

Anxiety and Coping Strategies in Sport Contexts: A Look at the Psychometric Properties of Portuguese Instruments for their Assessment

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The purpose of this study was to examine the psychometric properties of the Portuguese versions of the Sport Anxiety Scale and of the Brief COPE, as well as of the Cognitive Appraisal Scale in Sport Competition–Threat Perception, namely regarding their factor structure validity and internal consistency. Participants were 550 male and female athletes of several sports, aged 15 to 35 years old ($M=19.8$; $SD=4.5$). Exploratory and Confirmatory Factor Analysis indicated that the instruments demonstrated good psychometric properties. In general, the measurement models provided a good fit to the empirical data and with the exception of some scales of the Brief COPE, the calculated Cronbach's α coefficient of reliability indicated adequate internal consistency for the three instruments. Overall, the results of the present study provided evidence for these instruments' validity and reliability, ultimately supporting their importance for research and psychological intervention in sport contexts.

Keywords: stress, anxiety, coping, assessment, psychometric properties

El objetivo de este estudio fue examinar las propiedades psicométricas de las versiones portuguesas del Sport Anxiety Scale, el Brief COPE, y el Cognitive Appraisal Scale in Sport Competition–Threat Perception, atendiendo a su validez de estructura factorial y consistencia interna. Los participantes fueron 550 atletas de ambos sexos y diversos deportes con edades entre 15 y 35 años ($M=19.8$; $DT=4.5$). Los análisis factoriales exploratorio y confirmatorio indicaron que los instrumentos mostraban buenas propiedades psicométricas. En general, los modelos de medida proporcionaron un buen ajuste a los datos empíricos y, con la excepción de algunas escalas del Brief COPE, el coeficiente de fiabilidad de Cronbach indicó una consistencia interna adecuada de los tres instrumentos. Globalmente los resultados de este estudio proporcionaron evidencia de la fiabilidad y validez de los citados instrumentos, reforzando su importancia para la investigación y la intervención psicológicas en contextos deportivos.

Palabras clave: stress, ansiedad, afrontamiento, evaluación, propiedades psicométricas

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In sport contexts, the concepts of stress, anxiety, and psychological pressure are increasingly recognized as being of key importance and a large number of studies have shown the influence of these concepts on athletes' performance, regardless of sex, age or competitive level (Cruz, 1997). Traditionally, researchers' interests in this field have been largely focused in the identification of individual differences and situational components generating competitive anxiety (e.g., Jones, Swain, & Cale, 1990), but in the last decades, this attention has been transferred to other related aspects, such as the role of cognitive appraisal and coping processes in the experience of anxiety (Cruz, 1996).

On the one hand, the cognitive appraisal of threat has attracted considerable interest because the significance of what is happening for the athletes' well-being (i.e., the way athletes perceive, «see» and interpret the competitive situation) underpins stress perceptions and anxiety emotional reactions (Barbosa, 1996; Cruz, 1996; Dugdale, Eklund, & Gordon, 2002; Dunn & Nielsen, 1993; Hammermeister & Burton, 2001; Jones & Hanton, 1996; Krane, Williams, & Feltz, 1992; Lazarus, 2000). Moreover, it is increasingly accepted that the impact of anxiety on sport performance depends largely on the coping strategies athletes use to manage stressful situations (Gould, Eklund, & Jackson, 1993; Gould, Finch, & Jackson, 1993; Holt & Hogg, 2002). Depending on whether the strategies are considered adaptative and functional, or, conversely, maladaptative and dysfunctional, they can mitigate or exacerbate the impact of stress (Crocker, Kowalski, & Graham, 1998).

In order to understand, as accurately as possible, the mechanisms by which psychological factors may influence performance, the measurement of several psychological variables important to the field must resort to sport-specific measurement instruments, whose reliability and validity are well established (Marsh, 1998). However, even though over the years, sport-specific instruments have largely supplanted more general measures of psychological functioning (Smith, Schutz, Smoll, & Ptacek, 1995), many sport psychology instruments lack further development and refinement, namely regarding their psychometric properties (Schutz & Gessaroli, 1993). In Portugal, this is all the more true as sport psychology specialists and researchers rely almost exclusively on assessment instruments developed in foreign countries, especially in the USA, with athletes from different cultures and socioeconomic realities.

With regard to competitive anxiety, among the instruments developed to assess trait anxiety, currently the Sport Anxiety Scale (SAS; Smith, Smoll, & Schutz, 1990) seems to be one of the most, if not the most widely used assessment instrument by researchers in this domain. The SAS yields both a total score and three subscale scores (Somatic Anxiety, Worry, and Concentration Disruption). Both exploratory and confirmatory factor analyses supported these dimensions in several different athlete samples, demonstrating SAS's good psychometric characteristics,

namely regarding its validity and internal consistency (see Smith *et al.*, 1990).

This instrument was translated and adapted into Portuguese by Cruz (1994), who conducted an exploratory factor analysis that resulted in rejection of seven items, thus reducing the scale from 21 to 13 items. Reliability studies showed that the whole scale and subscale internal consistency values were at an acceptable level (see Cruz & Viana, 1997). At the moment, this Portuguese version of the SAS is one of the most widely used instruments for measuring trait anxiety in the field of sport psychology in Portugal (e.g., Barbosa & Cruz, 1997; Cruz, 1997; Dias, Palha, & Cruz, 1997; Rodrigues, 1996). Nonetheless, despite its conceptual and psychometric strengths, further evidence for factorial validity is needed, especially if we consider that originally, SAS was developed in a different country, with athletes with different characteristics from Portuguese athletes.

Regarding the assessment of threat perception, the Cognitive Appraisal Scale in Sport Competition– Threat Perception (CASSC- TP), developed by Cruz (1994), can be considered one of the most useful instruments to assess primary appraisal (i.e., the personal relevance of a situation), determining what is «at stake» in the sport competition from the athlete's point of view, and, ultimately, generating stress and anxiety. This scale revealed good psychometric properties (see Cruz 1994, 1997), but its original version, consisting of seven items, was recently modified with the addition of an eighth item - «The competition causes me stress because there is the possibility that I suffer a serious injury.». Thus, it is not only opportune, but necessary to conduct a further review and confirmation of the (good) psychometric properties of this «modified» version.

Finally, on the topic of coping, research has primarily addressed the identification of cognitive and behavioral skills athletes use to deal with stress and anxiety. At this level, most of the existing measures were generated empirically, in an inductive way (e.g., Ways of Coping Checklist; Folkman & Lazarus, 1988), which resulted in loose scales, only post hoc connected with the theoretical concepts (Hudek-Knežević, Kardum, & Vukmirović, 1999).

In an attempt to avoid the abovementioned problems, Carver, Scheier, and Weintraub (1989) combined an empirical and a theoretical approach to develop an instrument that they named COPE, which would reflect a wide range of self-regulatory functions. More specifically, this instrument was based on some empirically tested scales (e.g., the Ways of Coping Checklist) and on the existing scientific literature, namely Lazarus' model of stress (Lazarus & Folkman, 1984) and a model of behavioral self-regulation (Carver & Scheier, 1990). The COPE inventory revealed sound psychometric properties (see Carver *et al.*, 1989), and is considered one of the best quantitative instruments for measuring coping in sport by some of the most renowned sport psychology researchers (e.g., Crocker *et al.*, 1998; Hardy, Jones, &

Gould, 1996; Gould, Finch, *et al.*, 1993), who argue that among the existing coping instruments, the COPE subscales reflect, in a more precise manner the coping categories that emerged in qualitative studies with elite athletes (e.g., Gould, Eklund, *et al.*, 1993; Gould, Finch, *et al.*, 1993). Additionally, evidence shows that the factorial structure of the COPE is stable, having been used to assess different aspects of coping, in different samples and with diverse stressors in non-sport settings (Carver *et al.*, 1993; Carver *et al.*, 1989; Carver & Scheier, 1994), but also under varying sport-related conditions (e.g., Eklund, Grove, & Heard, 1998; Giacobbi & Weinberg, 2000; Hammermeister & Burton, 2001).

Still, some limitations related to the redundancy and extension of the original instrument (which consists of 60 items!), and, concurrently, with the amount of time required to implement the evaluation protocol - a particularly relevant issue in the sport context -, led Carver (1997) to develop a brief version of the instrument - consisting only of 28 items - which the author entitled Brief COPE. In general, the factorial structure of the Brief COPE is consistent with the previously reported structure for the full inventory (see Carver, 1997).

However, to our knowledge, no investigations have been conducted yet in Portugal to examine the psychometric properties of the COPE Inventory or the Brief COPE, specifically regarding its use with athletes and/ or in situations related with sport competition.

Indeed, in Portugal, the few investigations that attempted to study the coping strategies and processes used by athletes (e.g., Barbosa, 1996) generally used a different instrument to measure coping - the Athletic Coping Skills Inventory-28 (ACSI-28; Smith, *et al.*, 1995) - which, despite being sport-specific and having good psychometric qualities, seems to raise conceptual problems that have significant implications for the measurement of coping in sport. Firstly, the development of ACSI-28 was not based on the assumptions of any paradigm or theory of the coping process (Crocker, *et al.*, 1998), or on an explicit psychological skills training theory (Murphy & Tammen, 1998). In this regard, Murphy and Tammen argue that, since the heterogeneity of its items makes it difficult to understand if they represent a specific coping strategy, this instrument would benefit if improvements were made in the conceptual clarity of various scales. Secondly, several items appear to measure the effectiveness of coping and not its use, which is why some researchers contend that merging the two concepts in a single instrument can artificially increase its statistical correlation and ultimately lead to the development of unreliable guidelines for the promotion of sport performance (e.g., Crocker *et al.*, 1998; Gaudreau & Blondin, 2002).

Based upon the above review, the purpose of this study was to examine the psychometric properties of the Portuguese versions of the SAS (Smith, *et al.*, 1990) and of the Brief COPE (Carver, 1997), as well as of the Cognitive Appraisal Scale in Sport Competition- Threat

Perception (Cruz, 1994, 1996). More specifically, we examined these three instruments' internal consistency and factorial validity using confirmatory factor analysis.

The rationale for choosing confirmatory factor analysis is related to the fact that, to analyze the internal structure - also known as intra-construct validity (Maia, 1996) - of a translated and adapted psychological evaluation instrument, Portuguese researchers usually resort to exploratory factor analysis (EFA), which, as we have seen, was the case with the three analyzed instruments. In fact, a large number of authors consider that EFA may not be the most appropriate procedure to assess the validity of a psychological instrument when there is an *a priori* relatively consistent idea of the better structure of an instrument, being the first step to be taken in the absence of a solid body of hypotheses to which the structure underlying the scale may be submitted (Fonseca & Fox, 2003; Maia, 1996; Santos & Maia, 2003).

In this context, the EFA aims to «... exploit a data set and determine the number and nature of the factors that contribute to the covariance between the examined variables.» (Fonseca & Fox, 2003, p.12). In contrast, Confirmatory Factor Analysis (CFA) is used when it is possible to define the hypothesis in advance with some security, and it is «... in essence, mainly hypotheticist, since it tests the hypothesis of a particular relationship between the common factors whose number and interpretation is given *a priori*» (Maia, 1996, p.47), with the purpose of examining how the data adjust to it. Specifically, EFA is considered more appropriate for scale development and CFA to determine its validity (Fonseca & Fox, 2003). Accordingly, provided that the purpose of the present investigation was to examine the psychometric characteristics of existing instruments, particularly with regard to its factorial validity, CFA was determined to be the best method.

Method

Participants

Participants were 550 athletes (31.1% female and 68.9% male), aged between 15 and 35 years old ($M=19.8\pm 4.5$), representing a variety of team and individual sports, specifically, handball, track and field, basketball, soccer, artistic gymnastics, rhythmic gymnastics, field hockey, roller hockey (quad), swimming, water polo, rowing, tennis and volleyball.

Instrumentation

The participants were given a battery of questionnaires comprised of a section for the collection of demographic data, the Portuguese versions of the SAS (Smith *et al.*, 1990) and of the Brief COPE (Carver, 1997), as well as the CASSC-TP (Cruz, 1994; Cruz & Viana, 1997).

Sport Anxiety Scale_p. The Portuguese version of the Sport Anxiety Scale (Smith *et al.*, 1990) was translated and adapted by Cruz and Viana (1997). This scale is a multidimensional measure of trait anxiety and was designed to measure individual differences in cognitive and somatic anxiety experienced by athletes. It is composed of 21 items designed to reflect possible responses to competitive situations and yields a total score and three distinct subscale scores: (a) somatic anxiety (9 items; e.g., “My body feels tense.”); (b) worry (7 items; e.g., “I have self-doubts.”); and (c) concentration disruption (5 items; e.g., “I have lapses of concentration during competition because of nervousness.”). For each item, respondents rate how they feel before or during a competitive situation, on a four-point scale which ranges from (1) not at all to (4) very much so. Results in each subscale are obtained adding the respective items; a total score of competitive anxiety can be obtained summing the three subscales scores. Thus, SAS’ scores range from 9 to 36 in somatic anxiety subscale, 7 to 28 in worry scale and 5 to 20 in concentration disruption scale.

Cognitive Appraisal Scale in Sport Competition– Threat Perception. The CASSC- TP (Cruz, 1994, 1996) was designed to assess primary cognitive appraisal, i.e., the individual’s initial interpretations about what is at stake in competitive situations for the individual, and instigates stress and anxiety. This instrument is an adaptation of similar instruments used by Lazarus and colleagues in other contexts (Lazarus & Folkman, 1984) and can be administered in a situational or dispositional format; in the present study, it was used in its dispositional version. The CASSC- TP is composed of 8 items and, for each item, respondents rate how each statement generally applies to each of them, on a five-point scale ranging from (1) not at all to (5) very much. Hence, the total score ranges from 8 to 40. Higher scores reflect the tendency to appraise competitive situation as more threatening or higher levels of threat to the ego, self-esteem, or personal well-being generated by competition.

Brief COPE_p (Cruz, 2003), the Portuguese version of the Brief COPE (Carver, 1997), is an abbreviated inventory of coping responses. It is composed of 28 items, and yields 14 subscales with two items per scale: (a) acceptance (e.g., “I’ve been learning to live with it.”); (b) active coping (e.g., “I’ve been taking action to try to make the situation better.”); (c) behavioral disengagement (e.g., “I’ve been giving up trying to deal with it.”); (d) denial (e.g., “I’ve been refusing to believe that it has happened.”); (e) humor (e.g., “I’ve been making jokes about it.”); (f) planning (e.g., “I’ve been thinking hard about what steps to take.”); (g) positive reframing (e.g., “I’ve been looking for something good in what is happening.”); (h) religion (e.g., “I’ve been praying or meditating.”); (i) self-blame (e.g., “I’ve been criticizing myself.”); (j) self-distraction (e.g., “I’ve turning to work or other activities to take my mind out of things.”); (k) substance use (e.g., “I’ve been using alcohol or other drugs to help me get through it.”); (l) using emotional support (e.g., “I’ve

been getting emotional support from others.”); (m) using instrumental support (e.g., “I’ve been getting help and advice from other people.”); and (n) venting (e.g., “I’ve been expressing my negative feelings.”). Response choices ranged from (1) I didn’t do this at all to (4) I did this a lot. Results in each subscale are obtained adding the respective item, thus ranging from 4 to 8 in each subscale. In the present study, Brief COPE_p was administered in a dispositional response format, with the intention of assessing coping style. Instructions for administration asked participants to bring to mind how they usually responded to problematic and stressful situations in their sport experience.

As mentioned earlier, in all these instruments the subscales were calculated by summing the items in each subscale. To deal with missing data, and following suggestions from the instruments’ authors (Carver, personal communication, 2004; Cruz, personal communication, 2004; Smith, personal communication, 2004), a mean item score for each scale was computed. Additionally, Smith suggested setting a criterion for how many items needed to have been completed in each subscale (e.g., in SAS, concentration disruption has only 5 items, so at least 3 items had to be completed); then, the mean-item scores were multiplied by the number of items on each scale to get an estimated total score for each scale; after consultation, Cruz and Carver recommended a similar procedure.

Procedures

Data were collected using a battery of questionnaires, along with an attached letter of presentation explaining the objectives and implications of the study, ensuring the voluntary nature of athletes’ participation. In order to guarantee confidentiality and anonymity of the data, a return envelope accompanied each questionnaire.

Global data analysis

To determine whether there is a good fit between the empirical data covariance matrix and the matrix that imposes the data a structure postulated by the theoretical «corpus» or the author’s substantive suggestions (proposed measure model), there are several measures of fit which reflect different aspects of this discrepancy (Maia, Almeida, Morais, & Garganta, 1997). Absolute fit indexes evaluate the degree to which the specified model reproduces the sample data. In the present study, absolute fit indexes included the chi-square (χ^2), the root mean squared error of approximation (RMSEA), and the standardized root mean squared residual (RMR_{st}). Incremental fit indexes measure the proportionate amount of improvement in fit when a target model is compared with a more restricted, nested baseline model (Hu & Bentler, 1999), and was evaluated with the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI).

The χ^2 has been described, not so much as a statistical test in a strict sense (Maia, *et al.*, 1997), but as an index that assesses the global fit of the sample data to the specified model (Dunn, Dunn, Wilson, & Syrotuik, 2000; Jöreskog & Sörbom, 1996). More specifically, this index analyses the discrepancy between the model-implied (i.e., the theoretical model) covariance matrix and the observed covariance matrix, testing the hypothesis that the proposed model is consistent with the covariance matrix of the examined data. A significant χ^2 indicates lack of satisfactory model fit, meaning the residual values are statistically different from zero, and it can be assumed the data differ from the theoretical model; thus, the lower the χ^2 value is, the better the distributions are fitted to the data (Fonseca & Fox, 2003; Santos & Maia, 2003). It is then expected that significance tests show the hypothesized model provided a good fit to the data with small chi-square values relative to the degrees of freedom and a nonsignificant p-value (Harlow, Burkholder, & Morrow, 2002; Maia, 1996).

However, the χ^2 value is positively related to sample size, namely for models with more than 200 cases. A large sample size could have too much power, suggesting that there is a significant difference between a model and the data (Harlow, *et al.*, 2002; Motl & DiStefano, 2002). In fact, some researchers argue that no restrictive model with positive degrees of freedom is able to fit real data, and such models will often be rejected by a formal test of significance with a sufficiently large size (e.g., Motl & DiStefano, 2002).

Accordingly, other indexes of fit were employed to assess model fit: the RMSEA and the RMR_{st} . The RMSEA represents closeness of fit of the model to the true population model (Maia *et al.*, 1997), analyzing the adjustment discrepancy between the observed and estimated matrices considering the degrees of freedom; in other words, it uses prediction and measurement errors for assessing the degree of fit between the hypothesized model and the real model (Burkholder & Harlow, 2003). The RMR_{st} is the average of the standardized residuals between the specified and obtained variance/covariance matrices (Motl & DiStefano, 2002). In both indexes, values less than 0.08 demonstrate reasonable and close fit, respectively, while values above 0.10 should be rejected; values approximating zero demonstrate exact fit of the model to the data (Hu & Bentler, 1999; Jöreskog & Sörbom, 1996).

Finally, we employed the CFI and TLI indexes to compare and evaluate the global fit of models. Both CFI and TLI are incremental fit indexes, and measure the proportionate improvement in fit of the specified model compared to two

structural models: a null or independent model (baseline) and a saturated model (Maia, 1996; Maia *et al.*, 1997; Motl & DiStefano, 2002). Both CFI and TLI values can be higher than one, with values above 0.90 demonstrating an acceptable fit; values exceeding 0.95 indicate a good fit (Hu & Bentler, 1999; Kenny & McCoach, 2003; Marsh & Jackson, 1999).

Statistical data analysis and related procedures were carried out using the Statistical Package for Social Sciences (SPSS) (version 12.0 for Windows), LISREL (version 8.5 for Windows) and MPLUS (version 3.0 for Windows).

Results

Sport Anxiety Scale_p

Regarding SAS, Smith and colleagues (1990) provided evidence attesting to its good psychometric properties, namely concerning this instrument's validity and reliability. Additionally, previous adaptation and validation studies of the Portuguese version of the SAS confirmed its factorial structure, and demonstrated adequate psychometric characteristics, with Cronbach's α of 0.84, 0.65 and 0.91 in the subscales of worry, concentration disruption and somatic anxiety, respectively (Cruz & Viana, 1997).

Moreover, as mentioned earlier, these studies resulted in a reduction of the number of items from 21 to 13, maintaining the original dimensions: worry (7 items), concentration disruption (3 items) and somatic anxiety (3 items). Thus, taking into consideration that the decision of Cruz and Viana regarding the reduction of other items was based exclusively on results of a principal components analysis, we decided to conduct a CFA of the original three factor structure: worry (items 3, 5, 9, 10, 13, 16, 18) concentration disruption (items 2, 6, 7, 14, 20), and somatic anxiety (items 1, 4, 8, 11, 12, 15, 17, 19, 21) (Figure 1).

Table 1 shows that the model provided a good fit to the empirical data. Indeed, despite the significant χ^2 – an anticipated result, since, as mentioned previously, the χ^2 statistic is sensitive to sample size - CFI and TLI values exceeded 0.90, revealing that the final structural model is fairly good in the sense of reproducing the population covariance structure. However, RMSEA and RMR_{st} indexes, in particular the former, assumed a slightly higher value than 0.08, generally considered the conventional threshold of a reasonable error of approximation. Thus, even though the overall model does not appear to be called into question by these results, especially in view of the good values of

Table 1
Goodness of fit indexes for the SAS_p

	χ^2	CFI	TLI	RMSEA	RMR_{st}
M^3_{21}	1456.247<.000	.95	.95	.11	.08

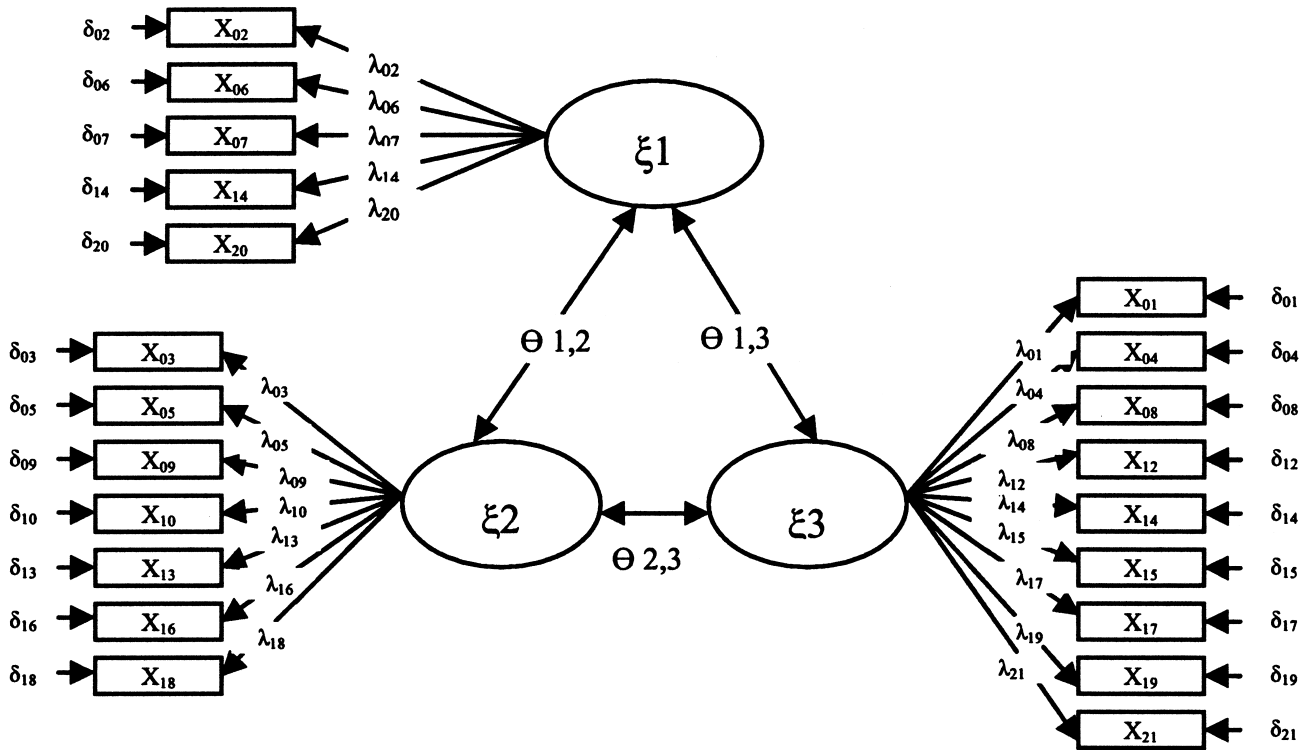


Figure 1. Measurement model of the SAS_p.

the examined global fit indexes, we believe they should receive further attention in future studies.

Furthermore, the correlation matrix of the factors of the SAS_p showed positive moderate correlations (ranging from 0.34 to 0.57); yet, those factors still proved to be independent. Additionally, Cronbach's α for all the SAS_p scales were greater than the recommended level of 0.70 (Nunnally, 1978), indicating a good internal reliability (Table 2).

In sum, it should be noted that the analysis of the factorial structure of the Portuguese version of the SAS provided further support for the multidimensional nature of competitive anxiety, as advocated by many experts in this field (e.g., Cruz, 1994, 1997; Gould & Krane, 1992; Martens, Vealey, & Burton, 1990). Indeed, the results of this CFA provided evidence in support of the notion that the measurement model exhibited a good global data fit to the empirical data, supporting the original factor structure proposed by Smith and colleagues

(1990), which, incidentally, was also supported in other adaptation and validation studies of the SAS, in countries like Norway (Abrahamsen, Roberts, & Pensgaard, 2006) or the Czech Republic (Repka, Man, Stuchlikova, & Hosek, 1993).

Cognitive Appraisal Scale in Sport Competition–Threat Perception

Concerning CASSC- TP, previous studies that sought to investigate the validity and reliability of this instrument in sport contexts, demonstrated its good psychometric properties (see Cruz, 1994, 1997). However, these investigations focused on the original version of the CASSC- TP, comprised of seven items. That is to say, strictly speaking, that the psychometric characteristics of this instrument are still not examined, for the reason that its current version includes an eighth item, related to the threat perception caused by the prospect of

Table 2
Interfactor correlation matrix and Cronbach's a reliability for the SAS_p

Factors	Worry	Concentration Disruption	Somatic Anxiety
Worry	1		
Concentration Disruption	.57	1	
Somatic Anxiety	.50	.34	1
All correlations are <.001			
Cronbach's α	.72	.88	.88

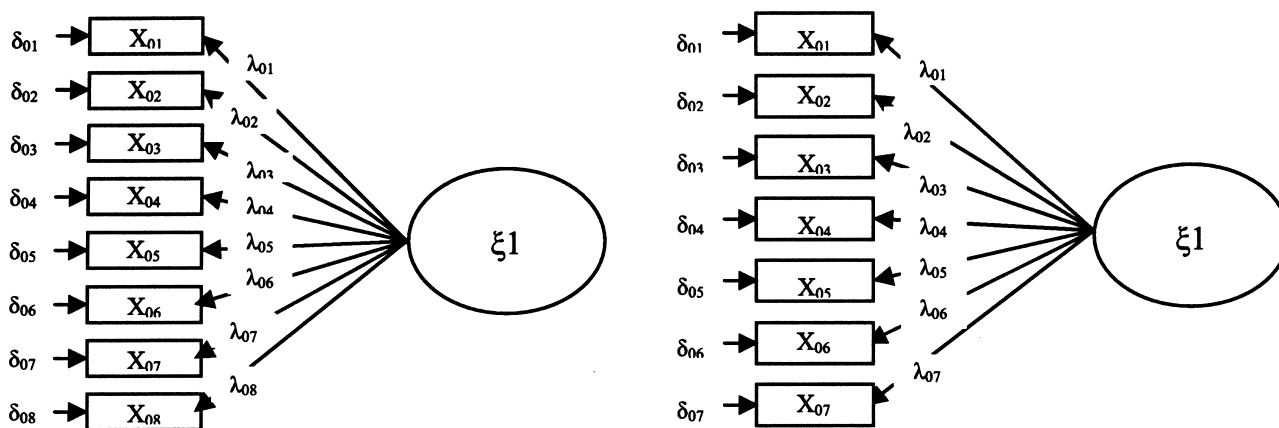


Figure 2. Measurement models for the CASSC- TP.

serious injury («Competition causes me stress because there is the possibility that I could suffer serious injury.»).

Thus, trying to fill this gap, we initially conducted an EFA with Varimax rotation. After Varimax rotation, which produced a solution with two factors (with *eigenvalues* of 4.04 and 1.00) explaining 63% of variance. Additionally, the first seven items of the scale loaded in the first factor, with loadings greater than an absolute value of 0.40 (0.76, 0.74, 0.75, 0.71, 0.71, 0.76 and 0.82), while the item that had been added *a posteriori* loaded isolate in the second factor, with a loading value of 0.97. Moreover, the internal consistency of the first factor was very high (Cronbach’s $\alpha=0.87$), with inter-item correlations ranging from 0.33 to 0.62.

In order to deepen the study of the psychometric properties of CASSC- TP, the next step would be to use CFA to examine the factor structure identified in the EFA presented earlier. However, given that two items per factor is generally considered the minimum necessary to create a psychometrically reliable measure, it would’t make sense to test the model suggested by the EFA, in which one of the factors consists of a single item. Furthermore, it was conceptually important to include the item in question («The competition causes me stress because there is a possibility that it could suffer serious injury.»), in that it could be a relevant indication of the perception of a kind of threat frequently present in competitive settings. Accordingly, we chose to examine the psychometric properties of the two models (i.e., with seven and eight items) (Figure 2).

Comparative analysis of goodness of fit of the two models revealed that there was clearly no benefit from the elimination

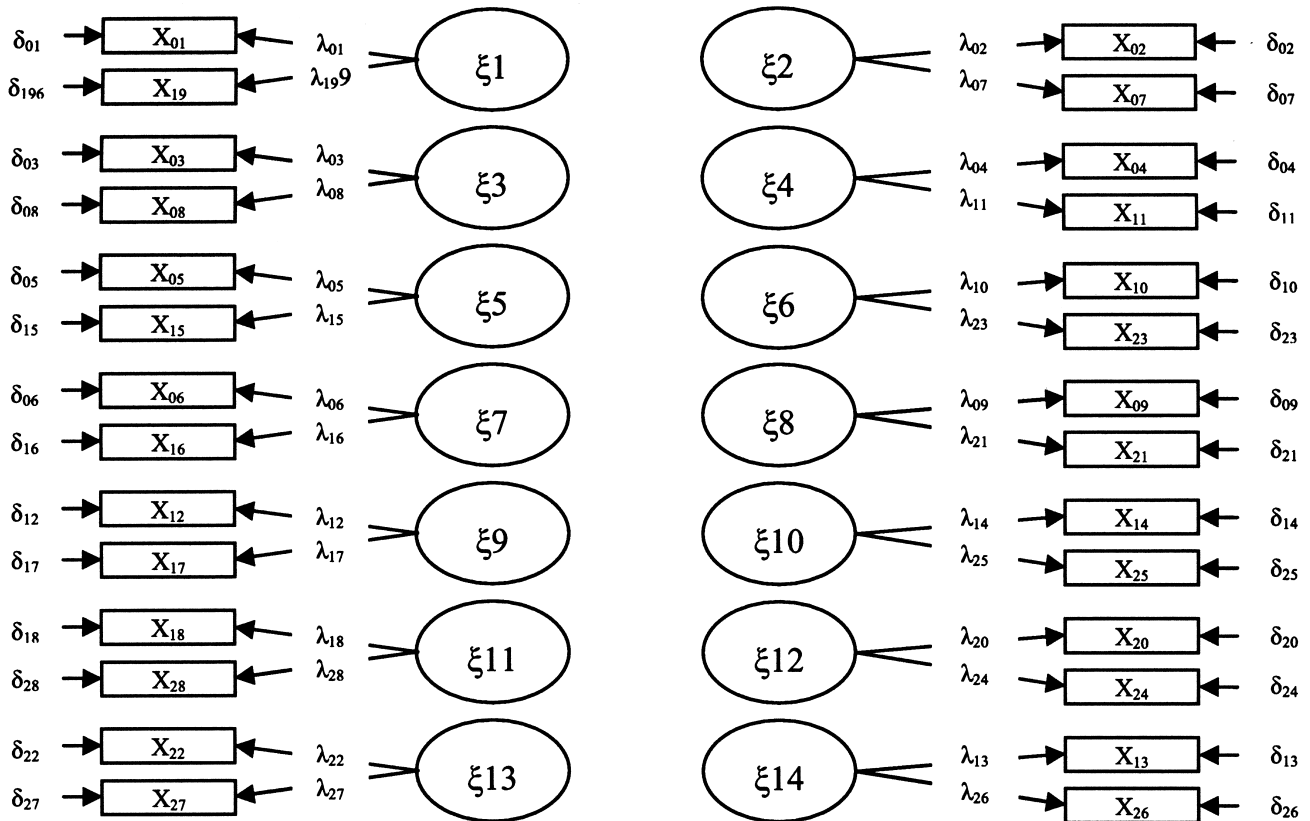
of item eight (Table 3). In reality, past the significant χ^2 (most likely due to the large sample size), both models equally demonstrated an adequate global fit to the empirical data. However, it should be noted that TLI was very close, but still less than the recommended cutoff value of 0.90. In addition, while RMS_{st} was clearly within acceptable values, RMSEA values for each of the models were higher than the accepted. As was the case of the SAS_p , we believe that even though these results do not call into question the quality of the overall fit of the data to the model, as shown by CFI and TLI, they should be taken into consideration in future studies.

Finally, the reliability analysis in the present study revealed a high internal consistency for both models (Cronbach’s $\alpha M^1_7 = 0.87$ and Cronbach’s $\alpha M^1_8 = 0.85$), clearly above the criterion value of 0.70 (Nunnally, 1978).

In conclusion, it seems there are no advantages in choosing a model composed of only seven items over the model with eight items, especially considering the conceptual relevance of the cognitive appraisal of threat athletes make about the possibility of suffering serious injuries. Indeed, the item that we have been referring to - «Competition causes me stress because there is the possibility that I could suffer serious injury.» – may be, as previously mentioned, particularly pertinent and relevant for evaluating threat perception in sports in which the type and intensity of physical contact (e.g., handball, football, rugby), or the characteristics and complexities of the task (e.g., gymnastics) increase the risk of injury. In this context, there seems to be enough, statistical and conceptual support to propose a structure consisting of eight items.

Table 3
Goodness of fit indexes of the two models for the CASSC- TP

	χ^2	CFI	TLI	RMSEA	RMR _{st}
M^1_8	156.7<.000	.92	.89	.11	.05
M^1_7	137.11<.000	.93	.89	.13	.05



NOTE: Due to lack of space, it is not possible to show the correlations between the latent variables in the pictogram.

Figure 3. Measurement model for the Brief COPE_p.

Brief COPE_p

As stated earlier, the Brief COPE (Carver, 1997) is a short measure of coping reactions, based on the COPE inventory (Carver *et al.*, 1989). The Brief COPE has a comparable factor structure to the full-length COPE inventory, which has good convergent and discriminate validity, good internal consistency, and modest test-retest reliability (Carver, 1997). In the present study, a CFA was conducted to examine the psychometric properties of the Portuguese version of this instrument (Figure 3).

Statistics of goodness of fit, shown in Table 4, indicate that the model in question fit the covariance matrix of the empirical data, with CFI and TLI greater than 0.90, while RMR_{st} and RMSEA were less than 0.08.

Correlations among the Brief COPE scales are displayed in Table 5. With very few exceptions, these correlations were not strong (even when inverse correlations between

conceptually opposite coping tendencies, such as acceptance and denial, were examined). In developing COPE inventory, Carver and colleagues (1989) also found that, in general, the factors were not strongly intercorrelated, in which respect they presented an explanation and an implication.

On the one hand, conceptually, the absence of high magnitude correlations between diverse factors suggested that people dealing with stressful experiences use different coping strategies simultaneously, “including instances of both sides of a mutually exclusive dichotomy such as acceptance and denial.” (Carver, *et al.*, 1989, p. 272). In pragmatical terms, empirically separable coping tendencies may imply that it should be possible to study their effects separately.

The Cronbach’s α indicated that although most factors demonstrated acceptable internal consistency (i.e., reliability coefficients were above 0.70; Nunnally, 1978) other factors demonstrated less-desirable reliability estimates (e.g., self-distraction, active coping, venting of emotions). The

Table 4
Goodness of fit indexes for the Brief COPE_p

	χ^2	CFI	TLI	RMSEA	RMR _{st}
M ¹⁴ ₂₈	441.23 p< 0.00	0,95	0.93	0,036	0,036

Table 5
Interfactor correlation matrix and Cronbach's a reliability for the Brief COPE_p

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1													
2	.14**	1												
3	.20***	.06	1											
4	.09*	-.14**	.19***	1										
5	.20***	.18***	.22***	.08	1									
6	.20***	.30***	.16***	.02	.72***	1								
7	.12**	-.18***	.24***	.23***	.08	-.001	1							
8	.24***	.25***	.25***	.11**	.27***	.30***	.04	1						
9	.18***	.38***	.09*	.03	.11*	.17***	-.05	.23***	1					
10	.12**	.43***	.09*	-.001	.14**	.22***	-.10*	.30***	.49***	1				
11	.20***	.14**	.11*	.13**	.09*	.15***	-.001	.20***	.36***	.27***	1			
12	.14**	.28***	.001	.008	.08	.19***	-.03	.24***	.34***	.35***	.24***	1		
13	.13**	.23***	.18***	.11**	.23***	.25***	.01	.29***	.27***	.22***	.12**	.15***	1	
14	.13**	.13**	.18***	.17***	.14***	.16***	.19***	.32***	.15**	.26***	.15***	.21***	.21***	1
α	.48	.41	.55	.73	.80	.73	.75	.32	.65	.55	.82	.57	.76	.66

1 – Self-distraction; 2 – Active coping; 3 – Denial; 4 – Substance use; 5 – Emotional support; 6 – Instrumental support; 7 – Behavioral disengagement; 8 – Venting of emotions; 9 – Positive reframing; 10 – Planning; 11 – Humor; 12 – Acceptance; 13 – Religion; 14 – Self-blame
 * $p < .05$; ** $p < .01$; *** $p < .001$

relatively low scores on some items may be partly due to the small number of items per factor. In fact, several researchers have claimed a minimum of three or four items per factor (e.g., Marsh & Jackson, 1999), to the detriment of the two items composing each factor of the Brief COPE.

In reality, Carver (1997) also reported low reliability estimates for some scales of the Brief COPE, since only six out of fourteen exceeded 0.70. Similar results were found in other investigations using Brief COPE or other versions of the COPE inventory (see Brissette, Scheier, & Carver, 2002; Carver *et al.*, 1989, 1993; Hudek-Knežević, *et al.*, 1999; Pensgaard, Roberts, & Ursin, 1999; Perczek, Carver, Price, & Pozo-Kaderman, 2000).

Accordingly, although investigation in the domain of coping in applied sport settings could benefit from the minimization of the amount of time and effort time demanded on the athletes, future investigations should consider increasing the number of items per factor of the Brief COPE, possibly including some of the items excluded by Carver (1997) in his original study.

Discussion and conclusions

In conclusion, the results of the CFAs demonstrated the satisfactory psychometric properties of the Portuguese versions of the SAS and of the Brief COPE, as well as of the CASSC- TP. Still, future research is warranted in order to further establish these three instruments' factorial validity and reliability, regarding, for example, the analysis of factorial invariance for sex, age, or culture, among other variables.

In any case, the results obtained demonstrate that we are in the presence of three potentially useful instruments for research and psychological intervention in sports contexts that may contribute to the clarification of the nature of the relationship between stress, anxiety and coping, and sport performance. In view of that, the use of these instruments in sport contexts is hereby recommended.

References

- Abrahamsen, F. E., Roberts, G. C., & Pensgaard, A. M. (2006). An examination of the factorial structure of the Norwegian version of the Sport Anxiety Scale. *Scandinavian Journal of Medicine & Science in Sports*, 16 (5), 358-363.
- Barbosa, L. G. (1996). *Stress, ansiedade e estratégias de confronto psicológico no andebol de alta competição [Stress, anxiety and psychological coping strategies in high level handball]*. Unpublished master's dissertation. Braga: University of Minho (Portugal).
- Barbosa, L. G., & Cruz, J. F. (1997). Estudo do stress, da ansiedade e das estratégias de confronto psicológico no andebol de alta competição [A study of stress, anxiety and psychological coping strategies in high level handball]. *Psicologia: Teoria, Investigação e Prática*, 2, 523-548.
- Brissette, I., Scheier, M. F., & Carver, C. S. (2002). The role of optimism in social network development, coping, and psychological adjustment during a life translation. *Journal of Personality and Social Psychology*, 82 (1), 102-111.
- Burkholder, G. J., & Harlow, L. L. (2003). An illustration of a longitudinal cross-lagged design for larger structural equation models. *Structural Equation Modeling*, 10 (3), 465-486.

- Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the Brief Cope. *International Journal of Behavioral Medicine*, 4 (1), 92-100.
- Carver, C. S., Pozo, C., Harris, S. D., Noriega, V., Scheier, M. F., Robinson, D. S., Ketcham, A. S., Moffat, F. L., Jr., & Clark, K. C. (1993). How coping mediates the effect of optimism on distress: A study of women with early stage breast cancer. *Journal of Personality and Social Psychology*, 65, 375-390.
- Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review*, 97, 19-35.
- Carver, C. S., & Scheier, M. F. (1994). Situational coping and coping dispositions in a stressful transaction. *Journal of Personality and Social Psychology*, 66, 184-195.
- Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, 56, 267-283.
- Crocker, P. R., Kowalski, K. C., & Graham, T. R. (1998). Measurement of coping strategies in sport. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 149-161). Morgantown WV: Fitness Technology Inc.
- Cruz, J. F. (1994). *Stress, ansiedade e rendimento na competição desportiva: A importância das competências e processos psicológicos* [Stress, anxiety and performance in sport competition: The importance of psychological skills and processes]. Unpublished doctoral dissertation. Braga: University of Minho (Portugal).
- Cruz, J. F. (1996). *Stress, ansiedade e rendimento na competição desportiva* [Stress, anxiety and performance in sport competition]. Braga: Research Centre of Studies in Education and Psychology, Institute of Education and Psychology, University of Minho (Portugal).
- Cruz, J. F. (1997). Stress, ansiedade e competências psicológicas em atletas de elite e de alta competição: Relação com o sucesso desportivo [Stress, anxiety and psychological skills in elite and high level athletes: Its relation with sport success.]. In J. Cruz, & A. R. Gomes (Eds.), *Psicologia Aplicada ao Desporto e à Actividade Física: Teoria, Investigação e Intervenção* [Psychology Applied to Sport and Physical Activity: Theory, Investigation and Intervention] (pp. 111-140). Braga: University of Minho and Portuguese Psychologists Association (Portugal).
- Cruz, J. F., & Viana, M. F. (1997). Escala de Ansiedade do Desporto: Características e validade da adaptação portuguesa [Sport Anxiety Scale: Characteristics and validity of the Portuguese version.]. In J. Cruz, & A. R. Gomes (Eds.), *Psicologia Aplicada ao Desporto e à Actividade Física: Teoria, Investigação e Intervenção* [Psychology Applied to Sport and Physical Activity: Theory, Investigation and Intervention] (pp. 349-365). Braga: University of Minho and Portuguese Psychologists Association (Portugal).
- Dias, A., Palha, A., & Cruz, J. F. (1997). Aspectos psicológicos nas lesões desportivas: Um estudo com atletas de diferentes níveis competitivos [Psychological aspects in sport injuries: A study with athletes from different competitive levels. In J. Cruz, & A. R. Gomes (Eds.), *Psicologia Aplicada ao Desporto e à Actividade Física: Teoria, Investigação e Intervenção* [Psychology Applied to Sport and Physical Activity: Theory, Investigation and Intervention] (pp. 235-254). Braga: University of Minho and Portuguese Psychologists Association (Portugal).
- Dugdale, J. R., Eklund, R. C., & Gordon, S. (2002). Expected and unexpected stressors in major international competitive: Appraisal, coping, and performance. *The Sport Psychologist*, 16, 20-33.
- Dunn, J. G. & Nielsen, A. B. (1993). A between-sport comparison of situational threat perceptions in ice hockey and soccer. *Journal of Sport and Exercise Psychology*, 15, 449-465.
- Dunn, J. G. H., Dunn, J. C., Wilson, P., & Syrotuik, D. G. (2000). Reexamining the factorial composition and factor structure of the Sport Anxiety Scale. *Journal of Sport and Exercise Psychology*, 22, 183-193.
- Eklund, R. C., Grove, R., & Heard, N. P. (1998). The measurement of slump-related coping: Factorial validity of the COPE and modified-COPE inventories. *Journal of Sport and Exercise Psychology*, 20, 157-175.
- Folkman, S., & Lazarus, R. S. (1988). *Manual for the Ways of Coping Questionnaire* (research edition). California: Consulting Psychologists Press.
- Fonseca, A. M., & Fox, K. (2003). Como avaliar o modo como as pessoas se percebem fisicamente? Um olhar sobre a versão portuguesa do *Physical Self Perception Profile* (PSPP) [How to evaluate the way people perceive themselves physically? A look into the Portuguese version of the Physical Self-Perception Profile (PSPP)]. *Revista Portuguesa de Ciências do Desporto* [Portuguese Journal of Sport Sciences], 2, 112-116.
- Gaudreau, P., & Blondin, J.-P. (2002). Development of a questionnaire for the assessment of coping strategies employed by athletes in competitive sport settings. *Psychology of Sport and Exercise*, 3, 1-34.
- Giacobbi, P. R., & Weinberg, R. S. (2000). An examination of coping in sport: Individual trait anxiety differences and situational consistency. *The Sport Psychologist*, 14, 42-62.
- Gould, D., Eklund, R. C., & Jackson, S. A. (1993). Coping strategies used by U.S. Olympic wrestlers. *Research Quarterly for Exercise and Sport*, 64, 83-93.
- Gould, D., Finch, L. M., & Jackson, S. A. (1993). Coping strategies used by national champion figure skaters. *Research Quarterly for Exercise and Sport*, 64, 453-468.
- Gould, D., & Krane, V. (1992). The arousal-athletic performance relationship: Current status and future directions. In T. S Horn (Ed.), *Advances in sport psychology* (pp. 119-141). Champaign IL: Human Kinetics.
- Hammermeister, J., & Burton, D. (2001). Stress, appraisal, and coping revisited: Examining the antecedents of competitive state anxiety with endurance athletes. *The Sport Psychologist*, 15, 66-90.
- Hardy, L., Jones, J. G., & Gould, D. (1996). *Understanding psychological preparation for sport: Theory and practice of elite performers*. Chichester (UK): John Wiley & Sons, Inc.
- Harlow, L. L., Burkholder, G. J., & Morrow, J. A. (2002). Evaluating attitudes, skill, and performance in a learning-enhancing quantitative methods course: A structural modelling approach. *Structural Equation Modeling*, 9 (3), 413-430.

- Holt, N. L., & Hogg, J. M. (2002). Perceptions of stress and coping during preparation for the 1999 women's soccer world cup finals. *The Sport Psychologist, 16*, 251-271.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.
- Hudek-Knežević, J., Kardum, I., & Vukmirović (1999). The structure of coping styles: A comparative study of croatian samples. *European Journal of Personality, 13*, 149-161.
- Jones, G., & Hanton, S. (1996). Interpretation of competitive anxiety symptoms and goal attainment expectancies. *Journal of Sport and Exercise Psychology, 18*, 144-157.
- Jones, G, Swain, A., & Cale, A. (1990). Antecedents of multidimensional competitive state anxiety and self-confidence in elite intercollegiate middle-distance runners. *The Sport Psychologist, 4*, 107-118.
- Jöreskog, K. G., & Sörbom, D. (1996). *LISREL 8: User's guide*. Mooresville: IN: Scientific Software.
- Kenny, D. A., & McCoach, D. B. (2003). Effect of number of variables on measures of fit in structural equation modelling. *Structural Equation Modeling, 10* (3), 333-351.
- Krane, V., Williams, J. M., & Feltz, D. (1992). Path analysis examining relationships among cognitive anxiety somatic anxiety, state confidence, performance expectations, and golf performance. *Journal of Sport Behavior, 15*, 279-295.
- Lazarus, R. S. (2000). Cognitive-motivational-relational theory of emotion. In Y.L. Hanin (Ed.), *Emotions in sport* (pp. 39-63). Champaign, IL: Human Kinetics.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.
- Maia, J. (1996). Um discurso metodológico em torno da validade de construto: Posições de um lisrelita [A methodological discourse on construct validity: Opinions of a lisrelit]. In L. Almeida, S. Araújo, M. Gonçalves, C. Machado, & M. Simões (Eds.), *Avaliação Psicológica: Formas e Contextos [Psychological assessment: Forms and contexts]* (vol. IV, pp. 43-59). Braga: Portuguese Psychologists Association (Portugal).
- Maia, J., Almeida, P., Morais, D. P., & Garganta, R. (1997). Invariância estrutural da escala do auto-conceito físico: Um estudo de análise factorial confirmatória em jovens dos dois sexos dos 13 aos 15 anos de idade [Structural invariance of the physical self-concept scale: A study of confirmatory factor analysis in youngsters from both sexes aged 13-15 years old.]. In M. Gonçalves, I. Ribeiro, S. Araújo, C. Machado, L. Almeida, & M. Simões (Eds.), *Avaliação Psicológica: Formas e Contextos [Psychological assessment: Forms and contexts]* (Vol. V, pp. 526-537). Braga: Portuguese Psychologists Association (Portugal).
- Marsh, H. W. (1998). Age and gender effects in physical self-concepts for adolescent elite athletes and nonathletes: A multicohort- multi-occasion design. *Journal of Sport and Exercise Psychology, 20*, 237-259.
- Marsh, H. W., & Jackson, S. A. (1999). Flow experience in sport: Construct validation of multidimensional, hierarchical state and trait responses. *Structural Equation Modeling, 6* (4), 343-371.
- Martens, R., Vealey, R. S., & Burton, D. (1990). *Competitive anxiety in sport*. Champaign, IL: Human Kinetics
- Motl, R. W., & DiStefano, C. (2002). Longitudinal invariance of self-esteem and methods effects associated with negatively worded items. *Structural Equation Modeling, 9* (4), 562-578.
- Murphy, S., & Tammen, V. (1998). In search of psychological skills. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 195-209). Morgantown, WV: Fitness Information Technology.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd Ed.). New York: McGraw-Hill.
- Pensgaard, A.M., Roberts, G.C., & Ursin, H. (1999). Motivational factors and coping strategies of Norwegian Paralympic and Olympic winter sport athletes. *Adapted Physical Activity Quarterly, 16*, 238-250.
- Perczek, R., Carver, C. S., Price, A., & Pozo-Kaderman, C. (2000). Coping, mood, and aspects of personality in Spanish translation and evidence of convergence with English versions. *Journal of Personality Assessment, 74* (1), 63-87.
- Repka, E., Man, F., Stuchlikova, I., & Hosek, V. (1993). The Sport Anxiety Scale. *Acta Universitatis Carolinae Kineanthropologica, 29* (2), 15-28.
- Rodrigues, R. (1996). *Expectativas de auto-eficácia, auto-confiança e rendimento na natação de alta competição [Self-efficacy expectancies, self-confidence, and performance in high level swimming]*. Unpublished master's dissertation. Braga: University of Minho (Portugal).
- Santos, P. J., & Maia, J. (2003). Análise factorial confirmatória e validação preliminar de uma versão portuguesa da escala de auto-estima de Rosenberg [Confirmatory factor analysis and preliminary validation of a Portuguese version of the Rosenberg's self-esteem scale]. *Psicologia: Teoria, Investigação e Prática, 2*, 253-268.
- Schutz, R. W., & Gessaroli, M. E. (1993). Use, misuse, and disuse of psychometrics in sport psychology research. In R. N. Singer, M. Murphey & L. K. Tennant (Eds.), *Handbook of Research on Sport Psychology* (pp. 901-917). New York: Macmillan.
- Smith, R. E., Schutz, R., Smoll, F. L., & Ptacek, J. T. (1995). Development and validation of a multidimensional measure of sport-specific psychological skills: The Athletic Coping Skills Inventory-28. *Journal of Sport and Exercise Psychology, 17*, 379-398.
- Smith, R. E., Smoll, F. L. & Schutz, R. W. (1990). Measurement and correlates of sport-specific cognitive and somatic trait anxiety: The Sport Anxiety Scale. *Anxiety Research, 2*, 263-280.

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