

The Application of Psychometric Testing in Sport and Performance Psychology

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Abstract

The following thesis paper aimed to review and analyze the application of psychometric testing in sport and performance psychology. This thesis takes an in-depth look at the past literature surrounding the field of sports psychology and the various application of psychometric testing in sports to determine current problems in the field and propose a solution. Chapter one reviews the history of psychometric testing in sports, proposing that the application of psychometric testing in sports has changed and advanced in parallel with its use shifting from an amateur sporting environment to a professional sporting environment. Chapter two reviews the importance of using psychometric testing as a tool for elite athlete talent identification and the current short comings of its use. Chapter three suggests the issue with the current use of psychometric testing in elite athlete talent identification programs is the lack of validity and fidelity. Moreover, chapter three also proposes a solution to this problem, by identifying key psychological sports performance indicators and using these indicators to develop new psychometric testing. Finally, chapter four serves as a reflection on how the previous chapters relate to each other and relate to clinical psychology and sports coaching field placements.

Key Words: sport, psychometrics, talent identification, sports psychology, performance

The History of the Application of Psychometrics in Sport and Performance

Psychology

This chapter aims to piece together the timeline of psychometric testing in sports psychology to understand the history of psychometric testing in sports. The thesis that this chapter proposes is that the application of psychometric testing in sports has changed and advanced in parallel with its use shifting from an amateur sporting environment to a professional sporting environment. Psychometrics is the process of mental measurements with the aim to make them observable, ultimately attempting to measure latent variables such as cognitive ability, personality, and aptitude. (Anunciacao., 2018). Sport and performance psychology is a relatively new field of psychology that looks at how psychological factors affect performance (Kornspan, 2012). The first movement that will be looked at occurred between the 1900's to the 1940's, and is the birth of sports psychology, which will help explain sports psychology testing prior to the application of psychometrics. Following this, the chapter will discuss the movement of applying personality psychometrics to amateur sports to enhance athletic ability, which occurred between the 1950's to the 1970's. The chapter will then review the movement of applying aptitude psychometrics to professional sports which occurred during the 1970's and 1980's. Finally, the chapter will review the movement of suspicion regarding the validity of the psychometric testing being used in professional sports and the improvements that occurred as a result, which happened during the 1990's and 2000's. By reviewing the key movements surrounding the use of psychometrics in sports this chapter will demonstrate that when professional sports became interested in psychometrics it led to the changes and advancement of psychometric testing in sports.

The Birth of Sports Psychology

Initially, sports psychology was a field that was born from physical educators and psychologists having an interest in how the field of psychology could be applied to the field of sports (Kornspan, 2012). Sports psychology started as primarily an experimental and theoretical field that was interested in how psychology could help explain sports phenomena (Griffith, 1930). One of the earliest examples of this is by Edward Scripture in 1895 who was interested in how psychology could be applied functionally to everyday life, such as enhancing athletic performance (Baugh & Benjamin, 2006). Scripture (1897) conducted studies comparing the reaction time of long distance and short distance runners, finding that short distance runners have faster reaction times to a starting pistol, suggesting that reaction time in athletes could be reduced with practice. Furthermore, Scripture (1897) conducted studies on the measurement of mental quickness and muscular movement in fencers, to determine if mental quickness is related to faster muscular movements. Furthermore, another early sport based psychological experiment was conducted by Norman Triplett who studied the social facilitation effect on cyclists in 1898 (Baugh & Benjamin, 2006). Triplett (1898) aimed to evaluate how the addition of competitors could possibly lead to increased performance in cyclists. This experiment demonstrated that when athletes (cyclists) raced against competitors they had faster lap times compared to when they raced alone (Triplett 1898). Therefore, these early psychological experiments by Edward Scripture and Norman Triplett emphasize the start of a psychological movement that was interested in how psychological measurements could be applied to sports, to better understand sports phenomena.

Moving into the 20th century sports psychology was truly born as a field and the movement of applying psychology to understand sports phenomena was championed by Robert

Griffith, regarded as the father of sports psychology (Baugh & Benjamin, 2006). In 1925 at the University of Illinois, Griffith established the first research laboratory for the purpose of studying the performance of athletes from a psychological perspective (Green & Benjamin, 2009). Green and Benjamin (2009) highlight that Griffith's research laboratory studied numerous psychological phenomena in sports including conditioning, habit formation, stress, and mental well-being. Griffith was particularly interested in the relationship between physiology and psychology, utilizing the research laboratory to conduct studies on the changes of muscle tension during competition and the differences in reaction time between athletes (Griffith., 1930). Unfortunately, Griffiths movement of applying psychology to sports was short lived as the research laboratory was closed in 1932, with there being two reasons for its closure (Green & Benjamin, 2009). The first is that due to the great depression the university had a lack of funding, and the laboratory was removed to cut costs. The second is that Illinois football coach Robert Zuppke had lost confidence in the research program, believing it was not yielding significant results. This closure of Griffith's sports psychology research laboratory emphasizes that despite psychologies interest in sports the sports field showed a lack of interest and confidence in psychology being add anything meaningful to the field.

After Griffiths work at the University of Illinois, he was employed part-time by the Chicago Cubs becoming the first psychologist employed by a professional sports team (Green & Benjamin, 2009). During his time at the Cubs Griffith wrote 16 reports on how psychology could be applied to baseball, including how improving practice efficiency would increase performance and how the stigma of baseball instinct diminishes learning ability (Green & Benjamin, 2009). Griffith explained that practices were extremely inefficient, with only about 25% of practice time helping to improve athlete performance. Moreover, Griffith explained that there was a

stereotyped belief that baseball ability is mainly instinctual and only partially learnt, which greatly hindered his ability to apply psychological methods to improve performance as athletes felt they did not need to learn. Griffith's time at the Cubs only lasted for 3 seasons as he reported that there was a clash of culture between the professional athletes and him, leading to none of the advice in his 16 reports being implemented (Green & Benjamin, 2009). Robert Griffith's rejected work at the Chicago Cubs shows that despite the best efforts of psychology to explain sports phenomena there was a huge push-back from both athletes and coaches in the sporting field leading to a decline in psychology involving itself in sports until the late 1950's. Therefore, through the early studies of Scripture and Triplett and the groundbreaking work of Griffith this period showed a movement of psychologists attempting to apply psychology to sports to better understand it, but sports not showing any interest in psychology doing so.

The Application of Personality Psychometrics in Sports

After the work of Griffith, the sports psychology movement died down until the early 1960's when a movement arose to apply psychology to sports to improve athlete performance not just understand it (Aoyagi et al., 2012). Sports psychologist began applying psychometric testing to sports to measure athlete behaviour and improve performance through coaching (Ogilvie & Tutko, 1972). The early days of applying psychometric testing in sports was largely applied to amateur sports such as collegiate and Olympic athletes primarily due to the easy access that sports psychologist had to amateur sports (Ceji, 2011). Ceji (2011) explains that in 1965 the Italian National Olympic Committee hosted the first congress of the International Society of Sports Psychology (ISSP) and in 1972 the second congress was hosted by the Olympic Congress at the Munich Olympics. This close relationship between international Olympic committees and

the ISSP shows that sports psychologist had an amateur sports platform to apply psychometric testing to. Furthermore, many sports psychologists worked at universities, for example Bruce Ogilvie, the American member of the ISSP in the 1960's and 1970's was a tenured professor at San Jose state university and was able to apply psychometrics to the universities football, basketball and track and field teams (Ogilvie & Tutko, 1972). Therefore, the movement of applying psychometric testing to amateur sports to improve athlete performance was largely due to the access that sports psychologists had to amateur teams.

Sports psychologist in North America had a growing interest in how an athlete's behaviour could be measured and if understanding their behaviour could lead to improved athletic performance (Ogilvie, 1968). Bruce Ogilvie was one of the first sports psychologists to apply personality psychometrics to amateur sports in the late 1960's (Ogilvie, 1968). Ogilvie (1968) was interested in utilizing personality testing to identify the specific personality traits that have the greatest relevance to athletic competition. The main idea of this movement was that by identifying sports specific personality traits psychologists could help coaches better understand their athletes and change their coaching methods depending on an athlete's personality (Ogilvie & Tutko, 1972). Ogilvie and Tutko (1972) explain that they used several personality inventories to measure athlete personality at both San Jose state university and Stanford university, including, the Minnesota Multiphasic Personality Inventory (MMPI), the Rotter Incomplete Sentences Blank (RISB), the Edwards Personal Preference Schedule (EPPS) and the Jackson Personality Inventory (JPI). This extensive use of different personality psychometrics emphasize a clear attempt by sports psychologists to apply psychometrics to sports to find sports specific personality traits and enhance athlete performance. Unfortunately, despite sports psychology growing as a field there was still a resistance from the sporting field in recognizing the potential

benefits that psychometric testing could offer sports. This was made clear by Ogilvie and Tutko (1972), who explained that they attended the NCAA coaches conference to present the benefits of personality psychometrics for coaches. They expected a crowd of over 200 coaches, but upon hearing their presentation topic only 20 individuals were present. This example clearly emphasizes that the movement to apply psychometric testing to amateur sports through the late 1960s and early 1970's was rejected by much of the sporting field as it was seen as an intrusion into a field that psychology did not belong in. Therefore, the movement of applying psychometrics to sports was an attempt by the psychological field to improve athletic performance, however, like the efforts of Robert Griffith 30 years earlier, the sporting field continued to reject the notion that psychology could add anything useful to sports

Professional Sports Become Interested in Psychometrics Testing

Throughout the 1970's and 1980's the sporting field had a shift in attitude towards applying psychometrics to sports and this occurred due to professional sports recognizing the potential benefits of psychometric testing (Gill & Brajer, 2012). This movement saw a shift from psychology attempting to improve athletic performance in sports, to sports utilizing psychology to predict an athlete's future performance (Gill & Brajer, 2012). Lyons and colleagues (2009) explain that the first example of aptitude psychometrics used in professional sports was the use of the Wonderlic personal test (WPT) by the National Football League (NFL). The WPT is a timed 50-item intelligence test that assess math, vocabulary, reasoning, and logic and is administered to a variety of work forces and different levels of employment (Hatch et al., 2008). Tom Landry is largely credited with first applying the WPT to the Dallas Cowboys in the early 1970's to predict the future performance of his players based on their intelligence (Green &

Benjamin, 2009). Green and Benjamin (2009) explain that since the initial use of the WPT by the Dallas Cowboys the psychometric test is now used by every NFL team. This example emphasizes that through the 1970's there was a shift in how sports viewed psychology and psychometrics, with sports starting to realize the benefits that psychometric testing provided.

Another example of the sports field applying aptitude psychometrics is in the early 1970's when Paul Brown, the coach of the Cincinnati Bengals applied the Terman Group Test of Mental Ability (TGTMA) to predict future athlete performance. (Green & Benjamin, 2009). In 1920 Lewis Terman developed the TGTMA which became one of the most widespread group intelligence tests, allowing for affordable intelligence testing in schools and workplaces (Aiken, 2004). Green and Benjamin (2009) highlight that 50 years after the creation of the TGTMA, Paul Brown adopted the aptitude psychometric test to help predict the future performance of his football athletes. The TGTMA measures an individual's verbal ability to solve different problems and Brown believed that higher scores on the TGTMA would predict players who could think quicker, think under pressure, and learn better (Green & Benjamin, 2009). Therefore, this example with the previous example highlight that through the 1970's professional sports became interested in the potential benefits that psychometrics could offer. This period saw a clear shift from the sports field rejecting psychology to a movement by the sporting field to apply aptitude psychometrics to predict an athlete's future performance.

Further evidence of the movement whereby professional sports begun utilizing psychometric testing is that the interest of aptitude psychometrics from professional sports teams caused a branched down effect to amateur collegiate athletics (Fogarty, 1995). For example, Jim Taylor was the sports psychologist at the University of Colorado, and he applied numerous aptitude psychometrics to predict athletic performance in collegiate athletes across several sports

including, alpine and nordic skiing, tennis, basketball, and track and field (Taylor, 1987). Moreover, Hans Eysenck conducted an extensive literature review that focused largely on applying psychometrics to amateur sports at the Olympic and college level to determine the key psychological indicators of an elite athlete (Eysenck et al., 1982). Eysenck and colleagues (1982) found that across several sports' psychology studies, the measurement of intelligence was crucial in predicting an athlete's future performance. These examples of sports psychology studies applying psychometric to amateur level sports highlight that the movement of professional sports to adopt aptitude psychometric testing caused a branching down effect that resulted in much of the sporting field becoming interested in and welcoming the use of psychometrics in sports. Therefore, based on professional sports utilizing aptitude psychometrics and influencing amateur sports to do the same, it is evident that between the 1970's and 1980's there had been a clear shift in the sporting fields attitude towards psychology by sporting teams utilizing psychometrics to help predict future athlete performance.

Suspicion and Growth of Psychometrics in Sports

As the use of aptitude psychometric testing increased in both amateur and professional sports there was a plethora of data that psychologists used to compare the effectiveness of psychometric tests in predicting future athletic performance (Fogarty, 1995). This led to a movement throughout the 1990's and into the 2000's whereby sports psychologists were highly suspicious of the effectiveness of psychometric tests in sports and began challenging their validity (Meredith et al., 2018). This suspicion eventually led to the development of more accurate sports based psychometric testing (Meredith et al., 2018). The validity of the psychometric testing being used prior to this time was questioned as the tests were not designed

for the populations they were being used on (Fogarty, 1995). Anshel and Lidor (2012) analysed the effectiveness of past psychometric testing in predicting future athletic performance, finding that the psychometric testing being applied to sports were not designed for athlete populations. This is further supported by Lyons and colleagues (2009) who assessed the efficiency of using the WPT in an employment setting it was not designed for, sports. By comparing the results of the WPT to the statistical playing data for the first 3 years of NFL performance in the 762 participants, Lyons, and colleagues (2009) concluded that there was no relationship between WPT scores and future NFL performance. This study highlights how the aptitude psychometric testing that was popular in the 1970's and 1980's was ineffective in predicting future performance as it was not designed for athletes.

Another aspect of psychometric testing that was questioned was that the psychological phenomena being measured by the psychometric tests, like intelligence had low fidelity for predicting future athletic performance (Fogarty, 1995). Bergkamp and colleagues (2019) found the effectiveness of past psychometric measures in predicting future performance was poor. This is due to sports specific attributes like shooting a ball having a high fidelity for predicting future performance, whilst attributes measured by psychometric testing like intelligence having a low fidelity for predicting future performance. This is further supported by Kuzmits and colleagues (2008) who analysed the effectiveness of the WTPs inventories in predicting future performance and found no correlation between higher test scores and better athletic performance. Therefore, these studies highlight that the psychometric testing being used throughout the 1970's and 1980's had low fidelity for sports like the NFL and as a result were poor at predicting future performance.

Due to psychometric testing becoming popular in professional sports despite its incorrect use, psychologists begun researching which psychological indicators that are important for predicting future sports performance (Mustafovic et al., 2020). Kite and colleagues (2021) studied talent identification indicators in soccer, concluding that psychological attributes are the most important indicator of future athletic performance, with attitude being the most important psychological attribute. Moreover, Mustafovic and colleagues (2020) highlighted that sports based psychometric testing should focus on psychological indicators like emotional intelligence, motivation and decision making to accurately predict future performance. These studies highlighted that the movement of suspicion by the psychological field surrounding the accuracy of the psychometric test being used by sports led to research focused on changing and advancing what the past psychometric tests had been measuring.

Currently there are two major psychometric tests that several professional and amateur sports organizations utilize to predict future performance, being the Athletic Coping Skills Inventory 28 (ACSI-28) and the Athletic Intelligence Quotient (AIQ) (Cox et al., 2010; Sanz et al., 2018). The ACSI-28 measures different psychological aspects that are key to performance, including coachability, concentration and confidence (Cox et al., 2010). Cox and colleagues (2010) explains that the ACSI-28 measured these key psychological skills to predict if an athlete can cope with stressful competitive situations, and ultimately predict future performance. The ACSI-28 has been shown to have strong validity in discriminating between different athletic levels from recreational to elite and has been shown to have strong predictive validity for future athletic performance (Sanz et al., 2018). The ACSI-28 is an example of a sports focused psychometric test that is far more advanced than the psychometric tests used in the past, due to it being designed for athlete populations and having a high fidelity to athletic performance.

Another example of a modern sports based psychometric test is the AIQ, which is a sports-based intelligence test that measures an athlete's ability to master new skills and adapt to changing environments (Bowman et al., 2021). (Bowman et al., 2021) highlights that the AIQ is currently used by several professional sporting leagues in North America including, Major League Baseball (MLB), the National Basketball Association and the National Football League (NFL) and professional leagues across Europe. The main difference between the AIQ and other aptitude psychometric testing used in sports, like the WPT is that the AIQ excludes measures of academic intellectual ability (e.g., math, comprehension, verbal ability) (Bowman et al., 2020). Bowman and colleagues (2021) compared test results on the AIQ to collegiate baseball hitting and pitching performance, concluding that higher AIQ scores correlated with better athletic performance. Furthermore, Bowman and colleagues (2020) analysed and compared the AIQ scores of 147 NFL players when they were drafted to current their NFL performance, concluding that athletes who had higher AIQ scores were also significantly higher in key football statistics (e.g., rushing yards and receiving yards). These mentioned studies on the AIQ highlight the validity and accuracy of the psychometric test in predicting the future performance of athletes. Therefore, both the ACSI-28 and the AIQ are examples of how the suspicion during the 1990's and 2000's regarding the predictive validity of past psychometric tests being used in sports led to sports psychologists developing and advancing aptitude psychometric testing to be valid and effective in predicting athlete performance.

Conclusion

Through extensive research this chapter highlighted and discussed the key movements of sports psychology and sports psychometrics that led to the changed and advanced use of

psychometric testing in sports today. Initially the sports psychology field from psychologists being interested in the relationship between sports and psychology, using experimental studies to explain this relationship. This period of the 1900's to the 1940's saw a push back from the sporting field where they felt psychology had no part in sports. There was then a movement of sports psychologists applying personality psychometrics to amateur sports in the hopes of improving athlete performance. Despite psychometrics being implemented to improve athletic performance this period of the 1950's to 1970's again saw the sport field reject the idea the sports psychology and psychometrics have any part in sports. The key shift, where psychometrics became utilized in sports was due to the movement of professional sport teams becoming interested in using aptitude psychometrics to predict the future performance of athletes and help select the best teams. This period of the 1970's and 1980's with the introduction of the WPT and other aptitude psychometrics was the first time the general sporting field accepted that psychology and psychometrics could benefit sports. The movement of professional sports becoming interested in psychometrics led to plethora of psychometric data that sports psychologist could use to assess the validity of past aptitude psychometrics in sports by comparing psychometric results with athletic performance. This movement through the 1990's and 2000's of suspicion on the effectiveness of the psychometric testing in sports being used at the time led to the development of more accurate sport specific psychometric tests like the ACSI-28 and the AIQ. Therefore, this chapter clearly demonstrates that the movement of professional sports being adopting aptitude psychometrics and shifting the use of psychometrics from the amateur sporting environment resulted in the eventual changes and advanced sports based psychometric testing that is used today.

Literature Review: The Effectiveness of Psychometrics in Sport and Performance

Psychology as a Tool for Elite Athlete Talent Identification and Recruitment

Athlete talent identification includes first the recognition that an athlete is suited for a particular sport and second that a coach selects an athlete for a team. In a traditional sense, and most common today, professional athletes are selected based on anthropometric characteristics and their physical athletic performance (Casolino et al., 2012). Whilst these are the traditional methods, the use of psychological testing, specifically psychometrics may provide beneficial information to recognize the most talented professional athletes. The following review will provide insight into the importance of using psychometric testing to identify talented professional athletes and the current shortcoming of its use now. Psychometrics is the process of mental measurements with the aim to make them observable, ultimately attempting to measure latent variables such as intelligence and personality (Anunciacao, 2018). Currently, within the field of sports and performance psychology (SPP), the emphasis is on how an athlete's mental state may impact their behavior in terms of health, performance, and wellbeing (Meredith et al., 2018). Moreover, Meredith and colleagues (2018) explain that psychometrics is currently used in SPP to measure how an athlete is feeling and measure how their athletic performance is impacted. It is important to note that SPP is mainly employed to benefit professional athletes that are already a part of a team and may be struggling in terms of performance and wellbeing. Sports and performance psychology is already a well-established field, so this paper is not concerned with the importance of SPP for athletic performance and the well-being of established athletes. Instead, this paper aims to discuss the underdevelopment of psychometric testing in SPP when it comes to recruiting athlete's and athlete talent identification. This problem is crucial for coaches, as using psychometrics during athlete pre-screening may provide important information into an

elite athlete's learning ability, how their personality will fit into the team and how the athlete's emotions may impact their performance. It is one thing to recruit an athlete based on their physical attributes but being able to predict latent variables may help coaches and teams identify if an elite athlete will succeed at a new club mentally and emotionally. Ultimately, applying psychometrics to elite athlete recruitment may help professional sports teams select the best athletes for psychological reasons as well.

The Benefits and Importance of Psychometric Testing in Athlete Talent Identification

The use of psychometric testing in elite athlete talent identification is a new movement in SPP and as a result there is limited research that is largely dated, with the current literature having mixed opinions on its effectiveness. Abbott and colleagues (2005) conducted an extensive review article on the place of psychometrics in athlete talent detection in sports, ultimately being in great support of it. The literature review explained that a range of psychometric tools such as IQ tests are utilized by successful business when recruiting potential employees. This non-sport example highlights a field where psychometric testing has been shown to be effective in recruiting talented employees. Abbott and colleagues (2005) emphasize that anthropometric characteristics are highly unpredictable in identifying elite athletes, as child development can vary greatly, therefore meaning that a child identified to have talent based on anthropometric characteristics may not be talented a few years later. In response to this the review suggested a theory that psychological behaviours offer a more complete and less unpredictable indication of talent. A more recent study by Ivarsson et al. (2020) researched the effectiveness of psychometric testing in predicting future elite footballers' performance. The results indicated that psychological factors only had a small effect on predicting future

performance, and that whilst they cannot be the sole reason for recruiting an athlete, it is important to include psychometric testing in the recruitment and talent identification process. Whilst this more recent study is not as definitive in its support of psychometric testing in elite athlete talent identification as Abbott and colleagues (2005), it still provides strong support that there is a place for psychometric testing in the recruitment and talent identification of professional athletes. Moreover, a study by Kite et al. (2021) utilized questionnaires to psychometrically measure the perceptions of managers, coaches and recruiting agents on what attributes most contribute to elite athlete talent. The study was completed in two phases, the first phase consisted of 30 participants offering their insight into what attributes are most akin to talent and performance. The second phase consisted of 45 participants rating the most listed attributes on a Likert scale to determine which attributes are the most important. The results of the study concluded that psychological attributes are the most important contributor to talent and performance of elite academy athletes. This study is crucial, as it provides evidence that psychological attributes are important for elite athletes to have and therefore psychometric testing may be useful in identifying important psychological attributes. The current literature is scarce when looking at the direct impact of psychometric testing for elite athlete talent identification however, these sources clearly highlight the importance of psychological attributes for elite athletes and the positives of using psychometric testing in elite athlete recruitment and talent identification.

The Limitations of Psychometric Testing in Athlete Talent Identification

In opposition to the effectiveness of psychometric testing in elite athlete recruitment and talent identification is Anshel and Lidor (2012), who argue that psychometric testing used in

talent identification in sports has poor predictive validity, and poor research methodologies and statistical procedures. Firstly, this study disagreed with Abbott and colleagues' (2005) notion that anthropometric characteristics did not predict consistent and inconsistent performances. In direct contrast, Anshel and Lidor (2012), highlighted those measures of motor ability and skill were highly reliable in predicting athletic performance at an elite level. The study explains that psychometrics are not beneficial in predicting athletic potential because of their poor predictive validity. Extensive studies comparing the psychological factors of elite and non-elite athletes did not find significant results to suggest that psychology may predict athletic performance (Anshel & Lidor, 2012). Moreover, it was highlighted that SPP places an over emphasis on self-report questionnaires that can lead to socially desirable responses. Furthermore, the results of the study explain that SPP have poor research methodologies when attempting to show that psychometrics may be useful in talent identification. These results are supported by Meredith and colleagues (2018) who aimed to assess the development of psychometric measures that have been used by the field of sports psychology between 1979 and 2013. This study used a coding system to quantify whether a psychometric test used behavioural or non-behavioural measures and the specific research design employed. After assessing 1377 studies, Meredith and colleagues (2018) concluded that whilst there is some evidence that psychometrics may be useful in SPP most of the psychometric testing used inventories that were not designed for elite athlete populations. Moreover, Meredith and colleagues (2018) emphasized that SPP overuses self-report questionnaires and that future research should focus on conducting a greater diversity of research methods. Therefore, based on the work of Anshel and Lidor (2012) and Meredith and colleagues (2018), there is evidence that psychometric testing is either ineffective or underdeveloped for the use of talent identification and recruitment in sports. Based on the current literature, there are

flaws regarding the use of psychometrics in sports recruiting and talent identification, however with further research and accurate inventories it is possible that psychometrics may be beneficial to the sports recruiting and talent identification processes.

Ineffectiveness of Psychometric Personality Tests in Predicting Sports Performance

How personality can impact an elite athlete's performance has been widely researched, with the current literature holding varying views on the importance of personality in predicting an athlete's performance. Gee and colleagues (2010) conducted a study that analysed the major limitations of sports based psychometric measures of personality and then developed a normative measure of personality and assessed how it may predict elite athletic performance. Gee and colleagues (2010) explain that prior studies followed a descriptive and cross-sectional research method, which resulted in highly varied results, meaning that generalizations necessary for talent identification nearly impossible. Gee and colleagues (2010) analysed athletic performance longitudinally in a homogenous sample, finding that psychometric tests of personality become reliable and beneficial for talent identification processes. Anshel and Lidor (2012) disagree with the findings from Gee and colleagues (2010), instead suggesting that personality tests are extremely poor at predicting athletic success. Anshel and Lidor (2012) conducted an extensive review of the current literature on personality tests predicting sports performance in elite athletes and found that despite multiple psychological personality inventories attempting to predict sports performance, there was no psychometric measure that could accurately predict sports performance potential. Moreover, research by Ivarsson et al. (2020) found that psychometric testing had a small effect on predicting elite athlete performance, however the study did find that the studies being reviewed had biases that may suggest a limitation in the current use of

psychometric in elite athlete identification. Overall, psychological factors such as personality are key aspects of who an individual is, and it stands to reason that this would impact an athlete's performance. Whilst the current literature has some positives, there are major limitations in the research regarding the ineffectiveness of personality psychometrics and sports performance. Further research must focus on eliminating study biases and increasing the predictive validity of personality psychometrics before it can be reliably implemented in elite athlete talent identification.

Conclusion

The current literature has mixed opinions on the effectiveness of psychometric testing for elite athlete talent identification and recruitment. Currently, most talent identification is based on an athlete's anthropology and skill, with psychology taking a back seat. As is evident in the literature discussed, there is evidence to suggest that talent identification based on anthropology is unpredictable due to the rapid development that young athletes go through (Abbott et al., 2005). In direct contrast, there is also evidence to show that the use of psychometrics in predicting elite athletic potential is highly limited due to poor predictive validity (Anshel & Lidor, 2012). Currently, there is clearly evidence suggesting that psychometric testing could be useful for coaches in talent identification and recruitment, however the current psychometric testing used by SPP is underdeveloped due to poor test validity and poor research methodologies. It is crucial that future research focuses on developing psychometric methods that are SPP specific to ensure accurate psychological predictions for talent identification. If this happens it is possible that psychometric testing could be highly beneficial for coaches in the talent identification and recruitment of elite athletes.

Problem and Solution: The Effectiveness of Psychometrics in Sport and Performance

Psychology as a Tool for Elite Athlete Talent Identification and Recruitment

The following chapter aims to look at the key problem of using psychometric testing for elite athlete talent identification and possible solutions to this problem. Traditionally, and currently athlete talent identification is based completely on anthropometric characteristics and an athlete's past performances (Casolino et al., 2012). The potential addition of psychological factors as predictors of future performance and athlete talent identification could add a new layer to determining the psychological and mental capacity of an athlete to succeed. Whilst it may be beneficial to use psychometrics in athlete talent identification, as stated in the previous chapter there is currently a consensus in the literature that the used of psychometrics is inaccurate (Anshel & Lidor, 2012; Meredith et al., 2018). The current problem that will be discussed in this chapter is that sports specific psychometric testing is underdeveloped and used incorrectly, leading to inaccuracies in using psychometric testing to identify talented athletes and predict future performances. This problem is important as it may be hindering coaches and recruitment agents from being able to utilize psychometric testing along with anthropometric and physical skill assessment to best identify elite talented athletes. The aim of this chapter is to present a solution that will allow coaches and recruitment agents to effectively utilize sport specific psychometric testing to accurately identify elite talented athletes.

The Problem with Current Psychometrics as a Tool for Talent Identification

The current literature agrees that when psychometrics is applied to talent identification in sports psychology it is lacking in validity and fidelity. Anshel and colleagues (2012) studied effectiveness of using psychological measures for elite athlete talent identification. The article

explains the flaws associated with using psychometrics in sports psychology, include measuring psychological attributes that have a low fidelity with sports performance and using inventories that are not designed for the target population, leading to poor predictive validity. Predictive validity is defined as the ability of a measuring instrument to accurately predict performance (Myers & Hansen, 2012). Anshel and colleagues (2012) highlight that there is a lack of consistency in deciding the sample populations a particular psychometric inventory was intended for, such as a collegiate athlete, an Olympic athlete, or a community level athlete. This short coming has prevented current inventories from having sufficient external validity, as certain psychometric tests such as personality tests are being used for populations that they were not designed for (Anshel et al., 2012). Moreover, Bergkamp and colleagues (2019) studied psychological measures in soccer talent identification. Like Anshel et al. (2012), this review found that the predictive validity of psychometrics used by talent identification in athletes is poor due to the predictor varying greatly from the criterion. Bergkamp and colleagues (2019) explained that sports specific attributes like shooting a ball have a high fidelity for predicting future performance, whilst attributes that are more general like intelligence and personality have a low fidelity for predicting future performance. Therefore, this study highlights the problem that psychological unobservable traits have low predictive validity. This means that until psychological traits are more predictable, psychometrics will not be used effectively in sports psychology for elite athlete talent identification.

An example of a psychometric test being applied to a population it was not intended for and having low fidelity is the use of the Wonderlic Personnel Test (WPT) in the National Football League (NFL) (Hatch, 2008). Initially created for workforce hiring, the NFL is the only sports league that uses the WPT, with studies having reported on the relationship between WPT

scores and NFL success and finding no significant relationship (Stanimirovic & Hanrahan, 2010). Kuzmits and Adams (2008) conducted a thorough correlational analysis study to better understand the effectiveness of the WTP in predicting future performance and found no correlation between higher test scores and better athletic performance. Moreover, Lyons and colleagues (2009) compared the results of the WTP to the statistical playing data for NFL athletes, concluding that there was no relationship between WTP scores and future NFL performance. This example provides evidence that currently the sporting field is using psychometric testing that is not intended for professional athlete populations and unless this changes, the low predictive validity of psychometric testing in sports psychology will remain.

A Solution to Help Psychometrics become an effective Tool for Talent Identification

Based on the problem and current literature there is a need to review the predictive validity of current psychometric tests used in professional sports and replace them with standardised psychometric assessments that are specific to elite sporting populations. To solve this problem, a two-stage solution is proposed that involves identifying key psychological sports performance indicators to increase attribute fidelity and using these indicators to help develop valid psychometric testing for sports psychology.

The first step is to identify key psychological attributes that have high fidelity with professional sports and as such may specifically predict future elite sports performance. Currently the psychometric testing being used in talent identification has low fidelity for predicting future performance, such as testing intelligence and personality traits which have not been shown to relate to athlete performance (Bergkamp et al., 2019). By identifying key psychological attributes that relate to elite sport performance, psychometrics can be utilized more

effectively to test attributes that have a high predictive validity for future elite sports performance. This is supported by Kite and colleagues (2021) who concluded that in talent identification psychological attributes are the most important indicator of talent and future performance, with attitude being the most important psychological attribute. Moreover, Mustafovic and colleagues (2020) express the importance of multivariate talent identification processes, where psychological indicators like emotional intelligence, motivation and decision making are measured alongside anthropometric and skill-based indicators. Therefore, further suggesting the importance of including psychometric tests in elite athlete talent identification to increase the prediction validity of the talent identification process. Furthermore, a study by Dimundo and colleagues (2021) agreed with Mustafovic et al. (2020) in implementing a multivariate talent identification process, and highlighted that the psychological characteristics of commitment, self-regulation, resilience, growth mind-set, and being proactive were crucial for predicting future performance. These studies offer suggestions for some of the key psychological attributes that could be included in future psychometric testing to make them specific for elite sport related talent identification.

Building on from the first step, the second step is to abandon the use of psychometric tests that were designed for non-sport populations and to use the identified sports related psychological attributes to develop psychometric tests that are designed for elite athlete populations. This will increase predictive validity as the tests will be measuring key psychological factors that are associated with sports, instead of applying non-sports related psychometric tests to sports populations. By developing psychometric testing with high fidelity for predicting future performance, talent identification programs will be able to utilize psychometric testing effectively. As mentioned earlier, the WPT is a good measure of

intelligence for traditional employment settings but was not designed for sports populations and as such has low fidelity and low predictive validity for future performance (Lyons et al., 2009). The NFL should invest in psychometric testing that is designed for professional sports populations to ensure strong predictive validity of future performance. Lyons and colleagues (2009) explain that future research should focus on the predictive validity of psychometric instruments that look at other psychological factors specific to sport, not just general intelligence tests like the WPT. With this example in mind, by developing and utilizing psychometric tests that look at psychological factors that have been shown to have high fidelity to sport performance such as attitude, determination, and resilience (Kite et al., 2021; Lyons et al., 2009; Mustafovic et al., 2020) they may have stronger validity for predicting future performance. Similarly in soccer, studies have shown the importance of key psychological characteristics in predicting future elite soccer performance (Kite et al., 2021). However, Kite and colleagues (2021) highlights that psychometrics is currently being used to measure psychological components that have low fidelity for predicting soccer performance, such as general intellect and personality tests that are not designed for athlete (soccer) populations. Therefore, by developing psychometric tests that have high fidelity of predicting soccer performance these tests will be able to predict future soccer performance accurately and effectively, serving as useful tools in elite athlete talent identification (Bergkamp et al., 2019).

Conclusion

Currently the majority of elite athlete talent identification is based on anthropometric and physical skill assessment as these methods have a high fidelity with sports performance and as such have a high validity for predicting future performance. Psychometrics can be and is

incorporated into elite athlete talent identification to measure unobservable psychological attributes. However, it is currently being used sparingly and ineffectively by measuring attributes that have a low fidelity to sports performance and a low validity for predicting future performance. By identifying key psychological attributes that research shows have a high fidelity to sports performance and then developing psychometric tests that measure these attributes in elite athlete populations this may increase the validity of psychometric tests predicting future sports performance. If this is the case then elite athlete talent identification programs will be able to incorporate psychometric assessments with anthropometric and physical skill assessments to gain a more wholistic insight into how a potential elite athlete will perform in the future, and thus decide on whether that athlete will fit into an elite athletic squad or program.

Chapter 4 redacted to remove personal reflections and any identifying information.

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