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Construct validity, reliability and interpretability of the Turkish version of the TENDINopathy Severity Assessment – Achilles (TENDINS-A) questionnaire☆

Abdulhamit Tayfur [a,b,*], Fatih Özyurt [a,b], Berna Nur Büyükperdah [a], Berika Eylül Genç [a], Ebonie K. Rio [c,d,e], Myles C. Murphy [f,g], Beyza Tayfur [a,b]

[a] School of Physical Therapy and Rehabilitation, Kırşehir Ahi Evran University, Türkiye
[b] Athlete Health and Thermal Rehabilitation Application and Research Center, Kırşehir Ahi Evran University, Türkiye
[c] La Trobe Sport and Exercise Medicine Research Centre, La Trobe University, Bundoora, Victoria 3083, Australia
[d] Victorian Institute of Sport, Albert Park, Victoria 3206, Australia
[e] The Australian Ballet, South Melbourne, Victoria 3205, Australia
[f] Nutrition and Health Innovation Research Institute, School of Medical and Health Sciences, Edith Cowan University, Joondalup, Western Australia 6027, Australia
[g] Institute for Heath Research, The University of Notre Dame Australia, Fremantle, Western Australia 6159, Australia

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ABSTRACT

Background: This study aimed to develop the Turkish version of TENDINS-A (TENDINS-A-TR) and evaluate its measurement properties.
Materials and methods: A total of 130 participants (n = 60 Achilles tendinopathy, 34.7 ± 11.7 years; n = 70 healthy, 27.8 ± 8.9 years) completed TENDINS-A-TR, Victorian Institute of Sport Assessment-Achilles (VISA-A), Foot and Ankle Outcome Score (FAOS), and Numeric Pain Rating Scale (NPRS). Construct validity, discriminative validity (cut-off score, sensitivity, specificity), test-retest reliability, standard error of measurement (SEM), internal consistency, minimal detectable change (MDC), minimal important change (MIC) and ceiling/floor effects were assessed.
Results: TENDINS-A-TR showed strong correlations with VISA-A (r = -0.71, $p < 0.001$), FAOS subscales (r_{range}=-0.55 to −0.77, all $p < 0.001$), and NPRS (r_{range}=0.61–0.80, all $p < 0.001$). The area under the ROC curve was 0.961 (95 %CI:0.934–0.988, $p < 0.001$) showing excellent accuracy with 0.817 sensitivity and 0.871 specificity at 18.5 cut-off score. Test-retest reliability was excellent (ICC=0.94, 95 %CI 0.90–0.97) with an excellent internal consistency (Cronbach's alpha=0.97). SEM and MDC were 5.92 and 16.4, respectively. MIC was 10.1, representing 26.4 % points of change in participants with Achilles tendinopathy. Lastly, there was no ceiling/floor effects.
Conclusion: Turkish version of TENDINS-A demonstrated strong validity, reliability and accuracy to evaluate pain, symptoms, and physical function in people with Achilles tendinopathy.

1. Introduction

Achilles tendinopathy is a clinical condition characterized by localized pain and impaired function of the Achilles tendon, particularly during mechanical loading [33]. Achilles Tendinopathy is prevalent among runners, with up to 60 % of active runners being affected over their lifetime [22]. While it is most commonly associated with overuse, it may also occur in the general population in sedentary, middle-aged, and overweight individuals [24]. The condition substantially impairs the functionality of the tendon and is known to cause disability in athletes who consistently load the

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* Corresponding author at: School of Physical Therapy and Rehabilitation, Kırşehir Ahi Evran University, Türkiye.
E-mail addresses: abdulhamit.tayfur@ahievran.edu.tr (A. Tayfur), fatih.ozyurt@ahievran.edu.tr (F. Özyurt), buyukperdah.bernanur@ogr.ahievran.edu.tr (B. Büyükperdah), genc.berikaeylul@ogr.ahievran.edu.tr (B. Genç), e.rio@latrobe.edu.au (E. Rio), m.murphy@ecu.edu.au (M. Murphy), beyza.tayfur@ahievran.edu.tr (B. Tayfur).

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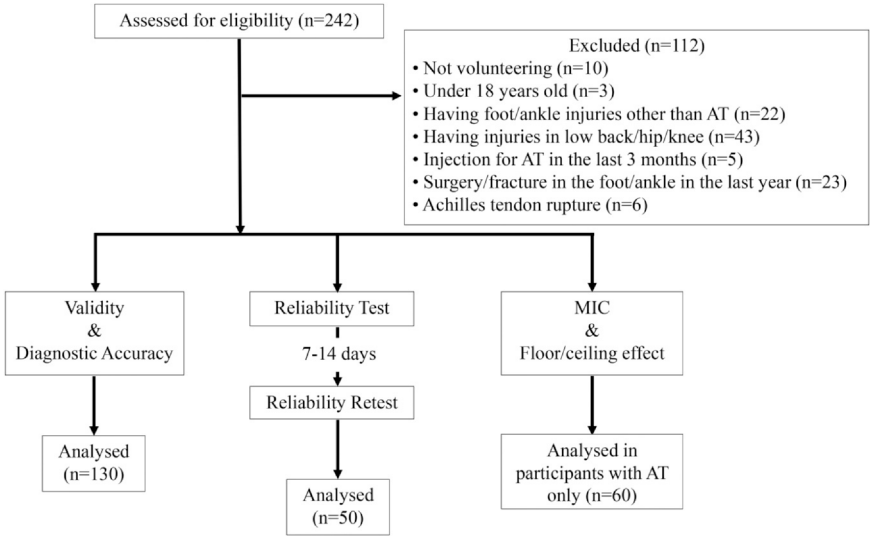

Fig. 1. Flowchart of the study.

Achilles tendon [32]. As a result, appropriate treatment and rehabilitation are critical, with exercise being the most frequently utilized therapeutic approach [16]. However, there is a lack of adequate patient-reported outcome measures (PROMs) to assess the effectiveness of these interventions, particularly regarding tendon-related disability [19–21].

The most frequently used self-reported scale in the evaluation of Achilles Tendinopathy is the Victorian Institute of Sport Assessment-Achilles (VISA-A) [30]. It was used in 46 % of the studies on Achilles Tendinopathy in 2021 [12]. However, VISA-A has substantial flaws in its measurement properties, including inadequate content validity (VISA-A development did not involve patient input [19–21,30,5]), and inadequate structural validity. Further, methodological testing using Rasch analysis has shown that VISA-A scale lacks sufficient structural validity and is significantly influenced by irrelevant factors, such as age and body mass index [20,40]. In clinical practice, tendon-related disability measures are rarely utilized with concerns related to the relevance, comprehensiveness and comprehensibility [19,26]. As a result, reviews have highlighted the need to move beyond VISA-A for both research and clinical purposes [19–21].

In response to these limitations, the TENDINopathy Severity Assessment–Achilles (TENDINS-A) scale was developed and its content validity confirmed (Myles C [28]). Co-designed by patients, clinicians, and researchers, the TENDINS-A addresses the need for a more reliable and valid measure of disability in Achilles Tendinopathy. The scale is focused on assessing the severity of tendon-related disability, covering subdomains of pain, symptoms, and physical function (Myles C [28]). Initial evaluations of TENDINS-A demonstrate that it has construct validity and excellent reliability (Myles Calder [27]). Further Rasch analysis has also demonstrated its structural validity and measurement invariance [3]. Given its excellent measurement properties, TENDINS-A has been recommended for use in both clinical practice and research to evaluate the severity of disability associated with Achilles Tendinopathy [8]. To date, TENDINS-A has not been cross-culturally adapted in any languages and its measurement properties have only been evaluated in English. Therefore, the aim of this study was to test the construct validity, reliability (test–retest, internal consistency and standard error of measurement) and interpretability of the Turkish version of TENDINS-A (TENDINS-A-TR) scale. Additionally, the study aimed to test and determine the measurement properties of the scale, including cutoff score, sensitivity, specificity, minimal detectable change, minimal important change and ceiling or floor effects. The introduction of the Turkish version of the scale will provide a comprehensive tool for improving the assessment and management of Achilles Tendinopathy in Turkish-speaking populations.

2. Materials and methods

This observational cross-sectional was approved on 23.11.2023 by XXX University Non-Interventional Clinical Research Ethics Committee (2023/957). Data were collected online between December 2023 and December 2024. Individuals with Achilles Tendinopathy and healthy individuals who agreed to participate signed the informed, electronic consent form. They then completed an online questionnaire containing socio-demographic information and outcome measures. Pain intensity was evaluated using the Numeric Pain Rating Scale (NPRS) at rest, activity, and night [17], physical activity level with the Tegner Activity Scale [2], and tendon symptoms with TENDINS-A, VISA-A, and the Foot and Ankle Outcome Score (FAOS).

3. Participants

People with Achilles Tendinopathy and healthy controls were recruited. Inclusion criteria were: age between 18 and 65 years, local pain using a pain map and tenderness on Achilles tendon palpation, pain and morning stiffness occurring with or after loading of the Achilles tendon (e.g., running, sprinting, jumping activities), pain in the tendon with a single-leg hopping test (NPRS > 1/10, where 0 represents "no pain" and 10 represents "the worst possible pain"), symptoms of pain, swelling, tenderness, and morning stiffness in the Achilles tendon in the last 3 months. People with a history of any foot or ankle surgery and/or fracture in the past year, previous Achilles tendon rupture on the affected side, who had injection therapy for the affected Achilles tendon in the past 3 months or have existing symptomatic lower back and other lower extremity musculoskeletal issues or neurological diseases were excluded. The flowchart of the study was shown in Fig. 1.

4. TENDINS-A translation procedure to Turkish

Permission to use and translate TENDINS-A scale was obtained from the scale's creators (MCM). The translation and cross-cultural adaptation procedure followed the international guidelines recommended by Beaton et al. [1]. The first step in this process is the

translation from the original language to Turkish. This translation was performed by two independent translators proficient in both languages and familiar with their structures. Then, both translations were compared by the authors who are fluent in both English and Turkish, and inconsistencies in the translations were emphasized. Next, authors reached on an agreed version of the translations. Following this, two other independent translators performed backward translation to the original language in order to compare with the original version by a committee consisting of a linguist, and the research team, which includes experts in Achilles Tendinopathy. This committee evaluated and checked the inconsistencies and appropriateness of the translations, and made any necessary cultural adaptations. The committee then finalized and approved the Turkish version of TENDINS-A (TENDINS-A-TR) which is available in Supplement 1.

We created a readily available online version as online use of PROMs are preferable to paper versions due to their accessibility, lower cost, faster completion, and efficient data management [34,6]. Thus, remote data collection is crucial for reducing patient burden and research costs while ensuring valid and reliable outcomes. Studies in musculoskeletal conditions have confirmed the feasibility and reliability of electronic PROMs [13,14,36,37].

5. Outcome measures

All outcome measures were completed by participants in a single questionnaire, which forced responses, ensuring no missing data. For the test-retest reliability, TENDINS-A-TR was re-administered within 3–14 days [38].

6. TENDINopathy Severity Assessment – Achilles (TENDINS-A)

TENDINS-A scale consists of 5 unscored and 10 scored items, 15 in total, assessing situations that increase pain or symptoms, their duration and timepoints (unscored items), pain itself (3 items), symptoms (4 items), and physical function (3 items) (Myles Calder [27]). Responses vary across items, with each item having its own scoring provided in Supplement 1. Specifically for the physical function subscale, if participants were unable to complete a load-dependent pain test (e.g., single-leg hop), they were instructed to skip it, and a score of '10' was assigned. The total score ranges from 0 to 100, with higher scores indicating a higher level of disability (Myles C [28]).

7. The Victorian Institute of Sport Assessment-Achilles (VISA-A)

The VISA-A, developed in 2001, consists of eight questions that assess pain (item 1–3), functionality (item 4–6), and activity levels (item 7–8) [30]. Responses to the first six questions are scored from 0 to 10, reflecting the severity of symptoms, while the seventh and eighth questions are categorized into five sections based on the activity-pain relationship and activity duration. An individual participating in asymptomatic sports can score up to 100, while someone not participating in sports can score a maximum of 70. Lower scores indicate greater disability, and scores below 80 suggest the presence of Achilles Tendinopathy. The Turkish validity and reliability of the scale were studied in 2011 [9].

8. The Foot and Ankle Outcome Score (FAOS)

The FAOS was developed in 2001 consisted of 42 questions under five subscales to assess pain (9 items), symptoms (7 items), daily life activities (17 items), sport functionality (5 items), and quality of life (4 items) related to the foot and ankle [31]. For each subscale, 0 represents the worst condition, and 100 represents the best condition. The Turkish version of FAOS was validated in 2009 [11].

9. Sample size calculation

Sample size calculation for the validity was based on minimum 10 events per variable as it is one of the most common methods to estimate sample size in observational studies [29]. Each item of TENDINS-A was considered as a variable. Therefore, minimum required sample size was 130 participants (10 ×13 item) in total. This was based on the development study of 13-item TENDINS-A (Myles C [28]). Sample size calculation for the reliability was based on COSMIN guidelines, which suggest that a sample of > 50 participants is considered adequate [10].

10. Statistical analysis

Descriptive statistics were reported as mean ± standard deviation for continuous variables and n (%) for categorical variables. Construct validity of TENDINS-A-TR was assessed with VISA-A and FAOS scales in all participants (n = 130). Construct validity was analyzed using Pearson's correlation coefficients and classified as < 0.3, 0.3–0.5 and > 0.50 being weak, moderate and strong, respectively [4]. For the discriminative validity, Receiver Operating Characteristic (ROC) analysis of TENDINS-A-TR was examined (participants with Achilles Tendinopathy vs healthy participants). With ROC analysis, the best cut-off point for TENDINS-A-TR was determined, and sensitivity and specificity values were calculated for this cut-off point to evaluate the classification success of the scale [35]. Area under the ROC curve was interpreted as acceptable (> 0.7) and excellent (> 0.8) [15]. To determine the relative reliability of TENDINS-A-TR, test-retest reliability (n = 50) was analysed using the Intraclass Correlation Coefficient (ICC, two-way random, absolute agreement). The ICC values were classified as < 0.5, 0.5–0.75, 0.75–0.9, and > 0.90 being poor, moderate, good, and excellent, respectively [18]. Internal consistency (n = 50) was analysed by calculating Cronbach's alpha coefficient, and a score of > 0.70 was considered high internal consistency [39]. For the absolute reliability (n = 50), the standard error of measurement (SEM) and the minimal detectable change (MDC) were calculated. The SEM was calculated as SD × $\sqrt{}$(1-ICC), where SD is the standard deviation of all test and retest scores. Minimal detectable change at the 95 % confidence level (MDC_{95}) was calculated as MDC_{95}=SEM × 1.96 × $\sqrt{2}$. For the interpretability, the minimal important change at the 95 % confidence level (MIC_{95}) was estimated using a distribution-based method as SD × 0.5 [25], where SD is the standard deviation of the test scores from participants with AT (n = 60). This approach provides a distribution-based estimate of the smallest detectable change likely to be meaningful but does not reflect an anchor-based, patient-reported minimal clinically important difference. Because, MIC_{95} refers a meaningful change, it was analyzed in participants with AT only. Finally, the presence of ceiling or floor effects was reported only when more than 15 % of participants with AT obtain the maximum (ceiling effect) or minimum score (floor effect) [7]. Statistical analyses were performed using the licensed IBM SPSS software (version 29.0, USA). A significance level of p < 0.05 was considered statistically significant for all analyses.

11. Results

A total of 130 participants including 60 people with Achilles Tendinopathy (Mean ± SD age=34.7 ± 11.7 years, n = 34 males) and 70 healthy participants (Mean ± SD age=27.8 ± 8.9 years, n = 39 males) were recruited. People with Achilles Tendinopathy were older (p < 0.001) and had lower physical activity levels (p = 0.02) compared to healthy participants. There was a significant difference between people with Achilles Tendinopathy and healthy participants in all PROMs. Demographics and PROM scores were provided in Table 1.

Table 1
Participants' descriptive features.

Demographics	All participants (n = 130)	People with AT (n = 60)	Healthy participants (n = 70)	P value
Age, years	30.9 ± 10.8	34.7 ± 11.7	27.8 ± 8.9	**< 0.001**
Height, cm	172.7 ± 9.3	171.8 ± 7.8	173.6 ± 10.4	0.27
Mass, kg	72.8 ± 13.6	72.5 ± 12.9	73.11 ± 14.4	0.79
Body mass index, kg/m^2	26.6 ± 4.3	24.5 ± 3.8	24.1 ± 3.5	0.54
Tegner Activity Scale	5.60 ± 2.7	5.0 ± 2.4	6.11 ± 2.9	**0.02**
Male: Female	73 (56 %): 57 (44 %)	34 (57 %): 26 (43 %)	39 (56 %): 31 (44 %)	0.91
Dominant side (Right:Left)	109 (84 %): 21 (16 %)	50 (83 %): 10 (17 %)	59 (84 %): 11 (16 %)	0.88
Injured side				
Right	NA	33 (55 %)	NA	NA
Left		12 (20 %)		
Bilateral		15 (25 %)		
Education				
Primary School	1 (1 %)	1 (2 %)	0 (0 %)	0.18
Secondary School	2 (2 %)	2 (3 %)	0 (0 %)	
High School	35 (27 %)	11 (18 %)	24 (34 %)	
Pre-registration	10 (8 %)	4 (7 %)	6 (9 %)	
Undergraduate	54 (41 %)	28 (47 %)	26 (37 %)	
Postgraduate	28 (21 %)	14 (23 %)	14 (20 %)	
Semptom Duration, months	NA	8.2 ± 11.9	NA	NA
Numeric Pain Rating Scale				
Rest	1.0 ± 1.8	2.15 ± 2.1	0.6 ± 0.5	**< 0.001**
Activity	1.9 ± 2.7	4.1 ± 2.6	0.1 ± 0.6	**< 0.001**
Night	0.9 ± 1.8	1.9 ± 2.3	0.0 ± 0.3	**< 0.001**
TENDINS-A-TR score (test)	20.9 ± 21.9	38.2 ± 20.2	5.9 ± 7.7	**< 0.001**
VISA-A	68.9 ± 26.3	45.1 ± 19.3	89.3 ± 7.7	**< 0.001**
FAOS score				
Symptom	85.4 ± 17.4	75.4 ± 18.4	94.0 ± 10.8	**< 0.001**
Pain	86.3 ± 16.9	73.9 ± 17.3	96.9 ± 5.8	**< 0.001**
Activity daily living	89.2 ± 16.8	78.8 ± 19.3	98.1 ± 5.8	**< 0.001**
Sports	80.9 ± 22.3	63.2 ± 20.2	96.1 ± 8.3	**< 0.001**
Quality of life	74.6 ± 29.0	51.9 ± 26.8	94.1 ± 11	**< 0.001**

Mean ± SD values for the continuous variables, n(%) for the categorical variables. P-values for differences between groups analyzed with independent *t*-test or Mann-Whitney *U* test based on normal distributions, and χ^2 was used for categorical variables. No missing data and skipped items occurred.
n, number of participants; AT, Achilles tendinopathy; NA, not applicable; TENDINS-A-TR, Turkish version of the TENDINopathy Severity assessment–Achilles; VISA-A, the Victorian Institute of Sports Assessment–Achilles Questionnaire; FAOS, Foot and Ankle Outcome Score.

Construct validity (n = 130)

In the total sample (n = 130), TENDINS-A-TR showed strong negative correlations with VISA-A (r = -0.71, p < 0.001), FAOS pain (r = -0.68, p < 0.001), FAOS symptoms (r = -0.55, p < 0.001), FAOS activities of daily living (r = -0.60, p < 0.001), FAOS sports and recreational activities (r = -0.77, p < 0.001), and FAOS quality of life (r = -0.76, p < 0.001). TENDINS-A-TR demonstrated strong positive correlations with NPRS at rest (r = 0.74, p < 0.001), NPRS at night (r = 0.61, p < 0.001), and NPRS during activity (r = 0.80, p < 0.001).

When analyses were restricted to participants with Achilles tendinopathy (n = 60), correlations remained significant and supported construct validity: VISA-A (r = -0.44, p = 0.01), FAOS pain (r = -0.39, p = 0.002), FAOS symptoms (r = -0.33, p = 0.01), FAOS activities of daily living (r = -0.34, p = 0.01), FAOS sports and recreational activities (r = -0.56, p < 0.001), and FAOS quality of life (r = -0.60, p < 0.001). Correlations with NPRS were also confirmed within the Achilles tendinopathy group, including rest (r = 0.61, p < 0.001), night (r = 0.43, p = 0.001), and activity (r = 0.60, p < 0.001).

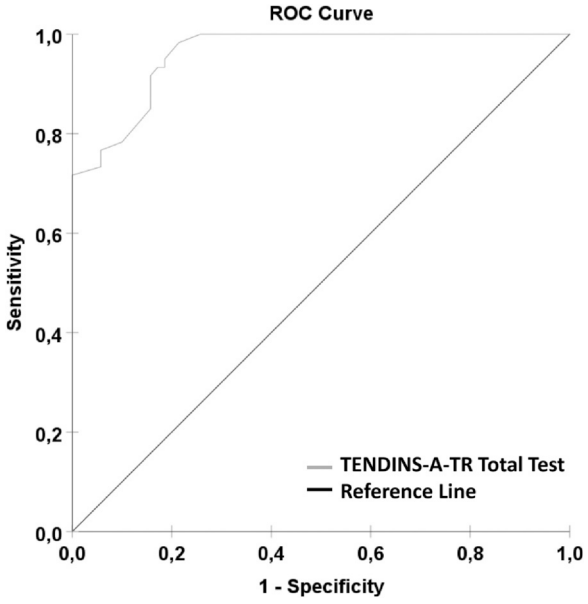

Fig. 2. Receiver Operating Characteristic analysis of TENDINS-A-TR.

Discriminative validity (n = 130)

When the performance of TENDINS-A-TR was examined according to the clinical diagnosis, the area under the ROC curve was 0.961 (95 % CI: 0.934–0.988; p < 0.001) showing excellent accuracy (Fig. 2). The best cut-off point of TENDINS-A-TR is 18.5. The sensitivity and specificity of TENDINS-A-TR were found as 0.817 (95 % CI: 0.701–0.894) and 0.871 (95 % CI: 0.773–0.931), respectively.

Reliability (n = 50)

Reliability of TENDINS-A-TR was analysed in 28 participants with Achilles Tendinopathy and 22 healthy participants, 50 in total. Test-retest reliability of TENDINS-A-TR was excellent (Test scores=26.5 ± 24.0, Retest scores=24.7 ± 26.2, ICC=0.94, 95 %CI 0.90–0.97). Cronbach's alpha for TENDINS-A-TR was 0.97, indicating an excellent internal consistency. For the absolute reliability, the SEM was calculated as 5.92 units for TENDINS-A-TR. Minimal detectable change at the 95 % confidence interval was 16.41 (95 % CI: 11.60–21.18) for TENDINS-A-TR.

Interpretability (n = 60)

The MIC_{95} for TENDINS-A-TR was estimated as 10.1 (95 % CI 6.49–13.71) units of difference, representing 26.4 % points of change from a mean TENDINS-A-TR score of 38.2 in participants with Achilles Tendinopathy.

Ceiling and floor effects (n = 60)

No participants with Achilles Tendinopathy obtained either a maximum or minimum score on the total score of TENDINS-A-TR, indicating no ceiling or floor effects for TENDINS-A-TR. The highest and lowest total scores for TENDINS-A-TR were 96 and 10, respectively.

12. Discussion

This study aimed to evaluate the measurement properties of the Turkish version of TENDINS-A questionnaire and found that TENDINS-A-TR demonstrates strong construct validity, high discriminative validity, excellent reliability, and no ceiling or floor effects, supporting its use as a robust PROM in both clinical and research settings. This is the first cross-cultural adaptation study of TENDINS-A. Thus, the findings from this study were directly compared with the original studies (Myles Calder [27]; Myles C [28]) or indirectly discussed with the other relevant PROMs [11,9]. The original study of TENDINS-A evaluated its measurement properties in

78 participants with Achilles Tendinopathy (Myles Calder [27]). We additionally included healthy controls in our study, to enable the evaluation of the tool's discriminative validity.

Construct validity of TENDINS-A-TR was confirmed through strong correlations with both condition-specific and general lower limb function PROMs. TENDINS-A-TR had strong correlations with the Turkish version of VISA-A (r = -0.71), the Turkish version of FAOS domains (r = -0.55 to −0.77), and NPRS scores (r = 0.61–0.80). These correlations were similar to those reported for the original TENDINS-A (Myles Calder [27]), which also showed strong correlations with VISA-A (r = −0.64) and FAOS (r = 0.60). The original VISA-A exhibited lower, but strong correlations with both Percy and Conochie's grade of severity (r = 0.58) and Curwin and Stanish (r = −0.57) [30]. The Turkish versions of related PROMs have moderate-to-strong convergent validity, including FAOS with the SF-36 (r = 0.42–0.78) and AIMS2 domains (r = -0.29 to −0.73) [11], and VISA-A with Curwin and Stanish tendon grading (r = -0.86), physical activity grading (r = 0.74), and the physical domain of WHOQOL-BREF (r = 0.37) [9]. Additionally, both the original [30] and Turkish VISA-A [9] versions demonstrated significant differences between symptomatic and healthy individuals. These findings suggest that TENDINS-A-TR had higher correlations compared to reported ranges in previously validated instruments, demonstrating the construct validity of measurement for TENDINS-A-TR.

Discriminative validity analyses revealed an area under the ROC curve of 0.961, suggesting that TENDINS-A-TR can accurately discriminate between individuals with and without Achilles Tendinopathy. The optimal cut-off point was determined as 18.5, meaning that a total score of 19 and above indicates the presence of Achilles Tendinopathy, while a score of 18 and below indicates the absence of pathology. At this threshold, TENDINS-A-TR exhibited good sensitivity (81.7 %) and specificity (87.1 %), supporting its potential utility as a screening tool in both clinical and research settings. These findings are particularly important in the context of clinical decision-making and align with COSMIN standards for diagnostic PROMs [10]. In comparison, the original TENDINS-A (Myles Calder [27]) and the other relevant PROMs [11,9] did not investigate the discriminative validity, while the original VISA-A demonstrated more modest discriminative performance, with an area under the ROC curve of 0.762 (95 %CI 0.64–0.88), sensitivity of 57 %, and specificity of 88 % [23]. Overall, TENDINS-A-TR demonstrates strong discriminative performance, effectively distinguishing individuals with Achilles Tendinopathy through its high accuracy, sensitivity, and specificity.

TENDINS-A-TR demonstrated excellent test-retest reliability (ICC=0.94) and internal consistency (Cronbach's α=0.97), consistent with the findings (ICC=0.93 (95 %CI 0.88–0.96); Cronbach's α= 0.81) of the original TENDINS-A (Myles Calder [27]). Both TENDINS-A-TR and the original TENDINS-A had similar SEM values (5.92 and 6.54, respectively), supporting the stability and precision of the instrument across cultures. These results reflect the stability of the instrument over time and its ability to consistently measure the construct of Achilles Tendinopathy symptom severity. The MDC_{95} of 16.41 units for TENDINS-A-TR provides a threshold for detecting real changes beyond measurement error, which is essential for longitudinal monitoring. The original study did not report the MDC_{95} directly (Myles Calder [27]), but we calculated as 18.13 with the reported SEM of 6.54. The slightly lower MDC_{95} of the Turkish version indicates potentially greater sensitivity to detecting real changes over time. When compared to other PROMs frequently used for Achilles Tendinopathy, TENDINS-A-TR demonstrates superior reliability metrics. The Turkish version of VISA-A showed very high test–retest reliability (Pearson's r = 0.99) but a relatively low internal consistency (Cronbach's α=0.66) [9]. In contrast, the original VISA-A demonstrated a wider range of test–retest reliability (Pearson's r = 0.81–0.98) across populations [30]. Similarly, the Turkish version of FAOS reported moderate to excellent reliability (ICC range=0.70–0.96) with high internal consistency (Cronbach's α=0.79–0.97) across its subscales [11], indicating good reliability but more variability compared to the consistently strong values observed in TENDINS-A-TR. These results highlight TENDINS-A-TR as a psychometrically robust tool with excellent reproducibility and internal consistency, making it highly suitable for both clinical monitoring and research purposes in Turkish-speaking populations.

The MIC_{95} for TENDINS-A-TR was 10.1 points (95 %CI 6.49–13.71), representing a 26.4 % change from the mean score. Similarly, the original TENDINS-A reported a MIC of 12.36 points (95 %CI 5.46–19.25), corresponding to a 25.6 % change from a mean score of 47.89 (Myles Calder [27]). Although the MIC for the original TENDINS-A was slightly higher than that of the Turkish version, both versions reflected a comparable percentage change from the mean score. This consistency supports the cross-cultural equivalence of TENDINS-A and reinforces its utility for detecting changes that exceed measurement variability in individuals with Achilles Tendinopathy. The original VISA-A has similar minimum clinical important difference of at least 14 points after 12 weeks, or at least 7 points after 24 weeks of exercise combined with an injection [23]. These findings collectively provide clinicians with valuable benchmarks for evaluating treatment efficacy and interpreting meaningful change across PROMs used in tendinopathy research and practice.

No ceiling or floor effects were observed in either the original study (Myles Calder [27]) or TENDINS-A-TR, which is critical for avoiding score clustering and ensuring interpretability across the full spectrum of symptom severity in people with Achilles Tendinopathy. The absence of such effects suggests that TENDINS-A-TR is appropriate for use in both mild and severe cases of Achilles Tendinopathy. FAOS subscales [11,31] and several VISA-A items may exhibit ceiling effects [5] suggesting that these items do not effectively capture the symptom severity of individuals with Achilles Tendinopathy. Therefore, TENDINS-A-TR seems more appropriate to implement in both mild and severe cases of Achilles Tendinopathy.

13. Limitations

The main limitation was that minimal clinically important difference could not be checked due to cross-sectional study design. Although TENDIS-A-TR was administered twice in 3–14 days, this duration was not enough to see clinically meaningful changes in Achilles Tendinopathy. Therefore, we provided the MIC using a distribution-based method. Similarly, responsiveness of TENDINS-A-TR over time or its response to interventions was not assessed. Future studies should address longitudinal validity and cross-cultural invariance. Lastly, because ROC analysis was conducted against a healthy control group, spectrum bias may have inflated the findings; thus, these findings should be interpreted as evidence of discriminative validity rather than diagnostic accuracy, and TENDINS-A-TR should not be considered a diagnostic tool.

14. Conclusion

A validated Turkish version of TENDINS-A questionnaire is now available and demonstrates strong validity, reliability, and accuracy for assessing symptom severity in individuals with Achilles Tendinopathy. The Turkish version of TENDINS-A meets contemporary standards for outcome measure evaluation and can be used with confidence in both clinical and research settings to provide consistent, precise, and meaningful assessment of Achilles tendinopathy in Turkish-speaking populations. However, further longitudinal studies are required to confirm its responsiveness and establish patient-anchored thresholds of clinical change.

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None.

Declaration of Competing Interest

None.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.fas.2025.11.009.

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