may come as no surprise that elite sport performance is the product of the complex interconnectedness of the athlete's genetics, his/her/their upbringing, along with the environment and systems in which he/she/they operates within. This, in itself, makes sport (at least in part) inherently chaotic and random. Despite best scientific efforts and technological advancements, sport performance may never truly be calculatable and/or predictable and it will likely mean making perfect selections will never be feasible. That being said, the emphasis should not be on making perfect selections, but rather shifting the focus to finding ways to be less incorrect.

Limitations and Future Directions

Despite the potential implications of this systematic review, there are limitations to consider. One of the most notable is this review only reflects information published through the peer-reviewed system, which is not necessarily indicative of the current climate of knowledge that exists within the field. Much of the accessible information is shared via journalism, online blogs, podcasts, and other media platforms. Additionally, it is well understood there is a lack of 'sharable knowledge' that exists in professional sport. Often, findings are not made public through peer-reviewed literature in order to keep knowledge 'in-house' for a competitive advantage. Another possible reason for the lack of peer-reviewed work in professional sport may be related to the time needed for the peer review process to occur. For example, longitudinal and even cross-sectional research can take months or years to reach publication, and in an industry that moves rapidly, many organizations cannot wait for the peer-review process.

It is noteworthy that most papers in this systematic review relied on data from 1970 – 1999 or early 2000s, which may not capture the contemporary strategies teams currently have in place when drafting. For instance, the recent use of Artificial Intelligence (AI), machine learning, and automation has resulted in more advanced capturing of players' pre-draft performance and analytics (Mondello & Kamke, 2014; Robertson, 2020; Stein et al., 2018; Theagarajan et al., 2018), meaning teams are now able to utilize data of higher quality when making draft decisions. Similarly, advancements in the fields of physiology and sport psychology may also have aided in making better talent evaluations at the draft (Jordet, 2015; Tarter et al., 2009).

Additionally, the fact that very few studies within the same sport examined the same measures of success, and the added complexity of comparing different types of statistical analyses and reporting practices, created a challenge to presenting quantitative findings in a

logical and comprehensible way. Ideally, the present study would have reported the statistical relationships between the variables examined corresponding each playing position, but due to inconsistencies and lack of standardization across articles, combined with the sheer number of variables examined in some articles, the authors were unable to do so.

In spite of these limitations, this systematic review highlights the clear need for peer-reviewed research on the efficacy of the draft process across the four major leagues. This is especially true for the MLB and the NHL which have very few articles relating to the efficacy of the draft in predicting future measures of success. Even using the articles examined, there are no definitive results that show the draft process is effective in its current structure; and thus, more research would be beneficial to explore the inefficiencies and, subsequently, approaches for improvement.

Additionally, future directions for research include examining the differences between international draft programs in terms of their processes and accuracy rates. This could perhaps draw attention to the unique ways 'talent' is identified, selected for, and developed. Highlighting these differences (and perhaps similarities) may, in turn, help to create opportunities for knowledge sharing and provide support for policy and procedure (re)considerations. Moreover, it would be beneficial to examine the athlete selection process from an even broader perspective by assessing free agencies to better understand the (in)efficiencies of the draft system at large.

Conclusion

In all four sports, from the studies that compared draft order by round, it was most commonly found that the first round most accurately predicted a measure of future success. As the rounds progressed, however, the efficacy of that variable to predict future success decreased (Hendricks et al., 2003; Koz et al., 2012). In short, teams and their managers/executives have

success in the early and late rounds of the draft, but the middle rounds are less accurate. These findings have implications for those involved in the drafting process, suggesting there is insufficient evidence to show the draft is a truly effective method for predicting certain measures of success.

In addition to the questionable effectiveness of predicting future success, the present systematic review highlights the limited existing evidence to support the notion that the reverse-order of the draft promotes equality, which is a fundamental principle of the draft system (Lock & Gratz, 1983). Based on the present findings, (and with so few articles in each sport category), the authors cannot draw any conclusion with confidence that athletes selected earlier in the draft (from weaker teams) are significantly better than those chosen later in the draft (by stronger teams).

In some ways, it is surprising that the efficacy of the draft has not received more scientific scrutiny. In other ways, it is understandable based on the proprietary nature of the information and how it can act as a competitive advantage for teams. Overall, the firmest conclusion we can make is that more research is needed to be able to truly test the efficacy of the draft to better understand its strengths and weaknesses.

Figure 1. Flow chart of the PRISMA process showing the number of records collected, number of articles screened, and the final number of articles included in the analysis.

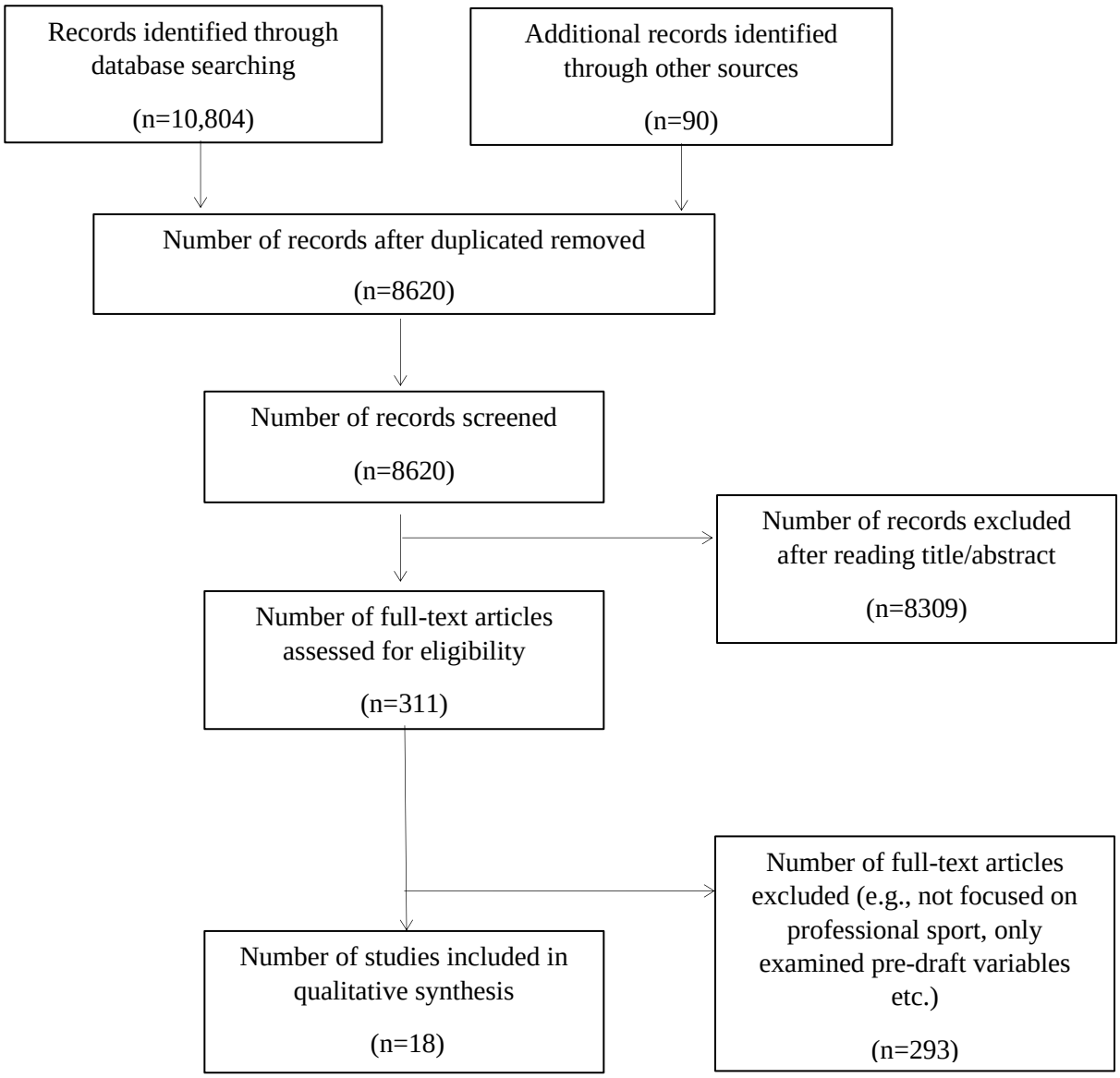

Table 1. Characteristics of the studies included in the review

Title	Author	Publication Year	Sample Size	Draft Years	Category of study foci	Key Findings
MLB[i]						
Scouts versus stats: the impact of Moneyball on the Major League Baseball draft	Caporale and Collier	2013	149	1995-1999	Career length/ games played at the majors	The earlier the player is taken in the draft (in the first round), the greater the likelihood he will make it to the Major Leagues.
Uncertain Prospects: Rates of return in the baseball draft	Burger and Walters	2009	2115	1990-1997	Financial compensation	Findings suggest teams are irrational in their spending where they select lower quality prospects and/or fail to appropriately reduce bonuses in the second and third round.
The baseball draft: a study of the ability to find talent	Spurr	2000	2708	1966-1968	Career length/ games played at the majors	The earlier you are taken the draft, the increased likelihood of playing in the majors until later in the draft (round 34) after which draft position has little to no value on the success of a player.
NBA[ii]						
The dilemma of choosing talent: Michael Jordans are hard to find	Groothuis et al	2009	NA	1987-2003	Future performance statistics at the professional level	Superstars are more likely to be found early in the draft. However, there are more inaccurate selections than accurate ones in early draft picks

The length and success of NBA careers: Does college production predict professional outcomes?	Coates and Oguntimein	2010	290	1987-1989	Career length/ games played at the majors	Early draftees, on average, have longer careers. However, differences in career length are much smaller later in the draft.
Predicting success in the National Basketball Association: Stability & potential.	Moxley and Towne	2015	376	2001-2006 and 2007-2010	Future performance statistics at the professional level	Draft order was significantly correlated with future win shares in the first 3 years of players' NBA careers
Predictive validity of National Basketball Association draft combine on future performance	Teramoto et al	2017	1,092	2000-2015	Career length/ games played at the majors	Draft order was significantly correlated with playing time in the NBA
Nonlinear judgment analysis: Comparing policy use by those who draft and those who coach	Young	2008	409	1989-2004	Future performance statistics at the professional level	Draft order is a good predictor of future points, assists, rebounds, steals and turnovers. However, there was no observed effect of draft order on shooting percentage or blocks
MoneyRoundball? The drafting of international platers by National Basketball Association teams	Motomura	2016	580	1996-2005	Future performance statistics at the professional level	International players were undervalued in the NBA draft until 2001. However, teams over-adjusted and began to overvalue those players from that point onwards.

From College to the pros: predicting the NBA amateur player draft	Berri et al	2011	661	1995-2001	Change in winning percentage/number of wins produced	Draft order explains very little of the variance in Wins Produced per 48 minutes (WP48) and total wins produced in the NBA
NFL[iii]						
Catching a draft: on the process of selecting quarterbacks in the National Football League amateur draft	Berri and Simmons	2011	331 QBs or 1943 observations	1970-2007	Future performance statistics at the professional level	Draft pick is not a significant predictor of NFL performance for quarterbacks (based on 19 different performance variables)
Deconstructing the Draft: An Evaluation of the NFL Draft as a Predictor of Team Success	Reynolds et al	2015	NA	2000-2010	Change in winning percentage/number of wins produced	A moderate, positive correlation was found between draft pick value and change in a team's winning percentage. Additionally, there was a low, positive correlation found between the change in winning percentage and number of first-round draft picks, along with a low, positive correlation between change in winning percentage and total number of picks.
Evaluating National Football League draft choices: The passing game	Boulier et al	2010	Varies by position	1974-2005	Mixed	For both quarterbacks and wide receivers, players taken in earlier rounds have longer careers. Specifically, those taken in the first and second rounds are significantly more

						successful in their performance (based on multiple performance variables)
The National Football League player draft: does it equalize team strengths?	Lock and Gratz	1983	NA	1970-1981	Change in winning percentage/number of wins produced	The correlation between a team's priority position in the draft and its change in performance (based on standings) in future years is low, but statistically significant.
Uncertainty, hiring and subsequent performance: the NFL draft	Hendricks et al	2003	5723	1979-1992	Career length/ games played at the majors	Players taken earlier in the draft are more likely to play in the NFL and those with a higher draft position have longer careers.
A valuation model for NFL and NHL draft positions	Hurley et al	2012	5611	1982-2000	Career length/ games played at the majors	A significant number of drafted players did not play in the NFL and this fraction tends to grow with draft position.
NHL[iv]						
The National Hockey League entry draft, 1969-1995: An application of a weighted pool-adjacent-violators algorithm	Dawson and Magee	2001	NA	1969-1995	Career length/ games played at the majors	The number of NHL games played decreases sharply as the draft pick number increases, but flattens out in the later picks.

Mixed Sport						
Accuracy of professional sports drafts in predicting career potential	Koz et al	2012	1028	1980-1989	Career length/ games played at the majors	NHL career length significantly differs across draft rounds in a descending fashion, but stabilizes in the later rounds of the draft.
			407	1980-1999	Career length/ games played at the majors	In the MLB, there is no significant differences between the draft rounds for games played
			2380	1980-1999	Career length/ games played at the majors	In the NFL, Players drafted earlier played more games than those drafted later.
			407	1980-1999	Career length/ games played at the majors	In the NBA, there was no significant differences between the draft rounds for games played

[i] MLB - Major League Baseball
[ii] NBA - National Basketball Association
[iii] NFL - National Football League
[iv] NHL - National Hockey League

Chapter Four: The Complex and (Sometimes) Conflicting Beliefs about Talent: A Case Study of Elite Distance Running Coaches

Johnston, K., & Baker, J. (2022). The complex and (sometimes) conflicting beliefs about talent: A case study of elite distance running coaches**.** *Journal of Expertise.* 5*(1), 38-57.*

***This manuscript has been presented in the formatting that has been accepted and published in the respective journal. References are included at the end of the dissertation starting on page 177.*

Abstract

The word ‘talent’ is commonly used to describe the antecedents of successful performance, especially in the context of sport. Despite the commonality of its usage, our understanding of what this term means and how it is used is limited. This case study has two main objectives, 1) to investigate the use and context of the term talent within a sample of distance running coaches and 2) to understand the coaches’ subjective beliefs regarding talent in their sport. Ten elite male coaches from across Canada participated in semi-structured interviews. All interviews were transcribed verbatim and analyzed using inductive thematic analysis. The statements made by this sample of coaches indicate they believe talent a) exists, b) can exist in multiple forms (e.g., raw talent and trained talent), c) can have physical and psychological components, and d) can present itself in obvious and less- obvious ways. Findings emphasize the nuanced and complex beliefs about talent in the context of elite distance running and reveal the need for a greater understanding of what the term means if it is to be used for consequential actions such as athlete selection.

Key Words: talent identification, expert coaches, elite athletes, distance running, qualitative design, qualitative description

Introduction

Few concepts in science are as laden with conceptual baggage as talent. Notions of talent are reflected in the ubiquitous use of the word to describe performance across nearly every domain of human endeavour (e.g., a talent for music, a natural talent in sport). Till and Baker (2020) noted the word itself has different meanings across different contexts. For example, a coach may describe an athlete by saying he/she/they has/have talent in a specific sense (a particular ability sometimes referred to as 'raw material') or even more generally to say he/she/they is/are a talent (the end product of a complex developmental process; Gagné, 2000). Another aspect further complicating talent and its operationalization is the number of closely related terms used synonymously. As noted by Tranckle and Cushion (2006), "The terms talent, gifted, and aptitude can, and frequently are, used interchangeably and can be found in most dictionary definitions where any one of these words tends to be used to describe the other" (p. 267). Howe and colleagues (1998) also noted this frequent misuse, succinctly stating, "People are rarely precise about what they mean by this term…" (p. 399) when referring to the term talent. Knowing this, it is perhaps not surprising that the inconsistent use of terms, combined with the added confusion of closely related (but theoretically distinct) terms, has resulted in a lack of both definitional and conceptual clarity.

In an effort to differentiate talent from its neighboring term, giftedness, Gagné (2000) proposed a continuum whereby aptitude and gifts are at one end of a spectrum, and talent is at the other, naming it the Differentiated Model of Giftedness and Talent (DMGT; Gagné 2000). With respect to the DMGT, Gagné believed maturation or even informal learning resulted in aptitudes or gifts, whereas talent was the product of development and thus, in theory, gifts can become talent (Gagné, 2000; Tranckle & Cushion, 2006). The word 'potential', in a similar

sense, has been described as “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” (Roberts, 2021, p. 6). As demonstrated in these examples, subtle, but unique, aspects of the terms separate the construct of talent.

Over the past two decades talent and talent identification in sport have gained considerable research attention (Anshel & Lidor, 2012; Baker et al., 2020; Davids et al., 2013; Li et al., 2014; Lidor et al., 2009). Much of this work to date has focused on how talent can be measured (for reviews see Baker et al., 2020 and Johnston et al., 2018) and how talent can be developed (see Burgess & Naughton, 2010 and Coutinho et al., 2016). Both these areas of research are rooted in the assumption that talent a) exists, b) can be measured, and c) can be manipulated. Very few articles in these fields, however, examine how talent is understood, (see Baker & Wattie, 2018 and Howe et al., 1998 for reviews). The limited theoretical and conceptual evidence on sporting talent appears to reflect talent as an extremely complex phenomenon (non-linear, emergent, and has self-organizing tendencies (Cox et al., 2019), meaning different things to different people within various contexts (Jones et al., 2020). For this reason, some believe it too elusive (Howe et al., 1998; Mann et al., 2017), and some even question its existence (see Ericsson et al., 2005).

Talent as a scientific concept can be traced to the formative work of Francis Galton, the first person to study the extent to which differences in attainment between individuals (in domains ranging from judicial appointments and politicians to wrestlers and rowers) were the result of hereditary factors. This early work found what Galton considered strong evidence for the role of biological and hereditary factors on attainment. Over the past 150 years, the pendulum of research has swung from Galton’s strong evidence along with the work of Lewis Terman

(1920; 1922) and his genetic studies of genius (which was also grounded in the assumption that talent was a significant contributor to eventual attainment), to more recent explorations of deliberate practice and experience-based models which relegate talent to a minor role, if having any role at all (Ericsson et al., 1993; Ericsson et al., 2005). Despite this almost continual deliberation about the role and value of talent for understanding human exceptionality, the concept remains poorly understood and ill-defined (Baker et al., 2018).

One of the most influential definitions guiding much of the scientific discourse today (cited more than 1,100 times at the time of writing this paper) is the work by Howe and colleagues (1998). Specifically, Howe et al. proposed a five-point definition of talent:

> 1) It originates in genetically transmitted structures and hence is at least partly innate. 2) Its full effects may not be evident at an early stage, but there will be some advance indications, allowing trained people to identify the presence of talent before exceptional levels of mature performance have been demonstrated. 3) These early indications of talent provide a basis for predicting who is likely to excel. 4) Only a minority are talented, for if all children were, there would be no way to predict or explain differential success. Finally, 5) talents are relatively domain specific. (p. 399-400).

Recently, Baker and Wattie (2018) revisited the assessment and discussions of talent according to Howe et al. and reviewed relevant research in the domain of sport to determine the usefulness of the original criteria 20 years later. The authors concluded the original five-point definition remains useful, with the exception of the fifth criterion. The authors also concluded that innate talent (defined as genetically constrained, biological influences on exceptional human

performance) was conceptually and theoretically valid but had limited utility to those who work in sport because of limited research, questionable research designs, and inconsistent definitions.

This type of work may provide valuable insight for neighboring fields such as athlete selection (also commonly known as talent selection). For example, directing greater attention to unpacking what talent might be, may provide information about the way coaches and other sport stakeholders behave when selecting and developing talent. Baker and colleagues (2018) suggested coaches' beliefs about where an athlete's talent stems from may affect the way they think about and interact with that athlete in their program. More specifically, a coach who believes talent is the product of genetic makeup may behave differently compared to a coach who believes talent is the product of hard work (for examples in other contexts, see Dar-Nimrod & Heine, 2011; Dweck, 2003; Phelan et al., 2002). Greater exploration of this hypothesis from various stakeholder perspectives could be useful for understanding the social and psychological factors of talent selection and development. Especially from the perspective of those responsible for making selection decisions (e.g., a coach who decides which athletes stay and which athletes are removed from the team), and thus directly influences an athlete's participation in the sport.

In a recent study of what talent means to collegiate level coaches, Jones and colleagues' (2020) raised a number of questions about how their findings (e.g., talent is multidimensional, context specific, has physical and psychological attributes, and is highly subjective) are positioned with other samples in other sports and at various levels of competition. Moreover, if talent is seen as a developmental construct (at least within the context of the Jones et el., 2020 study), then how does this influence coaches' subjective beliefs about talent across athlete development pathways? The present study hopes to complement work by Jones and colleagues (2020), along with others in the field, to explore subjective beliefs about talent further within

competitive sport. Distance running coaches were chosen as the focus sample due to the unique features of athletes in this sport. For instance, distance runners tend to have a later peak age (Allen & Hopkins, 2015) – meaning athletes continue to improve their performance until a later time in adulthood compared to other sports (e.g., gymnastics, swimming, soccer, etc.). This often means athletes at the highest levels of competition are at a relatively stable period from a developmental perspective (at least compared to childhood and adolescence). Asking coaches about their perceptions of talent during these later stages of athlete development, ideally removes elements of talent selection that may be related to puberty (e.g., differences in growth and maturation that promote relative age effects; Wattie et al., 2015). Additionally, distance running is an individual sport where coaches are not necessarily making selection decisions based on position-specific criteria (e.g., selecting a goalie over a forward in the context of ice hockey). Controlling some of these elements by focusing on a sport such as distance running allows us to center on the specific individual components of talent in this context.

To this end, the broad objectives of this case study were to interpret coaches' rich descriptions for the following purposes: 1) to investigate the use of, and the context where, the term talent is used, and 2) to explore coaches' subjective beliefs about talent in the context of distance running, all in an effort to better understand the phenomenon of talent.

Methodological Considerations

Philosophical and Theoretical Positioning

The authors determined the research question, designed the study, conducted the research, and interpreted the results through a pragmatistic lens. In this sense, the authors hold the ontological position that reality is always in a state of negotiation and can be debated, or interpreted, differently (Kelly & Cordeiro, 2020). Aligning with a pragmatistic paradigm, the

epistemological positioning supports the notion that knowledge (in this case about talent) should be examined using suitable tools. The following methodology section explains the authors' use of certain approaches deemed suitable for this research question under investigation.

A key tenet of pragmatism is the exploration, through the sharing of experiences, of what information has worked for the user. In this sense, "experiences create meaning by bringing beliefs and actions in contact with each other" (Morgan, 2014, p. 1046). For this reason, the present study embraces coaches' perceptions of their experiences in relation to talent in sport and accepts and explores an individual's subjective awareness.

Methodology

A Qualitative Descriptive (QD) design was chosen as the approach to address the question "*How can we find out?*". QD research is known in health psychology research to be one of the most appropriate designs when a description of a phenomenon is desired (Bradshaw et al., 2017). It also embraces a naturalistic perspective (i.e., aims to produce a straight description when examining poorly understood phenomena) and respects the notion there are many realities and individuals craft their own interpretation and meaning of the phenomenon, once again, keeping with the congruency of the philosophical and theoretical underpinnings (Kim et al., 2017; Sandelowski, 2000; 2010; Sullivan-Bolyai et al., 2005; Willis et al., 2016).

For this study, the question "*Why might that be the case*?" for the interviewee's responses was not the focus of the investigation. Rather, findings are reported below in a straightforward manner and include descriptive summaries of the "who, what, where, when, and how" in relation to talent and coaching. For this reason, sometimes, QD is known to be less theoretical than other qualitative designs and has been criticized for being too simplistic and lacking rigor (Sandelowski, 2000); however, when used appropriately, the design can be rich in other ways.

To highlight the unique elements of this approach, Neegaard and colleagues stated, “The aim of QD is neither thick description (ethnography), theory development (grounded theory) nor interpretative meaning of an experience (phenomenology), but a rich, straight description of an experience or an event” (Neergaard et al., 2009, p. 52). Furthermore, it is particularly useful for concept identification and development and for providing a vehicle for the voices of those experiencing the phenomenon. It has typically been employed as a suitable methodology for guiding policy documents and educational tools, which has particular value for shaping coach education discourse and selection policies in competitive sport.

This approach is believed to be advantageous for allowing the researchers to stay close to the data and allow for low inference when reporting findings (Neergaard, et al., 2009). Moreover, QD is recognized for its “focus on producing rich description about the phenomena from those who have the experience offers a unique opportunity to gain inside or emic knowledge and learn how they see their world” (Bradshaw et al., 2017, p. 3). As this is one of the first studies investigating this research question within this context, the authors believe a straightforward description of the coaches’ experiences and perceptions can act as the foundation for future investigations that include descriptions of the meaning or essence behind those experiences and perceptions. To date, there is considerable conceptual and definitional baggage associated with the word talent, and until more work has been done focusing on understanding what ‘talent’ means in the context of elite sport performance, scholarship in the area may benefit from a variety of philosophical, theoretical, and methodological positions and approaches (both qualitatively and quantitatively). Ultimately, with the use of QD interpreted through a pragmatistic lens, the authors hope to contribute to the broader theoretical and conceptual understanding of talent and its application in sport settings.

Participants

Participants included 10 distance running coaches (all male) from across Canada[19]. Seven were in head-coach positions at the time of the interview, two were in assistant-coach or co-coach positions, and one was currently in a physiologist's role, but had held a coaching position in the past. The ten participants had been coaching for an average of 24 years at the regional (n = 1), international (n = 5) or Olympic levels (n = 4) with a range between four and 48 years of coaching experiences. Combined with the number of years in a coaching position along with the competitive level of the athletes being coached, we believe this sample of coaches is "elite" (Swann et al., 2015). In addition to their relationship to sport as coaches, all were previously distance running athletes at either the regional (n = 2), national (n = 3) or international/Olympic level (n = 5) and sometimes referenced their past experiences as athletes.

Data Collection

Once ethics approval was obtained by our University's Office of Research Ethics[20], coaches were recruited using a snowball sampling technique. Each participant provided informed consent and a time was arranged for an interview either in-person (n = 1), over video calling (n = 8), or by phone (n = 1) when face-to-face or video calling was not feasible (Sweet, 2002). While telephone and video calling present some notable limitations (Holt, 2010; Irvine et al., 2012), for accessibility and safety reasons, they offered the only feasible ways to converse with some participants in this sample.

Semi-structured interviews were conducted with the goal of gaining an in-depth understanding of coaches' beliefs about talent in sport. The primary framework for the interview

[19] Coaches were working at the Provincial and National Sport Organizations as well as the U SPORTS Canadian collegiate sport body and private coaching opportunities
[20] University Research Ethics Board certificate number for approval: STU 2019-067

guide followed Morgan and Krueger's five main question areas: opening question(s), introductory question(s), transition question(s), key question(s), and ending question(s) (Morgan & Krueger, 1998). The main questions from the interview guide directed the flow of the conversation and probing/follow-up questions (such as "*Can you tell me what you mean by …?*") were used to clarify or expand upon participant's answers (Patton, 2002; Rubin & Rubin, 1995; Smith & Sparkes, 2016). See Appendix B for a complete list of main and probing questions.

The interview guide was developed as part of a larger research project by a team of three researchers and was piloted with nine collegiate level coaches then revised for interpretability, quality, and fluidity. The guide was based on the authors' in-depth reading of the literature (Potter & Hepburn, 2005) and was informed through discussions with two researchers in the field who have extensive experience in interviewing elite-level coaches.

Unlike prior investigations, we intentionally avoided the use of the word talent in the interview guide. We did not want to assume the word was used within this specific sample of coaches; therefore, the research question under investigation was rooted in understanding *whether* or not the term was used, and if so, *how* participants used the term without being prompted. This approach to gathering information on the frequency of words or phrases, along with the context within which the information is presented, is practiced in multiple disciplines (e.g., linguistics, psychology, and psycholinguistics - the blending of these disciplines) and is rooted in the belief that understanding language can help in the understanding of behavior (Harley, 2013). While this is the first study of its kind to explore the word talent in the context of distance running coaches, other studies have used a similar approach to study interview transcripts for phrases, sentiments, and words (such as Gibson et al., 2015 in the health psychology field).

Data Analysis

The interviews lasted between 24 minutes and 2 hours and 36 minutes, with an average length of 46 minutes[21]. Interviews were transcribed verbatim producing 109 single-spaced pages of data. Inductive Thematic Analysis (ITA) was used to analyze the data from this study. ITA was selected given its application can help in the interpretation of various aspects of the research topic by highlighting similarities and differences across the data, which is important for understanding the present research question (Boyatzis, 1998). In addition, the data were analyzed using an inductive process without trying to fit the data into pre-existing themes or coding outlines (Braun & Clarke, 2006; 2020), which also complements the principles of QD. This was attractive for the present study's design, as generating potentially unanticipated insights through the lens of coaches was important for a broader understanding of the research topic.

The phased approach of the ITA was shaped by Braun and Clarke's work (2019, 2021a, 2021b). The process began with the researchers familiarizing themselves with the data by listening and re-listening to the interviews, and once transcribed, reading and re-reading the interviews line by line. In addition, the lead author maintained descriptive field notes before and during data collection and analysis. The authors then coded the data by generating labels which highlighted important features of the data central to the research question. After the coding, the authors reviewed the labels and the associated data, and identified patterns which became the themes (and possible themes) of the data. The authors then performed a continuous cycle of reviewing and generating themes to help determine the fit of the themes to the research question. Finally, a process of defining the themes was performed to determine informative names that

[21] While this may seem relatively short for the research question under investigation, the coaches in the present sample (for the most part) stated their beliefs quite succinctly. The interviewer then used follow-up questions to illicit more information, but it seemed this sample had a matter-of-fact approach in their responses.

captured their scope and focus. The authors ensured that coaches were assigned a unique identifier (C1 to C10) to promote anonymity; additionally, all identifying information was removed for the coaches as well as the athletes they referenced.

Rigor

To demonstrate the quality of the data, the credibility, dependability, confirmability, and transferability will be addressed in congruence with Bradshaw and colleague's (2017) rigorous approach to QD and shaped by the early work of Lincoln and Guba (1985). With respect to credibility, a friendly rapport was established between the primary investigator and the interviewees before interviews began. This rapport was built through a number of e-mail exchanges and sometimes a phone call to discuss convenient meeting times. This helped build a more trusting relationship, which in turn, may have helped increase the likelihood of information sharing.

The confirmability of the data was addressed by incorporating a follow-up e-mail to each participant after the interview asking for confirmation of accuracy in the demographic information collected (e.g., number of years coaching, level of competition, etc.). In addition, the primary investigator added notes in a reflective journal. This reflectivity practice is known to be an essential component of the research process not only to engage more deeply with the data, but also to augment the trustworthiness (Finlay, 2006; Kingdon, 2005). The descriptive field notes were shared, read, and discussed with another researcher, which helped minimize the interpretation of the coaches' comments within the context of the lead author's personal experiences (Shaw, 2010). Additionally, findings are reported in a direct quotation fashion; that is, the authors have not modified or adjusted the information shared by the participant.

In terms of dependability, an audit trail was created describing the study's processes and procedures and this was closely monitored and adjusted as the study progressed. Finally, the transferability of the study was addressed in several ways; a) a purposeful sample of expert coaches from multiple places in Canada was chosen, b) a reflexive journal was used, and c) sufficient details of the present study's processes and procedures have been included to allow for future re-creation by other researchers.

Positioning the Authors in the Research

The authors acknowledge it is inevitable that different researchers will approach research with different perspectives intertwined with their own personal and situational experiences. Knowing this, it is important to discuss the positionality of the researchers within the study to show how the positions they occupy are deeply rooted in the construction of knowledge (Simon & Dippo, 1986). The interest in the present research question stems from the work and research experience of the two authors. Both authors have worked alongside coaches in a consulting and coach education role regarding the capacity of talent identification and selection. A particular concern expressed by coaches is talent wastage; therefore, one can presume that we entered this research looking through the lens of our own experience to find ways to identify inefficiencies and improve selection practices.

By situating ourselves within the context of this study, we acknowledge the influence of our experiences on the way in which this study was conceived and conducted. While the authors tried to minimize their personal interpretations (keeping descriptive field notes, using QD design, consulting with other practitioners and researchers, not using the word 'talent' until it was used organically in conversation), the authors acknowledge they brought with them preconceived ideas and theories regarding what talent is and how the word is used operationally.

Results

Findings are presented according to the themes (and sub-themes) identified through the ITA process, including 1) the contextualization of talent and 2) the characteristics of talent.

Contextualization of Talent

The following sections describe contextualization of coaches' use of the term talent, including discussion regarding the frequency of the term's use, how the term was positioned and used, and the specific application of its use. Four sub-themes were identified: a) embedded in lexicon, b) a descriptor for the best athletes, c) specific yet variable, and d) closely related to other terms.

Embedded in Lexicon

As noted above, the word talent is inconsistently defined and can be laden with personal meaning, thus it was important for the present sample that the authors should not make assumptions about how the term is used or the context within which it is used. For that reason, the interviewer made no mention of talent until a coach used the term of his own volition. The majority of coaches used the term talent in one form or another to reference distance running athletes. This finding helps to highlight the frequency of the term's use within this coaching sample and specifically within the context of elite distance running performance.

A Descriptor for the Best Athletes

The coaches most frequently used the term talent for the first time in response to the request "Tell me about the best athletes you have worked with". For example, Coach 10 was describing one of the athletes he recently coached and said, "You could see that she had a ton of talent". Statements such as this were made matter-of-factly and were not given any further explanation of the term as to context or meaning unless prompted by the interviewer, which may

also shed light on how common and accepted this term is. In another example, Coach 1, when describing the athletes in his program, said, “I believe talent is everywhere”. He further explained that the athletes he coached at that particular competitive level all had talent, but in varying degrees. In a similar sense, Coach 6 shared, “I work on the very, very sharp end of the curve and so, umm, to me talent at that end of the curve is already there and established and we’re just, we’re almost polishing it”. As shown in these two quotes (Coach 1 and 6), these coaches believed talent had already been selected for within the pathway and was widely observed within the athletes they worked with. In a way, the ease with which the term talent was used conversationally, combined with the sheer frequency of its mention with respect to descriptions of best athletes, indicates these coaches believe talent exists in the context of elite distance running.

Specific Yet Variable

The sub-theme ‘discrete and specific’ was chosen because it captured the distinct spheres within which coaches believe talent exists. This sample of coaches emphasized that a person can be talented in very focused areas and not others. For example, Coach 2 expressed, “…you have other athletes like whose talent is their speed, right? Like my talent laid in my efficiency. I was like a super smooth, efficient learner. I never had to really work on that”. It would appear from Coach 2, talent may apply only to certain qualities, aspects, or skills and may not be understood to carry over broadly to athletic ability. In line with Coach 2’s reference to the specific attributes of being talent, Coach 4 shared the following:

> I’ve been lucky enough to be around a number of Olympic gold medalists. Most of them are very self-aware, which is different than an elite performance perspective

> because it's their ability to just make themself better which is part of who you are, and that's part of their talent.

Similarly, Coach 9 explained, "Of course, it's not you have it or you don't, but everyone has it to a certain degree". These quotes help to highlight that this group of coaches believed talent, even in its unique spheres (like the sport of distance running), does not apply in an all or none fashion. Specifically, a coach's understanding of an athlete being talented does not necessarily mean the coach views that athlete as being generally talented, but rather being talented in specific and focused areas.

Closely Related to Other Terms

During conversations with coaches, it was noted that they used certain terms either interchangeably or in place of the word talent. For example, here is Coach 8's explanation:

> This kid is just like a bottle of wine. He just gets better as he's progressing…He doesn't have the blistering speed, but he's just a methodical individual who puts that time in and, you know, I wouldn't say he doesn't have the talent, but maybe he has a gift, right?

In contrast, Coach 9 explained, "I've had some extremely hard workers on the team that just, you know, go above and beyond. Not always, you know, matched by the gift of talent, but their work ethic is certainly quite exemplary".

From these two examples, and others, it appears there may be opposing views of what 'talent' and 'gift' mean in the context of elite sport. Having used both terms in the same sentence and having used the word 'potential' in an earlier statement, Coach 9 was asked to explain his definition for all three terms. He responded as follows:

> I think I would say potential, you don't really know it's there until you start to really see a glimpse of it…I mean, you can look at someone's physical attributes and say, oh, they look like a runner, but really you got to see them race, and you got to see them run to be able to confirm that they're running fast. Potential I think maybe speaks to when there's maybe been some more concrete signs of that talent. You've got a high school runner or someone new who's just started in and, you know, maybe they look like they might have talent and then the first couple showings, you know, I think this could be developed into something fast or based upon their rate of progression…And I think it comes also to the idea that talent is not an all or nothing, right? I mean it. It's a spectrum, you know, some people have a lot more talent than others, and so potential I think maybe speaks to where that ceiling of talent might lie. This athlete has the potential to be a champion maybe if you're getting some glimpses of, you know, they've really progressed early on or some other attributes about how hard they're ready to work or their resiliency to injury. You can, maybe, make a guess. Gift, I think I would only use that in the context of someone who has sort of demonstrated talent to an exceptional level. So as opposed to talent being a spectrum, and we all have some talents to some degree, I would describe that runner has the gift when they're just highly blessed, they run fast or have, you know, tremendous potential to be fast.

This long statement clearly indicates that Coach 9 believes the three terms are distinct, as demonstrated by the definitions he provided for each term; however, the lack of clarity about what the differences and/or unique characteristics of each construct are, speaks to the conceptual clutter around such nebulous and nuanced terms.

Characteristics of Talent

Once the term was used conversationally, the coaches were asked questions such as "*What does talent mean to you? What does it look like? What does it act like? How long does it take to know if someone has talent?*" Coaches' responses are captured below in the main theme, characteristics of talent, and are further separated by sub-themes including a) raw (untrained) and trained forms, b) various physical and psychological components, and c) different degrees of obviousness. Below, these sub-themes will be explained and supported by coach commentary.

Raw and Untrained Forms

Interestingly, many coaches in this sample perceived talent as existing in two distinct forms, raw (sometimes referred to as untrained) and trained. For example, Coach 3 said, "Yeah, they had the raw talent for sure. They were winning from the first step they took". When asked to elaborate on what was meant by this dichotomous perception of talent, Coach 3 explained as follows:

> So, there are a couple of ways to measure kind of raw ability in our sport. This kind of untrained abilities, usually it's a younger athlete, and they enter the sport without having, you know, done any training, or they or they don't know much about it at all, and they kind of see how well they do kind of right out the gate. So that's one kind of potential [uses air quotes]… the second kind is trainability [uses air quotes], so these are the people who … intuitively understand the training process, but also, they physically respond to it more robustly. So, an athlete can have the first thing, the high, like high non-trainability but not a high level of adaptability, so they don't respond that robustly to training stimulus, and you can have people who aren't very good without training but are becoming extremely good on very little bits of training.

> It's when you get a person with both of those qualities both like high, non-trained ability (raw talent) and also very high response to training stimulus that's where your top people come from. So yeah, so that's raw ability and neither is really sufficient to reach the top. You have to have some degree of, you have to be above average to some degree in both of those areas.

As demonstrated in this quote, Coach 3 believed untrained talent is seen/recognized in athletes who may have entered the sport with little sport-specific training but displayed obvious signs of potential. Trained talent, on the other hand, describes athletes with many years of sport specific training who have also displayed superior abilities. In a similar sense, Coach 9 discussed the distinction between the two forms of talent in his statement, "You can just tell the difference between a thoroughbred and a workhorse. Simply based on how someone moves and what they look like". Coach 9's statement sheds light on a potential dualistic perspective of athletes and perhaps the belief that there are signs/signals indicating whether an athlete fits one profile or the other. This distinction was also particularly interesting because of the choice of terminology (i.e., thoroughbred and workhorse). A statement such as this is both rich and intriguing, and the authors believe that this dualistic perspective offers an interesting area for future explorations (perhaps from a socio-cultural lens).

This cognitive separation between the forms of talent was further expressed by Coach 2. When asked in a follow-up question what he meant by the term talent in his previous response, he immediately responded, "So I think the term you mean is what we like to call a raw athlete". The authors interpret this statement to mean the coach may equate talent with innate qualities/characteristics or perhaps genetic predispositions, as captured in the use of the expression 'raw athlete'. This was further captured in Coach 1's definition of talent, who

explained, “I think, especially on the women’s side, there is a lot of untapped potential before the high school level in particular”. Here, Coach 1 may be alluding to the notion of a raw athlete as one who has little training but still demonstrates superior performance. When asked to elaborate on why this was female-dependent, Coach 1 continued, “I think it’s probably related to the ability to upregulate mitochondria through endurance training on the women’s side compared to the men’s side. I think you can actually derive a lot more aerobic fitness on the women’s side and out of thin air, than on the men’s side”. This quote speaks to the coach’s recognition of the potential physiological differences between females and males which draws attention yet again to the idea of genetic predispositions shaping this raw component of talent.

Through conversations with the coaches, it appeared both forms of talent, raw and trained, were important qualities for an elite distance running athlete, and in some cases, certain athletes displayed signs of both forms (as mentioned by Coach 3). Coach 2 shared his particular excitement around the individuals he classified as having raw talent as he explained, “The most undeveloped, the under-developed ones are the exciting ones because there’s so much to gain still and if they’re showing especially, you know, high school athletes that show good speed, so like I'm a good example…I had this like speed gift, but I had never run a day of mileage in my life”. What remains unclear is whether this group of coaches preferred a certain form of talent. For example, Coach 8 discussed the value of both the raw and trained forms of talent by explaining, “She [the athlete] dispelled the myth that distance runners have a certain physique, where she proved that hard work, obviously there’s some genes, and there’s some physiology there, it made her such a unique athlete”. Statements such as these by Coach 2 and Coach 8 indicate the need for further work using different approaches in qualitative exploration to gain a deeper understanding of why—or if—coaches prefer raw or trained forms of talent.

Various Physical and Psychological Components

It would appear, based on the discussions in the present sample, that talent in distance running is considered to have physical and psychological components. This was reflected in several comments throughout the interviews, some drawing greater attention to the physical components, as demonstrated by Coach 9:

> You can tell a runner based on their, their stature, their leg length, their physique, you know their build. … and then, of course, then there's the physiological component to it, their aerobic capacity, their anaerobic capacity, their ability to sustain endurance. You know, of course, all driven by everything from the muscle composition, the cardiovascular system so that's, of course, in varying degrees, where some people have more or less.

Other coaches drew greater attention to the psychological components as demonstrated by Coach 10 who discussed the role of mental skills and balancing emotions required for an athlete to persevere through the challenging competitive sport pathway. Specifically, as if he were speaking to the athlete, "Can you just push yourself to the absolute limit? It's not good at some point to keep doing that, but I would say that the majority of people [described as talented] are just super motivated to do that". Moreover, Coach 10 continues, "Well, I mean, in a part, we're just talking about being very mentally strong, right? And like have a positive outlook and be confident. I guess you'd say be very resilient, right? Because there's lots of ups and downs".

Surprisingly, even within the study group of elite distance running coaches (all male, coaching in Canada, at similar stages in the developmental pathway), there was variability in the physical profile used to describe the best athletes in their programs. For example, Coach 2 explains, "That's what's so cool about running, is you get both sides of that fence. We have

people, we have like two athletes who are essentially, have identical times and they're literally the opposite ends of the spectrum when it comes what their athletic IQ[22] is like". There is much to consider in this quote, perhaps most notably that the best and arguably most talented elite distance runners do not fit a cookie-cutter mold. Rather these athletes present unique combinations of physical attributes and skills.

Moreover, similar to the aforementioned physical profiles, a one-size-fits-all approach was not observed within the psychological characteristics. For example, Coach 3 noted the lack of leadership that two of his best and talented athletes exhibited with the following quotation:

> I wouldn't describe them necessarily as team players, they're very cooperative athletes, and they're liked and respected on the team, but neither of them has been captain. They don't play leadership role in that respect; they're very much focused on their own goals.

In contrast, Coach 7 believed that his best and most talented runner did have leadership qualities by stating, "You can never tell who's going to be on your team, and you can never tell who is going to be one of the better leaders on your team, and she was a leader".

One of the more agreed upon characteristics was the ability of the best athletes to understand and accept that reaching the end goal (which was athlete-dependent) will be a long, difficult, and possibly painful journey. Multiple coaches mentioned their best athletes had abilities to delay gratification. For example, Coach 2 discussed this notion by saying, "He was able to just buckle down for like three months of training and not let it get the better of him. Just get the benefit from it and walk away knowing it was for a bigger picture". He continued to explain that this ability to delay gratification may be increasingly important in this generation of

[22] IQ refers to intelligent quotient.

athletes which is “hyper-focused on the day-to-day” but needs to see “the bigger picture”. A quote from Coach 6 highlights the relevance of this capacity to delay gratification especially at the elite levels of performance,

> [She] is a multi-time Olympian but her cumulated running time at the games is 8 or is 12 minutes of racing. And if you divide 12 minutes by the 14-year career she had, it’s a pretty small percentage of time, and so you figure your self-worth is based on the Olympic outcome, and you do that percentage, you’re crazy! You better enjoy the journey and enjoy the people you meet, and you better have a bigger life purpose to what you do but, that said, the outcome is also important for a lot of people.

In addition to highlighting how vital it is for an athlete to see the bigger picture and delay gratification, these quotes highlight an area ripe for further exploration: the nuanced and complex interactions between athletes’ lived experiences and self-identity in pursuit of athletic success.

Another common psychological characteristic of talent was a strong work ethic. As noted by Coach 9, this work ethic may be, more broadly, one of the driving components of talent:

> Hard work is, is obviously essential regardless and so what separates those who do really well is those who have the, the physical gifts, especially in a sport like running, where you know, you have to just be endowed with certain attributes—the right body type, the right physiology—but you also have to have the, the psychological component— composure—to be able to put it all together and persevere and keep training, to suffer…

This comment may speak to the idea that talent is perceived, at least in part, to be related to an athlete’s capacity to work hard and train at very high levels. This coach paid particular attention to the idea of how important this is for the sport of distance running, but also acknowledged the

dynamic interactions of both the psychological and psychological abilities of the athletes to reach these elite levels of performance. It is also important to acknowledge the coach's use of the word gift in this context because the question to which he was responding was framed as "What does talent mean?". Perhaps this speaks once again to the notion of innateness or genetic predisposition being related to talent.

Different Degrees of Obvious

Intriguingly, some coaches stated that talent has varying degrees of obviousness. Some of the coaches' comments could be interpreted to mean that they think talent can be observed easily in some athletes but seemed to be hidden in others. For example, consider Coach 8, who explained that talent is ostensibly recognized through watching an athlete in practice execute a given task (perhaps with more ease than other athletes). Coach 8 said specifically, "You know, talent is one of those athletes who can just kinda come in and just, you know, you can just see that they have the ability right away. They're able to do the workouts that you want them to do. Right?". In another example, Coach 7 stated, "You see something in their first practice". Coach 10 said the following:

> You see them run, you know a hundred meters, or two hundred meters, and you see the time, and you're like, wow, that's pretty talented for a grade nine girl to be able to just walk out here and do that for the first time…there's some people that just run and anybody would say, "Look how talented they are!"

In contrast, Coach 3 said, "It's not to say they couldn't achieve these things, but they're not showing it in the obvious way that the [Athletes C & D] are, which is by kind of winning at every level sort of thing". In this case, Coach 3 compared two of the best athletes he worked with and believed that one was talented in more obvious ways and the other in less obvious ways.

The coaches' stories shared during the interviews highlighted the difficulty in identifying talent for even the most elite coaches in this field. With talent being displayed in both obvious and less obvious ways, it is easy to imagine that athletes have been overlooked throughout the selection and developmental pathways. While this is difficult to test, it can be postulated that fluctuations in athlete abilities over time are a likely cause. This may be magnified in a sport like distance running where peak race performance can occur later in an athlete's life compared to other sports like gymnastics (i.e., distance running is considered a late peak age sport). This complicates selection practices as many selections occur before an athlete may have reached their peak performance. This is expressed by Coach 3 who noted, "Talent is very difficult to identify as there are people who don't excel at every stage, but then all of a sudden will jump four or five stages when they hit the age of 25". This was emphasized further by comments from coaches who indicated that they believe talent was missed in the developmental pathways. Coach 1 noted, "I think there's talent in lots of places. It's just not developed correctly. So, like those are runners that would have been overlooked and never recruited by schools that then became champions [i.e., the runners, not the schools]". Comments regarding the institutional and organizational structures influencing athlete selection helps to position the coaches' perspective with regards to talent identification (and thus, selection) practices. In the case of Coach 1, it is a relatively short window to identify, and this window makes selection decisions even more challenging as coaches acknowledged the variability in time it takes for athletes to demonstrate their athletic abilities and for coaches to subsequently recognize those abilities.

Discussion

This study aimed to explore the frequency of use, contextualization, and subjective beliefs regarding the term talent through the lens of a sample of elite coaches working with an

elite group of distance running athletes. In the following discussion, the authors 1) consider the term's use and significance and discuss how these beliefs may affect coach behavior and 2) consider the extent to which the authors' findings provide support for the reconsideration of the term from an operationalization standpoint and discuss potential implications for future research.

First, it was important for the authors to determine whether the term talent was used at all, and whether the coaches believe that this construct exists *before* asking them what the term meant in the context of their sport. Findings of the present study indicate that coaches in the sample do use the term talent in their lexicon (at least at the time of, and context of, the interviews with them). For this reason, the authors interpret this to mean that the coaches believe that talent exists.

Through discussions with coaches regarding the systems they work within and the athletes with whom they worked, it appears that coaches use the term talent as a description of athletes' abilities. Most often, coaches described the best athletes as those who have talent, are talented, or display signs of talent. In other words, the coaches articulated an association between talent and the best athletes in their programs. When asked to confirm whether the person described as the best athlete was someone who did or did not match their connotations of the term talent, all respondents believed the terms 'best' and 'talent' went hand in hand.

The interview data also suggested that coaches believe talent has multidimensional qualities, in the sense that talent includes psychological, physical, emotional, and physiological components. This finding aligns with the work by Jones et al., (2020) where collegiate coaches were asked, "What does talent mean to you?". Their answers varied, and in some circumstances were inconsistent within the relatively homogenous group (from the same institution, at the same point in time, working with athletes at the same competitive level). Beyond the

multidimensionality of talent, in the work of Jones et al., (2020) and the present case study, beliefs about talent appear to be context-specific (e.g., understood within the coaches' environments and realities and dependent upon the individual and his/her/their circumstances), complex, and nuanced.

The data in the present study also implied that coaches believe talent not only exists but can exist in multiple forms (raw and/or and trained). This finding echoes the dualistic perspectives already observed within the literature with respect to expert performance (i.e., nature versus nurture debate; for an in-depth review of the perspectives in sport, see Davids & Baker, 2007, and Phillips et al., 2010) and draws attention to the notion of talent having a genetic component. Specifically, in the case of the present sample, similarities can be drawn between what coaches considered 'raw talent' and what is recognized in the literature as being a genocentric (nature) perspective (Phillips et al., 2010). Likewise, what the coaches considered to be 'trained talent' may be similar to that of the environmentalist perspective (nurture). Despite somewhat heated arguments to the contrary, some would argue that the notion of talent, at least as defined as genetically constrained, biological influences on exceptional human performance, is not only reasonable, but also irrefutable (Davids & Baker, 2007). A recent meta-analysis (Plomin, 2019) found no evidence of a single trait that was not, to some degree, heritable. This finding is also expressed in the "First Law of Behavior Genetics" which concludes, "All human behavioral traits are heritable" (Turkheimer, 2000, p. 160). With a sport such as distance running, where genetic predispositions have been studied (see Brown et al., 2011; Moir et al, 2019; Scott et al., 2004 for examples), it is perhaps unsurprising that coaches in the present sample referred to raw talent when describing their best athletes.

While it was not clear whether one form of talent was preferred, there were subtle signs that (at least for one Coach) there was interest and intrigue with raw/untrained athletes. While deeper investigations are needed to explore this further, statements such as that of Coach 2 (see p. 47 for direct quote), may shed light on a particular preference for innateness within the context of elite distance running. This preference or intrigue with a person's natural/innate ability/abilities was studied empirically by Tsay and Banaji (2011) in the context of music. Findings helped to highlight the potential interest or fascination—called 'the naturalness bias'—in those who are described as being a natural talent. More work is needed however, to test this naturalness bias in the context of sport and to explore the stability of coaches' beliefs, especially as Tsay and Banaji (2011) demonstrated, the stated preference (in their case for "strivers" or trained talent) does not always align with the actual decisions/selections made (which favored natural or raw talent).

Regarding beliefs about the two forms of talent, findings of the present study may also hold important insight into the way a coach thinks about and develops an athlete (i.e., a coach who believes an athlete's talent is trained, may believe his[23] ability to work with and further develop the athlete is limited). The finding that beliefs about talent (and its meaning) matter, aligns with existing research in the field (Baker et al., 2018; Dweck et a., 1995; Wulf & Lewthwaite, 2009). Specifically, the notion that individuals' attitudes about talent affect their motivations, behaviors, and performances was popularized by the term "Growth Mindset" by Dweck (1999), and this research suggests people have beliefs regarding the source of their abilities (inherent and innate or developed). These authors (among others like Baker and Wattie, 2018) believe that a view of sporting talent as something a person either has or does not have has

[23] The term 'his' is being used in reference to the present sample.

the potential to influence both the coach's and athlete's behavior in significant ways. Simply put, "When a coach or scout makes a decision about who has talent or has the potential for further development, they are ultimately making a prediction about a range of future sport outcomes" (Baker et al., 2018, p. 50).

Second, to add to the complexity of discussions regarding sporting talent, many coaches used words such as 'gift' and 'potential' in their descriptions of talent. This was seen with Coach 9 earlier in the coach commentary, and with Coach 8, who described the terms 'gift', 'potential', and 'talent', which speaks to the challenges of using such nuanced words for such a specific and precise task. In light of this finding, and to position the finding with other research in the field (e.g., Baker et al., 2018; Johnston & Baker, 2020), the authors of the present study take the position that using a term such as talent may be problematic. In their recent work, Baker and Wattie (2018) argued the validity of talent from a theoretical perspective (i.e., there is reason to believe talent exists in the world); however, they concluded the term may not serve any real use in practice without concrete definitions and reliable measurement tools. Moreover, trying to identify a uniform understanding of talent may never be feasible because of its dynamic and fluid nature (see, for example, Phillips et al., 2010). Knowing this, if talent cannot be seen or measured with reliability or validity, what purpose does it have for a coach to use this term when identifying an athlete's suitability to their program? The use of this term (and potential misuse) has repercussions for the coach when tasked with making accurate selection decisions, as well as for the athletes whose behavior may be influenced by their beliefs about whether they have talent or not (Dweck, 2003; Dweck & Yeager, 2019). The reality is that talent is a pervasive phenomenon in sport. This is seen in the language used in the media (e.g., Bleacher Report, 2021), the use in policy and organizational documents (e.g., swimming; Ontario Artistic

Swimming, 2019), and the accreditations that coaches and other administrators can earn (e.g., The Football Association Level 1 Talent Identification; The Boot Room, 2021). Collectively, these findings reinforce the importance of considering the language used in athlete development and sport participation, as it is a way of expressing beliefs (whether consciously or subconsciously) and may have lasting repercussions. Future work in the field is needed, even if for no other reason than to challenge the existence of talent and to question whether it deserves a place at all.

Future Directions

The authors believe this work should be interpreted as a case study whereby findings should be contextualized by the location (all in Canada), time (cross-sectional investigation), and sample (elite-level coaches discussing an elite-level sample of athletes). Future work could strengthen the credibility of the findings by expanding the focus of investigation to other sport stakeholders (i.e., athletes, sport staff, parents), policies, and other guiding documentation (e.g., using discourse analysis). This triangulation of data may help broaden the understanding of the socio-cultural factors at play and may provide more robust findings of how talent is constructed and perceived.

Additionally, future work could benefit from exploring how talent varies based on different training and education backgrounds. For example, this study included a coach who also worked as a physiologist. It would be interesting to compare findings with coaches who hold dual (or multiple) roles, which may provide a unique, more diverse perspective of talent in runners. Athlete selectors (such as coaches) are a critical sample from which to learn as many at the elite level have years of working with, developing, observing, and selecting athletes. If researchers can capture more coaches' insider's knowledge (often referred to as tacit

knowledge), then this deeper understanding of motives, goals, and practices could inform the development of more efficient models. For example, exploring how coaches believe that their approaches to athlete development change based on their subjective beliefs about talent may highlight personal and system-level biases. This, in turn, may help coaches work within the system, address their blind spots, and decrease talent wastage in the system (Johnston & Baker, 2020).

Limitations

While the present case study presents information that can advance our understanding of talent and talent identification in distance running, it had notable limitations. For instance, there are potential biases affecting the type and nature of the answers the coaches provided. As noted by Brink (1989), interviewees may respond with what they believe is the preferred social response, whether or not it aligns with their own personal beliefs. Similarly, the very nature of self-reporting requires the use of memory, which is often influenced by various cognitive biases and limitations (i.e., participants may draw from their most recent experiences for reflection as these are more easily pulled from memory; Tversky & Kahneman, 1973).

The researchers worked to mitigate these effects and biases by creating a safe and comfortable space for the interviewee (all interviews were done in the coach's office or in their own home) and the authors expressed the prioritization of protecting the coaches' (and their athletes') anonymity. To help mitigate the effect of the recollection bias, a probing question was added: "How might your perspective of talent have changed over time?". It is worth acknowledging that these biases are difficult to monitor, and future work may benefit from participant-driven methods such as journaling or think aloud protocols during selection tasks (Whitehead et al., 2016).

Finally, while the perspective of such an elite sample of distance running coaches is a strength of this study, the lack of diversity among the sample was a potential limitation. That this sample consisting entirely of white, male coaches likely speaks to the coaching landscape in Canada and highlights the need for greater diversity at the institutional and organizational level.

Concluding Thoughts

In a commentary on Howe et al. (1998), Davidson and Sloboda's work (1998), Starkes and Helsen stated, "Coaches scour the country looking for it, professional scouts claim they can identify it, the media wager on the basis of it, and the athletes judge their own worth based on others' perceptions of it, yet like the search for talent in music, precursor talents in sport remain elusive" (1998) (p. 425). Talent holds a particular place in the lexicon and practice in sport, and yet, to date, there is little empirical evidence to show its existence. Findings from the present study echo these elusive sentiments and further support the need to question its use in sport, as there remains little utility for the term when it comes to identification and selection practices. Findings also support the idea that talent means different things to different people under different circumstances, and without a better understanding (what talent looks like, how to predict it, and how it changes over time), it will likely remain a barrier to enhancing identification, selection, and developmental practices.

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Chapter Five: Sources of Information Used by Elite Distance Running Coaches for Selection Decisions

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***This manuscript has been presented in the formatting that was published in the respective journal. References are included at the end of the dissertation starting on page 177.*

Abstract

Talent identification and selection are critical components of competitive sport success. Despite the time, effort, and resources invested, the accuracy of selection decisions remains generally poor. While much of the scholarship in this area has focused on the factors discriminating skilled and less-skilled individuals, limited research exists on *what* information is used in the decision-making process for athlete selection. The current study seeks to gain a better understanding of the information used by elite distance running coaches when forming judgements for athlete selection. Ten semi-structured interviews with elite distance running coaches from across Canada were transcribed and analyzed using inductive thematic analysis. It was interpreted that coaches mainly gather information using their coach's eye to determine an athlete's 'fit' to the team. Coaches also use more objective information such as race times and movement analyses to assess performance and judge future 'potential'. As well, the decisions were believed to be influenced by situational considerations at the time of the selection procedure. Specifically, these considerations affecting a coach's selection included length of time to make a decision, personal limitations in decision-making abilities, and team circumstances. Interestingly, coaches recognized limitations in their selection practices and procedures and discussed some of their personal and system-level biases, highlighting their awareness of potential selection inefficiencies/inaccuracies. Overall, distance running coaches used a variety of techniques to gather information before a selection was made, relying on both subjective and objective information for crafting judgments. Findings are discussed in relation to implications for coaches, sport organizations, and talent identification and selection programs.

Key Words: talent selection, talent identification, elite athletes, elite coaches, qualitative description

Introduction

Evidence-based approaches to talent identification and selection have become critical components of sport systems around the world, reflected in the integration of sport science experts (analysts, medical teams, and researchers) and an increased use of technology (Balagué, et al., 2017; Ellapen & Paul, 2016). There has recently been a large upswing in the number of scientific articles on talent identification (Baker et al., 2020), especially on the assessment of the efficacy of selections between skilled and less-skilled athletes (e.g., Lidor, et al., 2005; Pion et al., 2015; Woods, et al., 2016). A strong research bias has been observed towards physical testing, speaking to a limited understanding of the 'less-tangible' characteristics of elite athlete performance (Baker et al., 2020; Johnston et al., 2018). Despite the common use of physical measures, it is important to acknowledge that it is unlikely coaches rely on such a narrow set of attributes for talent selection. Given the multidimensionality of sport (i.e., requiring tactical, inter/intrapersonal, perceptual-cognitive skills etc.), it is more likely coaches use (either consciously or subconsciously) a more complex approach to athlete selection than has been studied in prior research. In reality, most coaches and organizations appear to use a variety of information sources for identifying skilled performers (often referred to as 'talent') (Jokuschies et al., 2017; Vrljic & Mallet, 2008; Williams et al., 2020). However, little is known about what that information is and how that information is used in the decision-making process for athlete selection.

To investigate this, Roberts and colleagues (2019) recently conducted a systematic review on the types of information coaches use for 'talent' selection decisions. Their review highlighted 14 studies revealing four main types of information. Specifically, when coaches were asked how they identify 'talented' athletes, 'gut feeling' or 'instinct' (also known as the coach's

eye), was the preferred method of identification for many (see Christensen, 2009; Holt & Dunn, 2004; Johansson & Fahlén, 2017 for specific articles). Other themes included ‘drive and ambition’, ‘game intelligence’, and ‘physical and technical skills’.

In addition to the work by Roberts and colleagues on the types of information used by coaches for ‘talent’ selection, MacMahon and colleagues (2019) explored the factors affecting athlete selection (which they termed ‘recruitment’). Using semi-structured interviews, the researchers identified factors influencing a group of recruiters’ (who were responsible for scouting prospective players) decisions for athlete selection within the Australian Football League’s (AFL). These factors included 1) recruiter background, 2) recruiter attributes, 3) recruiter understanding of team needs, and 4) recruiter-coach relationship. Their work revealed both intuition and deliberation are used by AFL recruiters, and the extent to which they are used appears to be strongly influenced by the recruiter-coach relationship. This finding speaks to the complex (many inter- and intra-personal factors at play), dynamic (in a state of change/flux), and interconnected (considers the relationship between the selector and athlete) nature of athlete identification and selection.

This complexity is represented in the work done by Christensen (2009), (and further supported empirically by Roberts et al., 2020), who hypothesised two different coaches will identify ‘talent’ differently. Recently, Jones and colleagues (2020) also noted this finding, and concluded coaches conceptualize sporting ‘talent’ in different ways within different contexts. With this in mind, *who* is performing the identification may be just as important as *what* is being identified (Roberts, 2021). It is important to acknowledge, however, coaches do not only try to select the ‘best’ or most ‘talented’ athletes, they also make decisions based on their circumstances (i.e., the amount of information accessible and the context it is situated within)

(Jones et al., 2020). However, this type of complexity expressed by coaches during the decision-making process is rarely acknowledged or considered in the research. Often, this leads to a reductionist perspective of what athlete selection looks like (i.e., heavily dominated by physical assessment), which exposes the difficulty in determining how and why coaches craft judgements and make selection decisions the way they do. In their work, Cushion (2011) and Mills and colleagues (2020) acknowledged this 'bioscientifically-dominated' perspective and encouraged researchers to adopt a multidimensional lens that considers the athlete beyond his/her/their physicality and to explore the broader social influences at play. If research endeavours are able to gain a better understanding of coaches' and athletes' unique, experiential knowledge, it is plausible this information could enhance coach education tools and thus, enhance coach-athlete interactions (Greenwood et al., 2012; Waters et al., 2019). To this end, the objective of the present study was to better understand coaches' experiences with athlete selection practices and to illuminate the sources of information coaches use when forming judgments and making selection decisions.

Specifically, this work seeks to better understand selection practices in the unique domain of distance running in Canada. There are multiple pathways an athlete can take to reach the highest levels of competitive distance running in Canada; however, the primary route would include private club-based participation and school-based (i.e., college or university) participation. Both of these avenues funnel into Canada's provincial and national sport organizations, where resources are streamlined to support an athlete's journey to international competitions. Canada has a relatively long history with track and field and athletics, as the national governing body (Athletics Canada) is one of Canada's oldest National Sport Organizations (established in 1884; Athletics Canada, n.d). With training centres spanning coast

to coast, Athletics Canada has a purpose “to support high performance athletics excellence at the world level, and to provide leadership in developmental athletics” (Athletics Canada, n.d.). Coupled with an increase in funding and scientific attention, (e.g., government funding has more than tripled in the past 15 years; Dowling et al., 2015), Athletics Canada has seen improvements in podium finishes at major events like the Olympics and Commonwealth Games over the past two decades (Athletics at the Summer Olympics, Wikipedia, n.d). Although Canada is not necessarily known for developing world-class long-distance runners (compared to nations like Kenya and Ethiopia), multiple Canadians (males and females) have rankings in the top 100 athletes in the world for races such as the 5000 meter, 10,000 meter, half marathon, and marathon (as of Jan 4 2022, World Athletics, n.d.).

Perhaps in response to the international success and accolades, Canadian scientists and writers (for examples see Hutchison, 2018; Konoval et al., 2019; Mills & Denison 2013; Wilson & Baker, 2021; Young & Salmela, 2010) are exploring this ‘subculture’ of distance running within athletics, as it has been recognized as a ‘uniquely social world’ (Allen Collinson & Hockey, 2007; p. 387). Among other things, this subculture is renowned for placing value on certain traits such as the ability to tolerate and even embrace the routineness of pain, combined with extensive and exhaustive training (Allen Collinson & Hockey, 2007; Hutchinson, 2018; Smith, 2000; Young et al., 1994). These values present an interesting area for exploration from both an athlete level (e.g., examining personal identity; Allen Collinson & Hockey, 2007; Atkinson, 2011; Shipway et al., 2013) and from the perspective of coaches to illuminate what qualities, characteristics, and traits are valued and selected for within the Canadian sport landscape. To the best of the authors’ knowledge, this is the first study of its kind to unpack the selection decisions from the perspective of elite sport coaches within the Canadian context.

While work by other Canadian researchers (Denison et al., 2017; Konoval et al., 2019) have sought to explore the ways in which coaching practices have been shaped through social, historical, and cultural contexts, the present study seeks to explore the experiences with selection practices within this subculture of coaches.

Methodology

The present investigation was part of a larger research initiative examining talent and athlete selection in elite distance running and uses the same data corpus. The first study (Johnston & Baker, 2022) examined coaches' subjective beliefs of the term 'talent' in the context of distance running. While the first study examined theoretical constructs and definitions, the current investigation focuses on the approaches, beliefs, and practices regarding athlete selection. We recognize this is not an ideal approach and raises concerns about 'data slicing', however we believe a) the interviews provided such rich conversation that condensing both research questions into one manuscript may lead to an overly generalized view of the data, b) there was minimal overlap between the material presented in Study 1 and the current study, c) the authors designed the study with the intention to gather two sets of different data using two separate research questions with this very hard to access sample, and thus, believe the dataset is worthy of supporting multiple, distinct papers (Kirkman & Chen, 2011), and d) there is precedent for this type of approach (see Kirkman & Rosen 1999; Kirkman et al., 2001; 2004).

Theoretical Perspective

To guide our study, we draw upon the ontological and epistemological principles and philosophies relating to pragmatism. Pragmatism is a suitable paradigm for the present research given the debate about conceptualizations and interpretations of reality and that notions of reality should be examined using various research tools that help to answer a question and/or solve a

problem. In this sense, the authors subscribe to the notion that multiple research approaches can and should be used to help answer the question ‘how do coaches select athletes?’. Specifically, this research seeks to understand how coaches select athletes using one specific analytical approach (qualitative description), but this area would benefit from other approaches (both qualitative and quantitative) to gain a more thorough understanding.

While different versions of pragmatism exist (see Rorty et al., 2004 for more information) the present study draws on more traditional and classical versions of pragmatism, which accept people’s ideas and beliefs as tools for problem solving (Kelly & Cordeiro, 2020). From this perspective, examining the experiences shared by elite coaches when selecting athletes provides an indication of what has ‘worked’ in the past. While this ‘what works’ perspective is criticized by some theorists (see Hesse-Biber, 2015), others argue this perspective has the potential to help researchers map out various processes and procedures to guide social action. This classical view also respects what has ‘worked’ in the past does not assure what will ‘work’ in the future (Dewey, 1929). Therefore, the present investigations may hold value for coaches in particular contexts and may be of value for the creation of knowledge tools (such as coach education content); however, findings should not necessarily be interpreted with a prescriptive lens.

This practical, and ecological view of knowledge is a keystone feature of pragmatism (Kelly & Cordeiro, 2020), and one that is particularly valuable in this context. For example, when writing the analysis and discussion, pragmatism influenced the type of approach and techniques used to assess, analyze, and interpret the data. Similarly, through this pragmatistic lens, the authors focused the examination of the data on actionable knowledge (in a similar sense

to the work of Kelly and Cordeiro, 2020), which further helped to distill key takeaways for what has ‘worked’ for coaches in the past in relation to athlete selection.

Analytical Foundation

A prominent theme in the literature on pragmatism is that it provides a framework to help researchers choose which methods will be most appropriate rather than dictating a certain methodological approach (Feilzer, 2010; Morgan, 2014; Teddlie & Tashakkori, 2003). The analytical approach chosen for the present study is qualitative description (QD). This approach is appropriate for both the philosophical position and the research question under investigation because the overarching goal of QD is to describe an individual’s experiences (on a surface level) with the hope of transforming participants’ ideas, themes, or concepts and developing them into educational or behavioural intervention strategies (Sandelowski, 2000; 2010; Sullivan-Bolyai et al., 2005; Turale, 2020; Willis, et al., 2016). This approach allows researchers to stay ‘close’ to the data (using low inference) and seeks to report on the participant’s experiences, without trying to discover the essence and meaning of those lived experiences (as in approaches such as descriptive phenomenology; Sandelowski, 2000). QD is a practical choice for studies that seek to investigate a description of the phenomena, and while much of the QD work is applied to health care research (Sullivan-Bolyai et al., 2005; Willis & Griffith, 2010), the approach has been promoted by researchers to expand to other domains (Turale, 2020). QD is particularly relevant for exploring the present research question as the literature on ‘talent’ and ‘talent selection’ practices is quite sparse, and the scholarship could benefit from both surface level reporting (using QD) and thick description (as found in other qualitative approaches like ethnography) to broaden the scope of the research.

Participants

After obtaining university research ethics board approval (University Research Ethics Board certificate number for approval: STU 2019-067), participants were contacted via email to gauge interest in the project. Initial participants were contacted using the authors' personal contacts, and thereafter, snowball sampling and peer recommendation approaches were employed. Once written consent was obtained, an interview was arranged (either in person, over Skype, or over the phone). Interviews were conducted with 10, male coaches from across Canada who were either presently or previously working with distance running athletes (racing distances between 5km and 42km). The coaches worked with athletes at various competitive levels; regional (n=1), national (n=5), or international/Olympics (n=4) and had various years of experience competing themselves, ranging from regional- to Olympic-level competition. Many coaches held multiple coaching roles or coached athletes at different competitive levels at the same time (e.g., university-level, provincial- and/or national-level athletes). All but one of the coaches were actively coaching/working with athletes at the time of the investigation. To protect the coaches' anonymity, numerical codes have been used (Coaches 1-10) along with pseudonyms for any location and/or athlete the coach may have named during the interview.

Interview Guide

A key tenet of QD research is using expert knowledge of key informants to focus on an area that is under explored (Sandelowski, 2000; 2010). Knowing this, the authors met with two leading researchers in the field of talent in sport and two practitioners in distance running and endurance sports to discuss the nature of the questions being asked and the way the questions were framed in the context of the broader research goals. Additionally, the interview guide was piloted with a group of nine collegiate level coaches and questions were modified to enhance the

fluidity, interview length, and foci of the questions. The length of the interviews ranged from 24 minutes to 2 hours and 36 minutes with an average time of 36 minutes. The primary questions guiding the discussion along with a sample of probing questions to gain a deeper understanding about the coaches' selection processes and decision-making strategies has been added in Appendix C.

Positioning the Authors in the Research

The authors have been involved with athlete selection discussions with practitioners in the field and tried to position themselves within the data collection approaches in a way that reflects and embraces those experiences. Specifically, both authors have held consulting positions with a variety of high-performance sport organizations involved in improving identification practices and minimizing 'talent wastage' within selection systems. For this reason, the authors' experiences in athlete selection practices likely influenced the way the research questions, study design, analysis, and reporting were conceived and executed. Fundamentally, the authors' choice of pragmatism as the overarching philosophical orientation was influenced by our desire to understand selection practices from the experiences of coaches with the hopes of building the foundational knowledge for coach education. This has likely come from a recognition that coaches' voices regarding their experiences in athlete selection processes, combined with research and education on this topic, were lacking from a research perspective.

Data Analysis

The method used for data analysis was Inductive Thematic Analysis (ITA). ITA was particularly useful for this study because the literature to date indicates a variety of styles, practices, and approaches are used in selection, and thus, agreed upon, pre-determined themes do not exist in the literature to the best of the authors' knowledge. The analysis process was shaped

by the suggestions of Braun and Clarke's (2019; 2021a) work, with the initial step of data familiarization (where the researchers listened and re-listened to the interviews and read and re-read the transcriptions). Following this step, the researchers looked for commonalities and differences in the coaches' experiences and notes were made to capture general ideas. Thereafter, an initial set of codes was created and assigned to meaningful statements identified by the researchers. These codes were used to generate an initial set of themes from the data, and the researchers then embarked on a process of checking, re-checking, naming and re-naming the themes (in this sense, a 'theme' is used to capture "patterns of shared meaning, united by a central concept or idea" p. 342, Braun & Clarke, 2021b), This 'open coding' process did not utilize a coding framework, rather an interpretive reflexive process (i.e., *reflexive TA*), which allowed the themes to become the 'outcome' and thus the foundation for the discussion (Braun & Clarke, 2021b). This method allows the data to evolve instead of forcing it into neat, pre-determined themes, which is well-aligned with the principles of QD (Kim et al., 2017). To help demonstrate the coding and theming process, see Appendix D which shows specific codes and themes and the role they played in the analysis.

Trustworthiness of the Data

Specifically, the authors sought to increase the credibility of the study by utilizing appropriate and rigorous data collection, data management, and data analysis procedures outlined by leading researchers in the field (Braun & Clarke, 2019; Sandelowski, 2000). In line with reflexive TA principles, author notes were created throughout the data analysis process. These notes were not only shared with the second author, but also with other researchers and practitioners in the field (those who were invited to contribute their perspective on the interview

guide). The use of these notes and note-sharing practices helped minimize the influence of the lead author's personal experiences when interpretating the coaches' comments (Shaw, 2010).

Results

Broadly speaking, the coaches in this sample employed a multidimensional approach when gathering information for selection decisions. For example, when asked what information he uses to select athletes, Coach 1 stated:

> We have multiple processes; we have a rank list, or a list we would love to talk to and love to recruit that we've identified based on their times, national team appointments, connections with coaches, etc. That would be part one; within that, were looking at training age, training history, chronic training load, multi-sport - like when did they end multisport, how many years have they been specialized, what other sports were they doing, is there talent transfer that comes over to that, personality, culture fit, things like that.

From this quote, it was clear his approach to selection was multifactorial as he listed a range of 'subjective' and 'objective' qualities, characteristics, traits, and abilities, demonstrating the scale and complexity of his identification and selection processes. The authors also recognized that upon sharing their lists of variables, certain quantities (e.g., number of years, metrics, times or values) were assigned to these characteristics, giving the idea that perhaps a mental model (i.e., an organizational structure of ideas and preferences) was being used in the decision-making process. Similar to Coach 1, other coaches offered a multi-step approach to selection. Upon further investigation and subsequent analysis, three commonly discussed themes were generated in relation to the information used for selection decisions including, 1) subjective criteria and the coach's eye, 2) objective sources of information, and 3) situational

considerations. These three main themes are presented along with their associated sub-themes and supported by coach commentary below – for a visual depiction of the organization of themes and sub-themes, please see Figure 2.

Subjective Criteria and the Coach's Eye

Our interview data indicated coaches recognize patterns using their 'trained eye' (known colloquially as the 'coach's eye'). Using the coach's eye, it was interpreted they form judgements about an athlete's past, present, and future ability. For example, Coach 10 expressed, "there's some people that you just see them run for the first time and just the way they flow and their form you just look at them and you're like, 'oh my God'". When asked to explain how the coach's eye was developed/built/gained, Coach 1 explained it was "developed over years of experience of watching talent come through a pathway", and Coach 4 expressed, "I think it's just like anything if you do it a very, very, very long time, it just becomes more nuanced in your ability to 'feel it'. So, I've just been through more, worked with more people, I think my read is better".

Through follow-up questions and further probing, the interviews revealed two areas coaches primarily focus on when using their 'eye' including, a) the 'fit' of an athlete to the team, and b) an athlete's personality, which will be explored as sub-themes below.

Degree of 'Fit' to the Team

Through discussions with coaches, one of the primary uses of their 'eye' was to observe whether an athlete is/was a good 'fit' to the team. For example, Coach 4 remarked, "I just tell people, you're checking us out, but we're checking you out, and the fit sometimes isn't great". This 'fit' was interpreted to be an important component in building a successful distance running team for this sample of coaches, which is perhaps surprising because of the perceived nature of

the sport of distance running (i.e., as an 'individual' sport). However, based on the present discussions, the quality of the teams' dynamics was mentioned frequently as an important consideration when making selections decisions. For instance, Coach 6, referenced his perception of another elite coach's beliefs when considering team dynamics and selecting athletes for reasons of 'fit':

> … she's trying to figure out, alright this athlete's great, but if this athlete's going to be absolutely toxic to our culture, I'll move on because … the culture of what we're doing with the entire group for her is more important than like one superstar athlete that's going to come in and upset the whole apple cart.

Coach 6's comments draw attention to the importance of team culture and how a mismatch in 'fit' may disrupt the team's dynamics. It was interpreted the coach (whom Coach 6 is referencing) prioritizes this 'fit' even over running performance, speaking to the weight this variable may have in the judgement and decision-making process.

To further unpack what constitutes a 'fit' to the team, Coach 8 explained, "…you can't be a square peg and fit into a round hole. So for us, you need to fit into our culture". Additionally, Coach 2 noted certain aspects of what the 'fit' entails when he shared, "…there was a, just wasn't the right fit. The athlete wasn't feeling confident in how her program was being implemented". These examples provide support for the idea that the 'fit' is subjective in nature, meaning different things to different coaches. For example, it was interpreted that coaches 8 and 2 consider 'fit' to include the values, goals, preferences, and circumstances of the athlete, the coach and the team. Specifically, Coach 8 discussed a 'fit' with the alignment to the team's culture, and for Coach 2, he drew attention to an athlete's confidence in his/her/their program as being an important element of 'fit'. It is possible there are some common traits between coaches

in what characteristics make up ‘fit’, however the degree to which each characteristic is important may be unique to any particular coach and may also vary based on his/her/their circumstances at the time of the selection decision.

When asked how coaches examine this ‘fit’ during assessment opportunities, they revealed various strategies. In one example, Coach 6 described the close attention he paid to athlete interactions while away on a ‘team bonding’ excursion,

> to me it’s just a series of conversations and it’s even sometimes … putting athletes in competitive situations as part of our recruiting visits that we used to do with our groups of athletes … we would use, on purpose, some kind of competitive situation that they didn’t even realize they were in, like we’d go bowling or we’d play pool … just watch them, see how competitive they are or aren’t.

Additionally, Coach 8 shared:

> you sit and see in that group how are they fitting in to that group, are they in there, are they working together, are they doing stuff together, are they helping each other as they go through that process, and you figure it out and I think at that point, the kids need to figure out that “hey, I want to be part of this environment and the culture, or am I out?”

Based on this discussion, it was interpreted Coach 6 and 8 believed their ‘eye’ can ‘see’ elements of ‘fit’ such as social comfortability, leadership, competitiveness. Moreover, these comments shed light on the potential underlying personality traits coaches are looking for when observing an athlete’s ‘fit’, which will be discussed in the next sub-phase.

Personality

In addition to the coach’s eye being used to discern an athlete’s ‘fit’ to the team, some coaches in the present sample used their ‘eye’ to determine athletes’ personalities. For example,

Coach 5 shared he was looking for the following characteristics: “be nice to people, not bullying anybody, and we really start looking at what type of character do they have? It’s more important at the beginning of picking them than it is how fast they run”. This quote, once again, sheds light on the weight that coaches may place on such ‘subjective’ variables, which are perhaps even more heavily weighted than the athlete’s speed.

This idea of personality being an important factor for athlete selection was evident in multiple other coach responses. For example, Coach 10 shared:

> we've had athletes, who you know say “[Coach 10], I'm gonna go Uber to Walmart and get some ponchos for the girls” or something. You know?...That's great. Or bringing snacks for everybody or, I mean, those are all little things, but you know, if there's a bunch of things like that, that's really helpful to the team dynamic right or you know, I don't know the girl that braids all the other girls’ hair right or always brings the ribbons or you know, brings the face tattoos or whatever.

Similarly, Coach 3 discussed:

> people who, without being asked, perform a leadership role within the group…They show up for non-sport related team events. So, they generally participate in the life of the program. Those could be tiebreakers as well because those people bring value to the program besides from their performances and over the longer term, they'll actually help us be better.

It can be gleaned from Coach 3 and 5’s comments there are a range of indicators coaches look for to determine whether an athlete displays a desirable personality trait like kindness and initiative-taking. Quotes such as these may offer insight into not only the type of athlete the

coach is looking to select, but also the type of culture and value system embedded in the coach's program.

Another frequently mentioned personality trait coaches looked for was work ethic. For example, Coach 8 discussed how he observed an athlete's work ethic, demonstrated in the following quote, "you may have kids that come in that may not display at lot of talent, but they have a good work ethic, and I think when you are in distance, hard work can go a long way". Additionally, Coach 10, shared how he assessed work ethic: "by observing them in practices, how they do on their off days, like easy runs or how they work on the elliptical or whatever", which shows the importance of demonstrating a strong work ethic beyond practice and competitive environments.

Objective Information

In addition to the subjective information gleaned through the coach's eye, the use of objective information was found to be important information for coaches to use when selecting athletes. The objective information discussed by the coaches in the present sample was categorized in the following two sub-themes, 1) timed performance, and 2) fitness/movement testing.

Timed Performance

Unsurprisingly, race time (speed) was mentioned as the main objective criteria used in athlete selection. Put succinctly by Coach 9, "the great thing about running is it's relatively objective". It was interpreted many of the coaches use time trials as a preliminary way to assess and remove athletes in the initial stages of selection. As noted in his example, Coach 3 explains, "so our first criteria would be head-to-head performances", and similarly, Coach 8, noted, "….every athlete who's on our roster, even if they're returning, has to go through that time trial

and that's what we'll use to select our roster". The use of time trials and head-to-head racing highlights a particular advantage the sport of distance running has when it comes to ecological validity and representativeness of testing measures. Despite this advantage however, it could also provide a challenge to selection as athletes who are injured, sick, or who are having an 'off day' may be removed at early stages in the selection process. Coach 7 noted this and explained the way his program allows for 'wiggle room' during selection periods to help minimize the impact of this potential wrongful, early exclusion,

> …the athletes have … to hit those standards on the team; however, we're pretty flexible if they are within, you know, a certain percentage of the time and depending on how many people we are going to collect, we take everybody and then as I mentioned earlier, if you are a bit off the time, there's an opportunity for you to make the team down the road.

A similar approach was mentioned by Coach 9 who explained, "I'll base it off of what I see in practice over the week, that first week of classes, and I'll temper it a little bit sometimes [when] I've got a really strong athlete coming in, but maybe the fitness, because of injury or illness, isn't quite there". Even at the highest levels of sport performance, it was interpreted coaches consider these variables when analyzing race times as noted by Coach 6:

> …and Athletics Canada, this is all online, you can look on the selection criteria, the Canadian Athlete Performance Pathway or carding pathway for Athletics Canada called 'CAAP', and the majority of it is based on points that you get from your performances but there is a selection committee that comes together that looks at how you're tracking, how you're tracking compared to your team, whether you've had injury or illnesses, did you bring in reports, were you just pregnant?

As noted in this quote, there are particular organization-specific approaches that coaches consider, which ultimately may shape the way selections occur. This highlights an important area for future investigations, as the field could benefit from examining the policies and structures in place through various means (e.g., discourse analysis), to better understand the potential influence(s) on coaches' decision-making practices.

Movement Analysis

Another frequently mentioned source of information used for selection decisions was movement analysis. In this case, coaches and other support staff (like strength and conditioning coaches) judge, measure, and analyze athletes' physical abilities using fitness testing and screening protocols as noted by Coach 2,

> any athlete that comes into our environment has to go through their intake, and the intake looks like, you go down to S&C [Strength and Conditioning] and you go through a whole bunch of movements. It is through these movement screens that coaches are looking for indicators for running ability.

When asked to elaborate on how exercises and movements relate to running performance, Coach 2 explained:

> it's a bit of a screen, a preventative screen to see if there's any issues we have to address before we can load them appropriately but it also gives us a lot of information as to sort of what we're going to do in the weight room in order to get them [to] their best selves for whatever event group they're in…They have a physio screen as well, so they go in a room with a one of the our physiotherapists and they go through a whole series of movements ranges and motion and stuff… The big thing we're looking for is whether or

> not there's symmetry, you know, if one side is bad. That's what leads to injuries; we always want symmetry.

Similarly, Coach 7 shared, "if they [the athletes] show some agility, show some speed, show some strength, they show some flexibility, then those are things we're going to be looking for as well", further supporting the idea that physical (and perhaps more objective) indicators are considered when crafting judgements about an athlete's present, and perhaps future, running ability. It can also be interpreted from these two quotes that movement screens can be a helpful tool to highlight an athlete's risk of injury. Using Coach 2's explanation, we can interpret symmetry and other physical indicators are important for considering an athlete's likelihood to sustain an injury and, by extension, to try and determine what type of training would/should be provided for certain athletes in different circumstances.

Situational Considerations

In addition to the subjective and objective ways coaches obtain information, many coaches described internal (within-coach and within-team) and external (within program/sporting organization) considerations influencing their decision-making processes for selection. These included 1) team circumstances, 2) length of time, and 3) personal limitations, and are explored in depth below.

Team Circumstances

It was evident coaches' selection decisions considered the circumstances of the team in a number of different capacities. This gave the impression that coaches do not simply select the 'best' or most 'talented' performers. Rather, in the discussions with coaches, it was interpreted that many selections consider the range of ages and experiences (preferring a blend of senior and junior athletes), consider the balance of the number of graduating athletes

with rookies (for coaches in a collegiate setting), and consider how a coach may be viewed and judged for the decisions he makes. For instance, Coach 1 noted,

> obviously, we'd look at our gaps too right? So, who's on our team? Do we need to replace in year one, year two, year three of this athlete's development and where do we think we can fit in? So, constantly looking at a little bit of a gap analysis to see where our athletes [are] now and where we need to backfill.

As described in his comment, Coach 1 considered the diversity of experience (measured by number of years in the program) within his team, which may speak to the specific role he has within the collegiate coaching environment. In particular, at the university-level, the number of athletes on a team stays fairly consistent from year to year, and thus, coaches try to fill positions with incoming athletes as other athletes leave the program for various reasons (graduation, eligibility requirements etc.).

In addition to making decisions regarding experience levels of athletes on the team, it was interpreted coaches consider how their decisions are viewed by others. Coach 10, for example, considered the type of message he was sending to the team by selecting certain players over others, as he explained,

> … I hate the idea of someone being on the team for four years and then you know not letting them run their fifth year. I don't think that's really fair, … but of course if there's a young athlete that's coming in and has the ability to be much, much, much, better than where they are right now, you know, you want them to be part of your program …you'd also don't want the young people to see oh, hey if you're not, if you haven't improved in year four and five, you get cut from the team either, right?

This contemplation speaks to the multiple social and political factors Coach 10 considered in his selection process. These considerations further highlight how complex and nuanced these selection decisions can be and draw attention to the potential risk involved with making such decisions (i.e., perception of social image, emotional cost etc.).

Length of Time

In the present sample, coaches had varied responses to the length of time they were afforded to make selection decisions. For some coaches at the collegiate level, their windows for selection were described as being relatively short. This was noted by the coaches as a possible constraint due to the variability in how long it takes for an athlete to demonstrate his/her/their 'potential' in the sport of distance running. For example, when asked how long it takes Coach 4 to determine if an athlete has 'what it takes' to be a part of the team, he responded, "so the answer is somewhere between 15 seconds and five years". Similarly, Coach 3 explained,

> [Athlete A] is a good example, it's where it took her … eighteen months before we really saw her potential. It was exciting to watch; she could do a lot, but you were never sure if it she was going to sustain it. But it became apparent after about a year to eighteen months that she was going to be the real deal.…Our sport's famous for having people bloom late and do amazing things.

Coach 7 echoed these sentiments in his response: "it doesn't happen very often, but I would say every other year I probably have one or two athletes I didn't even know of, that showed up at our trials and made our team. So, [regarding] talent, sometimes you don't even know about talent coming in". Taken together, these commentaries help provide insight into some of the unique aspects of distance running. It also helps to highlight the high degree of variability and potential

instability of an athlete's performance, which draws attention again to the challenges faced by coaches (and other selectors) when forced to make selection decisions, especially early in an athlete's life and within relatively short periods of time.

Personal Limitations

It was surprising (yet humbling) to hear so many coaches recognized their own personal limitations, biases, and constraints when judging an athlete's ability. For example, Coach 4 acknowledged his fallibilities and shared even after years of coaching - "I still haven't figured it out!". In another example, Coach 6 commented, "you've got that gut feel, sense check, and at times you are going to have some type 1 or type 2 errors, false positives and false negatives and you're never going to get rid of that". This specific reference to making errors (wrongfully selecting athletes and wrongfully rejecting athletes) along with Coach 4's humility in not having mastered the selection process speak to an awareness of the 'talent wastage' in the sport of distance running. When asked why coaches believe this talent wastage in the form of selection errors continues to occur (in the form of a follow-up question), Coach 3 explained,

> maybe there are factors beyond their [coaches] control involved like favouritism. You're naturally going to get along better with some athletes on the team than others if you have something in common say for instance. I have club athletes who I have coached since grade eight or nine and I know them well, I know their parents in many cases and so if I were to select an athlete like that over someone else and didn't have a clear criteria to justify that selection, it could look like I'm just playing favorites.

This quote offers a lot to unpack as it is rich in nuance, however, a key takeaway from this quote is the coach's awareness of the potential influences of favouritism. It was interpreted Coach 3 tried to even mitigate the impact of this favouritism by creating and upholding a

more objective selection criteria. An important area of future explorations will be to further explore the perceived influence of ‘favouritism’ and how it relates to final decisions being made for athlete selection.

Discussion

The present research seeks to contribute to an underexplored area of study within sport sciences. Using a pragmatistic lens, the authors analyzed coaches’ perspectives of their experiences, processes, and procedures relating to athlete selection. Coaches discussed the various sources of information that ‘work’ and have ‘worked’ to craft judgments and make selection decisions. Through these discussions, a clear picture has been painted that coaches incorporated multiple strategies, practices, and approaches when assessing and selecting athletes to their teams. Our interpretations of the data support the idea that some coaches formed mental models of various preferences relating to the qualities, characteristics, skills, and abilities of athletes which are diverse and multidimensional in nature (i.e., utilize a combination of objective and subjective preferences). It was also interpreted coaches considered multiple environmental and situational conditions when using these mental models, indicating a relatively fluid, nuanced, and dynamic approach to athlete selection.

Perhaps the most surprising finding of the present study was the heavy reliance coaches placed on certain subjective preferences when selecting distance running athletes. While many coaches referenced their objective criteria (head-to-head racing (who beat whom), race performance (rankings), and time trials (speed)), nearly all discussed (and sometimes even prioritized) the ‘intangible’/subjective qualities for athlete selection. As evidenced by the various discussions surrounding an athlete’s ‘fit’ to the team and the alignment (with both the coach and the team more generally) of the athletes’ values, culture, personality, and beliefs, it indicates that

coaches assign a significant weight to these ‘subjective’ aspects of athlete selection in their mental models. Specifically, coaches emphasized an athlete’s personality as an important feature to consider when making selections. That said, the responses offered such varied personality traits valued by the coaches, that a single, or even a list of, desirable trait(s) would be too complex to untangle from the rich discussions with this group of coaches. These findings are likely a result of the various environmental and societal factors at play (such as culture, gender identity, background, education, location etc.), as they are all likely to shape a coach’s preferences for something like personality traits. Conversely, it is possible the design of this study may be affected by the false belief that a coach has the ability to articulate something that may be perceived as ‘intuitive’. As Silver (2012) notes, experts (in this case, coaches) often have a ‘feel’ (sometimes referred to as ‘gut feeling’ or intuition; for an example see Roberts et al., 2021) for what they want to ‘see’ when it is easily observable. When these traits/characteristics/skills are more difficult to judge, however, (like an athlete’s ‘potential’), it can be easily overlooked, misjudged, and/or miscommunicated. Moreover, it should be noted, this heavy reliance of subjective values may be a unique finding of the present sample of coaches and their environments (collegiate and national/international level competition), or it may speak to some of the unique elements of the sub-culture of distance running (i.e., dedication to training, tolerance for pain, ability to endure repetitive training) as noted in the work by Allen Collinson and Hockey (2007). Either way, future investigative work extending beyond ‘surface-level’ interpretations (e.g., deeper approaches than QD), would be beneficial to gain a more robust understanding of selection practices.

Interestingly, this focus on subjective skills/traits/characteristics does not necessarily align with the majority of research in TID in sport (Baker et al., 2020; Johnston et al., 2018).

Rather, most of the research conducted to date has focused on the physical and physiological profiles of athletes. For instance, research conducted on elite endurance athletes (including distance runners) has highlighted physiological (Esteve-Lanao et al., 2005; Saunders et al., 2004), biomechanical (Mooses et al., 2015; Tawa & Louw, 2018), and genetic factors (Collins et al., 2004; Hruskovicova et al., 2006; Scanavini et al., 2002), but relatively little is known about the various psychological traits (for exceptions see; Krouse et al., 2011; Kruger et al., 2012; and Samson et al., 2017). This could be due to a multitude of reasons, namely the potential difficulty in determining which 'softer' skills to investigate, and which of the various methods (and combination of methods) could and should be used to explore such skills (e.g., questionnaires, interviews, tests, etc.). It is also possible coaches already have measures in place to assess the preferred traits and characteristics (which may be 'seen' using the coach's eye), but current assessments and measures have yet to capture this nuanced and complex tacit knowledge. Future work could seek to explore this tacit knowledge in rigorous and ecologically-valid ways which could further enhance coach education strategies and help highlight the potential strengths and weaknesses of such approaches.

Perhaps a less surprising finding was the frequent mention of injury by the coaches. Specifically, coaches expressed their awareness of potential indicators for injury, recovery strategies for overcoming injury, and ability to tolerate injury, indicating a particular value placed on this specific component in their selection criteria. This is in strong alignment with the research surrounding the sub-culture of distance running that embraces pain and discomfort (Allen Collinson & Hockey, 2007; Bluhm & Ravn, 2021). Not only does this finding shed light on the coaches' selection preferences, it also sheds light on the coaches' subjective beliefs of running talent, which may in turn, cyclically inform their selection decisions. In work by Allen

Collens and Hockey (2007), the authors used a symbolic interactionist lens to analyze the impact of long-term injury on the identities of two middle- and long-distance runners. The authors note (along with others like Pike and Maguire, 2003) that 'distance running incorporates pain and injury as routine and normalized features' (p. 388). These injuries, however normalized, present a serious risk towards training, performance, well-being and athlete identity (Allen Collinson & Hockey, 2007; Ronkainen et al., 2016; Young et al., 1994; Young & White, 1995). It is likely a reason why coaches consider injury, potential to injure, and the ability to recover from injury, as important components in their selection considerations.

Our findings presented mixed results on whether judgements around injury and potential for injury were indicators selected for, or against. In other words, this is not necessarily to say having (or previously having) an injury is a reason for deselection. Some researchers have endeavoured to explore whether injury was potentially beneficial in some ways, as there may be developmental benefits from both a physiological and mental perspective (Bluhm & Ravn, 2021; Lev; 2019; 2020; McNarry et al., 2020). Specifically, their work Bluhm and Ravn, (2021) examined how an understanding of running-related pain and injury may contribute positively and in a meaningful way to the psychology of competitive and serious distance runners. As mentioned, however, the findings from the present investigation were unclear whether these 'features' are routinely selected for or against, just rather were found to be considerations in the selection process.

What was particularly interesting in the current investigation was coaches' awareness of their own limitations and potential errors in selection processes. The coaches in this study recognized they were susceptible to such errors and referenced the strategies they adopted to try and mitigate the effect of their biases and mental short cuts. This mindset and ability to question

beliefs and challenge practices is a quality often regarded as a superior strategy to enhance decision-making accuracy (Grant, 2021; Hastie & Dawes, 2001; Kahneman, 2011). A strategy that deserves further investigations, however, is the reliance/use of the coach's eye. To date, the specific elements of what the coach's eye is 'seeing', along with its value in decision-making accuracy remains relatively unknown. It is often believed the coach's eye *combined* with objective testing data can help increase the accuracy in selection decisions (Lidor et al., 2009; O'Connor et al., 2016; Van Yperen, 2009); however, more work is needed to confirm this across sports and competitive levels. On the one hand, this subjectivity in the coach's eye can be useful in athlete identification as coaches often have many years of experience, multiple levels of standardized training, and often a background in competitive sport participation. On the other hand, evidence from sport science and other disciplines (such as economics and medicine) suggests subjective approaches to selection can be biased, error-filled, and costly (Johnston & Baker, 2019; Silver, 2012; Taleb, 2007). A blended approach of integrating both subjective (e.g., coach's eye) and objective (e.g., metrics) likely holds the greatest value to a coach when making decisions about an athlete's likelihood of future success. The relative contribution of each, however, is something still to be discovered.

Limitations

Despite the potential advancements this study makes for understanding distance running coaches' sources of information for selection decisions, there are a number of limitations to consider. One of the most notable lies in the way the data were collected. It is possible more representative information could have been gained through different data collection strategies. It has been recognized investigations into coach decision-making (including the present study) are divorced from real-world situations and it can be argued this approach changes the

representativeness, relevance, and implications of the findings (Dennis & Carron, 1999; Giske et al., 2013; Lyle & Vergeer, 2013). Specifically, the present study investigated what coaches believe their practices are, where a separate study could be conducted on what coaches do in real-time through various research designs. As noted by Roberts (2021), the reflective nature of interviews may influence a coach's perception of his/her/their processes, including his/her/their justification for previous selection decisions, presenting a notable limitation. Therefore, information gleaned from the present study should be interpreted and considered only within the context in which the information was gathered, analyzed, and presented. Specifically, the current sample is only reflective of a small sub-sample of the coaching population (at one point in time, from all white, male coaches, and from Canada).

Ideally, future work could shift from a reliance on recall-based strategies and towards capturing real-time decision-making where possible. One alternative or complementary approach for researchers to consider is the 'think aloud method' where participants provide verbal reports of their thoughts allowing for a 'live' look at the mental processes of decision makers (for examples of this method in research, see Eccles et al., 2017 and Whitehead et al., 2016, and specifically in distance running, see Samson et al., 2017). For exploring similar research questions to those examined in the present study, think aloud protocols may help unpack what the coach's eye is seeing in live time and would offer richer insights into coaches' mental modelling and selection considerations, thus increasing the validity and representativeness of the data. The approach itself, however, presents some notable administrative constraints such as time (selections can happen over days, weeks, or months), resources (many coaches may be involved meaning many hours of transcripts to analyze), proprietary information (sensitive information or coaches protection over their selection practices), and logistics (multiple locations and days).

Another limitation lies within the nature of interviewing itself, as multiple factors may affect the quality and quantity of the data. Some of the more notable and common biases include the hindsight bias, (also known as the narrative fallacy), recency bias/recollection bias (Tversky & Kahneman, 1973), and social desirability bias (Fischer, 1993). In the case of hindsight bias, respondents may recall certain situations and occurrences from their past and use them to create a more congruent story/narrative of facts that may not have been connected. For example, if a coach remembers a certain athlete who did well, he/she/they may incorrectly remember qualities that fit a certain profile or stereotype, or that may inflate certain attributes that may not have been connected. This may lead an interviewee to misremember or inaccurately report his/her/their experiences, may embellish stories, and may miss critical pieces of his/her/their narrative. Similarly, the recency bias/recollection bias may lead an interviewee to only draw from the most recent memories whereby stories shared may be only representative of more current states, rather than a wholistic perspective over time. For example, if a coach has recently completed a selection process, he may rely on that singular experience to reflect upon, as it is more easily retrievable in his/her/their memory (Tversky & Kahneman, 1973). To help mitigate the effect of the recollection bias, a probing question "how do you think your current approach to talent selection differs from the way you selected players in previous years?" was added to the interview guide.

Finally, some coaches may have withheld information that could have been understood to be proprietary in nature. Only one coach noted this outright and explained that he could not provide all the details on his selection criteria in an effort to maintain his teams' competitive edge. This could mean the data presented here are incomplete, generalized, or superficial compared to what is experienced in reality. While this mindset and approach to information

protection is commonly practiced (and understandably so), it may continue to act as a barrier to understanding elite coaches' tacit knowledge, and subsequently, improvements in athlete selection.

Conclusion

The present study highlights the multidimensional approaches used by the present sample of coaches to gather information, form judgements, and make selection decisions. The coaches in the present sample were believed to rely on their coach's eye to gain information on subjective characteristics such as an athlete's 'fit' to the team and an athlete's personality. Coaches also utilized objective information gained from head-to-head performances and other race times along with movement analyses. When making decisions regarding athlete selection, coaches also consider the circumstances for the team, including the range of years of experience, number of years left for eligibility reasons and the 'gaps' of the team. Last, coaches have an awareness of their cognitive and systemic constraints such as the length of time needed to make a decision, personal biases, and errors in judgement.

This research has implications for coaches, sport organizations and talent identification and selection programs alike. Findings of this investigation may act as a launch pad for future qualitative and quantitative research on the different sources of information utilized by coaches (e.g., personality traits). The knowledge gained from this research may also be used in coach education and development, highlighting the ways elite coaches assess, evaluate, and form judgements about athletes.

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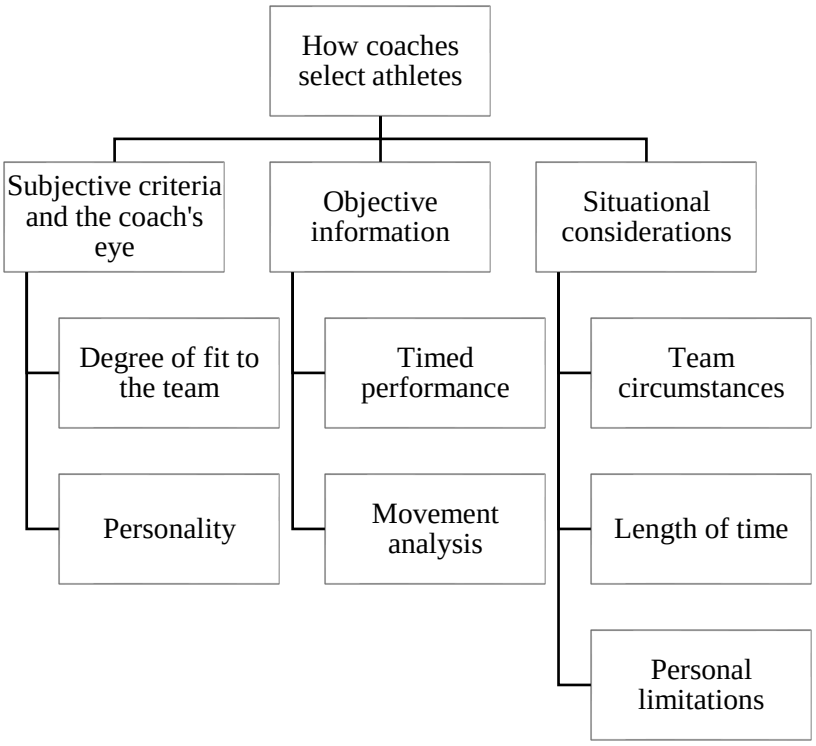
Figure 2. Organization of themes



Chapter Six: Examining Decision-Making Behaviour in Athlete Selection: A Methodological Description and Pilot Study

Abstract

Traditional perspectives of human decision-making have illuminated many ‘quirks’ of the human mind. While information regarding the number and scale of these phenomena seems to grow rapidly, discussions of the reasons why they may be there in the first place is lagging. A driving factor for this imbalance may be related to the methodological challenges in rigorously and validly exploring these ‘quirks’ through empirical means. The aim of this article was to 1) explore these methodological challenges 2) develop a tool to evaluate decision-making behaviour in the context of decisions made by athlete selectors (coaches, scouts, administrators), and 3) pilot the tool to experimentally test selectors’ decision-making. In doing so, we describe a 26-month long action research project during which we evaluate the usefulness of a software development tool designed to assess the decision-making behaviour of athlete selectors. We focus on how the processes evolved, how practitioners used the tool, and how the tool has been (and can be) improved. Using a reflexive case study approach, we discuss the intermediary results of the tool’s application, and the steps taken to arrive at these results. While this paper has implications from a theoretical perspective, it also has practical implications as the pilot study highlighted some of the methodological issues and challenges facing sport researchers. We believe this approach may inspire other tool-developers and/or researchers to organize similar studies to further our understanding of the complex processes involved in athlete selection.

Key Words: methodological examination, decision-making, athlete selection, decision theories, cognitive biases.

Introduction

> The popular view is that heuristics or biases are signs that humans are flawed decision makers due to our shotty mental hardware. The frustration here is that it leads to an unsatisfactory outcome of simply identifying more and more flaws, without actually seeking a deeper explanation for their occurrence, [for example] 'why do we have them'? My question is, does this help anyone, and in fact, can our very nature at looking pessimistically at all our so-called flaws, can that hinder us? (David Joyce speaking on the One Track Mind Podcast: Biases, Flaws of Features? 2021).

As outlined in this opening quote, there is a common understanding that human decision-making capabilities have been built from straw – in the sense they are flawed and easily dismantled. This is demonstrated through the growing number of articles, podcasts, books, and blogs across multiple domains (e.g., economics, medicine, education, and recently sport), discussing the multitude of 'cognitive quirks' humans demonstrate when making complex decisions, especially in situations of uncertainty (e.g., flaws, biases, and errors in decision-making; Hoerger et a., 2010). In comparison, less attention has been paid to understanding *why* these quirks are present. This is likely due to several factors, one of which may be the complexity of the methodology required to rigorously explore this research area. While appreciating this complexity, the purpose of the present investigation was to 1) explore these methodological challenges 2) develop a tool to evaluate decision-making behaviour in the context of decisions made by athlete selectors (coaches, scouts, administrators), and 3) pilot the tool to experimentally test selectors' decision-making. To this end, we provide an overview of the theoretical foundations for understanding human decision-making, along with methodological considerations that have shaped our proposed methodology. Subsequently, we present our research methodology and demonstrate the application and value of our approach from a reflexive perspective in the form of a pilot study. Finally, we conclude by highlighting the

contributions and future potential value of using our tool to design and analyze decision-making behaviour.

Theoretical Foundations

A Brief Overview of Decision-Making Theories

In Western science, early decision-making theories began in Renaissance Italy from the work of the mathematician and polymath Geronimo Cardano, one of the fathers of probability (Melo & Beck, 2014; Shubik, 1958). His combined interest in studying math and gambling behaviour laid the foundation for many of the common-day theories on 'rational thinking' (which has become generally known as the *theory of rationality*; Hastie & Dawes, 2000; Shubik, 1985). Rationality, in this sense, was defined as being centrally focused on the decision maker's current assets (i.e., primarily financial at the time) and dependent upon the outcome of the choice (assets gained versus assets lost). Building upon this work, Daniel Bernoulli (1738) proposed the concept of *expected personal utility* which supports the idea that the perceived utility (i.e., how beneficial something is for someone) a person believes he/she/they will have from playing a game (typically examined in gambling), is a significant factor in whether that person participates (Felder & Mayrhofer, 2022). This theory was driven by Bernoulli's investigations into the 'St. Petersburg Paradox', the curious finding that humans are reluctant to participate in fair games where the chance of winning is as likely as the chance of losing. In this sense, he hypothesized that a person accepts risk based on possible losses or gains and the utility gained from the action itself (Felder & Mayrhofer, 2022).

At a similar time, philosophers and economists Jeremy Bentham and James Mill theorized humans seek pleasure and avoid pain when making decisions and, in this sense, every object or action could be considered from a lens of 'pleasure-giving' or 'pain-giving' (also

known as the *theory of personal value or theory of general utility*). This increased the popularity of the study of quantifying a personal value, which Hicks and Allen, and later John von Neumann and Oskar Morgenstern explored in depth; the latter in their seminal work, *Theory of Games and Economic Behaviour* (1947), which helped build the connections between theorists' positions, and gave an updated perspective of 'rationality', 'general utility', and the marriage between these concepts. For example, rationality grew to include 'assets' such as psychological capacities, physiological states, social relationships, and feelings. Von Neumann and Morgenstern (among others like Fishburn, 1970; Wald, 1950) continued to devise mathematical ways to show discrepancies between logical (algebraic) choices and answers from a decision maker, giving the discipline the name *homo economicus*. Humans were believed to be 'economic' where 1) decisions were conscious choices (or actions) that were chosen from a well-defined set of alternatives, 2) the decision maker attaches value(s) to the outcomes of any given choice, and 3) the decision maker is motivated to act in a way that maximizes the value of the choice (Hastie & Dawes, 2001; Wald, 1950). Shortly after, the *theory of positive utility* (Edwards, 1954), and *theory of maximal utility* (Becker, 1976) became popular, and so did the belief that all human behaviour can be viewed as involving participants who 'maximize their utility' from a stable set of preferences and who accumulate an 'optimal amount' of information from a variety of sources. These beliefs were applied to multiple fields that were 'non-market' environments such as marriage and relationships, education, and medicine, and these remain popular theoretical frameworks for understanding many decision-making environments.

Theories of Decision-Making for Athlete Selection: Limitations and Considerations

While they have acted as a strong foundation of work, the traditional theories may be limited in their application for decision-making theories for athlete selection. Specifically, many

classical theories are rooted in the belief that choice options, consequences, and risks are knowable or at least can be attained through knowledge-seeking efforts. German psychologist Gerd Gigerenzer recognized this assumption in traditional decision-making theories and suggested many 'rational theories' cannot be applied to 'real-life' settings (Gigerenzer & Gaissmaier, 2015). For example, a decision maker is rarely (if ever) 'completely informed', which is a condition that many 'rational' theories assume. Take, for example, a sport coach who is asked to make decisions on which athletes should be removed from the program based on a few hours' worth of information during 'try-outs'. It is hard to argue the decision maker is 'completely informed' (aka has all the information necessary to make a decision). In their investigation, Bradbury and Forsyth (2012) explored the athlete selection procedures implemented by 25 provincial and national level coaches in New Zealand, noting most coaches felt that incorporating 'selection criteria' (having a formal and explicitly-stated outline of the preferred qualities, characteristics, skills etc.) would be beneficial. Despite this, one of the main perceived barriers preventing them from using the selection criteria in practice, was related to the perception that they did not have the time to develop or utilize such criteria, drawing attention to the potential time constraints coaches operate within.

Another limitation of traditional theories is that they assume conditions for decision-making are stable (e.g., are not continuously being shaped and changed by the environment). In reality, sport performance, and the outcome of a given sport performance, are moving targets. In this sense, sport rules change, sport equipment evolves, policies and politics change along with team dynamics and other factors, meaning a concrete answer of what decision is 'best' or 'optimal' is forever in a state of flux. In a similar sense, it is practically impossible to determine whether coaches select athletes 'correctly' (Lath et al., 2021), and thus 'maximizing' or

‘optimizing’ selection strategies or decisions is not possible. To address this, Gigerenzer and Gaissmaier (2015) proposed a distinction between ‘rational’ and ‘nonrational’ decision-making theories. In this sense, ‘rational’ theories include those listed above that are rooted in ‘maximizing’ or ‘optimizing’ value or utility, as they were created for ‘closed’ decision-making systems where odds, consequences, options, and outcomes were knowable. In contrast, ‘nonrational’ theories include, ‘theory of bounded rationality’, and ‘fast and frugal heuristics’ (among others), and are believed to be appropriate for decision-making under uncertainty where alternatives, consequences, and probabilities are less-known (Gigerenzer & Selten, 2002; Kahneman, 2003; Robertson & Joyce, 2019; Simon, 1957). For example, the theory of bounded rationality posits that in complex decision-making situations, individuals who intend to make rational decisions are confined to make ‘satisfactory’ choices, compared to decisions that ‘maximize’ or ‘optimize’ (Gama, 2013; Gigerenzer & Selten, 2002; Robertson & Joyce, 2019). Being bounded in this sense could mean experiencing constraints such as information, time, or memory recall (Todd, 2001).

As indicated above, there are many theories of decision-making, and not-surprisingly, little agreement on which theory/theories drive decision-making behaviour under various conditions. In the context of decision-making for athlete selection, theories for ‘*how and why coaches make decisions*’ are even more varied and sparse. In fact, studies on selection theory (i.e., *why* selectors make decisions the way they do) are practically non-existent. However, of the peer reviewed work, there is evidence illuminating *how* selectors make decisions (their approaches to selection). For example, Roberts et al., (2021) and Christensen (2009) proposed coaches make decisions on ‘gut feel’ and/or ‘intuition’. Bradbury and Forsyth (2012) shared that selection priorities may be related to ‘satisficing’, where the coaches may have utilized the

minimum amount of information needed to make an informed decision. While there are likely many more theories being operationalized, these distinct approaches, combined with the various traditional theories, present a notable limitation to developing a representative and ecologically valid tool to assess selection behaviours that mirrors coaches' decision-making approaches and theories.

Proposed Research Methodology: The Development of *Take Your Pick*

The following section outlines the steps taken to create a tool for empirically testing selectors' decision-making, called *Take Your Pick*. Grounded in the approach used by Nilsson et al. (2015) in their 'methodological description' of the development of a software tool, this process describes the creation of such a tool to enable other researchers and tool developers to better understand the steps taken, the hurdles and challenges that were overcome, and how the tool was used by a sample of practitioners. In their methodological description, Nilsson et al. (2015) created phases to delineate the major steps along the process including: pre-planning, first iteration, second iteration, third iteration, which we have chosen to implement in the section below (for an overview of the development process, please see Figure 3).

Pre-Planning

The pre-planning phase included the steps taken to prepare for the development of the first iteration of the tool.

Activities

During this pre-planning phase, a working group was identified (KJ & JB) for the project, and regular project meetings were established between the two researchers. During these meetings, establishing the broader goals of the research project were priority. Through conversations with each other and with others (e.g., thesis supervisory committee members,

colleagues), the researchers determined the primary goal of the project would be to develop a tool that could/can be used to assess decision-making behaviour of athlete selectors (i.e., coaches, scouts, administrative staff etc.). These regular meetings also provided a time to devise a research action plan outlining the (roughly stated) steps along the pathway to achieve the primary goal. One of the first steps along that action plan was to conduct a literature review on the topic of decision-making, in order to scan the work that had already been done in the field and highlight key areas where more information was needed. The literature review helped focus the project towards examining biases in athlete selection behaviour, with a particular focus on the 'naturalness bias'. This led to the initiation of focus groups with coaches and sport practitioners to allow for further discussions regarding the naturalness bias in the context of athlete selection. Subsequently, this resulted in a cyclical process of scanning the literature, synthesizing the findings, and using those findings to inform the direction of focus groups, which further sparked the need to revisit the literature (and so on). It was decided that the focal point of the tool would be creating an online experiment that allowed us to not only assess decision-making behaviours (by asking coaches to examine athlete profiles and make selection decisions), but also to test the strength of the naturalness bias in a mock decision-making environment. As such, the authors submitted for research ethics through the university's research ethics board, to formally initiate the process.

Developmental Situation

Development on the tool had not commenced at this point.

Insights

Findings from the literature revealed the substantial number of 'quirks' of the human mind when given the task of making decisions under complex and uncertain circumstances. One

of the most prominent ‘quirks’ is the use (and potential misuse) of cognitive biases (over 140 identified so far). A particular bias discussed in the decision-making literature was the ‘naturalness bias’.

One particular study investigating the naturalness bias (Tsay & Banaji, 2011), piqued our interest. In their study, Tsay and Banaji (2011) examined professional musicians who were asked to predict whether a musician who was a described as being a ‘natural’ or a ‘striver’ (i.e., a hard worker) would be the superior performer. Nearly all participants reported preferring the ‘striver’; however, when put to the task of making a selection after listening to two pieces of music and reading a brief biography/background on the musician, experts overwhelmingly selected the piece of music performed by the musician who was subtly described as being a ‘natural’ and judged that musician to be more talented. This work helped to highlight the potential interest/fascination towards those who are described as being a ‘natural talent’ and was labeled the ‘naturalness bias’.

First Iteration

Activities

Regular research meetings continued with the working group. A discourse analysis of online material was performed to determine whether similar tools already existed. Results of this search were relatively fruitless, and it was determined a pre-existing model that was to be used in sport to test athlete selector bias did not already exist within the systems and sports we investigated (and available in English). To help provide more context to this investigation, sport practitioners were contacted via email to determine whether their organizations used any such tools that may not be advertised online. Again, no pre-existing tools of a similar nature were identified.

To create a tool that was representative of the sport context, and without the guidance of a pre-existing blueprint, the authors established partnerships with two sport practitioners, one in football (soccer) and one in rugby union. These partnerships were seen as critical for the tool's success. Specifically, our research partners provided insight on the potential utility of this tool, the possible limitations and constraints, and the type and amount of information that might be valuable for coaches and other stakeholders to have when utilizing the tool. Once content for the experiment was established (at least preliminarily), the first web-developer was hired to help move created content to the online platform. Only some of the content was able to be moved online in the format we had planned for, and due to other developmental constraints, the first pilot phase was not realized.

Developmental Situation

An online presence was established through the creation of a webpage.

Insights

Through the creation of a webpage, several options were considered (i.e., pre-developed tools like Survey Monkey and Google Form). Despite being 'user-friendly', these options were not nimble enough to create the type of experiment we had envisioned. The decision was made to move the webpage under the research institution's hosting site.

In order to replicate the study by Tsay and Banaji (2011) with athlete selectors in the context of sport, some notable modifications were required. Specifically, to improve ecological validity, the information made available to participants changed significantly from the original study as coaches/athlete selectors require different information than musicians to craft decisions (e.g., most notably, they cannot listen to performances like in the context of music). This meant we needed to obtain accurate content/information and present it in the most realistic way to

strengthen the representativeness of the design. This content/information included a profile picture, testing data, performance data, brief personal biography, and perhaps some type of comparison of stats to the other group members. In gathering, organizing and presenting this information, several obstacles arose. Specifically, as noted by Den Hartigh et al. (2018b), an athlete's appearance in terms of clothing (Greenlees et al., 2005), body language (Furley et al., 2012), and skin colour (Stone et al., 1997) may significantly influence "the impressions people form of athletes" (p. 1192). This prompted us to create more 'controllable' variables in the analyses, which further created developmental obstacles in terms of confidentiality and privacy concerns with certain variables, such as profile pictures and videos. To circumvent this, profile pictures were artificially created using https://generated.photos/face-generator/. This allowed us to manipulate features on the avatars to fit our parameters (i.e., for coaches who assess 13-year-old athletes, it was important the athlete under assessment looked around the age of a 13-year-old). Additionally, names were manufactured using an online name generator (https://www.name-generator.org.uk/).

The sheer number of variables that needed to be created or obtained, and controlled for in the experimental design, combined with data accessibility concerns, prompted discussions around moving the content to another hosting site. This sparked the need for a new web-developer, and thus the search for an experienced web-developer began.

Second Iteration

Activities

The working group met to discuss changes to the webpage layout and user experience. Weekly meetings were arranged with the newly hired web-developer (JB2) and the primary investigator (KJ). JB2 created the data structure for the experiment in such a way that participant

responses were connected in a meaningful way, and where analyses could be run effectively and in a controlled manner.

The site temporarily went ‘live’ so that sport partners and working group members could pilot the experience. We then provided an opportunity for a follow-up with participants via Zoom to debrief on their experiences and to gather feedback on ways to improve the user interface. Specifically, we asked our partners questions like ‘how does this information relate to the type of information you (or other selectors) have access to when making selection decisions in your sport?’, ‘what information is missing?’, is there anything you would like to see changed?’. Answers varied based on the stakeholder (coach, scout, admin), level of competition the participant worked within, and the sport itself, but this information was incredibly helpful for updating the content, enhancing the flow of the user experience, and creating a more representative design.

Developmental Situation

JB2 created the website, a domain name was purchased, a subscription was purchased for the domain’s hosting provider, a data structure was created, and an application interface was created. JB2 organized the landing page in such a way that participants were asked to read and review the informed consent before truly ‘entering’ the site. Only once consent was given, were participants able to enter the site. Participants were then randomly assigned a status, either the ‘control’ group or the ‘experimental group’, which determined the type of information participants received later in the experiment.

Three main sections of the website were created including, 1) a survey of participant demographic information, 2) a questionnaire about participants’ perceptions of qualities important for sport expertise, and 3) the experiment where athlete profiles were assessed. The

first formal and fillable section the participants saw was the ‘demographic information’, where participants were asked to provide their information regarding their age, gender identification, number of years coaching, level of expertise (beginner, novice, expert), connection to sport (coaching role, scout role etc.), location of birth, and location of current residence. This information was gathered so that between-group comparisons could be analyzed to better understand relationships between groups and selection behaviours.

Following the demographic section, participants were instructed to select three variables out of a list of 10 variables[24] which they perceived to be the most important for athletic success. The reason for incorporating this section was to illuminate a participant’s stated preferences, which later could be used to assess transitivity and stability in their selection actions (i.e., do stated preferences match selection behaviours). To arrive at this list of 10 variables, the authors 1) established and grew partnerships with sport organizations, 2) ran focus groups with sport coaches, sport administrators, and researchers to determine critical ‘elements’ of talent for certain sports, 3) held separate interviews with coaches (asking questions like ‘what variables make up the ‘best’ athletes you have worked with?’(see Chapters 4 and 5), 4) disseminated a questionnaire to over 30 coaches over the span of two years during speaking engagements asking coaches to list elements/qualities of talent, and finally 5) performed a discourse analysis (e.g., Pion et al., 2015) to triangulate findings from practitioners with peer-reviewed findings.

Following the ‘attributes of talent’ question, participants were also asked the following question ‘which is more important, being a striver, or being a natural talent?’, to mirror the work by Tsay and Banaji (2011). Coaches were prompted to drag a sliding button on a scale of zero-

[24] Variables included: ability to recover quickly, aggressiveness, agility, anthropometric/body shape and size, creative playmaking, family environment, passion and commitment to the sport, personality characteristics, physical speed/explosivity, and technical efficiencies.

to-one hundred indicating the relative importance of each (for example, 50% of each means dragging the bar to the middle indicating an equal importance of each factor, whereas a selector who thinks being a natural talent is more important, he/she/they may drag the indicator to the far end towards being a 'natural').

Following that exercise, the next section asked selectors to assess a series of athlete profiles and make judgements about those athletes, and their future potential. At the point of this iteration of *Take Your Pick*, participants were asked to make judgements and selection decisions between two athletes (i.e., Athlete A or Athlete B), regarding which athlete was more likely to succeed in the sport, and which athlete was more desirable for selection. The control group was given the following player information: his profile picture, his playing position, his performance testing results[25], and anthropometric measures, along with a brief blurb containing information that would not necessarily be considered critical in the decision-making process (e.g., number of pets, other hobbies, food likes and dislikes etc.). The experimental group had all of the aforementioned components, however for the athlete blub/descriptions, the information was augmented with a brief description regarding whether the athlete's performance capabilities came from hard work and training, or were from genes/innateness, in an effort to signal towards or away from 'naturalness' (i.e., 'he was born with a natural gift for both size and speed').

Insights

Having a separate server, hosting site, and domain name were seen as critical for the success of this type of experiment to create the tool with the flexibility it requires. We were heavily reliant on JB2 and our sport partners for this iteration. Through debriefing with the sport

[25] Performance information included the players age (yrs), height (cm), sitting height (cm), weight (kg), playing position, vertical jump (cm), 10m sprint speed (sec), mid-thigh pull (kg), agility drills (5-0-5) left and right and aggregate scores (sec). For an example of a singular player's profile, see Appendix F.

partners, it was communicated that the athlete selection section scenario (i.e., select between athlete A or athlete B) was not representative, and was understood to be unrealistic in many selection environments. Knowing this, the scenario posed to participants at the beginning of the pilot experiment was changed from 'please make selections between the following two athletes' to 'you will be shown fifteen athlete profiles and asked for feedback. Imagine you have an empty roster you are looking to fill and consider these athletes as if you would be selecting them to your team'. This meant the participant would critically assess each athlete separately by answering, '*how likely are you to recruit this athlete?*' using a scale of 1 to 4, 1 being 'would not recruit' and 4 being 'would recruit', and '*how likely is it that this athlete will be successful?*' using a scale of 1 to 4, 1 being 'will not succeed' and 4 being 'will succeed'.

Third Iteration

Activities

Regular and frequent meetings were held with the working group, JB2, and the pilot participants to create a cyclical process of updating the website, piloting, obtaining feedback, and updating etc. It was through this cyclical process that the idea of an 'exit survey' was proposed. To achieve this end, a Google Forms survey was created and a link was embedded into the *Take Your Pick* website at the end of the user experience. Questions such as *'Do you feel this list adequately captured the primary elements of elite sport performance? (Yes/ No), If not, what elements were missing? Is there any way the question could be changed to help you answer it more completely?'* were posed for each section of the website to better understand how this information was being used and whether changes were necessary to adjust the way questions were being asked (for a full list of questions, please see Appendix H).

Developmental Situation

Enhanced appearance editing was performed (i.e., transitions, fields showing/hiding based on input etc.), and an exit survey was created and embedded into the website.

Insights

Meetings with our partners and early pilot participants revealed the user experience was perceived to be positive. Minor suggestions for language and visual changes were suggested, along with options for the future directions and future iterations on *Take Your Pick* to support scouts, coaches and administrative staff. The working group decided that the website and experiment were ready to begin the 'official pilot' with sport stakeholders outside of the research group, focus groups, and early pilot users.

Pilot Study

The goal of this pilot study was to gain insight into how sport stakeholders (coaches, administrative staff, and scouts) used and interacted with the *Take Your Pick* tool, particularly any preliminary results and findings, how the information provided was utilized in decision-making, and how the tool could be improved.

Participants

After ethics was approved by the university's ethics board, participants were recruited with a convenience sampling technique. After providing consent, 18 rugby coaches (1 female, 18 male) took part in the study – 18 completed the pilot study and 15 of those participants completed the exit survey. The participants varied in terms of their age (M_{age} = 47.39, SD ±11.23) and their number of years of coaching experience (M_{years}= 13.94, SD ±8.49). All participants were from the United Kingdom, were either currently coaching (n=16) or had previously coached (n=2) rugby athletes varying from ages 14 to 24 (M_{age}=16.7, SD ±2.53), and all but three (n=15) were rugby athletes themselves at some point in time. Upon entering the

Take Your Pick site, all participants were randomly assigned to the control (n=10) or experimental group (n=8) and asked to make a series of decisions with respect to talent and talent identification. They were then asked to complete an exit survey regarding their experience with the tool. For a full list of demographic information, please see Table 2.

Data Analysis

Pilot data

All data were processed in IBM's Statistical Package for Social Sciences (SPSS, for Windows version 28, SPSS; IBM Corp., Armonk, N.Y., USA). Data are presented as mean, ± SD, with statistical significance set at $p \leq 0.05$. To begin, descriptive statistics were calculated to help assess the distribution of the data. Data were also assessed for normality and homogeneity using the Kolmogorov-Smirnov and Shapiro-Wilk tests.

Four treatments groups were created to assess the differences between participant's experimental conditions ('control' or 'experimental') and the athlete bias type ('striver' or 'natural') on the outcome measures of 'likelihood to recruit' (aka a coach's likelihood to recruit that athlete to the team, on a scale of 1 to 4) and 'likelihood to succeed' (aka a coach's perception of the likelihood of that athlete to succeed in the sport, on a scale of 1 to 4). These four treatment groups were labelled 'control striver', 'control natural', 'experimental striver' and 'experimental natural'.

To determine whether a main effect was present between treatment groups, linear models (ANOVAs) were used to determine whether 'bias statements' (i.e., coded as either 'striver' or 'natural') and the coach 'treatment groups' (i.e., coded as 'control' or 'experimental') affected coaches' stated intentions for a) athlete recruitment and b) athlete success. To further evaluate

differences among treatment groups, a multiple pairwise t-test with a Bonferroni correction was employed as several independent statistical tests were being performed simultaneously.

Next, a linear model determined which variables (treatment group (control or experimental), stated preference (for naturals and strivers), height (cm), weight (kg), vertical jump (cm), 10 metre sprint (seconds), agility drills (left and right; seconds) and mid thigh pull(kg)) affected the responses of coaches by treatment status and by biased statement. To further explore our data, and to test the assumption that the randomization process yielded an equal distribution of important physical metrics, multiple independent samples t-tests were completed for each athlete statistic deemed statistically significant in the linear model.

Exit survey

To better understand the user-experience, participants completed an exit survey upon completion of the *Take Your Pick* selection questions. Responses were assessed using both qualitative and quantitative means. Specifically, to assess the quantitative data, basic summary and descriptive statistics were performed (means and standard deviations), whereas for the open-ended responses, an inductive thematic analysis was conducted. To accomplish this latter analysis, participant responses were read and re-read, and reflexive notes were taken during this familiarization process with the data (Boyatzis, 1998). Then, original labels were added to the responses in each question, and through a process of analyzing, reflecting, and labeling, a set of themes were developed for each question's responses (Braun & Clarke, 2006; 2020).

The processes of developing the research questions, and conducting and analyzing the responses, were all guided by a pragmatistic paradigm. When interpreting and reporting the data, a qualitative description approach was applied, whereby researcher interpretations were minimized, and a naturalist approach was emphasized (aka, participant responses were reported

verbatim whenever possible to allow the participants' experience to drive the narrative to their experiences; Sandelowski, 2000; 2010).

Results

Were Treatment Groups Significantly Different?

The results of the ANOVA revealed a main effect of treatment group on likelihood to succeed $F(3,247) = 7.67$, $p < 0.001$, and on likelihood to recruit $F(3,247) = 5.46$, $p<0.01$. These results indicate that the type of treatment group significantly affected a participant's ratings on a) likelihood to recruit and b) likelihood of success for an athlete. For more information regarding the differences, please see Appendix G1.

Results of the multiple pairwise comparison with a Bonferroni correction revealed both experimental groups ('experimental strivers' and 'experimental naturals') were significantly different than the 'control strivers' but not significantly different than the 'control naturals'. As well, the control groups were not statistically significantly different than one another, nor were the experimental groups (please refer to Figure 4, and for supplemental information see Appendix G2).

Which Information May be Driving These Treatment Differences?

To better understand these differences, a linear model was explored that included the between-coach (i.e., stated striver vs natural preference, treatment group, coach experience) and between-athlete variables (i.e., height, weight, vertical jump, sprint, agility drill, and mid thigh pull). After reducing the model to include only statistically significant variables, treatment group ($p<0.001$), stated striver vs natural preference ($p<0.01$), height ($p<0.05$), weight ($p<0.05$), vertical jump ($p<0.01$), and mid thigh pull ($p<0.001$) appeared to explain most of the variance in coach decisions for the likelihood to recruit an athlete. Whereas only treatment group ($p<0.001$),

vertical jump ($p<0.05$), and mid thigh pull ($p<0.001$) appeared to explain the variance in coach perceptions of likelihood to succeed. Interestingly, mid thigh pull results for both outcomes accounted for the majority of the variance between coaches. For details on the effect sizes, please see Appendix G3.

Are There Differences Between Groups of Athletes Categorized by Bias?

To determine whether or not our randomization was successful in creating equal scores for the performance metrics between athletes labelled as 'strivers' and athletes labelled as 'naturals', the four most critical performance statistics (see above section from the linear model variables) were compared in multiple independent samples t-tests. Across bias groups, we observed a trend that stivers were under-performers across all four variables, but this difference was only statistically significant for the mid-thigh pull (see Figure 5, and Appendix G4). This finding suggests improper randomization in our variables and perhaps more intriguingly, that despite strivers' underperformance in performance testing, coaches still rated them highly in terms of likelihood to recruit and likelihood to succeed.

Exit Survey Results

Fifteen participants responded to the exit survey, 7 of whom were in the experimental group and 8 of whom were in the control group. When asked whether the first section of the tool captured the list of traits deemed important to coaches (i.e., when asked to select three of the most important qualities/characteristics for their respective sport from a list of 10), 8 of the participants believed the list of 10 options did not adequately capture the primary elements of elite sport performance. Of those respondents, suggestions for what could be added included: 'game awareness', 'natural ability', 'body language on pitch', 'communication on pitch', 'game sense', 'hard work elements', 'physicality', 'parents', 'genetics', 'mental skills', 'coaching

influences', 'self-regulation/control', 'nutrition', 'resilience', 'intellect', 'tactical awareness/understanding', 'time spent playing other sports', 'coachability', and 'areas they excel in and areas they are limited by'. Of those 8 respondents, when asked how the question could have been created to help a coach answer more effectively, one participant (Coach 1), suggested "Don't keep it to three. Why not offer the opportunity to select all factors and then conduct a content analysis of the most common?" and Coach 4 suggested "Allow users to type their answer instead".

When participants were asked to reflect on how important the profile picture was, along with the player's position, age, height, sitting height, and weight were for their selection decisions, coaches on average rated that information a 3.46 on a scale of 1 to 5 (1 being not very important and 5 being very important). This was the highest rating of categories of information and when asked why this information was believed to be important, participants responded with statements like "This helped me try to picture him in action" (Coach 5), and "It only gave a gauge as a 13-year-old has so much potential growth" (Coach 7), and "I tried to work out the maturation of some players, some clearly early maturing, some late" (Coach 10). When asked what type of information could have been more helpful, participants suggested "quartile of birth", and "more relevant date of birth" would be helpful additions in future iterations.

With respect to the player's biography (the written statements), on average, respondents rated this information a 3.33 on the same 1 to 5 scale. When comparing treatment groups, the control group rated this information an average of 3.75 out of 5. Interestingly, the experimental group rated it to be less valuable, 2.85 out of 5 on average. When asked how this information was perceived to be used in decision-making, nearly all respondents in the control group alluded that it was not very helpful, whereas the experimental group responded with statements like

"Useful to see other influences as these can indicate areas of the game they might excel at or how they embrace challenge etc." (Coach 9), and "Gives you a glimpse. Some of the statements are subjective" (Coach 11), and "Some information was valuable, like if they enjoy sports, what their personalities are like for rugby, what their ability is like. Some of their likes were not very useful, for example their favourite movie is Thor. That has absolutely no bearing on their rugby potential." (Coach 13). This helped to highlight that the loaded statement may have been an important addition to the decision-making process for coaches in the experimental group. When asked what information would have been useful to include, comments were quite varied, but 'history of playing the sport' was stated by two participants.

In reference to the player's performance statistics, respondents rated this information an average of 3.4 out of 5 in terms of its usefulness. When asked how this information played into their decision-making, one respondent commented "Vertical jump and mid-thigh pull hold most value" (Coach 1), whereas four coaches stated this information was not particularly useful because of the age of the athlete. For example, Coach 13 wrote "Some of the information here is useful, such as their jumps and sprinting, but for a 13 year old to do any weights is pointless" (Coach 13). When asked what information could have been provided, the answers were varied and include statements like "video of their performance", "information about their skill level", and "this was not useful".

When the respondents were asked to define talent and to define success, participant responses were extremely varied. In reference to 'talent', more broadly, participants listed psychological skills, physical skills, and technical and tactical skills, without any real overlap of specific attributes/qualities/skills between respondents (with the exception of 'natural ability' which was commented on by two coaches). This may reflect the complex and subjective nature

of talent in the sport of rugby and provides insight into the difficulty in being able to fully capture talent identification processes in the form of a tool. Moreover, definitions of success were very coach dependent. Some coaches described success as 'becoming a professional player' (Coach 4 and 5), while others stated it was 'likelihood to recruit' (Coach 9 and 12), and two other coaches perceived it to be 'making it to the next level' (Coach 1 and 15). Again, this speaks to the complexity in creating a tool that captures the individual preferences, beliefs and nuances of coaches' talent and talent assessment strategies.

The final question of the exit survey asked participants to give any final feedback on the tool and how it can be improved. While the majority of respondents did not provide any feedback, some (n=3) commented on the lack of ecological validity of this tool for selecting 13 year old athletes. For example, Coach 13 stated,

> The survey was not specific to rugby, we don't talent ID [identification] players at that age, and the information wasn't fully available. We see more from players when they turn up to trial [try out], we can see their parents, we have information around how long they've been playing, and we can see their athleticism, mindset and technical abilities from the trials. We don't even assess their strength or conditioning at those early ages.

Results from the exit survey revealed some of the unique perceptions about the tool's use, its applicability, and functionality. Moreover, these results help to shine a spotlight on some of the individual differences in selection preferences and perceptions of decision-making behaviour.

Discussion

Pilot testing the tool (i.e., *Take Your Pick*) raised several intriguing results from both design and data collection perspectives. Preliminary pilot study data suggests the artificially

created biased statements emitted a strong enough signal to nudge a selector towards making certain selection decisions. While the sample size was clearly a limiting factor affecting the strength of any conclusion made about the tool's ability to assess decision-making behaviour and to specifically assess cognitive biases in action, these were hopeful preliminary results for future iterations of the tool. Specifically, the preliminary finding that coaches preferred strivers over naturals, when the strivers had worse performance scores across four important testing variables, was an intriguing result. This finding indicates that future iterations could benefit from better randomization of player data.

The results from the exit survey data suggested coaches utilized the information provided in the tool in various ways, and the information was valued differently across the participants. Perhaps unsurprisingly, based on what is known about perceptions of talent in the field already (see Baker & Wattie, 2017; Jones et al., 2021; Chapter 4), coaches within the sample held nuanced views of what 'talent' looks like, and what was deemed 'successful' for a rugby athlete.

Interestingly, based on the findings from the exit survey, the information that was perceived to be the most important (on average for both the experimental and control group) for making athlete selections, was the athlete's name, profile picture, playing position, age, height, and weight. It would be important for future iterations to tease out these specific variables to gain a better understanding of which variable(s) was/were perceived to be the most important, and to compare and contrast these results to selection behaviours using *Take Your Pick.*

Additionally, when asked*, 'If you had to choose between selecting a player that was known to be a 'natural' or a 'striver', what would be your preference?*', coaches on average reported a slight lean towards selecting stivers, and their selection behaviour using the pilot data suggests they make selections that align with those behaviours. Again, much more work with a

larger sample size and a stronger design is necessary to draw any real conclusions about 'striver' preferences, and to make comparisons to the 'naturalness bias' observed in music in the work by Tsay and Banaji (2011).

General Discussion

Findings indicate the *Take Your Pick* tool has promise in its capacity to assess the decision-making behaviour of athlete selectors. While more work is needed to fully understand the strengths and weaknesses of this tool, the current iteration was generally well-received by coaches and had some success in eliciting a selection bias using subtle language cues.

In line with Nilsson et al., (2015), we learned the importance of having a diverse team of researchers and practitioners for the co-creation of a tool. This proved to be especially critical in the early developmental stages of the design, when balancing the ecological validity with experimental control was a priority. This required frequent meetings, pre-pilot experiments, and a cyclical process of updating, assessing, testing, and re-assessing to continuously improve the tool's user experience. This feedback was critical for determining the tool's 'user friendliness' with specific attention to the ease of navigation and quality/quantity of information available. Moreover, the pilot exit survey provided important information regarding coaches' perceptions of how the tool was used.

Overall, based on the feedback provided by participants, the tool appeared to have some ecological validity (i.e., it appeared to capture some of the information used by participants during decision-making for selection), but more work is required to integrate aspects of athlete assessment that coaches are familiar with and that appear to be important for decision-making.

Limitations

While this study has the potential to advance our understanding of athlete selection processes, it is important to acknowledge the limitations. One of the most notable limitations is the lack of fidelity of this information in representing real life selection practices. While the goal of the process was to create a tool that was as reflective of coaches' selection practices as possible, there was no measure of how the selection beliefs and practices translate into selection practices outside of the experiment. It is also possible a tool such as the one discussed in this project will present more or different information than a coach is accustomed to using in his/her/their decision-making practices. It is also likely coaches use more and different information than it is possible to include in an artificial environment - most obviously, the 'live' observation that coaches are likely familiar with through watching athletes perform in real life.

Finally, and perhaps most significantly, the fact that the sample of pilot participants included only 18 coaches and the treatment groups were uneven and small, means the conclusions that can be drawn are extremely limited. This, combined with the fact that the performance statistics were significantly different between the athletes coded as 'striver' and the athletes coded as 'natural', are likely driving factors affecting the lack of statistical significance between the treatment groups.

Implications

This research project has the potential to advance our knowledge of talent, talent identification and talent selection in sport. In light of the relatively sparse research on decision-making for talent selection, this project contributes to a deeper understanding of how 'talent' may be assessed and judged. Given selection decisions have been understudied within the sport context, to the best of our knowledge, this study was the first to explore the creation of a tool to

test decision-making and selection biases in athlete selectors. Although more work is needed to iron out some elements of the design, trends in the results suggest the tool has the potential to offer insights into the decision-making and selection strategies of coaches and selectors.

Future Directions

The project emphasized several areas for future work. For instance, while the connection between stated preferences and actual preferences was not analyzed outright, a coach's transitivity (or lack thereof) would be an important future consideration. In this sense, choosing an option that is not aligned with previously established preferences, suggests 'transitivity' or 'instability' in their decisions. In previous literature, possible factors that may affect instability or transitivity include things like biases, mood, fatigue, habit, and social desirability (Hastie & Dawes, 2001).

It would be important for future iterations of the tool to examine different sports, as well as different gender identities, and spanning multiple stages and ages of the sport pathway. It may also be of value to increase diversity of participant perspectives, for example from athletes or other stakeholders. As well, other biases could be considered; for example, 'reputation bias' was identified in an investigation into sports judges' proneness to scoring female gymnasts significantly higher when they appeared in the fifth position of their team (typically occupied by the best gymnast) than when these same gymnasts appeared in the first position (Ansorge et al., 1978). In a similar finding, Findlay and Ste-Marie (2004) identified figure skating judges who had previous knowledge of the reputations of some figure skaters, evaluated those skaters more favourably than judges who were unaware of the skaters' reputations. These biases could be important future areas of exploration to better understand the ways to assess and mitigate bias and ideally create more fair environments for sport.

Concluding Remarks

In this paper, we investigated a 26-month long action research study and explored the strengths and weaknesses of the tool *Take Your Pick* in its ability to assess decision-making behaviour in athlete selection. This type of methodological description and pilot study generated many insights and opportunities for us to learn about areas for improvement and ways to expand the tool in a more ecologically valid way for sport practitioners. Based on the feedback, we believe the tool shows promise in achieving its goals and we are hopeful future iterations will continue to improve its quality for both research and practical implications.

It has been suggested that perfect objectivity, rationality and accuracy are unachievable when making decisions (Silver, 2012). While these limitations are sometimes viewed as weaknesses contributing to poor cognitive foundations (e.g., built from straw), more work is needed to fully understand how and why humans make decision the way they do. In the words of Hastie and Dawes (2001) “for researchers whose goals are to describe, predict, and enhance people’s decision-making behaviour, the critical first step in any psychological analysis will be to study how participants comprehend and represent the decision situation in their minds” (p. 36). As such, this research reflects only one step along a long journey of understanding decision-making in athlete selection.

Figure 3. Overview of activities in each iteration of the tool *Take Your Pick*

Pre-planning	**First iteration**	**Second iteration**	**Third iteration**
-Working group meetings -Workshops -Literature review -Focus groups -Ethics submission	-Working group meetings -Focus groups -Hiring of web designer	-Working group meetings -Focus groups -Hiring of a new web designer -Domain name purchased -Content moved to separate hosting site -Pilot testing with partners -Interviews with practitioners	-Working group meetings -Focus groups -Multiple rounds of piloting -Exit survey added

Figure 4. Results of the ANOVA showing the comparison of means between treatment groups. Effects are represented with respect to A 'likelihood to recruit' and B 'likelihood to succeed'

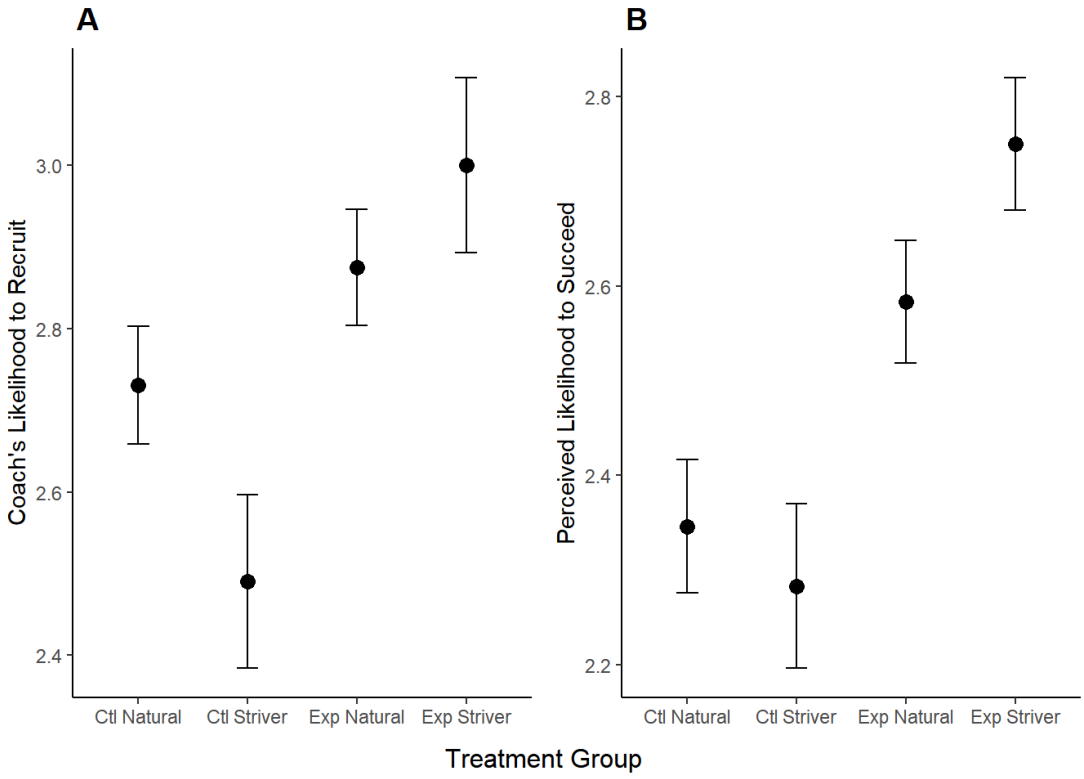


Figure 5. Comparisons between the ‘natural’ and the ‘strivers’ groups’ performance variables

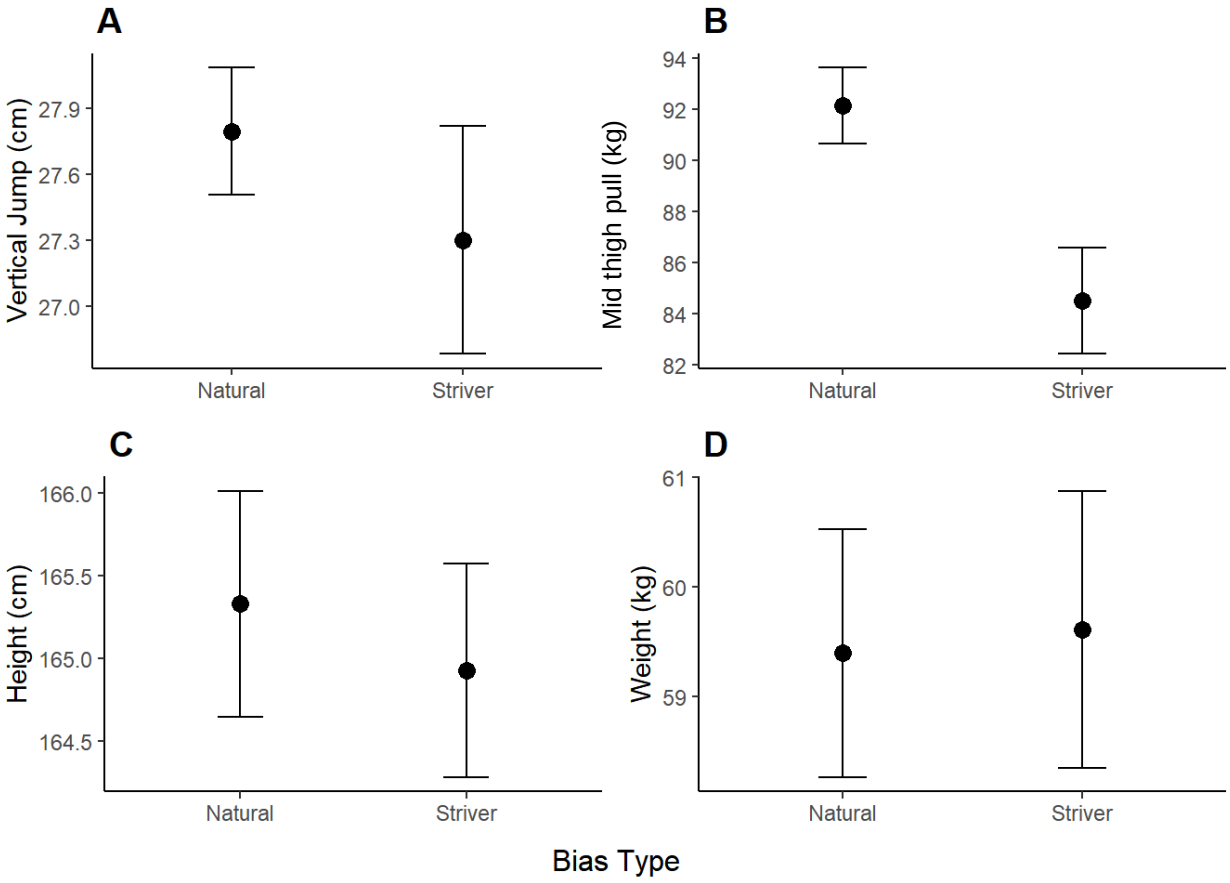


Table 2. Descriptive statistics for the participants of the pilot study

		Count	**Mean**	**SD**
Coaches (n=18)	Sex	17 Male 1 Female		
	Currently Coaching	16		
	Previously an athlete	15		
	Years experience		13.94	8.49
	Age of athlete most recently coached		16.72	2.53
	Selection preference	'Natural' 'Striver'	44.5 55.5	
	Treatment Control	8 10		

Chapter Seven: General Discussion

General Discussion

The purpose of this dissertation was twofold, 1) to explore the factors influencing talent wastage within sport, and 2) to illuminate areas of improvement for athlete selection practices. To achieve this, Chapters 1-3 provided a comprehensive overview of the literature pertaining to talent, talent identification, and talent selection. These overviews highlighted multiple 'weak points' in selection practices at various stages along the competitive pathway. Specifically, findings point to the use of vague terminology, questionable decision-making strategies, and both individual-and system-level constraints, as being some of the potential driving factors perpetuating these inefficiencies, which were explored empirically in Chapters 4-6. Chapter 4 focused on the usage of, and subjective beliefs about, the term 'talent' within a specific sample of elite distance running coaches. Chapter 5 highlighted some of the personal and system-level constraints coaches face when selecting athletes in their programs. Using information from the preceding chapters, a tool was created (described in Chapter 6) to examine the decision-making behaviours of athlete selectors in a mock selection environment.

The following sections explore the findings from Chapters 1-6 in greater depth, position them within the context of the broader literature in the field, and discuss possible implications and future directions for researchers and practitioners.

Striking a Balance Between Vagueness and Conceptual Clarity for 'Talent'

> "'But is a blurred concept a concept at all?' — Is an indistinct photograph a picture of a person at all? Is it even always an advantage to replace an indistinct picture by a sharp one? Isn't the indistinct one often exactly what we need?" (Ludwig Wittgenstein, Philosophical Investigations, p. 71)

A question that has routinely come to mind throughout the creation, interpretation, and translation of this dissertation is, *what is the value of the term 'talent'?* Chapters 1, 2, 4, and 5, brought to light that 'talent' is a well-represented term in the literature within the context of elite

sport, is deeply embedded within policy, structure, and program development, and is very much established in the spoken language of a group of elite sport coaches. Despite the breadth and depth of the usage of 'talent', findings indicate the term is nebulous, nuanced, and vague. Specifically, conversations with the elite distance running coaches in Chapters 4 and 5 and with rugby selectors in Chapter 6, emphasized that 'talent' is difficult to define, measure and evaluate, and even more challenging to untangle from its neighboring terms like 'gift' and 'potential'.

Within the context of elite distance running, a system driven by evidence-based approaches for aspects of training (e.g., Lum et al., 2019; Trowell et al., 2020), racing (e.g., Billat et al., 2020), and recovery (e.g., Burke et al., 2019; Wilson & Baker 2021), it is surprising that a vague and subjective term like 'talent' is so pervasive in the lexicon and seemingly so fundamental to selection practices - especially in a sport where even marginal discrepancies (e.g., milliseconds or millimetres) could be the difference between first place and third place. Using the findings from Chapters 4 and 5, however, and despite the evidence suggesting 'talent' is a valid construct (at least in principle, as we have evidence to support its existence; Baker & Wattie, 2018), it appears to have limited value and utility in practice in the contexts examined.

It is important to acknowledge the scale and scope of the research findings of this dissertation in informing this position. Chapters 4 and 5 were centered around a small sample of coaches in a singular sport, which greatly focuses the research findings and their potential implications for practice. That said, this work is supported by a larger program of research that is coach- and practitioner-centric where focus groups and consultancy meetings have illuminated similar findings to the ones presented here. Specifically, many coaches and practitioners acknowledged the prevalence of vague terms and recognize the difficulties in trying to refine, replace, and/or remove them altogether. For example, in a recent conversation with a sport

administrator, the expression ‘lazy labelling’ was used. In the organization he works within, this is an expression used to capture vague terms that may be too nebulous and abstract to be explored and interrogated scientifically. Using the findings from the present dissertation, ‘talent’ appears to fit this ‘lazy labelling’ tag as it is neither specific enough to measure, nor understood well enough to articulate in the groups that were sampled.

That said, while the more traditional philosophies of science place an emphasis on precision and conceptual clarity, evidence from the current research program suggest we are far from achieving such precision. Moreover, findings from this dissertation suggest there could be value in striking a balance between accepting conceptual vagueness in a term like ‘talent’ and attempting to delineate sharp boundaries to quantify and measure it as an exact science. This type of theoretical and philosophical trade-off has been proposed in other fields, such as ecology, ecological economics, and computing (see Davis & Thompson, 2001; Hodges, 2008a,b; Jax & Hodges, 2008; Seising, 2008; Strunz, 2012 for examples), and while it is beyond the scope of the present dissertation to argue the disputes between philosophy and cognitive science, an emphasis should be placed on moving away from such vague and ‘lazily labeled’ terms in the pursuit of making higher-quality decisions for athlete selection.

Not Everything Can or Should be Measured, but Making Higher Quality Decisions Should Always be the Goal

> “With sufficient labour and ingenuity, anything might be measured, and that measurement is the primary criterion of a scientific study” - (Francis Galton, referenced by Gould, 1996, p. 107).

In many domains of sport, there has been a growing trend towards ‘datafication’, characterized by an increase in collecting, recording, analyzing, interpreting, and monitoring sporting data (Millinton & Millinton, 2015). This movement can be tracked to the late 1800s, where a unique style of baseball, known as ‘scientific baseball’ was discovered - one that

embraced strategy and precision and relied on performance metrics for decision-making (Puerzer, 2002). Perhaps the most well-known datafication in sport history was captured by Michael Lewis in the bestselling book titled *Moneyball* (Lewis, 2004). The book told the story of the Major League Baseball Team, the Oakland As, and their success in exploiting market inefficiencies by adopting a predominantly analytical approach to athlete selection. Since then, other sports have been 'datafied' (and have even been termed 'Moneyballed'), in an effort to stay current and competitive with other analytically-driven teams. This trend has reached most major league sports in North America along with many other sports worldwide, and (unsurprisingly) has trickled down to other elite and sub-elite sport and physical activity programs (Lyall, 2021).

This data-centric view of sport offers many benefits – including hyper-specific training and development plans for athletes (Li et al., 2016; Song, 2021), enhanced fan engagement (e.g., Davenport, 2014; Sri, 2021), and improved tactical decisions for coaches (e.g., Herold et al., 2019; Rein & Memmert, 2016). A common thread connecting these improvements as discussed by the respective authors, is the reliance on evidence to inform judgements. While this use of 'evidence' in decision-making may appear sound in theory, findings from empirical work in the field suggests athlete selection practices (especially for non-professional-level sports) rely heavily on less-data driven approaches such as utilizing the 'coach's eye', 'intuition', and 'gut feeling' for decision-making strategies (Lath et al., 2021; Roberts et al., 2021).

In this dissertation, Chapter 5 highlighted the various strategies employed by distance running coaches when selecting athletes to their teams. Findings from the interview data revealed these strategies ranged from formal, data-driven approaches to less-formal and subjective approaches. The finding that some coaches in the sample formed their overall impression of an athlete without using a structured, computational, data-driven process has been recognized

elsewhere in the literature (see Bradbury & Forsyth, 2012; Christensen, 2009; Johansson & Fahlén, 2017; Lewis, 2003; Roberts et al., 2018; 2021). For example, Bradbury and Forsyth (2012), Johansson and Fahlén (2017), and Roberts and colleagues (2021), interviewed elite coaches regarding the ways in which they selected athletes to top-level sport teams. A common finding was coaches indicated the use of a selection criterion characterized as 'gut feel' or 'intuition'[26].

While acknowledging the seeming importance of more 'subjective' and less-formal selection strategies in both research and practice, the questions remain, '*what are 'intuition' and 'gut feeling'?', 'what value do they have for selection decisions?',* and in light of Galton's sentiments at the beginning of the section, *'how can we better measure them?*'. To help answer the first question, it is important to understand that 'intuition' appears to have many definitions. For Salder-Smith (2004), intuition was thought to be "understood as a composite phenomenon involving interplay between 'knowing' (intuition-as-expertise) and 'sensing' (intuition-as-feeling)" (p. 1). In the recent work by Roberts et al., (2021), coaches referred to 'gut feel' as instinct, experience, or just 'knowing'. It will be important when working with practitioners to further understand this terminology as it may provide insight into its use and perhaps misuse. To answer the second question, findings also appear to be mixed. Some would argue that using 'intuition' and 'gut feeling' have no place in high-stakes, complex-level decision-making situations (Kahneman & Tversky, 1979; 1982; Stephens-Davidowitz, 2022; Toplak et al., 2011). In fact, two of the most prominent researchers in the field of behavioural psychology, Daniel Kahneman and Amos Tversky, have argued 'intuition' and 'gut feeling' should be minimized in

[26] This should not necessarily be interpreted that a complex mental model was not used to formulate a judgement on an athlete, but rather, the process does not seem to be formalized in a structured selection process (i.e., formal written report, charting, analyzing data etc.).

decision-making strategies altogether as they are highly subjective (based on a sample size of one aka the judge and his/her/their experiences), unreliable, and susceptible to biases and errors in judgement. Instead, they propose more 'rational' decision-making approaches, driven by 'logic' and high-quality evidence, which is thought to lead to 'better' and 'higher quality' decisions and outcomes (i.e., more favourable results; Daft & Lengel, 1986; Dean & Sharfman, 1996; Djulbegovic et al., 2018; Kahneman & Tversky, 1979; 1982; Stanovich, 2011).

In contrast, others believe 'intuition' in decision-making has an important place (Akinci & Salder-Smith, 2019; Gigerenzer, 2000; 2008; 2015; Klein, 2004; Sicora et al., 2021). Salder-Smith (2004) suggests the more recent support for the use of 'intuition' in the past two decades has been driven by the realization and acceptance that much of cognition occurs automatically outside of consciousness and in the realm of 'intuition'. Both Salder-Smith (2004) and Klein (2004) argue the significance of unconscious mental processes and feelings, and propose 'intuition' should not be under-estimated or overlooked as it may be a useful source of judgments that could provide alternative perspectives, compared to 'consciously-derived' choices. Some even believe that intuition is a form of pattern recognition, built up over years of experience, and not simply non-rational thinking (Gigerenzer, 2000; 2008).

While it is beyond the scope of this dissertation to draw any conclusions regarding the strategies and mental processes that coaches utilize when making selection decisions, or their preferred methods for making the most 'accurate' selection decisions, it seems clear the process is blurry. In particular, more work is needed to better understand the strengths and limitations of both intuition and more rational approaches for athlete selection. On the one hand, athlete selection should follow a rational analysis where information is collected, collated, analyzed and interpreted, with a decision being made logically and responsibly. On the other hand, most

athlete selectors operate in time crunched, data-saturated and/or resource-constrained environments which will not always allow for such rational practices. Despite Galton's statement at the beginning of the section, it is possible that everything from 'talent' to 'intuition' *could* be measured, but perhaps we need to consider whether we *should* be measuring it, and what value it has in these types of decisions. Regardless, evidence from Chapter 2-6 highlight that selection practices may benefit from balancing approaches spanning both art and science, along with an acceptance that not everything can or should be measured, however, the goal should always be to try.

Interpreting Player Assessments and Accepting Risk in Selection Decisions

The act of selecting an athlete to a team is arguably one of the most challenging roles for a coach (Baker et al., 2018; Gee et al., 2010; Koz et al., 2012; Lath et al., 2021; Wiseman et al., 2014). Not only is the selector tasked with predicting an athlete's future performance, they also have to predict how the sport and training environments will change across time and space. It is perhaps not surprising that this complexity and difficulty has led to questionable accuracy rates across many sport systems spanning from youth- (i.e., Schorer et al., 2017) to senior-/professional-levels (i.e., Chapter 3). These accuracy rates have important implications at both the micro- (e.g., individual) and macro- (e.g., system) levels in sport. For example, telling a person he/she/they did not make a team has been shown to have lasting impacts on that person's motivation, self-efficacy, and confidence (Brown & Potrac, 2009), and in some cases, can prevent the athlete from pursuing that sport competitively. At the professional level, inaccurate selection decisions may have multi-million-dollar consequences for a team (Burger & Walters, 2009; Simmons & Berri, 2019). Moreover, selection decisions have been reported to affect

athletes' earnings from endorsement, sponsorship, employment and in some cases education opportunities (i.e., scholarships to colleges and universities) (Bradbury & Forsyth, 2012).

In essence, risk can be described as the measure of the probability and consequence of uncertain events (Yoe, 2019), and it is believed that how a person *feels* about a decision is a driving factor (see Chapter 6, Fischhoff et al., (1978), and Slovic (1987) for more information). In this sense, if a decision maker's feelings towards an activity or decision are favorable, they judge their risks as low and the benefits as high. Conversely, if his/her/their feelings are unfavorable, they judge risk as high and benefit as low (Slovic et al., 2005). In the context of athlete selection, it has been recommended that decision makers determine the level of risk they are willing to assume for each athlete being evaluated, and by extension, the type of error (Baker et al., 2018; Baker & Wattie, 2018). For example, if an athlete selector's goals were to select 'any' athlete with 'talent' or 'potential', then Type II errors (i.e., false negatives) would be considered more risky (and thus costly) than Type I errors (false positives). While it may sound idealistic, it is likely not feasible for athlete selectors to select with such goals, as many sport systems in most countries do not have the resources to accept 'any' athlete. Rather, what is more likely, is a selector's main objective would be to work with as many athletes as possible given the resources in the system. In Chapter 5, a number of distance running coaches noted this risk and even acknowledged their likelihood of making Type II errors (i.e., false negatives). Findings also revealed that some coaches recognized and anticipated their attitudes towards risk could change based on the circumstances of the team, which has been recognized elsewhere in the decision-making literature (e.g., Holloway, 1979). What remains unclear, however, was how coaches internalized this risk, how it was mentally computed in the decision-making process (if it was at all), and how selectors interpret the probabilities they compute (e.g., a 90% probability

of success rate still means the prediction will be wrong 10% of the time). Moreover, there was no discussion of what level of accuracy would be deemed 'acceptable' for a sport/system. For instance, an accuracy rate that may be deemed acceptable for one distance running coach, may not be acceptable for another. Future investigations could benefit from exploring acceptable ranges, as it may provide insight into both program retention and selector accuracy (i.e., to assess the assessors).

Transitive Thinking and the Use of Biases and Heuristics

The conclusion that humans are imperfect decision-makers is hard to refute. Many cognitive 'quirks' have been identified, leading to less-than-perfect decision outcomes reported across nearly all complex decision domains (e.g., medicine, education, economics, etc.). Some of these cognitive 'quirks' (e.g., the influence of biases) can be particularly problematic as they usually operate subconsciously and have the power to undermine decisions, even those using complex thinking strategies (Hastie & Dawes, 2021; Law, 2020). Much of the work on the influence of biases has traditionally lived within the fields of psychology and economics, with a growing interest in the sport science domains - some of which have been recognized empirically (e.g., Baker et al., 2010; Farah & Baker, 2020a; Mann et al., 2017; Wattie et al., 2008) or theoretically (e.g., Chapter 2; Law, 2020; Putrino et al., 2021). As highlighted in Chapters 1 and 2, these biases in sport include 1) relative age effects – reflecting the tendency for coaches to select 'relatively older' athletes because they appear bigger and stronger, when this is mainly a product of certain athletes having had more time to mature based on the yearly cut-off dates used to create age groups for the sport (i.e., with a September cut off date, those born in October will have nearly a year's worth of maturational development compared to someone born in August; Kelly et al., 2020; Mann & van Ginneken 2017), 2) racial stacking biases – seen in the

propensity for scouts to favor athletes of certain races in certain positions (Putrino et al., 2021), 3) sunk-cost effects – where the invested time and energy used to scout a player disproportionally affects the way that player is viewed leading to a tendency to 'oversell' the athlete in order to get a 'return on investment' (Farah & Baker, 2020a), and 4) tacit knowledge bias – where scouts who are former athletes or coaches themselves may judge the players who mirror them (same playing position, similar background) more harshly, and other positions less harshly (Putrino et al., 2021). These biases, among others, are believed to contribute to imperfect selection practices. As discussed in Chapter 2, more work is needed to fully understand both the value and the implications of applying these cognitive strategies with respect to decision-making, especially in the context of athlete selection.

In the case of this research, specifically in Chapter 5, distance running coaches believed being a 'raw talent' or a 'trained talent' were important considerations for talent and talent selection. Moreover, there were subtle cues that coaches were intrigued with the 'raw' type of talent, drawing attention to a 'natural' or 'innate' preference for athlete selection. To explore this further, Chapter 6 asked this question outright, '*which is more important for success, being a 'natural' or a 'stiver'?*'. Preliminary results from the pilot study indicated the sample of coaches had a stated preference towards athletes described as 'strivers'. Even when this was put to test in a mock selection situation, coaches' selection preferences leaned towards athletes who were coded as 'strivers' despite 'strivers' showing inferior performance scores. More work is needed, however, to understand the relative preferences (if any) for certain groups of coaches and selectors to draw any real conclusions from a research or practice standpoint.

Practical Implications

In the following section, findings have been distilled to form five recommendations for practitioners. These recommendations will be presented along with their supporting finding/set of findings within the dissertation. Additionally, a question, or series of questions will be presented with each recommendation to give practitioners topics for discussion (for both personal reflection and group discussion).

1. Coaches and scouts should conduct an evaluation on current selection practices.
    a. As demonstrated in Chapter 3, even the most resource-rich sport systems have inefficiencies in selecting athletes. Determine if there is a way to assess your selection practices, which may provide insight into your accuracy rate for selection from year to year. Important questions to ask may be*, 'Do I monitor my selection accuracy? If not, how can I start?' 'Can I justify my selection process to an athlete, a parent, or even a journalist if the outcome is poor?', 'If I had the opportunity to make this decision in 2 months time, what information would I like to have (or is reasonable for me to access)?'*.
2. Whenever possible, minimize arbitrary language (like 'talent') that can be mis-interpreted and loaded with pre-conceived notions and subjective beliefs (important to note this extends beyond the word 'talent').
    a. Chapters 2-6 highlighted the conceptual clutter surrounding terms like 'talent', 'gift' and 'potential' and outlined the possible impact such subjective beliefs might have on coaching behaviour. Consider some of the phrases, words, or terms you have in your selection criteria. Important questions include '*Which terms can*

be measured?', 'Which ones should be revisited to see if conceptual clarity can be gained?'.

3. Consider the potential influence of gut-feeling and intuition in athlete selections.
    a. Chapter 5 noted that some coaches use intuition and gut feel as their selection strategies. While these strategies have been questioned for their accuracy and validity, they still appear important for selection. Important questions to consider, '*Is there a way to categorize/evaluate my intuition?', 'Can a player be evaluated in a standardized way while still using your coach's eye/ gut feel/ intuition?', 'What is the strength of my intuition? If it is strong, is that helpful for me to use?'.*
4. Acknowledge the risks and risk culture within a team, organization, or system.
    a. As noted by some of the coaches in Chapter 5, Type I and Type II errors are considerations for some distance running coaches. Acknowledging what your tolerance for risk is and what the consequences may be, could be helpful strategies. Important questions to consider, '*What are the risks to my selection decision?', 'Do these risks align with my risk profile (i.e., comfort level if the decision is unsuccessful)?'.*
5. Consider personal preferences when it comes to assessing athletes.
    a. In line with the findings from Chapter 6, coaches and scouts may lean towards selecting an athlete who they believe has qualities aligning with being a 'natural' or a 'striver'. Consider what the value is for each label and what information supports that judgement. Questions to ask, may be, '*How might my style of coaching change based on athletes I consider being 'naturals' or 'strivers?'.*

Concluding Remarks

As is often the case with research, this dissertation generates more questions than answers. It merely starts one trail in a very dense forest that is understanding talent and talent selection in sport. Results from all chapters highlighted a range of areas for improvement in athlete selection strategies and emphasized the need for continued research in the field. These findings emphasize that identifying and selecting talent is far from a perfect science. It is clear talent's subjective, complicated, and dynamic nature presents a challenge for selection accuracy. The work in this dissertation illuminates some of the potential areas for talent wastage, and presents recommendations for both researchers and practitioners to consider when making selection decisions.

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Appendices

Appendix A. Email recruitment and consent form for running studies

Hi _____,

I'm a graduate student at York University completing a project on elite athlete development in distance running.
With your coaching background, I thought you may be interested in participating in a short interview on your coaching experiences.
If this is something you may be interested in, I would be happy to pass along more information about the project.
Thanks very much for your time and hope to hear from you!

Katie Johnston

Date: _____

Study Name: Athlete Development in Distance Running

Researchers

Principal Investigator: Kathryn Johnston, School of Kinesiology and Health Science, York University, Tait McKenzie Building, Room 317, 416-736 2100 x22224, krobinso@yorku.ca

Co-Investigator: Dr. Joseph Baker, School of Kinesiology and Health Science, York University, Norman Bethune College, Room 338 416.736.2100 x22361, bakerj@yorku.ca

Purpose of the Research: This study explores coaches' experiences with distance running athletes

What You Will Be Asked to Do in the Research: If you choose to participate in this study, you will be invited to complete an individual interview lasting approximately **15-30 minutes**. You will be asked to share your thoughts and experience pertaining to working with distance running athletes. Interviews will be audio recorded. These recordings will be transcribed verbatim. You may also be asked to complete a follow up online questionnaire two week later that would take approximately 10 minutes.

Risks and Discomforts: There are no anticipated risks associated with this study. However, if any question makes you uncomfortable in any way, you may decline to answer. If at any time during the interview you would like to stop, you may inform the interviewer and the interview will be stopped.

Benefits of the Research and Benefits to You: There are no direct benefits to you, however, the information you provide will advance our understanding the coaching experience with distance-running coaches in Canada. This will further contribute to the advancement of academic knowledge and applied practice in the area.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer will not influence the nature of your relationship with York University or the researchers either now, or in the future.

Withdrawal from the Study: You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating will not affect your relationship with the researchers, York University, or sport organization associated with this project. In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Confidentiality: Following the transcription of the interview's audio recording, any personal information will be removed, and all names will be replaced with pseudonyms. Any information that you provide will remain confidential. All electronic data will be stored on a password protected computer within a locked office. Hard copies of any relevant data will be securely stored in a locked file cabinet within a locked office. Only Dr. Baker and the co-investigators will have access to the data collected. The data will be kept for five years post publication, after which everything will be destroyed. Once we have finished the study we will present the results at conferences and in an academic journal. No identifying information (e.g., names, locations) will be included in any results presented in academic settings.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Kathryn Johnston either by telephone at 416-736-2100 x22224 or by e-mail at krobinso@yorku.ca. This research has been reviewed and approved by the Human Participants Review Sub- Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, York Research Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I _____consent to participate in Athlete Development in Distance Running, conducted by *Kathryn Johnston.* I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature _____ Date _____

Appendix B. Interview guide for understanding talent

Main question	Potential probing question(s)
Can you tell me a little bit about how you arrived in this coaching role?	- How long have you been coaching? - What level of competition do you coach right now? - What is your current role working with athletes? - Have you held other roles while working with athletes in the past?
Can you tell me about the best athletes in your program (can you provide 2-3 examples?)?	- How long did you work with him/her/them? - What makes him/her/them the best? - Did your impression of him/her/them change throughout your time working with him/her/them? - What age and competitive level was this athlete when you started working with him/her? -
What would you say makes this athlete stand out from the others?	- Was this something that was obvious to you? To others? - How did this change over time? - How long does it take to notice something like that? - Does it take special training?
IF the word ‘talent’ was mentioned:	- What does talent mean to you? - How did you arrive at that understanding? - What does it look like? - What does it act like? - How long does it take to know talent when you see it? - How might your perspective of talent changed over time? - How does your understanding of talent relate to the athletes you described at the beginning of the interview?
IF a word like ‘gift’ or ‘potential’ was used:	- Can you define that word? - How does that differ from the word ‘talent’
Is there anything else you would like to share about your experiences when assessing athletes and making selection decisions?	

Appendix C. Interview guide for understanding talent selection practices

Main question	Potential probing question(s)
Can you tell me a little bit about how you arrived in this coaching role?	- How long have you been coaching? - What level of competition do you coach right now? - What is your current role working with athletes? - Have you held other roles while working with athletes in the past?
In your role(s), can you tell me your relationship with assessing athletes' abilities and making selection decisions?	- Are you directly responsible for making selection decisions? - How often would decisions be made? - Is anyone else making this decision with you? Please explain who and how they influence the decision process
Can you walk me through your assessment and selection processes and procedures?	- When does the assessment procedure start? - What types of assessments do you use? Physical assessment? Psychological assessments etc.? - Has this approach changed over the years? If so, how, if not, why do you think that is?
What are the specific aspects you are looking for during assessments?	- Are there certain physical, social, etc. components?
How long does it take to make a selection decision?	- Is this something that is obvious or more difficult to tell?
Is there anything else you would like to share about your experiences when assessing athletes and making selection decisions?	

Appendix D. Example of interview coding for talent selection study

Example meaning unit	Example code	Example category	Theme
We've had athletes, who you know say "[Coach 10], I'm gonna go Uber to Walmart and get some ponchos for the girls" or something. You know?...That's great. Or bringing snacks for everybody or, I mean, those are all little things but you know, if there's a bunch of things like that, that's really helpful to the team dynamic right or you know, I don't know the girl that braids all the other girls' hair right or always brings the ribbons or you know, brings the face tattoos or whatever.	Recognition of 'softer' skills	Characteristics for selection	Subjective criteria and the coach's eye
Thankfully haven't had to make too many really tough ones [selection decisions] usually is pretty clear cut with head to head racing and you know within the season, umm it's, it's a previous performance we're talking about from an upper year student and how they performed in the championships	Displays of performance	Selection decision-making	Objective information
If there's eight runners who you know can stay together on a workout or run and can work together, but that ninth person is just significantly off the pace and can't, can't hang together just for logistics reasons, I often wont invite them out. You're managing people out on roads and through the city and in the trails and you can't have people getting left behind or dropped.	Consideration for logistics	Selection decision-making	Team circumstance

Appendix E. Email recruitment and informed consent for *Take Your Pick*

Hi Rugby Coaches, Scouts and Administrative Staff members,

We are looking to learn more about the way you make athlete selection decisions through a tool called Take Your Pick that we have created.

We hope you can take the next 20-25 minutes to 1) complete the selection exercise, and b) complete an exit survey on your experience with the exercise.

The website link is here: https://www.takeyourpick.ca/

And the exit survey will be prompted once you complete the exercise, but is also here for your reference: https://forms.gle/v6EdBynSjPePdDLm6

As outlined in the consent form when you enter the site, all personal information is kept confidential. If you have any questions, please feel free to reach out to Katie Johnston at krobinso@yorku.ca or Joe Baker bakerj@yorku.ca. We will also be able to provide report/summary of findings so that we can keep the discussions going!

Thank you so much for your time and your insight.

Virtual Informed Consent Date: Feb 1, 2021

Study Name: Understanding talent in sport: Perceptions on Athlete Development

Principal Investigator: Kathryn Robinson, PhD (Candidate) School of Kinesiology and Health Science, York University, Tait McKenzie Building, Room 317, 416-736 2100 x22224, krobinso@yorku.ca

Co-Investigator: Dr. Joseph Baker, Professor, School of Kinesiology and Health Science, York University, Norman Bethune College, Room 338 416.736.2100 x22361, bakerj@yorku.ca

Purpose of the Research: If you choose to participate in Phase 1 of this study, you will be invited to complete a questionnaire lasting approximately 15-20 minutes. This questionnaire collects background information (age, country, sex, education, relationship to sport, years and level of participation), along with your beliefs about athlete development (key characteristics, ranking of importance of those characteristics etc.). Last, you will be asked to take part in a short selection exercise where you will have to choose between two athletes.

You will also be invited to complete a follow up questionnaire 1-2 months after completion of the first survey. If you would like to participate in the follow up, an email address will be needed for correspondence. This email will be used only for the purposes of correspondence and not for any other means. With your ongoing consent at the follow up, the questionnaire will take approximately 15 minutes.

As noted, this project will employ on-going consent after each phase so that you can choose to participate or withdraw from the study before the next phase. Please note that the 'identifiable' information you provide (i.e., email address), will be used for the data collection portion of this study, and not when reporting our findings.

Risks and Discomforts: There are no anticipated risks associated with this study. However, if any question makes you uncomfortable or embarrassed in any way, you may decline to answer. If at any time during the questionnaire you would like to stop, you are able to exit the webpage and discontinue the questionnaire.

Benefits of the Research and Benefits to You: There are no direct benefits to you, however, the information you provide will advance our understanding of athlete development is understood. This will further contribute to the advancement of academic knowledge and applied practice in the area.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any time and during any phase of the project. Your decision not to volunteer will not influence the nature of your relationship with York University or the researchers either now, or in the future. Please note that by choosing not to participate in the study it will not result in a penalty or repercussion.

Withdrawal from the Study: You can stop participating in the study at any time (i.e., before or during any phase), for any reason, if you so decide. Your decision to stop participating will not

affect your relationship with the researchers or York University, associated with this project. In the event you withdraw from the study, all data collected will be immediately destroyed where possible. Should you wish to withdraw after the study, you will have the option to also withdraw your data up until the analysis is complete.

Confidentiality: Unless you choose otherwise your questionnaire responses and all information you supply during the research will be held in confidence. Your name will not appear in any report or publication of the research. Your data from the questionnaires will be safely stored on a password protected computer and only the researchers (primary investigator and her supervisor) will have access to this information. The data will be stored for 7 years on the password protected and file protected computer and then data will be destroyed by April 2028. Confidentiality will be provided to the fullest extent possible by law.

The data collected in this research project may be used by members of the research team (Dr. Baker, Katie Robinson) in subsequent research investigations exploring similar lines of inquiry. Such projects will still undergo ethics review by the Human Participants Research Committee, our institutional research ethics board. Any secondary use of data by the research team will be treated with the same degree of confidentiality as in the original research project.

The researcher(s) acknowledge that the host of the online survey may automatically collect participant data without their knowledge (i.e., IP addresses.) Although this information may be provided or made accessible to the researchers, it will not be used or saved without participant's consent on the researcher's system. Because this project employs e-based collection techniques, data may be subject to access by third parties as a result of various security legislation now in place in many countries and thus the confidentiality and privacy of data cannot be guaranteed during web-based transmission.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Kathryn Robinson by e-mail at krobinso@yorku.ca or my supervisor Dr. Joe Baker at bakerj@yorku.ca Additionally, the contact information for the Kinesiology Graduate Department is as follows: 4700 Keele Street, 341 Bethune College, to reach the graduate program assistant, please call (416) 736 2100 xt 33208.

This research has been reviewed and approved by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, York Research Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

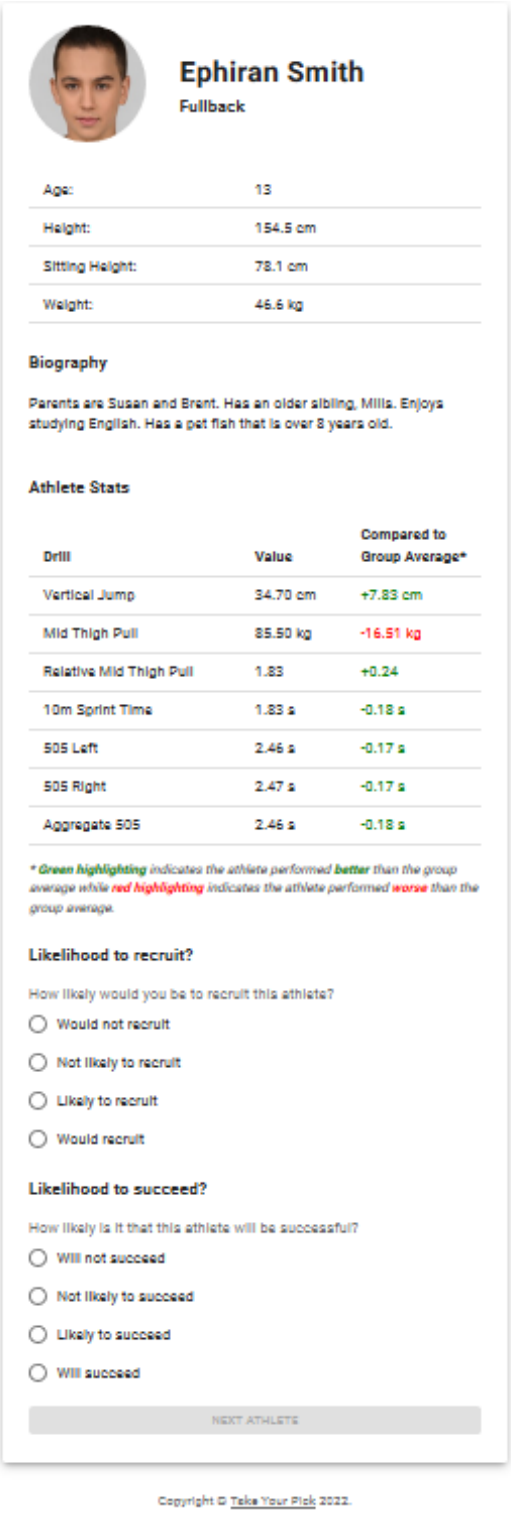
This research has received ethics review and approval by the Delegated Ethics Review Committee, which is delegated authority to review research ethics protocols by the Human Participants Review Sub-Committee, York University's Ethics Review Board, and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr.

Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Kaneff Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

I ___(your name)_____consent to participate in _____(name of study)_____ conducted by _____(Kathryn Robinson)_____. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form.

- Yes – by clicking ‘yes’, I consent to participate in the study and permit my data to be used for analyses
- No – by clicking ‘no’, I am not consenting to participate

Appendix F. Example of a player profile seen by respondents in the pilot study on *Take Your Pick*



Ephiran Smith

Fullback

Age:	13
Height:	154.5 cm
Sitting Height:	78.1 cm
Weight:	46.6 kg

Biography

Parents are Susan and Brent. Has an older sibling, Milla. Enjoys studying English. Has a pet fish that is over 8 years old.

Athlete Stats

Drill	Value	Compared to Group Average*
Vertical Jump	34.70 cm	+7.83 cm
Mid Thigh Pull	85.50 kg	-16.51 kg
Relative Mid Thigh Pull	1.83	+0.24
10m Sprint Time	1.83 s	-0.18 s
505 Left	2.46 s	-0.17 s
505 Right	2.47 s	-0.17 s
Aggregate 505	2.46 s	-0.18 s

** **Green highlighting** indicates the athlete performed **better** than the group average while **red highlighting** indicates the athlete performed **worse** than the group average.*

Likelihood to recruit?

How likely would you be to recruit this athlete?

- ◯ Would not recruit
- ◯ Not likely to recruit
- ◯ Likely to recruit
- ◯ Would recruit

Likelihood to succeed?

How likely is it that this athlete will be successful?

- ◯ Will not succeed
- ◯ Not likely to succeed
- ◯ Likely to succeed
- ◯ Will succeed

NEXT ATHLETE

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Appendix G.

G1. Results of the ANOVA showing effect of treatment group on outcome variables

Outcome	SS	DF	MS	F	P
Treatment group X likelihood to recruit	7.59	3	2.53	5.45	<0.001
Treatment group X likelihood to succeed	7.72	3	2.57	7.67	<0.001

G2. Results of the pairwise comparisons using t-tests with pooled standard deviation

	Control Natural	Control Striver	Experimental Natural
Control stiver	1.00	-	-
Experimental Natural	0.07	0.02	-
Experimental Striver	0.00	0.00	0.74

G3. Results of the linear model showing variables driving the variance between outcomes.

Outcome	Predictor Variable	SS	DF	F	P
Likelihood to succeed	Intercept	0.002	1	0.00	0.94
	Treatment	8.90	3	9.96	<0.001 *
	Strive preference	0.41	1	1.37	0.24
	Coach experience	0.01	1	0.06	0.80
	Height	0.14	1	0.50	0.47
	Weight	0.05	1	0.17	0.67
	Vertical jump	1.92	1	6.48	0.01 *
	Mid thigh pull	6.81	1	22.89	<0.001 *
Likelihood to recruit	Intercept	1.55	1	4.26	0.04
	Treatment	9.95	3	9.09	<0.001*
	Strive preference	3.49	1	9.57	<0.01*
	Coach experience	1.19	1	3.28	0.07*
	Height	2.23	1	6.11	0.01*
	Weight	1.85	1	5.08	0.02*
	Vertical jump	3.14	1	8.60	<0.01*
	Mid thigh pull	15.34	1	42.05	<0.001*

*Indicates statistical significance where $p \leq 0.05$

G4. Results of ANOVAs indicating the differences between randomized athlete statistics by bias statement (natural vs striver).

Variable	**DF**	**SS**	**Mean S**	**F**	**P**
Mid Thigh Pull	1	3535	3535.4	9.57	<0.01*
Height	1	9.7	9.70	0.16	0.68
Weight	1	3	2.75	0.06	0.90
Vertical Jump	1	14.90	14.87	0.81	0.37

*Indicates statistical significance where $p \leq 0.05$

Appendix H. Exit Survey

Question 1: ((while viewing a screen shot of the first page that asked about selecting top 3 qualities))

Do you feel this list adequately captured the primary elements of elite sport performance? Yes/ No

If not, what elements were missing? _____(text box)_____

Is there any way the question could be changed to help you answer it more completely?

Question 2: ((while viewing a screen shot of the first page that asked to slide preference towards or away from talent or striver))

Was this an easy or a difficult question? Easy / Difficult

Why do you think that was? _____(text box)_____

Is there any way the question could be changed to help you answer it more completely?

Question 3: ((while looking at a screen shot of the athlete selection page – first section highlighted for name and profile picture))

How important was this information for you in your decision-making process for your selection decisions?

1 not very important 2 3 moderately important 4 5 very important

Can you explain how this information was used in your decision-making ___(text box)__

What information could have been added to enhance your decision-making process? ___(text box)__

Question 4: ((while looking at a screen shot of the athlete selection page – second section highlighted for written bio))

How important was this information for you in your decision-making process for your selection decisions?

1 not very important 2 3 moderately important 4 5 very important

Can you explain how this information was used in your decision-making ___(text box)__

What information could have been added to enhance your decision-making process? ___(text box)__

Question 5: ((while looking at a screen shot of the athlete selection page – third section highlighted for athlete statistics))

How important was this information for you in your decision-making process for your selection decisions?

1 not very important 2 3 moderately important 4 5 very important

Can you explain how this information was used in your decision-making ___(text box)__

What information could have been added to enhance your decision-making process? ___(text box)__

Question 5: ((while looking at a screen shot of the athlete selection page – third section highlighted for athlete statistics))

How important was this information for you in your decision-making process for your selection decisions?

1 not very important 2 3 moderately important 4 5 very important

Can you explain how this information was used in your decision-making ___(text box)__

What information could have been added to enhance your decision-making process? ___(text box)__

Question 6: ((while looking at a screen shot of the athlete selection page – fourth section highlighted for the selection and prediction ratings))

For the purposes of this exercise, how did you define success? _____(text box)_____

Was this exercise difficult or easy? Difficult/Easy

Why do you think that is? Please provide your input on your experience. _____(text box)_____

Question 7: If you were to describe a player with 'talent' what key qualities would you be describing?