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What Do We Know About Player Selection in Academy Soccer? A Narrative Review

Rich J. Kite[1], Kathryn Johnston[2], and Joseph Baker[2]

[1]Department of Rehabilitation and Sport Sciences, Bournemouth University, United Kingdom

[2]Tanenbaum Institute for Science in Sport, Faculty of Kinesiology and Physical Education, University of Toronto, Canada

Correspondence: Rich Kite, rkite@bournemouth.ac.uk

Abstract

Identification and selection are critical elements in developing talented players in professional soccer. In academy systems, players must survive regular selection processes at various ages to retain their position at the club. Despite its prevalence, this process continues to present challenges that may affect the realisation of many talented players. This narrative review attempts to address what is known about ways to improve talent selection in soccer, while also highlighting key gaps in research that are critical for enhancing practices. Importantly, this review also discusses some of the many cognitive biases, both personal and systemic, that can influence player selection to ensure players are equally afforded development opportunities. This work has important implications for researchers and practitioners looking to improve identification and selection practices and processes.

Keywords

youth development, talent identification (TID), cognitive biases, youth, psychology

Introduction

Theoretically, talent identification (TID) for soccer plays a pivotal role in affording players superior resources (e.g., better coaches, advanced facilities, higher-skilled peers) to support their development. Within a typical United Kingdom soccer academy, the identification process commonly involves several steps: confirmation, selection, development and reselection, or deselection[1] (Ford et al., 2020; Reilly et al., 2000). Initially, recruitment staff (i.e., those responsible for identifying prospective athletes) undertake observations of players who are external to the academy over one or several performances (typically during a football game). If the observed player is considered to be 'of interest', they are often offered a trial period at the respective academy (Bergkamp et al., 2022). Once the player is introduced to the academy, coaches integrate the player within training sessions and games to further observe the athlete's performance (confirmation). After this trial period, a variety of key academy stakeholders (i.e., Academy Manager, Head of Coaching, Lead Phase Coach, to list a few) typically decide whether the player will be offered a contract with the academy (selection). Players who are successful in attaining a contract will undertake further systematic opportunities (as per the elite player performance plan—a curriculum for U.K. soccer academies), typically via organised training of different performance-related elements (e.g., psychological, physical, technical and tactical provisions) throughout the season.

Academy coaches (and other relevant staff) commonly undertake a reassessment of player abilities, usually before a development phase transition (i.e., foundation- to youth-development phase or youth- to professional-development phase). Consequently, players are either offered contract extensions (ongoing selection) allowing them to progress into the next development phase, or they are released following the end of their current contract (deselection). This cycle of development and (de)selection repeats until professional contracts are subsequently attained or the player is ultimately released. However, being released, at any point in the development pathway, greatly reduces a player's future opportunities to participate in competitive soccer. Speaking to the questionable long-term security of selected players, previous research has highlighted a 25-30% annual turnover in player selection (Ford et al., 2020; Güllich, 2014) and a probability of remaining within an age group for more than three years as <50% (Güllich, 2014).

In soccer, investigations into the traits related to 'talented' players have been vast. Researchers have typically sought to determine the attributes associated with 'talent' either through (1) coach subjective perceptions of attribute importance (Kite et al., 2022; Larkin et al., 2017; Roberts et al., 2019), or (2) comparing current top-performing players against their lesser-performing peers (likewise, selected vs. deselected) on attributes associated with performance (Dugdale et al., 2021; Höner et al., 2015; Kelly et al., 2022). Yet, given the ever-evolving nature of soccer, it is unclear whether these approaches are sufficient for identifying talent, and whether they adequately reflect the wider considerations required to overcome potential bias in athlete selection. Hence, the goal of this review is to highlight and discuss ways to improve the identification and selection process for academy soccer.

Methods

In this review, a narrative approach was used to identify relevant research. This type of review is valuable for synthesizing information from various sources using diverse methodologies, theoretical underpinnings, and constructs (Baumeister, 2013; Baumeister & Leary, 1997). Given the breadth of current information within talent identification and selection, a narrative review permitted a broader overview, as opposed to a more focused interrogation typically observed when undertaking quantitative systematic reviews. Moreover, a narrative review allowed for the blending of information sources both within and beyond soccer, and talent identification or selection to allow for research on soccer to be captured even if it was not focused on talent identification and selection, and vice versa. From this perspective, a narrative review allowed us to identify potential gaps in current understanding (though not as specific nor as comprehensive as a systematic review) while offering insights into future areas of research (i.e., postulate the influence of known theories within wider unknown areas) from a broad spectrum of information sources (Ferrari, 2015).

Literature Search

Given that the three authors have been entrenched within talent identification and selection at varying degrees (e.g., practical delivery, research, selection processes, and policy change, to list a few), the research question evolved from current understanding and awareness of practice and its limitations, to this: What is the current evidence for player selection in soccer and how can research support improvements to the identification and selection practices for soccer academies?

A preliminary step involved reading current research within the area of talent identification and selection within academy soccer and discussing this work to establish recurring topic areas for investigation. These included key phrases and terms such as 'objective measures', 'subjective measures', 'maturation', and 'physicality/physical attributes', highlighting important areas of investigation within the landscape. These terms helped to inform the search strategy, utilising the following search terms: [(Football OR Soccer) AND (Talent*) AND (Select* OR Deselect*)]; and, [(Football OR Soccer) AND (Talent*) AND (Maturation)]; and, [(Football OR Soccer) AND (Talent*) AND (Subjective OR Perception OR Intuition)]; and, [(Football OR Soccer) AND (Talent*)

AND (Recruit* OR Scout*)]. These search terms were then used by the first author to scan and retrieve articles from PubMed and Google Scholar databases, which were chosen for their breadth of information in sport science.

Literature (including peer-reviewed and otherwise[2]) was scanned by title, abstract, and key words and extracted for a full-text read if the following five inclusion criteria were met: (1) investigating academy soccer athletes, (2) examining the practices and processes of identification and selection, (3) open access (including book chapters, conference proceedings, research notes, current opinions and perspectives), (4) written within the last 10-years, and (5) written in English. A Microsoft Excel document was created to report on eligible articles and their findings. The lead author grouped the articles into similar themes by adding a label to each article based on its focus/foci. This labelling process was done by reading and re-reading the full-text and making digital notes about the main topic area of investigation. Three distinct areas were established from the literature: (1) physical assessments; (2) holistic needs; and (3) subjective assessments (Figure 1). During this stage, literature was also noted if it was focused on 'academy level athletes' and specifically on 'soccer athletes' as some literature was outside of these areas but still relevant to our review. Tables (1-7), which are included in the Appendix, were produced to offer a summary of the literature, specific to each topic area.

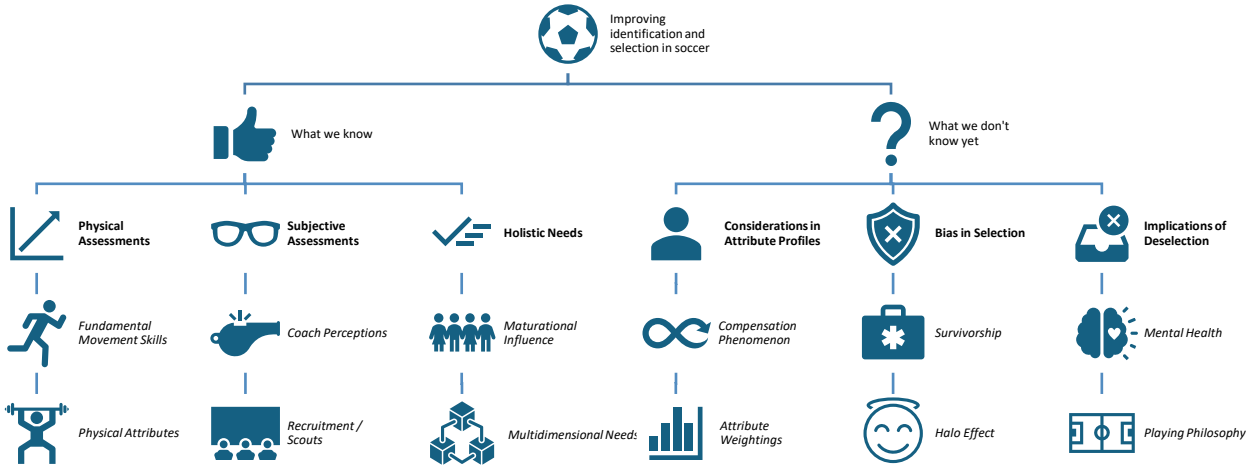

Figure 1. A schematic diagram of the themes determined, following the literature search

Findings

In this section, a summary of the search findings is reported. As noted above, groupings of research findings are presented and discussed in the form of sub-sections; physical assessments (e.g., fundamental movement skills, physical attributes), holistic needs (e.g., the 4-corner model, maturational influence) and subjective assessments (e.g., coach perceptions, recruitment/scouts).

Key Area for Improvement #1: Early Development – Fundamental Movement Skills

While limited, research has noted associations between the acquisition of fundamental movement skills and sporting performance (Duncan, Clarke et al., 2022; Duncan, Eyre, et al., 2022; Kokstejn & Musalek, 2019), establishing consensus on the need for early development of fundamental movement skills as underpinning qualities of athleticism (Baker et al., 2003; Bergeron et al., 2015; Côté et al., 2009; Côté & Vierimaa, 2014; Lloyd et al., 2016; Zwolski et al., 2017). Duncan et al.

(Duncan, Clarke, et al., 2022; Duncan, Eyre, et al., 2022) found positive associations between fundamental movement skills (measured via gross motor skill assessment) and soccer-related skill performance (boys, $r = 0.59 - 0.75$; girls, $r = 0.45 - 0.60$) (e.g., dribbling, passing, shooting and tactical skills). Likewise, their reports also established an almost large association ($r = 0.79$) with fundamental movement skills and physical fitness. While the reviewed literature encompassed a range of tests, these each typically assess gross motor skill competency, including running, throwing, catching, jumping, hopping, co-ordination tasks and balance. Moreover, wider research broadly supports the notion that fundamental movement skills are a precursor to more advanced skills/abilities (Hohmann & Siener, 2021; Irurtia et al., 2022), and therefore may be beneficial for early player development.

A case study by Ryan et al. (2018) detailed the operations of a high-level soccer academy in their pursuit of developing 'world-class athletes', advocating functional skill development (e.g., flexibility and muscle imbalances) and movement competency (e.g., general movement pattern proficiency) preceding sport-specific developments. Similarly, position statements produced by the International Olympic Committee (Bergeron et al., 2015) and the National Strength and Conditioning Association (Lloyd et al., 2016) focus on providing guidance for athlete long-term engagement (i.e., injury prevention, enjoyment for long-term participation, etc.), with an emphasis on fundamental movements stemming from the appreciation of movement competency as a precursor for higher performance. Further investigation into how such fundamental movement skills are both trained and measured within sporting environments may be beneficial.

Based on current discourse, it seems that coaches, selectors, and recruitment staff should be cognisant of the importance of fundamental movement skill development. Potential disregard may result in diminishing returns, whereby practitioners exhaust their efforts on the pursuit of more advanced qualities yet are unable to progress such skills due to the absence of foundational capacities (e.g., fundamental movement skills). Moreover, coaches should emphasize early efforts on fundamental movement development to provide the best opportunity (later on) for more advanced skills to flourish.

Key Area for Improvement #2: Physical Attributes

Anthropometric measures and physical performance markers have been the focus of extensive investigation within soccer, likely due to the ease of tangible assessment outcomes. However, findings from such research have been generally inconclusive, whereby a collective of researchers both agree and disagree on the physical traits and qualities confounding success within soccer (Table 2). For example, anthropometrics have been found as both capable of distinguishing (Gonaus et al., 2019; Papadakis et al., 2022; Sieghartsleitner et al., 2019; Zibung et al., 2016), and incapable of distinguishing (Bidaurrazaga-Letona et al., 2019; Craig & Swinton, 2021; Dugdale et al., 2021; Emmonds et al., 2016; Hohmann & Siener, 2021; Irurtia et al., 2022; Keiner et al., 2021; King et al., 2024; Konarski et al., 2021; Lago-Peñas et al., 2014; Saward et al., 2020; Trecroci et al., 2018) appropriate choices in player selection contexts. Similarly, the assessment of the popular countermovement jump has provided varying outcomes, with reports of the assessment as capable (Bidaurrazaga-Letona et al., 2019; Dugdale et al., 2021; Gonaus et al., 2019; Irurtia et al., 2022; King et al., 2024; Saward et al., 2020; Sieghartsleitner et al., 2019; Trecroci et al., 2018) and incapable (Craig & Swinton, 2021; Lago-Peñas et al., 2014) of detecting talented from non-talented players (although, it is acknowledged this is potentially due to technical variations employed and ambiguous definitions and criteria of 'talented' athletes).

Notably, several researchers established physical attributes as predictors of success via various methods of statistical modelling, either using holistic models (encompassing a variety of physical assessments combined, and/or with additional qualities such as psychometric and tactical abilities; see Craig & Swinton, 2021;

Papadakis et al., 2022; Sieghartsleitner et al., 2019; Zibung et al., 2016) or via long-term detection of change in performance (e.g., Gonaus et al., 2019; Hohmann & Siener, 2021; Höner et al., 2021; Saward et al., 2020). Sieghartsleitner et al. (2019), for instance, used a holistic model for selection, utilising subjective coach perceptions alongside multidimensional assessments (e.g., general motor performance, maturity, technical skills, psychological qualities, family support and training age), demonstrating a selection accuracy of 88%, over purely subjective perceptions (71%), general motor performance (73%) and the multidimensional model (82%). While these approaches are certainly encouraging, the high variation of differing models and processes (with varying outcomes) could be more streamlined to aid soccer practitioners. Additionally, the use of more complex statistical analysis is more evident in the identification of talent, which comes with a host of possible limitations (e.g., being capable of undertaking such analysis *and* correctly interpreting any results). Therefore, more work is required to further validate such models and educate others towards their application and utilisation.

Key Area for Improvement #3: The 4-Corner Model

Further drawing upon the multidimensional models as discussed above, the majority of researchers investigating attributes that distinguished more-talented from lesser-talented players established a range of multidisciplinary skills are essential (Table 3). Of particular note, while physical abilities remain an important element of player selection, psychological, technical and tactical abilities are perhaps more pertinent to performance (Dugdale et al., 2021; Kite et al., 2022; Larkin et al., 2017; Roberts et al., 2019). For instance, when inquiring with key stakeholders about the attributes considered most important for success, psychological and technical/tactical abilities and skills were rated highest in perceived importance, with most physical attributes (such as strength, stamina and agility, amongst others) rated least important (although still considered important).

Staff involved with player selection typically perceived perceptual-cognitive skills (e.g., decision-making, game-awareness, reading the game, etc.) as one the most important set of attributes to possess within soccer (Kite et al., 2022; Larkin et al., 2017; Roberts et al., 2019). Perceptual-cognitive skills are, perhaps, foundational to the execution of wider qualities, such as physical attributes. We may postulate that failing to recognise key moments during a performance, when physical qualities can be best exploited, likely renders such attributes ineffective at worst, or reduced in effectiveness at best. Yet, the development of perceptual-cognitive skills remains a challenge within soccer, and while various theoretical models appear to be sound, conflict has arisen in recent research noting various flaws in study designs (e.g., not theory-driven and lacking controlled experimental designs; Bergmann, 2021).

Psychological traits are equally considered as highly desirable. Players demonstrating positive attitudes, possessing strong coping skills and being resilient and capable of dealing with adversity, are examples of attributes perceived highly important (Dugdale et al., 2021; Kite et al., 2022; Larkin et al., 2017; Roberts et al., 2019; Sieghartsleitner et al., 2019). However, research specifically investigating psychological influences on talent identification and player selection is lacking, although there has been work on the value/role of perceptual-cognitive factors (Murr et al., 2018). In addition, players' abilities to interact with other players and coaches are undoubtedly important given the team/group based nature of the sport (e.g., how 'coachable' a player is seen to be; Mills et al., 2012; Kite et al., 2023b; Larkin et al., 2017). Therefore, while coaches and relevant staff may perceive these attributes as highly important, such perceptions require further validation. Moreover, although several researchers have attempted to correlate selection status and psychometric scores (Dugdale et al., 2021; Kelly et al., 2022; King et al., 2024; Kite et al., 2023a), there has been little experimental/intervention designs in this area.

Researchers have also investigated wider social influences, such as the effect of affluence

and socioeconomic status. Interestingly, Kelly et al. (2022) reported a discrepancy between higher and lower performing players, favouring lower economic status as being related to sporting ability. Conversely, research in Brazilian (Teoldo et al., 2021) and US Women's soccer (Allison & Barranco, 2021) established higher economic status was associated with talent emergence. Moreover, socioeconomic status is an important area to understand and investigate further, although, it appears to be location-dependent (Calvo & Aurrekoetxea-casaus, 2024; Morganti et al., 2023; Teoldo & Cardoso, 2021). However, social and socioeconomic research is lacking within soccer and talent identification with further work required in this area.

Key Area for Improvement #4: Biological Maturation

Considerable research has established the influence of maturation on talent identification (TID), including the effects of differing maturation levels on a variety of skills and abilities, and its influence on player selection (Table 4). While we continue to learn about the processes of growth and maturation, its influence on player selection can be powerful. Research indicates that a coach's perception of an athlete's 'potential' (e.g., what they are capable of doing in the future) is directly linked to maturation status, whereby early-maturing players are perceived as having high potential, or more pertinently, late-maturing as low potential (Cripps et al., 2016; Furley & Memmert, 2016). In the research by Furley and Memmert (2016) and Cripps et al. (2016), such beliefs were attributed to physical profile, whereby shorter stature players (i.e., late maturing players yet to reach peak height velocity) were perceived as being low potential).

Over the past decade, various maturational adjustments (variations of scaling, bio-banding, etc.) have been proposed and tested when evaluating players to ensure fairer comparisons when predicting player potential (Cumming et al., 2017). While these approaches may be useful for buffering the effects, the underlying mechanisms driving this maturation selection bias is the focus on short-term outcomes over long-term performance goals (Baker et al., 2018). Arguably, this is a wider infrastructure-related issue, whereby coaches have one or two seasons to demonstrate their 'worth' (i.e., value to the organisation), commonly measured in their team's (typically an age band) season performance. Therefore, players who exhibit the qualities most beneficial for short-term success (often reflected in early-maturing players) are more likely to be selected for games.

In consideration of late-maturing athletes, recent work by Hill et al. (2023) has grouped late-maturing athletes into one of two groups; the 'underdogs' and 'the released'. The 'underdogs' were linked to the underdog hypothesis, which stems from the notion that later maturing athletes must possess or develop superior skills in order to contend with their chronologically older and earlier maturing peers (Cumming et al., 2018). According to this hypothesis, over-stimulation and adaptation of abilities results in greater potential for later adult success. The comparison group, 'the released', reflects individuals who fail to cope with the overstimulation and subsequently fall foul of injury or burnout (Kite et al., 2022; Van Der Sluis et al., 2015).

As a consequence of maturational selection bias, a variety of scenarios may unfold: (1) early-maturing players accrue more match minutes and, by extension, have more opportunities for skill development; (2) the development of early-maturing players stagnates, fostering an overdependence on physical prowess and an under-stimulation for wider sporting demands, negatively impacting future performance, particularly when their later maturing peers physically 'catch up'; (3) recruitment staff are more inclined to seek out physically dominant players, due to a developed perception of the coach's desired qualities of a player, ultimately misidentifying talent; (4) late-maturing peers are continually over-stimulated and have to 'survive' in order to remain within the talent development system (Hill et al., 2023; Vandendriessche et al., 2012). While most soccer academies and key stakeholders acknowledge the importance of maturation, knowledge and application are not synonymous.

Recent research demonstrated this, whereby coaches presented knowledge and awareness of maturational biases, yet still demonstrated such bias in practice (Kite et al., 2024). Therefore, further understanding towards the consequences of maturation bias, alongside a multidisciplinary approach towards maturation assessment, may allow for more equitable and holistic long-term player development.

Key Area for Improvement #5: Coach Subjective Assessment

The identification process for soccer is informed heavily by coaches' subjective assessments (Dugdale et al., 2020; Jokuschies et al., 2017; Kite et al., 2023b; O'Connor et al., 2016; Roberts et al., 2019; Wrang et al., 2022), with additional support often from objective assessments (Dugdale et al., 2020; Ford et al., 2020; Kite et al., 2023b; Sieghartsleitner et al., 2019; Wrang et al., 2022) (Table 5). Such subjective assessments are usually guided by coach 'intuition', built from explicit knowledge, past experience and temporal factors such as previous playing and coaching experiences (Christensen, 2009; Lath et al., 2021; Roberts et al., 2021).

The use of subjective assessments via coach intuition is generally accepted as a valid and reliable method of player selection in soccer (Sieghartsleitner et al., 2019). That said, subjective approaches are recognized for having limitations (Hill & Sotiriadou, 2016; Kite et al., 2023b; Larkin et al., 2017), as the potential for bias is high when using subjectivity in isolation. Some examples of a subjective bias have been reported in; (1) biological maturation (Bradley et al., 2019; Kite et al., 2023b; Meylan et al., 2010; Patel et al., 2020; Toum et al., 2021), whereby players of an advanced biological maturation are selected over their later maturing peers (as discussed above); (2) relative age bias, defined as a misconceived perception of an association between birthdate and performance (disregarding maturational variation) (Hill & Sotiriadou, 2016; Patel et al., 2020; Towlson et al., 2017; Towlson et al., 2021); and, (3) favouritism (discussed later), while reported in youth rugby, players felt favouritism played a role in the attainment of minutes played (Rothwell et al., 2020), and can be speculated to hold ramifications in the sport of soccer.

Key Area for Improvement #6: Recruitment and Scouts

While members of the recruitment workforce (e.g., scouts) will likely prescribe a similar approach towards player assessment as other selectors (e.g., coaches, managers, etc.), it seems relevant to discuss both roles independently. However, at present, a limited body of research exists exploring how soccer scouts distinguish talented players (Table 7). As previously mentioned, scouts are typically the initiator towards player identification and selection, observing players externally from an academy and recommending them towards a trial period within the respective academy for further observation. Research has investigated which key attributes scouts consider when identifying talented players (Table 6) (Bergkamp, Frencken, et al., 2022).

Of note, a research investigation has found that recruitment staff typically over-emphasise the importance of specific attributes, compared to other relevant academy personnel (sports scientists, coaches, managers) (Kite et al., 2022). This may be explained by the different environments each staff operates within and the homogeneity of the group of players being observed. For example, a player who may appear as 'outstanding' amongst recreational standard players, might only look average amongst academy standard players (dependent upon the gap in league standards). Additionally, ambiguity appears to be further issue when recruitment staff undertake player observations. Bergkamp et al. (2022) noted on several occasions that scouts were broad in their descriptors, likely due to an inability to truly verbalise what they were assessing. With this absence of information, it remains uncertain what specific attributes scouts truly consider important and whether they are consistent in their approach. Ultimately, understanding the processes applied by scouts remains an area for further research exploration.

Future Directions - Unanswered Questions in TID and Soccer

As discussed above, while a wealth of research has outlined specific areas of focus in distinguishing talent, or improving identification practice, several gaps of knowledge have also been made apparent. Therefore, the following section raises awareness towards lesser-known elements/considerations within player selection processes, which warrant further investigation. These include: (1) player profiles, (2) bias measurement and reduction, and (3) the consequences and implications of player deselection.

Future Direction #1: Is There a 'Profile' of Key Attributes For Elite Soccer Players?

As previously stated, research has acknowledged that soccer performance (like most sports) hinges upon a contribution of attributes across a multifaceted skillset. However, the various successful (or unsuccessful) combinations of attributes working collaboratively both within and across disciplines (e.g., psychological, physical, social, technical/tactical) are largely unknown (and potentially unknowable). Nevertheless, several theories have been described that may benefit from further investigation or acknowledgement when considering talent selection.

The 'compensation phenomenon' (Huijgen, 2013; Mills et al., 2012; Sieghartsleitner et al., 2019; Woods et al., 2016) is a scenario whereby players display a deficit within or across disciplines that is compensated for by possessing a superior ability in another area. Moreover, these superior/inferior qualities/characteristics/skills can be antagonistic, whereby deficits are masked and counterweighted by other superior abilities, providing multiple ways of resolving any respective challenge presented to the player. For example, in a one-on-one attacking scenario, a player who lacks strength qualities (e.g., to resist physical duels), may instead possess superior evasive skills, reducing the need to engage in physical challenges (i.e., demonstrating within-discipline compensation). Likewise, a defensive player who lacks speed may compensate with superior game understanding and decision-making skills (Jokuschies et al., 2017), resulting in a greater ability to regain possession via pass interception from reading the game, rather than beating their opponent in one-on-one race scenarios (i.e., reflecting an across-discipline compensation).

However, caution must be taken in determining outstanding qualities, assuming adequate compensation for weaker areas of performances will occur. Merely possessing a superior quality/qualities may not be sufficient in masking deficits, resulting in the failure to counterbalance such downfalls and achieve compensatory performance. As an example, research from Woods et al. (2016) noted that while several players were identified as possessing superior skills, they were subsequently deselected due to excessive skill gaps in other areas. Ultimately, skill/quality deficits may either limit the use of such superior abilities (e.g., not able to acknowledge *when* to use such superior quality within performance), or be too vast in disparity, resulting in a poor overall soccer performance.

To help circumvent the above issues, it might be of interest to further understand whether a 'weighting' of abilities can be identified to address the value of a specific capacity, and how this might change at different phases of development (Huijgen et al., 2014; Vaeyens et al., 2008). For example, attributes such as decision-making and attitude are consistently accepted as essential qualities of 'talented' players (Dugdale et al., 2021; Kite et al., 2022; Larkin et al., 2017; Roberts et al., 2019) and may therefore be considered to hold a higher relative weighting. This is in contrast to a player's measured strength, which is considered to be less critical for soccer success (Dugdale et al., 2021; Kite et al., 2022; Larkin et al., 2017; Roberts et al., 2019; Towlson et al., 2019), and therefore, may hold a lower relative weighting. Likewise, there is a potential that relatively higher weighted attributes may serve as 'non-negotiable' skills (critical for success), whereas lower weighted attributes can be interchangeable in order to succeed. Extending from this notion, it is also important to consider a player's 'ability to compensate', which may be more achievable in lower-weighed abilities

(e.g., strength), whereas more difficult in higher-weighted qualities (e.g., decision-making skills), within a realistic timeframe.

At present, measuring such compensations remains difficult, given the wide range of skills and abilities associated with soccer, and the lack of empirical measures to assist evaluations. Even if tangible measures were obtained, comparing them across multidisciplinary skillsets, where different metrics are applied, is challenging. For example, while benchmark data is available for a wealth of physical assessments, in areas such as technical and tactical measures (of individuals, not team performance) and psychological metrics, such data is limited (or not validated).

An initial starting point may be found in establishing skill thresholds, whereby a cut-off (minimal ability) in performance is identified. Given the wide variety and combination of attributes and abilities exhibited by selected players, makes determining the thresholds of top-performers difficult (Dugdale et al., 2021; Kite et al., 2022; O'Connor et al., 2016; Roberts et al., 2019). Whereas, determining whether cut-off threshold(s) of abilities for deselection exists, may assist in the understanding of player developments and selection processes. Such information may provide further details as to whether 'non-negotiable' qualities of successful players exist.

In summary, having a greater understanding of the contributions of attributes individually and synergistically may provide greater insights into areas more impactful towards performance. While coaches and key stakeholders should be mindful towards these considerations, further work is required to validate these theories of player development and talent selection and, likewise, devise valid methods for assessment (e.g., the application of weighting).

Future Direction #2: How Can We Measure and Minimize Bias in Athlete Selection?

While the above section offers insights towards individual player assessment, emerging work emphasizes the importance of processes used within the player selection process, considering the potential for prejudice and preconceptions of talent. Notably, practitioners might begin by being mindful of the concept of *survivorship bias* and its influence on research discriminating talented from lesser talented players.

Survivorship bias has been credited to Abraham Wald, tasked with estimating aircraft vulnerability during World War II (Bermúdez-Guzmán et al., 2020; Mangel & Samaniego, 1984). Wald noted that the damage endured on the returned aircraft would typically influence vehicle developments. However, given these aircraft had successfully returned, suggested such sites of damage were non-critical. Conversely, the aircraft that had failed to return, likely received critical damage in other unique areas. Essentially, within a soccer context, this phenomenon outlines the misdirected focus of developments, addressing weaknesses of players based on successful/selected players, rather than further understanding those who were deselected. One of few studies (Dugdale et al., 2021) that has attempted to identify commonalities of abilities associated with deselection noted deficits across the following areas: (1) perceptual-cognitive skills, (2) behavioural skills, and (3) physical abilities. This might suggest that selection at the highest levels of soccer requires athletes to possess 'foundational' abilities (as discussed previously), that may benefit the directions of development plans.

Survivorships bias further highlights potential issues in retrospective designs used to distinguish talented players (Baker et al., 2022), extending to coach/scout experiences of 'talent' that are continually used to compare against the next generation of talent. Similar observations have been noted in research on talent selection regarding survival vs attraction advantages (Baker et al., 2022). Essentially, 'survival advantages' reflect an athlete's possession of abilities that allow for superior performance within the sporting environment, allowing them to survive selection processes by outperforming their peers. Whereas 'attraction advantages' are abilities perceived as advantageous for performance, as subjectively interpreted by key personnel (scouts, coaches, etc.). Much like Wald's aircraft scenario, attractors potentially evolve from previous beliefs and experience (arguably, outdated perceptions), resulting in

coaches and scouts misconceiving specific qualities as being more attractive.

The halo effect is another influential phenomenon for coaches and personnel to be mindful of when making decisions on recruitment and selection. The halo effect was originally studied within psychological sciences, with recent investigations in domains such as human resources, education, medicine and business, and recently in the context of sport, albeit business and management-focused (Noor et al., 2023; Nufer, 2018, 2019). In short, the halo effect suggests favourable perceptions about a person, place or thing, can bias perceptions about a related, but perhaps unconnected aspect of that person, place or thing. In sport, it has been proposed that the halo effect may influence how an athlete is viewed by recruiters and selectors (Johnston & Baker, 2020). In this sense, there is potential for a few positive qualities/characteristics to overshadow a player's negative qualities/characteristics, leading to a more positive view of the athlete more globally (or vice versa). Therefore, an athlete with a positive reputation will be perceived as being a good player without any prior assessments of abilities.

Given the above-discussed effects, selectors should not be naïve to what a high-performer looks like based on previous experiences (survivorship bias) or perceptions of an individual (halo effect). Instead, selectors should be open to identifying a range of abilities and skills and understand how these can be effective in attaining high performance. Likewise, selectors should take a neutral stance where possible, in attempts to promote fairness and avoid perceptual misleading.

Importantly, while prior research has established that these biases should be considered and managed theoretically, they are not always easy to measure with the rigor and specificity they require in sport environments. An important future direction for research is identifying strategies for adequately measuring athlete selection biases, in a way that isolates the bias from other cognitive processing, especially when such biases are subtle, nuanced, and multifaced (Johnston & Baker, 2024). Moreover, determining their value (e.g., cost and benefit) can be even more complicated in the context of sport, where outcomes are not always clear and targets are often moving (i.e., performance metrics and ways to play the game evolve over time).

Future Direction #3: Do We Understand the Consequences and Implications of Deselection?

From a psychological perspective, the experience of deselection has been found to have a high impact on a player's mental health (Blake & Solberg, 2023; Blakelock et al., 2016; Wilkinson, 2021). Players who have developed a robust athletic identity within their academy/club may develop mental health issues (i.e., depression, feelings of loss, etc.) when this identify is impacted through deselection (Blake & Solberg, 2023; Blakelock et al., 2016; Wilkinson, 2021). As a repercussion, players who may have the ability to thrive within another club may fail to realise this and subsequently exit the sport as a consequence of such mental health issues. Therefore, clubs must be mindful of how deselection is conveyed towards their players and ensure appropriate provisions are afforded, to safeguard players from being lost from the sport altogether. The exact way this information should be delivered in a way that maximizes respect and support is yet another important area for future investigations.

A player may be deselected for a variety of reasons, one being a lack of alignment between the player's abilities and the club's playing philosophy (Unnithan et al., 2012). For example, a club may express that their players are required to exhibit superior levels of speed, and if, in the eyes of the selectors, an athlete does not possess such speed qualities, then there is a lack of organisational 'fit'. A deselected player from one club, for reasons of 'lack of fit', may flourish within another club, whose playing philosophy lends to their performance skillset. Therefore, player deselection is unlikely to be generalisable or indicative of a player's ability to succeed in soccer, but perhaps reflects a far more nuanced assessment of an individual against a singular club's expectations (Unnithan et al., 2012).

Summary - Practical Applications and Limitations

As noted above, players may present compensatory abilities. Selectors should seek to identify whether such abilities are effective. For example, is a lack of physical size and strength compensated with superior evasive ability or decision making? If not, what can be done (if anything) to make these effective? Likewise, selectors should consider the relative weighting of a player's abilities. If athletes possess lower weighting abilities (i.e., strength or stamina) these may be less beneficial longer term, especially when compared to potentially higher weighted abilities (i.e., attitude or decision-making skills). This may benefit from the use of more recent advanced statistical modelling.

Similarly, considerations may need to be paid towards thresholds of abilities, in particular the minimal (cut-off) threshold for selection. One place to start is for academies to investigate performance data from those who are ultimately deselected, to identify commonalities in abilities. It is likely that, given the range in academy standards (i.e., academy category status), these thresholds may be unique to each club based on the expectation of performance abilities, as well as the academy philosophy towards games.

While it would be impossible to eliminate bias from player selection, coaches and selectors may benefit from being mindful towards such issues. Having awareness of bias is believed to play an important role in limiting a sub-conscious reliance on such biases (Mann & van Ginneken, 2017). For example, survivorship bias has demonstrated how attention might be focused in the wrong area, based on previous beliefs and retrospective data. Instead, as indicated above, understanding why players are being deselected may identify gaps in coaching provisions to prevent future talents from being lost.

Finally, to limit the various external biases, it may be of benefit for coaches to obtain additional external observations of players, to compare player performance perceptions. An external reviewer may be another coach (ideally, one that has no prior relations with the player) or managerial staff (i.e., head of coaching, academy manager, etc.). Attaining a 'second opinion' may reinforce the belief of the coach, or challenge a coach in their perceptions and, by extension, opportunities presented to such players.

Concerning the present review's limitations, the above 'gaps' in our understanding of TID in soccer are not presented as the *only* issues practitioners and researchers are dealing with in the contemporary context. They are simply presented to provoke action regarding novel research for player development and the selection processes within soccer and wider sports. The authors acknowledge additional limitations are presented within academy soccer (i.e., financial constraints), yet they do so with a firm belief that creating dialogue around such issues will allow for the opportunity to progress and enhance the player selection process in soccer.

Concluding Thoughts

This narrative review of the literature has demonstrated that players require multidisciplinary skillsets to be recognised as 'talented'. Despite recognising and appreciating the skillsets and qualities required to attain success in soccer, evidence supports that there are cognitive biases, heuristics, and socially constructed effects that shape the selection processes. Such insights are offered to practitioners to acknowledge the potential issues raised and ensure that players with the greatest talents are provided with the correct developments, afforded equal opportunities and offered the most time to realise their potential.

Endnotes

1. Deselection may (but not always) result in restarting the selection cycle within a new talent development environment (Dugdale et al., 2021).
2. Examples of 'Other' literature included books, non-peer reviewed journals, conferences, to list a few.

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ORCID iDs

Rich J. Kite
https://orcid.org/0000-0002-9336-4625
Kathryn Johnston
https://orcid.org/0000-0002-5956-5810
Joseph Baker
https://orcid.org/0000-0002-5686-1737

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Appendix

Table 1. Summary of literature concerning fundamental movement skills in soccer

Reference	Sample Size	Sample Age	Playing Level	Functional Movement Assessment	Overview	Effect Size
Bergeron et al.(2015)	n/a	n/a	n/a	n/a	This consensus statement for the IOC outlines how physical competency is essential prior to the pursuit of performance. Therefore, appropriate provisions focusing on multisport development and basic physical competency (as examples) should be implemented.	n/a
Duncan et al., (2022)	60	Under 9 to Under 12	English Grassroots Players	Test of Gross Motor Skill Development 2, Perceived Physical Ability Scale for Children	Technical competency was correlated with perceived physical ability (with the greatest correlation) and fundamental movement skills, suggesting grassroots soccer should emphasis movement competency of sport-specific qualities.	$r = 0.72$ to 0.79
Duncan et al. (2022)	121	Under 7 to Under 14	English Grassroots Players	Test of Gross Motor Development-3 (TGMD-3)	Fundamental movement skills, alongside technical skills and physical fitness, were critical in explaining tactical skills of players.	$r = 0.45$ to 0.75
Hohmann & Siener, (2021)	502	Under 8 to Under 17	German players of varied standards	3 motor competency tests and 5 physical fitness tests (unspecified)	Physical fitness and motor competency assessments were able to distinguish talented players from non-talented players following a multi-year follow-up (average of 8 years).	OR = 0.11 to 4.28
Jukic et al. (2019)	23	Under 10	Croatian elite soccer players	Test of Gross Motor Skill Development 2	While no significant differences were noted between player performance standards, it was observed that fundamental movement assessments were able to distinguish results between groups.	d = -0.40 to 0.82
Kokstejn & Musalek (2019)	24	Under 12	Czech Youth League	Test of Gross Motor Skill Development 2	Correlations were determined between fundamental movement assessment and soccer-specific performance tests. In particular, the horizontal jump and catch were notable assessments explaining performance in soccer-specific tests.	$r = 0.50$ to 0.77
Kokstejn et al. (2019)	40	Under 12	Czech Youth League	Bruininks-Oseretsky test - 2nd edition (BOT2 Short version)	Fundamental movement skills were established as a confounding quality for physical fitness, which in turn influenced soccer-specific skills (speed dribbling).	$r = 0.56$ to 0.66
Ryan et al. (2018)	n/a	Under 9 to Under 23	English Academy Players	Functional Movement Screen, Squat	This case study of a high-performing academy outlined the philosophy of player development. Players from under 9 to under 12 focused on movement competency, progressing to more advanced training from under 12. Players exhibiting deficits in movement competency were restricted from progression until satisfactory movement competency was attained.	n/a

Note. r = Pearsons correlation, OR = odds ratio, d = Cohen's d, n/a = not applicable

Table 2. Summary of Physical Assessments to distinguish 'talent'

Reference	Sample Size	Sample Age	Playing Level	Physical Assessments	Overview of Findings	Effect Size
Bidaurrazaga-Letona et al. (2019)	94	Under 13 and Under 15	National elite Spanish players	Standing height, seated height, body mass, maturation (Mirwald), body composition (triceps, subscapular, abdominal, suprailiac, thigh, calf), 15m sprint, modified Barrow zigzag run, counter-movement jump, yoyo intermittent recovery test (lvl.1)	Anthropometrics appeared similar between deselected and club players, but physical performance was able to distinguish player (de)selection.	$\mu^2 = 0.000$ to 0.297
Craig & Swinton, (2021)	512	Under 10 to Under17	Elite Scottish academy players	Standing height, body mass, counter-movement jump, 20m sprint, yoyo intermittent recovery test (lvl.1)	While variations were observed in counter-movement jump performance, predictive modelling determined no outcomes greater than random guessing.	Lasso error proportion = 0.39 to 0.49
Dugdale et al. (2021)	79	Under 11 to Under 17	Scottish junior elite players	Yoyo intermittent recovery test (lvl.1), counter-movement jump, functional movement screen, 5m sprint, 20m sprint, body mass, standing height, seated height, maturation (Mirwald)	Counter-movement jump, 5m sprint and 20m sprint were higher in reselected players over deselected players.	d = 0.09 to 1.14
Emmonds et al. (2016)	443	Under 18	English academy players	Standing height, body mass, 10m sprint, 20m sprint, yoyo intermittent endurance test (lvl.2)	A significant difference was found between selection status in speed variables from U16 and endurance from U18.	d = 0.37 to 1.26
Gonaus et al. (2019)	5141	Under 13 to Under 18	Austrian Academy Players	Standing height, body mass, body mass index, 5m sprint, 10m sprint, 20m sprint, 10m repeated sprints (x5), counter-movement jump, drop jump, overhead medicine ball throw (2kg)	Analysis compared current to previous players, noting current players as taller. Linear sprint ability had also demonstrated improvement. Counter-movement jump, drop jump and medicine ball throw were all equally greater.	d = -0.29 to 0.59
Hohmann & Siener, (2021)	502	Under 13 and Under 17	City to Provincial German players	Standing height, body mass, 20m sprint, sideward jumping, balancing backwards, standing torso bend, push-ups, sit-ups, standing horizontal jump, 6-minute endurance run	The 6-minute run, balance, 20m sprint, alongside sporting participation, were noted as important for future success. The eight physical tests were also considered to be valid as a means to assess talent.	OR = 0.11 to 4.28
Höner et al. (2021)	13,869	Under 12 to Under 15	German talent programme	20m sprint, modified slalom test	The sprint test was one of the best predictors of all tests (including subjective assessments) at distinguishing selected players	d = 0.22 to 0.82

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Table 2, continued. Summary of Physical Assessments to distinguish 'talent'

Reference	Sample Size	Sample Age	Playing Level	Physical Assessments	Overview of Findings	Effect Size
Irurtia et al. (2022)	722	Under 9 to Under 14	Chinese regional players	Standing height, body mass, body mass index, squat jump, counter-movement jump (with and without arms), 10m sprint, 30m sprint, repeated sidestep, forced vital capacity	No significant differences were noted between talented and non-talented players in anthropometrics of forced vital capacity. Speed and jumping tests were able to distinguish differences between groups (small effects). Repeated sidestep displayed the largest difference.	d = 0.16 to 0.49
Keiner et al. (2021)	45	Under 17 and Under 19	Elite and amateur German players	Body mass, standing height, squat jump, 505 change of direction, Illinois change of direction, 10m sprint, 20m sprint.	Elite players were significantly better than amateur players in squat jump, linear sprints and change of direction tests.	hedges' g = 0.27 to 6.84
King et al. (2024)	90	Under 12	Scottish Academy Players	20m Sprint, 505 change of direction, counter-movement jump, standing height, seated height, body mass, maturation (Fransen) and GPS metrics (total distance covered, high-speed running distance, accelerations and decelerations)	Anthropometric and maturity-based assessments were unable to distinguish (de)selected players. 20m sprint, 505 COD and CMJ were able to distinguish (de)selected players. All GPS metrics were able to distinguish (de)selected players.	d = -0.89 to 0.21
Konarski et al. (2021)	31	Under 15	Polish Elite Academy	5m sprint, 20m sprint, figure of 8 change of direction, squat jump, grip strength, yoyo intermittent recovery test (lvl.1), standing height, seated height, body mass, maturation (Khamis-Roche),	Maturation was able to distinguish (de)selected players. 20m sprint, squat jump and grip strength were able to distinguish (de)selected players.	η_p^2 = 0.00 to 0.37
Lago-Peñas et al. (2014)	156	Under 15, under 17 and under 20	regional Spanish players	Standing height, body mass, body mass index, body composition (triceps, thigh, calf, biepicondylar humerus, biestyloid, biepicondylar femur and bimalleolar), yoyo intermittent endurance test, 30m sprint, Balsom test, counter-movement jump (with and without arms)	No consistent findings were reported. A note of successful players being leaner and more muscular than unsuccessful players.	n/r
Papadakis et al. (2022)	44	Under 19 and Senior	Greek semi-professional to professional players	Standing height, body mass, body mass index, repeated vertical jumps.	Height and body mass index were the most likely predictors of future success.	d = 0.30 to 1.90

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Table 2, continued. Summary of Physical Assessments to distinguish 'talent'

Reference	Sample Size	Sample Age	Playing Level	Physical Assessments	Overview of Findings	Effect Size
Saward et al. (2020)	2875	Under 8 to Under 19	Elite youth English academy players	Standing height, body mass, 20m sprint, slalom change of direction, counter-movement jump, multistage fitness test	Anthropometric measures were not able to distinguish later professional (de)selection. Future-selected professional players also ran faster (sprint) and further (multistage fitness). They were also better in change of direction and power (CMJ) from a young age, continually through to U18.	d = 0.10 to 1.20
Sieghartsleitner et al. (2019)	117	Under 14	1st to 4th Swiss League	Yoyo intermittent recovery test (lvl.1), counter-movement jump, 40m sprint, modified slalom test, standing height, seated height, maturation (Mirwald)	Motor performance (which also consisted of dribbling assessment) was able to distinguish 73% of selected players correctly.	OR = 0.37 to 4.24
Trecroci et al. (2018)	44	Under 15	Italian regional and national standard	Yoyo intermittent recovery test (lvl.1), standing height, body mass, Counter-movement jump, 10m sprint, modified Illinois change of direction	A difference was observed between elite and non-elite players in only the 10m sprint and counter-movement jump.	d = 0.16 to 2.03
Zibung et al. (2016)	136	Under 12	Regional Swiss players	Standing height, seated height, body mass, maturation (Mirwald), yoyo intermittent recovery test (lvl1), 40m sprint, modified slalom test	The components of fitness assessments were capable of creating profiles that could predict potential selection outcomes.	OR = 0.20 to 3.70

Note. μ^2 = Eta squared, d = Cohen's D, η_p^2 = partial eta squared, OR = odds ratio, n/r = not reported

Table 3. Summary of literature accounting for multidisciplinary assessment (4-corner model)

Reference	Sample Size	Sample Age	Playing Level	Multidisciplinary Assessments	Overview of Findings	Effect Size
Kelly et al. (2022)	98	under 9 to under 16	English academy players	Technical/tactical tests, physical assessment, psychological tests and social assessment	With two research outcomes, the first reviews development characteristics of players (under 9 to 16). This highlighted a clear multidisciplinary need for player assessment, with notable tests with predicted adult height, lob pass, dribble completion, match play hours and relative age. The second outcome, reviewing selection in scholarship, highlighted key areas of the PCDEQ factors 3 (coping with performance and development pressures) and factors 4 (ability to organise and engage in quality practice) as standout qualities.	OR = 0.89 to 1.89
Kite et al. (2022)	45	Coaches	English and Scottish coaches	Physical, psychological, sociological, technical/tactical, additional, other	Coaches agree that multi-dimensional development is important. All domains were considered important; however, physical was considered least important and psychological and tactical skills as the most important.	n/a
Larkin et al. (2017)	20	Coaches	Australian Coaches	Skill (first touch, striking the ball, 1v1, decision making, technique under pressure, running with the ball, x-factor, game understanding, game awareness, anticipation, consistent execution, vision, team understanding, defensive ability), Psychology (coachability, positive attitude, love of the game, confidence, competitive, personality/character, adaptability, concentration, professionalism, communication, pressure)	Coaches agree that multi-dimensional development is important. All domains were considered important; however, physical was considered least important and psychological and tactical skills as the most important.	n/a
Murr et al. (2018)	n/a	n/a	n/a	Review of literature	This systematic review highlights a lack of research relating to wider psychological demands, and the need for such inclusion alongside multidisciplinary assessments. Notably areas for review include the use decision-making skills.	n/a
Roberts et al. (2019)	9	Varying staff	English academy staff.	Physical, psychological, technical, hidden.	A list of attributes were determined and ranked by importance, with the additional consideration of positional value. This demonstrated differences in attribute needs by position, demonstrate multidisciplinary needs throughout.	n/a

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Table 3, continued. Summary of literature accounting for multidisciplinary assessment (4-corner model)

Reference	Sample Size	Sample Age	Playing Level	Multidisciplinary Assessments	Overview of Findings	Effect Size
Saward et al. (2020)	111	Under 11 to Under 16	Elite youth English academy players	Psychological characteristics of developing excellence questionnaire (PCDEQ)	Through longitudinal analysis, as players aged, eventual scholars (academy category 1-2) demonstrated higher levels of coping with performance and developmental pressures (by age and compared to category 3-4 and non-scholars), and increases in evaluating performances and working on weaknesses.	n/a
Sieghartsleitner et al. (2019)	117	Under 14	1st to 4th Swiss League	Profile: height, weight, maturation, relative age. Physical: Yoyo, counter-movement jump, 40m sprint, agility test. Technical Skills: dribbling, passing, juggling. Psychological: achievement motive, achievement goal orientations, self-determination. Other: family support and training history. Subjective Assessment: Coach perception of in-game performance.	While each model independently (coach's eye, motor performance, multidimensional, coach's eye and motor performance, and holistic) demonstrates high sensitivity and specificity in identifying correctly selected players, it was apparent the strongest model utilised all disciplines.	OR = 0.37 to 4.24
Williams et al. (2020)	n/a	n/a	n/a	Review of literature	This systematic review outlines the need for more multidisciplinary approaches towards assessments. It further highlights how social elements of multidisciplinary assessment are commonly neglected. Additional considerations towards research direction are outlined, such as validating methods to measuring player overall performance from game performance analysis, amongst a call for greater research designs to reliably uncover further findings.	n/a

Note. OR = odds ratio, n/a = not applicable,

Table 4. Summary of maturation assessments in soccer selection.

Reference	Sample Size	Sample Age	Playing Level	Maturational Assessments	Overview of Findings	Effect Size
Bidaurrazaga-Letona et al. (2019)	94	Under 13 and Under 15	National elite Spanish players	Age at Peak Height Velocity (Mirwald)	New players introduced to clubs are typically of advanced maturation, indicating talent identification at U15 was influenced by maturation.	$\mu^2 = 0.00$ to 0.05
Cripps et al. (2016)	264	Under 16	Semi-elite Australian players	Age at Peak Height Velocity (Mirwald)	Late maturing players were perceived to hold lower long-term potential	n/a
Cumming et al. (2018)	171	Under 10 to Under 16	English academy players	Percentage of Adult Predicted Height (Khamis-Roche)	Later maturing players were associated with greater self-regulation, planning, reflection and evaluation skills.	$r = -0.22$ to 0.58
Dugdale et al. (2021)	79	Under 11 to Under 17	Scottish junior elite players	Age at Peak Height Velocity (Mirwald)	Deselected players were typically advanced in maturation, whereas reselected players were less advanced in maturation. This is likely related to the recruitment of advanced maturation players who are later deselected.	d = 0.39
Hill et al. (2023)	9	Coaches	English Academy Coaches	N/A	Maturation was acknowledged as a confounding variable. Early maturing players were perceived as more athletic and consistent in performance, yet relied on their size. Later maturing players were perceived as holding higher long-term potential.	n/a
King et al. (2023)	90	Under 12	Scottish Academy Players	Age at Peak Height Velocity (Fransen)	No significant differences were found between successful and unsuccessful players.	n/r
Kite et al. (2023b)	96	Under 10 to Under 16	English Academy Players	Percentage of Adult Predicted Height (Khamis-Roche)	An early maturational bias was associated with player selection	n/r
Kite et al. (2024)	24	Coaches	English Academy Coaches	N/A	Maturation was acknowledged as a confounding variable in player selection	n/a
Massa et al. (2022)	143	Under 14	Elite Brazilian players	Tanner Stages and salivary testosterone assessment	Maturation and hormonal production (linked to maturational stage) are related to player selection.	$\eta^2 = 0.11$

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Table 4, continued. Summary of maturation assessments in soccer selection

Reference	Sample Size	Sample Age	Playing Level	Maturational Assessments	Overview of Findings	Effect Size
Sieghartsleitner et al. (2019)	195	Under 13 to Under 17	Swiss talent pathway players	Prediction of adult height (Sherar)	Maturation can influence talent identification tests at specific ages (U13/14 = counter-movement jump and 40m sprint, U17 = change of direction)	OR = 0.95 to 1.61
Sweeney et al. (2023a)	159	Under 13 to Under 16	Irish talent pathway players	Percentage of Adult Predicted Height (Khamis-Roche)	Early maturing players were more likely to be selected over their lesser mature peers.	d = 0.56 to 1.88
Sweeney et al. (2023b)	159	Under 13 to Under 16	Irish talent pathway players	Percentage of Adult Predicted Height (Khamis-Roche)	Maturational bias was exhibited specific to playing position, with only central defensive and attacking midfielders not exhibiting such bias.	d = 0.49 to 1.65
Takahara & Miyakawa, (2021)	475	Under 12	Japanese professional league youth players	Tanner-Whitehouse method (Xray images of wrist bone formation)	Early maturing players were more likely to be selected over their lesser mature peers.	n/r
Towlson et al. (2017)	465	Under 13 to Under 18	English Academy Players	Age at Peak Height Velocity (Mirwald)	Maturational bias was exhibited specifically to playing position, with central defenders and goalkeepers displaying the most consistent biases.	n/r

Note. μ^2 = Eta squared, r = Pearsons' correlation, η^2 = partial Eta squared, OR = odds ratio, d = Cohen's d, n/r = not reported, n/a = not applicable

Table 5. Summary of literature investigation coach subjective assessments.

Reference	Sample Size	Sample Age (Years)	Playing Level	Assessments	Overview of Findings	Effect Size
Dugdale et al. (2020)	80	Under 10 to Under 16	Junior-Elite Scottish academy players	Yoyo intermittent recovery test (lvl.1), counter-movement jump, functional movement screen, 5m sprint, 20m sprint, maturation	Varied outcomes were identified, with coaches exhibiting abilities to identify abilities at either end of extremes, yet less capable of identifying and distinguishing the ability of players in the middle range of performance.	n/a
Dugdale et al. (2021)	79	U11 to U17	Scottish junior elite players	Skill (first touch, striking the ball, 1v1, decision making, technique under pressure, running with the ball, x-factor, game understanding, game awareness, anticipation, consistent execution, vision, team understanding, defensive ability), Psychology (coachability, positive attitude, love of the game, confidence, competitive, personality/character, adaptability, concentration, professionalism, communication, pressure)	All skill and psychological attributes were perceived higher in reselected players over deselected players, by coaches.	d = 0.09 to 1.14
Höner et al. (2021)	13,869	11 to 15	German talent programme	Kicking skills, endurance, individual tactical skills, psychosocial skills	The subjective assessments were deemed as superior to predicting player selection over objective assessment. Kicking skills demonstrated the highest predictive power of all the assessments.	d = 0.22 to 0.56
Jokuschies et al. (2017)	5	Coaches	Swiss Coaches	Overall player evaluation, determining each coach's subjective talent criteria, the evaluation of the players based on the coaches' subjective talent criteria, and the coaches' re-evaluation of players based on their subjective talent criteria	Coaches were able to reliably assess players based on their own criteria. The criteria represented a multidimensional concept of talent including personality traits, cognitive–perceptual skills, motor abilities, development, technique, social environment and physical capability.	n/a
Kelly et al. (2022)	98	Under 9 to Under 16	English academy players	Technical/tactical (technical/tactical tests, match analysis, perceptual-cognitive expertise video simulation tests), physical (anthropometrics, fitness tests), psychological (psychological characteristics for developing excellence questionnaire) and social (participation history question and postcode data)	Subjective ratings of players were aligned with technical, tactical, physical, psychological and social disciplines. Notable influences were observed in maturation (early maturation bias), greater lob pass, and average dribble completion and increased match-play hours.	OR = 0.89 to 1.89

Table 5, continued. Summary of literature investigation coach subjective assessments.

Reference	Sample Size	Sample Age (Years)	Playing Level	Assessments	Overview of Findings	Effect Size
Kite et al. (2022)	45	Coaches	English and Scottish coaches	Physical, psychological, sociological, technical/tactical, additional, other	Coaches agree that multi-dimensional development is important. All domains were considered important; however, physical was considered the least important and psychological and tactical skills as the most important.	n/a
Kite et al. (2023a)	45	under 9 to under 16	English academy players	Psychological (Motivation, self-confidence, anxiety, team emphasis, concentration), Tactical (knowing about ball actions, knowing about others, positioning and deciding, acting in changing situations), Tactical analysis (TSAP), Physical (5m sprint, 15m sprint, 30m sprint, arrowhead change of direction, 505 change of direction)	Coach perceptions of general overall performance were capable of distinguishing (de)selection. Subjective vs objective assessments found only a few associations specific to age groups.	$r = 0.16$ to 0.75
Konarski et al. (2021)	31	Under 15	Elite Polish players	General technical skills, tactical skills (offensive), tactical skills (defensive), creativity and decision-making skills, and effectiveness	Coaches perceived decision-making and creativity skills as a distinguishing factor of player (de)selection.	n/r
Larkin et al. (2017)	20	Coaches	Australian Coaches	Skill (first touch, striking the ball, 1v1, decision making, technique under pressure, running with the ball, x-factor, game understanding, game awareness, anticipation, consistent execution, vision, team understanding, defensive ability), Psychology (coachability, positive attitude, love of the game, confidence, competitive, personality/character, adaptability, concentration, professionalism, communication, pressure)	Coaches agree that multi-dimensional development is important. All domains were considered important; however, physical was considered the least important and psychological and tactical skills as the most important.	n/a
Sieghartsleitner et al. (2019)	117	Under 14	1st to 4th Swiss League	Current performance using a visual scale	Subjective assessments were capable of selecting the correct players with 71% accuracy. A combined holistic model of subjective and objective assessment established the greatest accuracy of 88%	n/a

Note. d = Cohen's d, OR = odds ratio, *r* = Pearson's correlation, n/r = not reported, n/a = not applicable

Table 6. Attributes that scouts consider important for future success, adapted from Bergkamp Frencken, et al. (2022)

Performance Category	Attribute
Technical	Technical Skills with the ball, ball control, transitioning, defending, pass intention or accuracy, first touch, attacking skills, shooting or shot technique, two-legged, dribbling, applying pressure, blocking, building up offensively, disrupting the offensive build-up, preventing goal scoring opportunities, scoring goals.
Tactical and Perceptual-cognitive	Game sense and awareness, speed of handling, positioning or moving without the ball, vision, perception, seeing teammates and opponents, gaze behaviour, decision-making, tactical skills, and soccer intelligence.
Physical, physiological and motor skills	Physiological or motor skills, sprint speed, physical attributes, coordination, body composition or athletic build, agility, strength in duels, explosiveness, length, mobility, movement rhythm, stability.
Personality-related and mental skills	Winning mindset or mentality, drive or intrinsic motivation, personality-related attributes, perseverance, resilience or toughness, behaviour on and off the pitch, coachability or fast learner, assertiveness or dominance, coaching other players or leadership, positive attitude, performance or goal orientated, focus or concentration, self-confidence.
Miscellaneous	Team understanding, involving teammates, communication, undefined, X-factor, innate talent (nature), adaptability, biological age, calendar age, appearance, education level, and lifestyle.

Table 7. A summary of literature investigating how scouts identify talent in soccer

Reference	Sample Size	Playing Level	Study Aim and Design	Overview of Findings	Effect Size
Bergkamp, Frencken et al. (2022)	125	Dutch academy and first team scouts	How do scouts identify talented players, using a self-report measure.	Majority of participants believed they could predict future performance. Notable attributes being observed were technical skills or technique with the ball, game sense/awareness, physiological or motor skills, sprinting speed, winning mindset or mentality, intrinsic motivation, ball control, speed of handling and physical attributes.	n/a
Bergkamp et al. (2022)	94	Dutch academy and first team scouts and coaches	Examining the predictive validity of coaches' and scouts' performance ratings, using observational assessment with mechanical information.	Reliability and validity assessment yielded poor results. This was attributed to various study design limitations relating to both the instruments used and assessments methods applied. Moreover, the study highlighted how structured assessments face challenges in talent prediction.	r_s = 0.25 to 0.41
Lüdin et al. (2023)	100	Swiss academy scouts	Determining agreement in scouts, achieved by the ranking of players and a questionnaire.	The study found little to no agreement in the selection of players. Some of this may stem from vague or ambiguous descriptors towards identifying talent. Moreover, inconsistency was evident, and successful selection/identification may purely be a result of the individual scout observing.	d = -1.6 to 0.6
Mann et al. (2017)	25	PSV Eindhoven (Dutch) scouts	Determining whether relative age selection bias could be reduced through the intervention of age numbered shirts.	When scouts were not aware of the observed players age, a relative age bias was present. When provisions were made to share the age of the player (age-ordered shirt numbering), relative age bias was eliminated.	d = 0.09 to 1.44

Note. r_s = Spearman rank correlation, d = Cohen's d, n/a = not applicable