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Reliability and Validity of the Turkish Version of Foot and Ankle Ability Measure for Patients With Chronic Ankle Disability

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ABSTRACT

The Foot and Ankle Ability Measure is a valid, reliable, and widely used self-reported questionnaire for the foot. It has been adapted and validated for a Turkish-speaking population. The purpose of this study was to provide evidence for validity and reliability of the Turkish version of the Foot and Ankle Measure (FAAM-T) in patients with chronic ankle instability (CAI). A total of 316 patients with CAI were enrolled. The internal consistency and test–retest reliability were evaluated. Validity was examined using correlations with the Short Form Health Survey version 2.0 (SF-36v2) questionnaire. Cronbach's alpha scores were 0.94 and 0.96 for the the FAAM-T ADL (Activities of Daily Living) and FAAM-T Sports subscales, respectively, indicating high internal consistency. For the second administration, Cronbach's alpha was found to be 0.96 for both subscales of the FAAM-T. The test–retest reliability of the FAAM-T was very high for both subscales with an intraclass correlation coefficient of 0.97 and 0.94, respectively ($p < .001$). The standard error of the mean and minimal detectable change were determined to be 2.5 and 6.7 for the FAAM-T ADL and 6.9 and 18.5 for the FAAM-T Sport. The FAAM-T ADL and Sport subscales were strongly correlated with the SF-36v2 PF (physical functioning; $r = 0.51$, $r = 0.40$, respectively; $p = .001$) and SF-36v2 PCS (physical component scale; $r = 0.64$, $r = 0.55$, respectively; $p = .001$). The weakest associations between the FAAM-T ADL and Sport and the SF-36v2 were noted for the mental health subscale ($r = 0.08$ and $r = 0.03$) and the SF-36v2 MCS (mental component scale; $r = .05$ and $r = .006$, respectively). This study provides evidence for validity, internal consistency, and test–retest reliability for the FAAM-T to evaluate patients with CAI.

The ankle is the most commonly injured body part in sports. Ankle sprains compose about 77 % of ankle injuries (1). Individuals who participate in volleyball, basketball, and football are at higher risk for chronic ankle instability (CAI) (2). CAI usually occurs after at least 1 previous lateral ankle sprain (3). Insufficient treatment of the initial trauma and recurrent injury may result in CAI, which leads to pain and swelling of the ankle (2,4). Patients with CAI frequently seek rehabilitation (5).

Self-reported outcome instruments can provide valuable information about the patients' impairments, disabilities, and quality of life, and they are commonly used for clinical evaluation and outcome measurements of treatment and research. These instruments have to be translated, cross-culturally adapted, and validated to be used in different countries and within specific populations (5). The information acquired from self-reported instruments is useful only if there is evidence to support their use (4,6). This evidence is obtained for validity, reliability, and responsiveness of the instrument. Several instruments have been implemented for foot and ankle disorders in outcomes-related research with variable evidence to support their use. Of these instruments, the Foot and Ankle Ability Measure (FAAM), the Foot Function Index, the Foot Health Status Questionnaire, the Lower Extremity Function Scale, and the Sports Ankle Rating System quality of life measures were shown to have good clinimetric qualities (7).

In a systematic review, the Foot and Ankle Disability Index and the FAAM questionnaire were identified as the most suitable instruments for individuals with CAI (8). The Foot and Ankle Disability Index is the former version of the FAAM. The FAAM, originally published in English, has evidence of reliability, responsiveness, and validity to evaluate foot and ankle disorders (9). The FAAM consists of 29 items and includes Activities of Daily Living (ADL) and Sport subscales. Construct validity of the FAAM has been verified in athletes with CAI (4) and individuals with diabetes mellitus (10). A cross-cultural adaptation and validation have been carried out for German (5), Persian (11), French (6), Dutch (12), Italian (13), Japanese (14), Thai (15), Turkish (16), Brazilian (17), Chinese (18), and Spanish (19) versions of the FAAM.

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The FAAM has been shown to have good evidence of psychometric properties in different languages; it has been adapted and validated in a Turkish-speaking population by Çelik et al (16) (Supplemental Appendix 1). The aim of this study was to validate and provide the evidence for the reliability of the Turkish version of the Foot and Ankle Measure (FAAM-T) in patients with CAI.

Patients and Methods

Outcome Measurements

FAAM

The FAAM consists of separately scored 21-item ADL and 8-item Sport subscales (Supplemental Appendix 2). The ADL subscale investigates basic functional activities; the Sport subscale evaluates more challenging activities occurring during sport. Each item is scored on a 5-point Likert scale representing different levels of difficulty (4 no difficulty at all, 3 slight difficulty, 2 moderate difficulty, 1 extreme difficulty, 0 unable to do). Items without a response or marked, as "nonapplicable" are not counted. Item score totals, which range from 0 to 84 for the ADL subscale and from 0 to 32 for the Sport subscale, are transformed to percentage scores that range from 0% to 100%. A higher score represents a higher level of physical function for both the ADL and Sport subscales. At the end of each FAAM subscale, participants completed a global rating of function scale. Participants rated their level of function from 0% (inability to perform the listed ADL or Sport tasks) to 100% (level of function before the injury). On the categorical rating scale, participants categorize their ankle as normal, nearly normal, abnormal, or severely abnormal (9).

Short Form Health Survey Version 2.0 Turkish

All participants completed the Short Form Health Survey version 2.0 (SF-36v2) questionnaire once at the first assessment. SF-36v2 is widely used to assess health status. It consists of 36 items, organized into 8 multi-item domains: physical functioning (SF-36v2 PF), social functioning (SF-36v2 SF), role limitation due to physical problems (SF-36v2 RP), role limitation due to emotional problems (SF-36v2 RE), mental health (SF-36v2 MH), energy and vitality (SF-36v2 VT), bodily pain (SF-36v2 BP), and general perception of health (SF-36v2 GH). The latest improved version the SF-36v2 was translated into Turkish and a validation study of the Turkish version was performed by Çelik and Çoban (20). The SF-36v2 is an efficient outcome parameter in musculoskeletal research.

Participants

Ethical approval was obtained for the study from the ethical committee of Baskent University, Ankara, Turkey, registered under the ID KA12/204, in accordance with the Declaration of Helsinki. Each participant who was a native Turkish speaker signed a written informed consent form before the study. A total of 316 consecutive patients diagnosed with CAI participated in this study. They were outpatients from the physiotherapy and rehabilitation departments of Baskent University Hospital and Ataturk Education and Research Hospital, Ankara, Turkey.

The study was performed from April 2013 to April 2015. Participants were excluded if they had a history of knee or hip injury, rheumatoid arthritis, neurologic or vascular conditions, diabetes mellitus, alcohol or drug addiction, or psychiatric comorbidity. To assess the validity of the Turkish version of the FAAM-T, initially all participants completed the FAAM-T; to assess test–retest reliability, the participants completed the FAAM-T twice within 3 to 5 days after the first assessment.

Statistical Analyses

Statistical analyses were performed using Statistical Package for the Social Sciences version 20 (SPSS Inc, Chicago, IL). The level of significance was set at $p < .05$. Descriptive statistics were calculated for all variables. These included frequency counts and the percentage for nominal variables and measures of central tendency (means and medians) and dispersion (standard deviations and ranges) for continuous variables. Before the statistical analysis, the Kolmogorov–Smirnov test was used to test for normal distribution of data. The measurement properties analyzed in this study for the instruments included internal consistency, test–retest reliability, agreement, construct validity, and ceiling and floor effects.

Internal Consistency

Internal consistency was assessed using Cronbach's alpha. This test indicates the homogeneity between the items within a questionnaire or the subdomains of a questionnaire. The test was used to determine the interrelatedness among the items of the FAAM-T. An interitem correlation matrix was used to indicate whether one of the items did not positively correlate with the other items. A Cronbach's alpha value ranging from 0.70 to 0.95 was considered adequate (21). Excessively high values are not necessarily desirable, because they may indicate a redundancy of the questionnaire items. In this study, data from the patients included in the first administration of the FAAM-T were used to assess internal consistency.

Test–Retest Reliability

Test–retest reliability represents a scale's ability to yield consistent results when administered on separate occasions during a period when an individual's status has remained stable (13). Intraclass correlation coefficients (ICCs) were calculated using a 2-way, mixed model under consistency. Values ≥0.4 were considered satisfactory (ICC = 0.81 to 1.0, excellent; 0.61 to 0.80, very good; 0.41 to 0.60, good; 0.21 to 0.40, fair; and 0.00 to 0.20, poor) (22).

Agreement

Agreement was assessed with the standard error of the mean (SEM) and minimal detectable change (MDC). The ICC is used to calculate the SEM, which is an index of measurement precision. The SEM is calculated as the standard deviation of the scores × the square root of (1-ICC). The MDC refers to the minimal amount of change within the measurement error. The SEM was used to determine the MDC at 95% confidence limits and was calculated as SEM × 1.96 × the square root of 2 (21).

Validity

Validity is the extent to which a score captures its intended meaning and interpretation (23). In this study, we examined 3 aspects of validity: construct convergent, construct divergent, and content validity. The SF-36v2 PF, SF-36v2 RP, and SF-36v2 PCS (physical component scale) domains of the SF-36v2 were used to assess convergent validity. Evidence for divergent validity was provided by determining the relationships with the SF-36v2 MH, SF-36v2 RE, and SF-36v2 MCS (mental component scale) domains. It was hypothesized that there would be moderate to strong correlations ($r \geq 0.6$) between the FAAM-T ADL and Sport scores and concurrent measures of physical function, and low correlations ($r \leq 0.3$) between the FAAM-T ADL and Sport scores and concurrent measures of mental health emotional function. Content validity was assessed by the distribution of the scores and occurrence of ceiling and floor effects. Floor and ceiling effects of the FAAM-T at the first and second completion of the form were assessed by calculating the proportion of patients scoring the minimum or maximum values on the scale relative to the total number of patients. We considered scores between 0% and 10% to be minimum scores and scores between 90% and 100% to be maximum scores. Floor and ceiling effects were considered to be relevant if >30 % of the patients had a score at the limits of the scale (23).

Results

Demographic and clinical characteristics are shown in Table 1. Descriptive statistics for the scores at baseline and at the second assessments of the FAAM-T are provided in Table 2.

Internal Consistency, Test–Retest Reliability, and Agreement

The Cronbach's alpha values were 0.94 and 0.96 for the FAAM-T ADL and the FAAM-T Sport subscales, respectively, indicating high internal consistency. For the second administration, the Cronbach's alpha value was 0.96 for both the ADL and Sport subscales of the FAAM-T (Table 3). The test–retest reliability of the FAAM-T ADL and FAAM-T Sport was very high for both subscales, with an ICC of 0.97 and 0.94, respectively ($p < .001$) (Table 3). The SEM and MDC were 2.5 and 6.7 for the FAAM-T ADL and 6.9 and 18.5 for the FAAM-T Sport.

Table 1
Patient demographics (N = 316)

Age, Mean ± SD	33.4 ± 11.1	Female 35 ± 11.8	Male 31± 9.4
Gender, n (%)		190 (60.1)	126 (39.9)
Occupation, n (%)			
White collar		14 (4.4)	
Labor		43 (13.6)	
Self-employment		51 (16.1)	
Retired		29 (9.2)	
Student		139 (44)	
Unemployed		40 (12.7)	
Dominant side, n (%)			
Right		277 (87.7)	
Left		39 (12.3)	

Abbreviation: SD, standard deviation.

Table 2
Descriptive statistics for the patient-reported outcome measures used in this study (N = 316)

Outcome Measurements		Mean ± SD
First assessment	FAAM-T ADL	78.96 ± 14.63
	FAAM-T Sports	67.22 ± 27.48
Second assessment	FAAM-T ADL	79.15 ± 13.93
	FAAM-T Sports	67.23 ± 26.64
SF-36v2		
SF-36v2 PF		45.61 ± 10.64
SF-36v2 RP		46.79 ± 10.82
SF-36v2 BP		49.78 ± 23.17
SF-36v2 GH		46.30 ± 7.63
SF-36v2 VT		51.16 ± 7.14
SF-36v2 SF		44.05 ±9.43
SF-36v2 RE		44.48 ± 12.48
SF-36v2 MH		44.36 ± 9.18
SF-36v2 PCS		45.97 ± 9.22
SF-36v2 MCS		45.70 ± 8.55

Abbreviations: ADL, activity of daily living; BP, bodily pain; FAAM-T, Turkish version of Foot and Ankle Ability Measure; GH, general perception of health; MCS, mental component scale; MH, mental health; PCS, physical component scale; PF, physical functioning; RE, role limitation due to emotional problems; RP, role limitation due to physical problems; SD, standard deviation; SF, social functioning; SF-36v2, Short Form Health Survey version 2.0; VT, energy and vitality.

Table 3
Internal consistency and test–retest reliability of the Turkish version of Foot and Ankle Ability Measure

	FAAM-T ADL	FAAM-T Sports
(Cronbach's alpha) first assessment	0.94	0.96
(Cronbach's alpha) second assessment	0.96	0.96
ICC	0.97	0.94

Abbreviations: ADL, activity of daily living; FAAM-T, Turkish version of Foot and Ankle Ability Measure; ICC, intraclass correlation coefficient.

Construct Validity

The correlation between the subscales of the FAAM-T and SF-36v2 are presented in Table 4. The FAAM-T ADL and Sport subscales were strongly correlated with the SF-36v2 PF ($r = 0.51$ and $r = 0.40$, respectively; $p = .001$) and the SF-36v2 PCS ($r = 0.64$ and $r = 0.55$, respectively; $p = .001$). The weakest associations between the FAAM-T ADL and Sport and the SF-36v2 were noted for the mental health subscale ($r = 0.08$ and $r = 0.03$) and the SF-36v2 MCS ($r = 0.05$ and $r = 0.006$, respectively). Floor and ceiling effects and the number of items answered were identical during the test–retest assessment. None of the patients' scores was at the maximal or minimal value, indicating no floor or ceiling effect.

Discussion

The aim of this study was to examine reliability and validity for the FAAM-T with CAI. Based on our sample, the FAAM-T demonstrated acceptable levels of reliability and validity for patients with CAI.

In the present study, Cronbach's alpha for internal consistency of the FAAM-T was excellent for both ADL and Sport subscales in all administrations. Cronbach's alpha was 0.94 for the FAAM-T ADL and 0.96 for the FAAM-T Sports subscales. This high internal consistency is similar to the values provided for the Turkish and other translated versions of the FAAM (6,9,11,13–19). The German version is the only study that reported the validity and reliability in patients with CAI. Cronbach's alpha for internal consistency of the German version of the Foot and Ankle Measure (FAAM-G) was 0.91 for both the FAAM ADL and FAAM Sport subscales in the group of conservatively treated patients with CAI and 0.81 in the preoperative patients with CAI (5). The test–retest reliability of the FAAM-T was found to be excellent for the patients with CAI (ICC = 0.97 for the FAAM-T ADL and 0.94 for the FAAM-T Sports subscales). The ICC values of this study were higher than the values reported previously in the literature (9,11,13–19) except for the French version (6). The reason for the higher value in the French version may be the short time interval (2 days) between test and retest. The test–retest interval was between 2 and 7 days in the literature (5,6,11–19). We believe that short test–retest intervals such as 2 days carry the risk of patients "becoming familiar with the questions" and simply answering based on memory of the first assessment. In the present study, the participants completed the FAAM-T twice within 3 to 5 days after the first assessment. In addition, our findings were higher than the FAAM-G results (ICC = 0.91 for the both FAAM-G ADL and Sport subscales) of the patients with CAI in the conservatively treated group.

To assess construct validity of the FAAM in patients with CAI, Carcia et al (4) used the ankle laxity classification system that was standardized by Good et al (24); Nauck and Lohrer (5) used a global rating of function in addition to the FAAM. In the present study, the convergent and divergent validities were assessed by comparing the SF-36v2

Table 4
Correlations between different versions of the Turkish version of Foot and Ankle Ability Measure and the domains of the 36-Item Short Form Survey

SF-36v2 Subscales	Present Survey (n = 316)		Turkish (n = 39)		Dutch (n = 369)		Chinese (n = 294)		English (n = 243)		Persian (n = 93)		French (n = 105)		Thai (n = 60)		Japanese (n = 83)		Brazilian (n = 90)	
	ADL	SPORTS	ADL	Sports	ADL	Sports	ADL	Sports	ADL	Sports	ADL	Sports	ADL	Sports	ADL	Sports	ADL	Sports	ADL	Sports
SF-36v2 PF	0.51*	0.47*	0.71*	0.51*	0.78	0.61	0.75	0.83	0.84	0.78	0.60	0.53	0.85	0.72	0.59	0.53	0.86	0.75	0.78	0.65
SF-36v2 RP	0.52*	0.40*	0.51*	0.50*	0.53	0.44	0.54	0.53	–	–	–	–	–	–	–	–	–	–	–	-
SF-36v2 BP	0.20*	0.08	0.53*	0.52*	0.72	0.57	0.71	0.70	–	–	–	–	–	–	–	–	–	–	–	-
SF-36v2 GH	0.19*	0.13**	0.41	0.38	0.35	0.27	0.69	0.66	–	–	–	–	–	–	–	–	–	–	–	-
SF-36v2 VT	0.28*	0.22*	0.27	0.28	0.44	0.31	0.37	0.41	–	–	–	–	–	–	–	–	–	–	–	-
SF-36v2 SF	0.25*	0.21*	0.50*	0.40*	0.58	0.45	0.67	0.62	–	–	–	–	–	–	–	–	–	–	–	-
SF-36v2 RE	0.29*	0.22*	0.48*	0.45*	0.37	0.31	0.29	0.33	–	–	–	–	–	–	–	–	–	–	–	-
SF-36v2 MH	0.08	0.03	0.32	0.30	0.39	0.29	0.43	0.48	0.18	0.11	0.21	0.10	0.26	0.21	0.30	0.19	0.29	0.27	–	-
SF-36v2 PCS	0.64*	0.55*	0.70*	0.55*	0.75	0.57	0.84	0.77	0.84	0.80	0.61	0.48	0.81	0.72	0.54	0.50	–	–	–	-
SF-36v2 MCS	0.05	0.006	0.30	0.33	0.27	0.21	0.37	0.33	0.05	-0.02	0.36	0.27	0.37	0.29	0.36	026	–	–	–	-

Abbreviations: ADL, activity of daily living; BP, bodily pain; GH, general perception of health; MCS, mental component scale; MH, mental health; PCS, physical component scale; PF, physical functioning; RE, role limitation due to emotional problems; RP, role limitation due to physical problems; SF, social functioning; SF-36v2, Short Form Health Survey version 2.0; VT, energy and vitality.

* $p < .001$.

** $p < .01$.

questionnaire. Both the FAAM-T ADL and FAAM-T Sports subscales of the FAAM-T in patients with CAI had high correlations with the SF-36v2 PF and SF-36v2 PCS subscales and low correlations with the SF-36v2 MH and SF-36v2 MCS subscales. The correlation coefficients with SF-36v2 PF and SF-36v2 PCS were 0.51 and 0.64 for the ADL subscale and 0.47 and 0.55 for the Sport subscale, respectively ($p = .001$), whereas those of SF-36v2 MH and SF-36v2 MCS were 0.08 and 0.05 for the ADL subscale and 0.03 and 0.006 for the Sport subscale, respectively ($p > .05$). The correlations between different versions of the FAAM and the domains of the SF-36 presented in Table 4 show the correlation between the FAAM-T ADL and Sports subscales. In our survey, SF-36v2 PF values were lower than values in the English, Dutch, Turkish, Japanese, Chinese, Persian, French, Thai, and Brazilian versions of the FAAM (6,9,11,12,14–18). The SF-36v2 PCS values were lower than the values in English, Dutch, Turkish, Chinese, and French but higher than the values in the Persian and Thai versions (6,9,11,12,15,16,18). The level of association between the FAAM and the mental domains of the SF-36v2 compared favorably to the results found with other translated versions (6,9,11,12,14–16,18). This range of results is not surprising, and we believe that the range is the result of contextual differences between condition-specific questionnaires. The strength of correlations between the SF-36v2 and scores of specific instruments has been limited. This confirms that the SF-36v2 measures additional aspects of physical health and therefore provides a more comprehensive, but less specific, range of information about a patient's overall health than obtained with condition-specific questionnaires.

The German version included patients with CAI only; the results are reported within a group of presurgical CAI patients and in conservatively treated CAI patients. In the present study, only 9.5% of the patients had previous ankle surgery and the rest were diagnosed as CAI only, but they did not receive any treatment. In addition, the patients included in the German version were younger than our patients, all of which makes it difficult for us to directly compare our results with the German version.

Despite sufficient reliability, validity, and internal consistency of the FAAM-T in patients with CAI being demonstrated, the present study had some limitations. Only patients with chronic foot disorders were included in the present study. The reliability and validity of the FAAM-T can be conducted with different ankle disorders in future studies. In addition, further studies are needed to provide evidence of responsiveness and determine the minimal clinically important difference for the FAAM-T.

In conclusion, this study provides evidence for validity, internal consistency, and test–retest reliability for the FAAM-T to evaluate patients with CAI.

Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:10.1053/j.jfas.2018.07.007.

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