Predictive ability of psychological factors with future performance of football players: a systematic review with meta-analysis

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Abstract

Objectives: This systematic review had 3 key objectives: (1) to investigate whether psychological factors were associated with future football performance (e.g., progression to professional football, better game statistics during the next season); (2) to critically review the methodological approaches used in the included studies and summarize the evidence for the current research question; (3) to provide guidelines for future studies.

Design: Systematic Review

Methods: Electronic databases (SPORTDiscus, PubMed and PsycINFO) and previously published systematic and scoping reviews were searched. Only prospective studies were considered for inclusion.

Results: Eleven published studies that reported 39 effect sizes were included. Psychological factors; task orientation, task-oriented coping strategies and perceptual-cognitive functions had small effects on future performance in football (*ds* = 0.20-0.29). Due to high risk of bias there were low certainty of evidence for psychological factors relationship with future football performance.

Conclusions: Psychological factors investigated showed small effects on future football performance, however, there was overall uncertainty in this evidence due to various sources of bias in the included studies. Therefore psychological factors cannot be used as a sole deciding factor in player recruitment, retention, release strategies, however it would appear appropriate to include these in the overall decision-making process. Future, studies with more appropriate and robust research designs are urgently needed to provide more certainty around their actual role.

1. Introduction

One key goal of applied sport science research should be to provide evidence-informed recommendations that practitioners and other key stakeholders (coaches, the board etc.) can use to improve their decision-making and ultimately positively impact their practice.[1] To help, research should be guided by real-world issues that come directly from the field/key stakeholders. In contemporary professional football, psychology is an area that has gained more attention in both the applied setting of football teams and the research literature. More specifically, one main focus within both applied as well as research work is to implement interventions programs aimed to facilitate the development of psychological skills. A question regarding psychological factors was posed in our daily practice: can and/or should psychological factors guide the selection or de-selection decision players (i.e. as a part of the recruitment strategy to sign a player, keep or release him/her) based on psychological factors? In other words, are psychological factors associated with future football performance?

In one systematic review there were 48 psychosocial factors suggested as important for developing successful (talented) footballers.[2] Psychosocial factors were classified as: (a) psychological factors (e.g., self-control, task orientation, adaptive perfectionism, intrinsic motivation, resilience, anticipatory skills, coping strategies), (b) external social factors (e.g., autonomy supportive coaching, parenting styles, coach-player relationships, effective learning environment, talent development environments) and, (c) player-level behavioral indicators (e.g., adaptive lifestyle choices and volitional behaviors, quality of football specific practice and play, appropriate use of coping strategies).[2] One limitation, however, is that a majority of the included studies had used a cross-sectional or retrospective design. To not measure the proposed predictors prior to the outcome is a limitation when it comes to discuss causality.[3]

In a recently published systematic review, including only prospective studies, the findings revealed that decision-making, high level of achievement motives hope for success, and fear of failure were strongly associated with future football success.[4] More specifically, the results highlighted that perceptual-cognitive functions, closely related to decision-making, may be important for footballers. This is in line with other research suggesting that superior perceptual-cogntive functions may be

especially important for footballers[5] by enhancing the ability to respond to rapidly changing scenarios.[6] This suggestion is logical given football is played in an unpredictable environment where players constantly receive information, have to process it and then make an appropriate decision (e.g. pass and to whom, shoot or not and where or keep the ball, where to run or not to run i.e. positional play etc). Visual attention and decision-making may, therefore, be important.[6] Working memory, inhibitory control, cognitive/mental flexibility, anticipation and pattern recognition are examples of perceptual-cognitive functions that have been suggested as useful for future performance and the development of elite football players [6,7]

One limitation , in both Gledhill and collegues as well as Murr and collegues systematic reviews is the lack of information about the weighted average effect size of psychological factors infleunce on future football performance. The systematic review of Gledhill and colleagues[2] did not provide any effect sizes for the psychological factors that they identified, therefore it is difficult to assign an importance for example in our question of to what extent we should use these in the decision to recruit, retain or release a player. While Murr and colleagues[4] did provide strength of association through reporting effect sizes for each of the included studies no overall weighted average effect size was reported. An additional limitation is also that neither of the studies included potential moderators (e.g., age) that might influence the strength of the association between psychological factors and future football performance. Understanding the strength of links between psychological factors and future performance and developing football players would be useful to inform decision makers during the recruitment strategy.

Therefore we aimed: (1) to investigate whether psychological factors are associated with future football performance as defined by the research field (e.g., progression. to professional football, performance during next season); (2) to critically review the methods used in the included studies and summarize the evidence for the current research question; (3) to provide guidance for future studies.

2. Methods

This systematic review was registered on the PROSPERO database (registration CRD42017069799). The structure and reporting of this systematic review followed the PRISMA[8] guidelines.

We included studies if they met the following three criteria: (a) were of prospective design; (b) investigated the relationship or predictive power between psychological factors and future progression or performance in football; and (c) presented statistical data necessary for calculation of Cohen's *d* effect sizes. For the studies where the necessary statistical data were not presented, we requested the data from the corresponding author. Studies including male and female elite or sub-elite football/soccer players were eligible.

We defined the future performance in football outcome according to the following criteria: selected to a specific team or higher playing level, receiving a contract extension, professional contract (or equivalent, including being retained in an elite-level team) or superior technical/tactical performance in games such as statistics (e.g., goals and assists) from match-analyses or subjective ratings of coaches, technical/academy directors in the future season(s).

We searched the SPORTDiscus, PubMed and PsycINFO electronic databases using two sets of search terms. We also hand-searched published peer-reviewed articles [5,9] and reference lists of included studies to identify any studies that were not found in the initial electronic database search. Databases were searched from inception to July 14, 2018 using a combination of keywords:

Set I: (((cognitive function* OR executive function* OR working memory OR inhibitory control OR cognitive flexibility) AND elite soccer OR elite football) AND success in football OR success in soccer) OR talent identification in soccer OR talent identification in football.

Set II: (((psychology OR resilience OR coping OR anxiety OR mental OR confidence OR skill OR personality OR motivation OR questionnaire) AND elite soccer OR elite football) AND success in football OR success in soccer) OR talent identification in soccer OR talent identification in football.

In the first step, two reviewers independently screened titles and abstracts for all articles identified in the search procedure. All articles highlighted by the reviewers as potentially eligible where then assessed for eligibility by the same two reviewers, independently. Any disagreements about studies that should be included or excluded were resolved by consensus, or by a third reviewer if consensus could not be reached.

Data were extracted and checked by two reviewers, independently. Disagreements were, in line with the recommendations in PRISMA[8] guidelines, resolved by consensus, or by a third reviewer

if consensus could not be reached. Data were entered into an Excel spreadsheet (see Supplement B). The information extracted from each study was (i) study design, (ii) participant characteristics (gender, age, playing level), (iii) the psychological attribute/s studied and (iv) type of outcome measure.

In the next step the two reviewers, independently, classified the psychological attributes, collected within each of the selected articles, into theoretical domains. This classification resulted in four different theoretical domains: task orientation, ego orientation, task-oriented coping strategies, and perceptual-cognitive functions. Each of these theoretical domains are described below.

Achevement goal orientations were investigated in several studies. These orientations were, based on previous research, classified into two theoretical domains: task and ego orientation.[10]

To classify coping strategies a number of different frameworks have been used. One of the most frequently used is based on three dimensions; task-oriented, emotion-oriented, and avoidance-oriented.[11] In the classification process 12 factors all considered to be task-oriented strategies were classified to one domain; Task-oriented coping strategies. More specifically, the task-oriented coping strategies "refers to actions that are employed in order to change or master some aspects of a situation that is perceived as stressful".[12 (p. 2)]

All factors associated with perceptual and cognitive processes were classified into one domain; perceptual-cognitive functions. Based on the theoretical assumption that the effects between perceptual-cognitive functions and future football performance might be different depending if a general or a football-specific test were used[13] we also coded the data into two subgroups: perceptual-cognitive functions measured in general tests (i.e., tests where the athlete's responses were related to general standardized perceptual-cognitive tests) and perceptual-cognitive functions measured in football-specific tests (i.e., tests where the athlete's responses were related to football-specific questions, video clips or photos) was performed. Another classification we did in relation to the cognitive functions was based on age. More specifically, the mean age of the study participants for each study was extracted by the reviewer and included into the information sheet. The reason for this was that cognitive functions are likely to develop as a function of age.[14] Both these classifications were later used in two separate moderator analyses.

The classifications from the reviewers were then compared. Disagreements were resolved by consensus. A minimum of two effect sizes were required to include the theoretical domain in meta-analysis.[15]

The Risk of Bias Assessment Tool for Non-randomized studies (RoBANS) was used to assess the risk of bias in included studies.[16] The RoBANS consists of six domains for evaluation, each judged as "high risk", "unclear risk", or "low risk" by two independent assessors (AI; AKP). The RoBANS guidelines were followed in the evaluation process.[16] Disagreements were resolved by consensus or consultation with a third assessor (AM), if required. For the judgement of item 2 (accounting for confounding variables), we considered age and training hours as the most relevant confounding variables.

All analyses were conducted using Comprehensive Meta-Analysis.[17] Cohen's *d* coefficients were used as effect size estimates. In the first step of the analyses, the statistical data (e.g., means and standard deviations, Cohen's *d* effect sizes, odds ratios, sample sizes) were entered into the software. Next, we computed Cohen's *d* effect sizes based on the aggregate data from individual studies. To correct for sampling errors, each effect size was weighted for sample size, then we used all the weighted Cohen's *d* effect sizes to calculate the average Cohen's *d* effect size. We used the suggested cut-off for Cohen's d (small = 0.2-0.5, moderate = 0.5-0.8, and large = above 0.8) to interpret the magnitude of the effects.[18] The I^2 statistic was used to assess heterogeneity.[19] We used the following cut-offs to guide the interpretation of the I^2 statistic: 25% (low), 50% (moderate), and 75% (high).[19] We also calculated the fail-safe number (FSN). The FSN indicates the number of additional studies, reporting null-results (e.g., not statistically significant effects), that would be needed to change a potential statistically significant finding to not statistically significant.[20]

We conducted one meta-analysis, investigating if different domains of psychological factors predicted future performance and/or progression in elite football. In these analyses baseline scores on the psychological factors were compared between the players who demonstrated a successful progression to elite level or better performance in the future, and those who did not. All results were reported using mean Cohen's *d* effect sizes with 95% confidence intervals (CI). We considered results to be statistically significant when $p < 0.05$.

We used the Grading of Recommendations Assessment, Development and Evaluation (GRADE)[21] methodology to evaluate the certainty of the evidence for our research question (GRADEpro, McMaster University, 2015). The GRADE is a framework to present summaries of evidence for a specific research (or clinical) question, and to make clinical practice recommendations.[22] One author judged the strength of evidence as: high, moderate, low, or very low based on five domains: methodological limitations creating risk of bias within the study, inconsistency of results, indirectness of evidence, imprecision of results, and publication bias.[21] A second author reviewed the GRADE judgements. An overall certainty of evidence classification, based on the classification of the five domains, was then decided. The full process is described in the GRADE Handbook.[21]

3. Results

The literature search identified 1163 records. We excluded 1099 records after title and abstract screening. The full text articles of the remaining 64 studies were assessed for eligibility. Eleven studies met the inclusion criteria and were included for review (Figure 1).

Examples of definitions of future football performance ranged from numbers of goals and assists during the next season to progression to professional football. In the studies, the timing of administration of psychological measures and the measure of football success ranged from immediately, to selection/nonselection after a qualification tournament to up to 15 years after the psychological data were collected (See Supplement B).

In total, 3070 male and 26 female football players participated in the selected studies (See Supplement B). Six studies measured perceptual-cognitive functions, and five measured task orientation, four measured ego orientation, and six measured coping strategies. The perceptual-cognitive functions assessed included anticipation, inhibitory control, working memory, cognitive flexibility, creativity, and planning (for a complete summary of the cognitive functions measured in the studies see Supplement B). Examples of identified task-oriented coping strategies were mental preparation, concentration/attention, goal commitment, seeking social support, and hope for success. A summary of all included studies, including their measures is provided in Supplement B. The 11 studies reported 40 effect sizes.

Ten studies were at high risk of bias in at least 1 RoBANS domain (for more information see Supplement A). All studies were at low risk of selection bias for selection of participants (item 1). Five studies had adequate statistical adjustment for confounding variables (item 2). Eight studies were at high risk of performance bias (item 3) due to inadequate measurements of exposure (i.e., self-reported psychological variables). None of the studies were at high risk of bias due to inadequate blinding of outcome measures (item 4): eleven studies were at low risk of bias. Four studies were at high risk of attrition bias due to incomplete outcome data while four studies did not report or discuss missing data (item 5). In four studies, statistical analyses were performed to show that the missing data could be considered to be missing at random, and we judged these as being at low risk of attrition bias. Because none of the studies reported a pre-registered study protocol the risk of reporting bias was unclear for all studies (item 6).

Perceptual-cognitive functions had a small, positive effect on future football performance (Cohen's d = 0.27, 95% CI = 0.19, 0.36). Players with better future performance according to our definition (e.g., contract at elite level, more goals scored during the next seasons) had superior perceptual-cognitive function.

There were small differences in effect estimates between the results from the football-specific perceptual-cognitive (Cohen's d = 0.26, 95% CI = 0.12, 0.40) tests and the general perceptual-cognitive tests (Cohen's d = 0.29, 95% CI = 0.16, 0.42). There were small, and positive, effects between football-specific perceptual-cognitive test performance and future football performance and general perceptual-cognitive tests performance and future football performance. A meta-regression was performed to test if age (i.e., mean age of the participants) was related to the magnitude of the effect. The result showed no statistically significant relationship between age and the magnitude of effect size (β = 0.004, 95% CI = -0.007, 0.014).

There was a small, positive effect of task orientation on future football performance (Cohen's d = 0.28, 95% CI = 0.07, 0.50). There was a small, positive effect of task-oriented coping strategies on future football performance (Cohen's d = 0.20 95% CI = 0.11, 0.28). There was a trivial effect of ego orientation on future football performance (Cohen's d = 0.06, 95% CI = -0.03, 0.14). For a summary of results see Table 1.

Using the GRADE recommendations, there was very low to low certainty evidence for the association between task orientation, ego orientation, task-oriented coping strategies and perceptual-cognitive factors, and future elite or non-elite football performance (Table 2). Therefore, there is currently uncertainty in the level of evidence for psychological factors and future football performance.

4. Discussion

Our results showed that psychological factors, task orientation, task-oriented coping strategies, and perceptual-cognitive functions (measured with general and football-specific tests) had small effects on future football performance. However, differences in outcome measures, and inadequate consideration of confounding variables were common methodological issues of included studies which meant that overall, there is uncertainty around the level of scientific evidence for the precise role / size of role for psychological factors and future football performance.

To our knowledge this is the first systematic review of psychological factors and future football performance that includes a meta-analysis procedure for psychological factors and their association with future football performance. More specifically, advantags of meta-analysis, in comparison to systematic reviews, are; the generation of precise estimates of effect sizes, increased power in comparison to single studies, and the analyzis of the heterogeneity across studies.[23] Also, "well conducted meta-analyses allows for a more objective appraisal of evidence".[23 (p. 1371)] Our results lend support and hopefully advance the current research literature from the systematic reviews of Gledhill et al[2] who support psychological factors but did not provide any effect sizes and Murr et al[4] who also, presenting effect sizes from included studies, suggest a potential role though did not perform a meta-analysis.

Despite only finding small associtions, this is not surprising as there are likely multiple factors that interact to influence a players' future performance (and development) in football.[24] A combination of technical and tactical skills, anthropometric, physiological as well as psychological characteristics and skills are all involved in the development of football players.[24] Not to mention the influence of the environment they inhabit (reference?). Although a lower level of scientific evidence compared to systeamtic reviews, previous narrative reviews (level 5 expert opinion) have also suggested that

psychological factors such as adversity-related experiences are essential for success at the highest level of sport.[25]

Despite our findings of small associations, it is important to acknowledge that based on GRADE recommendations, the overall certainty of this evidence is unclear, given the sources of bias found in the included studies (see table 2). Importantly, this does not mean that the associations do not exist, but we cannot be certain of their precise role and as such, caution and consideration of the uncertainty should be taken when using this information to guide recommendations on player recruitment, release or retention strategies, as in the case of our study i.e. do not over emphasise their contribution and highlight their use in combination with other information .

Overall, we cannot and do not exclude the potential contribution of psychological factors to the overall development and success of footballers and their performance,[24, 26] but urgently need high quality, low risk of bias studies to improve our confidence in the practical setting.

We identified three important methodological considerations of the included studies in particular, which may have important implications for future research: (1) using ecologically valid assessments, (2) choosing an appropriate outcome measure, and (3) choosing an appropriate study design.

Future research must use ecologically valid assessments. The studies included in our review measured psychological characteristics (i.e., task and ego orientation) and coping strategies with self-report questionnaires. There are inconsistencies between an individual's reporting of how they think they will react or feel, and the behaviours in the real-life situation.[27] Given that behaviours are closely related to sport performance[28] the inconsistencies between self-report and observed behaviours are a major limitation. A limitation many authors acknowledge in applied setting work. Therefore, we recommend future studies include observation of behaviours.[29] Despite the small effects for the relationship between future football performance and perceptual-cognitive functions, measured with both sport specific and general tests, the use of field-based tests might provide a more accurate idea wheter psychological factors are relevant to future performance i.e. relevant to the pitch.

Differences in the definition of future football performance as an outcome may affect the applied value of previous research. Included studies in our systematic review used a variety of overly

broad performance outcomes, such as becoming a professional football player, goals and assists performed during a season, and selection to a football academy at the age of 16. Even if the direction of effects is homogenous for the relationship between perceptual-cognitive functions and future performance in the prospective studies, it is difficult to draw strong conclusions because the outcomes vary and their appropriateness may be questionable (e.g. of the goals and assists during the next 2 seasons). One might also question whether goals and assists represent successful football performance when a defender's job is to stop goals, not to score goals or set them up. Unfortunately, this also makes the applied contribution of the prospective studies low. Among the included studies, there were individual articles that did use more practical outcomes which are probably more relevant to key stakeholders. For example, progression to professional football (i.e., becoming elite football players 4 to 15 years after the psychological factors were measured).[30 31]

Prospective research is required to investigate relationships between psychological factors and football performance. We excluded 27 articles that did not meet this criterion, highlighting the number of studies performed with an sub-optinal design to answer our review question. Methodologically-sound studies (i.e. using prospective designs and football-relevant tests), involving researchers and practitioners from different fields, are warranted to understand the multidimensional aspects that might help develop successful players (e.g., Sarmento et al.[24]). Due to the multifactorial and complex pattern of variables that might influence the likelihood of future performance in football, it is difficult to use unidimensional factors to predict which players will succeed in the future. [32] Instead, studies can contribute evidence to implement different strategies or programs that may be associated with future football performance and therefore may increase the chance of future success.

5. Limitations

The overall effect sizes for the studies measuring several of the constructs were only based on a small number of effect sizes overall. This might influence the accuracy of the results for this category of factors. Relying on the definitions of future football performance limits our results because it is difficult to generalize the findings to any specific performance indicator. The heterogeneity of definitions may reduce the generalisability of the results. Also, within several of the theoretical domains (i.e., task-oriented coping skills and perceptual-cognitive functions) several different

variables were included. Even if we followed previous recommendations in constructing these domains it is considered as a limitation because the heterogeneity of included variabes might infleunce the intepretation of the results.

6. Conclusion

Psychological factors (task orientation, coping strategies/skills and perceptual-cognitive functions) had small effects on future football performance, however the specific level of this evidence is currently uncertain. Despite the uncertainty, psychological factors nevertheless should continue to be discussed, trained and researched as one of several aspects that might be relevant to future football performance and ideally alongside other factors (e.g. technical, tactical, physical) in situ. Future research is urgently needed to provide more certainty and therefore higher confidence than currently available for providing recommendations to key decision-makers in practice.

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Table 1. Results of meta-analysis and homogeneity tests for the relationship between psychological factors and football success

Variable	***k***	**ES (*d*)**	**95% CI**	**FSN**	**I^2 (%)**
Ego	4	0.06	-0.03, 0.14	0	0
Task	5	0.28	0.07, 0.50	18	40
Task-oriented Coping strategies	12	0.20	0.11, 0.28	91	13
Perceptual and cognitive functions	18	0.27	0.19, 0.36	216	14
Perceptual and cognitive functions (football-specific tests)	9	0.26	0.12, 0.40	25	0
Perceptual and cognitive functions (general tests)	9	0.29	0.16, 0.42	81	42

Note: *k*: number of effect sizes; ES (*d*): effect sizes; CI: confidence intervals; FSN: fail-safe number; NA = Not available.

Table 2. Summary of the GRADE evaluation.

Research question	Factors that may decrease certainty of evidence					Test accuracy CoE
	Risk of bias	Indirectness	Inconsistency	Imprecision	Other considerations	
1	Serious	Serious	Not serious	Not serious	None	Low
2	Serious	Serious	Not serious	Serious	None	Very Low
3	Serious	Serious	Not serious	Not Serious	None	Low
4	Serious	Serious	Not Serious	Not Serious	None	Low
5	Serious	Serious	Not Serious	Not Serious	None	Low

Note: CoE = Certainty of Evidence; 1 = Should task orientation be used to predict future success in football?; 2 = Should ego orientation be used to predict future success in football?; 3 = Should task-oriented coping strategies be used to predict future success in football?; 4 = Should Perceptual and cognitive functions measured in football-specific tests be used to predict future success in football?; 5 = Should Perceptual and cognitive functions measured in general tests be used to predict future success in football?

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Supplement A. Summary of quality scores from the RoBANS

Ref	Q1	Q2	Q3	Q4	Q5	Q6
Forsman et al.[30]	Low	High	High	Low	Unclear	Unclear
Huijgen et al.[33]	Low	Low	High	Low	Low	Unclear
Höner & Feichtinger[34]	Low	High	High	Low	Unclear	Unclear
Kannekens et al.[35]	Low	High	High	Low	Unclear	Unclear
O'connor et al.[36]	Low	Low	Low	Low	Low	Unclear
Sakamoto et al.[37]	Low	High	Low	Low	Unclear	Unclear
Van Yperen & Duda[38]	Low	Low	High	Low	High	Unclear
Van Yperen[31]	Low	Low	High	Low	Low	Unclear
Vestberg et al.[39]	Low	High	Low	Low	High	Unclear
Zuber et al.[40]	Low	High	High	Low	High	Unclear
Zuber et al.[41]	Low	Low	High	Low	High	Unclear

Note: Q1 = Selection biases caused by the inadequate selection of participants; Q2 = Selection biases caused by the inadequate confirmation and consideration of confounding variables; Q3 = Performance biases caused by inadequate measurement of exposure; Q4 = Detection biases caused by the inadequate blinding of outcome assessments; Q5 = Attrition biases caused by the inadequate handling of incomplete outcome data; Q6 = Reporting biases caused by the elective reporting of outcomes.

Supplement B. Summary of included studies.

Reference	Study type	Participants (N, Mage, Sport)	Psychological variables included into the review	Questionnaires/Tests	Definition of success
Forsman et al.[30]	P	N = 114, 15.4, male, soccer	Positioning and deciding (0), knowing about ball actions (0), knowing about others (0), acting in changing situations (S>NS), confidence (0), concentration (0), mental preparation (0)	The Tactical skills inventory for sports (TACSIS), Psychological skills inventory for sports (PSIS-R-5)	Progression to professional level
Huijgen et a.[33]	P	N= 113, 17.1 male, soccer	Knowing about ball actions (0), knowing about others (0), positioning and deciding (S>NS), acting in changing situations (0), task orientation (0), ego orientation (0), anxiety control (0), mental preparation (0), concentration (0)	Task and Ego Orientation in Sport Questionnaire, Psychological Skills inventory for Sport, TACSIS	Team selection
Höner & Feichtinger[34]	P	N=1804, 11.9, male, soccer	Hope for success (S>NS), task orientation (S>NS), ego orientation (0), concentration disruption (0)	Achievement Motive Scale-Sport, Sport Orientation Questionnaire, Task and Ego Orientation in Sport Questionnaire, Volitional Components in Sport, Physical Self-Concept scale, Self-Efficacy in Soccer, Competition Anxiety Inventory-Trait	Selection at U16 age class to German professional academies (first assessed at U12 age class)
Kannekens et al.[35]	P	N= 105, 17.8, male, soccer	Knowing about ball actions (0), knowing about others (0), positioning and deciding (S>NS), acting in changing situations (0)	Tactical Skills Inventory for Sports	Future professional players
O'Connor et al.[36]	P	N=127, 14.8, male, soccer	Decision making (S>NS), anticipation (0), situational probability (0), pattern recognition (0)	Participation history questionnaire, perceptual-cognitive video-based assessment procedure.	Selected vs not selected
Sakamoto et al.[37]	P	N = 383, 9.7,	Core executive functions (S>NS), Higher-order	Cognitive function tests,	Team selection

		male, soccer	executive functions (S>NS)	The Grit scale, the resilience scale	
Van Yperen & Duda[38]	P	N = 75, 16.4, male, soccer	Task orientation (+), Ego orientation (0)	Task and Ego Orientation in Sport Questionnaire	Coach subjective rating
Van Yperen[31]	P	N=65, 16.58 male, soccer	Goal commitment (S>NS), Problem-focused coping (S>NS), seeking social support (S>NS)	The Ways of Coping Questionnaire	Progression to professional level
Vestberg et al.[39]	P	N = 57, 25.3, (31 male and 26 female), soccer	Design fluency (+)	D-KEFS test battery of executive functions (design fluency, color-word interference test)	Later performance (success)
Zuber et al.[40]	P	N=134, 12.26 (n=97 took part in two tests and were included in the analyses), male, soccer	Goal orientation (+), Hope for success (+)	Achievement Motives Scale-Sport, Sport Orientation Questionnaire, Sport Motivation Scale	Later performance
Zuber et al.[41]	P	N= 119, 12.27, male, soccer	Achievement motivation (S>NS), Hope for success (S>NS)	Achievement Motives Scale-Sport (the German version)	Later performance

Note: S = Selected; NS = Non Selected; S>NS = The selected sample has better functions/strategies in comparison to the non-selected sample; S<NS = The non-selected sample has better functions/skills in comparison to the selected sample; + = positive statistically significant relationship; - = negative statistically significant relationship; 0 = no statistically significant relationship/difference