Athlete Fear Avoidance Questionnaire: Cross-cultural Adaptation and Validation in Italian Athletes With Musculoskeletal Injuries

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Research

Keywords: Fear-avoidance model, athletic injuries, psychometrics, rehabilitation, psychology

Posted Date: September 29th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-917467/v1

Abstract

Background. The aim of this study was to translate, culturally adapt and validate an Italian version of the Athlete Fear Avoidance Questionnaire (AFAQ-I).

Methods. We conducted a cross-sectional evaluation of the psychometric properties of the AFAQ-I in athletes with musculoskeletal injuries, culturally adapting it in accordance with international standards. Psychometric evaluation included exploratory factor analysis, reliability (internal consistency [Cronbach's alpha], inter-item correlation, and test–retest reliability [intra-class correlation coefficient]). To examine construct validity, we compared (Spearman rank correlation) the AFAQ-I with a numerical pain rating scale (NPRS), the Pain Catastrophizing Scale (PCS), and the Fear Avoidance Beliefs Questionnaire subscales (Physical Activity, FABQ-PA; and Work, FABQ-W). We evaluated sensitivity to change through the minimum detectable change (MDC).

Results. The AFAQ-I was administered to 133 university athletes with musculoskeletal injuries (26 females, mean age 25.3 ± 5 years, mean average pain duration 5.6 ± 8.7 months), and resulted acceptable. Factor analysis revealed a 1-factor 10-item solution (explained variance: 53%). Internal consistency was 0.78; average inter-item correlation 0.27; test–retest reliability $ICC_{(2,1)}$ 0.95. As hypothesized *a priori*, construct validity showed moderate correlations of the AFAQ-I with NPRS (ρ = 0.42), PCS (ρ = 0.59), FABQ-PA (ρ = 0.40) and FABQ-W (ρ = 0.34). The MDC was 4.42 points.

Conclusion. The AFAQ-I is a valid Italian translation of AFAQ and demonstrates acceptable psychometric properties. We can recommend its use for clinical and research purposes.

Background

Musculoskeletal injuries in athletes can cause or facilitate mood disorders including depression, anxiety, anger, catastrophizing, fear-avoidance, and distress [1–3]. Persistent fear-avoidance behaviour refers to maladaptive thinking that interferes with common activities [4]. Fear-avoidance beliefs can critically influence whether a person adjusts to the injury and recovers, or engages in negative behaviors that impede full recovery [4–7]. Previous studies found fear-avoidance as a barrier to the return to sport, and recommended the need to support athletes in this regard to help them fully recover their activities [8–14].

The Athlete Fear Avoidance Questionnaire (AFAQ) [15] was developed in 2015 based on a Delphi process of item generation followed by selection led by a group of experts in athletic therapy and sports psychology. The final version was a 10-item tool dealing with individual fear-avoidance thoughts and feelings after a sports injury. Psychometric testing demonstrated good internal consistency and acceptable concurrent validity, as assessed through established measures of fear-avoidance and catastrophizing [15].

Despite clinical use of this tool in different countries [9, 13, 16, 17], to our knowledge no psychometric validation of the AFAQ in a language other than English has been indexed in PubMed. One of the main

reasons for the development of the AFAQ was to create a scale targeted to athletes and on their wavelength, so having the questionnaire in the athlete's first language would help ensure that the answers truly reflect what the athlete is experiencing. Moreover, independent psychometric studies can enhance confidence in the use of an outcome measure, and provide the basis for comparisons across different samples and countries [18].

The aim of this study was therefore to develop a culturally adapted and validated Italian version of the AFAQ for assessing fear-avoidance beliefs in Italian athletes with musculoskeletal injuries.

Methods

This cross-sectional study was approved by our Local Ethical Committee (005/16, on 8th April 2016), and conducted in accordance with ethical principles of the Declaration of Helsinki.

Cross-cultural adaptation

Translation and cross-cultural adaptation of the AFAQ consisted of the following steps, in line with International Guidelines [19].

Forward translation. First, two Italians fluent in English and experienced in the biomedical field independently translated the original scale [15] into Italian. The translators were briefed on the main concepts in the questionnaire, to ensure that they captured the conceptual meaning of the items, and were instructed to keep the language colloquial and compatible with a reading age of 12 years. Discrepancies between the translations were resolved by consensus between the two translators and two local rehabilitation professionals (MM and FF), fluent in English and expert in these methodological and clinical areas. This led to the creation of a unified preliminary Italian version.

Back-Translation into English. Two bilingual native-English professional translators independently translated the preliminary Italian version back to English.

Expert Committee. Two professional translators and the two local rehabilitation professionals (MM and FF) together explored the semantic, idiomatic, and conceptual equivalence of the items and response options, in order to arrive by consensus at a unified pre-final version, striving to select Italian terms able to capture the meaning of the source text and reflect it in layman's terms.

Test of the prefinal version. This version underwent a pilot test in 10 athletes with musculoskeletal injuries who, upon completion of the questionnaire, were face-to-face interviewed by a trained psychologist about the intelligibility, appropriateness, cultural relevance and potential ambiguity of each part of the questionnaire (cognitive debriefing). The Expert Committee reviewed the results of the cognitive debriefing to identify if any text refinement or change was necessary.

Final version: The Expert Committee consolidated the text according to the pilot test results, and prepared the definitive Italian version of the AFAQ (namely, AFAQ-I). A full copy is available on request from the

corresponding author.

Survey participants

We invited students of Motor Sciences at the Faculty of Medicine, University of Cagliari (Sardinia, Italy) between January 2019 and March 2021 - via the institutional website (request updated every three months) - to participate in a survey if they were currently suffering from any musculoskeletal injury occurred during their athletic activities.

Data collection and procedure

From all the potential participants (more than 300 students per academic year), those who volunteered to participate in the survey and who met the inclusion criteria were asked to sign written informed consent to participate in the study. We then invited this convenience sample to access a dedicated webpage through the University website to record their demographic and clinical characteristics, and complete the outcome measures planned for the study. All participants completed the electronic questionnaire twice, 10 days apart.

Outcome measures

AFAQ-I: this 10-item self-administered questionnaire investigates injury-related fear-avoidance in athletes. Each item has a 5-point response scale ranging from 1 (“not at all”) to 5 (“completely agree”), with higher scores indicating higher fear-avoidance beliefs [15].

Numerical Pain Rating Scale (NPRS): an 11-point numerical scale from 0 (no pain at all) to 10 (the worst imaginable pain) [20] by which participants rated their average pain intensity over the last 24 hours.

Fear Avoidance Beliefs Questionnaire (FABQ): a 16-item self-administered questionnaire consisting of two subscales assessing subjects’ beliefs related to physical activity (FABQ-PA) and work (FABQ-W). Items are scored on a 7-point Likert scale, with higher values indicating higher fear-avoidance beliefs. The FABQ-W subscore (range 0–42) represents the sum of 7 of the 11 original items (# 6, 7, 9–12, and 15), while the FABQ-PA subscore (range 0–24) is the sum of 4 of the 5 original items (# 2–5) [21]. The five remaining questions serve simply as delusive items, as proposed by Waddell et al [22].

Pain Catastrophizing Scale (PCS): a self-report questionnaire in which respondents rate how frequently they experience 13 different thoughts and feelings related to pain, using a 5-point scale from 0 (never) to 4 (always). The total score ranges from 0 to 52, with higher scores indicating higher catastrophizing [23].

Statistical analysis

FACTOR software version 10.9.2 (Departament de Psicologia – Universitat Rovira I Virgili, Tarragona, Spain) [24] was used to perform the parallel and factor analyses for ordinal data, while STATA (version 13.1, StataCorp LP, College Station, TX, USA) was used for all remaining analyses.

A subject-to-item ratio > 10:1 suggested a sample size > 100 [25]; at least 120 subjects were necessary to verify a test-retest correlation of 0.85 with a 95% CI width of 0.1 (alpha = 0.05) according to the Bonnett formula [26].

Acceptability – We recorded the time needed to answer the AFAQ, and checked data for missing responses.

Factor analysis - As an independent replication of the preliminary dimensionality analysis performed in the original study [15], we estimated the number of meaningful dimensions in the response matrix of the AFAQ-I according to the following procedure [25]. First, we performed Horn's Parallel Analysis (PA), comparing the size of eigenvalues obtained from principal component analysis with those obtained from a randomly generated data set of the same size and number of variables (100 replications). To investigate each item's contribution (percentage of variance) to the factor(s), we tested the model suggested by PA using Exploratory Factor Analysis (EFA) with the Minimum Rank Factor Analysis of the polychoric correlation matrix as the method for factor extraction. For stable and representative results, an item was considered as correlated to the latent factor when its loading was 0.30 or more [27].

Reliability and sensitivity to change (minimum detectable change) - The following parameters were evaluated[18]:

- internal consistency (Cronbach's alpha), considering values > 0.70 as acceptable for group-level comparisons, while a minimum of 0.85–0.90 is recommended for individual judgments;

- inter-item correlation (where values < 0.20 indicate the item is not measuring the main construct very well) and item-rest correlation (values > 0.30 are considered satisfactory);

- test–retest reliability of the global score, using the intraclass correlation coefficient, with a 'two-way mixed effects, single measurement' model, $ICC_{(2,1)}$; values of 0.75–0.9 indicate good reliability, and > 0.90 excellent reliability [27].

- standard error of measurement (SEM), estimated according to the formula: $SEM = SD\sqrt{1 - ICC_{2,1}}$, where the $ICC_{(2,1)}$ value was taken from test-retest results and SD was the standard deviation of the population measure.

The minimum detectable change (MDC) was calculated as follows: $MDC = SEM * z\ value * \sqrt{2}$, with its 95% confidence level (MDC_{95}) corresponding to a z value of 1.96 [27].

Floor/ceiling effects - Descriptive statistics were calculated to identify floor/ceiling effects, which were considered to be present when > 15% of the subjects obtained the lowest or highest possible scores [18].

Construct validity – We used hypothesis testing to verify this property [18]. Based on the findings of the original study [15], we were expecting to find fair to moderate positive correlations (0.30–0.60) between

the AFAQ and measures of pain intensity (NPRS), fear-avoidance beliefs (the two FABQ subscales: FABQ-PA, FABQ-W), and pain catastrophizing (PCS).

Correlations were performed by Spearman's rank correlation coefficient (ρ): construct validity was considered good if ≥ 75% of the hypotheses were met.

Results

Participants

Of the 145 eligible participants, 12 refused to participate. The remaining 133 athletes composed the study population. Their clinical and socio-demographic characteristics are reported in Table 1.

Table 1
Main socio-demographic characteristics of the study population (n = 133)

Sex (male/female)	**95/38**
Age (years), mean ± SD	25.3 ± 5
Body mass index (kg/m^2), mean ± SD	23.2 ± 1.7
Pain intensity (at NPRS 0–10), mean ± SD	6.2 ± 2.3
Pain duration (months), mean ± SD	5.6 ± 8.7
AFAQ-I (score range 10–50), mean ± SD	24.9 ± 7.1
FABQ-PA (score range 0–24), mean ± SD	14.9 ± 6.1
FABQ-W (score range 0–42), mean ± SD	18.3 + 7.8
PCS (score range 0–52), mean ± SD	18.3 ± 9.1
Marital status, n (%)	
Married/Single	6/127 (5/95%)
Injured structure, n (%)	
Bone	35 (26.3)
Muscle	14 (10.5)
Tendon	61 (45.9)
Ligament	23 (17.3)
Mechanism of injury, n (%)	
Strain and sprain	47 (35.4)
Trauma	26 (19.6)
Contusion	28 (21.0)
Overuse	32 (24.0)
Site of injury, n (%)	
Upper limb	30 (22.6)
Spine	5 (3.8)
Lower limb	98 (73.6)
Type of current treatment, n (%)	

NPRS: Numerical Pain Rating Scale; AFAQ-I: Athlete Fear Avoidance Questionnaire, Italian version; FABQ-PA: Fear Avoidance Beliefs Questionnaire - physical activity subscale; FABQ-W: Fear Avoidance Beliefs Questionnaire – work subscale; PCS: Pain Catastrophizing Scale; SD: standard deviation.

Sex (male/female)	95/38
Therapeutic exercises	55 (41.3)
Physical therapy modalities	32 (24.0)
Drugs	21 (15.9)
Rest	20 (15.0)
Orthoses	5 (3.8)

NPRS: Numerical Pain Rating Scale; AFAQ-I: Athlete Fear Avoidance Questionnaire, Italian version; FABQ-PA: Fear Avoidance Beliefs Questionnaire - physical activity subscale; FABQ-W: Fear Avoidance Beliefs Questionnaire – work subscale; PCS: Pain Catastrophizing Scale; SD: standard deviation.

Translation and cross-cultural adaptation

The whole procedure took one month. In most cases, no difficulties emerged but there was a slight modification of some words based on the Italian context and the need to increase the questionnaire's applicability. The word "play" was changed with "do sports" (in Italian "*svolgere attività sportive*"), and the words "role with the team" were changed with "my role in the sport" (in Italian "*il mio ruolo sportivo*"). For a uniform wording of the response options (all examining the degree of agreement with item statements) we translated them as follows: 1 = 'Non sono affatto d'accordo' ('Not at all'); 2 = 'Solo parzialmente d'accordo' ('To a slight degree'); 3 = 'In moderato accordo' ('To a moderate degree'); 4 = 'Prevalentemente d'accordo" ('To a great degree'); 5 = 'Completamente d'accordo' ('Completely agree').

The cognitive debriefing interviews endorsed the intelligibility, appropriateness and relevance of the questionnaire's translation. Finally, the principal investigator (MM), the original author (GD) and the Expert Committee confirmed the appropriateness of the final version.

Psychometric properties of the AFAQ-I

Acceptability **-** The questionnaire took 6.7 ± 1.8 min to complete; no missing responses were found, nor were any comprehension problems during compilation reported.

Factor analysis – PA indicated the presence of one factor only, accounting for 53% of the variance. Seven items loaded > 0.5 to this factor, and two between 0.30 and 0.50, while item #6 loaded 0.25. Each item's communality was higher than 0.40.

Reliability and sensitivity to change – Cronbach α was 0.78. The average inter-item correlation was 0.27; items #4 ("I am not sure what my injury is"), #6 ("I am not comfortable going back to play until I am 100%") and #9 ("I worry if I go back to play too soon I will make my injury worse") showed four to five inter-item correlations in the range 0.0-0.2, while all other correlations ranged 0.26–0.75. The item-rest correlation of seven items ranged 0.40–0.64, while that of item #6 was 0.23, and those of items #4 and #9 were 0.30 and 0.34, respectively. Test-retest reliability, SEM and MDC are reported in Table 2.

Table 2
Test–retest reliability of the global score – $ICC_{(2,1)}$, standard error of measurement (SEM), and minimum detectable change at its 95% confidence level (MDC_{95}), related to the Athlete Fear Avoidance Questionnaire, Italian version (AFAQ-I).

AFAQ-I	
$ICC_{(2,1)}$	0.95 (95% CI: 0.93–0.97)
SEM	1.60
MDC_{95}	4.42
CI = confidence interval	

Floor/Ceiling Effects. The AFAQ-I did not show any significant floor/ceiling effect.

Construct validity. All *a priori* hypotheses were confirmed. There were positive correlations of fair to more-than-moderate level between the AFAQ-I and measures of pain intensity (NPRS), fear-avoidance beliefs (FABQ-PA, FABQ-W), and pain catastrophizing (PCS) (Table 3). The scatterplot of the relationship between AFAQ-I and PCS ($\rho = 0.59$) is shown in Fig. 1.

Table 3
Spearman's correlation (ρ) between the Athlete Fear Avoidance Questionnaire, Italian version (AFAQ-I) and other questionnaires. For all correlations $p < 0.0025$.

	ρ
NPRS	0.42
FABQ-PA	0.40
FABQ-W	0.34
PCS	0.59
NPRS: Numerical Pain Rating Scale; FABQ-PA: Fear Avoidance Beliefs Questionnaire, Physical Activity subscale; FABQ-W: Fear Avoidance Beliefs Questionnaire, Work subscale; PCS: Pain Catastrophizing Scale.	

Discussion

This study describes the process of cross-cultural adaptation and validation of an Italian version of the AFAQ for Italian-speaking athletes with current musculoskeletal injuries. The AFAQ-I showed acceptable psychometric properties, as assessed with classic test theory methods.

The cross-cultural adaptation procedure followed guideline recommendations [18, 19] and assured an adequate semantic, idiomatic and conceptual equivalence between the original and the Italian version (a prerequisite for data comparability across countries). Any refinement was discussed by the Expert Committee and agreed upon with the original author. Further, the in-field test confirmed the comprehensibility and appropriateness of the translated questionnaire for the target population.

The questionnaire showed good acceptability, and was well understood and easy to self-administer. Factor analysis revealed a 1-factor structure of the scale, in line with the original authors [15]. The main factor explained more than half of variance in the data, confirming the substantial unidimensionality.

Cronbach's alpha showed a value acceptable for group-level comparisons, similar to that found by the original developers (0.78 vs. 0.80) [15], while in a Pakistani study on female medical students it was higher (0.90) [17]. The analysis of the inter-item and item-rest correlations showed that items are, on average, reasonably homogeneous without being isomorphic with each other. However, the rather low values of items #4 ("I am not sure what my injury is"), #6 ("I am not comfortable going back to play until I am 100%"), and #9 ("I worry if I go back to play too soon I will make my injury worse") suggest that these three items measure something slightly different from athlete fear-avoidance. Indeed, a close inspection of these three questions shows that item #4 seems to assess "unawareness of the type of injury", while the answers to items #6 and 9 could stem from distinct protective attitudes and behaviors, including hypervigilance [4].

An excellent test-retest reliability emerged between the scores at baseline and after a 10-day interval. To the best of our knowledge, this is the first report of this AFAQ property in the peer-reviewed literature. Accordingly, the AFAQ-I showed a relatively low measurement error. Thus, the MDC_{95} was just 11% of the score range. This finding indicates, at 95% confidence level, that a change of at least 5 points in the individual score is needed to reflect a true change in athlete fear-avoidance thoughts (i.e. outside measurement error).

As for construct validity, the AFAQ-I showed the expected correlations with "legacy" tools measuring pain intensity, fear-avoidance, and catastrophizing [4]. The correlation of the AFAQ-I with the NPRS indicates a moderate link between the degree of fear-avoidance beliefs and reported levels of pain intensity. This finding is in line with two other studies examining similar issues in athletes [9, 10]. However, due to the cross-sectional design of the current study, no causal relationship can be established between the two variables.

Consistent with the cognitive-behavioural model of fear-avoidance [4], the AFAQ-I scores were also associated with measures of similar constructs such as fear of movement and catastrophizing. This result supports the scale's construct validity and suggests that individuals who persistently focus on maladaptive thinking after an athletic musculoskeletal lesion tend to be more avoidant and catastrophizers also in other stressful life events, as also found in previous studies [10, 13].

However, as suggested by the scale's developers [15], the AFAQ contains sport-specific items, so the expected relationship with FABQ subscales cannot be strong. Higher correlations were found with FABQ-PA than with FABQ-W, because the items included in the latter subscale are work-related and less relevant for athletes than those related to general physical activity. The level of these correlations in our study (ρ = 0.40 with the FABQ-PA, ρ = 0.34 with the FABQ-W) was a little higher but similar to that reported by the original developers (ρ = 0.35 with the FABQ-PA; ρ = 0.14 with the FABQ-W) [15].

Interestingly, the AFAQ-I presented a quite good correlation with the PCS (ρ = 0.59). This in line with the findings of two previous studies [9, 15], indicating that the issues assessed in AFAQ parallel those examined by a pain catastrophizing measure [4].

All the above results suggest the importance of an adequate understanding of the psychological reactions in these particular patients. Also, they indicate that the AFAQ (and fear-avoidance model) may be useful to individually tailor both cognitive-behavioural and physical interventions within multimodal treatments for athletes with musculoskeletal injuries who have high levels of fear-avoidance beliefs [16, 28, 29]. Similar results were already found in non-athlete populations where other measures of pain-related fear were used [30, 31]. Thus, there is need for prospective studies in athletes with recent musculoskeletal injuries, to examine the sequential relationships between AFAQ-I and rehabilitation recovery, as well as the effects of cognitive-behavioral interventions on those with high levels of fear-avoidance [10, 28, 32].

Overall, our results indicate that the AFAQ-I has acceptable psychometric properties when used for the clinical assessment of athletes recovering from musculoskeletal injuries. However, we recommend further analyses (using advanced factor analytic and item-response-theory methods) in order to examine better the structural validity and additional metric properties of the scale at item level. This includes how well each item performs in terms of its relevance for measuring the underlying construct, the amount of the construct (i.e. fear-avoidance beliefs) targeted by each item, possible redundancy of items, and the appropriateness of the response options. Such advanced knowledge would enable to further optimize the content coverage and technical quality of this tool through selection of the most convenient type and number of items and response categories.

Our study has some limitations. First, it is a cross-sectional study so we could not assess the responsiveness or minimal important change of the AFAQ. Second, the study was based on self-administered questionnaires, and thus the relationships with clinical, functional and instrumental tests were not considered. Third, correlations between these measures of pain-related fear and quality of life questionnaires still need to be analysed. Fourth, our study was restricted to university athletes with post-acute musculoskeletal injuries and it is uncertain how well these findings may reflect other injured individuals or athletes with past (not present) injury.

Conclusion

The new AFAQ-I confirmed the substantial unidimensional structure of the questionnaire and demonstrated acceptable psychometric features in terms of reliability (including measurement error) and construct validity (hypotheses testing), mainly assessed with classical test theory methods. This preliminary evidence encourages further, prospective studies in order to enhance confidence in the clinical and research use of this questionnaire for the assessment and rehabilitation treatment of athletes with recent musculoskeletal injuries.

Abbreviations

AFAQ - Athlete Fear Avoidance Questionnaire; AFAQ-I - Athlete Fear Avoidance Questionnaire, Italian version; EFA - Exploratory Factor Analysis; FABQ-PA - Fear Avoidance Beliefs Questionnaire, Physical Activity subscale; FABQ-W - Fear Avoidance Beliefs Questionnaire, Work subscale; ICC – Intraclass Correlation Coefficient; MDC - Minimum Detectable Change; NPRS - Numerical Pain Rating Scale; PA - Horn's Parallel Analysis; PCS - Pain Catastrophizing Scale; SD – Standard Deviation; SEM - Standard Error of Measurement.

Declarations

Acknowledgements

The authors thank all participants involved in the study.

Authors' contribution

MM, FF and MyM took part in study conception and design. MM and MyM performed the data collection and acquisition of data. AG and FF performed data analysis. MM, GD, AG and FF interpreted data. MM, AG and FF participated in the original draft writing. MM, GD, MyM, AG and FF had a role in critical revision of text, tables and figure. All authors have read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests

Consent for publication

Not applicable

Ethical approval and consent to participate

This study was approved by our Local Ethical Committee – University of Cagliari (Italy) (n. 005/16, on 8th April 2016). All participants provided written informed consent.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data statement

Data of the current study are available from the corresponding author on reasonable request.

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Figures

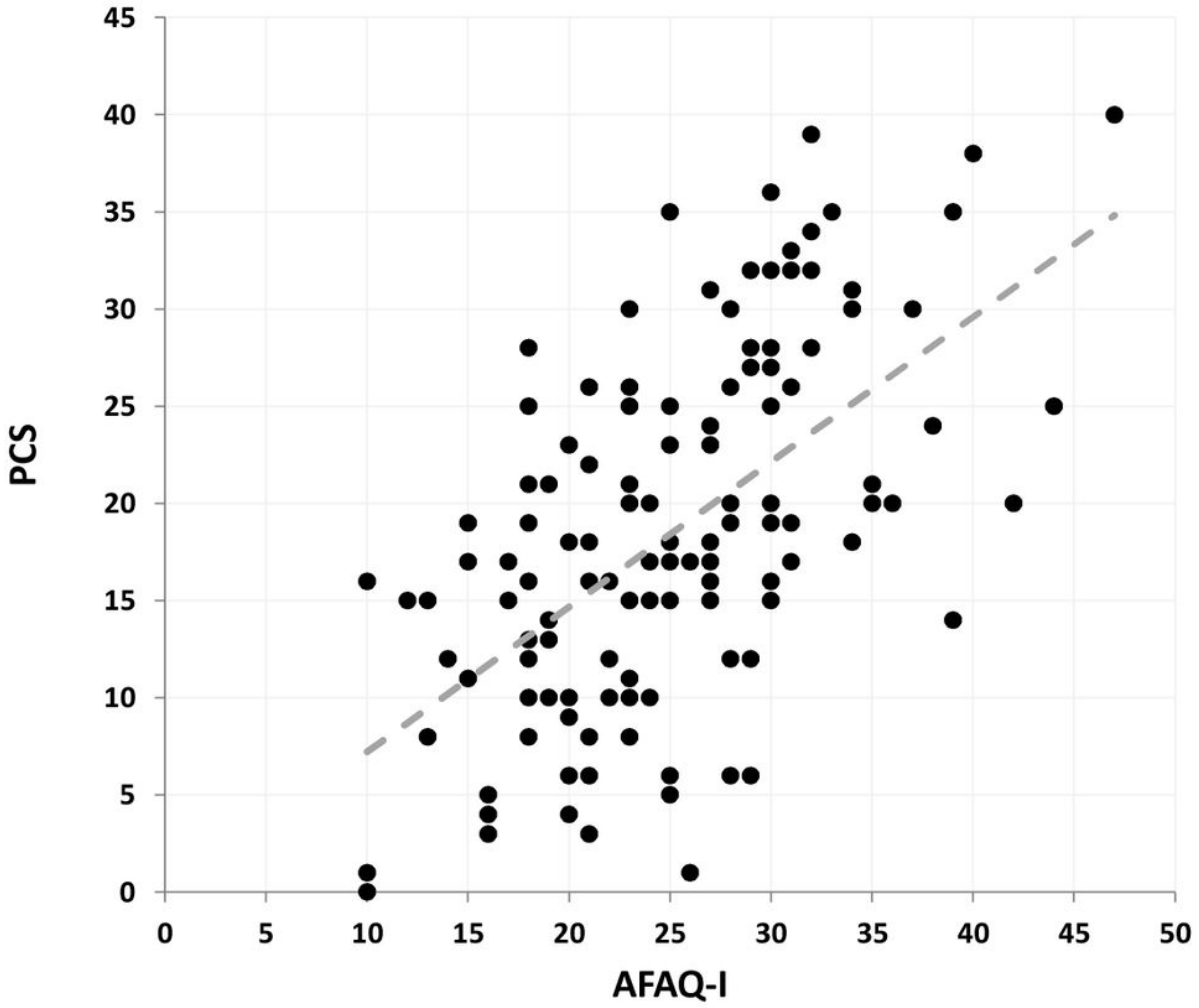

Figure 1

Scatterplot showing the relationship between total scores of the Athlete Fear Avoidance Questionnaire, Italian version (AFAQ-I) and the Pain Catastrophizing Scale (PCS) (ρ = 0.59). The dotted line represents the linear regression line.