



Development and initial validation of athletes' perceptions of coach-related critical attitudes scale

Sara Oliveira¹ · Inês A. Trindade¹ · António Rosado² · Marina Cunha¹ · Cláudia Ferreira¹

Accepted: 22 December 2020

© Springer Science+Business Media, LLC, part of Springer Nature 2021

Abstract

The aim of this study was to develop and validate the Athletes' Perceptions of the Coach-related Critical Attitudes Scale (APoCCAS), using three independent samples of Portuguese adult athletes. In the first stage, the items were developed to assess athletes' perceptions of coach-related critical attitudes and the items' factorial structure were explored via a principal components analysis. In a second stage, the findings of Principal Components Analysis were confirmed and cross-validated using confirmatory factor analysis with two independent samples of athletes. The development of a pool of items resulted in a 10-item with a unifactorial structure. This scale presented high internal consistency, adequate convergent validity, and presented a negative association with self-reassurance and positive associations with self-criticism, anxiety, and depressive symptoms. The APoCCAS demonstrated to be a short and reliable measure of the athletes' perceptions regarding coach-related critical attitudes and seems to be useful for practice and research fields in clinical sport psychology. By highlighting the associations between the athletes' perception of coach-related critical attitudes and mental health indicators, this study could create a space to alert coaches towards the effect of their attitudes on athletes' mental health.

Keywords Athletes · Criticism · Coach-athlete relationship · Factor analysis · Psychometric properties · Scale development · APoCCAS

Introduction

Despite the direct benefits of participating in sports, athletes do not always have positive experiences within their sport context (Fraser-Thomas & Côté, 2009; Fontana & Fry, 2017). In fact, athletes sometimes choose to stop participating in sports due to past negative experiences in this context, including a negative relationship with their coaches (Coakley, 2004). The relationship between coach and athlete is a crucial component in the life of the athletes that influences not only their performance, but also their physical and psychological development (Davis, Appleby, Davis, Wetherell, & Gustafsson, 2018; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016; Schinke, Stambulova, Si, & Moore, 2017). Some studies have suggested

that the coach can create the opportunity to maximize and support the physical, mental, technical, tactical, social, and emotional development of the athletes so that they can achieve their highest goals (Mujika, Halson, Burke, Balague, & Farrow, 2018). In this sense, a coach should be able to apprehend how the athlete feels in a training setting, as well as during and after competition (independently of winning or losing), and to establish a healthy and supportive relationship with the athlete (Karakoç et al., 2011). However, a positive and healthy relationship does not always happen (Gilbert & Trudel, 2004; Siekanska, Blecharz, & Wojtowicz, 2013). Untrustworthiness, disrespect, overexpectations, lack of knowledge about the athlete, cheating behaviors, and inability to support the athlete during injury periods, have been indicated as the most problematic coaches' characteristics, hindering the athlete-coach relationship (Gilbert & Trudel, 2004; Teatro, Thompson, Kulinna, Van Der Mars, & Kwan, 2017).

Also, a study conducted by Siekanska, Blecharz, and Wojtowicz (2013), demonstrated that athletes reported excessive criticism as a behavior in the coach-athlete interactions that inhibited their athletic development and progress. In fact, it is well known that critical attitudes from meaningful figures play a crucial role in mental health (e.g., Brewin, Andrews, & Furnham, 1996; Frazer, Fite, Stone, & Clinkenbeard, 2018;

✉ Sara Oliveira
sara.oliveira.uc@gmail.com

¹ CINEICC – Center for Research in Neuropsychology and Cognitive Behavioural Intervention, Faculty of Psychology and Educational Sciences, University of Coimbra, Rua do Colégio Novo, 3000-115 Coimbra, Portugal

² Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal

Han & Shaffer, 2014), as they are consistently linked to depression and anxiety (McLeod, Weisz, & Wood, 2007; Wood, McLeod, Sigman, Hwang, & Chu, 2003). Meaningful figures that criticize and minimize the individual's feelings and behaviors may also influence the individual's emotion regulation skills, promoting self-criticism (Koestner, Zuroff, & Powers, 1991; Lee, Siegle, Dahl, Hooley, & Silk, 2015). Indeed, there is evidence that self-criticism is the result of the individual internalizing criticism from others (e.g., Brewin, Andrews, & Furnham, 1996). Individuals' perception of others' attitudes towards them ('reflected appraisals') determine which attitudes are internalized and become part of the self-concept (Brewin, Andrews, & Furnham, 1996). Therefore, critical attitudes from meaningful figures have been positively associated with indicators of psychopathology (Brewin, Andrews, & Furnham, 1996; Frazer, Fite, Stone, & Clinkenbeard, 2018; Han & Shaffer, 2014; Koestner, Zuroff, & Powers, 1991; Lee, Siegle, Dahl, Hooley, & Silk, 2015).

Although there has been a growing interest in the coach–athlete relationship over the past decade, there are few studies on a relationship based on perceived criticism. In fact, the interest in the coach–athlete relationship has been accompanied by a network of theoretical frameworks and measurement tools, which in part have been derived from psychosocial scientific disciplines into the context of sport (Poczwadowski, Barott, & Jowett, 2006). Initially, the dynamic between coaches and athletes was largely examined from a leadership perspective. For example, Chelladurai (1984) developed The Leadership Scale for Sport, which comprises 40 items that are divided into 5 subscales: Training and Instruction, Democratic Behavior, Autocratic Behavior, Social Support, and Positive Feedback. However, more recently, relationship models and other related approaches more focused on the nature of the coach–athlete relationship have been presented. For example, Jowett and Ntoumanis (2004) developed The Coach–Athlete Relationship Questionnaire, which measures the positive aspects of coaches' and athletes' emotions (Closeness); cognitions (Co-orientation) and behaviors (Complementarity). Bartholomew, Ntoumanis, and Thøgersen-Ntoumani (2010) developed the Controlling Coach Behaviors Scale, a self-report measure designed specifically to assess athletes' perceptions of controlling coach behaviors from the perspective of the Self-Determination Theory. This scale comprised four factors: controlling use of rewards, negative conditional regard, intimidation and excessive personal control. Despite the existence of reliable instruments that assess the coach–athlete relationship, to our knowledge there is no scale that specifically measures the perception that an athlete has of their coach's critical attitudes towards their performance and ability. This is especially relevant considering calls for advancing research on the coach–athlete interactions from the perspective of the athlete (Siekanska, Blecharz, & Wojtowicz, 2013). In this qualitative study, athletes reported that excessive criticism

from the coach inhibits their athletic development and progress. Taking into account the crucial role of a coach in the psychological development of the athlete (Norman & French, 2013), and the harmful consequences of perceiving high critical attitudes from meaningful figures (Frazer, Fite, Stone, & Clinkenbeard, 2018; Lee, Siegle, Dahl, Hooley, & Silk, 2015), it seems important to explore the perceptions that athletes have on their coach's critical attitudes.

The current research aimed to develop and validate a scale, for the Portuguese population, that measures athletes' perceptions of their coach's critical attitudes: The Athletes' Perceptions of Coach-related Critical Attitudes Scale (APoCCAS). This study was divided in phases: first, a pool of items that captured the athletes' perceptions of coach-related critical attitudes was generated, and, the factorial structure of the scale in a first sample, was explored via a principal components analysis. Then, it was necessary to confirm and cross-validate the findings principal components analysis using confirmatory factor analysis with two independent samples of athletes. Also, statistical tests were used to assess APoCCAS' psychometric characteristics (internal consistency, composite reliability, and average variance extracted, which tested convergent validity). Furthermore, external validity was tested through correlations between this new scale and self-criticism, self-reassurance, anxiety and depressive symptoms. It was hypothesized that APoCCAS presented positive associations with indicators of psychopathology (self-criticism, anxiety, and depression) and a negative correlation with self-reassurance (an indicator of mental health).

Material and Methods

Sample Recruitment and Participants

The present study's procedures respected all ethical and deontological requirements inherent to scientific research and the study was approved by the Ethical Board of the Faculty of Psychology and Education Sciences of the University of Coimbra.

After the development of the final version of the scale, with the aim of examining the factorial structure of the scale, a first sample was collected. An invitation to participate in the study was electronically sent through a popular social network platform (Facebook) to potential participants. Attached to the invitation was detailed information regarding the purpose and procedures of the study, voluntary and anonymous character of the participation, and the link that would redirect the participant to the online informed consent and survey composed of demographic data and the APoCCAS (through GoogleForms). Participants accepted to participate, signed the informed consent and completed general background information before answering to the APoCCAS.

Then, two additional samples were additionally collected in order to perform a confirmatory factor analysis. Participant's recruitment followed the same procedures described above. These samples were collected in two different time periods, using two different internet links. The first link comprised the informed consent and a protocol with sociodemographic data, the APoCCAS, and relevant self-reported measures to examine the validity in relation to external variables (Forms of Self-Criticizing & Self-Reassuring Scale and Depression, Anxiety and Stress Scales-21). The second link comprised sociodemographic data and the APoCCAS (to cross-validation procedures).

All individuals ($n = 567$) who accepted to take part in this study provided their written informed consent before answering an online version of self-report measures. However, considering the aims of the present study, the database was cleaned to exclude: (a) participants who completed the survey but were not athletes ($n = 9$); (b) participants younger than 18 ($n = 23$). The final samples 1, 2 and 3 were composed of 107, 214 and 214 athletes, respectively.

In this sense, this study comprised three independent samples, which makes a total of 535 Portuguese adult athletes. We assumed a 10:1 ratio (i.e., ten subjects for each parameter to be estimated), as suggested by Kline (2016). The first sample of the study was used to perform a Principal Components Analysis. In order to confirm and cross-validate the findings of the principal components analysis, the two remaining samples were used. The first sample was composed of 107 athletes (52 males and 55 females) with a mean age of 24.92 ($SD = 6.97$). Regarding sports data, the athletes presented a mean of 11.63 ($SD = 6.61$) years of practice, and competed in regional ($n = 21$), national ($n = 53$), and international ($n = 33$) levels. The second sample comprised 214 athletes (90 males and 124 females) with a mean age of 22.55 ($SD = 4.36$). Concerning sports data, participants presented an average of 11.53 ($SD = 4.99$) years of practice, and competed in regional ($n = 63$), national ($n = 146$), and international ($n = 5$) levels. Finally, the third sample was also composed of 214 athletes (102 males and 112 females), with a mean age of 22.13 ($SD = 5.75$). In this sample, athletes presented a mean of 10.73 ($SD = 5.52$) years of practice and also competed in regional ($n = 46$), national ($n = 138$), and international ($n = 14$) levels. In all three samples athletes practiced a variety of sports, such as basketball, beach soccer, futsal, handball, korfbal, soccer, volleyball, water polo, and so on.

Procedures

Development of the Item Pool

The first step of the development of this scale corresponded to the generation of pool of items by the authors of the manuscript, based on literature review.

Literature has highlighted the importance of the coach on performance, physical and psychological development of athletes (Davis, Appleby, Davis, Wetherell, & Gustafsson, 2018; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016; Schinke, Stambulova, Si, & Moore, 2017), and the impact of criticism on individual's mental health (Brewin, Andrews, & Furnham, 1996; Frazer, Fite, Stone, & Clinkenbeard, 2018; Han & Shaffer, 2014; McLeod, Weisz, & Wood, 2007; Wood, McLeod, Sigman, Hwang, & Chu, 2003). The authors discussed a definition on the attributes and characteristics of the desired construct (athletes' perception of coach-related critical attitudes) and developed fourteen items in Portuguese Guidelines for item wording (Clark & Watson, 1995) were closely followed to maximize their clarity and specificity. The items were generated in accordance with the principles of over-inclusiveness (i.e., the authors sampled a sufficient breadth of content and wrote more items than necessary to assess the intended construct), basic principles of writing (i.e., appropriate and understandable language, avoiding expressions pertaining to a specific sport to broaden the applicability of the questionnaire across sports).

In a second step, an expert panel comprised of ten international research experts of Clinical Psychology and/or Sport Psychology, were invited to appreciate the pool of the items. The experts were asked to specify whether an item is necessary for operating a construct in a set of items. They were asked to score each item from 1 to 3, "not necessary; useful but not essential; and essential". Therefore, under the quantitative content validity method, confidence is maintained in selecting the most important and correct content in a measure that is than quantified by the content validity ratio (CVR). The numeric value of content validity ratio was determined in accordance with Lawshe (1975). According to Lawshe (1975), the value of CVR needs to be bigger than .62 for the item to be accepted. As a result, four items were deleted and the final version of the scale comprised ten items to evaluate athletes' perceptions of coach-related critical attitudes.

Finally, a pilot test was conducted to assure the comprehensibility and adequacy of the items. Therefore, the ten items were administered to a convenience sample of 10 athletes (5 females and 5 males, who practiced different sports), not included in this study's samples, who approved all items. Each item was scored on a 5-point scale (1 = "Completely Disagree"; 2 = "Disagree"; 3 = "Neither agree nor disagree"; 4 = "Agree"; 5 = "Completely Agree"), since literature has suggested that five-point scale appears to be less confusing and increases the response rate of the subjects (Devlin, Dong, & Brown, 1993; Revilla, Saris, & Krosnick, 2014). In this scale, higher scores indicate higher levels of coach-related critical attitudes perceived by athletes.

Measures

The athletes were asked about *general demographic data* (sex, age) and *sport-specific information* (type of sports they competed in, competitive level, and time competing in years) and completed the *Athletes' Perceptions of Coach-related Critical Attitudes Scale* (APoCCAS) previously described. Sample 2, in addition to demographic data, sport-specific information, and the APoCCAS, also completed the following self-reported instruments were used in order to contribute to the study of the validity of APoCCAS:

Forms of Self-Criticizing & Self-Reassuring Scale (FSCRS; Gilbert, Clarke, Hempel, Miles, & Irons, 2004; Portuguese Version by Castilho, Pinto-Gouveia, & Duarte, 2015) FSCRS is a 22-item scale designed to assess participants' critical and self-reassuring responses when confronted with failures or setbacks. This scale comprises three subscales which measure: (1) inadequate-self, focused on feelings of inferiority and inadequacy; (2) hated-self, characterized by feelings of disgust and self-punishment; and (3) self-reassurance, to assess the ability to self-reassure. Participants were asked to answer all items following the statement "When things go wrong for me..." in a 5-point scale (0 = "Not at all like me" to 4 = "Extremely like me"). All subscales presented good psychometric properties in the original version (Cronbach's alphas ranged between .86 and .90) and the Portuguese version (Cronbach's alphas ranged between .86 and .96). For the purpose of this study, the self-criticism (calculated from the sum of inadequate-self and hated-self subscales as suggested by Halamová et al., 2018) and the self-reassurance dimensions of the scale were used, presenting Cronbach's alphas of .91 and .87, respectively.

Depression, Anxiety and Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995; Portuguese Version by Pais-Ribeiro, Honrado, & Leal, 2004) DASS-21 assesses depression, anxiety, and stress symptoms. Respondents were asked to indicate how frequently they experienced such symptoms over the previous week on a 4-point scale (ranging from 0 = "Did not apply to me at all" to 3 = "Applied to me very much, or most of the time"). In the current study, only depression and anxiety scales were used. These subscales were found to have adequate internal consistencies in both the original validation study and in the Portuguese validation study (with Cronbach's alphas of .85 and .74 in depression and anxiety subscales, respectively). In the current study, the anxiety and depression subscales presented a Cronbach's alpha of .87 and .89, respectively.

Statistical Analyses

Following the collection of data, it was transferred into SPSS Statistics (v.22; IBM Corp, 2013). In sample 1, normal

distribution of items was confirmed through coefficients of skewness and kurtosis ($|Sk| < 3$ and $|Ku| < 10$) (Kline, 2016). The multivariate outliers of the items were assessed by the Mahalanobis distance (D^2). Descriptive statistics were conducted to explore the sample's characteristics. The factorial structure of the APoCCAS was explored through a Principal Component Analysis (PCA). The suitability of the data to conduct the analysis was confirmed through the Kaiser-Meyer-Olkin test and inter-item correlations. Factor retentions and loadings were based on suggestions by Howard's (2016) review on factor analytical procedures, which entailed eigenvalues above 1 and scree plot variance for factor retentions, minimum factor loading of .40. Item retention was also based on items with communalities higher than .40 and alpha values were considered reliable if equal to .70 or above (Lance, Butts, & Michels, 2006).

In samples 2 and 3, the normality of the distribution was verified through the distribution kurtosis and skewness for each item (Kline, 2016). The multivariate normality of the items was assessed by the Mahalanobis distance (D^2) and statistically by multivariate kurtosis in the form of critical ratio of kurtosis in Amos. Critical ratio of kurtosis < 5.0 indicates a multivariate normality (Byrne, 2010). The preliminary factorial structure was confirmed through a Confirmatory Factor Analysis (CFA) using the software AMOS (v. 22; IBM Corp, 2013) in two independent samples. The Maximum Likelihood estimation, which is robust against departures from multivariate normality was applied. A bootstrapping procedure of Bollen and Stine was used to obtain an accurate estimation of standard errors as reflected in p values and confidence intervals. Bootstrap samples were set at 250 and the bias-corrected confidence interval was set at the 95% confidence level (Nevitt & Hancock, 2001). The following goodness-of-fit indices were considered: normed chi-square (CMIN/DF), which indicate an adequate fit when it presents values below 5; the chi-square goodness-of-fit (which indicates that the model has a good fit to empirical data when non-significant, but is sensible to high sample sizes); the Comparative Fit Index (CFI) and the Tucker and Lewis Index (TLI), which indicate an adequate fit when above .90 (Hu & Bentler, 1999). The Standardized Root Mean Square Residual (SRMR) was also analyzed considering that values below .08 demonstrate an acceptable fit (Hu & Bentler, 1999). The local adjustment of the model was evaluated by the items' individual reliability and standardized factor weights, with values of standardized regression weights equal to or above .50 and squared multiple correlations equal to or above .25 (Marôco, 2010).

The other APoCCAS' psychometric properties were further examined through additional analyses. Internal consistency was analyzed through Cronbach's alpha and composite reliability, with values above .70 indicating acceptable reliability (Kline, 2016; Fornell & Larcker, 1981). To examine

the APoCCAS' convergent validity, the average variance extraction (AVE) was calculated; this indicator should be above .50 (Fornell & Larcker, 1981). APoCCAS' correlations with external variables (other relevant constructs) were analyzed by Pearson's correlation coefficients (Cohen, Cohen, West, & Aiken, 2003). The analysis of the magnitudes of the results followed the recommendations of Cohen, Cohen, West, and Aiken (2003).

Cross-validation procedures were used in order to study the adequacy of model replication. A multi-group CFA was also conducted in order to assess cross-validity. More specifically, to evaluate the replication of the model, a cross validation technique using a multi-group analysis with two equivalent samples ($n_{\text{testing sample}} = 214$; $n_{\text{validation sample}} = 214$) was used. Invariance was assessed testing two models: an unconstrained model, testing if the structure of the scale was invariant, with no measurement parameters constrained to be equal; and, a measurement weights model (factor loadings constrained to be equal). It was considered invariant when the added restriction did not lead to a worse model fit. Given that the χ^2 difference test is highly sensitive to sample size, statistical differences between models were assessed through the difference between Comparative Fit Indices (ΔCFI), where a value equal to or lower than .01 indicates strong invariance (Cheung & Rensvold, 2002).

Results

Preliminary Analysis

A preliminary analysis on APoCCAS's items was performed on the data in order to scan for evidence of non-normality, univariate and multivariate outliers, and patterns of missing data. No missing values were found.

In sample 1, absolute values of skewness varied from 0.29 (item 9) to 0.71 (item 4), and absolute values of kurtosis ranged from -1.35 (item 1) to 3.46 (item 4), which indicate that data presented a normal distribution (Kline, 2016). Also, multivariate outliers were not detected. In sample 2, normal distribution of items was confirmed through coefficients of skewness, with values ranging from .12 (item 1) to .90 (item 4), and kurtosis values ranging from -1.02 (item 9) to .61 (item 4). However, results revealed that data violated the normality assumption ($c.r. = 16.05$; Byrne, 2010). Based upon the Mahalanobis distance statistics, three multivariate outliers were identified from the sample. Nevertheless, three outliers were detected, but after confirming that there were no significant differences in results with and without outliers, they were maintained in the sample (Hair, 2010). Also, in sample 3 normal distribution of items was confirmed through coefficients of skewness, with values ranging from 0.30 (item 9) to 1.20 (item 7), and kurtosis values ranging from -1.08 (item 9) to

.81 (item 7). Results also revealed that data violated the normality assumption ($c.r. = 19.33$; Byrne, 2010). Based upon the Mahalanobis distance statistics, five multivariate outliers were identified from sample 3, and the procedure was the same (outliers were maintained).

Principal Components Analysis

In sample 1, data were analyzed using PCA in SPSS.22 to explore the factorial structure of the scale ($N = 107$). Results from the conducted PCA showed that the Kaiser Meyer-Olkin test (0.86) and the Bartlett's sphericity test ($\chi^2_{(45)} = 604.633$; $p < .001$) demonstrated the adequacy of the data. This PCA also identified two factors with eigenvalues above 1 (factor one accounted for 53.45% of the variance and factor two accounted for 12.67% of the variance). These factors accounted for 66.12% of the cumulative variance of the scale. Given that the second factor only explained 12.67% of the variance and that the analysis of loadings from the component matrix indicated that all 10 items are related in their majority to the first factor, only this factor was retained. A Direct Oblimin rotation forcing a one-factor solution was thus conducted. This factor explained 53.45% of the scale's variance and all items presented communalities and factor loadings above .40 (see Table 1).

Confirmatory Factor Analysis

A Confirmatory Factor Analysis (CFA) of APoCCAS was performed in two independent samples to examine and confirm the scale's structure and adequacy. In both samples, the Maximum Likelihood estimation was applied. A bootstrapping procedure of Bollen and Stine was applied to adjust the p value of the chi-square statistic. Bootstrap samples were set at 250 and the bias-corrected confidence interval was set at the 95% confidence level (Nevitt & Hancock, 2001). For Sample 1, the indices indicated that the model did not adjust to data adequately ($X^2_{(35)} = 250.43$, $p < .001$; B-S $p = .004$; CMIN/DF = 7.16; CFI = .80; TLI = .74; SRMR = .08). Therefore, modification indices (MI) analysis was performed. Results suggested that the inter-correlation of pairs of error terms (8–9; 9–10; 8–10) would benefit the model fit (MI > 25). In the case of this study, adding these error covariances was theoretically justified given the similar content of the items. This resulted in an improvement of the model fit to acceptable values ($X^2_{(32)} = 94.45$, $p < .001$; CMIN/DF = 2.95; CFI = .94; TLI = .92; SRMR = .05). The analysis of local adjustment indices revealed that all items presented SRW values above .50 and SMC values above .25. The APoCCAS seems to present both adequate global and local adjustments (see Table 2). This model was run in sample 2, and the adjustment indices also indicated an adequate adjustment to data ($X^2_{(32)} = 121.98$, $p < .001$; B-S $p = .004$; CMIN/

Table 1 Component Matrix of the APoCCAS (N = 107)

APoCCAS item	Factor 1	h^2
1. I feel that my coach expects me to be perfect.	.67	.44
2. The standards/goals that my coach establishes for me are excessive.	.71	.50
3. Only an outstanding performance is enough for my coach.	.74	.54
4. My coach never tries to understand my mistakes.	.72	.52
5. I struggle to satisfy my coach's expectations.	.73	.53
6. I feel that my coach expects more from me than I can give.	.67	.44
7. My coach does not tolerate mistakes.	.74	.55
8. My coach gets upset when I fail in something.	.82	.67
9. I realize that my coach gets anxious and/or angry when I fail.	.74	.55
10. My coach is tough and critical when I do not meet my goals.	.77	.59

Note. h^2 = communalities

DF = 3.81; CFI = .92; TLI = .90; SRMR = .06). Therefore, the unifactorial structure of the APoCCAS was thus confirmed.

Cross-Validity

Cross-validation procedures were used in order to study model replication. Table 3 presents a summary of goodness-of-fit indices to measure cross-validity, using samples 2 and 3. The baseline unconstrained model tested the structure of the APoCCAS across samples. Results showed an acceptable model fit (CFI = .93), indicating that the one-factor structure model fitted the data well in both samples. Subsequently, a measurement weights model was tested with factor loadings constrained to be equal across groups. This model showed an acceptable model fit (CFI = .93). When compared to the baseline unconstrained model, no significant changes occurred (Δ CFI = .004), indicating that the factor loadings were invariant across samples (see Table 3). These results demonstrated the model's invariance, indicating that the factorial structure of the scale was stable in two independent samples.

Psychometric Properties

The psychometric properties of the scale were analyzed in sample 2. The APoCCAS presented a Cronbach's alpha of .89, revealing a good internal consistency (Kline, 2016). The removal of any of these items would not result in an increase of the internal consistency of the scale (see Table 2). The value for composite reliability was .89, which indicated that the APoCCAS presented construct reliability (Fornell & Larcker, 1981) and the value of average variance extracted was .66, which demonstrated that the scale presented convergent validity.

Validity in Relation to External Variables

Pearson correlation coefficients (Cohen, Cohen, West, & Aiken, 2003) were estimated to analyze the APoCCAS' relationship with other relevant variables. Results demonstrated

that athletes' perceptions of coach-related critical attitudes were positively and moderately associated with self-criticism and positive and poorly linked to other negative indicators of mental health (anxiety and depressive symptoms). Also this new measure was negatively and poorly, yet significantly, linked with self-reassurance (see Table 4).

Discussion

Athletes' perceptions of their social environment may have psychophysiological implications (Davis, Appleby, Davis, Wetherell, & Gustafsson, 2018). A substantial body of theoretical and empirical research has shown that the coach-athlete relationship is an important component in the life of athletes (Jowett & Ntoumanis, 2004; Siekanska, Blecharz, & Wojtowicz, 2013). Hence, literature has highlighted the need for more research in the area of coach-athlete relationship (e.g., Poczwardowski, Barott, & Jowett, 2006). At the same time, there is a scarcity of instruments in clinical sport psychology, namely regarding the psychological experience of athletes and their perceptions about coach's attitudes (Siekanska, Blecharz, & Wojtowicz, 2013). Given the known consequences of high critical attitudes from meaningful figures, the main aim of this study was to develop and validate a brief and reliable self-report instrument that allows for the assessment of the athletes' perceptions of coach-related critical attitudes.

The structure of the APoCCAS was first examined through a PCA, which demonstrated that the 10 items were relevant to measure athletes' perceptions of coach-related critical attitudes. Initial evidence of a unifactorial structure was further corroborated in another two independent samples. The global and local adjustment indices also indicated the suitability of the APoCCAS' factorial structure, taking into consideration the recommended standards. The convergent validity of the APoCCAS and its association with other constructs were also established, demonstrating that this scale is a reliable and valid

Table 2 APoCCAS' items' means (*M*), standard deviations (*SD*), Cronbach's alpha if item deleted, standardized regression weights (SRW), squared multiple correlations (SMC), and composite reliability (CR) (*N* = 214)

Items	<i>M</i> (<i>SD</i>)	APoCCAS		
		<i>α</i> if deleted	SRW	SMC
<i>α</i> total = .90; <i>CR</i> total = .89				
1. I feel that my coach expects me to be perfect.	2.81 (1.22)	.89	.59	.35
2. The standards/goals that my coach establishes for me are excessive	2.06 (1.00)	.88	.76	.58
3. Only an outstanding performance is enough for my coach	2.34 (1.08)	.88	.75	.56
4 My coach never tries to understand my mistakes	1.88 (0.88)	.88	.69	.47
5. I struggle to satisfy my coach's expectations.	2.20 (0.96)	.88	.65	.42
6. I feel that my coach expects more from me than I can give	2.19 (1.10)	.88	.68	.47
7. My coach does not tolerate mistakes	2.02 (1.00)	.87	.77	.60
8. My coach gets upset when I fail in something	2.40 (1.13)	.88	.63	.39
9. I realize that my coach gets anxious and/or angry when I fail.	2.72 (1.21)	.88	.55	.30
10. My coach is tough and critical when I do not meet my goals.	2.71 (1.21)	.88	.52	.27

measure of athletes' perceptions of coach-related critical attitudes. Moreover, cross-validation procedures showed the replicability of the measurement model in a different sample.

Correlational analysis demonstrated that APoCCAS was positively associated with self-criticism, and general psychopathology indicators, and negatively linked with self-reassurance, as expected. In fact, these findings are in accordance with other data found in other type of meaningful relationships (e.g., Gilbert, Clarke, Hempel, Miles, & Irons, 2004). For example, individuals' perceptions of parental criticism have been associated with the development of maladaptive mechanisms, such as self-criticism (Koestner, Zuroff, & Powers, 1991). This tendency to harshly criticize and punitively judge and scrutinize oneself (e.g., Shahar et al., 2012) develops from anxieties of losing the approval of harsh, detached, and punitive meaningful figures (Campos, Besser, & Blatt, 2010). This form of self-relating has been associated with emotional suffering and recognized as a risk factor for the development of psychopathology, such as anxiety and depressive symptoms (Campos, Besser, & Blatt, 2010; McIntyre, Smith, & Rimes, 2018). In this sense, these results are in accordance with previous studies in other contexts (e.g., parenting), but added new

data to literature, showing the same type of associations in the sport context. In the context of sport, self-criticism has also been an important predictor to explain athletes' well-being. More specifically, Pinto-Gouveia and Xavier (2010) demonstrated that self-criticism was positively associated with competitive anxiety and was the best predictor of perceived threat generated by competition. In contrast, self-reassurance comprises feelings of warmth and satisfaction with oneself while overcoming obstacles and failures (Gilbert, Clarke, Hempel, Miles, & Irons, 2004). However, there are no studies, to our knowledge, regarding the association between critical attitudes from the coach and athletes' self-reassurance. Given that self-reassurance has been recognized as a protective factor against psychopathology (e.g., Petrocchi & Couyoumdjian, 2016), and that criticism has been appointed as a behavior of the coach that inhibited athletes' athletic development and progress (Siekanska, Blecharz, & Wojtowicz, 2013), the association between APoCCAS and self-reassurance was explored. The negative association between these constructs seems to show that athletes who perceived their coach as very critical towards their behaviors and performance present lower levels of self-reassurance, an important indicator of mental

Table 3 Results of the Multi-Group Analysis across the Unconstrained Model and the Constrained Models of the APoCCAS (Testing sample: n = 214; Validation Sample: n = 214)

	χ^2	<i>df</i>	CFI	SRMR [95% CI]	$\Delta\chi^2$	Δdf	<i>p</i>	ΔCFI
Multi-group analyses								
Unconstrained model	17.61*	9	.93	.05 [.06/.09]	–	–	–	–
Measurement weights	1.12*	1	.93	.06 [.06/.08]	17.61	9	<.001	.004

Note. χ^2 = Chi-square goodness-of-fit statistic; *df* = degrees of freedom; CFI = comparative fit index;

SRMR = Standardized Root Mean Square Residual.

* χ^2 significant at *p* < .05

Table 4 APoCCAS' correlations with relevant variables (N = 214)

	<i>M</i>	<i>DP</i>	1.	2.	3.	4.
1. APoCCAS	16.21	5.72	–	–	–	–
2. Self-criticism (FSCRS)	8.12	5.40	.40***	–	–	–
3. Self-reassurance (FSCRS)	20.96	6.45	–.20**	–.43***	–	–
4. Anxiety (DASS-21)	3.64	4.56	.23**	.47***	–.32***	–
5. Depression (DASS-21)	3.57	4.48	.22**	.50***	–.45***	.73***

Note: APoCCAS = Athletes' Perceptions of Coach-related Critical Attitudes Scale- FSCRS = Forms of Self-Criticizing & Self-Reassuring Scale; DASS-21 = Depression, Anxiety and Stress Scales-21

** $p < .010$, *** $p < .001$

health. Indeed, our results support previous studies indicating the important role of coaches on the physical and psychosocial development of athletes (e.g., Jowett & Ntoumanis, 2004; Siekanska, Blecharz, & Wojtowicz, 2013) and seem to suggest that athletes who perceived their coaches as very critical towards their behaviors and performance presented higher levels of self-criticism, lower levels of self-reassurance, and more anxiety and depressive symptoms. These results, by demonstrating the importance of the coach's attitudes towards the athlete's performance on their mental health, are in line with prior research that had demonstrated that coaches play an important role on the physical and psychosocial development of athletes (e.g., Jowett & Ntoumanis, 2004; Siekanska, Blecharz, & Wojtowicz, 2013). The current study extends previous studies by showing that higher levels of a coach's critical attitudes as perceived by athletes were associated to vulnerability for the development of psychopathological symptoms (anxiety and depression). These attitudes from the coach were associated with a form of self-to-self relating that is based on the tendency to harshly criticize and punitively judge and scrutinize oneself. In contrast, lower levels of coach critical attitudes as perceived by athletes are associated with an adaptive form of self-to-self relating - self-reassurance. Self-reassurance reflects a positive and warmth attitude for the self, which allows compassion, acceptance, and understanding of flaws and failures as part of the human condition and promotes tolerance when facing vulnerability and fragility (Gilbert, Clarke, Hempel, Miles, & Irons, 2004).

This was the first study to develop and examine the structure and psychometric properties of a new tool measuring athletes' perceptions of their coach's critical attitudes in different samples of Portuguese adult athletes. The significant associations found between the APoCCAS and psychological distress open new possibilities for further examining the impact of coach's critical attitudes on other psychological processes, indicators of mental health, well-being, quality of life, and sport-related outcomes.

Our findings need to be, nonetheless, interpreted taking into consideration some limitations. Although the results pointed out to the validity of the APoCCAS, future research

should investigate the structure and reliability of this scale in other samples (e.g., adolescents), languages, countries and cultures. Given the cross-sectional nature of the data, we did not assess the temporal stability and predictive validity of the scale. Future studies should thus investigate these properties and determine the test-retest reliability and predictive validity of APoCCAS. Future studies ought to also explore whether these athletes' perceptions of coach-related criticism are in accordance with the coaches' perceptions.

Conclusions

In conclusion, APoCCAS is a valid, short and reliable measure of athletes' perceptions of coach-related critical attitudes and may constitute a valuable resource for both practice and research in sport psychology. This new scale can serve as a basis for the assessment of the quality of coach-athlete relationship and help identify potential associated risks for the mental health of athletes. Also, this study, by highlighting the associations between the athletes' perception of coach-related critical attitudes and other mental health indicators could create a space to alert the coaches to the effect of their attitudes on athletes' mental health. By increasing coaches' awareness about their critical and judgmental attitudes, this study can also guide changes towards the establishment of a better coach-athlete relationship (marked by warm, supportive and compassionate attitudes). This is especially relevant considering the importance that the coach-athlete relationship has on an athletes' mental health, sport performance, and on their career and personal development (Schinke, Stambulova, Si, & Moore, 2017).

Funding Funding Research by the author Sara Oliveira is supported by a Ph.D. Grant (SFRH/BD/143410/2019) sponsored by the Portuguese Foundation for Science and Technology (FCT), the Human Capital Operational Programme (POCH) and the European Union (EU).

Data Availability The datasets collected and analysed during the current study are not publicly available due to the present research is part of a wider research, thus the data is still being used by the authors.

Compliance with Ethical Standards

Declaration of Interest Statement The authors declare no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

This study was approved by the Ethical Board of the Faculty of Psychology and Education Sciences of the University of Coimbra.

Informed Consent Informed consent was obtained from all individual participants included in the study.

References

- Bartholomew, K. J., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2010). The controlling interpersonal style in a coaching context: Development and initial validation of a psychometric scale. *Journal of Sport & Exercise Psychology, 32*(2), 193–216. <https://doi.org/10.1123/jsep.32.2.193>.
- Brewin, C. R., Andrews, B., & Furnham, A. (1996). Self-critical attitudes and parental criticism in young women. *British Journal of Medical Psychology, 69*(1), 69–78. <https://doi.org/10.1111/j.2044-8341.1996.tb01851.x>.
- Byrne, B. M. (2010). *Structural equation modeling with Amos: Basic concepts, applications, and programming* (2nd ed.). Taylor and Francis Group.
- Campos, R. C., Besser, A., & Blatt, S. J. (2010). The mediating role of self-criticism and dependency in the association between perceptions of maternal caring and depressive symptoms. *Depression and Anxiety, 27*(12), 1149–1157. <https://doi.org/10.1002/da.20763>.
- Castilho, P., Pinto-Gouveia, J., & Duarte, J. (2015). Exploring self-criticism: Confirmatory factor analysis of the FSCRS in clinical and nonclinical samples. *Clinical Psychology and Psychotherapy, 22*(2), 153–164. <https://doi.org/10.1002/cpp.1881>.
- Chelladurai, P. (1984). Discrepancy between preferences and perceptions of leadership behavior and satisfaction of athletes in varying sports. *Journal of Sport Psychology, 6*(1), 27–41.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5.
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment, 7*, 309–319.
- Coakley, J. (2004). *Sports in society: Issues and controversies* (8th ed.). New York: McGraw-Hill.
- Cohen, J., Cohen, P., West, S., & Aiken, L. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). New Jersey: Lawrence Erlbaum Associates.
- Davis, L., Appleby, R., Davis, P., Wetherell, M., & Gustafsson, H. (2018). The role of coach-athlete relationship quality in team sport athletes' psychophysiological exhaustion: Implications for physical and cognitive performance. *Journal of Sports Sciences, 36*, 1–8. <https://doi.org/10.1080/02640414.2018.1429176>.
- Devlin, S. J., Dong, H. K., & Brown, M. (1993). Selecting a scale for measuring quality. *Marketing Research: A magazine of Management and Applications, 5*(3), 12–17.
- Fontana, M., & Fry, M. (2017). Creating and validating the shame in sport questionnaire. *Journal of Sport Behavior, 40*(3), 278–296.
- Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*, 39–50.
- Fraser-Thomas, J., & Côté, J. (2009). Understanding adolescents' positive and negative developmental experiences in sport. *The Sport Psychologist, 23*, 3–23. <https://doi.org/10.1123/tsp.23.1.3>.
- Frazer, A. L., Fite, P. J., Stone, K. J., & Clinkenbeard, J. (2018). Parental criticism moderates sibling influence on proactive and reactive aggression. *Journal of Child and Family Studies, 27*, 4025–4032. <https://doi.org/10.1007/s10826-018-1210-5>.
- Gilbert, W. D., & Trudel, P. (2004). Analysis of coaching science research published from 1970–2001. *Research Quarterly for Exercise and Sport, 75*(4), 388–399. <https://doi.org/10.1080/02701367.2004.10609172>.
- Gilbert, P., Clarke, M., Hempel, S., Miles, J. N. V., & Irons, C. (2004). Criticizing and reassuring oneself: An exploration of forms, styles and reasons in female students. *The British Psychological Society, 43*, 31–50.
- Hair, J. (2010). *Multivariate Data Analysis* (7th ed.). Prentice Hall.
- Halamová, J., Kanovský, M., Gilbert, P., Troop, N. A., Zuroff, D. C., Hermanto, N., Petrocchi, N., Sommers-Spijkerman, M., Kirby, J. N., Shahar, B., Krieger, T., Matos, M., Asano, K., Yu, F., Basran, J., & Kupeli, N. (2018). The factor structure of the forms of self-Criticising/Attacking& Self-Reassuring Scale in thirteen distinct populations. *Journal of Psychopathology and Behavioral Assessment, 40*(4), 736–751. <https://doi.org/10.1007/s10862-018-9686-2>.
- Han, Z. R., & Shaffer, A. (2014). Maternal expressed emotion in relation to child behavior problems: Differential and mediating effects. *Journal of Child and Family Studies, 23*, 1491–1500. <https://doi.org/10.1007/s10826-104-9923-6>.
- Howard, M. C. (2016). Review of exploratory factor analysis decisions and overview of current practices: What we are doing and how can we improve? *International Journal of Human-Computer Interaction, 32*(1), 51–62. <https://doi.org/10.1080/10447318.2015.1087664>.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. <https://doi.org/10.1080/10705519909540118>.
- Isoard-Gauthier, S., Trouilloud, D., Gustafsson, H., & Guillet-Descas, E. (2016). Associations between the perceived quality of the coach-athlete relationship and athlete burnout: An examination of the mediating role of achievement goals. *Psychology of Sport and Exercise, 22*, 210–217.
- Jowett, S., & Ntoumanis, N. (2004). The coach – Athlete relationship questionnaire (CART-Q): Development and initial validation. *Scandinavian Journal of Medicine & Science in Sports, 14*, 245–257. <https://doi.org/10.1046/j.1600-0838.2003.00338.x>.
- Karakoç, Ö., Yükses, S., Aydın, A. D., Karakoç, B., Yetiş, Ü., & Baydil, B. (2011). Milli takım düzeyindeki erkek judocuların kulüp antrenörlerinde gözlemledikleri etik dışı davranışlar. *Kastamonu Eğitim Dergisi, 19*(1), 321–323.
- Kline, R. B. (2016). *Methodology in the social sciences. Principles and practice of structural equation modeling* (4th ed.). Guilford Press.
- Koestner, R., Zuroff, D., & Powers, T. (1991). The family origins of adolescent self-criticism and its continuity into adulthood. *Journal of Abnormal Psychology, 100*, 191–197.
- Lance, C. E., Butts, M. M., & Michels, L. C. (2006). The sources of two commonly reported cutoff criteria. What did they really say? *Organizational Research Methods, 9*, 202–220. <https://doi.org/10.1177/1094428105284919>.
- Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel Psychology, 28*(4), 563–575. <https://doi.org/10.1111/j.1744-6570.1975.tb01393.x>.

- Lee, K. H., Siegle, G. J., Dahl, R. E., Hooley, J. M., & Silk, J. S. (2015). Neural responses to maternal criticism in healthy youth. *Social Cognitive and Affective Neuroscience*, *10*(7), 902–912.
- Lovibond, S., & Lovibond, P. (1995). *Manual for the Drepresion anxiety stress scales* (2nd ed.). Sydney: Psychology Foundation.
- Marôco, J. (2010). Análise de equações estruturais. Lisboa, Portugal: ReportNumber.
- McIntyre, R., Smith, P., & Rimes, K. A. (2018). The role of self-criticism in common mental health difficulties in students: A systematic review of prospective studies. *Mental Health and Prevention*, *10*, 13–27. <https://doi.org/10.1016/j.mhp.2018.02.003>.
- McLeod, B., Weisz, J., & Wood, J. (2007). Examining the association between parenting and childhood depression: A meta-analysis. *Clinical Psychology Review*, *27*(8), 986–1003.
- Mujika, I., Halson, S., Burke, L., Balague, G., & Farrow, D. (2018). An integrated, multifactorial approach to periodization for optimal performance in individual and team sports. *International Journal of Sports Physiology and Performance*, *13*, 538–561. <https://doi.org/10.1123/ijsp.2018-0093>.
- Nevitt, J., & Hancock, G. (2001). Performance of bootstrapping approaches to model test statistics and parameter standard error estimation in structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal*, *8*(3), 353–377. https://doi.org/10.1207/s15328007sem0803_2.
- Norman, L., & French, J. (2013). Understanding how high performance women athletes experience the coach-athlete relationship. *International Journal of Coaching Science*, *7*(1), 3–24.
- Pais-Ribeiro, J. L., Honrado, A., & Leal, I. (2004). Contribuição para o estudo da adaptação portuguesa das escalas de ansiedade, depressão e stress (EADS) de 21 itens de Lovibond e Lovibond. *Psicologia, Saúde e Doenças*, *5*(2), 229–239.
- Petrocchi, N., & Couyoumdjian, A. (2016). The impact of gratitude on depression and anxiety: The mediating role of criticizing, attacking, and reassuring the self. *Self and Identity*, *15*(2), 191–205. <https://doi.org/10.1080/15298868.2015.1095794>.
- Pinto-Gouveia, J., & Xavier, A. (2010). O (in)sucesso na competição desportiva: a influência da aceitação e do auto-criticismo. *Psychologica*, *52*(2), 361–386.
- Poczwardowski, A., Barott, J. E., & Jowett, S. (2006). Diversifying approaches to research on athlete–coach relationships. *Psychology of Sport and Exercise*, *7*, 125–142. <https://doi.org/10.1016/j.psychsport.2005.08.002>.
- Revilla, M., Saris, W., & Krosnick, J. (2014). Choosing the number of categories in agree-disagree scales. *Sociological Methods & Research*, *43*(1), 73–97. <https://doi.org/10.1177/0049124113509605>.
- Schinke, R. J., Stambulova, N. B., Si, G., & Moore, Z. (2017). International society of sport psychology position stand: Athletes' mental health, performance, and development. *International Journal of Sport and Exercise Psychology*. <https://doi.org/10.1080/1612197X.2017.1295557>.
- Shahar, B., Carlin, E., Engle, D., Hegde, J., Szepeswol, O., & Arkowitz, H. (2012). A pilot investigation of emotion-focused two-chair dialogue intervention for self-criticism. *Clinical Psychology and Psychotherapy*, *6*, 496–507.
- Siekanska, M., Blecharz, J., & Wojtowicz, A. (2013). The athlete's perception of coaches' behavior towards competitors with a different sports level. *39*(1), 231–242. <https://doi.org/10.2478/hukin-2013-0086>.
- Teatro, C., Thompson, M., Kulinna, P. H., Van Der Mars, H., & Kwan, J. Y. (2017). Coaching behaviors and stakeholders' views of coaches' efficacy. *International Journal of Sports Science and Coaching*, *12*(4), 452–460. <https://doi.org/10.1177/1747954117718094>.
- Wood, J., McLeod, B., Sigman, M., Hwang, W. C., & Chu, B. (2003). Parenting and childhood anxiety: Theory, empirical findings, and future directions. *Journal of Child Psychology and Psychiatry*, *44*(1), 134–151.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.