# Development and validation evidence for the Resilience Scale for Sport (RS-Sp)

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> This multistudy paper aims to develop and examine the psychometric properties of a Resilience Scale for Sport (RS-Sp). Two sub-studies were carried out: a) Develop the RS-Sp b) Verify the initial validity evidence of the RS-Sp. The first study develops the item to RS-Sp and provided content validity for an initial item set. 30 athletes and 5 experts judge participated. Five factors were identified that corresponded to the subscales of the RS-Sp with 73 items. The second study explored the initial validity evidence of the RS-Sp. The least strong items in each factor were removed, producing five 3-item subscales for the 15-item final version of the Rs-Sp for athlete. Overall, the RS-Sp was shown to be reliable to individual and team sports and sexes (Male and Female). The RS-Sp is recommended for examining components the psychological resilience in athletes, as well as the impact of resilience on sport performance.

KEY WORDS: Athletes, Protective factors, Resilience Scale development,.

To achieve success in sport athletes are submitted to situations of pressure and physical and mental stress (Fletcher & Sarkar, 2012; Galli & González, 2015). Against this background, several recently published studies have shown that psychological resilience has been shown to be an important construct to protect the athlete from the potential negative effect of stressors in sport (Bicalho, Melo & Noce, 2020; Galli & González 2015; González, Castillo & Balaguer, 2019; Hosseini & Besharat, 2010; Morgan, Fletcher & Sarkar, 2019).

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The psychological resilience in the athlete is developed from his exposure to significant adverse situations in a dynamic process influenced by personal characteristics and social support (Bicalho et al., 2020; Fletcher & Sarkar, 2012; Morgan, Fletcher, & Sarkar, 2013). The dynamic process of psychological resilience is observed through fluctuations over time according to the adverse situations that athlete is encountering and the developmental stage of the individual or team. About this, Fletcher and Sarkar (2012, p.672) 'indicate that numerous psychological factors (positive personality, motivation, confidence, focus, and perceived social support) protect the world's best athletes from the potential negative effect of stressors by influencing their challenge appraisal and meta-cognitions'.

Despite the critical role psychological resilience plays in athletes' behaviour, there are limited empirical studies of resilience in sport (Bicalho et al., 2020). Existing research reflects methodological flaws, which may be partially explained by the lack of questionnaires specifically designed and validated to assess psychological resilience in athlete (González, Moore, Newton, & Galli, 2016; Sarkar & Fletcher, 2014; Secades et al., 2014). The accurate measurement of psychological resilience in sport is a key step towards an in-depth understanding of why athletes grow and achieve success in sport while others fail to perform at their best because they cannot manage the psychological demands of the competitive environment.

Through the psychometric properties the resilience scale used in sport, several studies have shown that the adaptations are inadequate (Cowden, Meyer-Weitz, & Asante, 2016; Galli & Gonzalez, 2015; González et al., 2016; Gucciardi, Jackson, Coulter, & Mallett, 2011; Sarkar & Fletcher, 2013). For example, Bicalho et al. (2020) identified that the most used scales to measure resilience in athletes are the CD-RISC Scale (Connor & Davidson, 2003) and the Resilience Scale (Wagnild & Young, 1993), however, there are many problems with these scales regarding factor loadings when applied in the sports context.

According to González et al. (2016) in CD-RISC athletes could be influenced by the instructions as they are asked to speculate on how they would react to adversity even though they have not had an adverse experience recently. Other criticisms raised by Bicalho, Melo and Noce (2022) that is the CD-RISC presents problems in relation to the factorial loads and the instructions, as athletes are invited to speculate on how they would react to adversity even though they have not had an adverse experience recently. The aforementioned studies have pointed out that short version of CD-RISC has a reduced scope for assessing the experience of adversity and positive adaptation and a lack of assessment of social and environmental factors. Lastly, this scale does not yet have normative indications for the interpretation of the resilience of athletes, because the norms indicated in scale's validation manual, are used for classification purposes of the general population.

1. The Resilience Scale (Wagnild & Young, 1993) obtained low and inadequate psychometric properties especially for the factor acceptance of self and life in the study of García-Secades et al. (2016). Bicalho et al. (2022) compared the semantic and psychometric structure of this scale and identified the low adaptability for use in sport. The limitations of measuring resilience reported goes beyond the psychometric issues and encompass characteristics exclusively based at the individual level, limited evidence base for the selection of items to assessment of resilience in athletes (Sarkar & Fletcher, 2013).

2. To advance studies on resilience in athletes it is necessary to expand the measurement perspective, to bring adequate the theory with measure on sport. Therefore, a resilience scale for athletes needs to capture the dynamic process from sporting experiences, the protective factors and the positive adaptations arising from athlete exposure to stressful situations (Galli & González, 2015; Sarkar & Fletcher, 2014).

There are two major reasons for addressing the issue of developing sport specific resilience measures. Firstly, self-report measures are often deemed unsuitable for resilience in athletes (Cowden et al., 2016; Galli & González, 2015; Sarkar & Fletcher, 2013). Second, the absence of specific norms for the interpretation of the measurement of the resilience in athletes (Bicalho et al., 2020; Galli & Gonzalez, 2015; García-Secades et al., 2016). To evaluate the resilience in athletes is a challenge for the professionals and researches who deal with the formation of athletes for performance sport because there are no specific criteria and parameters in the literature to measure the resilience in athletes. This is a barrier to the advancement of research and interventions for the growth of this athlete in sport.

Therefore, the purpose of this study was to develop and validate evidence a Resilience Scale for Sport RS-Sp. The methodological procedures for the development and validation evidence of a psychological measure were divided into two studies: a) Develop of the RS-Sp b) Examine of the initial validity evidence of the RS-Sp in an athlete sample.

# Study 1

# Method

The research aim of the first study was to develop the RS-Sp Scale. The ethics committee CAAE 83220417.4.0000.5149 approved the study. In accord to DeVellis (2016), two stages were elaborated: Stage 1 explored the resilience concept in Brazilian athletes to the develop the items of the RS-Sp; in Stage II the RS-Sp content validity was tested.

The main review studies have shown psychological resilience from: Experience Sporting-represent the dynamic and learning resilience process; personal components -represent the individual characters like as personality, confidence, motivation, concentration; and social components - represent the family, sports environment and spirituality (Bicalho et al., 2020; Fletcher & Sarkar, 2012; Sarkar & Fletcher, 2014; García-Secades et al., 2014). These elements define the property of the psychological system for sports resilience.

Several sources can be used to investigate the theoretical content during the process of construction of the items of a scale, for example, the literature review, analysis of other instruments about the thematic, reports of the target population, clinical observations, among others (Damásio & Borsa, 2017 p.48). About the reports of the target population, the focus group is one of the ways indicated by several psychometric researchers (Streiner & Norman, 2008; Pasquali, 2013).

Thus, to identify the concept of psychological resilience by Brazilian athletes a focus group was developed. This step was necessary to evaluate the components of resilience which involve the stressors and adversities, personal and protective factors, and the positive adaptation in Brazilian athletes. According to Galli and Reel (2012) one of the ways to facilitate the growth process from resilience is to ask athletes to reflect on the adversities they have faced in the past and on any benefits that may have come from these experiences. Similarly, to understand the dimensionality of this construct in sport and build an instrument capable of measuring it, it was first necessary to learn about how Brazilian athletes developed resilience throughout their careers.

This stage followed the recommendations of Morgan et al. (2013), the methodology was determined through an inductive thematic analysis. In the structure proposed by Braun and Clarke (2006) emphasis was placed on reading and rereading transcripts, highlighting the relevant material, and making preliminary notes using codes (for example, words or phrases used by participants related to the research question) representing each component of the psychological resilience for athletes. Subsequently, the results determined the elaboration of specific items for the RS-Sp.

### **PROCESS STAGE 1**

# Participants

To classify athlete samples was used the definitions should be based on the athletes' highest standard of performance, their success at that level, and the amount of experience that they have gained at that level (Swann, Moran, & Piggot, 2015). Was considered in the currently study an athlete who: had accredited in the federation, competed at national levels in their modality and had at least three years' experience in competitive sport. Thus, participated 30 athletes (17 male/13 female), with a mean age of 19.52  $\pm$ 1.4 years. The athletes were practitioners of soccer (n = 10), volleyball (n = 5), athletics (n = 5), swimming (n = 4), judo (n = 2), taekwondo (N = 3), and jiu-jitsu (N = 1). All athletes had competed in national and international competitions with 6.7 $\pm$ 3.18 years of experience in the sport.

*Procedures.* A pilot focus group was formed to test the methodological rigor to reinforce the quality control criterion of the analysis (Stewart, Shamdasani, & Rook, 2007). The pilot focus group was composed of 3 athletes of national level performance (athletics, judo, and swimming). Based on these interviews, the questions were analysed and adjusted to the athletes' vocabulary.

For the focus group, the athletes were grouped according to the characteristics of their modality (collective or individual). The 30 participating athletes were organized into 6 groups with 5 athletes in each group. In each focus group, 5 sessions were held, totalling 30 sessions. The focus group sessions took place in private rooms. A semi-structured interview was proposed. This strategy is in accordance with the studies of (Liamputtong, 2011; Stewart et al., 2007; Morgan et al., 2013). The interviews were recorded using a "voice recorder application" for android system, version 3 (34.0).

The sessions were organized over 5 consecutive days (Monday to Friday). In session 1 (day1) the athletes signed the informed consent form and completed the demographic data questionnaire which contains personal information and details of life as a sportsman. Next, the athletes reflected on the promotion of resilience, with questions on "being a resilient athlete". Next, the athletes reflected on the promotion of resilience, with questions on "being a resilient athlete" such as "Does the psychological resilience stands for to you?", "What do you understand a resilient process in sport? In session 2 (day 2), participants gave speeches on the experiences, challenges, stressful situations, and adversities faced by them in sport. In session 3 (day 3), they spoke about characteristics associated with athlete's resilience and in session 4 (day 4), they talked about the perspective of resilience from their personal issues and social relationships. Finally, in session 5 (day 5), the athletes reflected and shared their identification under the theory resilience in sport and their components: experience sporting, personal and social. Opportunities were also provided for participants to add comments, reflect on, and evaluate participation in the focus group.

The sessions lasted an average of 45 minutes (minimum duration was 30 minutes and maximum 60 minutes). Studies have shown an average of 63-88 minutes for focus groups in sport (Morgan et al., 2013). The responses produced in the focus group meetings formed the reference basis for the items that would compose the Resilience Scale for Sport RS-Sp.

#### Data analyses

In total, 1404.55 minutes (23.41 hours) of the focus groups were transcribed on 153 pages (Times New Roman font, size 12 of single-spaced text, justified text). The document was imported in txt. format to Iramuteq Software Version 0.7 [Iramuteq is anchored on R software (www.r-project.org) and on the Python language (www.python.org)]. To analyse the text, a Descending Hierarchical Classification (DHC) was used. A DHC is a rich and complex account of data allowing for social and psychological interpretations of data (Reinert, 1990). This analysis classifies the text segments according to their respective vocabularies for each resulting class, data regarding its content, being, n. (number that orders the words in the table and total percentage of textual segments from the database used in the analysis); ST (number of text segments in the corpus which contain); % (percentage occurrence of the word in the text segments in that class, relative to its occurrence in the corpus). The set was divided based on the frequency of the reduced forms to obtain classes of text units that, at the same time, present vocabulary similar to each other, and vocabulary different from the text units of the other classes (Camargo & Justo, 2013). The figure 1 presents the methodological procedures applied for the development of the RS-Sp.

# Results

A total of 120129 occurrences of text units was identified and 89.15% of the segments used for analysis, 6244 numbers of forms, and 27702.25 average occurrences of text units, with 2752 hapax (2.29% of the occurrences, 44.07% of the forms). The figure 2 showed the results of DHC to define the Hierarchical Model of Resilience in Sport.



Fig. 1 - Qualitative methodological procedures for development the items of the RS-Sp.



Fig. 2 - Hierarchical Model of Resilience in Sport.

From this analysis, it was possible to identify elements of resilience in athletes. At the first level we identified sporting experiences and personal resources: Sporting experiences represent the athlete's ability to perceive his or her instincts and strengthen the effects of stress, a positive self-assessment of the situations experienced in daily sport (training and competitions); Personal resources reflect (1) the athlete's internal characteristics, emotional self-control in his ability to adapt to challenging or stressful situations in daily sport, and (2) the social support perceived by the athlete.

On the second level, sporting experiences were represented by competition experiences (510 ST, 24%) and training experiences (706 ST, 24%). Personal resources were identified as internal resources and social resources. Internal resources were represented by individual psychological characteristics (706 ST, 23.9%) and social resources by family/friends support (676 ST, 23%) and coaches/teammates support (347 ST, 11.8%).

# PROCESS STAGE II

Researchers may also consider using a collection of measures in order to separately assess the resilience components of adversity, positive adaptation, and protective factors (Galli & Gonzalez, 2015; Sarkar & Fletcher, 2013). To build the resilience scale was considered these three components as fundamental for the measurement of resilience in sport, using as support the main studies published so far and applied a fundamental qualitative step to understand how Brazilian athletes react when adversity occurs. The result of applying these methodologies gave rise to the conceptual and operational model of this scale

A constitutive definition of the psychological resilience in sport was as "a dynamic process initiated from the exposure of athletes to adverse situations, involving experiences sporting, personal and social components, being able to promote positive adaptations in sporting performance". The analysis of the DHC was a source for the operational definition of the construct of resilience in sport encompasses the characteristics personality, confidence, motivation, focus, and beliefs of the athlete, in addition to family social support, teammates and professionals who work directly with the athlete in the sporting environment.

The attributes identified for this psychological resilience in sport were: Stress factors (injuries, nutritional issues, pressure, mistakes and failures, financial problems, structural environmental problems); Personal factors (personality, confidence, motivation, concentration, beliefs, persistence, and passion for sport); Social factors (family and friends, coaches and teammates).

After, in total 150 items were formulated by the three researches. The researchers had proven practical and theoretical expertise in sport psychology. At the moment, the development of the items was based on the theoretical framework and the results of DHC. The items should express ideas and behaviours relevant to the construct of resilience in sport and satisfy the following criteria (DeVellis 2016; Pasquali, 2010): Conduct: express a behaviours; Objectivity: knows the answer or is able to perform the task; Simplicity: should not offer a reason or justification; Clarity: the item should be intelligible, avoid negatives, short sentences, with simple expressions; Relevance: constitutes the covariance between the item and the factor; Accuracy: difficulty and discrimination; Variety: vary the language to avoid monotony; Modality: do not use extreme expressions; Typicity: form sentences with expressions consistent with the attribute; Credibility: unfavourable attitude to the test; Amplitude: discriminate subjects of different levels of magnitude of the latent trait; Balance: easy, difficult and medium items. It was established as initial quantity the triple of items to ensure a quantity of items that is three times larger than the final scale (DeVellis, 2016; Pasquali, 2013). To achieve a greater variability of the items 30 initial items were constructed for each class identified in the DHC. Content validation

is performed by a panel of expert raters who judge the content validity indicators of these items follow the Dunn, Bouffard, and Rogers (1999). This stage was described in figure 1.

*Participants.* 11 professionals were invited but only 5 expert raters of sport psychology in Brazil gave feedback about contend analysis. All raters have a PHD degree in sport training or sport psychology, more than 10 years practice in sport training or sport psychological evaluation and relevant publications in international peer reviewed journals. From a practical standpoint, the number of raters used to assess content relevance should be largely dictated by the availability of experts who are willing to participate in the assessment process and who truly have the expertise and qualifications necessary to make valid judgments (Dunn et al., 1999).

In addition, 6 athletes, the target public of this study, were randomly selected to participate in the semantic analysis of the 150 items (DeVellis, 2016; Pasquali, 2013). The inclusion criterion adopted was that the athletes had already participated in the focus group.

### Procedures

The raters performed a semantic, clarity of language, theoretical relevance, practical pertinence, and comprehensibility of the items (Devellis, 2016; Pasquali, 2013). Ratings ranged from 1 (not very representative) to 5 (very representative). The raters were contacted by email and analysed the 150 items on an online form. A retest analysis was performed after the first round of evaluation.

In sequence, a brainstorming session was carried out with the athletes (Pasquali, 2013; Figure 1). The athletes were divided into 2 groups with 3 athletes in each group and a single session was held with each group. Each session lasted an average of 1 hour and 45 minutes. The athletes signed the consent form and then received the item analysis form.

#### Data analysis

The Content Validity Coefficient (CVC) was adopted as a statistical analysis procedure, Cohen's Kappa Coefficient (K) which is used to measure the intensity of the Rater agreement regarding the choice of components for the items of the RS-Sp (Hernández-Nieto, 2002). To determine satisfactory levels for language, clarity and pertinence, was adopted CVCc  $\geq$  0.70 for each of the items and for the general scale (Cassepp-Borges, Balbinotti, & Teodoro, 2010).

To analyse the intensity of agreement between the Raters, the percentage of agreement and the average *K* was used (Pasquali, 2013; Fleiss, Levin, & Paik, 2013). The procedures were carried out using the Statistical Packaged for Social Science<sup>®</sup> (version 21.0). The *K* was interpreted according to Fleiss et al. (2013), in which values .40 have weak agreement,  $\ge$  .40 to  $\le$  .75, medium to substantial agreement, and  $\ge$  .75, excellent agreement.

### Results

In the item's evaluation by Raters, the  $\text{CVC}_{\text{mean}}$  for language clarity was 0.98, for theoretical relevance 0.88, practical pertinence 0.90, and intelligibility 0.95. Following DeVellis (2016) recommendations when the number of items is exceptionally large, the researcher can eliminate some items based on a priori criteria, such as lack of clarity, questionable relevance, or undesirable similarity to other items. Thus, a total of 16 Items with a CVC below 0.70 in relation to theoretical relevance and practical relevance were excluded (Training Experiences = 9 items; Competition Experiences= 4 items; Coaches and Teammates Support = 1 item,

Judge	1	2	3	4	5
1	_	.567	.585	.658	.658
2		-	.684	.842	.842
3			-	.783	.783
4				-	1
5					-

 TABLE I

 Values found for KAPPA and KAPPAmean inter judge in the internal evaluation of the RS-Sp.

*Note*:  $K_{mean} = 0.740 (p = 0.001)$ .

Family and Friends Support = 1 item; Individual Psychological Characteristics = 1 item). The results can be accessed in Appendix 1.

After the adjustments, the 134 items of the RS-Sp was again sent to the raters for re-evaluation of the items. In this evaluation, the CVC<sub>mean</sub> for language clarity was 0.99, theoretical relevance was 0.92, practical pertinence 0.90, and intelligibility 0.89. In this stage, items with a CVC<sub>item</sub> below 0.70 were excluded (Training Experiences=10 items; Competition Experiences = 12 items; Coaches and Teammates Support = 16 items, Family and Friends Support=16 items; Individual Psychological Characteristics = 7 items). The results can be accessed in Appendix 2. The  $K_{mean}$  between raters which demonstrates the intensity of agreement in the choice of dimensions, was 0.740 (p = 0.001). Table 1 shows the Kappa value among the rates for the evaluation.

In the evaluation performed by the athletes, the  $\text{CVC}_{\text{mean}}$  for clarity and verbal fluency was 0.96 and for comprehension, 0.94. Of the total items, only one item of the Trainning Experiences (*Eu me sinto culpado quando sou prejudicado no treino por outra pessoa/* I feel guilty when I'm treated unfairly in training by someone else) obtained a  $\text{CVC}_{\text{mean}} = 0.63$  and was therefore excluded from the scale. At the end of this stage of evaluation of the Raters and athletes, of the 150 items on the initial RS-Sp, 77 items were excluded, resulting in a scale of 73 items (Appendix 3).

# Study 2

The aim of the second study was to test the validity evidence of the Resilience Scale for Sport (RS-Sp). Specifically, the aims were: (a) test the factorial structure the RS-Sp; (b) test the internal consistency of the final factors the RS-Sp; (c) test the reliability analyses and invariance analysis (sex and sport) the RS-Sp; (d) Develop a normative to use the RS-Sp.

### METHOD

#### Participants

In total, 906 athletes were invited to participate. Of these, 115 athletes declined or did not complete the RS-Sp. In total, 791 athletes (549 Male, 242 female) participated, made up

of 611 team sport athletes (n= basketball n=144, beach volleyball n=4, futsal n=61, handball n=90, hockey n=13, water polo n=22, rugby n=5, soccer n=210, volleyball n=62) and 180 individual sport athletes (artistic gymnastics n=8, badminton (single) n=3, BMX Race n=6, boxing n=14, cycling n=5, diving n=1, fencing n=4, jiujitsu n=17, judo n=27, MMA n=1, olympic wrestling n=14, shooting sport n=2, swimming n=12, taekwondo n=9, tennis n=1, track and field n=43, triathlon n=13). Regarding competitive level, 18.50% of the participants competed at a state level, 60.55% at a national level, and 20.85% at an international level. The sample resided in Brazil, 57.90% in the southeast 16.30% the central west, 14.28% the south, 8.6% the northeast, and 3% the north.

#### Measures

The RS-Sp was developed in study 1, to measure sports resilience from the sporting experiences and personal resources. The athletes answered each item completing the question thinking in the actual experiences and reflecting about "I am...". Each item was scored on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, and 5 = strongly agree), with higher scores indicating a stronger tendency to engage psychological resilience in sport.

# Procedures

The athletes were informed of the test protocol and signed the consent form. They answered the RS-Sp on paper, under the supervision of the researcher, in an interference-free room. The questionnaires were answered in the training centres in the second half of 2019.

# DATA ANALYSES

The Exploratory Factor Analysis (EFA) was conducted based on a polychoric correlation matrix using an orthogonal rotation (Muthén & Muthén, 2012). The Kaiser–Meyer– Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity was used for the evaluation of model sufficiency (KMO>0.70). EFA was carried out in Factor version 10.5.03.

To test the multifactorial hypothesis of the RS-Sp was used the indicator *Closeness to unidimensionality* (Ferrando & Lorenzo-Seva, 2017). The indices UniCo (Unidimensional congruence), ECV (explained commom variance) and MIREAL (mean of item residual absolute loadings) (Ferrando & Lorenzo-Seva, 2018) indicate when it is safe to consider the instrument unifactorial (Uni>.95; ECV >.85; MIREAL <.30).

The ORION (Overall Reliability of fully-Informative prior Oblique N-EAP scores), which assesses the extent to which the generated factor score is reliable, i.e. the accuracy of the factorial scores (>0.70), and the Factor Determination Index (FDI), which assesses how well the factorial scores represent the latent trait, were included in the EFA and >0.80 for research use (Damásio & Borsa, 2017, p. 258; Ferrando & Lorenzo-Seva, 2016).

The indices of measures of solution quality and factor scores obtained and replicability of the factors in different studies (H-observed; H-latent) were also adopted (Ferrando & Lorenzo-Seva, 2018). The H-latent index reflects the estimated replicability when items are interpreted as continuous variables and the H-observed when items are interpreted as ordinal variables. The values range from 0-1 with values above 0.80 being considered acceptable (Damásio & Borsa, 2017; Ferrando & Lorenzo-Seva, 2018).

In sequence, the "Exploratory Graph Analysis" (EGA) was used to represent the model

from the connection networks. The procedures were carried out in program R, version 3.6 and R studio packages *EGAnet* (Golino & Christensen, 2019) and *Lavaan* (Rosseel, 2012). The figures were generated using the *ggplot2* package (Wickham, 2016) and *qgraph* package (Epskamp, Cramer, Waldorp, Schmittmann, & Borsboom, 2012). Item retention was also based on items with communalities higher than 0.5.

CFA was conducted to assess the model fit of the original model. The Weighted Least Squares Mean-and-Variance Adjusted (WLSMV). The adequacy of the structure for the observed data was assessed using the chi-square test and the ratio between chi-square and degrees of freedom ( $\chi 2 / gl$ ); Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root-Mean-Square Error of Approximation (RMSEA). CFI and TLI values should be greater than 0.90, preferably above 0.95, and RMSEA values (90% CI) should not be greater than 0.08 (Brown, 2015). All analyses were carried out in program R, version 3.6 and *Lavaan* (Rosseel, 2012).

After, a new refinement of the RS-Sp was developed. For this, a second strategy was adopted, verification of the modification index (IM) criterion to assess other sources of poor specification of the model. The IM enables evaluation, among other aspects, of overlap of content between the items (Brown, 2015), which is a well-known factor of prejudice for confirmatory factor models. Items that showed errors correlated with IM values above .50 were inspected for each pair of these items, we chose to exclude the one with the lowest factor load (Brown, 2015). In addition, the internal reliability Cronbach's alpha and ( $\omega$ ) ômega de McDonald was calculated (Dunn, Baguley, & Brunsden, 2013; Mcdonald, 1999; DeVellis, 2016).

To test for measurement invariance, Mplus (Version 7.3; Muthén & Muthén, 2012) was used. The five-factor structure RS-Sp model was examined for invariance across sports (individual and team) and sex (Male and Female). The invariance testing was conducted using a procedure of three models: configural, metric, and scalar (Marsh, Nagengast, & Morin, 2012). The indicators used were the chi-square difference as computed in Mplus for categorical variables, and differences in Comparative Fit Index (CFI), Tucker and Lewis Index (TLI), and Root Mean Squared Error of Approximation (RMSEA). Based on the guidelines of Marsh et al. (2012), the more parsimonious model should be selected only if changes in CFI ( $\Delta$ CFI) are less than .01 (Cheung & Rensvold, 2002), and TLI and RMSEA are equal to or better than that of the more complex model.

For interpretation and classification of the RS-Sp scores a normative reference table was constructed, in which the final values were grouped into five levels from the calculation of distribution by percentiles (20; >20 40; >40 60; >60 80; ≥80). The classification was named from the categories: extremely low resilience indices; low resilience indices; medium resilience indices; high resilience indices and extremely high resilience indices. The calculation was performed in SPSS version 21.0

# Results

The EFA results of descriptive data through the KMO measure of sampling adequacy (KMO=0.932) and the Bartlett's test of sphericity 18447.8 (df=2628; p=0.000010). The Parallel analysis resulted in an RS-SP with a 5-factor factorial structure (Figure 3).

The factorial structures were conceptualized from the grouping of items. Thus, Factor 1 represents the sporting experiences, Factor 2 represents the family social support, Factor 3 represents personal resources and competence, Factor 4 represents the components of spirituality, and Factor 5 represents the sports social support. [see factor loadings of items in appendix 3].

The RS-Sp structure was convergent to Hierarchical Model of Resilience in Sport. The results of both EGA estimations were compared to the theoretical dimensionality structure (five-factors) briefly described above. All items that had reverse orientations strongly loaded on a single factor, indicating that this was not truly representative of a theoretical factor were removed. In total, 73 items from the RS-Sp were removed based on communality and factor loading scores to improve the efficiency and factor balancing of the RS-Sp. The process reduces questionnaire fatigue and item redundancy. A total of 48 items were included in the first RS-Sp model. The structure with the distribution of items by five-factors was confirmed using the EGA plot (Figure 4).

A new explanatory analysis to test the structure of the Hierarchical Model of Resilience in Sport was tested and confirmed using the network analysis technique by the EGAnet package in R. The results are shown in figure 5.

The ORION factor index and the FDI indicated that the RS-Sp structure is suitable for use in measuring resilience (Table 2). The indices of quality measures and replicability of the factors in other samples (H-latent) showed acceptable values indicating that the factor structure is well defined and tends to replicate in other studies (Table 2). The H-observed index is necessarily lower than the H-Latent (Ferrando & Lorenzo-Seva, 2018; Man-



Fig. 3 - RS-Sp Parallel Analysis Scree Plots. Parallel Analysis Scree Plots.



Fig. 4 - Structure of the RS-Sp (48 items) data using EGA. Note. In these network analyses, nodes represent the individual items in the RS-Sp and edges represent partial Pearson's correlations between two items given all other items in the network.



Fig.5 - Explanatory analysis to test the structure of the RS-Sp in accord to Hierarchi-cal Model of Resilience in Sport.

Factor	Var.	ORION	FDI	H-Latent	IC* (95%)	H-Observed	IC* (95%)
SExp	1,571	0,833	0,913	0,833	0,797-64,224	0,687	0,663-88.467
FSS	2,007	0,834	0,913	0,834	0,803-4,353	0,769	0,740-10.881
PRC	2,229	0,940	0,969	0,940	0,909-2,109	0,794	0,767-1.088
Spr	1,620	0,811	0,901	0,811	0,753-0,845	0,773	0,734-9.600
SSP	1,871	0,877	0,936	0,877	0,830-0,910	0,751	0,716-0.776

TABLE II ORION Index, FDI And Index Of Factor Replicability Measures (H-Latent; H-Observed) For Rs-Sp.

*Legend:* SExp=Sporting Experiences; FSS=Family Social Support; PRS=Personal Resources and competence; Spr=Spirituality; SSS=Sports Social Support; Var.=Variance; FDI=Factor Determination Index; CI=confidence interval; considered adequate values above .80 (Ferrando & Lorenzo-Seva, 2018).

zar et al., 2020). Although in the literature studies have considered the adequacy above 0.70 (Manzar et al., 2020), in this study, only the factor sports experiences did not reach the reasonable index, i.e., from the scores of the items this factor may present differences in the factorial loadings when tested in different populations.

Next, CFA analyses were used to examine the fit of Model 1. First adjustment indices of the 48 items on the five-factor model did not show adequate values (Table II). Thus, RS-Sp refinement processes were implemented as previously mentioned. A total of 16 items with factor loadings below .50 were removed (7, 18,19,20, 22, 25,28, 32,41,51,54,56,57, 67, 69, 73). A total of 32 items were included in RS-Sp Model-2. Although this presented adequate indices (Table II), the previously mentioned refinement processes were reapplied, seeking better applicability of the RS-Sp in athletes.

The factor loadings and explained variances of items 23, 71(Factor 1), 26, 34, 38, 45, 58 (Factor 2) and items 6, 21, 33, 35, 37, 48, 49, 50, 53, 61 (Factor 3) were low and it was decided to remove these items from the RS-Sp. The final RS-Sp version (Model 3) with 15 items demonstrated good fit to the data (Table III).

	Goouness Of Th	Statistics Of The Differe	in Models 101	ine Rs-sp vana	allon Evidence.
Model	Nº item	$X^2$ (gl)	CFI	TLI	RMSEA (90% IC)
Model 1 Model 2	48 32	3337.321 (1070) 1410.983 (517)	0.823 0.908	0.814 0.900	0.052 (0.050-0.054) 0.047 (0.044-0.050)

TABLE III Goodness Of Fit Statistics Of The Different Models For The Rs-Sp Validation Evidence.

*Legend:* X<sup>2</sup>(gl)= chi-square and degrees of freedom; RMSEA = Root Mean Square Error of Approximation; TLI = Tucker Lewis Index; CFI = Comparative Fit Index; BIC = Bayesian Information Criterion.

0.914

0.887

0.051 (0.044-0.058)

243.734 (80)

15

Model 3

The RS-Sp for athletes therefore presented a structure with 15 items, divided between five-factors with respective internal consistency: 1 - Sporting Experiences ( $\alpha$ =.742; t=.82); 2- Family Social Support ( $\alpha$ =.774; t=.77); 3- Personal Resources and Competence ( $\alpha$ =.699; t=.70); 4 - Spirituality ( $\alpha$ =.806; t=.74); 5- Sport Social Support ( $\alpha$ =.644; t=0,68); RS-Sp total( $\alpha$ =.812; t=0,89). The reliability coefficients were higher than the criterion of .65 indicating a minimal internal consistency acceptable (DeVellis, 2016). The results showed that the model proposed was adequate to the data and demonstrated solid reliability the RS-Sp. For the final structure, items were renumbered from 1 to 15 (appendix 4). The final structure of the RS-Sp is shown in figure 6.



Fig. 6 - Standardised loading estimates and factor correlation of the RS-Sp. *Note:* All loadings were significant, p < .01.

The RS-Sp was tested with a configural invariance between sex and sports (ICM-CFA). More specifically, no significant changes in fit statistics were found when constraining factor loadings and intercepts between groups (Table IV). The chi-square difference between invariance models reached a p< .05 level, the changes in CFI were minimal ( $\Delta$ CFI < .01) and showed better fit for most of the more restricted models (increase in CFI and TLI, decrease in RMSEA). Thus, the RS-Sp scalar (strong) invariance for the loadings and threshold structure was supported across sexes and sports.

As interpretation instructions, the total score of the RS-Sp was determined by the average of the sum of the items of each factor. It was stipulated as initial values the score of the athletes participating in this study. Table V indicates the distribution by percentiles in each of the classifications for the measurement of psychological resilience in Brazilian athletes.

1					1 - )		
Sex(Male x Female)	M (SD)	$\chi^2$ (df)	CFI	TLI	RMSEA	CFI	$\Delta\chi^2 (df)$
Configural invariance Metric invariance Scalar invariance Female Male	11.98±1.97 12.09±1.75	481.957 (160) 467.108 (170) 492.959 (210)	.950 .953 .956	.934 .943 .956	.071 .066 .058	.003 .003	8.074 (10) 37.813 (40)
Sport(Individual x Team)	M (SD)	$\chi^2$ (df)	CFI	TLI	RMSEA	CFI	$\Delta\chi^2 (df)$
Configural invariance Metric invariance Scalar invariance Sport individual Sport Team	11.72±2.10 12.04±1.73	463,546 (160) 457,103 (170) 497,579 (210)	.951 .953 .953	.935 .942 .953	.069 .065 .059	.002 .00	13.531 (10) 37.813 (40)

 TABLE IV

 Rs-Sp Invariance Analysis Of Sport And Sex: Multi-Group Cfa Results

*Note:* M=Mean; SD= Standard Deviation;  $\Delta \chi^2$  (df)= chi-square difference, CFI = change in CFI, when comparing the fit of the more constrained model with the previous less constrained model (Cheung & Rensvold, 2002).

 TABLE V

 Normative Reference Parameters For Rs-Sp.

Classification (level)	Sporting Experiences	Family Social Support	Personal Resources and Competence	Spirituality	Sport Social Support	RS-Sp
Extremely low	<11,9	<9,2	<9,8	<9,5	<7,5	<10,4
Low	≥11,9 < 13,5	≥9,2 < 11,9	≥9,8 < 11,5	≥9.5 < 12.31	≥7.5 < 9.5	≥10,4 < 11,7
Moderate	≥13,5 < 14,4	≥11,9 < 13,7	≥11,5 <12,9	≥12,3 < 14,0	≥9,5 < 11,29	≥11,7 < 12,7
High	≥14,4	≥13,7 <14,7	≥12,9 < 14,4	≥14,0 <14,9	≥11,29 <13,28	>12,7 <13,6
Extremely high	-	≥14.7	≥14,4	≥14.9	≥13.28	≥13.6
Mean	13.41	11.95	12.0	12.13	10.33	11.96
median	14.07	12,86	12.28	13.22	10,42	12.21
Standard-deviation	n 2,02	3,18	2,47	3,24	2,99	1,84

*Note:* \* Classification according to resilience indexes. This calculation refers to the sample (N=791 athletes).

# Discussion

This study showed that the evaluation of the measure of resilience in sport needs to be specific and adequate to the theoretical literature (Cowden et al., 2016; Galli & González, 2015; Sarkar & Fletcher, 2014). This represents the first empirical effort to address this fundamental research deficit by developing and validating evidence a measure of psychological resilience in sport.

The purpose of the RS-Sp is to assess resilience as a measure specifically among athletes to account for their unique experiences that may facilitate the development of resilience. The multiple components of support act as protective components (personal and social components) that are supports for metacognitions and appraisals to promote facilitative manifestations of an individual's own resilience are measured. In this sense, the RS-Sp is a new adequate scale of resilience, that breaks down the barrier of assessment in sport which will allow the research on sport resilience to advance and will help in the practical intervention of the sport psychologist.

This study advances by answering emerging theoretical and practical questions in sport. There is consensus that the psychological factors that constitute psychological resilience encompass sporting experiences, personal characteristics, and social support (Fletcher & Sarkar, 2012; Secades et al., 2014). All these components are covered in the measurement by the RS-Sp. and in addition, spirituality emerged as an independent factor Spirituality is related to the athlete's spiritual influences, a strengthening of belief through coping with stressful situations in sport. To Mosley, Frierson, Cheng, and Aoyagi, (2015) spirituality through genuine and mature spiritual beliefs often serves to support one's self-efficacy. In Brazil, religiosity is a very present cultural element and the functions of religion point as a mark of this population. It is interesting to note that few studies to date have investigated spirituality in sport as a protective component. This can be considered an important advance in this scale, which differentiates it from others applied until now in the sports context, bringing it closer to the athlete's reality (González et al., 2016; Gucciardi et al., 2011).

Galli and Gonzales (2015) suggest, with a process view of resilience, and as an alternative to current resilience measures that focus solely on personal qualities, a process-focused resilience scale would ideally assess resilience across multiple domains of sport adversity (e.g. Performance failures, injuries, and organizational demands), examine the social and environmental resources held by athletes (e.g., perceived social support and access to health and wellness services), and account for state changes in athletes' level of resilience to a given type of adversity by prompting athletes to consider the presence of personal, social, and environmental resources in different context. In accordance, the Hierarchical Model of Resilience in Sport represents this theory and was confirmed through the interaction between sporting experiences and the athlete's personal and social resources developed in specific contexts of their careers.

The positive adaptation indicated in several studies of resilience in sport (Bicalho et al. 2020; González et al., 2016; Morgan et al., 2014) is only possible from the sports experiences associated with the athlete's self-assessment of his personal resources and social support. Personal resources and competence reflect the determination and emotional self-control of the athlete in their ability to adapt to challenging or stressful situations in daily sports. Secades et al. (2014) defend that people who are more resilient are also more optimistic, enthusiastic, and energetic and are characterized by high levels of positive emotionality, which results in the importance of positive psychology as a protective factor against threatening agents.

In accord to Fletcher and Sarkar (2012) that Olympic champions were protected from the pressures of elite sport by perceiving that high-quality social support. This study showed that perceived social support is essential to protect athletes from the pressures of sport. The RS-Sp measure this component in two different factors: the family social support and Sport social support.

Family Social Support represents the cohesiveness and collaborative ties of family and friends with the athlete's performance in sport. Several studies show that while features of the individual are undoubtedly important for positive adaptation in the face of adversity, the availability of resources from family (e.g., close bonds with at least one relative) and the community (e.g., support from friends) are also invaluable (Fletcher & Sarkar, 2012; Sarkar & Fletcher, 2013; Sarkar & Fletcher, 2014; Secades et al., 2014).

Sport social support represents the cohesiveness and collaborative ties of coaches and teammates with the athlete's performance in sport. This is supported by studies such as Pedro and Veloso (2018) who stated that coaches who effectively support the needs of athletes for autonomy by allowing opportunities for choice within limits, and displaying acceptance behaviours and recognition of athlete's needs, may in fact contribute to the wider ability of their athletes, in a way that they can internalize values, practices, and competencies that could possibly result in greater engagement towards sport activities and therefore also create a solid foundation for resilience development and growth. Thus, in accord to Fletcher and Sarkar, (2014) high perceived emotional esteem, and informational support from coaches and teammates buffered the potentially detrimental effect of performance-related stressors on self-confidence.

The RS-Sp internal consistency and reliability represent a good operationalization the psychological resilience theory in sport and more adequate indexes than other scales already tested in the sport (González et al.2016; Gucciardi et al., 2011). The fit indices indicate a fairly good model fit and the narrow confidence interval indicates a good degree of precision. The RS-Sp is an important advance to measure resilience in athletes. In the field of sport psychology, the development of specific scales has grown considerably, since the greater the risk of fatigue and boredom for the participants, which can compromise the quality of the data. In general, the results demonstrated by the RS-Sp are reliable to the evaluation of resilience in athletes and can be used to monitor both the current state and the development of resilient characteristics in athletes. In addition to presenting the advantage of being more parsimonious and easier to apply, without losing the reliability of the scores.

About the explore measurement invariance across sexes and sports the negligible reductions in the CFI indicated that the RS-Sp model (15 items) as well. In this sense, it can be said that the work engagement scores obtained through the scale are invariant for sex and sports modality and that these groups can be compared with each other. Much needs to be studied about the resilience in sport and this scale seems adequate for the purpose of comparing these variables.

Among the expected impacts, the RS-Sp will provide a resilience assessment method accessible to sports teams and without cost to the sport psychology professional. Thus, it is expected that this scale will help professionals who dedicate their work in the set of their evaluation and intervention practices for the development and monitoring of resilience in athletes. Another important impact will be perceived in the research on resilience in sport from the use of a specific instrument that assesses the parameters of psychological assessment. Since this construct is associated with success in the athlete's sport career, exploring the relationship between resilience and athlete performance has been of great interest to coaches and sport psychologists. Future studies can be use the RS-Sp to the understanding the mechanism that guides the dynamic process of resilience as well as its interaction with other constructs in sport.

Nevertheless, some limitations are indicated in this study. The scale was elaborated in Portuguese with a sample of exclusively Brazilian athletes. The majority of sport psychology scales have been developed in English-speaking countries; therefore, intercultural and international collaborative studies are needed, as well as the possibility of testing the RS-Sp. Furthermore, to reforce the validity evidence of the RS-Sp, an examination of concurrent or predictive validity is important to understanding how adverse sport situations can modify athlete's psychological resilience, as well as the associations of resilience with other constructs (ex. coping, self-confidence, motivation, mental toughness). Also, it is interesting to note how RS-Sp scores can change over the course of a sporting season and in response to adversity.

# Conclusion

The study showed the first resilience scale specific to athletes in sport. It is expected that the development of the RS-Sp will facilitate the investigation of the resilience of athletes by expanding the knowledge of this construct and enabling the evaluation with other variables of sport performance. Therefore, for future investigations this scale needs to be culturally explored, tested in different fields of sport.

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~	CVC-Valu	es For The	Parameter.	s Clarity C	fLanguag	ge, Theoret	ical Releva	nce, Practi	cal Relev	ance, And	Intelligibili	A
Class	Ũ	ompetitior	ı Experiene	ces	Tra	uining Exp	eriences	Ind	ividual P	sychologic	al Charact	eristics
Items	CVCCI	CVC <sub>TE</sub>	<b>CVC</b> <sub>PR</sub>	CVCIN	CVC <sub>CI</sub>	CVC <sub>TE</sub>	<b>CVC</b> <sub>PR</sub>	CVCIN	CVC <sub>CI</sub>	CVC <sub>TE</sub>	CVCPR	CVCIN
-	0,92	0,92	0,96	0,92	0,96	0,92	0,96	0,96	1,00	0,88	0,88	0,96
7		1,00	1,00	0,88	1,00	1,00	1,00	1,00	1,00	0,88	0,88	0,96
m	0,96	1,00	1,00	0,88	1,00	1,00	1,00	1,00	1,00	0,88	0,88	1,00
4	1,00	0,92	0,92	0,96	0,92	0,64	0,68	0,92	1,00	0,88	0,88	1,00
5	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,96	0,92	1,00	1,00	0,88
9	1,00	1,00	1,00	0,96	0,96	0,72	0,88	0,92	0,96	1,00	1,00	1,00
7	1,00	1,00	1,00	1,00	1,00	0,64	0,76	0,96	1,00	0,96	0,96	0,96
∞	0,96	0,92	0,92	0,96	0,96	0,56	0,68	0,88	1,00	0,88	0,88	1,00
6	0,96	0,96	0,96	0,96	0,96	0,56	0,68	0,88	0,96	1,00	1,00	0,96
10	1,00	1,00	1,00	1,00	1,00	0,80	0,80	0,96	0,96	0,64	0,64	1,00
11	1,00	1,00	1,00	1,00	1,00	0,92	0,92	0,96	1,00	0,80	0,80	1,00
12	1,00	0,80	0,88	1,00	1,00	0,84	0,84	0,96	0,96	0,96	0,96	0,96
13	0,88	1,00	0,80	0,72	0,88	0,76	0,76	0,88	0,96	0,96	0,96	0,96
14	0,96	1,00	1,00	0,96	1,00	0,72	0,84	0,96	0,96	0,96	0,96	0,96
15	0,96	0,96	0,96	0,88	1,00	0,88	0,88	0,96	0,92	1,00	1,00	0,88
16	0,88	0,88	0,88	0,88	0,88	0,52	0,64	0,84	1,00	0,88	0,88	0,92
17	0,92	0,92	0,92	0,92	0,92	0,56	0,68	0,88	1,00	0,72	0,72	0,92
18	0,92	0,68	0,80	0,88	0,92	0,56	0,68	0,88	1,00	1,00	1,00	1,00
19	0,92	0,76	0,80	0,84	0,92	0,68	0,68	0,88	0,88	1,00	1,00	0,92
20	1,00	0,68	0,80	0,92	1,00	0,76	0,76	0,96	1,00	1,00	1,00	0,92
21	0,96	0,64	0,76	0,88	0,96	0,96	0,96	0,92	1,00	0,80	0,80	1,00
22	1,00	0,84	0,80	0,96	1,00	0,92	0,92	0,96	0,92	0,96	0,96	0,96
23	1,00	0,80	0,80	0,88	1,00	0,92	0,92	0,96	1,00	0,92	0,92	1,00
24	0,96	0,84	0,84	0,88	1,00	0,72	0,84	0,96	1,00	1,00	1,00	1,00
25	1,00	0,80	0,80	0,92	1,00	0,76	0,76	0,96	1,00	0,80	0,80	1,00
26	1,00	0,80	0,92	0,96	1,00	0,96	0,96	0,96	1,00	1,00	1,00	1,00
27	1,00	0,80	0,92	0,96	1,00	1,00	1,00	0,96	0,96	0,72	0,84	0,96
28	1,00	0,80	0,92	0,96	1,00	0,92	0,92	0,96	1,00	1,00	1,00	1,00
29	0,96	0,60	0,76	0,88	0,88	0,88	0,88	0,88	0,96	1,00	1,00	0,92
30	1,00	0,72	0,72	0,92	1,00	0,68	0,80	0,96	1,00	0,96	0,96	1,00

Appendix 1

516

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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			Coaches/Team	mates Support			Familv/Frie	nds Support	
		CVCci	CVC <sub>TE</sub>	CVCPR	CVCIN	CVCa	CVCTE	CVCPR	CVCIN
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1	0,96	0,96	0,96	0,96	0,96	0,96	0,96	0,96
3         100	7	1,00	0,92	0,92	1,00	1,00	0,96	0,96	1,00
4         100	e G	1,00	1,00	1,00	1,00	1,00	0.96	0,96	1,00
5         100         0.96         0.96         100         0.96         0.96         100         0.96         100           7         1.00         0.88         1.00         1.00         1.00         0.92	4	1,00	1,00	1,00	1,00	1,00	0.96	0,96	1,00
6         1.00         0.88         1.00         1.00         0.92         0.93         0.96         0	S	1,00	0,96	0,96	1,00	1,00	0,96	0,96	1,00
7         100         0.84         0.96         1.00         1.00         0.92         0.92         1.00           8         1.00         0.96         0.96         1.00         1.00         0.96         0.96         1.00           10         1.00         0.96         0.96         0.96         0.96         0.96         0.96         1.00           11         0.84         0.80         0.96         0.96         0.96         0.96         1.00           12         1.00         1.00         1.00         0.96         0.96         0.96         1.00           14         0.88         0.84         0.88         0.96         0.96         0.96         1.00           15         1.00         1.00         1.00         1.00         0.96         0.96         1.00           16         1.00         1.00         1.00         1.00         0.96         0.96         1.00           17         0.96         0.96         0.96         0.96         0.96         0.96         1.00           17         0.96         0.96         0.96         0.96         0.96         0.96         0.96         0.96           17	9	1,00	0,88	1,00	1,00	1,00	0.92	0,92	0,92
8         0.96         0.06         0.06         0.96         0	7	1,00	0,84	0,96	1,00	1,00	0.92	0,92	1,00
9         100         0.96         0.96         1.00         0.96         0.96         1.00         1.00         0.96         0.96         1.00         1.	æ	0,96	0,96	0,96	0.92	1,00	0.96	0,96	1,00
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	9	1,00	0,96	0,96	1,00	1,00	0.96	0,96	1,00
	10	1,00	0,96	0,96	1,00	1,00	0.96	0,96	1,00
12         1,00         1,00         1,00         1,00         1,00         1,00         0,72         0,72         0,72         0,88         0,96         0,72         0,88         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         0,96         0,96         0,96         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         0,96         0,96         0,96         1,00	11	0,84	0,80	0,80	0,84	1,00	0,96	0,96	1,00
13         0.88         0.84         0.84         0.88         0.96         0.96         1.00           14         0.88         0.88         0.84         0.88         0.88         0.96         0.96         1.00           15         1.00         1.00         1.00         1.00         1.00         1.00         0.92         0.96         1.00           16         1.00         1.00         1.00         1.00         1.00         0.96         0.96         0.96         1.00           17         0.96         0.96         0.96         0.96         0.96         0.96         1.00           19         1.00         1.0	12	1,00	1,00	1,00	1,00	0,96	0,72	0,72	0,88
140,880,880,880,880,880,880,960,960,960,961,00161,001,001,001,001,001,001,000,950,951,00170,960,960,960,960,960,960,960,960,961,00170,960,960,960,960,960,960,960,960,960,96201,000,960,960,960,900,910,000,960,960,96211,000,920,921,001,001,001,001,001,00211,000,920,921,001,001,001,001,001,00221,000,920,921,001,001,001,001,001,00231,000,920,921,001,001,001,001,001,00241,000,930,931,001,001,001,001,001,00251,000,980,880,921,001,001,001,001,00261,000,880,880,880,921,001,001,001,00270,920,960,960,960,960,960,960,960,96270,920,920,921,001,001,001,001,00280,980,880,98	13	0,88	0,84	0,84	0,88	0,96	0.96	0,96	1,00
15         1,00         0,96         0,96         1,00	14	0,88	0,88	0,88	0,88	1,00	0.96	0,96	1,00
16         1,00	15	1,00	1,00	1,00	1,00	1,00	0.92	0,92	1,00
17         0,96         0,96         0,96         0,96         0,96         0,96         0,96         0,96         0,96         0,06         1,00         0,96         0,96         0,96         0,96         0,96         0,96         0,06         1,00	16	1,00	1,00	1,00	1,00	1,00	0,96	0,96	1,00
18         0,96         0,96         0,96         0,96         1,00         0,88         0,90         1,00	17	0,96	0,96	0,96	0,96	1,00	0.96	0,96	1,00
19         1,00         0,84         0,84         0,96         1,00	18	0,96	0,96	0,96	1,00	0,92	0,88	0,88	0,88
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	19	1,00	0,84	0,84	0,96	1,00	1,00	1,00	1,00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	20	1,00	0,92	0,92	1,00	1,00	1,00	1,00	1,00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	21	1,00	0,80	0,80	0,92	1,00	1,00	1,00	1,00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	22	0,96	1,00	1,00	0,92	1,00	1,00	1,00	1,00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	23	1,00	0,92	0,92	1,00	1,00	0,84	0,84	0,96
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	24	1,00	0,96	0,96	1,00	1,00	0,64	0,64	0,96
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	25	1,00	0,84	0,84	1,00	1,00	1,00	1,00	1,00
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	26	1,00	0,88	0,88	1,00	1,00	1,00	1,00	1,00
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	27	0,92	0,88	0,88	0,92	1,00	1,00	1,00	1,00
29         1,00         0,88         0,84         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         1,00         0,96	28	1,00	0,88	0,84	1,00	1,00	1,00	1,00	1,00
301,000,640,600,721,000,840,96Legend: $CVC_{cl}$ : clarity of language, $CVC_{TR}$ : theoretical relevance, $CVC_{PR}$ : practical relevance, $CVC_{IN}$ intelligibility	29	1,00	0,88	0,84	1,00	1,00	1,00	1,00	1,00
Legend: CVCci: clarity of language, CVCrR; theoretical relevance, CVCPR: practical relevance, CVCn intelligibility	30	1,00	0,64	0,60	0,72	1,00	0,84	0,84	0,96
	Γ	egend: CVCci: cl	arity of language,	CVC <sub>TR</sub> :theoretica	l relevance, CVC	CPR: practical relev	ance, CVC <sub>IN</sub> intell	ligibility	

517

	Competition Experiences	Training Experiences	Individual Psychological Characteristics	Coaches/Team mates Support	Family/Frie nds Support
Item	CVC <sub>i</sub>	CVC <sub>i</sub>	CVC <sub>i</sub>	CVC <sub>i</sub>	CVC <sub>i</sub>
1	0,59	0,96	0,96	0,62	0,94
2	0,96	0,62	1,00	0,56	0,48
3	0,48	0,68	0,65	1,00	0,67
4	0,56	-	1,00	0,67	0,94
5	0,96	0,94	0,68	0,96	0,94
6	1,00	0,59	1,00	0,98	0,98
7	1,00	-	1,00	0,60	0,52
8	0,88	-	0,66	0,52	1,00
9	0,60	-	0,88	0,96	0,60
10	1,00	1,00	-	0,68	0,67
11	0,67	0,90	0,88	0,96	1,00
12	0,59	0,55	0,95	0,95	0,94
13	0,94	0,68	0,90	0,60	0,66
14	1,00	0,96	0,95	0,69	0,60
15	0,65	1,00	0,98	0,88	0,52
16	1,00	-	0,52	1,00	0,88
17	0,53	-	0,95	1,00	0,58
18	-	-	1,00	0,96	0,63
19	0,96	-	0,96	0,65	0,63
20	-	0,88	0,88	0,66	0,94
21	-	0,63	1,00	1,00	0,88
22	0,94	0,59	0,48	0,60	0,88
23	0,70	0,96	0,88	0,58	0,69
24	0,96	1,00	0,96	0,92	-
25	0,58	0,94	0,90	0,90	0,58
26	0,94	0,55	0,58	1,00	1,00
27	0,88	0,94	1,00	0,63	0,96
28	0,63	0,58	0,56	0,52	0,66
29	-	0,63	0,88	0,63	0,63
30	0,64	-	0,96	-	0,63

**Appendix 2** *CVC<sub>i</sub>* Values Of The Items After Reevaluation By The Rates.

Legend: CVCi = Item content validity coefficient (mean scores). The items highlighted in the table were excluded.

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The RS-Sp 73 Items With Factor Loadings For The 5 Factors

	Item	F1	F2	F3	F4	FS
1.	Eu amo competir no meu esporte.	0.123	0.459	0.012	- 0.142	- 0.002
2.	Eu gosto de ser desafiado no esporte.	0.390	0.275	- 0.022	- 0.080	- 0.124
3.	Eu me sinto realizado quando estou no ambiente de treinamento.	0.220	0.207	- 0.109	0.206	- -
4.	As experiências de sucesso em competições me dão forças para continuar no esporte.	- 0.040	0.401	- 0.031	0.123	0.015
5.	When I'm frustrated, I talk to teammates or my coach. Quando estou frustrado eu converso com colegas da minha equipe ou com o meu treinador.	_ 0.008	- 0.159	0.047	- 0.068	0.658
6.	Eu suporto bem os treinos difíceis.	0.080	- 0.140	0.505	0.139	- 0.131
7.	Eu lido bem com as críticas duras da mídia ou torcida.	0.014	- 0.090	0.463	0.063	- 0.083
8.	I rely on my coach to solve difficult situations related to the sport I practice./ Eu conto com o meu treinador para resolver as situações difficeis do esporte.	0.047	0.052	0.006	- 0.124	0.514
9.	Mesmo quando estou sendo derrotado, eu continuo me esforçando.	0.189	0.380	- 0.068	0.058	0.005
10.	When I'm faced with challenges in sport, I seek support from my family or friends./ Quando estou em situações diffeeis no esporte eu procuro apoio na minha família ou nos meus amigos.	0.041	0.619	- 0.169	0.163	0.102
11.	Eu quero ser o melhor no meu esporte.	0.002	0.370	0.007	- 0.211	0.227
12.	In difficult moments during a competition, I ask God or fate for help./ Nos momentos difficeis de uma competição eu peço ajuda a Deus ou ao destino.	- 0.301	0.082	0.228	0.837	- 0.068

Resilience scale for sport

Continued - Appendix 3

su falo lurante	palavras positivas para mim mesmo ou para minha equipe situações difíceis no esporte.	0.017	0.148	0.020	0.280	0.236
<u>Duando estou c</u>	om problemas no esporte eu sigo a minha intuição.	0.010	0.031	0.030	0.225	0.255
vnen I think at onvince me no á suporte para	out giving up, my ramity supports me and tries to t to quit./ Quando penso em desistir minha família me continuar.	611.0	U./88	- 0.144	- 0.008	1+0.0
lu consigo recu	uperar bem o meu desempenho após uma lesão.	0.255	0.136	0.015	0.124	- 0.016
ara obter resu nim do que na	ltado no esporte eu tomo decisões pensando mais em equipe.	0.050	- 0.144	- 0.113	0.040	0.280
Eu gosto de co	mpetir com torcida adversária me pressionando.	0.008	0.133	0.379	- 0.201	- 0.020
As experiência orte.	s de fracasso em competições me ensinaram a ser mais	0.510	- 0.034	0.115	0.050	0.171
su dependo ma esultado no es	ais de mim do que de outra pessoa para alcançar o sporte.	0.169	0.083	0.144	- 0.143	- 0.105
Cer que lidar o orte ou confia	com as situações difíceis no treino me faz sentir mais inte	0.060	- 0.046	0.556	0.269	- 0.077
du treino porq	lue é desafiador.	0.142	0.023	0.335	- 0.065	0.151
Ju me sinto pi reinos.	reparado para competir porque estou indo bem nos	0.573	0.017	0.047	0.048	0.154
always keep ninha fé em s	my faith in difficult situations / Eu sempre mantenho a ituações difficeis no esporte.	- 0.107	0.235	0.209	0.705	- 0.007
As experiênci o esporte.	as de sucesso me dão forças e confiança para continuar	0.517	0.039	0.123	0.061	- 0.033
) orgulho que superar os d	e minha família ou meus amigos sentem de mim me ajuda esafios do esporte	0.111	0.767	- 0.075	0.077	0.091
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Continued - Appendix 3

520

CONUTINA		-	-		-	-
27.	Eu tento ver o lado positivo das coisas quando não alcanço meus	0.194		0.073	0.278	0.179
	resultados numa competição.		0.024			
28.	Eu me sinto bem quando ajudo um colega da equipe.	- 0.160	- 0.001	0.217	0.056	0.291
29.	Eu tenho orgulho da minha carreira no esporte.	0.147	0.155	0.107	0.128	0.089
30.	Eu persisto no esporte mesmo após uma falha grave.	0.079	0.424	- 0.086	0.133	0.095
31.	I can overcome negative thoughts after a poor sports performance/	- 0.072	- 0.014	0.624	0.153	- 0.069
	Eu consigo superar pensamentos negativos apos um desempenno rum no esporte.					
32.	Eu me sinto satisfeito com os meus resultados no esporte.	- 0.052	0.050	0.458	0.114	0.043
33.	Eu consigo me manter concentrado durante os treinos exaustivos.	0.091	- 0.105	0.562	0.123	0.001
34.	Eu me sinto fortalecido quando percebo que minha família, amigos ou professores acreditam no meu sucesso.	0.038	0.606	- 0.048	0.242	0.060
35.	Eu fico calmo quando estou diante de adversários fortes.	- 0.173	0.192	0.555	- 0.195	- 0.044
36.	Quando estou competindo o resultado é o que mais importa.	0.247	0.068	0.057	- 0.372	0.219
37.	Eu consigo me manter concentrado mesmo durante os imprevistos em uma competição.	0.011	0.061	0.626	- 0.129	- 0.111
38.	Eu percebo o apoio da minha família no esporte.	- 0.091	0.765	0.175	- 0.070	- 0.055
39.	I trust my potential concerning the sport. / Eu confio no meu potencial dentro do esporte.	0.675	0.297	0.184	- 0.151	- 0.043
40.	Eu tenho facilidade em me adaptar às pessoas novas na equipe.	0.289	0.097	0.070	0.267	- 0.110
41.	Eu acredito que posso vencer uma competição.	0.521	0.175	860.0	- 0.105	- 0.031
42.	Eu percebo o apoio da escola e professores para o meu desenvolvimento no esporte.	0.063	- 0.045	0.273	0.308	0.044

Continued - Annendix 3

Continued - Appendix 3

43.	Quando estou competindo o desempenho do adversário não me preocupa.	0.343	0.008	0.077	- 0.041	0.183
44.	I keep thinking positively even during the difficult moments in my career / Fu nenso nositivo mesmo em momentos difficeis da minha	0.124	0.002	0.641	0.124	0.113
	carreira.					
45.	Eu me sinto bem quando minha família ou os meus amigos participam	0.019	0.540	0.013	0.047	0.204
46.	Eu sou frequente nos treinos.	- 0.023	0.554	- 0.099	- 0.140	- 0.077
47.	Eu percebo que os estudos me ajudam a ter sucesso no esporte.	0.072	0.045	0.057	0.248	0.072
48.	Eu consigo me adaptar quando acontecem situações difíceis antes ou durante uma competição.	- 0.057	0.004	0.670	0.099	- 0.038
49.	Eu busco soluções para os imprevistos da competição antes deles acontecerem.	- 0.121	- 0.064	0.503	0.169	0.182
50.	Eu consigo lidar com qualquer imprevisto que aconteça no dia da competição.	- 0.161	0.057	0.604	0.057	0.081
51.	Durante a competição eu me esforço ao máximo, não importa qual seja o resultado.	0.511	0.038	- 0.058	0.007	- 0.081
52.	When I'm faced with challenges in sport I look to my training colleagues/ Quando estou em situações difíceis no esporte eu procuro os meus colegas de treino.	0.111	- 0.138	0.189	- 0.000	0.668
53.	Quando estou competindo eu consigo tomar decisões corretas mesmo sob pressão.	600.0	0.044	0.643	0.113	- 0.031
54.	Eu me sinto bem quando o treinador me valoriza na equipe.	0.435	- 0.096	0.103	- 0.019	- 0.064
55.	I trust my performance during my training. /Eu confio no meu desempenho durante os treinos.	0.668	0.369	600.0	- 0.084	- 0.075

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56.	Eu acredito que ter um bom relacionamento com a minha equipe/treinador é importante para o meu sucesso no esporte.	0.495	- 0.139	0.032	0.073	- 0.118	
57.	Eu me sinto valorizado quando o treinador me cobra um melhor desempenho nos treinos.	0.481	- 0.028	0.078	0.149	- 0.033	
58.	Eu me sinto realizado no esporte porque minha família ou a minha escola valorizam a minha participação.	0.048	0.710	0.066	0.089	- 0.025	
59.	Eu cumpro as minhas metas de treinamento.	0.113	0.408	- 0.044	- 0.057	0.123	
60.	Eu gosto de vencer a competição porque consigo patrocínios financeiros.	0.182	- 0.142	0.141	- 0.054	0.298	
61.	Eu tento ver o lado positivo das coisas quando o treino está difícil.	0.194	0.162	0.535	- 0.114	0.187	
62.	Ser atleta é muito importante para mim.	- 0.065	0.739	- 0.119	- 0.102	- 0.026	
63.	Eu percebo que tenho amigos na minha equipe.	0.132	0.334	0.084	0.199	- 0.256	
64.	I believe I have emotional control during stressful sporting situations./Eu sinto que tenho controle emocional em situações de pressão dentro do esporte.	- 0.111	0.088	0.663	0.013	- 0.116	
65.	I'm satisfied with practicing sports because my family or my school value my participation./ Eu acredito que o meu sucesso no esporte vem do apoio que recebi da minha família, amigos ou professores	0.080	0.731	- 0.068	0.078	0.014	
66.	I believe in myself during difficult moments in a competition./ Nos momentos difficeis de uma competição eu acredito em mim.	0.650	0.301	0.075	- 0.076	0.041	
67.	Quando preciso me concentrar no esporte eu me afasto da minha família ou dos meus amigos.	0.102	- 0.172	$^{-}$ 0.188	0.033	0.289	
68.	When a problem related to my training doesn't seem to have a clear solution, I ask God or fate for help./ Quando os problemas do treino não tem uma solução clara, eu peço a Deus ou o destino para ajudar.	- 0.255	0.076	0.161	0.780	- 0.039	
	-	-	-	Co	mtinued - P	Appendix 3	

69.	Eu me sinto bem quando minha família ou os meus amigos	.449	1	0.241	0.049	0.069
_	compreendem a minha rotina do esporte.		0.190			
70.	Eu posso contar com pelo menos uma pessoa quando enfrento dias	0.220	0.534	0.016		0.003
_	difíceis no esporte.				0.093	
71.	Eu me sinto capaz de superar os desafíos no esporte para atingir as	.662	0.220	0.016		0.003
_	minhas metas.				0.093	
72	En confio nas orientacões do men treinador.		0.390	I	0.305	I
i		0.104		0.084		0.024
73	Eu sei onde quero chegar no esnorte	.493	1	1	I	0.152
			0.040	0.002	0.063	
	Motor Only the items of the final version (DC Sn 15 items) want throw	thatr	anclation	0.0000		

Continued - Appendix 3

*Note:* Unly the items of the final version (RS-Sp 15 items) went through the translation process. They are highlighted in red.

# Appendix 4

Escala De Resiliência No Esporte (Original Version In Portuguese) Responda as questões objetivamente com o grau de certeza que você possui sobre as questões descritas abaixo, sendo 1 (Absolutamente não concordo) e 5 pontos (Absolutamente eu concordo).

Vf	Vv	Eu sou assim	1	2	3	4	5
1	31	Eu consigo superar pensamentos negativos após um					
		desempenho ruim no esporte					
2	12	Nos momentos difíceis de uma competição eu peço					
		ajuda a Deus ou ao destino.					
3	8	Eu conto com o meu treinador para resolver as					
		situações difíceis do esporte.					
4	10	Quando estou em situações difíceis no esporte eu					
		procuro apoio na minha família ou nos meus amigos.					
5	24	Eu sempre mantenho a minha fé em situações difíceis					
		no esporte.					
6	65	Eu me sinto realizado no esporte porque minha					
		família ou a minha escola valorizam a minha					
		participação					
7	39	Eu confio no meu potencial dentro do esporte.					
8	52	Quando estou em situações difíceis no esporte eu					
		procuro os meus colegas de treino.					
9	64	Eu sinto que tenho controle emocional em situações					
		de pressão dentro do esporte.					
10	66	Nos momentos difíceis de uma competição eu					
	_	acredito em mim.					
11	44	Eu penso positivo mesmo em momentos difíceis da					
		minha carreira					
12	68	Quando os problemas do treino não tem uma solução					
		clara, eu peço a Deus ou o destino para ajudar.					
13	55	Eu confio no meu desempenho durante os treinos.					
14	5	Quando estou frustrado eu converso com colegas da					
		minha equipe ou com o meu treinador.					
15	15	Quando penso em desistir minha família me dá					
		suporte para continuar.					

Note: Vf= final numbering of the scale. Vv: numbering of items during the validation process (used in the article). The scale is presented in its original version.

# Sport Resilience Scale (English version\*)

Please answer the questions objectively using the scale below, where "1" means "I strongly disagree" and "5" means "I strongly agree."

Vf	Vv	That is how I am	1	2	3	4	5
1	31	I can overcome negative thoughts after a poor sports					
		performance.					
2	12	In difficult moments during a competition, I ask God					
		or fate for help.					
3	8	I rely on my coach to solve difficult situations related					
		to the sport I practice.					
4	10	When I'm faced with challenges in sport, I seek					
		support from my family or friends.					
5	24	I always keep my faith in difficult situations.					
6	65	I'm satisfied with practicing sports because my					
		family or my school value my participation.					
7	39	I trust my potential concerning the sport.					
8	52	When I'm faced with challenges in sport I look to my					
		training colleagues.					
9	64	I believe I have emotional control during stressful					
		sporting situations.					
10	66	I believe in myself during difficult moments in a					
		competition.					
11	44	I keep thinking positively even during the difficult					
		moments in my career.					
12	68	When a problem related to my training doesn't seem					
		to have a clear solution, I ask God or fate for help.					
13	55	I trust my performance during my training.					
14	5	When I'm frustrated, I talk to teammates or my coach.					
15	15	When I think about giving up, my family supports me					
		and tries to convince me not to quit.					

Note: Vf= final numbering of the scale. Vv: numbering of items during the validation process (used in the article).

\*Translated by Taylor & Francis Editing Services.

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