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Exploring the psychological skills of development in talented young African footballers

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Abstract: The Psychological Characteristics of Developing Excellence (PCDEs) are psycho-behavioral skills enabling talented athletes to excel in achievement-based contexts. Although Africa overflows with talented footballers struggling to develop locally, no study has investigated the PCDEs in African footballers yet. This study aimed to test the reliability of the Psychological Characteristics of Developing Excellence Questionnaire-Short Version (PCDEQ-SV) across three African football nations (Morocco, Côte d'Ivoire, and Cameroon) and to assess and compare psycho-behavioral skills in academy footballers. Participants (n = 506) aged 10 to 23 completed the PCDEQ-SV. Results from factor analyses and Kruskal–Wallis testing support a good fit for PCDEQ-SV. In the overall sample, the least and the most developed PCDEs were coping skills, and evaluating performances and working on weaknesses, respectively. This study provides a reliable measurement tool to measure PCDEs in African academy footballers and to design interventions effectively.

Keywords: PCDEQ; talent development; football; Africa; psycho-behavioral skills

Introduction

Talent Development (TD) in football remains a major issue on the African continent. Most African countries face a shortage of qualified sports professionals, lack of sports infrastructures, and effective sports governance, thus hindering their capacity to nurture talented young athletes effectively. However, North African nations have striven to build sports environments that are better than most sub-Saharan countries. For instance, Morocco has implemented substantial sporting investment programs, obtaining the top ranking amongst African football nations and winning many African and international awards in football competitions. At a lower level of investment, West Africa's Côte d'Ivoire has collaborated with European football academies to support its talented players, with it becoming the leading exporter of footballers to French-speaking countries and winning many awards in football competitions (Poli, 2004; Poli et al., 2022). Cameroon has lost its competitiveness in football talent development in Central Africa, but it still holds a dominant position in African football (Eboko, 2018, December 9–15; Poli et al., 2022). Overall, despite a poorer environment, many African footballers achieve high-level performance. The primary driver of these achievements is the athlete's psychology (Elumaro, 2022). Since the environment is not supportive enough, African athletes rely on psychological skills to cope with challenges. Unfortunately, there are few studies on the psychological skills of young athletes in the African context during their TD journeys.

Psychological characteristics of developing excellence as key situated skills to navigate in the sport TD pathway effectively

Mental skills represent the key factor enabling talented athletes to excel in achievement-based contexts (Collins et al., 2016; Elumaro, 2022; Van Yperen, 2009). Mental skills have been identified as the best supporting factor to overcome developmental challenges during TD pathways compared to other factors such as athleticism, socioeconomic status, amount of training, or geographical location (Kelly et al., 2022, 2024; Mills et al., 2012; Sæther, 2017). Many athletes fail not because of their sports skills, but because their mental skills are insufficiently supportive of talent development. This does not mean that other factors are unimportant for achieving a high level. There is a growing interest in studying the psychological skills that future high-level athletes should develop to cope with TD challenges. For instance, resilience, commitment, self-regulation, discipline and social adaptability skills are associated with becoming a professional athlete, as is adapting to critical transitions (Gledhill et al., 2017; Owiti & Hauw, 2023). Ambition, goal commitment, engagement in problem-focused coping behaviors, and seeking social support have been associated with successful progression into professional adult football (Sæther, 2017; Van Yperen, 2009). Among the few available studies conducted with young African athletes, it has been shown that Côte d'Ivoire's elite athletes use self-talk and mental imagery to deal with sports performance stressors (Dagrou et al., 1991). Self-confidence and the use of mental imagery characterize Cameroon's talented young footballers (Tachom Waffo et al., 2020; Tagne Nossi et al., 2024). In Morocco, El Moutaraji et al. (2021) found that team-sport athletes had better mental skills for coping with adversity and succeeding in challenging situations. In Africa, and specifically in sub-Saharan countries, athletes have strong religious and spiritual identities that shape their psychological strength and skills (Hagan et al., 2019). These identities provide a cognitive-behavioral drive supporting psychological skills that serve to overcome challenges in a sporting context (Dagrou et al., 1991; Hagan et al., 2019; Tachom Waffo et al., 2020).

Thus, beyond the cultural context, psychological skills are a germane factor for succeeding in a sports TD pathway.

To design a model which encompasses psychological skills for successful sport TD, MacNamara and collaborators developed the Psychological Characteristics of Developing Excellence (PCDEs) model (MacNamara & Collins, 2011, 2013; MacNamara et al., 2010). The PCDEs are situated psycho-behavioral skills underpinning a talented athlete's ability to develop, i.e., to learn, exploit opportunities, successfully transfer skills from one stage to another, and achieve long-term high-level performance. They are adaptive skills that young athletes need during their TD pathway to face up to and benefit from TD challenges (Collins et al., 2016; MacNamara & Collins, 2011). These psycho-behavioral skills can be taught, modified, and tested as athletes progress in their pathways (Hauw et al., 2023). In this line, MacNamara and Collins (2011) validated the Psychological Characteristics of Developing Excellence Questionnaire (PCDEQ) as a useful tool for monitoring and nurturing PCDEs in talented athletes.

The PCDE model is composed of six psycho-behavioral skills (Gesbert et al., 2021; Hauw et al., 2023; MacNamara & Collins, 2011). According to MacNamara and Collins (2011), the first factor, **skills drawn from support for long-term success** (F1-SSLS), refers to skills to ensure long-term success (goal setting, coping, persistence, resilience, distraction control, etc.) that young athletes develop and deploy through the perception of inducement from significant others. These skills enable talented young athletes to engage purposefully with developmental opportunities, learn, and develop for the future rather than to focus on immediate performance. The second, **imagery use during practice and competition** (F2-IUPC), refers to the ability to use imagery as a cognitive and motivational strategy to optimize training behaviors and performance. The third, **coping with performance and developmental pressures** (F3-CPDP), refers to the ability of young athletes to deal with the challenges associated with the sport TD pathway. The fourth, **ability to organize and engage in quality practice** (F4-AOEP), refers to psychological skills which shape young athletes' ability to engage in deliberate practice to ensure their athletic growth. The fifth, **evaluating performances and working on weaknesses** (F5-EPWW), underscores the need to focus on process rather than outcome. It refers to young athletes' ability to assess their performance realistically regardless of competition outcomes, to identify their areas of improvement, and to work on to ensure future progression. The sixth, **skills drawn from support to compete to my potential** (F6-SSCP), refers to skills developed by young talented athletes (self-responsibility, ambition, self-regulation, willingness to self-update, etc.) related to the encouragement received from others to maintain progression and compete to one's potential. These skills help athletes to engage in an ongoing development process of their potential by constantly making the most of their dispositional tendencies. Overall, F1-SSLS and F6-SSCP highlight developing psychological skills that talented young athletes deploy as a result of inducement from surrounding people, while the remaining factors highlight skills they deploy independently (MacNamara & Collins, 2011).

The PCDEs have been proven to be crucial dynamic skills to fit the situated needs of young footballers in the TD process. Kelly et al. (2022) found that compared to technical and social factors, the PCDEs are the best predictors of the likelihood or not of young footballers signing a professional contract during the junior-senior transition. The PCDEs have also been used to compare talented young footballers in English academies according to their social background, and it appears that players from disadvantaged social backgrounds have the highest psycho-behavioral skills associated with better athletic potential (Kelly et al., 2024). Moreover, the changes in PCDEs according to age and academy level have been identified in elite youth footballers in England (Saward et al., 2020). Hauw et al. (2023) found that not all talented young Swiss athletes were equipped with PCDEs, specifically imagery use and skills drawn from coaches and other support. They also identified that the feedback technique made it easier for athletes to develop the PCDEs in order to reach their highest potential, with the exception of the skills drawn from support. Moreover, PCDEs contribute significantly to a comprehensive, situated, and broad approach to aspiring footballers' personalities (Hauw et al., 2022).

Goals of the current study

The general objective of this study was to explore the PCDEs in talented young footballers in an African context. To explore the PCDEs in talented African footballers effectively, the overall reliability of the short version of the PCDEQ (PCDEQ-SV) in an African context was tested (specific objective 1), and the PCDEQ-SV was used to describe and compare these psycho-behavioral skills in academy footballers from the three African countries selected (specific objective 2).

This study provides an insight into the mindsets of young footballers in an African context in order to be able to offer suited psychological support, given that an athlete's psychology is the core factor of success in the African sports context (Elumaro, 2022). In addition, considering the flexible and adaptive nature of athlete-environment interactions, the mental skills developed are fortified through encountering challenges (Collins et al., 2016; Hauw et al., 2022; Owiti et al., 2020). Similarly, there are calls to examine athletes' PDCEs in terms of contexts and cultures (Saward et al., 2020; Sæther, 2017). However, the PCDEQ has already been validated or applied in several sociolinguistic contexts, except in an African one: they include the United Kingdom, Spain, Switzerland and the United States of America (Ruiz-Barquín et al., 2014; Gesbert et al., 2018; MacNamara & Collins, 2011; Pennisi, 2023; Saward et al., 2020). Most recently, a short version of the PCDEQ has been designed for fast, dynamic and situated use (Hauw et al., 2023).

Method

Participants and procedure

The study selected three countries (Morocco, Côte d'Ivoire and Cameroon), representative of three sub-regions in

Africa (North, West and Central), and which have displayed certain distinctive features in nurturing talented footballers (Eboko, 2018, December 9–15; Poli, 2004; Pomé & Djedji, 2020). A convenient sample of 506 male academy footballers aged from 10 to 23 ($M = 15.11$; $SD = 2.35$ years) were recruited from Cameroon (52.2%), Côte d'Ivoire (33.6%), and Morocco (14.2%). The players' age groups were distributed as follows: U13 (20.6%), U15 (28.7%), U17 (28.1%), U20 (10.1%) and U23 (12.1%). A total of 73.1% of the participants took part in competitions at the regional level and the remainder at the national level.

This study applied a cross-sectional research design in accordance with the previous studies of PCDEs (Gesbert et al., 2018; Hauw et al., 2023; MacNamara & Collins, 2011). The participating academies were contacted via collaboration with the Fédération Internationale des Associations de Footballeurs Professionnels of Africa (FIFPro-Africa). Eligible participants had to be engaged in an elite football program in their academy and provide consent. The data were collected on-site in each of the three countries and in French by the first author, an African native with experience of football academies in Cameroon. The study received approval from the ethics committee of the University of Lausanne, Switzerland (E-SSP-032023-00001). Also, institutional permission to conduct the survey was secured from the academy directors. Before proceeding to data collection, the researcher carefully explained to the participants the purpose and process of the study, together with its confidential, anonymous, and voluntary nature. All the participants or their guardians completed a consent form. Participants took approximately 10 min to complete the questionnaire.

Measure

The data was collected using the French version of the Psychological Characteristics of Developing Excellence Questionnaire-Short Version (PCDEQ-SV) (Gesbert et al., 2018; Hauw et al., 2023). The PCDEQ-SV is an 18-item self-report questionnaire structured according to six factors (with three items per factor) corresponding to the six PCDEs: F1-SSLS (e.g., "My coach sets my goals and we work together to achieve them"), F2-IUPC (e.g., "I use mental imagery in my preparation"), F3-CPDP (e.g., "I find it difficult to push myself to cope with difficulties"), F4-AOEP (e.g., "I set demanding goals for myself that I can only achieve through hard work"), F5-EPWW (e.g., "I always have at least one goal that I'm trying to achieve"), and F6-SSCP (e.g., "Before an important competition, people around me help me stay focused"). For each item, players rated their psycho-behavioral skill on a six-point Likert scale ranging from *very unlike me* (1) to *very like me* (6).

Data analysis

Out of the 506 participants, 483 completed the PCDEQ-SV. For the 18 items, 0.04% of the values were missing. Items with the most missing data were: item 13 (0.98%), item 10 (0.79%), item 2 (0.59%), and item 5 (0.59%). As the proportion of missing data was below 5%, no treatment of missing data was undertaken (Schafer, 1999). Data analysis was undertaken in two main steps. The first step aimed to assess the factor structure and internal consistency of the PCDEQ-SV. The data from the items met normality assumption, thus allowing Confirmatory Factor Analysis (CFA; Muthen & Kaplan, 1985; Swami & Barron, 2019). CFA is a theory-driven method which was used to test whether the PCDEQ-SV's six factors, totalling 18 items, were suitable with the study's dataset. To determine the goodness of fit, the following indices with their thresholds are recommended: chi-squared ratio on degree of freedom (χ^2/ddl < 2.5), Root Mean Square Error of Approximation (RMSEA ≤ 0.08), Standardized Root Mean Square Residual (SRMR ≤ 0.08), Tucker Lewis index (TLI ≤ 0.90), and Comparative Fit Index (CFI ≤ 0.90; Swami & Barron, 2019). Internal consistency was assessed with Cronbach's alpha (α) and McDonald's omega (ω), and Mean Inter-item Correlations (MIC). Given that each of the six subscales of the PCDEQ-SV contains only a small number of items (three), methodological recommendations suggest considering the MIC (Briggs & Cheek, 1986). An MIC range from 0.2 to 0.4 indicates an optimal level of consistency between items (Briggs & Cheek, 1986; Pallant, 2010). The second step aimed to describe and compare the PCDEs according to country, competition level and age group. The data did not meet the multivariate normality assumption. Thus, the Kruskal–Wallis test (H) was used to assess the differences between countries, competition levels, and age groups on the six factors of the PCDEQ-SV (Field, 2009). It was supplemented by the post-hoc tests of Dwass-Steel-Critchlow-Fligner (DSCF) and the Jonckheere–Terpstra test (J-H). The post-hoc tests were used for pairwise comparisons with the age group and country grouping variables. The Jonckheere–Terpstra test was used to determine if there is a significant trend between competition levels and age groups and PCDEQ-SV factors. The analyses were conducted with SPSS 24 and Jamovi 2.3.24.

Results

Factor structure analysis of PCDEQ-SV

The CFA results suggested that the PCDEQ-SV had good overall reliability with a sample of talented young African footballers (Table 1). The fundamental (χ2/ddl, SRMR, and RMSEA) and incremental (CFI and TLI) statistic indices met the required thresholds. Thus, the factor structure of the PCDEQ-SV composed of 18 items and six factors is well adjusted to the data. In addition, the standardized factor loadings for the six-factor solution items ranged from 0.380 to 0.671 across the six factors, and were all significant. The inter-factor correlations were significant, except the correlations between F3-CPDP with F1-SSLS, F2-IUPC, and F6-SSCP.

The analysis of Cronbach's alpha (α) and McDonald's omega (ω) suggested adequate (F1-SSLS) and low (F2-IUPC, F3-CPDP, F4-AOEP, F5-EPWW, and F6-SSCP) internal consistency (Table 2). However, the Mean Inter-item Correlations (MIC) showed an optimal level of coherence between the items of five subscales, except for subscale F2-IUPC, whose MIC was under the thresholds required. Subsequently, F2-IUPC was not considered in further inferential analysis.

Table 1. Results of confirmatory factor analysis for PCDEQ-SV

Factor loadings				Inter-factor correlation					
Factors	**Items**	**Std. Est**	**z**	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
F1-SSLS	Item 3	0.636	13.2**	—					
	Item 10	0.664	13.8**						
	Item 18	0.589	11.7**						
F2-IUPC	Item 5	0.383	5.91**	0.174**	—				
	Item 7	0.382	6.94**						
	Item 16	0.551	8.27**						
F3-CPDP	Item 1	0.556	8.74**	0.044	0.027	—			
	Item 4	0.437	7.17**						
	Item 17	0.541	8.59**						
F4-AOEP	Item 9	0.489	9.98**	0.156**	0.371**	0.218**	—		
	Item 12	0.477	9.71**						
	Item 13	0.527	10.4**						
F5-EPWW	Item 6	0.557	12.1**	0.288**	0.455**	0.235**	0.591**	—	
	Item 8	0.550	11.9**						
	Item 15	0.565	12.3**						
F6-SSCP	Item 12	0.380	7.54**	0.507**	0.216**	0.021	0.276**	0.391**	—
	Item 11	0.460	9.41**						
	Item 14	0.671	13.7**						

	χ2(ddl)	**χ2/ddl**	**SRMR**	**CFI**	**TLI**	**RMSEA**	**90% CI for RMSEA**	
							Lower	Upper
PCDEQ-SV	0.198(120)*	1.65	0.039	0.943	0.928	0.035	0.028	0.045

Note. Std. Est = Standardized Estimate; F1-SSLS = Skills drawn from Support for Long-term Success; F2-IUPC = Imagery Use during Practice and Competition; F3-CPDP = Coping with Performance and Developmental Pressures; F4-AOEP = Ability to Organize and Engage in Quality Practice; F5-EPWW = Evaluating Performances and Working on Weaknesses; F6-SSCP = Skills drawn from Support to Compete to my Potential. *$p < 0.01$; **$p < 0.001$.

Table 2. Internal reliability and descriptive statistics on the PCDEQ-SV's factors

	Internal reliability				**Descriptive statistics**	
	Number of items	**Cronbach's alpha**	**McDonald's omega**	**Mean inter-item correlations**	**Mean**	**Standard deviation**
F1-SSLS	3	0.66	0.67	0.40	4.41	1.11
F2-IUPC	3	0.40	0.44	0.18	4.14	0.92
F3-CPDP	3	0.51	0.52	0.26	3.87	1.04
F4-AOEP	3	0.50	0.50	0.25	4.63	0.92
F5-EPWW	3	0.56	0.58	0.31	4.84	0.95
F6-SSCP	3	0.52	0.52	0.27	4.44	0.95

Note. F1-SSLS = Skills drawn from Support for Long-term Success; F2-IUPC = Imagery Use during Practice and Competition; F3-CPDP = Coping with Performance and Developmental Pressures; F4-AOEP = Ability to Organize and Engage in Quality Practice; F5-EPWW = Evaluating Performances and Working on Weaknesses; F6-SSCP = Skills drawn from Support to Compete to my Potential.

Comparison and description of psycho-behavioral skills between the selected countries

The distribution of mean scores of the PDCEQ-SV's factors suggested that across the different countries, competition levels, and age groups, the players had a medium level of PCDEs overall (Tables 2 & 3). Skills drawn from support for long-term success (F1-SSLS) and skills drawn from support to compete to my potential (F6-SSCP) appeared moderately developed with mean scores of around 4 ("somewhat like me"), except for the players from Morocco, who had a mean score of close to 5 ("like me") on F1-SSLS. Coping with performance and developmental pressures (F3-CPDP) emerged as underdeveloped in all participants regardless of country, competition level and age group, with mean scores of around 3 ("somewhat unlike me"). Ability to organize and engage in quality practice (F4-AOEP) was moderately developed (mean scores of around 4) for most participants, except for the players competing at national level and those from U20 and U23 age groups, who have developed this skill to a

high degree (mean score close to 5). Finally, evaluating performances and working on weaknesses (F5-EPWW) appeared highly developed in most of the players (mean score close to 5), except for those from Cameroon, footballers playing at regional level, and those from the U13 age group, who had developed this skill moderately (mean scores of around 4).

The results of Kruskal-Wallis's test showed significant differences on the PCDEQ-SV's scores between the countries, competition levels, and age groups (Table 3).

Regarding ***country***, significant differences were observed on two PCDEQ-SV factors: F1-SSLS $H(2) = 23.10, p < 0.001$, and F5-EPWW $H(2) = 7.04, p < 0.001$. The post-hoc DSCF test revealed that Moroccan players had higher levels of F1-SSLS compared to footballers from Cameroon $W = 6.60, p < 0.001$, and Côte d'Ivoire $W = 5.87, p < 0.001$. No significant differences were found between Cameroon and Côte d'Ivoire $W = 0.92, p > 0.05$. On F5-EPWW, the players from Morocco had higher levels compared to footballers from Cameroon $W = 3.49, p < 0.05$. No significant difference was found between Morocco and Côte d'Ivoire $W = 2.15, p > 0.05$, nor between Cameroon and Côte d'Ivoire $W = 2.11, p > 0.05$.

Concerning ***competition level***, significant differences were noticed on two PCDEQ-SV factors, with the highest levels recorded for the young footballers competing at national level: F4-AOEP $H(1) = 4.23, p < 0.05$, and F5-EPWW $H(1) = 6.27, p < 0.001$. The Jonckheere–Terpstra's test revealed a significant trend in the data: as the players progress from regional to national competition level, their levels increase on F4-AOEP $J\text{-}T = 2.99, p < 0.001$, and F5-EPWW $J\text{-}T = 4.44, p < 0.001$.

Finally, regarding ***age group***, significant differences were found on Ability to organize and engage in quality practice (F4-AOEP) $H(4) = 22.99, p < 0.001$, and evaluating performances and working on weaknesses (F5-EPWW) $H(4) = 28.97, p < 0.001$. The post-hoc DSCF test revealed that the level of F4-AOEP in players from the U13 age group was lower than for footballers from U17 ($W = 4.07, p < 0.05$), U20 ($W = 4.67, p < 0.01$) and U23 ($W = 5.71, p < 0.001$). The players from the U15 age group also had a lower level compared to those from U23, $W = 3.99, p < 0.05$. On F5-EPWW, the players from the U13 age group had lower levels compared to those from U15 ($W = 4.47, p < 0.01$), U20 ($W = 4.10, p < 0.05$), and U23 ($W = 6.72, p < 0.001$). The U23 age group also had higher levels compared to U15 ($W = 4.75, p < 0.01$) and U17 ($W = 4.90, p < 0.01$). Jonckheere–Terpstra's test revealed a significant trend in PCDEs according to age group: as the players progress across age groups, their levels increase on F3-CPDP ($J\text{-}T = 2.96, p < 0.05$), F4-AOEP ($J\text{-}T = 2.99, p < 0.001$), and F5-EPWW ($J\text{-}T = 4.44, p < 0.001$).

Discussion

The general objective of this study was to explore the PCDEs in talented young footballers from three African football nations: Morocco, Côte d'Ivoire, and Cameroon. For this purpose, the overall reliability of the PCDEQ-SV in an African context was tested (specific objective 1), and the PCDEQ-SV was used to describe and compare the psycho-behavioral skills in academy footballers from the three African countries selected (specific objective 2). The results showed that the French version of the PCDEQ-SV is reliable for assessing the PCDEs in a sample of talented young African footballers. Moreover, the levels of PCDEs in academy footballers were compared according to country, competition level, and age group. This means that higher levels of skills drawn from support for long-term success, and evaluating performances and working on weaknesses, were observed in Moroccan players compared to Cameroonian and Ivoirian players. An increase was observed according to age group and competition level in the ability to organize and engage in quality practice, and evaluating performances and working on weaknesses; similarly, the higher the age group, the better the skills in coping with performance and developmental pressures. Regardless of country, competition level, and age group, the least and most highly developed PCDEs are coping with performance and developmental pressures, and evaluating performances and working on weaknesses, respectively.

The results showed that the psychometric properties of the PCDEQ-SV incorporating the data from the three countries are aligned with the questionnaire's initial factor structure (Gesbert et al., 2018; Hauw et al., 2023; MacNamara & Collins, 2011; Ruiz-Barquín et al., 2014). Thus, the initial six-factor structure of the PCDEQ validated in Western contexts (the United Kingdom, Spain and Switzerland) is also reliable in an African context when using the short version of this questionnaire with footballers. The results of inter-factor correlations were also consistent with those of the initial study of MacNamara and Collins (2011), which supported that the factors represent distinct but related psychological characteristics of developing excellence. However, the results suggested that some items on the PCDEQ-SV's subscales need improvement. Cronbach's alpha and McDonald's omega showed internal consistency that ranged from low to adequate. However, given the small number of items per subscale, the mean inter-item correlations were considered and suggested optimal consistency between items, except for the subscale assessing imagery skill, i.e., F2-IUPC (Briggs & Cheek, 1986; Pallant, 2010). This internal consistency concern has been encountered in studies with the short version of the PCDEQ (Hauw et al., 2023) but not in those with the long version (Gesbert et al., 2018; Ruiz-Barquín et al., 2014). The results regarding the F2-IUPC subscale's inconsistency are not completely surprising, as imagery skills have not been considered as important in the skill set of team sport (MacNamara & Collins, 2013). Furthermore, the interactive nature of team sport tends not to stimulate athletes to form specific mental representations of themselves while practicing, to reduce the feeling of individual responsibility (Di Corrado et al., 2019). Overall, psychometric results allowed the PCDEs of academy footballers to be assessed in the three countries, but with the omission of the imagery skill factor from the interpretation of the results.

Across the three African countries selected, the results suggesting significantly higher levels of two PDCEs (skills drawn from support for long-term success, and evaluating

Table 3. Results of Kruskal-Wallis (H) and Jonckheere–Terpstra (J-T) tests: Differences on PCDEQ-SV's scores between countries, competition levels, and age groups

		Countries			Competitions		Age groups				
		MRC	**CIV**	**CMR**	**REG**	**NAT**	**U13**	**U15**	**U17**	**U20**	**U23**
F1-SSLS	Mean	4.95	4.38	4.27	4.40	4.44	4.28	4.38	4.45	4.38	4.59
	Median	5.00	4.33	4.33	4.50	4.33	4.33	4.67	4.67	4.33	4.67
	SD	1.00	1.01	1.15	1.10	1.12	1.12	1.14	1.12	0.97	1.09
	Rank	329.3	246.2	237.5	252.5	256.3	235.6	251.9	260.5	243.3	275.8
	H		23.10**		0.37				3.61		
	J-T		N.A		0.26				1.46		
F2-IUPC	Mean	4.36	4.03	4.16	4.12	4.21	3.94	4.20	4.13	4.02	4.48
	Median	4.33	4.00	4.33	4.00	4.33	4.00	4.00	4.33	4.00	4.67
	SD	1.01	0.85	0.94	0.92	0.95	0.94	0.87	0.87	0.95	1.04
	Rank	285.9	233.0	257.9	249.9	256.3	224.8	259.7	251.6	237.3	302.0
	H		7.20*		1.30				11.83*		
	J-T		N.A		0.92				2.25*		
F3-CPDP	Mean	3.83	3.80	3.92	3.83	3.98	3.80	3.73	3.93	3.87	4.12
	Median	4.00	3.67	4.00	4.00	4.00	4.00	3.67	4.00	4.00	4.00
	SD	1.25	0.96	1.04	1.05	1.02	0.96	1.01	1.09	0.82	1.21
	Rank	249.3	241.3	262.5	248.8	266.3	243.6	237.8	261.2	252.1	286.3
	H		2.26		1.70				5.78		
	J-T		N.A		1.19				2.96*		
F4-AOEP	Mean	4.66	4.59	4.66	4.56	4.86	4.30	4.60	4.70	4.85	4.95
	Median	5.00	4.67	4.67	4.67	5.00	4.33	4.67	4.67	5.00	5.00
	SD	0.93	0.86	0.97	0.96	0.81	1.04	0.88	0.85	0.82	0.95
	Rank	256.1	242.4	259.9	241.8	285.3	206.4	244.8	259.4	288.2	307.0
	H		1.52		4.23*				22.99**		
	J-T		N.A		2.99**				4.76**		
F5-EPWW	Mean	5.02	4.92	4.74	4.73	5.16	4.48	4.91	4.81	5.03	5.20
	Median	5.33	5.00	5.00	5.00	5.33	4.67	5.00	5.00	5.00	5.67
	SD	1.01	0.85	1.00	0.99	0.77	1.07	0.86	0.93	0.70	1.04
	Rank	288.7	260.2	239.6	236.2	300.7	202.8	258.5	246.8	270.6	325.3
	H		7.04*		6.27**				28.97**		
	J-T		N.A		4.44**				4.53**		
F6-SSCP	Mean	4.48	4.48	4.40	4.42	4.50	4.29	4.47	4.56	4.50	4.30
	Median	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67
	SD	1.05	0.88	0.97	0.98	0.89	1.04	0.88	0.90	0.96	1.05
	Rank	266.1	257.3	247.7	250.7	261.2	234.0	252.3	271.1	260.4	238.2
	H		1.08		1.02				4.80		
	J-T		N.A		0.72				0.98		

Note. *$p < 0.05$; **$p < 0.001$. N.A = Not Applicable; SD = Standard Deviation; MRC = Morocco; CIV = Côte d'Ivoire; CMR = Cameroon; REG = Regional level; NAT = National level; F1-SSLS = Skills drawn from Support for Long-term Success; F2-IUPC = Imagery Use during Practice and Competition; F3-CPDP = Coping with Performance and Developmental Pressures; F4-AOEP = Ability to Organize and Engage in Quality Practice; F5-EPWW = Evaluating Performances and Working on Weaknesses; F6-SSCP = Skills drawn from Support to Compete to my Potential.

performances and working on weaknesses) in academy footballers from Morocco tie in with previous studies on young footballers in Western countries. Research carried out in Spanish and English football academies found higher scores of PCDEs compared to studies conducted in Switzerland (Hauw et al., 2022; Ruiz-Barquín et al., 2014; Saward et al., 2020). MacNamara et al. (2010) demonstrated that needs and requirements shaping the levels of PCDEs in athletes are related to the sports context. Thus, the quality of the football environment may be a driver for developing PCDEs. Morocco offers a better experience of the football environment than Cameroon or Côte d'Ivoire, as do Spain and England compared to Switzerland (Tachom Waffo & Hauw, 2025). In this respect, for instance, support from others can help significantly by providing continuous and realistic evaluations enabling players to develop the skill of evaluating performances and working on weaknesses (MacNamara & Collins, 2011). On the other hand, evolving linear trends

regarding the skills of coping and athletic investment (F4-AOEP and F5-EPWW) in relation to age groups and competition levels strengthen the findings of previous studies (Hauw et al., 2023; Pennisi, 2023; Saward et al., 2020). The higher the age group and competition level, the greater the challenges, and psycho-behavioral skills develop according to the challenges athletes encounter (Collins et al., 2016; Stambulova et al., 2021). The methodological difference between this study (cross-sectional) and the previous ones (longitudinal) supports the robustness of this conclusion. Thus, considering the findings of the current study and those of previous ones carried out in western countries (Hauw et al., 2023; Pennisi, 2023; Saward et al., 2020), it might be advanced that the trend of PCDEs to improve with age and the number of challenges faced is independent of cultural differences.

The levels of PCDEs in the academy footballers participating in this study emerged as lower than those in academy footballers from Switzerland, Spain, and England (Hauw et al., 2022; Ruiz-Barquín et al., 2014; Saward et al., 2020), or in Swiss athletes (Hauw et al., 2023) and Spanish MMA fighters (Ruiz Barquin et al., 2019). Considering that Western countries provide more resources enabling athletes to improve their mental skills, these findings are consistent with the "4E" approach, which argues that the deployment of situated development processes emerges from distributed and functional relationships between the individual and their context (Hauw, 2018). Such findings stand in partial contrast with the studies suggesting that young footballers from lower socio-economic backgrounds have higher PCDEs (Kelly et al., 2022, 2024). Indeed, the skills drawn from support (F1-SSLS and F6-SSCP) observed in the study are higher than those observed in swimmers from the USA (Pennisi, 2023). Otherwise, analysis of the PCDE scores based on commonly used cut-offs (MacNamara & Collins, 2013) suggested that in this study, participants were good developers on F1-SSLS and F4-AOEP, and poor developers on F3-CPDP, F5-EPWW, and F6-SSCP. The latter three are skills that appropriate technical support may help to acquire. African countries lack appropriate psychological support in sports technical teams, and subsequently, players rely more on spirituality and religiosity as mindset drivers (Hagan et al., 2019). Obviously, it is not enough to be completely equipped with the PCDEs. Indeed, Ivorian athletes pay more attention to physical factors than psychological ones, and use the same psychological strategies whatever the sports situations (Dagrou et al., 1991). Considering the role of coping skills in achieving high-level performance in the TD process, a low level on F3-CPDP may provide further explanation of the poorer mental health experience and performances of African youth teams in international football competitions (Kelly et al., 2022, 2024; Saward et al., 2020; Tachom Waffo & Hauw, 2024).

Theoretical and practical implications

The current study has important implications. A TD program aims to equip talented athletes with skills that enable them to take up opportunities provided by their environment to excel in achievement-based contexts. This is the first study on the PCDEs of talented footballers in an African context. It has shown that the PCDEQ-SV can be a measurement tool to rapidly, situationally, and reliably monitor academy footballers' psychological skills in an African context. In addition, it can also be a constructive and useful tool to prepare talented young players for a transnational career based on the standards required in a European context. The current study's findings can be used to initiate workshops and educational and psychological interventions with coaches, parents and players according to their developmental stage. Regarding the low level of coping skills, evaluating performances and working on weaknesses, and skills drawn from support to compete to potential, these interventions may focus on strengthening coping strategies, reinforcing realistic evaluations, of the best or worst performances, and stimulating support. Given the importance of coaches for African athletes (Elumaro, 2022), such interventions can help them to improve the PCDEs as part of their coaching and relationships with players. The role of sports psychologists is crucial in this process, and they should recognize the cultural background in the psychological universe of athletes.

Limitations and conclusion

Some limitations are noted in this study. The sample did not include female footballers or players from English- or Portuguese-speaking African countries. Future studies should be extended to the latter countries and Arabic-speaking countries in view of the small subsample of Morocco. A mixed-method study would provide an in-depth exploration of psycho-behavioral skills in talented African athletes. It is possible that the participants' beliefs and values influenced how they interpreted the meaning of the items and subsequently impacted the scores (Gavin et al., 2024). For instance, spirituality and religiosity shape the psychological strength of African athletes, and many consider a poor environment as normal (Elumaro, 2022; Hagan et al., 2019). Such a background needs to be considered for an in-depth understanding of the psychological skills with which talented African athletes are equipped. Thus, interpreting these results based on comparing them with findings from studies conducted in Western contexts must be conducted with caution.

To conclude, the key take-home message from this study can be summarized in the following five points.

- This was the first study to investigate the PCDEs in talented young footballers from three African football nations.
- The original six-factor structure of the PCDEQ-SV fitted data with a sample of young male African footballers.
- Moroccan academy footballers had higher levels of PCDEs compared to those from Cameroon and Côte d'Ivoire.
- Evolving linear trends of the PCDEs associated with age groups and competition levels of players were observed.
- Evaluating performances and working on weaknesses was the most developed skill, while coping with developmental pressures was the least.

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