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Investigating Player Selection within UK Academy Soccer: The Application of Objective and Subjective Assessments in Detecting Talent

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Abstract: Talent selection and development in academy soccer is highly dependent on coach intuition. Given such reliance upon subjective inputs, a greater understanding towards the utility of coach intuition may prove invaluable. The present study investigated coach agreement, the associations between subjective and objective outcomes and prominent traits highlighted within player (de)selection. Academy players (n = 45, age = 14 ± 2yrs) and coaches (n = 10, age = 31 ± 5yrs) were recruited from a professional soccer academy. Objective assessments included tactical and psychological surveys, physical assessments (linear sprints, change of direction and jumping tasks) and performance analysis (performance assessment for team sports). Coach subjective player gradings were collected using a visual analogue scale aligned to the objective assessments. Lead and assistant coaches demonstrated poor-to-moderate agreements in perceived player skills (ICC = 0.48 to 0.76) and fair to almost perfect agreement in player (de)selection (ICC= 0.23-1.00, P <.001 to .26). However, coach agreement reduced as players aged. Likewise, a maturation related bias was present whereby biologically older players were selected over their lesser mature players. Moreover, coach intuition demonstrated a strong predictive capability to select players, whilst the study was incapable of distinguishing exclusive traits related to selection outcome.

Keywords: Physiology, Youth, Psychology, Technical/Tactical, Maturation, Talent Identification.

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1. Introduction

Talent identification within academy soccer plays a crucial role in developing and retaining players with a perceived potential for professional success and thus attenuating the financial costs associated with recruiting players (Sarmento, Anguera, Pereira, & Araújo, 2018). In order to attain a professional contract, academy players must continually develop holistic skills and abilities (psychological, social, physical and technical/tactical) throughout their academy journey. Players perceived as exhibiting superior skills and abilities are typically afforded further developments (retention), whilst those lacking qualities will likely be deselected and exit the academy programme (Unnithan, White, Georgiou, Iga, & Drust, 2012). Given that recruitment, retention and deselection of players are largely decided by coach beliefs and perceptions – a subjective processes (Dugdale, Sanders, Myers, Williams, & Hunter, 2020; Noon *et al.,* 2020; Unnithan *et al.,* 2012; Williams, Ford, & Drust, 2020), it is in an academies best interest to understand how such decisions are determined.

The utility of subjective assessments for player (de)selection, via coach intuition, is commonplace within soccer (Bergkamp, Frencken, Niessen, Meijer, & den Hartigh, 2022; Dugdale, McRobert, & Unnithan, 2021; Larkin, O'Connor, & O'Connor, 2017; Roberts, McRobert, Lewis, & Reeves, 2019; Sieghartsleitner, Zuber, Zibung, & Conzelmann, 2019; Unnithan *et al.,* 2012). Coach intuition extends from experience, knowledge, temporal factors and self-efficacy working with each player (Roberts *et al.,* 2021). Previous studies have acknowledged that coaches can recognise successful qualities (Larkin *et al.,* 2017; Roberts *et al.,* 2019), are able to subjectively assess talent (Hendry, Williams, & Hodges, 2018; Jokuschies, Gut, & Conzelmann, 2017) and as a result, can correctly distinguish between talented and lesser-talented players (Hendry *et al.,* 2018; Sieghartsleitner, Zuber, Zibung, & Conzelmann, 2013; Sieghartsleitner *et al.,* 2019). However, several implications have been associated with subjective observations, including; i) maturational selection bias (Dugdale *et al.,* 2021; Sieghartsleitner *et al.,* 2019); ii) poor between-coach agreement regarding perceived player abilities (Dugdale *et al.,* 2020) and; iii) contention regarding a coaches subjective abilities to undertake psychometric evaluations (Sieghartsleitner et al., 2019). Therefore, the addition of objective evidence has been proposed to enhance selection outcome and overcome subjective downfalls.

Previous research has investigated coach agreement comparing lead and assistant coach perceptions of player physical abilities. Based upon retrospective game performances, Likert scales were applied across a variety of physical qualities (endurance, power, movement quality, physical development, acceleration and speed) (Dugdale *et al.,* 2020). The results reported moderate to substantial agreements in player ratings (Sklar's $\omega = 0.48 – 0.68$) and concluded that whilst agreement was established at end ranges (1 or 5), fluctuations were observed within such extremes, ultimately challenging the agreement between coaches. Similar findings were also observed within Rugby, also comparing Likert scale ratings between coaches, concluding coaches were unable to accurately assess physical competency (McCormack, Jones, Elliott, Rotheram, & Till, 2021).

In regards to objective testing, the summary of literature investigating the application of objective assessments to distinguish of talented players (with the absence of subjective inputs) provides heterogeneous results, ultimately providing inconclusive findings. As an example, whilst some studies (e.g. Bidaurrazaga-Letona *et al.,* 2019) have noted anthropometry as defining characteristics of talented players, others have found these to be unrelated (Deprez, Fransen, Lenoir, Philippaerts, & Vaeyens, 2015). Moreover, there is a likeliness that each academy and club has an individual philosophical approach, that requires unique set of skillsets and characteristics to fulfil expectations (Unnithan *et al.,* 2012). Instead, the implementation of objective tests might be best applied to provide insights to support subjective decisions within player selections. Therefore, the present studies objective is to assess the competency of coach intuition in player selection. This will be achieved by examining agreement between lead and assistant coaches considering player performance (across a holistic assessment), exploring associations of subjective (coach perception) and objective measures of holistic abilities, and further identifying subjective and objective attributes related to player (de)selection. It is hypothesised that i) player rating and (de)selection will demonstrate good agreement between coaches ii) coach perception of holistic performance will be associated with objective performance measures, and iii) the strengths/weakness of unique attributes will be associated with (de)selection outcomes.

2. Methods

2.1 Participants

Invites were distributed to 113 youth players and 19 coaches of an English category 2 soccer academy. Forty-five players (age = 13.5 ± 2.2yrs) and ten coaches (age = 30.9 ± 4.5yrs, coaching experience = 10.6 ± 5.4yrs) agreed to participate. The players were divided into three groups aligned to the EPPP (Premier League, 2011) and the academies development philosophy consisting of Foundation Development Phase (FDP) (Ages = 9-11yrs, n = 12), Early Youth Development Phase (YDP1) (ages = 12-13yrs, n = 11) and Late Youth Development Phase (YDP2) (Ages = 14-16yrs, n = 22). The players had been signed to the academy for at least three months. Coaching staff included UEFA-A qualified lead coaches (n = 3, coaching experience = 13.7 ± 1.5yrs) and assistant coaches (n = 7, coaching experience = 9.3 ± 6.0yrs) who held either UEFA-A (n = 3) or UEFA-B (n = 4) qualifications. The distribution of coaches ensured one lead coach per age band, and one assistant coach per age group. Data collection occurred concluding the season (April), aligned with (de)selection timings within UK academy soccer. Institutional ethical approval (No: P99816) and informed consent was obtained prior to any investigations.

2.2 Objective Assessments – Holistic Abilities

The psychological skills inventory for sports short form (PSIS-SF) (Milavic *et al.,* 2019) and the tactical skills inventory for sports (TACSIS) (Elferink-gemser, Visscher, Richart, & Lemmink, 2004) were created as online surveys (www.onlinesurveys.ac.uk) using Likert scales, in line with the original surveys. With prior parental consent obtained, the surveys were distributed to the players for completion over eight-weeks. Guidance was provided suggesting players complete one survey a day, to avoid monotony. Only those participants who had completed both surveys were eligible for further analysis.

Following a two-week washout period, a random sample of players (n=10) undertook a second round of surveys to determine reliability in responses. A single measurement, 2-way mixed-method intraclass correlation coefficient (ICC) with an absolute agreement, was applied. Results for the ICC and 95% confidence intervals (95% CI) <0.5 were deemed as poor reliability, >0.5 to <0.75 indicate moderate reliability, >0.75 to <0.9 indicated good reliability and >0.9 was deemed as excellent reliability (Koo & Li, 2016). The TACSIS reported poor-to-good reliability (ICC = 0.65, 95% CI = 0.42 to 0.80) and the PSIF-SF reported good-to-excellent reliability (ICC = 0.92, 95% CI = 0.88 to 0.95).

Physical assessments included linear sprints, change of direction (COD) and anthropometric measures. Testing was conducted in January, during routine quarterly sports science testing. All players were familiarised with the testing protocols. Two age groups completed each of the tests within one evening session, with all ages assessed within a week. A standardised 10-minute dynamic warm-up preceded assessments. Speed tasks were performed on an indoor 4G pitch, with players wearing soccer kits and moulded-stud boots. Anthropometric and jumping tasks were performed indoors and barefoot.

The linear sprints (splits of 5m, 15m and 30m) were collected using single-cell light gates (Smartspeed, Fusion Sport, Australia). Three trials were collected per player, with sprints initiated using a falling start (Cronin, Green, Levin, Brughelli, & Frost, 2007). Assessment for COD featured the 505-change of direction test (Nimphius, Callaghan, Bezodis, & Lockie, 2018) (505) and the Arrowhead agility test (Rago *et al.,* 2020). Both tests used a single cell light gate (Smartspeed, Fusion Sport, Australia) with four trials were collected per test (two trials per side). The 505 is a 20m linear change of direction test, where players are required to sprint 15m, perform a 180-degree turn, and then return 5m. The turning foot is stated prior to each run, alternating each trial. Not placing the turning foot beyond the 15m line marking resulted in a foul attempt, which was repeated following rest. The arrowhead agility test (Rago *et al.,* 2020) features 3 turns and a 15m return to start. Incorrect navigation of the course resulted in a foul attempt, which was repeated following rest. For all speed assessments, two minutes of rest were provided between trials, with the best attempts used for statistical analysis.

Reliability of physical assessments was determined using coefficient of variation (CV), whereby data >10% variation was deemed as poor and excluded from further analysis (Cormack, Newton, McGulgan, & Doyle, 2008; Jennings, Cormack, Coutts, Boyd, & Aughey, 2010). Consequently, four data points were excluded from the data set. Additionally, CV was applied within each age group, to identify and explore the variation in performance measures and detecting the homogeneity of performance by age groups.

2.3 Objective Assessments – Somatic Maturation

In line with standard academy practice, measures of somatic maturation were collected utilising player height and mass (Khamis & Roche, 1994). Anthropometric data collection was attained using a stadiometer and scales (Seca, UK), with height measures conducted abiding to ISAK protocols. The same investigator collected anthropometric measures throughout. Predicted adult height was calculated from anthropometric data and previously attained parental heights (Khamis & Roche, 1994), corrected for overprediction when self-reported (in line with previous research (Epstein, Valoski, Kalarchian, & McCurley, 1995). Whilst maturation was not provided to the coaches as a variable to subjectively score, it was used to assess its influence upon coach perception of player abilities.

2.4 Objective Assessments – Tactical Analysis

Video assessments were collected during routine games. A camera was positioned at the pitch halfway line, tracking the ball during play. Twenty minutes of continual match video footage was captured per player for the Performance Assessment for Team Sports (TSAP) instrument (Gréhaigne, Godbout, & Bouthier, 1997). The time length mimicked the typical length of a quarter as played by the ages U9-14yrs. Therefore, the same time length was applied to the U15-16yrs groups for consistency across all ages. Due to uncontrollable reasons (team selection, illness or injury), it was rare that all players featured within the same game. Consequently, performance scores were determined across a range of games (an average of 2 games per age group). Two analysts (mean age = 28.0 ± 9.9 yrs) assessed all players following the TSAP protocol. The reliability between analysts was assessed using a mean-measure, 2-way mixed-method absolute agreement ICC, establishing a poor-to-excellent inter-rater agreement (ICC = 0.84, 95% CI = 0.60 to 0.93).

2.5 Subjective Assessments - Coach Subjective Scores

Similarly to previous research (Fanchini, Coutts, & Schena, 2014; Metz, Deleuze, Pereira, & Thivel, 2015; Sieghartsleitner *et al.,* 2019), a visual analogue scale (VAS) was used for coaches to subjectively score player skills and abilities. The VAS featured a 100mm line with two anchors of 'Very Poor' and 'Outstanding' (Grant *et al.,* 1997; Sung & Wu, 2018). The TSAP match footage was made available to coaches for determining subjective player scores, featuring the same 20 minutes of continual play as used within the TSAP instrument. The coaches were able to freely review the footage, including the use of pausing and replaying. Footage of a top performing Category 1 soccer academy was also provided, per age group, as a reference point for the 'outstanding' anchor, in line with previous research (Sieghartsleitner *et al.,* 2019). Due to differing games programmes across age groups, the category 1 team differed per age group (n = 3 teams). Yet, each team was categorically considered to be outstanding, based upon the academy games programme and internal measurements. The reference footage mimicked the player footage for consistency (20 min of continual match play). Coaches were required to mark the VAS line where perceived as best representing each player's abilities. The VAS items mimicked objective assessments for psychological ('Mental Preparation', 'Motivation', 'Concentration', 'Self-Confidence', 'Team-Emphasis' and 'Anxiety') technical & tactical ability ('Knowing About Ball Actions', 'Knowing About Others', 'Positioning and Deciding' and 'Acting in Changing Situations'), physical skills ('Speed' and 'Change of Direction'), and others ('Game Understanding', 'Overall Performance'). Definitions for each item were provided to ensure clarity and consistency of interpretations (appendix 1). Additionally, a checkbox was provided for coaches to state whether they would hypothetically select or deselect the assessed player.

2.6 Statistical Analysis

To investigate the level of agreement between lead and assistant coaches, a mean-measure, 2-way mixed-method ICC with consistency was applied per VAS score (psychological, tactical, physical and other), by age group. Additionally, Cohen's Kappa was used to identify the agreement of binary (select or deselect) data. The results were interpreted as <0 no agreement, 0.01-0.20 none to slight, 0.21-0.40 fair, 0.41-0.60 moderate, 0.61-0.80 substantial, and 0.81-1.00 almost perfect agreement (McHugh, 2012).

Following normality checks (Shapiro-Wilk), the data was assessed for associations between objective (PSIS-SF, TACSIS, TSAP, and Physical scores) and subjective (VAS scores) outcomes. With the data displaying non-normal distribution in the subjective data only, a Spearman's rank correlation was applied to determine associations. Effect sizes for correlations were determined as; <0.1 very small, 0.1-0.29 small,

0.3-0.49 moderate, 0.5-0.69 large, 0.7-0.89 very large and 0.9-1.0 nearly perfect (Hopkins, 2002).

To identify discriminative traits, an independent samples T-test was used to distinguish selection status by objective outcomes. The under 12-13 age group was excluded from the analysis, due to an insufficient variation in selection status. Hedge's G was used to measure the effect size, with outcomes set at 0.2 = small, 0.5 = medium and 0.8 = large (Fritz, Morris, & Richler, 2012). Additionally, a Mann Whitney-U test was applied within subjective responses, by lead and assistant coaches. Furthermore, a Binary Regression analysis was applied to determine predictor variables associated with subjective player (de)selection by lead coach, per age group. All data were analysed using SPSS Statistics for Windows, Version 26.0 (Armonk, NY: IBM Corp.).

3. Results

3.1 Coach Agreement

When examining agreement between lead and assistant coaches (Table 1), the ICC results found the FDP to have poor-to-good agreement in psychological, tactical and physical subjective measures, and poor-to-excellent agreement in game understanding and overall performance. A perfect agreement was established in player selection. The YDP1 found poor-to-moderate agreements in physical scores, poor-to-good agreement in psychological and tactical scores, and poor-to-excellent agreement in game understanding and overall performance scores. A substantial agreement was established in player selection. Lastly, the YDP2 found poor-to-moderate agreements in psychological and physical scores, moderate-to-good agreement in tactical scores, poor-to-moderate agreement in game understanding scores, and poor to excellent agreement in overall performance. Only a fair agreement was established in player selection.

3.2 Subjective and Objective Associations

When investigating the associations between subjective (coach scores) and PSIS-SF, few moderate-to-very large significant associations were identified (Table 2). Significant associations were identified with subjective score and '*Anxiety*' in the FDP, '*Self-Confidence'* in the FDP and YDP2 and '*Concentration'* in the FDP only.

When assessing the relationship between coach subjective scores and the TACSIS (Table 3), a large association was reported in '*Knowing About Others*' within the FDP and a very large association in '*Positioning and Deciding*' in the YDP1. No further signification (P >.05) associations were determined. Likewise, the TSAP demonstrated no significant (P >.05) outcomes between the instrument and coach subjective scores.

Associations between coach subjective scores and physical performance established moderate-to-very large associations (Table 4). Significant associations with subjective scores of *'Speed'* (singular measure compared across all distances) were identified in the YDP1 and YDP2 in 5m, and the YDP2 in 15m and 30m sprint. Subjective scores for *'Change of Direction'* reported significant findings in the YDP2, within the Arrowhead assessment only.

3.3 Player Selection

Objective data differentiated players in the YDP2 with large differences between (de)selected players within the PSIS-SF '*Team Emphasis*', and physical 15m and 30m sprints (Table 5). The PSIS-SF '*Team Emphasis'* demonstrated higher self-reports (t(20)= -2.13, P = .05, g = 1.17) for selected players (mean = 4.39 ± 0.38) over deselected players (mean = 3.92 ± 0.50). Likewise, the 15m (t(19)= 3.24, P <.001, g = 0.93) and 30m sprints (t(19)= 3.57, P <.001, g = 0.99) demonstrated a superiority in speed performance in selected players (mean = 2.53 ± 0.14 and 4.42 ± 0.24) over deselected players (mean = 2.65 ± 0.03 and 4.64 ± 0.03) respectively.

Coach subjective scores found significant differences within the FDP and YDP2 groups (Table 6 & Figure 1). The FDP lead coach exhibited no significant (I >0.05) differences in all scores, whilst the assistant coach was able to identify selected players by 'Overall performance' only. The YDP lead coach was able to distinguish selection status by all minus one variable (TACSIS - knowing about others), and the assistant coach was able to determine selection status by all tactical and physical variables, '*Self-Confidence'* and *Overall Performance*.

When undertaking the binary regression, a violation of assumptions was established in all variables except for '*Overall Performance'* when assessing for multicollinearity.

Table 1 The reliability results comparing coach agreement by psychological, tactical, physical and other (game understanding, overall performance and player selection) criteria.

	Psychological		Tactical		Physical		Game Understanding		Overall Performance		Player Selection	
Group	***ICC***	***95% CI***	***ICC***	***95% CI***	***ICC***	***95% CI***	***ICC***	***95% CI***	***ICC***	***95% CI***	***Kappa***	***Sig.***
FDP	0.68	0.47 to 0.80	0.70	0.46 to 0.83	0.74	0.42 to 0.88	0.78	0.29 to 0.93	0.78	0.30 to 0.94	1.00	<.001
YDP1	0.67	0.45 to 0.80	0.70	0.47 to 0.83	0.40	-0.39 to 0.74	0.73	0.05 to 0.92	0.72	0.04 to 0.92	0.63	.02
YDP2	0.58	0.39 to 0.71	0.74	0.61 to 0.83	0.48	0.04 to 0.71	0.67	0.19 to 0.86	0.75	0.39 to 0.90	0.23	.26

FDP = Foundation Development Phases, YDP1 = Early Youth Development Phase, YDP2 = Late Youth Development Phase

Results for ICC and 95% confidence intervals (95% CI) <0.5 were deemed as poor reliability, >0.5 to <0.75 indicate moderate reliability, >0.75 to <0.9 indicated good reliability and >0.9 was deemed as excellent reliability (Koo & Li, 2016) . Results for Kappa were interpreted as <0 no agreement, 0.01-0.20 none to slight, 0.21-0.40 fair, 0.41-0.60 moderate, 0.61-0.80 substantial, and 0.81-1.00 almost perfect agreement (McHugh, 2012).

Table 2 The associations of subjective scores and PSIS-SF sub-categories, by age groups.

Age	Coach	PSIS-SF									
		Motivation		***Self Confidence[1]***		***Anxiety***		***Team Emphasis***		***Concentration [1]***	
		R_s	**Sig**	**R_s**	**Sig**	**R_s**	**Sig**	**R_s**	**Sig**	**R_s**	**Sig**
FDP	Lead Coach	0.00	-.17	0.58	.05*	0.80	.00*	0.12	.71	0.70	.01*
	Assistant Coach	0.99	.60	0.27	.40	0.29	.37	0.48	.11	0.76	.00*
YDP1	Lead Coach	0.45	.16	-0.09	.80	-0.33	.32	0.24	.48	0.01	.97
	Assistant Coach	-0.11	.75	0.24	.49	0.08	.82	0.05	.88	0.11	.75
YDP2	Lead Coach	0.17	.46	0.48	.02*	0.18	.42	0.33	.13	0.16	.47
	Assistant Coach	0.26	.25	-0.12	.61	0.17	.45	0.02	.95	-0.01	.95

FDP = Foundation Development Phases, YDP1 = Early Youth Development Phase, YDP2 = Late Youth Development Phase

Significant results are marked with * for <0.05, and ** for <0.01. Effect sizes for correlations were determined as; <0.1 very small, 0.1-0.29 small, 0.3-0.49 moderate, 0.5-0.69 large, 0.7-0.89 very large and 0.9-1.0 nearly perfect (Hopkins, 2002).

[1]Self Confidence and Concentration are reverse scored.

Table 3 The associations of subjective scores and TACSIS sub-categories and subjective score tactical ability and the TSAP outcomes, by age groups.

Age Group	Coach	TACSIS: *Knowing about ball actions* Rs	Sig	*Knowing about others* Rs	Sig	*Positioning and deciding* Rs	Sig	*Acting in changing situations* Rs	Sig	*TSAP* Rs	Sig
FDP	Lead Coach	0.28	.37	0.24	.45	0.17	.60	0.23	.47	0.22	.50
	Assistant Coach	0.39	.21	0.66	.02*	0.40	.20	0.44	.15	0.19	.56
YDP1	Lead Coach	0.54	.09	0.38	.24	0.72	.01*	0.06	.86	-0.41	.24
	Assistant Coach	0.34	.31	0.23	.51	0.53	.09	0.07	.84	-0.01	.99
YDP2	Lead Coach	-0.15	.49	0.01	.98	0.01	.96	0.08	.73	0.23	.31
	Assistant Coach	0.16	.49	-0.14	.54	0.06	.80	0.36	.10	0.22	.33

FDP = Foundation Development Phases, YDP1 = Early Youth Development Phase, YDP2 = Late Youth Development Phase
Significant results are marked with * for <0.05, and ** for <0.01. Effect sizes for correlations were determined as; <0.1 very small, 0.1-0.29 small, 0.3-0.49 moderate, 0.5-0.69 large, 0.7-0.89 very large and 0.9-1.0 nearly perfect (Hopkins, 2002).

Table 4 The associations of subjective scores and physical assessments, by age groups.

Age	Coach	Physical Assessments: *5m Sprint (s)* R	Sig	*15m Sprint (s)* R	Sig	*30m Sprint (s)* R	Sig	*Arrowhead R (s)* R	Sig	*Arrowhead L (s)* R	Sig	*505 R (s)* R	Sig	*505 L (s)* R	Sig
FDP	Lead Coach	-0.07	.83	-0.40	.20	-0.41	.19	-0.18	.57	-0.32	.31	0.10	.76	-0.09	.78
	Assistant Coach	-0.34	.31	-0.43	.17	-0.34	.28	-0.18	.58	0.06	.86	0.50	.10	-0.09	.78
YDP1	Lead Coach	-0.63	.04*	-0.55	.78	-0.19	.57	-0.70	.86	-0.10	.78	0.20	.75	0.10	.87
	Assistant Coach	0.05	.88	0.02	.95	0.03	.94	-0.14	.70	-0.23	.52	-0.10	.87	0.15	.81
YDP2	Lead Coach	-0.37	.08	-0.70	.00*	-0.65	.00*	-0.48	.03*	-0.52	.01*	-0.15	.51	-0.29	.19
	Assistant Coach	-0.51	.02*	-0.43	.05*	-0.36	.10	-2.80	.21	-0.31	.15	-0.09	.68	-0.29	.19

FDP = Foundation Development Phases, YDP1 = Early Youth Development Phase, YDP2 = Late Youth Development Phase
Significant results are marked with * for <0.05, and ** for <0.01. Effect sizes for correlations were determined as; <0.1 very small, 0.1-0.29 small, 0.3-0.49 moderate, 0.5-0.69 large, 0.7-0.89 very large and 0.9-1.0 nearly perfect (Hopkins, 2002).

Table 5 The findings from the independent samples T-Test comparing objective performances between selected and deselected players.

Age	Assessment	Sub-Category	T-Value (DF)	Sig	Deselected (Mean ± SD)	Selected (Mean ± SD)	Hedges *g*
FDP	PSIS-SF	Motivation	0.90 (10)	.39	5.00 ± 0.00	4.77 ± 0.35	0.69
		Self-Confidence	-1.23 (10)	.25	3.34 ± 0.47	3.83 ± 0.53	0.93
		Anxiety	-1.35 (10)	.21	2.67 ± 0.00	3.50 ± 0.84	1.04
		Team Emphasis	0.30 (10)	.77	4.17 ± 0.71	4.06 ± 0.41	0.24
		Concentration	-1.60 (10)	.14	3.00 ± 0.47	3.87 ± 0.72	1.24
	TACSIS	Knowing About Ball Actions	0.91 (10)	.85	4.66 ± 0.53	4.50 ± 0.87	0.19
		Knowing About Others	-0.86 (10)	.41	3.70 ± 0.71	4.22 ± 0.79	0.66
		Positioning and Deciding	-1.18 (10)	.27	3.94 ± 0.08	4.53 ± 0.68	0.91
		Acting in Changing Situations	-0.55 (10)	.59	4.38 ± 0.18	4.73 ± 0.86	0.43
	TSAP	TSAP	0.26 (10)	.80	16.32 ± 7.33	15.20 ± 5.26	0.2
	Physical	5m (s)	-1.23 (10)	.25	1.25 ± 0.07	1.30 ± 0.05	0.96
		15m (s)	-0.70 (10)	.50	2.91 ± 0.10	2.98 ± 0.12	0.59
		30m (s)	-0.37 (10)	.72	5.22 ± 0.25	5.30 ± 0.29	0.28
		Arrowhead R (s)	-0.85 (10)	.42	9.34 ± 0.48	9.62 ± 0.42	0.66
		Arrowhead L (s)	-0.87 (10)	.40	9.47 ± 0.04	9.70 ± 0.36	0.67
		505 R (s)	-0.75 (10)	.47	2.63 ± 0.01	2.73 ± 0.18	0.59
		505 L (s)	-0.19 (10	.85	2.72 ± 0.25	2.75 ± 0.16	0.18
YDP2	PSIS-SF	Motivation	0.79 (20)	.44	5.00 ± 0.00	4.93 ± 0.18	0.42
		Self-Confidence	0.11 (20)	.92	3.83 ± 0.43	3.80 ± 0.63	0.05
		Anxiety	0.85 (20)	.41	3.84 ± 0.88	3.44 ± 0.82	0.48
		Team Emphasis	-2.13 (20)	.05*	3.92 ± 0.50	4.39 ± 0.38	1.17
		Concentration	0.49 (20)	.63	4.33 ± 0.47	4.19 ± 0.55	0.26
	TACSIS	Knowing About Ball Actions	1.77 (20)	.09	5.00 ± 0.20	4.51 ± 0.53	0.99
		Knowing About Others	-0.55 (20)	.59	4.30 ± 0.50	4.46 ± 0.52	0.31
		Positioning and Deciding	0.54 (20)	.60	4.64 ± 0.41	4.53 ±0.36	0.30
		Acting in Changing Situations	0.31 (20)	.76	4.63 ± 0.43	4.51 ± 0.68	0.18
	TSAP	TSAP	0.01 (20)	.99	8.53 ± 2.67	8.51 ± 4.28	0.00
	Physical	5m (s)	0.24 (20)	.81	1.15 ± 0.03	1.14 ± 0.13	0.08
		15m (s)	3.24 (19.94)	.00**	2.65 ± 0.03	2.53 ± 0.14	0.93
		30m (s)	3.57 (19.21)	.00**	4.64 ± 0.03	4.42 ± 0.24	0.99
		Arrowhead R (s)	1.00 (20)	.33	8.89 ± 0.25	8.67 ± 0.40	0.58
		Arrowhead L (s)	0.83 (20)	.42	8.89 ± 0.27	8.71 ± 0.41	0.46
		505 R (s)	-0.29 (20)	.77	2.45 ± 0.08	2.45 ± 0.15	0.00
		505 L (s)	0.09 (20)	.93	2.44 ± 0.07	2.43 ± 0.11	0.1

FDP = Foundation Development Phases, YDP2 = Late Youth Development Phase

Significant results are marked with * for <0.05, and ** for <0.01. Effect sizes for Hedges *g* were determined as; 0.2, 0.5 and 0.8 as small, medium and large effect sizes respectively (Fritz, Morris, & Richler, 2012)

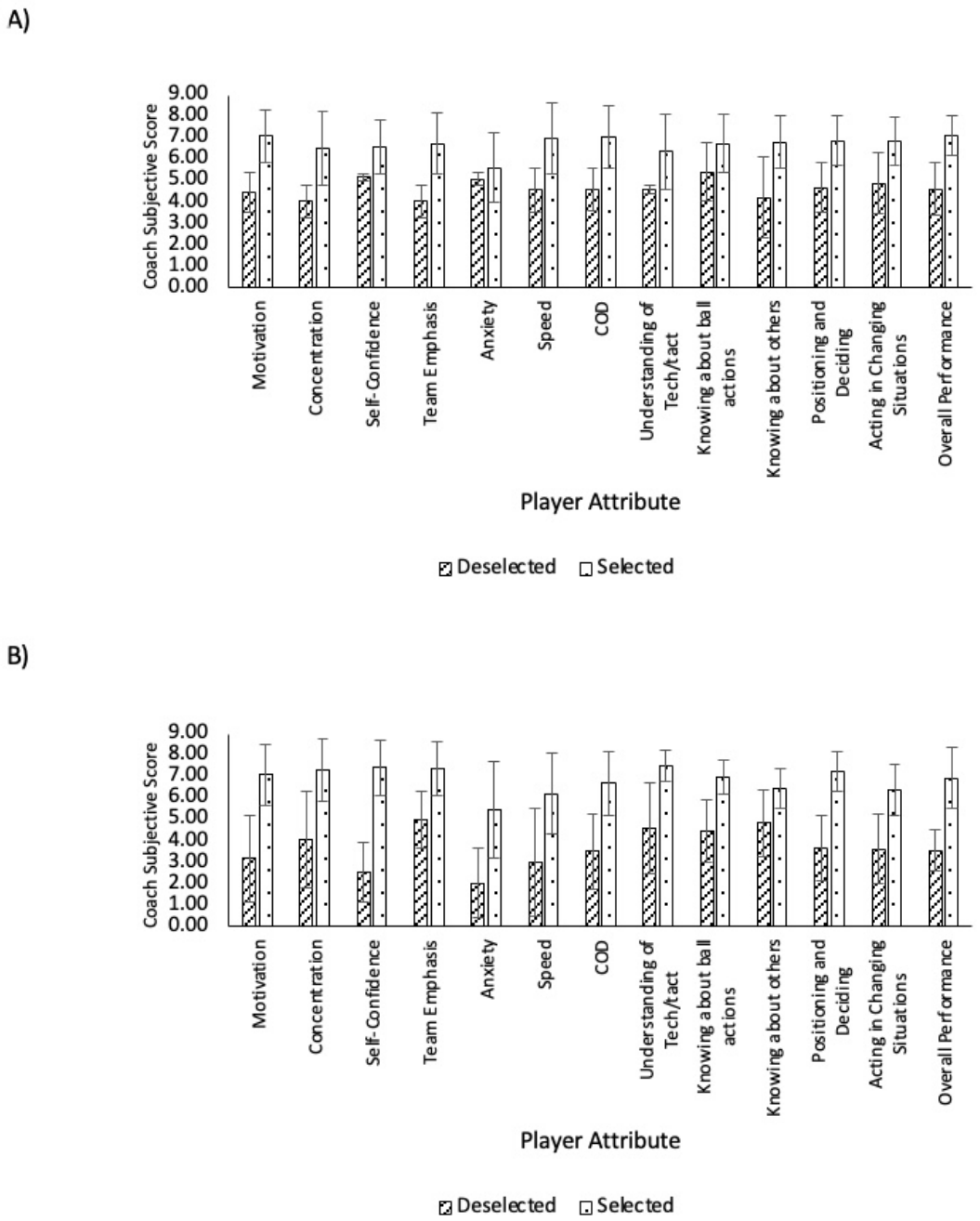

Figure 1 The comparison of subjective scores on attribute performance for selected and deselected players in A) FDP and B) YDP2 age groups

Satisfying all other assumptions, '*Overall Performance*' from the lead coach was found to be a significant factor for predicting player selection. Statistical assessment of residuals found no cases to be influential towards outcomes. Therefore, a positive increase in overall performance score resulted in an increase in a players odds (by ~5% by each increase in score) in being selected.

3.4 Maturation

The influence of maturation was explored within both objective and subjective outcomes. For the objective variables, the FDP found a large correlation (R_s = .72, P = .01) between maturation and '*Knowing About Ball Actions*' only. Within the YDP2, large associations were established with '*Team Emphasis*' (R_s = .56, P = .02) and 15m sprint (R_s = -.61, P = .01), and a very large association with 30m sprint (R_s = -.70, P < .001). No associations were determined within the YDP1.

Table 6. The Mann-Whitney U results comparing differences in selected and deselected players by subjective coach scores.

Age	Assessment	Sub-Category	Mann - Whitney U	Sig	Deselected Median (IQR)	Selected Median (IQR)	R
FDP Lead Coach	PSIF	Motivation	1.00	.06	4.45 (-)	7.35 (2.01)	.56
		Self-Confidence	2.00	.12	5.18 (-)	6.88 (1.88)	.16
		Anxiety	7.50	.61	5.10 (-)	5.70 (2.21)	.16
		Team Emphasis	1.00	.06	4.05 (-)	7.40 (2.39)	.56
		Concentration	3.00	.18	4.05 (-)	7.37 (1.95)	.43
	TACSIS	Knowing About Ball Actions	5.00	.36	5.43 (-)	6.90 (2.09)	.31
		Knowing About Others	1.00	.06	4.23 (-)	6.83 (1.48)	.56
		Positioning and Deciding	1.00	.06	4.70 (-)	6.83 (1.15)	.56
		Acting in Changing Situations	1.00	.06	4.90 (-)	7.05 (0.59)	.56
	Physical	Speed	2.00	.12	4.57 (-)	6.60 (2.86)	.50
		Change of Direction	2.00	.12	4.60 (-)	6.73 (1.89)	.50
	Other	Game Understanding	2.00	.12	4.60 (-)	6.80 (1.61)	.50
		Overall Performance	1.00	.06	4.63 (-)	7.23 (0.58)	.56
FDP Assistant Coach	PSIF	Motivation	5.00	.36	4.13 (-)	6.05 (2.93)	.31
		Self-Confidence	3.00	.18	2.90 (-)	5.90 (3.01)	.43
		Anxiety	2.00	.12	3.63 (-)	5.70 (1.29)	.50
		Team Emphasis	2.00	.12	3.25 (-)	6.93 (2.47)	.50
		Concentration	1.00	.06	2.53 (-)	6.85 (2.74)	.56
	TACSIS	Knowing About Ball Actions	3.00	.18	3.88 (-)	7.38 (3.20)	.43
		Knowing About Others	2.00	.12	3.17 (-)	7.15 (3.01)	.50
		Positioning and Deciding	2.00	.12	2.40 (-)	6.45 (2.87)	.50
		Acting in Changing Situations	4.00	.27	2.68 (-)	5.96 (4.35)	.37
	Physical	Speed	6.00	.49	5.83 (-)	6.53 (3.51)	.25
		Change of Direction	6.00	.49	5.80 (-)	6.88 (2.54)	.25
	Other	Game Understanding	2.00	.12	3.93 (-)	6.40 (3.19)	.50
		Overall Performance	0.00	.03*	2.60 (-)	7.23 (2.85)	.62
YDP2 Lead Coach	PSIF	Motivation	3.50	.00**	3.23 (3.76)	7.28 (2.80)	.59
		Self-Confidence	0.00	<.001**	2.83 (2.66)	7.65 (2.03)	.65
		Anxiety	9.00	.02*	1.58 (2.96)	6.33 (4.46)	.49
		Team Emphasis	5.00	.01*	5.43 (2.45)	7.55 (1.80)	.56
		Concentration	8.00	.01*	3.23 (3.88)	7.63 (2.14)	.51
	TACSIS	Knowing About Ball Actions	0.50	<.001**	4.58 (2.66)	6.65 (1.41)	.64
		Knowing About Others	14.00	.07	4.28 (2.64)	6.68 (1.61)	.40
		Positioning and Deciding	1.00	<.001**	3.13 (2.70)	7.23 (1.13)	.64
		Acting in Changing Situations	5.00	.01**	3.48 (3.14)	6.35 (1.85)	.56
	Physical	Speed	11.00	.03*	2.30 (4.64)	6.00 (2.76)	.45
		Change of Direction	2.00	.00**	3.28 (3.34)	6.80 (1.78)	.62
	Other	Game Understanding	2.00	.00**	4.68 (3.90)	7.65 (1.09)	.62
		Overall Performance	3.00	.00**	3.38 (1.79)	6.85 (1.83)	.60
YDP2 Assistant Coach	PSIF	Motivation	26.50	.12	4.78 (3.23)	5.88 (2.00)	.34
		Self-Confidence	12.00	.01*	4.30 (2.55)	5.68 (1.31)	.57
		Anxiety	35.00	.37	4.05 (2.30)	4.55 (1.91)	.20
		Team Emphasis	32.00	.26	4.63 (5.09)	5.40 (1.68)	.25
		Concentration	25.00	.10	3.59 (3.54)	5.70 (1.54)	.36
	TACSIS	Knowing About Ball Actions	0.00	<.001**	3.23 (1.82)	5.78 (1.36)	.75
		Knowing About Others	14.00	.01*	4.40 (3.83)	5.85 (1.74)	.53
		Positioning and Deciding	4.00	<.001**	3.40 (3.20)	5.93 (2.74)	.69
		Acting in Changing Situations	3.00	<.001**	3.75 (2.28)	5.73 (2.45)	.71
	Physical	Speed	20.00	.04*	4.23 (3.35)	5.78 (2.59)	.44
		Change of Direction	19.00	.03*	4.28 (3.47)	5.23 (1.99)	.46
	Other	Game Understanding	0.00	<.001**	3.18 (2.28)	5.98 (4.50)	.68

Overall Performance	4.50	<.001**	3.50 (2.20)	6.00 (1.80)	.75

FDP = Foundation Development Phases, YDP2 = Late Youth Development Phase
Significant results are marked with * for <0.05, and ** for <0.01. IQR = Interquartile range.

When identifying the influence of maturation on coach subjective scoring (each VAS variable), large associations were established with the FDP assistant coach (R_s = .63, *P* = .03) within '*Team Emphasis*', the YDP1 assistant coach (R_s = .62, *P* = .04) and '*Concentration'*, and YDP2 lead and assistant coaches (R_s = .50 to .63, *P* = .01 to .03) within '*Motivation'*, '*Self-Confidence'*, '*Change of Direction'*, '*Knowing About Ball Actions'*, *'Knowing About Others'*, *'Positioning and Deciding'*, *'Overall Performance'* And *'Game Understanding'*.

Additionally, a Mann Whitney-U test was applied to determine if maturational age differed by selection outcome. A significant finding was established in the YDP2 lead coach (U = 3.0, *P* = .02), whereby higher maturation was linked to selection (M = 96.93 ± 0.69) over deselected (M = 92.44 ± 0.20). No significant findings (*P* >.05) were established in the FDP or YDP2 assistant coach. Furthermore, a binary regression analysis was running utilising maturation as a predictor variable. However, maturation was not significant (*P* >.05) in determining selection status.

4. Discussion

Utilising multidisciplinary assessments (psychological, technical/tactical, physical and other), the present study investigated the associations of player selection outcomes with subjective (coach scores and level of agreement) and objective (PSIS-SF, TACSIS and components of fitness) assessments. The key finding of this study was that the subjective criteria '*Overall Performance'* was found to be a predictor for player selection. However, further observations noted older age groups appeared to be selected based on tactical and physical variables, whereby these attributes were distinguished by maturation status, further highlighting a potential for selection bias within subjective methods.

The findings of the between-coach agreement for (de)selection reported a fair agreement between coaches in combined age groups. However, when separated into respective age groups, the level of agreement reduced as age increased. Whilst previous research has attributed this to an increase in homogeneity of performance by age (Dugdale *et al.,* 2020), the current research found the contrary to be true; as players aged, the group coefficient of variation increased. One rationale to explain this variation may coincide with the age from professional contract attainment and the narrowing attribute requirements to achieve selection status. As players enter the academy system, a general focus on 'development' is employed, with aims for players to exhibit a broad range of fundamental abilities (Lloyd & Oliver, 2012). As the players age, a shift in focus occurs from 'development' towards 'performance'. With this change in focus, measurements in player abilities for selection become more refined and expectations on abilities go beyond general competency. Whilst players are likely required to demonstrate more advanced abilities, coaches have an increase pressure to distinguish such abilities (in addition to mounting pressures of selecting the 'right player'). Therefore, it seems likely that the assessment of players is potentially more generalised at early ages, consequently resulting in an increased potential for agreement in abilities between coaches. Whereas the contrary may be true as players age, whereby player skills are more advanced, finite and unique, resulting in lower levels of coach agreement and higher margins of error for attribute identification. A further plausible explanation for the reduction in agreement aligns to a wider range of abilities exhibited across the team. Such performance variations may also coincide with maturation status, given that the FDP identified the highest agreement (ages prior to maturational influence) and the YDP2 demonstrated the lowest agreement (ages most influenced by maturation). Moreover, the expression of physical abilities will be influenced significantly by maturational timing.

Previous reports (Bidaurrazaga-Letona *et al.,* 2019; Dugdale *et al.,* 2021; Emmonds, Till, Jones, Mellis, & Pears, 2016; Towlson, Cope, Perry, Court, & Levett, 2019) have demonstrated maturational influence within physical performance, whereby a higher maturational age will typically exhibit superior physical abilities. Consequentially, without accounting for maturation, raw physical performance scores will provide misleading perceptions of player abilities that may result in questionable (de)selection outcomes. The findings of this study found maturation to be a highly influential factor that must be accounted for

within player selection. Whilst a general maturational bias in player selection from the YDP2 lead coach was acknowledged, it was also evident that maturation influenced subjective perceptions of technical and tactical abilities. This contradicts previous reports, which have noted maturation to have minimal influence on technical and tactical capabilities (Bidaurrazaga-Letona *et al.,* 2019; Lüdin, Donath, Cobley, & Romann, 2021). Whilst the difference may be due to the collaboration of physical and technical/tactical qualities within the assessed components, it further highlights the potential need for maturational adjustments when assessing technical/tactical competency. Moreover, these findings highlight how maturation influences player selection and assessment, challenging the use of coach subjective inputs in isolation. To mitigate such bias, coaches must be mindful of maturational status prior to determining perceptions of performance. Additionally, given the influence of maturation of objective assessments, steps must be taken (such as allometric scaling) to adjust for maturation to prevent the misidentification of players.

When identifying the associations between subjective and objective outcomes, only few correlations were established, possibly related to the ecological validity of the assessments. The physical data was collected within a controlled environment and therefore may not be ecologically representative of performance conditions (Waldron & Worsfold, 2010) in that the isolation of physical qualities neglects the wider holistic elements required within the game. Furthermore, in consideration of the self-report surveys (PSIS-SF and TACSIS), both assessments share an absence of perception-action coupling, whereby they lack the contextual pressures and team cooperation within a performance. Consequently, the assessments may provide a false reflection of abilities (Murr, Feichtinger, Larkin, O'Connor, & Höner, 2018). Furthermore, limitations have been found in self-report methods, whereby players' abilities to reflect upon performance increase with age (Kannekens, Elferink-Gemser, Post, & Visscher, 2009), and will depend upon the reflection skills taught to the players (Collins, MacNamara, & McCarthy, 2016). Such issues may have been exampled within the present study, considering the test-retest results of the TACSIS found the instrument to hold poor-to-good reliability. Additionally, the lived experience will differ by player, resulting in varying exposure and development of reflective abilities, that should be accounted for.

In consideration of physical testing, the coaches of the YDP2 age group reported good associations with sprints. Following further analysis of objective data, 15m and 30m sprint performances demonstrated large discriminative power within player (de)selection of the YDP2 age group. This may suggest superior physical speed will influence selection outcomes within older age groups. Similar findings have been reported in previous research (Dugdale *et al.,* 2021; Emmonds *et al.,* 2016), whereby speed and jumping abilities have been the determining factors in selection. However, as previously discussed, physical performances will be heavily impacted by maturational status, potentially explaining these observations in older ages only. Youths will mature at different rates, so caution must be used not to discount players exhibiting lesser performances who are of late maturation status. Therefore, measurements of player maturation should be implemented within player assessments, via allometric scaling, to provide fairer comparisons of performance (Dugdale *et al.,* 2021; Sieghartsleitner e*t al.,* 2019; Till & Baker, 2020).

In summary, it is apparent that coaches were able to intuitively identify which players to select, given the high associations with 'overall performance' scores (a general subjective perception of all-round ability) and player selection. However, when looking across holistic components, poor associations were determined between objective and subjective measures, in addition to a lack of agreement on perceived player abilities between lead and assistant coaches. This eludes, coaches are able to identify talented from lesser talented players, but are unable to identify the unique intricacies of player abilities. Therefore, In line with previous research (Sieghartsleitner *et al.,* 2019), the combination of subjective and objective measures should be applied in order to improve the accuracy and overcome potential biases in both player assessment and selection.

This study is not without its limitations. The current study lacks generalisation, given how the participants were recruited from a singular academy. However, the approach undertaken replicates a common practice applied within a majority of academies. Additionally, the TSAP instrument reported no differences between selected and deselected players, or alignment with coach associations, initially challenging the use of the instrument. However, various studies have reported on the influence of match-to-match variations in performance (Liu, Gómez, Gonçalves, & Sampaio, 2016). Therefore, the

use of numerous games to determine tactical performance may have proven more beneficial. Lastly, the choice of objective assessments provided constraints on subjective inputs, whereby the consideration of interdependent attributes was neglected. Further research should consider wider participant recruitment spanning multiple academies, with an openness to more qualitative approaches to unpick coach perceptions and actions within (de)selection scenarios.

5. Conclusion

This study sought to understand the difference between subjective (coach scores) and objective holistic player assessments. The results demonstrated that the subjective criteria '*Overall Performance'* may predict player selection. Conversely, few associations between coach perceptions of abilities and objectively measured performances were identified. Furthermore, coach agreement on perceived player abilities and (de)selection reduced as players aged. This is potentially attributed to maturation, given that PHV will be highly influential on performance, with the average age of PHV starting within the YDP1 age groups. Additionally, it was evident that a maturation influenced subjective perceptions of player abilities in both physical and tactical competencies, and a selection bias was present within the YDP2. This ultimately suggests that more work needs to be done in order to control for maturational influence in player selection and perceptions of abilities.

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Data availability
The datasets generated and analyzed during the current study are available from the corresponding author upon approval of the request.

Author contribution Statement
Rich J. Kite - Conceptualization, Supervision, Methodology, Data collection, Analysis, Validation, Writing—review & editing; **Mark R. Noon** - Conceptualization, Supervision, Methodology, Writing— review & editing; **Rhys Morris** - Conceptualization, Supervision, Methodology, Writing—review & editing; **Peter Mundy** - Conceptualization, Supervision, Methodology, Writing—review & editing; **Neil D. Clarke** - Conceptualization, Supervision, Methodology, Analysis, Writing—review & editing. All the authors read and approved the final version of the manuscript**.**

Supplementary Information
Definitions of VAS items provided to coaches.

Informed Consent
Written consent was obtained from the participants.

Conflict of interest
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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