BEHAVIORAL REGULATION IN SPORT QUESTIONNAIRE (BRSQ): USE IN YOUNG BRAZILIAN ATHLETES

BEHAVIORAL REGULATION IN SPORT QUESTIONNAIRE (BRSQ): USO EM ATLETAS JOVENS BRASILEIROS

BEHAVIORAL REGULATION IN SPORT QUESTIONNAIRE (BRSQ): USO EN ATLETAS JÓVENES BRASILEÑOS

Original Article
Artigo Original
Artículo Original

Dartagnan Pinto Guedes[1]
(Physical Education Professional)
Vilmar Aparecido Caus[1]
(Physical Education Professional)
Sandro Lucas Sofiati[1]
(Physical Education Professional)

1. Universidade Norte do Paraná, Health Sciences Research Center, Londrina, PR, Brazil.

Correspondence:
Dartagnan Pinto Guedes. Rua Ildefonso Werner, 177, Condomínio Royal Golf, Londrina, PR, Brazil. 86055-545. darta@sercomtel.com.br

ABSTRACT

Introduction: The Behavioral Regulation in Sport Questionnaire (BRSQ) was originally proposed in English in order to identify sports motivation regulations according to the self-determination theory. Objectives: To translate into Portuguese, to perform cross-cultural adaptation, and to examine the psychometric properties of the BRSQ in a sample of young Brazilian athletes. Methods: The original version was translated according to international recommendations. A panel of judges analyzed the translated versions of the questionnaire, using semantic, idiomatic, cultural and conceptual equivalence as analysis criteria. The final version of the translated questionnaire was administered in a sample of 1217 young athletes (410 girls and 807 boys) aged 12 to 17 years. An exploratory factor analysis was carried out to identify initial psychometric properties, followed by a confirmatory factor analysis. Cronbach's alpha coefficient was used to assess the internal consistency of each factor associated with the BRSQ. Results: After minor changes identified in the translation process, the panel of judges was of the opinion that the Portuguese version of the BRSQ had semantic, idiomatic, cultural and conceptual equivalence. The factor analysis confirmed the structure of the eight factors proposed originally, through the statistical indicators $\chi^2/gl = 1.87$, CFI = 0.940, GFI = 0.945, AGFI = 0.958 and RMSR = 0.052 ($_{95\%}$ CI 0.043 - 0.062). The Cronbach's alpha ranged from 0.71 to 0.85. Conclusions: Translation, cross-cultural adaptation and analysis of the psychometric qualities of the BRSQ were satisfactory, facilitating its application in future studies involving young athletes in Brazil. ***Level of Evidence III; Retrospective comparative study.***

Keywords: Questionnaire; Psychometrics; Self-determination; Athletic performance; Brazil.

RESUMO

Introdução: O Behavioral Regulation in Sport Questionnaire (BRSQ) foi originalmente proposto no idioma inglês com o intuito de identificar as regulações de motivação para a prática de esporte, segundo a teoria da autodeterminação. Objetivos: Traduzir para o idioma português, realizar a adaptação transcultural e examinar as propriedades psicométricas do BRSQ em uma amostra de atletas jovens brasileiros. Métodos: A versão original foi traduzida de acordo com as recomendações internacionais. Um comitê de juízes analisou as versões traduzidas do questionário, utilizando como critério de análise as equivalências semântica, idiomática, cultural e conceitual. A versão final do questionário traduzido foi utilizada em uma amostra com 1217 atletas jovens (410 moças e 807 moços) com idade entre 12 e 17 anos. Para identificar as propriedades psicométricas iniciais, realizou-se a análise fatorial exploratória e, na sequência, a análise fatorial confirmatória. Para análise da consistência interna de cada fator associado ao BRSQ foi empregado o coeficiente alfa de Cronbach. Resultados: Após poucas alterações apontadas no processo de tradução, o comitê de juízes considerou que a versão para o idioma português do BRSQ apresentou equivalências semânticas, idiomáticas, culturais e conceituais. A análise fatorial confirmou a estrutura dos oito fatores originalmente propostos mediante os indicadores estatísticos $\chi^2/gl = 1,87$, CFI = 0,940, GFI = 0,945, AGFI = 0,958 e RMSR = 0,052 (IC $_{95\%}$ 0,043 – 0,062). O alfa de Cronbach apontou uma consistência interna dos fatores associados à motivação para a prática de esporte entre 0,71 e 0,85. Conclusão: A tradução, adaptação transcultural e análise das qualidades psicométricas do BRSQ foram satisfatórias, viabilizando sua aplicação em futuros estudos envolvendo atletas jovens no Brasil. ***Nível de Evidência III; Estudo retrospectivo comparativo.***

Descritores: *Questionário; Psicometria; Autodeterminação; Desempenho atlético; Brasil.*

RESUMEN

Introducción: El Behavioral Regulation in Sport Questionnaire (BRSQ) fue originalmente propuesto en el idioma inglés con el propósito de identificar las regulaciones de motivación para la práctica del deporte bajo la luz de la teoría de la autodeterminación. Objetivos: Traducir para el idioma portugués, realizar la adaptación transcultural y examinar las propiedades psicométricas del BRSQ en una muestra de atletas jóvenes brasileños. Métodos: La versión original fue traducida de acuerdo con las recomendaciones internacionales. Un comité de jueces analizó las versiones traducidas del cuestionario, utilizando como criterio de análisis las equivalencias semántica, idiomática, cultural y conceptual. La versión final del cuestionario traducido fue utilizada en una muestra de 1217 atletas jóvenes (410 del sexo femenino y 807 del masculino) con edades entre 12 y 17 años. Para identificar las propiedades psicométricas iniciales se realizó el análisis factorial exploratorio y, a continuación, análisis factorial confirmatorio. Para el análisis de la consistencia interna de cada factor asociado al BRSQ fue empleado el coeficiente alfa de Cronbach. Resultados:

Después de pocas alteraciones apuntadas en el proceso de traducción, el comité de jueces consideró que la versión para el idioma portugués del BRSQ presentó equivalencias semánticas, idiomáticas, culturales y conceptuales. El análisis factorial confirmó la estructura de los ocho factores originalmente propuestos, mediante los indicadores estadísticos $\chi^2/gl = 1,87$, CFI = 0,940, GFI = 0,945, AGFI = 0,958 y RMSR = 0,052 ($IC_{95\%}$ 0,043 - 0,062). El alfa de Cronbach apuntó una consistencia interna de los factores asociados a la motivación para la práctica del deporte entre 0,71 y 0,85. Conclusión: La traducción, adaptación transcultural y análisis de las cualidades psicométricas del BRSQ fueron satisfactorias, lo que viabiliza su aplicación en futuros estudios involucrando a atletas jóvenes en Brasil. ***Nivel de evidencia III; Estudio retrospectivo comparativo.***

Descriptores: *Cuestionario; Psicometría; Autodeterminación; Rendimiento atlético; Brasil.*

DOI: http://dx.doi.org/10.1590/1517-869220192501184936 Article received on 09/04/2017 accepted on 07/19/2018

INTRODUCTION

The motivational profile of young people for sports practice is an issue that has been attracting the attention of researchers and professionals in the area. Evidence of this includes recent theoretical approaches attempting to explain motivational behavior in sports contexts[1-3] and efforts directed towards the proposal and validation of instruments for identifying and scaling the motivational indicators that lead young people to initiate, continue, or discontinue sports practice.[4,5]

Presently, as well as in past decades, Self-Determination Theory (SDT) has been highlighted as a consistent and specific way to analyze the motivational aspects involved in the practice of sport.[6-12] In fact, SDT is a general human motivation theory that seeks to analyze the degree to which related behaviors are self-determined; that is, the intensity with which people voluntarily perform actions by their own choice.[13-15]

Specifically, SDT establishes different degrees of motivation on a continuum ranging from less to more self-determined. The constructs related to amotivation and intrinsic motivation are located on opposite ends of the continuum, while the constructs associated with extrinsic motivation and its respective regulations (external, introjected, identified, and integrated) are located in the center.[14,15] Details on the design and characterization of SDT and its implications for sport practice have been widely described in other publications.[1,3,6,7]

To consider the assumptions of a theory, instruments that can identify and scale the associated attributes are required. In the sporting context, two questionnaires have been designed specifically to meet the assumptions of SDT; these are the *Sports Motivation Scale (SMS)*[16] and the *Behavioral Regulation in Sport Questionnaire (BRSQ)*.[17]

Initially, the SMS scale was criticized for not considering the more autonomous form of extrinsic motivation foreseen in SDT: integrated regulation.[18] Therefore, an adjusted version of the SMS, called the SMS-6, was subsequently developed. This version maintained the original structure of the scale; however, an additional factor was added, equivalent to integrated regulation.[19] More recently, there was an attempt to present a revised version of this instrument, the SMS-II.[20] However, despite the efforts of its proponents, important statistical limitations in its psychometric properties were identified in both versions of the SMS, in particular the factorial validity and internal consistency of the items.

The BRSQ was conceived with the aim of minimizing the limitations presented by the different versions of the SMS and has received attention in the specialized literature. Originally, the BRSQ was proposed in the English language, but many researchers from other countries have been interested in its translation and validation, which has allowed its expanded use in other cultures.[21] In Brazil, there has been an attempt to translate and validate the BRSQ for use in the Brazilian context.[22] However, during the design of the study, due attention was not given to the methodological rigor recommended for the transcultural translation and adaptation of questionnaires with these characteristics. Furthermore, in order to identify the psychometric properties of the translated version of the BRSQ, an overly heterogenous sample for age with an insufficient number of subjects was used to attain a statistically suitable factorial adjustment for the 36-item instrument. Consequently, the solid conceptual criteria presented in SDT gave way to compromised statistical findings.

The objective of this study was to perform a translation and cross-cultural adaptation of the BRSQ to the Portuguese language and to examine the psychometric properties for use in young athletes.

METHODS

Instrument

The original version of the BRSQ is composed of 36 items, preceded by the statement "I participate in my sport .../*Eu pratico esporte* ....", and the respondent is asked to indicate the degree of agreement that applies to his case by means of a 7-point Likert scale (1 = "not at all true/*nada verdadeiro*"; 4 = "somewhat true/*mais ou menos verdadeiro*"; 7 = "very true/*muito verdadeiro*"). According to its proponents and accompanying the continuum of self-determination, the set of items allows the identification, dimensioning, and ordering of nine motivational subscales: (a) amotivation (AMOT); (b) extrinsic motivation of external regulation (REEX); (c) extrinsic motivation of introjected regulation (REIJ); (d) extrinsic regulation of identified motivation (REID); (e) extrinsic motivation of integrated regulation (REIG); (f) global intrinsic motivation (MIGL); (g) intrinsic motivation to reach objectives (MIOB); (h) intrinsic motivation for stimulating experiences (MIEE); and (i) intrinsic motivation for mastery of knowledge (MICH). The equivalent score for each subscale is defined by calculating the mean of the items of that factor.

Depending on the objective and the details required for the interpretation of the information submitted by the respondent, the BRSQ allows for analysis of the self-determination continuum through two formats, called the BRSQ-6 and the BRSQ-8. The difference between the formats refers to the scope of analysis required for intrinsic motivation. In the case of the BRSQ-6, intrinsic motivation is considered globally, disregarding the specificities related to the scope of objectives, stimulating experiences, and knowledge domain. Therefore, in this format, the items grouped in the MIOB, MIEE, and MICH subscales are ignored, considering only six subscales (AMOT, REEX, REIJ, REID, REIG, MIGL) for this purpose. On the other hand, the BRSQ-8 utilizes the subscales suggested by Vallerand and Rousseau to identify the three types of intrinsic motivation,[18] taking into account eight subscales (AMOT, REEX, REIJ, REID, REIG, MIOB, MIEE, MICH), disregarding the global subscale equivalent to intrinsic motivation (MIGL).

Translation and transcultural adaptation

The translation and cross-cultural adaptation procedures followed internationally suggested protocols.[23] First, two researchers with detailed understanding of the BRSQ independently translated it from its original language (English) to Portuguese. Both were native Portuguese speakers who were also fluent in English and had experience translating academic

texts. In addition to the translation, they were asked to record expressions that could lead to ambiguous interpretation. Subsequently, a bilingual group of three sports researchers compared the translated texts, standardizing the use of divergent expressions, and produced a consensual version of the questionnaire that combined the two previous versions.

Subsequently, two other translators independently back-translated the questionnaire. The translators chosen for this step were native English speakers who were fluent in Portuguese and worked as university professors at a Brazilian institution. The translators were asked to record expressions that might generate discrepancies in the back-translation process. The bilingual group compared both back-translated texts, producing a consensual version.

A committee formed by nine members, including the study authors, translators who completed the translation/back-translation, and three university professors in the area of sports, all bilingual in English and Portuguese, examined the translation process and the results. The committee conducted a review of seven available versions of the BRSQ: the original version in English, the two versions translated to Portuguese, the consensual version of both translations to Portuguese, the two back-translated versions, and the consensual version of the two back-translations.

The committee assessed the types of equivalence between the original instrument and the Portuguese version. The members received written guidelines on the purpose of the study and the definitions adopted for equivalences. Each one responded individually to an analysis form that compared items from the original questionnaire to the corresponding items on the translated Portuguese version and the synthesized back-translated version in terms of semantic, idiomatic, cultural, and conceptual equivalences. The analysis form was structured using a discrete scale with discrete alternatives: "unchanged," "slightly changed," "greatly changed," and "completely changed".

Psychometric properties

The next step of the study was to test the Portuguese-translated BRSQ in order to analyze the psychometric validity indicators. For such, the BRSQ was applied in a sample of young athletes participating in the Youth Games of Paraná in 2015. Around 3,600 young athletes participated in this competition in different modalities: basketball, handball, volleyball, futsal, soccer, athletics, swimming, cycling, gymnastics, judo, karate, taekwondo, and tennis. The non-probabilistic casual method was used for the sample selection. Accordingly, before the start of the competitions, all of the coaches and officials participating in the games were contacted and informed of the nature and objectives of the study, as well as the parameters of confidentiality. Subsequently, authorization was requested to contact and invite young athletes to participate in the study. Upon signing an informed consent form, 1,217 young athletes (410 girls and 807 boys) aged 12 and 17 years agreed to participate in the study, which represented around 30% of the sample of participants in the competition.

Procedures

The *BRSQ* was individually administered during a single session to each young athlete by two researchers. We sought to avoid administering the questionnaire at times when the athletes could be experiencing pre- or post-competition stress. Thus, the questionnaire was administered when the athletes were not in competition environments or when they were spectating other competitions. The athletes received the questionnaire with instructions and recommendations for its completion without any time limit. Any doubts expressed by the respondents were promptly clarified by the researchers.

Statistical analysis

Initially, in order to identify the psychometric properties, the total sample was divided randomly into two independent subsets of equal size, ensuring proportional representation within the sample by sex, age, and training history (training time, volume/week of training, practice, and level of competition).

An exploratory factor analysis (EFA) was used in the first subset (n_1 = 608) through the principal component technique with orthogonal rotation (Varimax). The adequacy of the data subset for the EFA procedures was verified by the Kaiser-Meyers-Olkin (KMO) and Bartlett's sphericity statistical tests. The factorial matrix of the scores derived from the 36 items was observed by items-factor saturation analysis. For such, a bivariate correlation using the Pearson correlation coefficient was used. In this case, items with factorial saturation lower than $\lambda = 0.40$ or which were represented in more than one factor with factorial saturation $\lambda \geq 0.40$ were excluded. Cronbach's alpha calculations were used for internal consistency analysis, followed by mean, standard deviation, and inter-factor bivariate correlations.

The procedures of the confirmatory factorial analysis (CFA) by means of maximum likelihood estimation were conducted with the data gathered in the second subset of the sample ($n_2 = 609$); the aim was to identify indicators of validation equivalent to the factorial structure extracted by the EFA. As to the indicators associated with construct validity, the adjustment between the proposed theoretical model and the data matrix was tested using multiple criteria: the ratio between chi-square and degrees of freedom (χ^2/df), the comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), and root mean square residual (RMSR). In this case, a χ^2/df <2, CFI, GFI, and AGFI ≥ 0.9, together with RMSR values ≤ 0.08, suggest a good fit of the model.[24]

Additionally, to estimate the factorial invariance of the adjusted model for BRSQ use in young athletes of both sexes and of different ages, multi-group analysis was conducted, setting factor loads, variance/covariance, and residuals. To identify any significant differences between submodels differentiated by sex (girls versus boys) or age (≤ 14 years versus 15-16 years versus 17 years), differences between chi-square values ($\Delta\chi^2$), respective degrees of freedom (Δdf), and CFI (ΔCFI) were taken into account. Values of p> 0.05 for $\Delta\chi^2$ and ΔCFI ≤ 0.01 were the criteria for factorial invariance.[25] Data were processed using the SPSS and AMOS statistical packages, Version 22. The study was approved by the Research Ethics Committee Involving Human Beings of the Universidade Norte do Paraná - Plataforma Brasil (Opinion 208.975/2013).

RESULTS

Minor differences were observed at certain steps of the translation process in the use of certain expressions. These differences were discussed by the analysis committee, and expressions that were more easily understood and more frequently used were selected. In general, the comparison of the translation and back-translation revealed clarity of the items, and the proposed final version was contextually similar to the original version. Of the 36 items in the translated version of the BRSQ, 31 (86%) were identified by members of the review committee as possessing semantic, idiomatic, cultural, and conceptual equivalence. In the remaining five (14%), committee members selected the "slightly changed" option for at least one of the equivalencies.

With respect to the suitability of the first data subset for the EFA procedures, the value of the KMO test was equal to 0.915 and the Bartlett sphericity test showed that $\chi^2_{(372)} = 4821.9$ ($p < 0.001$), pointing to the legitimacy of the factorial analysis. Information provided by the EFA is shown in Table 1. A detailed analysis of the factorial matrix reveals that all *r values* associated with factorial weight showed statistical significance ($p < 0.001$); no items with factorial λ saturation ≥ 0.40 were found on more

Table 1. Exploratory Factorial Analysis of the translated Behavioral Regulation in Sport Questionnaire (BRSQ) applied to young athletes of both genders.

	Factor 1 AMOT	Factor 2 REEX	Factor 3 REIJ	Factor 4 REID	Factor 5 REIG	Factor 6 MIGL	Factor 7 MIOB	Factor 8 MIEE	Factor 9 MICH
Item 6	0,72								
Item 8	0,79								
Item 17	0,77								
Item 30	0,75								
Item 13		0,73							
Item 18		0,77							
Item 20		0,80							
Item 33		0,78							
Item 5			0,75						
Item 7			0,83						
Item 16			0,70						
Item 24			0,75						
Item 10				0,75					
Item 22				0,78					
Item 27				0,77					
Item 31				0,76					
Item 3					0,72				
Item 4					0,76				
Item 9					0,78				
Item 35					0,72				
Item 1						0,74			
Item 14						0,80			
Item 21						0,77			
Item 25						0,78			
Item 11							0,75		
Item 12							0,77		
Item 23							0,74		
Item 34							0,77		
Item 2								0,70	
Item 19								0,81	
Item 29								0,74	
Item 32								0,77	
Item 15									0,78
Item 26									0,84
Item 28									0,87
Item 36									0,79
Eigenvalues	14,2	9,6	7,3	5,4	3,9	2,8	2,0	1,5	1,2
Variation	32,6	14,4	10,9	6,3	3,7	2,1	1,3	1,0	0,8
		47,0	57,9	64,2	67,9	40,0	71,3	72,3	73,1

AMOT: amotivation; REEX: extrinsic motivation of external regulation; REIJ: extrinsic motivation of introjected adjustment; REID: extrinsic regulation of identified motivation; REIG: extrinsic motivation of integrated regulation; MIGL: global intrinsic motivation; MIOB: intrinsic motivation to reach objectives; MIEE: intrinsic motivation for stimulating experiences; MICH: intrinsic motivation for mastery of knowledge.

than one factor or with insufficient saturation. The factorial solution of the data matrix defined nine factors with eigenvalues greater than one unit, explaining about 73% of the total variance and commonalities higher than 0.53. The definition of nine factors with equal quantity and distribution of items in each factor confirms the original BRSQ proposal, thus recommending the use of identical denominations: amotivation (factor 1), extrinsic motivation of external regulation (factor 2), extrinsic motivation of introjected regulation (factor 3), extrinsic motivation of identified regulated (factor 4), extrinsic motivation of integrated regulation (factor 5), global intrinsic motivation (factor 6), intrinsic motivation to achieve objectives (factor 7), intrinsic motivation for stimulating experiences (factor 8), and intrinsic motivation for mastery of knowledge (factor 9).

Regarding the magnitude of the indices of internal consistency of the nine factors, preliminary statistics were conducted prior to the calculation of the Cronbach alpha coefficients that underpin their estimates, as seen in Table 2. The mean values found ranged from 1.91 to 6.01 with standard deviations between 0.41 and 0.96. In principle, these findings heavily support the reliability of the estimates of internal consistency, given that the average value of any of the scales alone approached the extreme scores (1 or 7). Furthermore, the variability of individual scores was restricted, denoting some uniformity in its dispersion, regardless of the factor considered. The interfactor bivariate correlations displayed values between -0.39 and 0.85. When calculating Cronbach's alpha coefficients, dimensions ranging from 0.71 (REIG) to 0.85 (MICH) were identified, which points to desirable internal consistency indices for both formats of the translated version of the BRSQ.

Once the factorial structure was defined using AFE procedures, the indicators associated with the construct validation of the proposed model were analyzed. Accordingly, CFA procedures were used with the second subset of the sample. Initially, with the help of the box plot graph, an absence of outliers was observed, providing an important assumption. The results indicated the following statistical indicators: $\chi^2/df = 1.87$, CFI = 0.940, GFI = 0.945, AGFI = 0.958, and RMSR = 0.052 (95% CI 0.043 - 0.062). Subsequently, by testing the model separately for each of the two proposed formats, it was verified that the dimensions of adequacy to the theoretical model met the suggested criteria, both for the BRSQ-6 format ($\chi^2/df = 1.52$; *CFI* = 0.940; *GFI* = 0.961; *AGFI* = 0.981; *RMSR* = 0.048; 95% CI 0.040 – 0.056) and the BRSQ-8 format ($\chi^2/df = 1.96$; *CFI* = 0.940; *GFI* = 0.926; *AGFI* = 0.912; *RMSR* = 0.069; 95% CI 0.058 – 0.081). Figures 1 and 2 display the factorial saturation information of both models proposed.

Indicators related to the tests of factorial invariance between the different strata associated with sex and age are provided in Table 3. The multigroup analysis conducted for sex showed values of $\Delta\chi^2$ and *ΔCFI*, which reveal the existence of invariance between girls and boys in the factorial structure of the model. Similarly, indicators were found suggesting good settings for the models that have loadings, variance/covariance, and residuals in the three age groups (≤ 14 years versus 15-16 years versus 17 years). However, it should be emphasized that adjustments were improved when comparing sex-related strata as opposed to when comparing age-related strata.

Table 2. Descriptive statistics and Cronbach's alpha coefficient of the subscales of the translated Behavioral Regulation in Sport Questionnaire (BRSQ) applied to young Brazilian athletes.

	Average	STD	Cronbach's alpha	AMOT	REEX	REIJ	REID	REIG	MIGL	MIOB	MIEE
AMOT	1,91	0,41	0,81								
REEX	2,27	0,50	0,84	0,78							
REIJ	2,62	0,66	0,83	0,74	0,85						
REID	5,45	0,76	0,74	-0,19	-0,19	-0,09					
REIG	5,79	0,88	0,71	-0,31	-0,17	0,02	0,70				
MIGL	5,98	0,84	0,82	-0,34	-0,29	-0,19	0,62	0,67			
MIOB	5,99	0,90	0,79	-0,33	-0,25	-0,19	0,75	0,55	0,80		
MIEE	6,01	0,96	0,80	-0,39	-0,34	-0,23	0,61	0,58	0,75	0,79	
MICH	5,48	0,82	0,85	-0,29	-0,29	-0,16	0,50	0,57	0,71	0,52	0,68

AMOT: amotivation; REEX: extrinsic motivation of external regulation; REIJ: extrinsic motivation of introjected adjustment; REID: extrinsic regulation of identified motivation; REIG: extrinsic motivation of integrated regulation; MIGL: global intrinsic motivation; MIOB: intrinsic motivation to reach objectives; MIEE: intrinsic motivation for stimulating experiences; MICH: intrinsic motivation for mastery of knowledge.

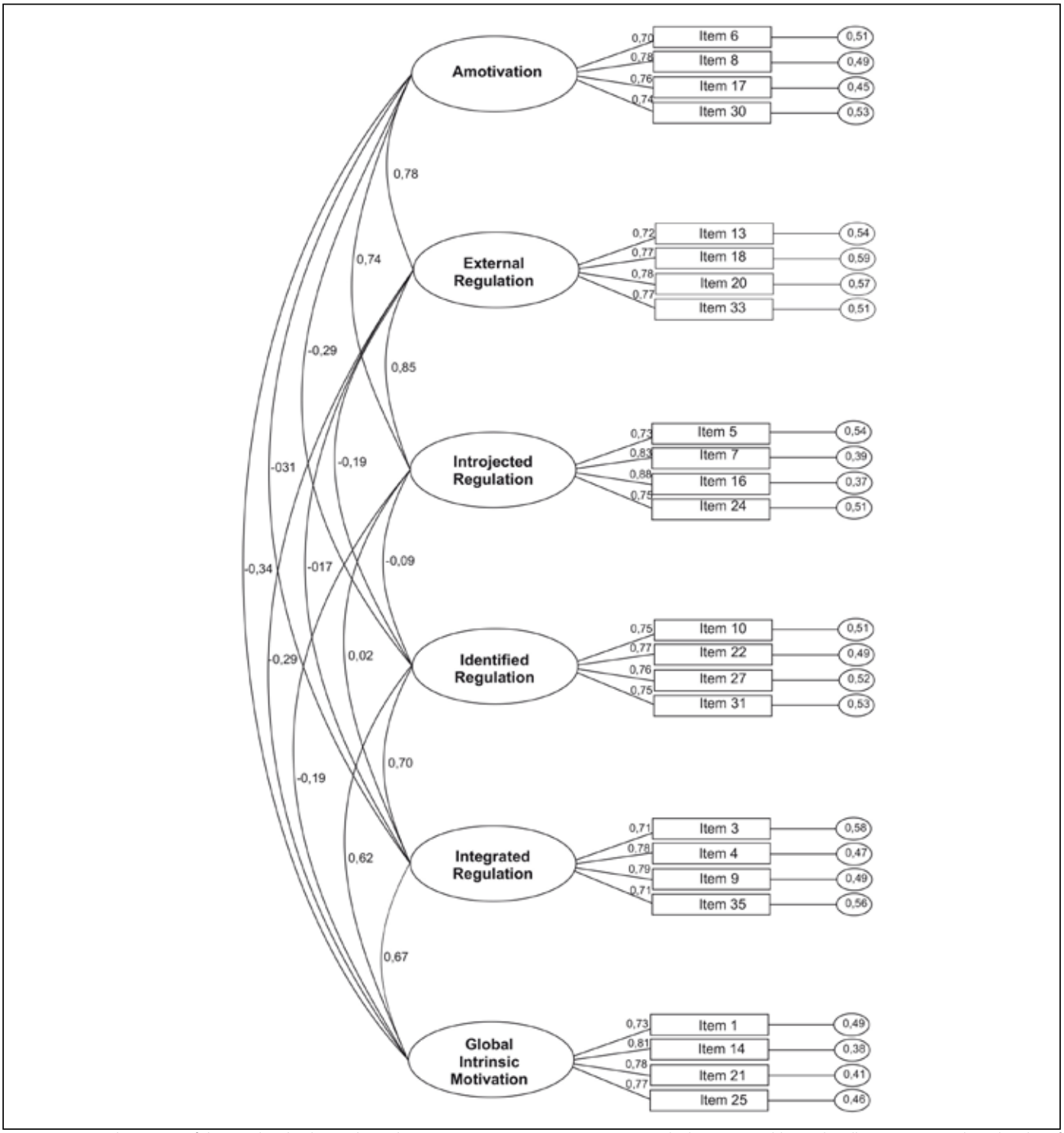

Figure 1. Factorial structure of the translated Behavioral Regulation in Sport Questionnaire (BRSQ-6) applied to young athletes. The ellipses represent the subscales of motivation, while the rectangles represent the questionnaire items. The residual variances are shown in smaller circles.

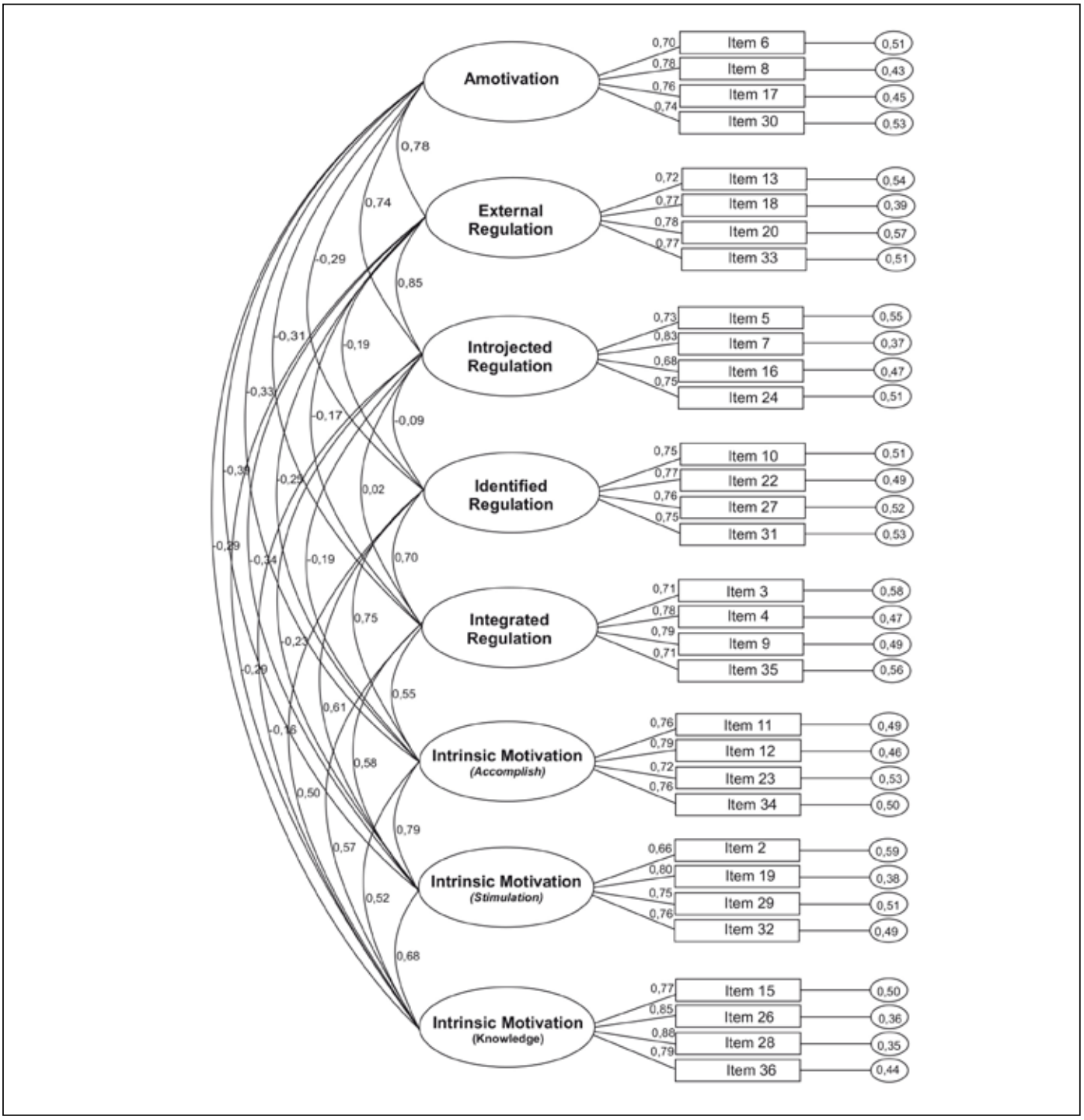

Figure 2. Factorial structure of the translated Behavioral Regulation in Sport Questionnaire (BRSQ-8) applied to young athletes. The ellipses represent the subscales of motivation, while the rectangles represent the questionnaire items. The residual variances are shown in smaller circles.

Table 3. Indicators produced by multigroup confirmatory factor analysis for tests of factorial invariance between different strata related to gender and age.

	χ^2	df	$\Delta\chi^2$	Δdf	p value	CFI	ΔCFI
Sex							
Model 1	178.21	50	-	-		0.925	-
Model 2	185.30	64	7.09	14	> 0.05	0.923	0.002
Model 3	192.79	66	14.58	16	> 0.05	0.921	0.004
Model 4	200.55	78	22.34	28	> 0.05	0.918	0.007
Age							
Model 1	181.51	50	-	-		0.919	-
Model 2	190.74	64	9.23	14	> 0.05	0.913	0.006
Model 3	198.16	66	16.65	16	> 0.05	0.909	0.010
Model 4	206.19	78	24.68	28	> 0.05	0.903	0.016

χ^2: Chi-square; df: degrees of freedom; $\Delta\chi^2$: differences between values of chi-square test; Δdf: differences between degrees of freedom; CFI: Comparative Fit Index; ΔCFI: differences between values of the Comparative Fit Index. Model 1: Configuration model (all parameters are free to be estimated); Model 2: Model in which factorial loads are contrasted; Model 3: Model in which variance/covariance are contrasted; Model 4: Model in which residuals are contrasted.

DISCUSSION

Overall, the analysis of the semantic, idiomatic, cultural, and conceptual equivalences, equivalent to transcultural adaptation, such as the translation step, indicated that the instrument was easily translated. The implementation of the translation process was not impeded by the methodology adopted or by the simple and objective structure of the BRSQ item formulation. The initial translation, performed by the two translators, was minimally modified in subsequent steps. The back-translation, when compared to the original instrument, presented minor discrepancies resulting from adjustments made to meet the specificities of certain items.

The analysis of the equivalences also showed that the domains of the BRSQ are appropriate, and the attributes used in the original version of the instrument are equally valid for the target culture, meeting cultural equivalence. The conceptual equivalence indicated that few items needed adjustments. The items could be considered similar to the original format, indicating, once more, that the structure of the BRSQ formulation was well prepared. With regard to the idiomatic equivalence, when comparing the original, translated, and back-translated versions, the translated version showed that nearly all of the items were evaluated as "unchanged."'

Regarding the factorial structure of the *BRSQ* translated and adapted to Portuguese, there was a provision similar to that in the original version proposed by Lonsdale et al,[17] confirming the same number of motivation subscales, whether using the reduced version (*BRSQ-6*) or the extended version (*BRSQ-8*). In addition, with high factor loads on the expected subscale and Cronbach's alpha values above 0.70 on all motivational subscales extracted from the factorial structure, it can be assumed that the translated BRSQ version has an acceptable internal consistency, indicating its reliability in the analysis of young athletes' motivational profiles in Brazil.

In comparison with the original version, the internal consistency of each subscale of motivation was slightly lower in the factorial structure of the BRSQ translated to Portuguese. Additionally, the amplitude of variation between the higher (0.85) and lower scores (0.71) was higher than that presented by the original BRSQ version (0.91 and 0.76, respectively), which suggests a lower balance between the subscales on the translated Portuguese version. A likely explanation for these findings may be associated with the characteristics of the samples selected in either study. Originally, the BRSQ was applied and validated in a sample of national elite athletes from New Zealand, with an average age close to 25 years, while in the present study the sample consisted of young athletes aged ≤ 17 years, all of whom participated in the final stage of the Paraná Youth Games (a state competition gathering participants with diverse competition/training experiences). Thus, it is possible that the contexts of the studies may be responsible for the differences due to different training histories and interests in the practice of sport.

As a complement to the factorial analysis, another option to analyze the validity of the theoretical factors composing the Portuguese-translated BRSQ is in the dimensions of the correlation coefficients of the inter-subscales arising from the constructs, which, in theory, should behave according to the self-determination continuum. In this case, it was noted that the provision of *r* values between the subscales confirmed the presence of the self-determination continuum in both BRSQ versions. In particular, the correlations between adjacent subscales on the continuum showed higher and more positive values, while the correlations between more separated subscales displayed lower and, sometimes, more negative values. As on the original BRSQ, indications that the subscales with the highest levels of self-determination were those that correlated more closely may also support the validity of the translated version.

In theory, the analysis of the factorial invariance of an instrument allows one to assess the possibility that the data identify a given construct in a similar way in different substrates of the validation sample, thus minimizing any differences observed between the strata that could be attributed to the inconsistency of its psychometric properties.[25] In this case, another important finding of the present study was the confirmation of the factorial invariance for sex and age, demonstrating that there are strong indications that the treated BRSQ versions can identify the motivational characteristics of young male and female athletes in an equivalent manner, regardless of age.

One of the possible limitations derived from the application of the BRSQ as a data collection instrument is the veracity of the participants' responses, given that the questionnaire answers are self-reported. However, self-reporting is the current procedure for surveys with these characteristics and is the most feasible way to gather data for this purpose. Another limitation of the study is that even though the sample had a large number of participants (n = 1,217), the selection was not random. Therefore, it may not be truly representative of the chosen population.

CONCLUSION

The BRSQ version translated and adapted to Portuguese presented satisfactory psychometric properties. The factorial solution generated by the EFA and validated through indicators produced by the CFA was similar to that originally presented, with confirmation of factorial invariance for sex and age for both the reduced version (*BRSQ-6*) and the extended version (*BRSQ-8*). However, the findings showed that the *BRSQ-8* displayed signs of more appropriate internal consistency and factorial validity. Thus, both BRSQ versions presented in this study are promising for use in future interventions with the objective of analyzing young athletes' motivations to practice sport in light of SDT.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. DPG (0000-0002-7367-2276)*, VAC (0000-0002-6873-4209)* and SLS (0000-0002-5986-9355)* participated equally in the conception, planning, analysis and interpretation of data, in the preparation of the content and in the final version of the manuscript. *ORCID (Open Researcher and Contributor ID).

REFERENCES

1. Ryan RM, Deci EL. Active human nature: self-determination theory and the promotion and maintenance of sport, exercise, and health. In: Hagger MS, Chatzisarantis NLD (eds.). Intrinsic Motivation and Self--Determination in Exercise and Sport. Champaign, IL: Human Kinetics; 2007. p. 1-19.
2. Gill DL, Williams L. Psychological Dynamics of Sport and Exercise. 3th ed. Champaign, Illinois: Human Kinetics; 2008.
3. Ntoumanis N. A self-determination theory perspective on motivation in sport and physical education: current trends and possible future directions. In: Roberts GC, Treasure D (eds.). Advances in Motivation in Sport and Exercise. Leeds, England: Human Kinetics Europe; 2012. p. 91-128.
4. Newton M, Duda JL, Yin Z. Examination of the psychometric properties of the perceived motivational climate in sport questionnaire-2 in a sample of female athletes. J Sport Sci. 2000;18(4):275-90.
5. Biddle S, Markland D, Gilbourne D, Chatzisarantis N, Sparkes A. Research methods in sport and exercise psychology: quantitative and qualitative issues. J Sports Sci. 2001;19(10):777-809.
6. Vlachopoulos SP, Karageorghis CI, Terry PC. Motivation profiles in sport: a self-determination theory perspective. Res Q Exerc Sport. 2000;71(4):387-97.
7. Vallerand R. Intrinsic and extrinsic motivation in sport and physical activity: a review and a look at the future. In: Tennenbaum G, Eklund R (eds.). Handbook of Sport Psychology. 3th ed. New York: John Wiley & Sons; 2007. p. 59-83.
8. Hagger M, Chatzisarantis N. Intrinsic Motivation and Self-Determination in Exercise and Sport. Leeds, England: Human Kinetics Europe; 2007.
9. Calvo TG, Cervelló R, Jiménez R, Iglesias D, Murcia JAM. Using self-determination theory to explain sport persistence and dropout in adolescent athletes. Span J Psychol. 2010;13(2) 677-84.
10. Koh KT, Wang CK, Erickson K, Côté J. Experience in competitive youth sport and needs satisfaction: the

Singapore Story. Int J Sport Psychol. 2012;43(1):15-32.

11. Slingerland M, Haerens L, Cardon G, Borghouts L. Differences in perceived competence and physical activity levels during single-gender modified basketball game play in middle school physical education. Eur Phys Educ Rev. 2014;20(1):20-35.

12. Van de Berghe L, Vansteenkiste M, Cardon G, Kirk D, Haerens L. Research on self-determination in physical education: key findings and proposals for future research. Phys Educ Sport Pedag. 2014;19(1):97-121.

13. Deci EL, Ryan RM. Intrinsic motivation and self-determination in human behavior. New York: Plenum; 1985.

14. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol. 2000;55(1):68-78.

15. Deci EL, Ryan RM. Self-determination theory. In: Van Lange PAM, Kruglanski AW, Higgins ET (eds.). Handbook of Theories of Social Psychology. Thousand Oaks, CA: Sage; 2012. p. 416-37.

16. Pelletier LG, Tuson DM, Fortier MS, Vallerand RJ, Brière NM, Blais MR. Toward a new measure of intrinsic motivation, extrinsic motivation and amotivation in sports: the Sport Motivation Scale. J Sport Exerc Psy. 1995;17(1):35-53.

17. Lonsdale C, Hodge K, Rose EA. The Behavioral Regulation in Sport Questionnaire (BRSQ): instrument development and initial validity evidence. J Sport Exerc Psy. 2008;30(3):323-55.

18. Vallerand RJ, Rousseau FL. Intrinsic and extrinsic motivation in sport and exercise: A review using the hierarchical model of intrinsic and extrinsic motivation. In: Singer RN, Hausenblas HA, Janelle CM (eds.). Handbook of Sport Psychology. New York: Wiley; 2001. p. 389-416.

19. Mallett CJ, Kawabata M, Newcombe P, Otero-Ferero A, Jackson SA. Sports motivation Scale-6 (SMS-6): a revised six-factor sport motivation scale. Psychol Sport Exerc. 2007;8(5):600-14.

20. Pelletier LG, Rocchi MA, Vallerand RJ, Deci EL, Ryan RM. Validation of the revised sport motivation scale (SMS-II). Psychol Sport Exerc. 2013;14(3):329-41.

21. Viladrich C, Torregrosa M, Cruz J. Calidad psicométrica de la adaptación española del Cuestionario de Regulación Conductual en el Deporte. Psicothema. 2011; 23(4):786-94.

22. Vasconcellos DIC. Avaliação da motivação para a prática esportiva em adolescentes e jovens adultos brasileiros: validação do Questionário de Regulação do Comportamento no Esporte (QRCE). Dissertação de Mestrado publicada. Brasil: Universidade do Estado de Santa Catarina – UDESC. 2011.

23. Hambleton RK. Issues, design and technical guidelines for adapting tests into multiple languages and cultures. In: Hambleton RK, Merenda PF, Spielberger CD (eds). Adapting Psychological and Educational Tests for Cross-Cultural Assessment. Mahwah, NJ: Lawrence Erlbaum Associates; 2005. p.3-38.

24. Hu L, Bentler P. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Modeling. 1999;6(1):1-55.

25. Byrne BM. Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming. Mahwah, NJ: Lawrence Erlbaum Associates; 2010.