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ORIGINAL RESEARCH

Measurement properties of the Brazilian Portuguese anterior cruciate ligament - return to sport after injury (ACL-RSI) scale short version after anterior cruciate ligament reconstruction

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Abstract
Background: Higher scores (closer to 100) on the Anterior Cruciate Ligament - Return to Sport after Injury (ACL-RSI) scale indicate better psychological readiness to return to sport after anterior cruciate ligament reconstruction (ACLR).
Objectives: To verify the validity and reliability of the ACL-RSI-short version (ACL-RSI-SV) in Brazilian Portuguese in individuals who underwent ACLR.
Methods: Participants (n=168) answered the Brazilian versions of ACL-RSI, Tampa Scale for Kinesiophobia (TSK-17), and International Knee Documentation Committee (IKDC) to assess the convergent validity of the short version. Internal consistency was also verified through correlation between items. Scores of participants who did not return to sport, who returned at a lower level, and at the pre-injury level were compared to verify divergent validity. ACL-RSI was answered again after 5-8 days to verify test-retest reliability.
Results: ACL-RSI-SV in Brazilian Portuguese showed good test-retest reliability ($ICC_{2.1}$ = 0.85, 95% CI: 0.76, 0.90) and acceptable internal consistency (Cronbach's alpha = 0.78). Standard error of measurement (SEM) and smallest detectable change (SDC) were 4.98 and 13.82. High positive correlation was found with the full version of the ACL-RSI (r=0.93, 95% CI: 0.91, 0.95), moderate positive correlation with the IKDC (r=0.52, 95% CI: 0.40, 0.62), and weak negative correlation with the TSK-17 (r = -0.45, 95% CI: -0.60, -0.28). It also presented good divergent validity to identify individuals who returned to sport.

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Conclusion: ACL-RSI-SV in Brazilian Portuguese is a consistent, valid, and reliable instrument to assess patients who have undergone ACLR, with good ability to identify those who return to sport.

Introduction

The anterior cruciate ligament (ACL) is one of the structures responsible for knee stability,[1,2] and can be injured through pivot, cut, jump, and deceleration movements.[2] ACL rupture is common in football, with an incidence ranging from 500 to 8500 cases per 100,000 players per year.[3] This injury is also frequently reported in basketball, volleyball, and skiing.[4] ACL reconstruction (ACLR) aims to allow the individual to return to sport at pre-injury level.[5] However, not all individuals who undergo ACLR succeed, with rates of return to sports ranging from 33 to 65%.[6,7]

Psychological readiness is one of the main factors for returning to sport after ACLR, especially at the pre-injury level.[7–9] Athletes who do not return to sport tend to have more negative psychological responses than those who return to sport.[8] Some of the reasons given for not returning to sport include: lack of confidence in the knee, fear of suffering new injuries, and poor knee function.[3] Knee confidence is one of the important attributes of psychological readiness for returning to sport and it is related to injury and sports performance.[10]

The Anterior Cruciate Ligament - Return to Sport after Injury (ACL-RSI) scale was developed to assess psychological readiness.[11] This scale is able to predict the return to sport after 12 months of ACLR with the scores obtained in the fourth,[12] sixth,[10,13] and twelfth month.[10] The ACL-RSI has been validated and culturally adapted to Brazilian Portuguese,[14] Japanese,[15] Spanish,[16] Lithuanian,[17] French,[18] Turkish,[19] Korean,[20] Norwegian,[21] Chinese,[22] Swedish,[23] and Dutch.[24] The Brazilian Portuguese version of the ACL-RSI has good internal consistency and good test-retest reliability. In addition, it presents moderate-good negative correlation with the Tampa Scale for Kinesiophobia (TSK-17) and moderate-good positive correlation with the International Knee Documentation Committee (IKDC).[14]

However, more recently, Webster and Feller[25] developed a shorter version of the ACL-RSI, which includes half of the items from the previous version. The measurement properties are consistent with the full version, being equally helpful to discriminate the return to sport after ACLR. This short version is important to make the evaluation simpler and faster, especially in a busy clinical environment.[25] Thus, the objective of the present study was to verify the validity and reliability of the ACL-RSI short version (ACL-RSI-SV) in Brazilian Portuguese in individuals who underwent ACLR.

Methods

Study design

This longitudinal prospective study was conducted at the Human Movement Analysis Laboratory of Physical Therapy of the Universidade Federal do Ceará, between November 2014 to January 2018. The study was approved by the Research Ethics Committee of the Universidade Federal do Ceará (protocol 1,000,404) and all participants signed a consent form. The study followed the Consensus-based standards for the selection of health measurement instruments (COSMIN).[26]

Sample

The sample consisted of 168 participants who had a complete ACL tear, confirmed with magnetic resonance imaging, and positive Lachman and anterior drawer tests; and who underwent ACLR at least three months before the study, regardless of the type of graft used in the surgery, and regardless of having any concomitant lesion. Concomitant injuries were not excluded as they do not appear to affect recovery of symmetrical performance in postoperative muscle function tests.[27] Participants were at least 16 years old, and those who practiced sports before the injury that involved deceleration, cutting, jumping, or turning, such as football, basketball, and volleyball were included. Those who did not undergo rehabilitation after the surgical procedure, individuals who did not correctly complete the questionnaires, and those with a history of fracture or signs of symptomatic knee osteoarthritis (presence of osteophytes on radiographs and pain) were excluded.

The sample size was determined according to Terwee et al.,[28] which suggests that at least 50 individuals are needed for proper analysis of validity, reproducibility, and floor and ceiling effects; and a minimum of 100 patients to analyze internal consistency.

Instruments

Full version of ACL-RSI contains 12 items subdivided into three domains: emotions, performance, and risk assessment. Each item is rated from 0 to 10 in 1-point increments on an 11-point Likert scale. Questions 2, 3, 6, 7, 9, and 10 and their respective scores were inverted to facilitate answers. To calculate the total score, the sum of each item was divided by 120 and then multiplied by 100. The total score of the questionnaire ranges from 0 to 100. A value of 0 indicates extremely negative psychological responses, while a value of 100 represents positive psychological responses. The full version has been validated and culturally adapted to Brazilian Portuguese.[14]

The ACL-RSI-SV was composed of questions 1, 2, 3, 5, 6, and 7 of the full version,[25] consisting of three questions about emotions, two questions about performance, and one question about risk assessment. Questions 2, 3, 5, and 6 and their respective scores were inverted in ACL-RSI-SV. The total score of the questionnaire also ranges from 0 to 100. To calculate the total score, the sum of each item was divided

by 60 and then multiplied by 100. Both versions express continuous measures. The Brazilian Portuguese ACL-RSI-SV is provided as an Supplementary material.

The Tampa Scale for Kinesiophobia (TSK-17) consists of a self-administered questionnaire consisting of 17 questions that address pain and the intensity of symptoms. The final score ranges from 17 to 68 points. The higher the score, the greater the degree of kinesiophobia. The TSK is used in several studies with the ACLR population. In addition, it is used in other ACL-RSI translation and cultural adaptation studies. The TSK-17 has been translated and cross-culturally adapted for Brazilian Portuguese and it is a valid and reliable instrument.[29,30]

The International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form is an instrument consisting of 10 items, divided into three domains: symptoms, activities, and sports functions. The final score is calculated by adding the scores for individual items and then transforming them in a scale that ranges from 0 to 100. The highest score indicates that there is no limitation in daily life activities or in sports activities, and that there is an absence of symptoms. The IKDC has been translated and cross-culturally adapted for Brazilian Portuguese and it is a valid and reproducible instrument.[31]

Evaluation of measurement properties

Test-retest reliability and measurement error

Participants should have had the ACLR at least three months prior to the initial visit. All participants were assessed on two ocasions with the second visit being 5-8 days after the initial visit. This interval was chosen so that it would not be too long, to avoid the likelihood of significant changes in the patient's clinical condition; nor would it be too short, to avoid the likelihood of participants memorizing the answers.

Test-retest reliability was assessed by the intraclass correlation coefficient ($ICC_{2,1}$). Values below 0.69 indicate low reliability; between 0.70 and 0.79 are considered acceptable; between 0.80 and 0.89 indicate good reliability; and between 0.90 and 1.0 indicate excellent reliability.[32]

We used two measures to access measurement error: standard error of measurement (SEM) and smallest detectable change (SDC). The SEM was calculated by multiplying the standard deviation of the mean differences between the two measurements by the square root of 1 minus ICC ($SD_{differences}$ x $\sqrt{1}$ - ICC), and SDC was calculated using the formula SDC = 1.96 $\times$ $\sqrt{2}$ $\times$ SEM. The SEM reflects the absolute error of the instrument, and the SDC reflects the smallest change within a person in a score that can be interpreted as a "real" change, above an individual's measurement error.[33]

The ratio between SEM and the instrument's total score is interpreted as follows: less than or equal to 5% is very good; between 5% and 10% is good; between 10% and 20% is doubtful; and above 20% is negative.[34]

Internal consistency

Internal consistency was measured using Cronbach's alpha. An alpha value below 0.70 indicates a lack of correlation between items, between 0.70 and 0.95 is considered acceptable, and greater than 0.95 suggest that there are items with repeated information, usually found on scales with a large number of items.[28]

Dimensionality

Dimensionality was tested through confirmatory factor analysis (CFA) using Jamovi. Standardized estimates (R^2) can be interpreted as a correlation between factors.[35] R^2 ranges from 0 to 1, values > 0.70 indicate a better correlation. The correlation between ACL-RSI-SV domains was also verified. Model fit was assessed with the ratio between χ^2 and the degree of freedom (χ^2/df).[36] In addition, the global goodness of fit indices were used: standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), and the comparative fit index (CFI).[35,37] Adequate model fit is considered if: (1) χ^2/df < 3.84,[35] (2) χ^2 not statistically significant, (3) RMSEA < 0.06, (3) SRMR < 0.10, (4) CFI and TLI > 0.90.[36] In addition, the χ^2/df test was also performed on the full version of ACL-RSI.

Convergent validity

The instruments used to test the convergent validity of the Brazilian version of the ACL-RSI-SV were the full version of the ACL-RSI, the TSK-17, and the IKDC Subjective Knee Evaluation Form.

Construct validity was determined using Pearson's linear correlation. A correlation coefficient below 0.30 was considered low correlation; between 0.30 and 0.50 was considered weak correlation; between 0.50 and 0.70 was considered moderate-good correlation, between 0.70 and 0.90 was considered high correlation, and above 0.90 was considered very high correlation.[38]

The convergent validity was determined by testing the following predefined hypotheses involving correlations between ACL-RSI-SV and the full version of ACL-RSI, IKDC, and TSK: (1) Very high correlation between ACL-RSI-SV and the full version of the ACL-RSI; (2) Moderate to high positive correlation between ACL-RSI-SV and IKDC; (3) Moderate to high negative correlation between ACL-RSI-SV and TSK-17.[39]

Divergent validity

Unidirectional analysis of variance (ANOVA) with Bonferroni's post hoc test was performed to assess the divergent validity of the full scale and the ACL-RSI-SV by comparing the scores of patients who did not return to sport, of those who returned to a lower level, and of those who returned to the pre-injury level.[25] Our hypothesis is that the ACL-RSI-SV will have good divergent validity, with significant differences between the scores of the groups.

Floor and ceiling effects

The floor and ceiling effects were performed to check for the presence of extreme scores.[28] The floor and ceiling effects of a questionnaire are considered to be present if more than 15% of respondents obtain the lowest or highest possible score.[28]

Data analysis was performed using the statistical program *Statistical Package for the Social Sciences* (SPSS), version 24.0.

Results

One hundred and seventy-six participants were contacted to participate in the research. Out of this number, eight participants were excluded: six participants answered the questionnaires inappropriately (for example, indicating more than one response for an item or nor completing the questionnaire), and two had a history of recent fracture. The anthropometric and clinical characteristics of the 168 participants are shown in Table 1.

Internal consistency, test-retest reliability, and measurement error

The ACL-RSI-SV showed Cronbach's alpha of 0.78, demonstrating an acceptable correlation between items; and $ICC_{2,1}$ of 0.85 (95%CI: 0.76, 0.90), indicating good test-retest reliability. In addition, it obtained SEM of 4.98 and SDC of 13.82, showing a ratio between SEM and the total score of the scale of 4.98%, being very good.

Table 1 Anthropometric and clinical characteristics (n = 168).

Variables		Values
Sex, %	Male	85.1
	Female	14.9
Age, years		28.14±7.25
Weight, kg		82.01±16.97
Height, m		1.73±0.07
Body Mass Index, kg/m^2		27.20± 4.85
Dominance, %	Right	86.1
	Left	13.9
Injured Limb, %	Right	60
	Left	37
	Bilateral	3
Graft, %	HT	86.8
	PT	13.2
Time surgery and follow-up, months		12 [7 - 24]
Sports Practice, %		47.6 soccer
Return to sport, %	Not returned	45,8
	Lower level	41.1
	Pre-injury level	11.9
ACL-RSI		48.04±20.23
ACL-RSI re-evaluation		46.66±22.13
ACL-RSI Short Version		42.26±21.95
ACL-RSI Short Version re-evaluation		41.71±22.80
TSK-17		38.61±7.83
IKDC		71.55±16.02

Data are mean ± standard deviation or median [$25^{th} - 75^{th}$ percentile] Abbreviations: ACL-RSI, Anterior Cruciate Ligament-Return to Sport After Injury; HT, hamstring tendon; IKDC, International Knee Documentation Committee; PT, patellar tendon; TSK-17, Tampa Scale for Kinesiophobia.
ACL-RSI (including Short Version) ranges from 0 to 100 - higher scores indicate better psychological readiness.
IKDC ranges from 0 to 100 - higher scores indicate that there is no limitation in activities of daily living or sports activities and that there is an absence of symptoms.
TSK-17 ranges from 17 to 68 points - higher scores indicate greater kinesiophobia.

Dimensionality

Standardized estimates (R^2) are shown in Table 2. In addition, the ACL-RSI-SV presented: χ^2/df = 2.95 (χ2 = 20.7, df = 7, p = 0.004); RMSEA = 0.11 (90% CI: 0.06, 0.16); SRMR = 0.04; CFI = 0.95 and TLI = 0.90. The domains correlate as follows: emotions with risk appraisal (R^2 = 0.89); emotions with confidence in performance (R^2 = 0.41); and confidence in performance with risk appraisal (R^2 = 0.61). Full version of ACL-RSI presented χ^2/df = 5.90 (χ2 = 301, df = 51, p<0.001).

Convergent validity

ACL-RSI-SV showed a very high correlation with the full version of the ACL-RSI (r = 0.93, 95% CI: 0.91, 0.95). In addition, it presented a weak and negative correlation with TSK-17 (r = -0.45, 95% CI: -0.60, -0.28), and moderate-good and positive correlation with IKDC (r = 0.52, 95% CI: 0.40, 0.62).

Divergent validity

Out of the 168 participants, 77 (45.8%) did not return to sport, 69 (41.1%) returned to a lower level, 20 (11.9%) returned at the pre-injury level, and two participants (1.2%) did not respond. The means and standard deviation of the full and short versions of ACL-RSI are shown in Table 3.

In ACL-RSI-SV, participants who did not return to sport had 7.4 points (95% CI: 0.2, 1.5) less than those who returned to a lower level, and 37 points (95% CI: 25.3, 48.7) less than those who returned at the pre-injury level; while those who returned to a lower level had 29.6 points (95% CI: 17.7, 41.5) less than those who returned at a pre-injury level.

In the full version of the ACL-RSI, participants who did not return to sport scored 7.2 points (95%CI: 0.1, 14.3) less than those who returned to a lower level, and 32.2 points (95% CI: 21.3, 43.2) less than those who returned to their pre-injury level; while those who returned to a lower level scored 25.0 points (95%CI: 13.9, 36.1) less than those who returned at a pre-injury level.

Floor and ceiling effects

One participant (0.6%) obtained the lowest score on the ACL-RSI-SV and also only one participant (0.6%) obtained the highest score. Eight participants (4.8%) had scores $\leq$ 10, and four (2.3%) had scores $\geq$ 90. The hypotheses of each measurement property evaluated and whether these hypotheses were confirmed or rejected are shown in Table 4.

Discussion

The Brazilian translation of the ACL-RSI-SV proved to be consistent and with good test-retest reliability, being a reliable instrument for patients who underwent ACLR. In addition, the ACL-RSI-SV in Brazilian Portuguese showed a high correlation with the full version of ACL-RSI, a moderate

Table 2 Confirmatory *Factor Analysis* of the questions maintained in the ACL-RSI-SV by domains.

ACL-RSI Short Version domains	ACL-RSI Short Version questions	R2
Emotions	Q3. Você se sente apreensivo ao praticar seu esporte?(Are you nervous about playing your sport?)	0.68
	Q5. Você se sente frustrado em ter que se preocupar com seu joelho durante sua prática esportiva? (Do you find it frustrating to have to consider your knee with respect to your sport?)	0.80
	Q6. Você sente medo de lesionar novamente seu joelho durante a prática esportiva? (Are you fearful of re-injuring your knee by playing your sport?)	0.76
Confidence in performance	Q1. Você está confiante que seu desempenho esportivo está no mesmo nível antes da lesão? (Are you confident that you can perform at your previous level of sport participation?)	0.78
	Q4. Você está confiante que pode praticar seu esporte sem qualquer preocupação com o joelho? (Are you confident that your knee will not give way by playing your sport?)	0.71
Risk appraisal	Q2. Você acha que terá a mesma lesão no joelho ao praticar seu esporte? (Do you think you are likely to re-injure your knee by participating in your sport?)	1.0

Abbreviations: ACL-RSI-SV, Anterior Cruciate Ligament – Return to Sport after Injury Short Version; R^2, Standardized estimates

Table 3 Comparative scores between full ACL-RSI and ACL-RSI-SV according to sport status.

	Did not return	Returned at lower level	Returned pre-injury level	Between-group difference		
				Returned at lower level versus Did not return	Returned pre-injury level versus Did not return	Returned pre-injury level versus Returned at lower level
ACL-RSI	41.4±19.2	48.7±15.7	73.7±17.6	7.2 (0.1, 14.3)	32.2 (21.3, 43.2)	25.0 (13.9, 36.1)
ACL-RSI-SV	35.1±19.5	42.5±18.0	72.1±19.7	7.4 (0.2, 1.5)	37.0 (25.3, 48.7)	29.6 (17.7, 41.5)

Data are mean ± standard deviation or mean difference (95% confidence interval). Abbreviations: ACL-RSI, Anterior Cruciate Ligament-Return to Sport after Injury; ACL-RSI-SV, Anterior Cruciate Ligament-Return to Sport after Injury Short Version.

Table 4 Description of the hypotheses of each measurement properties.

Measurement properties	Hypothesis	Hypothesis:confirmed or rejected?
Test-retest reliability	Between good and excellent test-retest reliability	Confirmed
Measurement error	Between good and very good	Confirmed
Internal consistency	Acceptable internal consistency	Confirmed
Dimensionality	$\chi 2/df < 3.84$ for the ACL-RSI short version	Confirmed
	RMSEA< 0.06	Rejected
	SRMR < 0.10	Confirmed
	CFI > 0.90	Confirmed
	TLI > 0.90	Rejected
Convergent validity	Very high correlation between ACL-RSI-SV and ACL-RSI	Confirmed
	Moderate to high positive correlation between ACL-RSI-SV and IKDC	Confirmed
	Moderate to high negative correlation between ACL-RSI-SV and TSK-17	Rejected
Divergent validity	Good divergent validity, with significant differences between the scores of the groups	Confirmed
Floor and ceiling effects	Less than 15% of participants will achieve the lowest or highest possible score	Confirmed
	Less than 15% of participants will score ≤ 10 or ≥ 90	Confirmed

Abbreviations: ACL-RSI, Anterior Cruciate Ligament-Return to Sport After Injury; ACL-RSI-SV, Anterior Cruciate Ligament-Return to Sport After Injury Short Version; CFI, comparative fit index; IKDC, International Knee Documentation Committee;RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker-Lewis index; TSK-17, Tampa Scale for Kinesiophobia; $\chi 2/df$, Bartlett's χ^2 /degree of freedom.

correlation with IKDC, and a low and negative correlation with TSK-17. The ACL-RSI-SV had a better overall fit of the model than the full version. In addition, there was no floor and ceiling effect. Therefore, our findings support the Brazilian version of ACL-RSI-SV as a valid instrument for those who underwent ACLR.

As far as we are aware, this is the first study to verify the measurement properties in non-English language of the ACL-RSI-SV. This may have happened due to the very recent publication of the original version of ACL-RSI-SV. The original ACL-RSI-SV obtained a Cronbach's alpha of 0.92,[25] which indicates that the redundancy presented in the long version (Cronbach's alpha = 0.96)[11] has been resolved, although the value remains high. The ACL-RSI-SV in Brazilian Portuguese has demonstrated acceptable internal consistency. It also had better test-retest compared to the full version.[14] The internal consistency in the most diverse versions ranged from good to excellent,[15–21,23,24] being consistent with the original scale. The test-retest reliability was excellent in all versions.[15,16,18–20,24] The ACL-RSI-SV measurement error in Brazilian Portuguese was considered very good, in view of the good measurement error found in the Dutch[24] and Norwegian[21] versions. Finally, ACL-RSI-SV presents SEM and SDC values smaller than those for the full version of the questionnaire (6.5 and 18.1, respectively).[14] The SDC was calculated in only three other versions: Swedish,[23] Dutch,[24] and Norwegian.[21] The Swedish version obtained a lower SDC for scoring the scale from 0-10[23] and not from 0-100 as the others. The SDC of the long version of the ACL-RSI has a high value in other validations, ranging from 15.3-19 (normalized the Swedish SDC score of 1.9).[21,23,24] Thus, the short version seems to have a smaller SDC than the long version.

Correlation between ACL-RSI-SV and IKDC remained moderate and positive, while the correlation with TSK-17 was weak-moderate and negative. In addition, the original ACL-RSI-SV also showed a high correlation with the full version of the scale.[25] Correlation between ACL-RSI and IKDC is moderate and present in virtually all translations.[15,17,19,20,22] IKDC results corroborate ours, demonstrating a good construct validity of the ACL-RSI when compared to the IKDC. Likewise, there is a moderate inverse correlation with TSK-17 or TSK-11 in studies that used this instrument for construct validation, indicating that the lower the TSK score, the higher the score in the ACL-RSI. The TSK presented a weak correlation in the present study, although it approached the established value to be considered a moderate correlation. This may have occurred due to excluding items related to fear and beliefs of patients after ACL injury of ACL-RSI-SV. The Japanese, Swedish, Chinese, French, Turkish, and Korean versions of the ACL-RSI also found weak to moderate correlations with the Lysholm scale,[19,20,22,23] and low to moderate correlations with the Knee and Osteoarthritis Outcome Score (KOOS) subscales.[16,18–20,22–24] The Swedish version found a high correlation with the Knee Self-Efficacy Scale (K-SES).[23] The questionnaire that seems to have the strongest correlation with the ACL-RSI is the Injury-Psychological Readiness to Return to Sport (I-PRRS) scale.[16,24] The Lysholm scale is validated and culturally adapted to Brazilian Portuguese.[40] However, we believe that for the ACLR population there could be a significant ceiling effect in individuals with more than three months after ACLR. The KOOS was recently validated for Brazilian Portuguese.[41] The K-SES and I-PRRS have not been validated and culturally adapted to Brazilian Portuguese.

ACL-RSI is widely used to differentiate individuals who have returned to sport from those who have not, because it has a good predictive ability concerning return to sport at the pre-injury level.[9] The Japanese version of ACL-RSI found a significant difference between the scores of those who returned to the same sport they played before the injury, and those who did not return.[15] The same was found in the Turkish and Swedish versions, where patients who did not return to sport had a lower score on the ACL-RSI than those who returned to sport. Higher scores were also found in individuals who returned to the pre-injury level, when compared to those who did not.[22,23] These findings corroborate what is also found in the ACL-RSI-SV in Brazilian Portuguese, where individuals who did not return to sport obtained lower scores than those who returned to sport and even lower than those who returned to the pre-injury level. The original ACL-RSI-SV had a score of 47.9 for individuals who did not return to sport, 63.7 for those who returned to a lower level, and 77.8 for those who returned at pre-injury level,[25] with the average score for the pre-injury level being similar to that found in our study. The ACL-RSI-SV performed after 12 months of ACLR also seems to have a good divergent validity in terms of re-injury rates in 2 years.[42] This indicates that the ACL-RSI-SV appears to be better for identifying athletes who return to sport at the pre-injury level.

One of the strengths of this study is that it is the first to our knowledge to verify the measurement properties of the ACL-RSI-SV. In addition, the scale was able to identify those who returned to the sport at a lower level and at a pre-injury level in both versions. There were also some limitations in the present study. The ACL-RSI-SV was not directly translated or cross-culturally adapted to Brazilian Portuguese, because the short version was extracted from the full version and that it has already been translated and cross-culturally adapted. The language barrier prevented the realization of the construct validity of the ACL-RSI-SV with other questionnaires or scales, such as K-SES and I-PRRS, because these instruments are not validated and culturally adapted to Brazilian Portuguese. The level of sports activity of the participants was also not evaluated. Because of this it was not possible to compare the results of professional and amateur athletes. Additionally, the disproportion between the participation of men and women in the study, because there may be differences in psychological readiness according to the sex. Finally, the wide variation in the postoperative time of the participants was also a limitation, because this can influence the result. Despite that, the ACL-RSI-SV is a scale with good divergent validity to identify individuals who do not return, return at a lower level, and return at the pre-injury level. Therefore, it can be used in clinical practice as one of the criteria for returning to sport. Future studies may verify the ability to predict the return to sport over time.

Conclusions

The ACL-RSI-SV in Brazilian Portuguese is a consistent, valid, and reliable instrument to assess patients who have

undergone ACLR, with good ability to identify those who return to sport to a lower level, those who return at the pre-injury level, and those who do not return to sport.

Conflicts of interest

The authors declare no conflicts of interest

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Supplementary materials

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