Title: Psychological Characteristics of Developing Excellence in elite youth football players in English professional academies

Running head: PSYCHOLOGICAL CHARACTERISTICS OF DEVELOPING EXCELLENCE IN ELITE YOUTH FOOTBALL

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Key Words: psychological characteristics, talent development, youth soccer, football academies

Abstract

This mixed-longitudinal prospective study examined the development of psychological characteristics of developing excellence in relation to the career progression of elite youth football players. In a 20-month period, 111 academy football players aged 11-16 completed the Psychological Characteristics of Developing Excellence Questionnaire (PCDEQ) on 1-5 occasions. This combination of single and repeated assessments resulted in a mixed-longitudinal sample of 226 completed PCDEQs. Players were then prospectively tracked, and their scholarship status assessed at follow-up, at age U17. Multilevel modelling revealed that coping with performance and developmental pressures scores increased with age, and that Category 1-2 academy scholars (4.35 ± 0.61) scored higher than Category 3-4 academy scholars (3.99 ± 0.67) and non-scholars (4.02 ± 0.78) ($p<.05$). Evaluating performances and working on weaknesses scores increased with age for Category 1-2 academy scholars (U12-U14 vs. U15-U16 = 5.16 ± 0.48 vs. 5.38 ± 0.45), compared to non-scholars (U12-U14 vs. U15-U16 = 5.11 ± 0.59 vs. 5.03 ± 0.71) ($p<.05$). Imagery use during practice and competition scores decreased with age (U12-U14 vs. U15-U16 = 4.45 ± 0.66 vs. 4.29 ± 0.70) ($p<.05$). A blend of PCDEs may facilitate optimal career progression. Football academies should develop players' PCDEs, with a particular focus on developing their coping skills and their ability to realistically evaluate performances and work on weaknesses.

Key Words: psychological characteristics, talent development, youth soccer, football academies

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Introduction

Talent development programmes in football aim to increase the likelihood that players progress from academy to senior football (Gledhill, Harwood, & Forsdyke, 2017). However, between the 2009/10 and 2017/18 seasons, the percentage of players having grown up in England accounted for around just 40% of minutes played in the English Premier League, indicating a reliance on players developed outside the English academy system (Poli, Ravenel, & Besson, 2019). In response to this, the English Premier League are currently implementing a long-term strategy aimed at promoting a world-leading talent development system, namely, The Elite Player Performance Plan (EPPP) (Premier League, 2011). The EPPP proposes a multidisciplinary approach to developing players with an emphasis on technical, physical, psychological and social elements. This approach is supported by recent research that has suggested that development in football is dependent on various factors (Huijgen, Elferink-Gemser, Lemmink, & Visscher, 2014). However, until recently, there has been less focus on the psychological aspects of development, especially in an English professional football academy context (Gledhill et al., 2017; Murr, Feichtinger, Larkin, O'Connor, & Höner, 2018).

In a series of papers, Collins and colleagues (e.g., Abbott & Collins, 2004; Hill, MacNamara & Collins, 2015; MacNamara, Button, & Collins, 2010a, 2010b; MacNamara & Collins, 2011, 2013, 2015) proposed that psychological components underpin a young athlete's capacity to learn and exploit the opportunities available in the environment. MacNamara et al. (2010a, 2010b) conducted retrospective semi-structured interviews with several world-class athletes and their parents. Inductive analyses revealed that, when they were younger, a range of psychological components appeared to support their progression towards excellence. These components are termed psychological

characteristics of developing excellence or PCDEs, and include a blend of characteristics, attitudes, behaviours, and psychological skills, such as commitment, imagery, coping with pressure, and actively seeking social support (MacNamara et al., 2010a; MacNamara & Collins, 2011). The use of appropriate PCDEs allowed athletes to optimise development opportunities, adapt to setbacks, and effectively negotiate key transitions encountered during development, thus providing young athletes with the capacities to strive to realise their potential (MacNamara et al., 2010a, 2010b). MacNamara and Collins (2013) provided quantitative support for this proposition by using the Psychological Characteristics of Developing Excellence Questionnaire (PCDEQ) (see methods for details) to compare 'poor developers' and 'good developers' amongst 192 elite youth athletes (mean age = 15.94) from rugby, hockey, and football. Each participant was classified as a poor or good developer based on their coach's subjective rating of the athlete's behaviour in, and attitude towards, their sport. Good developers were superior to poor developers based on their PCDEQ scores, specifically with regards to the support for long-term success given by significant others, coping with performance and developmental pressures, and evaluating performance and working on weaknesses.

The PCDE approach also suggests that the use of PCDEs is context-specific, and PCDEs are developed with age as performers progress towards senior excellence (MacNamara et al., 2010b). With regards to the context-specific nature of PCDEs, although MacNamara and Collins (2013) included football players within their sample of team sports athletes, a specific exploration of the role of PCDEs in academy football is required, as this context may differ compared to rugby and hockey for example. Indeed, research into other sports, such as orienteering, has shown limited differences in PCDEQ scores between senior elite performers recalling their developmental years and performers from national elite youth development programmes from Britain and Switzerland

(Newton & Holmes, 2017). With regards to the development of PCDEs, MacNamara et al. (2010b) suggested that young athletes develop and refine PCDEs as they progress towards elite senior performance, in response to changing demands and opportunities associated with different stages of development and the macro and micro transitions encountered on the pathway to excellence (see Côté, 1999, for a discussion on stages of development). For example, athletes' commitment, motivation, and determination became especially important in the later stages of career progression, when athletes were advancing to the elite senior standard. However, no research has examined age-related changes in PCDEs in academy football, so such research is warranted to understand how PCDEs develop in elite youth football players, and thus support practitioners in moderating aspects of the development environment to better support players within different age groups.

Previous research has considered psychological components of development in elite youth football, from a variety of perspectives, for example in relation to self-regulation (e.g., Toering, Elferink-Gemser, Jordet, & Visscher, 2009), coping skills (e.g., Van Yperen, 2009), and motivation (e.g., Höner & Feichtinger, 2016). It has been argued that each of these components could be considered as PCDEs (Dohme, Backhouse, Piggot, & Morgan), however, the PCDE approach is considered a more appropriate perspective from which to study the psychological components related to talent development in elite youth football for several reasons. Firstly, the PCDE approach provides a more comprehensive examination of psychological components related to talent development, as opposed to considering single components in isolation, e.g., self-regulatory skills are just one of the components considered by the PCDE approach. Secondly, the PCDE approach was purposefully developed to consider psychological components in a talent development context, and is grounded

in theoretical (Abbott & Collins, 2004) and empirical evidence (MacNamara et al. 2010a, 2010b) in this regard. Thus, the PCDE approach specifically relates to psychological components relevant to the talent development process, as opposed to only in relation to sport performance, for example. For instance, the PCDEQ assesses a young athlete's use of coping skills in relation to developmental pressures as well as sports performance.

Nevertheless, previous work not explicitly adopting a PCDE approach has clearly contributed to our understanding of the psychological components related to career progression in football (see Gledhill et al., 2017 and Murr et al., 2018 for reviews). For example, Van Yperen (2009) showed that high levels of goal commitment, appropriate coping strategies, and the seeking of social support were important in determining the career success of 65 professional academy football players aged 14-18. However, Van Yperen (2009) is one of the few studies to adopt a prospective design when examining psychological components related to career progression (see Murr et al., 2018). An issue with most previous work is that it has tended to compare young players of varying standards (e.g., elite vs. sub-elite) cross-sectionally (e.g., Crust, Nesti, & Littlewood, 2010, Toering et al., 2009). Such study designs can only provide information on current accomplishments and not future successes. Conversely, a prospective design is able to assess elite youth football players at a younger age and subsequently determine their playing status later in their careers, which allows the psychological components relating to their potential to progress to be examined.

Previous research not explicitly adopting the PCDE approach has also contributed to our understanding of how psychological components develop in elite youth football players (e.g., Crust et al., 2010; Feichtinger & Höner, 2015; Reeves, Nicholls, & McKenna, 2009). For example, Reeves et al. (2009) showed differences in the stressors

experienced, and coping strategies employed, by early adolescent (12-14 years) versus late adolescent (15-18 years) academy football players. However, once again, such research tends to cross-sectionally compare players of differing ages, and so any within-player changes in psychological components are not accounted for, indicating a need for a more longitudinal approach.

Another issue is that talent development studies in football have tended to consider either the relationship between psychological components and future playing standard, or the development of these psychological components, but not both (cf. Zuber Zibung, & Conzelmann, 2015, 2016). The drawback to single-assessment prospective designs, such as that adopted by Van Yperen (2009), is that the psychological components of young football players are only assessed once, at one age group, in this case aged 14-18. Thus, it is assumed that the range and level of psychological components important for career progression are the same for a 14-year-old and an 18-year-old, which may not be the case (MacNamara et al., 2010b). Indeed, it is possible that different developmental patterns relate to varied future accomplishments, yet despite recent calls, this is rarely considered in studies of talent development in football (Murr et al., 2018).

Therefore, repeatedly assessing the PCDEs of elite youth football players across age and then prospectively tracking players to determine their future playing standard would allow the examination of how the development of PCDEs are associated with future playing standard. The purpose of the present study was to examine the development of psychological characteristics of developing excellence in relation to the career progression of elite youth football players in English professional academies.

Methods

Participants and design

A total of 111 elite male youth football players aged 11-16, belonging to two Category 2 English professional academies participated in the study. Players were considered elite based on their participation in a world-class talent development system, as prescribed by the EPPP (Swann, Moran, & Piggott, 2015). In a 20-month period between 2012 and 2013, players completed the PCDEQ (MacNamara & Collins, 2011) on 1-5 occasions, (mean ± SD completed PCDEQs per player: 2.0 ± 1.1). This combination of single and repeated assessments resulted in a mixed-longitudinal sample of 226 completed PCDEQs. Players were then prospectively tracked. A key indicator of career progression in football is whether and where players are offered a full-time 2-year scholarship at a professional academy at U17, as this is considered a crucial step towards becoming a professional player (Holt & Dunn, 2004; Mills, Butt, Maynard, & Harwood, 2012). Therefore, at U17, players' career progression was classified in the following manner: those completing a scholarship at a Category 1-2 academy (considered by EPPP as the most optimal talent development systems) (n=35), those completing a scholarship at a Category 3-4 academy (considered by EPPP as less optimal talent development systems) (n=28), or those not completing a scholarship at a professional academy (n=48). This design allowed for the relationship between age-related changes in PCDEs and eventual scholarship status to be examined.

Instrument

The PCDEQ is designed to assess athletes' use of PCDEs in sport. In developing and validating the PCDEQ, an exploratory factor analysis with a sample of 363 youth athletes revealed a 59-item, 6-factor solution that, post-rotation, explained 42% of the total explained variance (MacNamara & Collins, 2011). The six factors included: imagery use during practice and competition (Factor 2), coping with performance

and developmental pressures (Factor 3), ability to organize and engage in quality practice (Factor 4), and evaluating performances and working on weaknesses (Factor 5), and two factors (Factor 1: support for long-term success and Factor 6: support from others to compete to my potential) that contained items associated with how significant others promote and reinforce PCDEs. Items consisted of statements such as 'I am willing to push myself really hard' (example item from Factor 4, ability to organise and engage in quality practice). For each item, participants were asked to respond on a 6-point Likert scale ranging from 1 (very unlike me) to 6 (very like me). The internal consistency of the PCDEQ was shown to be excellent, with a Cronbach alpha of 0.91. Furthermore, the internal consistency of each subscale was shown to be good, with factor Cronbach alpha's ranging from 0.70-0.87 (MacNamara & Collins, 2011). Moreover, in terms of ecological validity, the PCDEQ successfully discriminated between coach-rated 'poor developers' and 'good developers' amongst 285 elite youth athletes aged 16 (MacNamara & Collins, 2013).

Procedure

Ethical approval for the study was obtained from the Ethical Advisory Committee at [*Institution*]. Prior to taking part in the study, players and their parents or guardians were provided with a written and verbal summary outlining the purpose, procedures involved, possible risks and benefits, and the voluntary and confidential nature of the research. Written assent was obtained from players and written consent was obtained from parents or guardians.

Across a 20-month period, the PCDEQ was administered approximately every 4 months. On each occasion, to aid the understanding of the players, the meaning of some common words within items of the PCDEQ were defined prior to

completing the questionnaire. For example, the words ‘imagery, mental practice, and mental rehearsal’ were explained as ‘using all your senses to create or recreate an experience in your mind’. These definitions were posted in large print throughout the room so that players could refer to definitions during the completion of the questionnaire. The questionnaire was conducted in a small group setting (10-15 players) under the supervision of two researchers who were also able to support player understanding as appropriate. Players were reminded to complete the questionnaire on their own and be honest when answering questions. Players were reassured that their answers would remain strictly confidential. The questionnaire took between 20 and 30 minutes to complete.

Data analysis

The final mixed-longitudinal sample consisted of 226 completed questionnaires. From the 226 completed questionnaires, there were 338 (2.5%) missing responses across all items. Data were considered missing at random and were replaced using single imputation. Missing items were imputed using completed item responses from the same subscale via regression analyses in the software package R (v.3.2.0) (Kabacoff, 2011). The internal consistency of each subscale of the PCDEQ was examined with Cronbach’s alpha, using IBM SPSS (v.24).

Due to the hierarchical structure of the data, i.e., PCDEQ completion occasions nested within players, multilevel modelling was used to examine the development of each PCDE factor score (MLwiN v 3.00, Bristol, U.K.). As an extension of standard statistical models such as ANOVA, multilevel modelling does not require the same number of measurement occasions per individual and the temporal spacing of measurements may vary between players (Rasbash, Steele, Browne, & Goldstein, 2017). Hence, this statistical technique is well suited to the

current data structure. Multilevel models describe the underlying trends of a particular component in the population (fixed part), and also models the unexplained variation around the mean trend for that component (random part) (Twisk, 2003).

Multilevel modelling was used to examine the development of each PCDEQ factor score in turn. For each model, a two-level hierarchical structure was defined, with measurement occasion (level 1) nested within player (level 2). Relevant parameters were systematically added to a baseline model to observe their effect on explaining and partitioning variation in the development of players' PCDE factor score. Parameters were accepted or rejected on the basis of changes in model fit, as indicated by differences in -2 loglikelihood, and the effect of explanatory variables on the outcome variable, as indicated by z-scores. The baseline model included a given PCDEQ factor score as the outcome variable, a fixed intercept, and a fixed age term (centred at 14 years) as a single explanatory variable. From the baseline model, the first model tested was a random intercept model, which involved allowing the intercept to randomly vary to examine variance in the level of PCDEQ factor score between players. The subsequent model tested was a random slope model, which involved allowing the slope for age to randomly vary to examine variance between players' development in the PCDEQ factor score. Next, the fixed effect of scholarship status on the PCDEQ factor score was examined, and finally, the fixed effect of the interaction between age and scholarship status on the PCDEQ factor score was examined. Following each analysis, the assumption that variation in intercepts were normally distributed with an average of zero, was checked (Twisk, 2003). Statistical significance was accepted at the 95% confidence level ($p<.05$). Mean (SD) were used to describe the average and variability of data.

Results

The internal consistency for all subscales of the PCDEQ was good, with Cronbach alphas of 0.88, 0.84, 0.78, 0.76, 0.74, and 0.71 for Factors 1, 2, 3, 4, 5, and 6, respectively. The mean (SD) PCDEQ factor scores by age group and scholarship status are displayed in Table 1. Table 2 shows the multilevel models for the development of PCDEs. Modelling indicated that there was no effect of age or eventual scholarship status on scores for support for long-term success (Factor 1), ability to organize and engage in quality practice (Factor 4), and support from others to compete to my potential (Factor 6) ($p>.05$).

*****Table 1 here*****

Modelling indicated that imagery use during practice and competition (Factor 2) scores significantly decreased with age ($p<.05$). The fit of the model was improved by allowing the intercept and the slope of age to randomly vary ($p<.05$). Modelling showed that coping with performance and developmental pressures (Factor 3) scores significantly increased with age ($p<.05$) and that those who went on to scholarships at Category 1-2 academies had significantly higher scores compared to those who went on to scholarships at Category 3-4 academies and those who did not go onto scholarships ($p<.05$). The fit of the model was improved by allowing the intercept and the slope of age to randomly vary ($p<.05$). The model for evaluating performances and working on weaknesses (Factor 5) indicated that age-related changes differed based on eventual scholarship status. That is, scores increased with age for those who went on to scholarships at Category 1-2 academies, compared to those who did not go onto scholarships ($p<.05$). The fit of the model was improved by allowing the intercept to randomly vary ($p<.05$).

*****Table 2 here*****

Discussion

The current mixed-longitudinal prospective study examined the development of PCDEs in relation to the career progression of elite youth football players. Results revealed age-related changes and an effect of eventual scholarship status on several PCDEs, including a decrease in imagery use during practice and competition with age, an increase in coping with performance and developmental pressures with age, higher levels of coping with performance and developmental pressures in eventual Category 1-2 scholars, and an increase in evaluating performances and working on weaknesses with age for eventual Category 1-2 scholars.

A range of PCDEs have been shown to be important in talent development processes in several sports (MacNamara et al., 2010a, 2010b; MacNamara & Collins, 2013, 2015; Newton & Holmes, 2017). Based on the mean (SD) PCDEQ factor scores displayed in Table 1, the current sample of U12-U16 elite youth football players displayed high scores on all factors of the PCDEQ, in relation to elite youth individual and team sport athletes and elite youth and senior orienteers (e.g., the mean ± SD of Cohen's d differences across all factors in the current sample vs. elite youth team sport athletes in MacNamara and Collins (2013) = 0.33 ± 0.20, and vs. British elite youth orienteers in Newton and Holmes (2017) = 0.38 ± 0.19). This indicates that in general, players possess high levels of a range of PCDEs. However, only some factors changed with age and related to career progression.

Coping with performance and developmental pressures scores increased with age, possibly due to the increased demands placed on players as they progress on the pathway to excellence. The current findings support previous qualitative research that has also shown age-related differences in the coping skills of elite youth football players (Reeves et al., 2009), suggesting that facilitating the development of

appropriate coping skills may be important in supporting elite youth football players at different stages of an academy development system.

Having superior scores on the coping with performance and developmental pressures factor between ages 11-16 was also found to be important in determining career progression (Category 1-2 > Category 3-4 and Non-scholars= 4.35 ± 0.61 > 3.99 ± 0.67 and 4.02 ± 0.78). This finding is congruent with a previous study using the PCDEQ in elite youth team sport athletes aged 16, whereby coach-rated 'good developers' outscored 'poor developers' (4.27 ± 0.77 vs. 3.87 ± 0.86) (MacNamara & Collins, 2013). Current findings also support literature examining coping skills not using the PCDEQ in talented football players (Holt & Dunn, 2004; MacNamara & Collins, 2013; Mills et al., 2012; Van Yperen, 2009). For example, interviews with academy players aged 16, and their coaches, suggested that progression to professional senior status in football required high levels of resilience, which involved employing appropriate coping strategies (Holt & Dunn, 2004; Mills et al., 2012). It is noteworthy that in the current study, superior coping skills differentiated eventual Category 1-2 scholars from eventual Category 3-4 scholars, as well as eventual non-scholars, suggesting that this factor seems useful for distinguishing the excellent developers from the very good developers, which is a unique finding. The current findings also extend previous literature by simultaneously considering both the development of coping skills and the role of coping skills in predicting future success. Furthermore, the coping skills assessed by the PCDEQ related to developmental pressures, as well as performance pressures, suggesting that it is more directly aligned to coping with the challenges of talent development processes than previous work. In summary, it would appear that a range of coping skills may

facilitate progression through an academy system toward elite status, and so academies should support the development of these skills in their players.

Results revealed that evaluating performances and working on weaknesses was particularly important in the development of elite youth football players. This factor relates to the extent to which young athletes realistically evaluate their performances, regardless of win or loss outcome, and work on their weaknesses for future progression (MacNamara & Collins, 2011). For optimal career progression, i.e., on to a Category 1-2 scholarship, evaluating performances and working on weaknesses improved with age. MacNamara and Collins (2013) showed that in elite youth team sports athletes aged 16, coach-rated 'good developers' displayed higher scores than 'poor developers' on evaluating performances and working on weaknesses (4.99 ± 0.72 vs. 4.56 ± 0.85). Furthermore, British elite youth orienteers scored particularly highly on this factor (4.97 ± 0.79), and in-depth interviews with their coaches revealed that it was a major focus of talent development processes in this context (Newton & Holmes, 2017). The current study is the first to provide evidence that this unique factor is important in the development of elite youth football players. Previous work has shown the importance of potentially-related factors such as achievement motivation (Höner & Feichtinger, 2016; Zuber et al., 2015, 2016) and self-regulation (Toering et al., 2009). However, unlike most previous work, the current study considers the factor in relation to both age-related change and future career success (Murr et al., 2018), and provides evidence that unique developmental trajectories may exist for those players who demonstrate excellent career progression. Therefore, in elite youth football players aged 12-16, it may be important to improve one's ability to evaluate performances and work on weaknesses throughout development to overcome obstacles, learn from setbacks, and

adjust to key transitions on the pathway towards excellence (MacNamara et al. 2010b).

The current study suggested that imagery use during practice and competition decreased with age. This may seem surprising given that qualitative studies have consistently shown imagery to be important for development into an elite senior athlete (Durand-Bush & Salmela, 2002; Gould, Dieffenbach, & Moffett 2002; MacNamara et al., 2010a, 2010b). However, despite the reduction in imagery use during practice and competition, the mean scores of U15-U16 players in the current study were similar or higher compared to elite youth and senior orienteers (Newton & Holmes, 2017) and elite youth individual and team sport athletes (MacNamara & Collins, 2013) (e.g., average imagery use during practice and competition scores in U15-16 players in the current study vs. elite youth team athletes aged 16 in MacNamara and Collins, 2013 = 4.29 ± 0.70 vs. 3.89 ± 0.99, respectively). Therefore, elite youth football players aged 11-16 years engage in relatively high levels of imagery usage, suggesting that it may be useful in engaging in their current context, i.e., being a member of a professional academy. However, its usage decreased with age and it was not a determinant of future career progression in football.

A possible explanation for imagery usage decreasing with age is that in the English elite youth football context under consideration, at younger ages the explicit and overt use of imagery may be considered more acceptable, whereas as players move towards senior professional status, cultural issues may reduce the likelihood that players engage in imagery behaviours, or report its usage via the PCDEQ (Champ, Nesti, Ronkainen, Tod, & Littlewood, 2018; Pain & Harwood, 2004). Further, in two recent reviews of the psychological components associated with effective talent development in football, none of the quantitative studies reviewed, examined the role of imagery in relation to talent development (Gledhill et al., 2017; Murr et al., 2018), and imagery was

not reported as a key factor for development in any of the qualitative studies reviewed (Gledhill et al., 2017). Therefore, there is a need to investigate the development of imagery processes in elite youth football players in relation to talent development in greater depth.

Practical implications

The EPPP aims to increase the number and quality of home-grown players progressing through the academies of professional football clubs in England. A focus of the strategy is improving aspects such as coaching provision and sport science support, which includes consideration of the technical, physical, psychological and social elements of player development. The current study suggests that psychological elements are indeed important for the development of players. The present findings support the propositions of MacNamara et al. (2010a, 2010b) that a blend of PCDEs may allow players to negotiate different stages of development and eventually progress to elite levels of performance. The ability to cope with performance and developmental pressures and evaluate performances and work on weaknesses appeared to be particularly important for progression. Therefore, academies could assist players in developing a repertoire of coping strategies, pertinent to the challenges of particular stages of development. Assisting players in making realistic evaluations of their own performances and to support them to work on areas of weakness may also support their development. This may entail regular discussions with players, encouraging them to reflect on key aspects of their performance and supporting them in developing strategies to target areas for improvement.

Limitations and future research

The current study provided a mixed-longitudinal examination of the development of PCDEs of elite youth football players aged U12-U16, and then prospectively tracked

them to age U17 to determine career progression. As recommended by Gledhill et al. (2017) and Murr et al. (2018), the longitudinal aspects of this design extend previous, purely cross-sectional work that compares youth players across different age groups (e.g., Crust et al., 2010) and varying statuses (e.g., Toering et al., 2009) based on psychological components. Recognising the unique contribution of the current study, it would have been preferable still to assess the PCDEs of a group of elite youth football players at U12 and periodically reassess the same players for the next 8-10 years, where senior playing status could be determined, i.e., adopt a pure longitudinal prospective design. Unfortunately, recruiting and tracking an elite sample over such a period is expensive and suffers from the problem of participant dropout.

The use of a single measurement type, particularly a self-report measure such as the PCDEQ, is associated with some common method biases (Podsakoff, MacKenzie, & Podsakoff, 2012). Although there was an attempt to reduce response bias by conducting the PCDEQ away from coaches, reminding participants that all information remained confidential, and encouraging participants to respond honestly, future research should consider other avenues to improve this further. Within the pure longitudinal prospective design proposed above, it would be useful for future work to supplement the PCDEQ with interviews, reflective diaries and participant observations, to better understand the PCDEs used by elite youth football players, how these develop, and how this may relate to career progression.

Conclusion

The current study showed that several PCDEs change with age and may facilitate optimal career progression in elite youth football players aged U12-U16. Coping with

performance and developmental pressures and evaluating performances and working on weaknesses appear to be key factors that influence the talent development process. It is recommended that professional football academies encourage the systematic development of these PCDEs in their players. Future research should employ a pure longitudinal prospective design to better explore age-related changes in PCDEs across players' academy careers and into adulthood.

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Declaration of interest statement

No potential conflicts of interest.

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