ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

Translation of the Re-injury Anxiety Inventory into Turkish and Assessment of its Psychometric Properties

Yeniden Yaralanma Kaygısı Envanterinin Türkçe Çevrimi ve Psikometrik Özelliklerinin Değerlendirilmesi

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ABSTRACT Objective: The aim of this study was to investigate the validity and reliability of the Re-injury Anxiety Inventory (RIAI) in Turkish language. **Material and Method:** One hundred athletes aged between 16 to 50 years and being treated due to sports-related injury were included in the study. They completed the RIAI twice (with a 48-to-80 hours interval). Construct validity was analyzed with the Tampa Scale for Kinesiophobia (TSK). Cronbach alpha was used to assess internal consistency. Intraclass correlation coefficient (ICC) was used to estimate the test-retest reliability. **Results:** A low level correlation (r=0.225) was found between the scores of TSK and Rehabilitation Re-injury Anxiety (RIA-R) scale, and a moderate level correlation (r=0.401) was found between the scores of TSK and Re-entry into Competition Re-injury Anxiety (RIA-RE). The internal consistency of the Turkish version of the RIAI was reported to have an excellent Cronbach's alpha coefficient of 0.932. Furthermore, the Turkish version of RIAI showed a high level of test-retest reliability with an intraclass correlation coefficient (ICC) of 0.919. **Conclusion:** Given the excellent validity and reliability scores, the Turkish version of the RIAI reported by this study was proven to be a promising tool for assessment of the re-injury anxiety of the Turkish athletes.

Keywords: Validity; reliability; sports injury;
the re-injury anxiety inventory

ÖZET Amaç: Bu çalışmanın amacı, Türkçe Yeniden Yaralanma Kaygısı Envanteri'nin (YYKE) geçerliliğini ve güvenilirliğini araştırmaktır. **Gereç ve Yöntemler:** Sporla ilgili yaralanmalardan dolayı tedavi gören 16-50 yaş arası 100 sporcu çalışmaya dahil edildi. YYKE'yi iki kez cevapladılar (48 ila 80 saat arayla). Yapı geçerliliği Tampa Kinezyofobi Ölçeği (TKÖ) ile analiz edildi. İç tutarlılığı değerlendirmek için Cronbach alfa kullanılmıştır. Sınıf içi korelasyon katsayısı (ICC), test-tekrar test güvenilirliğini tahmin etmek için kullanıldı. **Bulgular:** TKÖ skoru ile rehabilitasyonda yeniden yaralanma kaygısı envanteri (YYKE-R) arasında düşük seviye korelasyon (r = 0.225), rekabete dayalı yeniden yaralanma kaygısı envanteri (RIA-RE) arasında orta seviye korelasyon (r=0.401) bulundu. YYKE'nın Türkçe versiyonunun iç tutarlılığı (Cronbach alfa katsayısı= 0.932) mükemmel olarak belirlendi. Ayrıca, YYKE'nın Türkçe versiyonu, yüksek düzeyde test-tekrar test güvenilirliği (sınıf içi korelasyon katsayısı= 0.919) göstermiştir. **Sonuç:** Mükemmel geçerlik ve güvenilirlik puanları dikkate alındığında, bu çalışma ile bildirilen YYKE'nın Türkçe versiyonunun, Türk sporcuların yeniden yaralanma kaygısının değerlendirilmesi için umut verici bir yöntem olduğu belirtilmektedir.

Anahtar Kelimeler: Geçerlilik; güvenilirlik; spor yaralanması;
yeniden yaralanma kaygısı envanteri

Musculoskeletal injuries are potential consequences of attendance to sports. The present medical model for treatment of these injuries only addresses local pathologies, ignoring its psychological impact on the athlete. Similarly, evidence-based sports return criteria and postoperative rehabilitation protocols center more on muscle disorders and localized acute symptoms in functional, but not on the psychological state of the injured athlete.[1] Clinical reports and anecdotal reports indicate that an injured athlete tends to experience fears, particularly about re-injury (RI).[2-6] The number of reports about the athletes that have fear and anxiety of being injured again during rehabilitation and returning to training and competi-

tions following rehabilitation has been increased. Athletes state that fear of injury is the most significant source of stress when returning to sports.[5] As a result, it has increasingly become acceptable that the physical preparedness to return to sports after injury is not sufficient to completely address for the psychological readiness. Therefore, the current medical paradigm needs improvement to be able to account for both the physical and psychological states.[1]

RI is defined as the injury of the similar type or position as a previous injury.[7] An athlete that is afraid of being re-injured may have problems leading to disruption of her/his skills including mental anguish. Additionally, this condition may also affect the overall performance through reduced biomechanical efficiency of the skill, weak use of energy resources or/and reduced attention. Eventually, these effects on the performance can create a reciprocally supporting, self-renewing cycle, and increase the risk of RI.[8,9] Therefore, the fear of RI has been suggested to cause psychological damages such as decreased self-confidence and weak focus, which prevents the return to sports.[8-10] Kleinert states that injury-related concerns may not be biological, and that they arise from the first injury experience and be affected by other factors such as the qualification of rehabilitation.[11] This type of emotional development is more common for anxiety than fear. Therefore, while searching for conceptual clarity, it has become more accurate to use the term 'injury anxiety'.[9-13]

The way that athletes assess the risk of returning to sports is considered to be an important component of post-injury rehabilitation. Therefore, the first step of treatment in sports rehabilitation includes psychological approaches.[1,4,9,13] Brewer stated that the importance of the development of the standardized psychological scales that are specific to the rehabilitation environment following sports injury.[14] The use of standardized psychometric tools allows researchers to measure the same construct in the same way, and obtain reliable measurements. Thus these tools would provide a reliable and valid way of measuring the responses of athlete to injuries. The re-injury anxiety inventory (RIAI) which was developed by Walker et al. is an example of such tools for measuring RI anxiety.[13]

Despite the wide applicability of such scales, their translation to a different language from its original language may lead to problems interfering the validity and reliability of the scale.[15] Hence, it is essential to assess the psychometric properties of the translated scales prior to their usage in research. This study for the first time reports the psychometric properties of the Turkish version of RIAI.

MATERIAL AND METHODS

TRANSLATION AND INTERCULTURAL ADAPTATION

Following the permission of the original developer of the RIAI, Natelie Walker, for the Turkish translation and psychometric evaluation of the RIAI questionnaire, local ethics committee (The Research Ethics Committee of Acıbadem University and Acıbadem Healthcare Group; reference no. 2018-6/12) has approved the study. In accordance with Helsinki criteria, patients' assent verbal and written consent were obtained. Five stages of adaptation of the questionare were performed as in the international guideline proposed by Beaton et al.[16] In the first stage, the English questionnaire was independently translated into Turkish by an English translator without any knowledge about the study and a physiotherapist with knowledge about the study. Both of the translators spoke English and Turkish fluently. After the translations had been completed, the second stage was preceded and a translation was made. Following the transcription, a review to find any conceptual errors or inconsistencies was performed by someone who speaks both languages fluently. In the third stage, the Turkish questionnaire was re-translated into English by two native speakers of English that were also able to speak Turkish. Both translators did not know about the study and did not have access to the original questionnaire. In the fourth stage, the comparison of the original English questionnaire with the back translated and Turkish versions was made and the comparisons were evaluated and finalized by an expert committee (a developer, a methodologist, 4 of translators who were allocated in the adaptation stages and a language professional). In the fifth and last stage, a pretest was performed.

PRELIMINARY TESTING

Twenty athletes with sports-related injuries that met the rules of recruitment and non-recruitment participated in the Preliminary Testing at Acıbadem Sports. Each athlete was completed the survey and then had a face-to-face interview with the physiotherapist who gave the questionnaire. The participants read the questions and evaluated the items for openness. The words and sentences that were difficult to understand were noted by the physiotherapist and the athletes were allowed to propose modifications to the items such as deletion or replacement.

CONTENT VALIDITY

The members of the expert committee indicated whether each item in RIAI was appropriate and relevant to the basic construct. Each expert scored the items and then the percent scores given by the experts were averaged. This method described by Popham was used to assess the content validity of the Turkish version of RIAI.[17]

PARTICIPANTS

The study included 100 athletes from 16-to-50 years of age who were admitted to the Sports Health Unit of Acıbadem Sports due to sports-related injury requiring rehabilitation for at least 1 month. The athletes were included in the study during the intermediate-strengthening phase of rehabilitation. The reason for choosing this time was based on the fact that the patients start to sports-specific exercises and to focus on returning to sports in this period. Athletes diagnosed with tumor, infection, chronic systemic and psychological illness were excluded from the study. A sample size of at least 100 was noted to be sufficient for the similar studies that investigated the measurement characteristics of questionnaires and a sample size of 50 was accepted as sufficient for the analyzing the test-retest reliability.[18] Therefore, a sample size plan was made to assess the construct validity of the RIAI, with at least 100 athletes and at least 50 athletes to establish test-retest reliability. For the test retest, the RIAI was administered twice to the same participants with a waiting interval ranging from 48-to-80 hours. The time interval between two administrations was noted to be acceptable for the

test-retest reliability based on the number of questionnaire items. Athletes failed to re-fill the questionnaire were excluded from the test-retest analysis. In addition, we applied the Global Change Rating (GRC) to assess whether patients experienced any physical or psychological change in the anxiety of RI over time. GRC was scored on a 5-point Likert scale, ranging from "feeling much better" (+2) to "feeling worse" (-2).[19] Participants who reported feeling better or worse according to GRC were excluded from the test-retest analysis. Given these conditions, overall 86 athletes were completed the test repetition analysis. The study was conducted between November 2018 and October 2019.

PROCEDURE

Socio-demographic characteristics of the patients including age, BMI, educational level, sports type, history and mechanism of injury, and complaints were collected. Pain severity at rest or during activity is measured by the visual analogue scale (VAS), which was developed by Price et al.[20] The VAS is 10-cm long and its one end indicates no pain (0), while the other end indicated the most severe pain ever experienced. RIAI and Tampa Scale for Kinesiophobia (TSK) were filled out. For test-retest, the RIAI was refilled twice with the interval of 48-80 hours.

QUESTIONNAIRE

The RIAI questionnaire measures anxiety of re-injury. Rehabilitation re-injury anxiety (RIA-R) and re-entry into competition re-injury anxiety (RIA-RE) are two subgroups of this questionnaire. The scores for the items corresponding to each construct were summed up and separate scores for two subgroups were obtained [Not at all (0), somewhat (1), moderately so (2), very much so (3)]. To calculate the RIAI-R of an athlete, the scores of items numbered 1, 3, 5, 7, 9, 11, 14, 16, 18, 21, 24, 25, 27 were summed (item 24 requires inverse scoring). The highest RIAI-R score obtained was 39, indicating that the score of the athlete who was the most anxious about RI during rehabilitation. In order to calculate the RIAI-RE of an athlete, the scores in items numbered 2, 4, 6, 8, 10, 12, 13, 15, 17, 19, 20, 22, 23, 26 and 28 were summed (item 13 of this construct requires inverse

scoring). The highest score was 45, indicating that the score of the injured athlete who was the most worried about RI related to return to sports and training.[13] The latest version of RIAI is given in the Appendix.

Assessment of fear of movement the Tampa Scale for Kinesiophobia (TSK) is a 17-item scale that is used to measure the fear of movement/re-injury. The Turkish reliability and validity of the scale was

Tekrar Sakatlanma Kaygı Envanteri	Hiçbir zaman	Nadiren	Bazen	Her zaman
1. Rehabilitasyon sırasında, tekrar sakatlanma kaygısı duyuyorum.				
2. Müsabakalara dâhil olma sürecinde, tekrar sakatlanma kaygısı duyuyorum.				
3. Rehabilitasyon sırasında, tekrar sakatlanma konusunda gergin hissediyorum.				
4. Müsabakalara dâhil olma sürecinde, tekrar sakatlanma konusunda gergin hissediyorum.				
5. Rehabilitasyon sırasında, tekrar sakatlanmayacağım konusunda kuşkuluyum.				
6. Müsabakalara dâhil olma sürecinde, tekrar sakatlanmayacağım konusunda kuşkuluyum.				
7. Rehabilitasyon sırasında, tekrar sakatlanma konusunda endişeli hissediyorum.				
8. Müsabakalara dâhil olma sürecinde, tekrar sakatlanma konusunda endişeli hissediyorum.				
9. Tekrar sakatlanma kaygıları nedeniyle rehabilitasyonda yapabileceğimin en iyisini yapamayacağım konusunda kaygılanıyorum.				
10. Tekrar sakatlanma kaygıları nedeniyle müsabakalara dâhil olma sürecinde yapabileceğimin en iyisini yapamayacağım konusunda kaygılanıyorum				
11. Vücudum, tekrar sakatlanma kaygılarından dolayı rehabilitasyon konusunda gergin hissediyor.				
12. Vücudum, tekrar sakatlanma kaygılarından dolayı müsabakaya dâhil olma sürecinde gergin hissediyor.				
13. Müsabakalara dâhil olma sürecinde tekrar sakatlanmayacağıma ilişkin kendimi güvende hissediyorum.				
14. Tekrar sakatlanma kaygılarından dolayı, rehabilitasyon sırasında başarısız olmaktan endişeliyim.				
15. Tekrar sakatlanma kaygılarından dolayı, müsabakalara dahil olduğumda başarısız olmaktan endişeliyim.				
16. Rehabilitasyonla ilgili tekrar sakatlanma kaygıları, vücudumu gergin hissettiriyor.				
17. Müsabakalara dâhil olma süreciyle ilgili tekrar sakatlanma konusundaki kaygılar, vücudumu gergin hissettiriyor.				
18. Tekrar sakatlanma kaygılarından dolayı rehabilitasyon sırasında kötü performans göstermekten endişeliyim.				
19. Tekrar sakatlanma kaygılarından dolayı müsabakalara dâhil olma sürecinde kötü performans göstermekten endişeliyim.				
20. Tekrar sakatlanma kaygılarından dolayı müsabakalara dâhil olma sürecinde, tam anlamı ile dâhil olmayı başaramayacağımdan endişeliyim.				
21. Tekrar sakatlanma kaygılarından dolayı rehabilitasyon sırasında karnımda ağrılar hissediyorum.				
22. Müsabakalara dâhil olma sürecinde, tekrar sakatlanırsam başkalarının hayal kırıklığına uğrayacağı konusunda endişeliyim.				
23. Müsabakalara dâhil olma sürecinde, tekrar sakatlanma düşüncesi avuçlarımı terletiyor.				
24. Rehabilitasyon sırasında, tekrar sakatlanmayacağım konusunda kendime güveniyorum, çünkü kendimi zihinsel olarak sakatlanmamış olarak hayal ediyorum.				
25. Tekrar sakatlanma kaygılarından dolayı rehabilitasyon sürecine yoğunlaşma konusunda endişeliyim.				
26. Tekrar sakatlanma kaygılarından dolayı müsabakaya dâhil olma sürecine yoğunlaşma konusunda endişeliyim.				
27. Tekrar sakatlanma kaygılarından dolayı, rehabilitasyon sırasında vücudumu kasılmış hissediyorum.				
28. Tekrar sakatlanma kaygılarından dolayı, müsabakaya dâhil olma sürecinde vücudumu kasılmış hissediyorum.				

Tekrar Sakatlanma Kaygı Envanteri (TSKE) Puanlama Yönergesi

TSKE rehabilitasyona ilişkin tekrar yaralanma kaygı/endişe (TSKE-R) ve spora ve antremana dönüş ile ilişkin tekrar yaralanma kaygı/endişe (TSKE-SA) içeren iki alt gruptan oluşur. Her yapıya karşılık gelen öğeler için puanlar toplanmak suretiyle iki alt grup için ayrı bir puan hesaplayarak puanlanır [hiçbir zaman (0), nadiren (1), bazen (2), her zaman (3)]

Bir sporcunun TSKE-R'sini hesaplamak için madde 1, 3, 5, 7, 9,11,14,16,18,21,24,25,27' ye ait puanlar eklenir (madde 24 ters puanlama gerektirir). RIAI -R'nin en yüksek skoru 39 dur ve sporcunun rehabilitasyon sırasında yeniden yaralanma için son derece endişeli olduğunu gösterir.

Bir sporcunun TSKE-SA'sini hesaplamak için 2, 4, 6, 8, 10, 12, 13, 15, 17, 19, 20, 22, 23, 26 ve 28 numaralı maddelerdeki puanlar eklenir (bu yapıdaki madde 13'de ters puanlama gerektirir). En yüksek skor 45 puandır ve yaralı sporcunun spora ve antremana dönüş ile ilişkin yeniden yaralanmaya karşı aşırı derecede endişeli olduğunu gösterir.

APPENDIX: Turkish version of the Re-injury Anxiety Inventory.

previously evaluated by Yilmaz et al.[21] The total score is calculated after inverting the individual scores of the items numbered 4, 8, 12, and 16. The total scores ranged between 17 to 68.

CONSTRUCT VALIDITY

To evaluate the construct validity, the Tampa Scale for Kinesiophobia (TSK) was filled by all participants. Construct validity refers to the extent to which scores on a given criterion correlate with other criteria, consistent with theoretically derived hypotheses about the measured constructs.[22] Construct validity of this questionnaire was investigated in this study because Walker et al. emphasized the necessity of analyzing the scores of this questionnaire and the Tampa Scale for Kinesiophobia.[13] The Spearman's Rho was calculated between the RIAI and TSK. Correlation coefficients are considered to be above 0.6 high, 0.6–0.3 moderate, and less than 0.3 low.

RELIABILITY AND AGREEMENT

Reliability of the Turkish version of RIAI was evaluated by test-retest reliability, internal consistency and measurement error according to COSMIN rules.[23] Internal consistency (Cronbach's alpha coefficient) measures the correlation of homogeneous items on a sub-scale of a questionnaire, thus measuring the same concept.[22] Cronbach's alpha value ranging from 0.70 to 0.95 was regarded excellent.

Reliability is a measure of how a device or scale consistently delivers the same scores in a row for a given stable subject and therefore it provides the scale with the capacity to differentiate between subjects in the presence of measurement errors. Test-retest reliability relates the degree of patient scores and the same for repeated measurements.[23] Intraclass correlation coefficients (ICC) were calculated using a 2-way, mixed model under consistency. Values 0.4 were considered satisfactory (ICC = 0.00 to 0.20, poor; 0.21 to 0.40, fair; 0.41 to 0.60, good; 0.61 to 0.80, very good and 0.81 to 1.0, excellent).

Furthermore, a Bland and Altman analysis was performed; the mean difference between the first and second administration of the RIAI with a 95% CI was calculated.[22,24] The agreement was evaluated as the

standard error of the mean (SEM) and the smallest detectable change (SDC) as suggested by Beaton et al.[16]

FLOOR AND CEILING EFFECTS

The existence of floor and ceiling effects can jeopardize the reliability and validity of a survey tool.[22] Floor and ceiling effects were defined as 15% of the participants with maximum or minimum scores, respectively.[25]

DATA ANALYSIS

Data analysis was performed by the SPSS software (Version 22.0). Categorical variables were summarized in terms of number of absolute (n) and relative frequencies (%). Group comparisons were conducted by the Mann-Whitney U test, because all of the continuous data departed from the normal approximation which was tested by the Shapiro Wilk test. Statistical significance was reported for the case where $p<0.05$.

The Spearman's Rho was calculated between the

TABLE 1: Demographic characteristics of the participants.	
Characteristics	**Mean± standard deviation (n:100) or n and frequency (%)**
Age (years)	23.37±6.33
Gender	
Male (%)	50 (50)
Female (%)	49 (49)
Body Mass Index (kg/m²)	22.68±3.12
Sports	
Basketball (%)	32 (32)
Soccer (%)	31 (31)
Volleyball (%)	15 (15)
Others (%)	22 (22)
Place of Injury	
Dominant side (%)	72 (72)
Non-dominant side (%)	28 (28)
Time for injury (month)	3.01±1.56
Type of injury	
Anterior cruciate ligament surgery (%)	47 (47)
Bankart operation (%)	10 (10)
Ankle injury (%)	17 (17)
Meniscus injury (%)	8 (8)
Strain (%)	5 (5)
Others	13 (13)

TABLE 2: Descriptive statistics of various measurements.				
	Mean	**SD**	**Minimum**	**Maximum**
RIAI-R	18.80	5.08	13	33
RIAI-RE	26.81	6.97	9	45
RIAI	45.61	11.61	28	74
RIAI-R test-retest	17.80	4.81	13	31
RIAI-RE test-retest	26.91	7.28	15	44
RIAI test-retest	44.70	10.64	28	73
VAS rest	1.09	1.64	0	5
VAS activity	3.73	1.87	0	7
TSK	36.57	4.56	25	49

SD: Standard deviation; RIAI-R: Rehabilitation reinjury anxiety inventory; RIA-RE: Re-entry into competition re-injury anxiety inventory; RIAI: The re-injury Anxiety inventory; VAS: Visual Analogue Scale; TSK: The Tampa Scale for Kinesiophobia.

RIAI and TSK for construct validity. Correlation coefficients are considered to be above 0.6 high, 0.6–0.3 moderate, and less than 0.3 low. Internal consistency (Cronbach's alpha coefficient) value ranging from 0.70 to 0.95 was regarded excellent. To determine test–retest reliability of ICC were calculated using a 2-way, mixed model under consistency. Values 0.4 were considered satisfactory (ICC = 0.00 to 0.20, poor; 0.21 to 0.40, fair; 0.41 to 0.60, good; 0.61 to 0.80, very good and 0.81 to 1.0, excellent). Furthermore, a Bland and Altman analysis was performed, the mean difference between the first and second administration of the RIAI with a 95% CI was calculated. When zero is lying within the 95% CI of the mean difference, it can be seen as a criterion for absolute agreement. When zero lies outside the 95% CI, a bias in the measurements is indicated The value of the SEM can be derived by dividing the SD of the mean differences between 2 measurements (SDdiff) by $\sqrt{2}$. The smallest detectable change (SDC) for the individual score and for the group was calculated according to Beaton (SDCind = 1,96x$\sqrt{2}$xSEM; SDCgroup = SDCind/$\sqrt{n}$)[16,22,24,25]

RESULTS

TRANSLATION, PILOT STUDY AND CONTENT VALIDITY

The RIAI has been successfully translated into English according to the guidelines (Appendix). The RIAI in the pilot study did not require any major modifications as all of the items in the questionnaire were found clear and understandable. A portion of the patients in the pilot study (5 females, 15 males; mean age, 27.4 ± 2.3 years; range, 17-34 years; body mass index ([BMI], 20.4 ± 2.8 kg/m^2) mentioned that questions were frequently repeated. This observation is likely to be due to the semantics of the words anxiety, concern and stress which are very similar in Turkish. The group expressed boredom during administration of the questionnaire. As a result, the expert committee suggested excluding some of the questions based on their contribution to the overall validity and reliability of the scale. However, upo completion of the overall analysis, none of the scale items were omitted as none of the similar questions when deleted showed a significant improvement of the overall reliability. Hence, the final version of the Turkish RIAI was approved by all of the members of the expert committee and all of the items were identified in accordance with their basic construct. As a result, the content validity was reported to be 100%.

PARTICIPANTS AND DESCRIPTION OF THE RESULTS

A total of 100 patients completed the RIAI and TSK, and 86 patients completed test-retest reliability (86%). The mean time between receiving the first and second questionnaire was 52.04 ± 11.22 hours (mean ± SD). Demographic characteristics of the participants are given in Table 1. An overview of the scores on the various questionnaires is shown in Table 2.

CONSTRUCT VALIDITY

RIAI scores, total or scores of subscales (RIAI-RE or RIAI-R) were found to be significantly correlated with the total TSK score, while there were no statis-

tically significant correlations between the scores of RIAI or its subscales and VAS-rest or activity (Table 3). There was a low correlation (r=0.225) between TSK and RIAI-R, and moderate correlations between TSK and RIA-RE (r= 0.401) and TSK and total RIAI (r=0.376).

RELIABILITY AND AGREEMENT

The internal consistency was found to be excellent since the Cronbach's alpha score of the RIAI was 0.932. Eighty six athletes participated in the test-retest procedure. Four participants (4%) reported less confidence, five (5%) more confidence, and 5 participants (5%) were excluded from the study because they did not come to the study in test-retest time. The results of the test–retest reliability analysis were given in Table 4. The RIAI has been found to have an excellent test-retest reliability (ICC=0.919). To analyze the agreement between repeated measurements, the Bland and Altman method was recruited to investigate the presence of systemic bias, and no bias (0.107) was found (Figure 1). The ICC was used to calculate a standard measurement-error (SEM). The SEM result was found to be 0.552, while the SDCindividual and SDCgroup was 3.580 and 0.391, respectively.

FLOOR AND CEILING EFFECTS

Floor and ceiling effects were defined as 15% of the participants with minimum or maximum points, respectively. While there was no floor effect in all subscales of RIAI, there was no ceiling effect in RIAI-R. The ceiling effect for RIA-RE was observed in 3 athletes (3%) without any statistically significant difference.
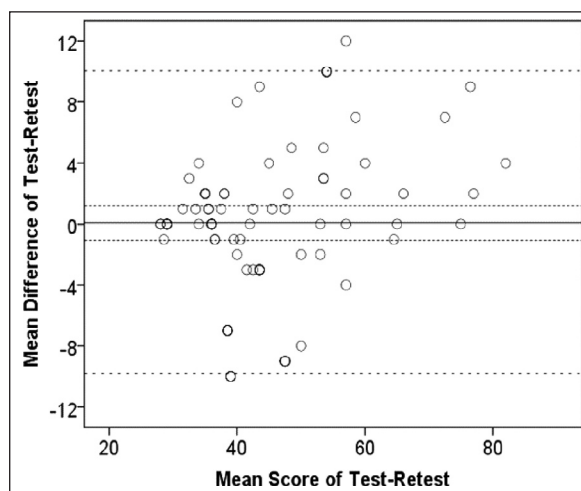

FIGURE 1: The Bland and Altman graph of the test–retest.

DISCUSSION

The aim of this study was to translate the RIAI scale from English to Turkish and to examine whether the translated Turkish version is a reliable and valid tool for investigating the psychological factors related to athlete RI anxiety. This study provided considerable evidence that the Turkish version of the RIAI has appropriate psychometric properties, including good to excellent internal consistency, test–retest reliability and construct validity.

Heil (1993) argued that the anxiety/fear of injury has always been present for all athletes.[10] He stated that this anxiety could lead to psychological and physiological changes that reduce performance and increase the risk of a real injury. Further, the psychological changes included skills-based changes (e.g. reduced concentration and increased distraction) and

TABLE 3: Spearman correlation between RIAI and other questionnaires.						
	RIAI-R		**RIAI-RE**		**RIAI**	
Rho	**(r)**	**p**	**(r)**	**p**	**(r)**	**p**
VAS-rest	-0.040	0.723	0.108	0.335	0.048	0.667
VAS-activity	-0.134	0.231	0.040	0.724	-0.005	0.964
TSK	0.225	0.025	0.401	<0.001	0.376	<0.001

RIAI-R: Rehabilitation reinjury anxiety inventory; RIA-RE: Re-entry into competition re-injury anxiety inventory; RIAI: The re-injury Anxiety inventory; TSK: Visual Analogue Scale; TSK: The Tampa Scale for Kinesiophobia.

TABLE 4: Test-retest reliability measures of the RIAI (n=84).

		95% Confidence Interval for ICC	
	ICC	Lower Bound	Upper Bound
RIAI-R	0.882	0.824	0.922
RIAI-RE	0.897	0.846	0.932
RIAI	0.919	0.878	0.947
Agreement			
SEM	0.552		
SDC (individual)	3.580		
SDC (group)	0.391		

RIAI-R: Rehabilitation reinjury anxiety inventory;
RIA-RE: Re-entry into competition re-injury anxiety inventory;
RIAI: The re-injury Anxiety inventory; ICC: Intraclass correlation coefficient;
SEM: Standard error of measurement; SDC: Smallest detectable change.

interpretation changes (e.g. increased pain awareness and reduced self-confidence). He also suggested that the psychological changes can induce physiological changes in muscles, such as diffuse spasm, and autonomic symptoms such as increased heart rate and neurochemical changes. The fear of RI can be developed due to a lack of confidence in the injured area.[11] This lack of confidence and self-confidence could affect the emergence of RI through mechanisms suggested by Heil and may create an unstable performance in returning to training/competition through rehabilitation.[10] Indecision will continue the cycle, creating reduced performance, and concerns are predicted to lead to reduced coordination and increased muscle tension, while increasing the likelihood of RI.[26]

The injured athlete's mind has often been engaged in technical details due to the loss of natural feelings associated with well-studied and learned skills.[11] Kvist et al. reported that many individuals complained that their performance was become worse after injury, and thus their RI concerns prevent them from returning to sports.[27] Furthermore, Kleinert stated that concerns and anxiety about injury were not completely biological, and that they can originated from previous experiences such as the first injury or from other developmental factors such as the quality of rehabilitation.[12] This type of emotional development has been suggested to be more typical of anxiety than fear. Therefore, when searching for conceptual clarity, the term RI anxiety has been stated to be more appropriate than fear of injury.[13]

Brewer states that the development of psychological scales specific to the sports injury rehabilitation environment will provide researchers with standardized tools and help them prepare specific research questions.[14] Since the use of standardized psychometric tools allows researchers to measure the same construct in the same way and to obtain reliable results, the lack of appropriate scales to accurately measure athletes' responses to injury requires referral to non-population-specific scales.[14,28] This situation undermines the reliability of the study and as a result of referring to non-population-specific scales, coverage validity may be incomplete.[28] Developing and using appropriate injury-specific scales has been crucial to assess related constructs such as RI anxiety and to respond to important research questions. Previous research has attempted to utilize single-choice Likert-type scales or other tools designed to measure other constructs than RI anxiety, such as the Competitive State Anxiety Inventory-2. For example, Castillo et al.[29,30] used the Competitive State Anxiety Inventory-2 scale to measure RI anxiety; whereas it actually measured competition concerns. Walker et al.[13] have therefore developed the RIAI, which measures RI anxiety both in return to sports and in rehabilitation. It has been recommended that this inventory could be used as a key element in the clinic for determination of psychological factors in returning to sports.[1]

Walker et al. have stated that there was insufficient interest in rehabilitation when there was an anxiety of injury.[9] The construct of this relationship needs further investigation. Therefore, it is important that the RIAI has a subscale that measures RI anxiety during rehabilitation. The way in which athletes assess the risk of returning to sports is considered to be an important component of post-injury rehabilitation. Therefore, the first step of treatment in sports rehabilitation includes psychological approaches. For optimal recovery, both careful psychological treatment and the most appropriate rehabilitation program should be applied to the athlete. Studies on the benefits of these conditions have become popular in the

literature in recent years. In these studies, it has been reported that the physical readiness of the athlete to return to sports is not sufficient to let the athlete to decide to return to sports. The athlete may be physically ready, but not psychologically, the condition which in turn affects the athlete's return and performance.[1-3,9,13] In our study, the average of both return to rehabilitation- and return to sports-anxiety was above the midline of the inventory score. Although a cut-off of the score has not been determined, this may indicate that the anxiety among the participants is high. For this reason, it is also important to assist athletes in coping mechanisms to reduce their concerns during rehabilitation and return to sports. Overall, the developed questionnaires that are properly assessed by means of validity and reliability would be important in this process.

Walker et al. asked to investigate whether or not RIAI was compatible with the TSK while investigating the construct validity in their study in which they developed RIAI.[13] In our study, we investigated the construct validity with the TSK and found that the construct validity was in a moderate relationship. We also had a high level of content validity and reliability. Furthermore, the RIAI was not correlate with VAS. This result is important to show that athletes experience injury anxiety regardless of their pain level. However, we could not compare our data with the literature since RIAI was not translated into other languages. Despite this limitation, our study represents an important tool for assessing the RI anxiety among Turkish athletes. Lastly, this study was conducted to investigate the psychometric properties of the Turkish version of RIAI. Responsiveness could not be measured on how much this scale changed following treatment, which is another, a limitation of our study.

CONCLUSION

The Turkish version of RIAI was reported to show excellent content and test-retest reliability and good construct validity. This study concluding that this RIAI Turkish could be used for psychological outcome measures in return to sports opens the path for other research studies that would be held by using Turkish athletes.

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