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ORIGINAL ARTICLE

Fear of Return to Sport Scale (FRESS): a new instrument for use in injured professional or recreational athletes in rehabilitation

Artur Eduardo Kalatakis-dos-Santos[1] · Cid André Fidelis de Paula Gomes[2] · André Pontes-Silva[3] · Leticia Padilha Mendes[4] · Gabriel de Oliveira Simões[4] · Maria Cláudia Gonçalves[5] · Flavio de Oliveira Pires[1,4] · Daniela Bassi-Dibai[6] · Almir Vieira Dibai-Filho[1,3,4]

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Abstract

Objective To create, develop, and validate the Fear of Return to Sport Scale (FRESS) for injured professional or recreational athletes in rehabilitation.

Methods This is a questionnaire validation study. To determine the structural and construct validity, 192 injured professional or recreational athletes of different sports modalities were included. We used a subsample with 32 participants to analyze test–retest reliability and internal consistency. Main outcome measures were the FRESS, Numerical Pain Scale (NPS), Pain-Related Catastrophizing Thoughts Scale (PCTS), Self-Estimated Functional Inability because of Pain Questionnaire for athletes (SEFIP-sport), and Hospital Anxiety and Depression Scale (HADS).

Results Initially, 25 questions were proposed by the specialists. Of these, 4 questions were excluded due to similarity with others. After applying the content validity coefficient, 8 questions were excluded for presenting a value lower than 0.80, leaving 13 items. The exploratory factor analysis identified the one-dimensional structure of the FRESS with 13 items. However, five items were excluded for presenting high covariance with the error of several other FRESS items in the confirmatory factor analysis. Thus, the final version of the FRESS was defined with one domain and eight items. Regarding the construct validity, we observed a magnitude of correlation varying between 0.257 and 0.470 between the FRESS and the instruments used here. We observed adequate test–retest reliability (intraclass correlation coefficient = 0.896) and internal consistency (Cronbach's alpha = 0.868). Ceiling and floor effects were not observed.

Conclusion The FRESS with one domain and eight items has acceptable measurement properties and its use in clinical and sports environments to measure the fear of returning to sport in injured professional or recreational athletes is supported.

Keywords Reproducibility of results · Sports · Surveys · Questionnaires

✉ André Pontes-Silva
contato.andrepsilva@gmail.com

1 Postgraduate Program in Physical Education, Universidade Federal do Maranhão, São Luís, MA, Brazil

2 Postgraduate Program in Rehabilitation Science, Universidade Nove de Julho, São Paulo, SP, Brazil

3 Postgraduate Program in Adult Health, Universidade Federal do Maranhão, Avenida dos Portugueses, 1966, Vila Bacanga, São Luís, MA 65080805, Brazil

4 Department of Physical Education, Universidade Federal do Maranhão, São Luís, MA, Brazil

5 Postgraduate Program in Environment, Universidade Ceuma, São Luís, MA, Brazil

6 Postgraduate Program in Programs Management and Health Services, Universidade Ceuma, São Luís, MA, Brazil

Introduction

Sports injuries are common events. An epidemiological study carried out in Olympic sports identified a greater number of injuries in team and combat sports, especially in the knee and shoulder joints. Besides, the authors point out that 48% of the injuries were accompanied by a reduced level of performance [1]. In this scenario, several factors (physical and psychological) must be considered for the return to sport after an injury.

Among the physical factors, a recent study points out the muscle strength (quadriceps, hamstring and hip muscles) and the knee range of motion as the main criteria used by physical therapists to return to sport [2]. However, psychological variables are of great importance in the success of

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the athlete's return to sport [3]. In this sense, an important systematic review indicates that the fear was a prominent emotional response at the time of transition back to sport and recommends that health professionals should be prepared to address this and other autonomy and competence-related psychological factors early in the rehabilitation phase with confidence-building strategies such as goal setting [3].

Others variables that are commonly associated with return to sport in high performance athletes are: anxiety, depression, kinesiophobia, self-efficacy, stress, and mood [4–7]. Thus, a holistic approach is essential, with the participation of several health professionals in the rehabilitation team (such as physical therapists, orthopedists, physical education professionals, and psychologists), to ensure an approach that considers the physical and psychological factors that compromise the adequate return to sport [5, 8].

One of the first instruments developed to assess psychological aspects related to returning to sport was the Emotional Responses of Athlete Injury Questionnaire (ERAIQ) [9], making it possible to identify some of the feelings that can interfere with rehabilitation (such as tension, depression, and anger). However, despite this important initiative, this instrument was not developed based on robust international guidelines [10], e.g., content validity was not described in the construction of the tool, furthermore, the reliability and internal consistency of the ERAIQ were not evaluated in the study.

To the best of our knowledge, only two instruments were created to measure fear of returning to sport: the Anterior Cruciate Ligament—Return to Sport after Injury (ACL-RSI) and the Athlete Fear Avoidance Questionnaire (AFAQ). The ACL-RSI was developed and validated by Webster et al. [11], to be used only in athletes who have undergone anterior cruciate ligament reconstruction. The AFAQ was developed and validated by Dover and Amar [12] to be used in team sports athletes with any type of injury. Of these two instruments, only the ACL-RSI was adapted and validated for Brazilian Portuguese [13].

Thus, the rationale of the present study is related to the possibility of offering a generic tool that can be used in athletes of any sport (team or individual) with any type of injury resulting in absence of sports practice. These aspects were not covered by the available questionnaires for use to measure the fear of returning to sport (the ACL-RSI and AFAQ). Therefore, our aim was to create, develop, and validate the Fear of Return to Sport Scale (FRESS) for professional or recreational athletes of sports modalities who are injured, away from sports practice, and at the end of the rehabilitation period.

Methods

Study design

This is a questionnaire validation study carried out in accordance with the guidelines of the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) [10]. Content, construct and structural validity, and reliability are the measurement properties of the FRESS that were tested in this study.

The research was carried out in two ways: (1) by means of an online platform (Google Forms, Mountain View, CA, USA) for anyone residing in Brazil; and (2) in person in the city of São Luís (Maranhão, Northeast Brazil). The participation of professional or recreational athletes was validated by means of the agreement or signing of the free and informed consent form. The procedures of this study were approved by the research ethics committee of the Universidade Federal do Maranhão (opinion number 4.256.657).

Sample size calculation

Regarding the sample size, using the COSMIN guidelines, an appropriate sample size was considered to be seven times the number of items in the instrument, with a minimum sample size of 100 participants [14].

Participants

We adopted the following inclusion criteria: professional or recreational athletes of sports modalities (minimum regular practice twice a week in the 3 months prior to the injury); absence from sport for at least 7 days due to injury or pain; over 18 years of age; literate; and with Brazilian Portuguese as their native language. Participants who do not wish to return to sport, as well as those with any cognitive impairment or severe psychiatric diagnoses, were not included in the study.

We included 192 participants and observed that the study sample was composed mostly of male adults, who practiced sport over 4 times a week (Tables 1 and 2). The average training experience was 98.92 months (standard deviation [SD] = 83.75). The sports most practiced by the majority of the sample were soccer, running, jiu-jitsu, and volleyball.

Regarding injuries, most participants had been injured for more than 8 months; the knee was the most injured region. Rupture of the anterior cruciate ligament, sprain and contusion were the most frequently reported injuries.

Table 1 Characterization of the sample of quantitative variables ($n = 192$)

Variable	Minimum	Maximum	Mean	Standard deviation
Age (years)	18	58	29.80	9.28
Weight (kg)	43.00	145.00	74.24	14.17
Height (m)	1.43	1.93	1.71	0.08
Body mass index (kg/m^2)	15.79	43.30	25.04	3.86
Weekly frequency (times)	2	7	4.23	1.46
Weekly practice time (minutes)	120	2160	426.69	310.89
Training experience (months)	6	360	98.92	83.75
Injury time (months)	1	60	8.02	9.13
NPS (score, 0–10)	0	10	4.19	2.79
PCTS (score, 0–5)	0	4.78	1.21	1.18
HADS-Anxiety (score, 0–21)	0	19	7.35	4.17
HADS-Depression (score, 0–21)	0	16	4.78	3.47
SEFIP-sport (score, 0–56)	0	36	6.68	5.45
FRESS (score, 0–100)	0	100	47.21	24.63

NPS, Numerical Pain Scale; PCTS, Pain-Related Catastrophizing Thoughts Scale; HADS, Hospital Anxiety and Depression Scale; SEFIP, Self-Estimated Functional Inability because of Pain; FRESS, fear of return to sport scale

Classification of the athletes

We used the athlete's report to categorize him/her as professional or recreational. Based on a previous study [15], we consider a recreational athlete the individual who is physically active but who does not train for competition. In addition, professional athletes were classified as individuals receiving regular compensation for their sports-related engagement, whereas recreational athletes were not.

Content validity

To create the questionnaire, content validity was assessed using the Delphi method [16]. To reach the initial version of the questionnaire, two rounds were carried out with eight specialists in the field of rehabilitation. In the first round, specialists were asked to freely list which questions they would ask to investigate an athlete's fear of returning to sport after an injury. Table 3 shows the academic and professional characteristics of the eight specialists who participated in the study.

In the second round, after compiling all the questions listed and excluding questions with similar content, the questions suggested in the first round were sent to the specialists so that an assessment could be issued for two aspects using a Likert-type scale with 5 points (1—not at all; 2—a little; 3—reasonably; 4—a lot; and 5—totally): aspect 1, "How much does each question actually assess the athlete's fear of returning to sport?"; and aspect 2, "To what extent is each question clear and easy to understand?". Then, the content validity coefficient was calculated based on the descriptions by Filgueiras et al. [17] and Hernandez-Nieto [18].

Structural validity

We used exploratory factor analysis (EFA) to explore the structure of the scale, followed by confirmatory factor analysis (CFA) [19]. The theoretical assumption is that the FRESS presents a structure with a single domain and the exclusion of items was used to guarantee this one-dimensionality.

Construct validity by means of correlations between tools

To assess the construct validity, the FRESS score was correlated with the scores of the following questionnaires already validated for the Brazilian population: the Numerical Pain Scale (NPS), Pain-Related Catastrophizing Thoughts Scale (PCTS), Self-Estimated Functional Inability because of Pain Questionnaire for athletes (SEFIP-sport), and Hospital Anxiety and Depression Scale (HADS).

The NPS is a tool already validated by Ferreira-Valente et al. [20] to quantify the pain intensity. The scale is a numerical sequence of 11 items, from 0 to 10, so that 0 indicates no pain and 10 indicates the worst possible pain.

The PCTS is a tool validated for the Brazilian population by Sardá-Junior et al. [21] to assess negative thoughts that are related to the presence of pain. For the total score of the scale, all the answers given to the items are added up and divided by the number of checked items. The total score ranges from 0 to 5; the higher the score, the greater the catastrophizing.

Table 2 Characterization of the sample of qualitative variables ($n = 192$)

Variable	Number (%)
Gender	
Female	77 (40.1%)
Male	115 (59.9%)
Schooling	
Basic education	5 (2.6%)
High school	100 (52.1%)
University education	49 (25.5%)
Postgraduate	38 (19.8%)
Sport modality	
Soccer	58 (30.2%)
Running	22 (11.5%)
Jiu-Jitsu	20 (10.4%)
Volleyball	20 (10.4%)
Basketball	13 (6.8%)
Futsal	13 (6.8%)
Judo	6 (3.1%)
Handball	5 (2.6%)
Karate	5 (2.6%)
Swimming	4 (2.1%)
Other modalities	26 (13.5%)
Injury	
Rupture of the anterior cruciate ligament	31 (16.1%)
Sprain	27 (14.1%)
Contusion	22 (11.5%)
Fracture	16 (8.3%)
Low back pain	15 (7.8%)
Muscle stretch	13 (6.8%)
Joint dislocation	13 (6.8%)
Meniscal injury	10 (5.2%)
Rupture of other ligaments	6 (3.1%)
Anterior knee pain	5 (2.6%)
Tendonitis	5 (2.6%)
Other injuries	29 (15.1%)
Injury site	
Knee	79 (41.1%)
Ankle	26 (13.5%)
Low back	17 (8.9%)
Shoulder	15 (7.8%)
Foot	9 (4.7%)
Thigh	8 (4.2%)
Elbow	8 (4.2%)
Pubis	5 (2.6%)
Forearm	5 (2.6%)
Other regions	20 (10.4%)

The SEFIP-sport was validated for Brazilian Portuguese by Reis-Júnior et al. [22] and Reis-Júnior et al. [23] to measure musculoskeletal pain and disability related to sports practice in a regionalized way (considering the parts of the body separately). The SEFIP-sport is composed of 14 items, with responses on a 5-point Likert scale, where 0 represents "no pain" and 4 represents "I can't play the sport because of the pain". The total score ranges from 0 to 56 point; the higher the score, the greater the disability related to musculoskeletal pain.

The HADS is a scale validated for the Brazilian population by Marcolino et al. [24] to identify symptoms of anxiety and depression. It consists of 14 questions divided into 2 domains: 7 items in the anxiety domain (HADS-A) and 7 items in the depression domain (HADS-D). The score for each item ranges from 0 to 3 points and the total scores for the HADS-A and HADS-D domains range from 0 to 21 points; the higher the score, the greater the symptoms.

Reliability and internal consistency

For the test–retest reliability and internal consistency, we used a subsample of 32 participants who responded to the FRESS at 2 timepoints, with an interval of 7 days between assessments [25].

Fear of Return to Sport Scale (FRESS)

The FRESS is the target tool of this study. This scale aims to assess the fear of returning to sport after an injury that the professional or recreational athletes present. The scale consists of a list of thoughts or feelings that may occur in the athlete when their return to sport is considered. The respondent must mark the answer option that best indicates the frequency of these thoughts or feelings: never (0 points), almost never (1 point), sometimes (2 points), almost always (3 points) or always (4 points). For the total score, the values of the answers given to the items must be summed and divided by the number of items answered, generating a score ranging from 0 to 4. Then, the value must be multiplied by 25, generating a score of 0 to 100. The higher the score, the greater the fear of returning to sport.

Statistical analysis

We performed descriptive statistics and the variables were presented as mean and SD or absolute and relative frequency. We used the SPSS software (version 17.0, Chicago, IL, USA) for the analyses of descriptive statistics, as well as for calculating reliability, internal consistency, and construct validity.

To assess content validity, the content validity coefficient was calculated [17, 18]. Initially, the average of the grades given (scale from 1 to 5) was calculated by the specialists for each of the FRESS items in terms of clarity and content. Then, the average of the grades given was divided by the

Table 3 Professional and academic characteristics of the specialists participating in the study

Specialists	Characteristics
Specialist 1	Physiotherapist for 13 years, with a doctorate in the field of rehabilitation. He is a university professor for 5 years and conducts research related to clinical evaluative measures. He works clinically with patients with chronic pain, including athletes, for 13 years
Specialist 2	Physiotherapist for 24 years, specialist in sports physiotherapy, with a master's degree in physical education. He is a university professor for 21 years and conducts research related to athletes and muscle injury
Specialist 3	Physical therapist for 13 years, specialist in musculoskeletal injuries and physical therapy resources, with a doctorate in the field of rehabilitation. He is a university professor for 10 years and conducts research related to the effects of physical therapy resources on musculoskeletal injuries
Specialist 4	Physiotherapist for 23 years, with a doctorate in the biomedical field. He is a university professor for 21 years and conducts research related to evaluation methods related to human movement
Specialist 5	Physiotherapist for 5 years, with clinical practice focused on the application of manual therapeutic resources and exercises in the rehabilitation of patients with pain, and athletes, especially strength training athletes
Specialist 6	Physiotherapist for 5 years, doctoral student in the field of rehabilitation. He has undertaken clinical and academic research related to sports injuries, especially in handball and soccer
Specialist 7	Physiotherapist for 11 years, specialist in sports training. He holds a doctorate in the field of rehabilitation. He is a university professor for 4 years, with research and clinical practice with athletes, especially in football, eSports, basketball, triathlon and cycling
Specialist 8	Physiotherapist for 10 years and specialist in orthopedic physiotherapy, with a doctorate in physiotherapy and chronic pain. She has undertaken clinical practice in women's football teams

maximum possible value that the item could reach (5). Then, an error value is subtracted from the value resulting from the division. To reach the error value, the value 1 was divided by the number of specialists (8) and this value was raised to the power of the same number of specialists (8). The value of the content validity coefficient was thus reached, with a value equal to or greater than 0.80 being considered acceptable. Items with content validity coefficient values below this cutoff point were excluded.

For structural validity, EFA was initially used, with the implementation of a polychoric matrix and a robust diagonally weighted least squares (RDWLS) extraction method, since the response possibilities for each FRESS item are ordinal values [26, 27]. The identification of the number of factors to be retained was defined by means of parallel analysis with random permutation of the observed data and the rotation used was the robust promin [28, 29]. Data processing was performed using the FACTOR software (Universitat Rovira i Virgili, Tarragona, Spain). Model adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) criterion and Bartlett's Sphericity test. A KMO value above 0.70 and a significant p value (<0.05) in the Bartlett test are considered adequate indices [30, 31].

CFA was performed using the R Studio software (Boston, MA, USA), using the lavaan and semPlot packages. We also used the implementation of a polychoric matrix and the RDWLS extraction method. Model fit was evaluated by root mean square error of approximation (RMSEA) with a 90% confidence interval (CI), comparative fit index (CFI), Tucker–Lewis index (TLI), standardized root mean square residual (SRMR), and Chi-square/degrees of freedom (DF). In the present study, values greater than 0.90 were considered adequate for CFI and TLI, and values less than 0.08 were considered adequate for RMSEA and SRMR. Values below 3.00 were considered adequate in interpreting the Chi-square/DF [32, 33]. In the CFA, factor loadings equal to or greater than 0.40 were considered adequate for the domain. Modification indices (MI) were used to identify the error covariance between the items. Thus, we used the MI as a guide to exclude items but considering the theoretical proposal for the creation of the instrument [34, 35].

In addition, internal consistency was calculated using Cronbach's alpha to identify whether there are redundant or heterogeneous items in the questionnaire. Cronbach's alpha values ranging between 0.70 and 0.95 were considered adequate [36].

Reliability was evaluated based on a test–retest model, using the intraclass correlation coefficient (ICC). The interpretation of the ICC value was performed as follows: for values below 0.40, reliability was considered low; between 0.40 and 0.75, moderate; between 0.75 and 0.90, substantial; and greater than 0.90; excellent [37]. In addition, we calculated the standard error of measurement (SEM), minimum detectable change (MDC), and coefficient of variation (CV) [25].

On the construct validity, we used Spearman's correlation coefficient (rho) to determine the magnitude of correlation between the FRESS and the other instruments. As there is no instrument with a similar construct used in Brazil, our hypothesis is that correlations with instruments that measure related but different constructs should range from 0.30 to 0.50 [10]. We used the t-test for independent samples to compare the FRESS score according to sex (male versus

female) and type of athlete (professional versus recreational athletes).

Ceiling and floor effects will be evaluated in this study. By definition, these effects occur when more than 15% of the study participants reach the minimum or maximum values of the questionnaire as a total score.

Results

Content validity

Initially, emails were sent to 12 specialists in the field of sport and/or rehabilitation. Of these, eight specialists replied to the request in the first round, while two psychologists and two physical education professionals did not respond to the initial contact. The eight specialists proposed 25 questions for measuring the fear of returning to sport for injured athletes. Of these 25 questions, 4 questions were excluded due to similarity to other questions.

For the second round, specialists were asked to assign a score from 1 to 5 for the content and clarity of each of the 21 questions proposed in the first round. Then, as shown in Table 4, the content validity coefficient was applied, excluding eight questions as they presented a value lower than 0.80. Therefore, after content validity assessment, the FRESS had 13 questions.

Then, the questions were transformed into sentences in the first person and five response options were added to the items of the scale: never, almost never, sometimes, almost always and always. The 13-item FRESS version was then applied to 30 athletes to investigate the comprehension of the FRESS items. The athletes were injured and away from the sport, 24 (80%) were men, with a mean age of 23.73 years (SD = 4.28) and with Brazilian Portuguese as their native language. One hundred percent comprehension was observed for all FRESS items.

Structural validity

Initially, EFA was performed with implementation of parallel analysis, identifying the one-dimensionality of FRESS, as shown in Fig. 1, with KMO value = 0.91 and p value < 0.001 in the Bartlett test. Then, the model with 1 domain and 13 items was tested using the CFA, and we observed the following fit indices: Chi-square/DF = 4.12, TLI = 0.953, CFI = 0.944, RMSEA (90% CI) = 0.128 (0.112–0.144) and SRMR = 0.066. Thus, we observed a large amount of residue in the model evidenced by the RMSEA value > 0.08 and the Chi-square/GL > 3.

Table 4 Content validity coefficients of the Fear of Return to Sport Scale (FRESS) for each item proposed by the specialists

Number	Items	Content	Clarity
1	Do you feel insecure about returning to the sport?	0.96	0.98
2	Do you think you will be able to present the same sporting performance that you had before the injury?	0.94	0.95
3	Are you afraid of getting injured again once you return to the sport?	0.98	0.95
4	Do you trust your body after this injury?	0.74[a]	0.83
5	Do you feel ready to return to sport?	0.96	0.93
6	Do you believe your abilities in the sport will be compromised by the current injury?	0.84	0.85
7	Do you only feel comfortable returning to the sport when you are 100%?	0.74[a]	0.78[a]
8	Are you afraid that your injury could get worse if you return to sport too soon?	0.96	0.98
9	Do you think you will have to change your sporting characteristics after the injury?	0.92	0.88
10	Do you feel that this injury can shorten your career in the sport?	0.88	0.90
11	Do you feel pressure to return to sport?	0.74[a]	0.93
12	Are you happy to be able to return to the sport?	0.74[a]	0.93
13	Are you afraid to perform some movements with your body?	0.98	0.93
14	Do you think you should have spent more time in treatment to recover from the injury?	0.94	0.93
15	Do you feel you will not regain the confidence that you had before the injury?	0.94	0.90
16	Are you afraid of the criticisms and judgments of other people?	0.80	0.90
17	Do you think your injury left your body vulnerable to further injury?	0.96	0.93
18	Do you think your fear of getting hurt again is interfering with your performance?	0.68[a]	0.95
19	Do you feel any instability in the injured region?	0.68[a]	0.68[a]
20	Do you feel that the muscles in the injured region are as strong as before?	0.74[a]	0.88
21	Do you feel any clicks or crackles in the injured region?	0.66[a]	0.78[a]

[a]Item excluded for presenting coefficient less than 0.80

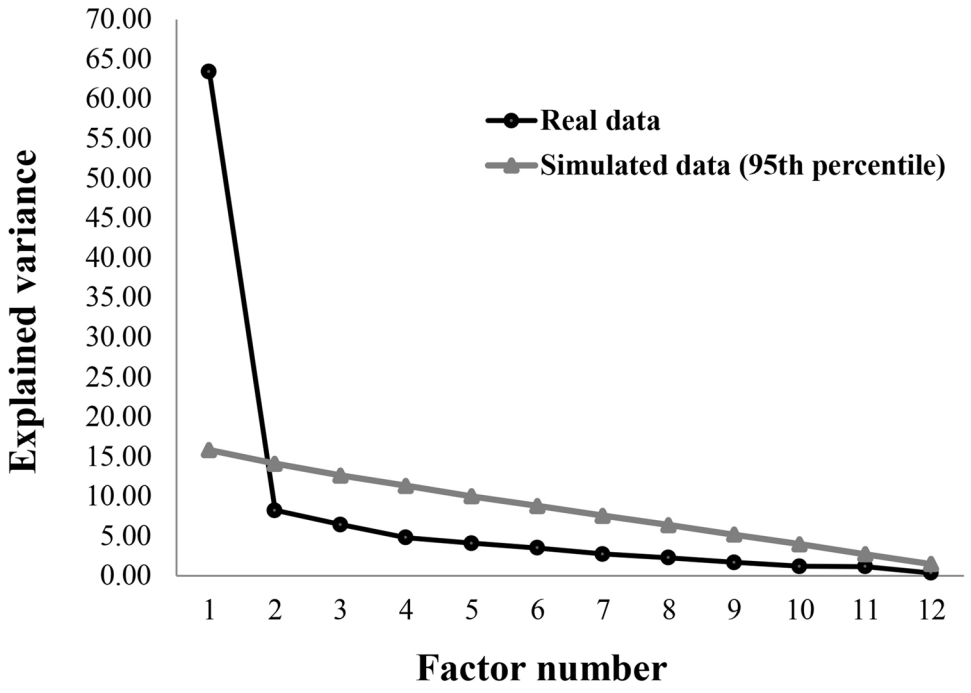

Fig. 1 Scree plot with the identification of one domain in the Fear of Return to Sport Scale (FRESS)

Subsequently, we verified that five items had high covariance with the error of several other FRESS items by means of the MI. Thus, we excluded these items and tested the FRESS structure with one domain and eight items, observing adequate fit indices: Chi-square/DF = 1.79, TLI = 0.992, CFI = 0.989, RMSEA (90% CI) = 0.064 (0.027 to 0.098) and SRMR = 0.036. Furthermore, as shown in Fig. 2, we observed an adequate factor loading (greater than 0.40) between domain and items.

The FRESS with eight items in Brazilian Portuguese and English (free translation) is presented are Supplements 1 and 2, respectively.

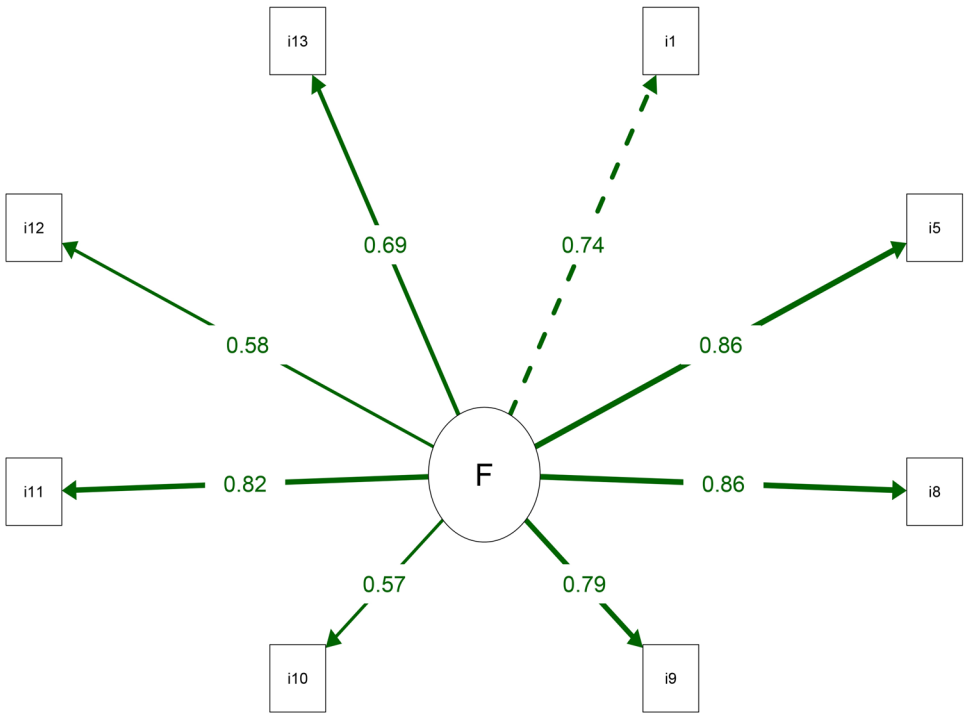

Fig. 2 Path diagram of Fear Return to Sport Scale (FRESS) with 1 domain and 8 items. F, fear of returning to sport

Construct validity

To date, there is no questionnaire or scale with a construct similar to the FRESS. Thus, we calculated correlations with instruments with related constructs (pain intensity, catastrophizing, anxiety, depression and disability) and observed correlation magnitudes ranging between 0.257 and 0.470 (Table 5), as expected according to our a priori hypothesis.

We compared the FRESS score between men (mean = 44.89, SD = 24.07) and women (mean = 50.68, SD = 25.20), and we found no significant difference (p value = 0.110), which indicates similar fear, regardless of sex. Regarding the type of athletes, we observed that 87 (45.3%) participants were professional athletes and 105 (54.7%) were recreational athletes. When comparing the FRESS score, we found no significant difference (p value = 0.847) between professional (mean = 46.83, SD = 25.55) and recreational athletes (mean = 47.52, SD = 25.55).

Reliability and internal consistency

Test–retest reliability and consistency analysis was calculated in a subsample of 32 participants. As shown in Table 6, acceptable reliability was observed, with an ICC value of 0.896. We observed adequate internal consistency for the FRESS, with a Cronbach's alpha value of 0.868.

Table 5 Correlation between the total score of the Fear of Return to Sport Scale (FRESS) and the other instruments used in this study (n = 192)

Scale	FRESS	
	rho	p value
NPS	0.317	< 0.001*
PCTS	0.520	< 0.001*
HADS-anxiety	0.410	< 0.001*
HADS-depression	0.334	< 0.001*
SEFIP-sport	0.293	< 0.001*

NPS, Numerical Pain Scale; PCTS, Pain-Related Catastrophizing Thoughts Scale; HADS, Hospital Anxiety and Depression Scale; SEFIP, Self-Estimated Functional Inability because of Pain for athletes

*Significant correlation (p < 0.05)

Ceiling and floor effects

We observed that five (2.6%) participants obtained the minimum score and two (1%) participants obtained the maximum score of FRESS. Thus, ceiling and floor effects were not observed.

Discussion

This study aimed to develop a new questionnaire and validate it for the Brazilian population to measure the fear of returning to sport in injured athletes. We observed that the FRESS presents a one-dimensional structure with eight items after analyzing the content and structural validity. Furthermore, the 8-item FRESS is reliable and presents adequate correlation with instruments that measure related constructs, mainly catastrophizing and anxiety. Ceiling and floor effects were not observed.

The current scientific literature presents two questionnaires used to measure fear of returning to sport. The first of these is the AFAQ, created by Dover and Amar [12], including Canadian athletes injured or with a history of previous injury. The AFAQ has specific questions for team sports athletes and has the measurement properties adequate. However, this questionnaire is only available in the English language.

The ACL-RSI is another evaluative possibility related to the fear of returning to sport, developed and validated by Webster et al. [11]. This questionnaire was designed for athletes undergoing anterior cruciate ligament reconstruction. The ACL-RSI has already been adapted and validated in Brazilian Portuguese, with adequate reliability, internal consistency and construct validity [13]. In addition to this language, the ACL-RSI has been adapted and validated for French [38], Turkish [39], Chinese [40], Spanish [41], Lithuanian [42], Korean [43] and Italian [44].

In this context, the FRESS presents some positive characteristics when compared to the AFAQ and the ACL-RSI. For example, it presents a smaller number of items, resulting in a shorter filling time; it has a valid internal structure based on factor analysis; and it has items that allow a comprehensive assessment, so can be applied to athletes of any sport (individual or collective) and with any type of injury.

Table 6 Test–retest reliability and internal consistency of the Fear of Return to Sport Scale (FRESS) (n = 32)

Test	Retest	ICC (CI 95%)	SEM (score)	SEM (%)	MDC (score)	MDC (%)	CV (%)	Cronbach's alpha
44.72 (23.89)	39.25 (20.92)	0.896 (0.799, 0.948)	7.23	17.21	20.03	47.70	18.16	0.868

ICC, intraclass correlation coefficient; CI, confidence interval; SEM, standard error of measurement; MDC, minimum detectable change; CV, coefficient of variation

The present study has limitations that must be considered. Part of the collection was performed online. Thus, there was no medical diagnosis or clinical evaluation to determine the athletes' injuries, instead using self-reporting of injury. In addition to including professional athletes, we included in this study recreational athletes with lower volume and intensity of sports practice before the injury. Recreational athletes who did not participate in competitions were included.

The specialist committee consulted during the creation of the FRESS was entirely composed of physical therapists and this aspect must be considered by the professional who will use the tool. Part of the data collection took place during the COVID-19 pandemic period and social restriction may have interfered with the responses of the participants, as highlighted by a previous study [45]. Despite the adequate ICC value (0.896) for test–retest reliability according to COSMIN [10] and Fleiss [37], SEM, MDC, and CV values were higher than expected. The likely explanation for this result was the reduced sample size for the reliability analysis ($n = 32$) and the sample heterogeneity, which resulted in high SD values. Therefore, we recommend that future studies retest reliability in larger samples.

Conclusion

The FRESS with one domain and eight items has acceptable measurement properties and its use in clinical and sports environments to measure the fear of returning to sport in injured professional or recreational athletes is supported.

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Declarations

Conflict of interests The authors declare that they have no competing interests.

Ethical approval This study was approved by the research ethics committee of the Universidade Federal do Maranhão (opinion number 4.256.657).

Informed consent Informed consent was obtained from all patients in this study.

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