Original Article

Cross-Cultural Adaptation, Validity And Reliability Of Egyptian Arabic Version Of Foot Function Index For Patients With Foot And Ankle Disorders

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Abstract

Background: Foot function index (FFI) is a self-reported questionnaire utilized to examine functional disabilities in subjects suffering from ankle and foot problems and is available in many languages. The aims of this research were translation, cultural adaptation, and analysis of the reliability and validity of the Egyptian Arabic version of the Foot function index (FFI-A) questionnaire. **Methods:** Thirty experts (3 panels) with PhD, and 460 patients (41.84 ± 11.07 years) with foot and ankle disorders, were involved in this research. Face and content validity were examined descriptively and calculated by scale content validity index and item content validity index. Cronbach alpha value was determined to measure internal consistency reliability. Whereas test-retest reliability was measured by Intra-class correlation coefficient (95% Confidence Interval). Internal construct validity was examined by factor analysis, external construct validity was examined through measuring degree of association between FFI-A and shortform health survey questionnaire (SF-36). **Results:** FFI-A exhibited two factorial structures, according to factor analysis, and showed a very significant connection with the SF-36 (r = -0.89). FFI-A demonstrated an excellent internal consistency reliability in which Cronbach alpha of disability domain was 0.986, activity limitation domain was 0.964, and pain domain was 0.973. Test-retest reliability of FFI-A total score was 0.998, revealing a substantial correlation of test-retest results. **Conclusion:** Egyptian Arabic version of Foot function index showed an excellent validity and reliability. As a result, it could be taken into account when evaluating Arabic-speaking population with ankle and foot disorders.

Keywords: Foot function index, Cross-cultural adaptation, validity, reliability, Ankle and foot disorders.

BACKGROUND

Ankle and foot disorders are one of the most common causes patients visit primary care clinics for consultations. Foot pain reduces mobility and freedom making it challenging to carry out daily tasks. Consequently, injuries to the knees, hips, pelvis, and back can develop from foot problems **(1,2).**

The use of self-administrated, valid, and reliable questionnaires can evaluate a wide range of health and rehabilitation outcomes **(3,4).** The use of a valid questionnaire in different languages is more convenient than creating a new questionnaire **(5).** Which makes translation a crucial step that may compromise the psychometric characteristics of the questionnaire if errors occur **(6).** Adapting a questionnaire in different languages is a multi-step process. Translating, then culturally adapting, and finally examining the psychometric characteristics of the questionnaire must be done **(5).**

A few foot-specific questionnaires were created and validated to ascertain the impact of different foot disorders on health-related outcomes **(7).** The foot function index (FFI) was one of the frequently mentioned questionnaires in the ankle and foot literature **(8).**

The translated and validated foot function index is already available in Danish **(9),** German **(10),** Italian **(11),** Spanish **(12),** Portuguese **(13),** French **(14),** Chinese **(7),** Korean **(15),** Turkish **(16),** Thai **(2),** Persian **(17),** Saudi Arabic **(18,19)** languages. Although the FFI is widely used, to our knowledge a version for Egyptian Arabic speaking populations has not yet been translated and validated.

Native Arabic speakers frequently study and employ two distinct language types. The official language being Modern Standard Arabic (MSA), and a regional dialect or slang is also used which differ from one country to another. Most of the Egyptian population use the slang language which made having an Egyptian Arabic version of the questionnaire a more pressing issue. As there are some Arabic terms different in their meaning among different Arabic countries and it is highly important to ensure congruency between words and their true meaning in the language to which the questionnaire is translated. The objectives of this study therefore included translation, cultural adaptation and examining validity and reliability for FFI-A.

Methods

Study Design

The design of the study was cross-cultural validation of FFI-A. The present study was carried out at the orthopedic and Rheumatology outpatient clinics of Cairo university hospitals. The study was granted approval from the ethical committee review board of the faculty of physical therapy (No: P.T.REC /012/002941). Every participant who volunteered to partake in the research was required to sign a written consent that had details of the procedure. The authors of this research received permission for translation and cultural adaptation through e-mail from the original English version author.

Participants

Thirty experts (10 experts per panel) took part in this research to measure the content and face validity of FFI-A. All experts had a PhD in physical therapy, most of their field experience is with the Arabic speaking people, they were eloquent in both Arabic and English.

Four hundred and sixty patients (20 per item) **(20)** were recruited based on the following criteria: Age ranging from 18 to 60 years (41.84 ± 11.07), with foot and ankle disorders (rheumatoid arthritis 34%, ankle sprain 31%, planter fasciitis 17%, calcaneal spur 12%, Achilles tendinopathy 6%), referred by an orthopedic physician, awake and mobile, and who is capable of writing and reading Arabic. Patients suffering from vascular disorders, neurological disorders, tumors, and psychiatric diseases were not included.

Translation and Cultural Adaptation

The steps listed below were performed:

Step one: Translation of the original English version into Egyptian Arabic (forward translation).
Two translators whose first language is Arabic and eloquent in English produced (A1, A2). One of the translators had to have an understanding of the specific subject of the questionnaire in Arabic, the other translator had to have an understanding of the language and cultural terms in Arabic.

Step two: Comparison of A1 and A2 versions.
The investigator, other members of the study team and a research committee from basic science department of physical therapy staff members were requested to assist in the merging process to address any inconsistencies. After the merging process, preliminary initial translated version (A1,2) was produced.

Step three: Blind backward translation of A1,2 version.
Two bilingual translators produced (B1 and B2). one translator had to be familiar with the health terminology in English. The other translator had to have an understanding of the linguistic as well as cultural terms in English.

Step four: Comparison of B1 and B2 versions.
A multidisciplinary committee (researchers, health care professionals and the translators) revised (A1and A2, A 1,2, B1andB2) translations. These translations led to the assumption that the preliminary version was also the pre-final version.

Step five: initial evaluation of the pre-final version.
Ten experts (panel one) were requested to assess the clearance of every item in the questionnaire (face validity) and provide ideas to make the questionnaire more understandable. The committee suggested the use of "500 meters" as an equivalent to "4 blocks". The committee also recommended the use of a numeric line from 0 to 10 instead of the horizontal line used in the original version. The authors of the current study were granted approval via email from the original version author to use the numeric line. Panel two (ten experts) re-evaluated the clearance of the amended pre-final form. Any item that at least 20% of the members deemed to be ambiguous had to be amended. All items in the amended pre-final form were reviewed for content-related validity by panel three (ten experts) using the following

scale: Score (1,2) is non-relevant, and score (3,4) is relevant. Following the approval of the experts the amended pre-final version was designated the final version.

Step six: complete psychometric assessment of the prefinal form in a sample of the intended subjects.
The shortform health survey questionnaire (SF-36) Arabic version and the FFI-A were both completed by the patients. A week later, the patients again filled out both questionnaires.

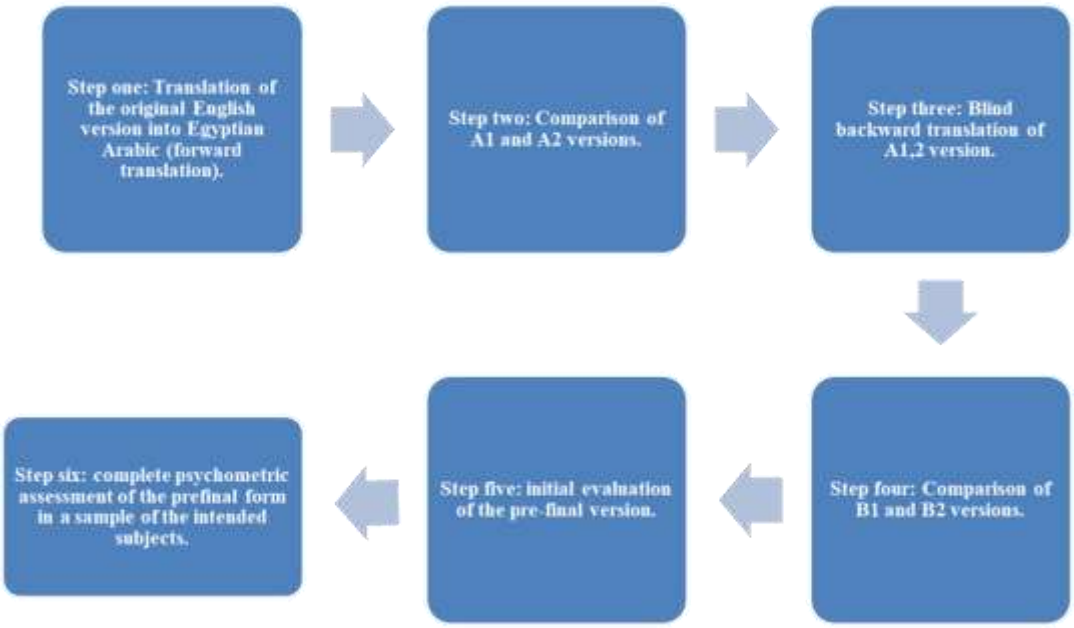


Figure (1) Translation and Cultural Adaptation

Statistical Analysis

Continuous variables were represented by describing the data in the form of mean and standard deviation, whereas categories were represented by frequency and percentage. Scale-content validity index (S-CVI) and item content validity index (I-CVI) were utilized to examine the content and face validities. Convergent/divergent validity and factor analysis were utilized to examine construct validity. Using Pearson correlation coefficients to evaluate responses at base point and one week later, the degree of correlation among SF-36 and FFI-A subscales (divergent and convergent validity) was determined. Preceding factor analysis, the Kaiser-Meyer-Olkin and Bartlett tests were carried out to assess suitability and sufficiency of the selected subjects. Analyses of test-retest and internal consistency were carried out to assess FFI-A reliability. Internal consistency reliability was evaluated using Cronbach alpha. Above 0.80, Cronbach alpha value was deemed excellent **(21).** To evaluate test-retest reliability, the intra-class correlation coefficient (95% CI) was used. The ICC (95% CI) values of above 0.8 were considered to have a strong degree of association **(22).** SPSS computer program (version 25) was used for data analysis.

Results

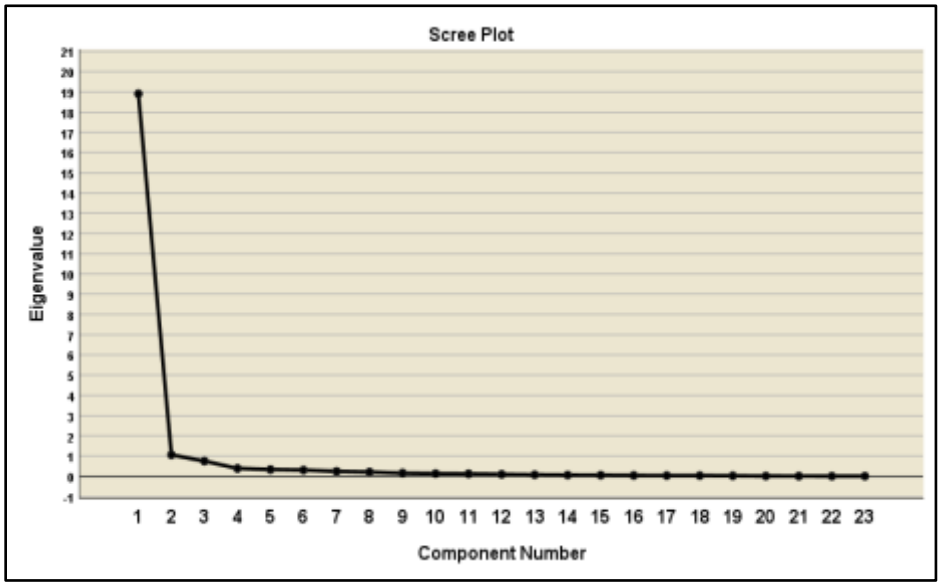
Face Validity

Face validity of FFI-A questionnaire was excellent as tested by two expert panels of ten experts for each panel who are a PhD holder. The mean expert proportion of clearance was 98.26%. The adjustments recommended by both expert panels were incorporated into the prefinal form. The index of clarity of FFI-A questionnaire ranged from 90% to 100%. This form then became the final FFI-A for content related validity testing.

Content Validity

Depending on the opinions of the experts (third expert panel), the mean expert proportion of relevance was 95.65%. The scale CVI(S-CVI) was 100%. According to opinions of experts the content related validity of FFI-A was excellent.

Construct Validity



By using a scree plot graph, the FFI-A was revealed to have two factors **figure (2)** constituting 86.803 % of the total variance. Divergent as well as convergent validity were examined using Pearson correlation coefficients. A strong negative significant association (r = -0.89) was found among total score of FFI-A and total score of SF-36 **table (1).**

Figure (2) Scree plot graph of FFI-A questionnaire**.**

Table (1) Correlation between FFI questionnaire and Sf-36 questionnaire

SF-36 questionnaire		**FFI questionnaire**		
	Activity Limitation	**disability**	**Pain**	**Total**
Physical functioning	-0.839**	-0.827**	-0.831**	
Role limitations due to physical health	-0.723**	-0.733**	-0.7**	
Role limitations due to emotional problems	-0.087	-0.096*	-0.080	
energy/vitality	-0.353**	-0.364**	-0.338**	
Mental health	-0.368**	-0.371**	-0.347**	
Social functioning	-0.198**	-0.213**	-0.218**	
bodily Pain	-0.814**	-0.838**	-0.840**	
General health	-0.873**	-0.873**	-0.856**	
Total				**-0.89****

r value: Pearson correlation coefficient p value: probability value **: significant

Internal Consistency Reliability

For examining internal consistency of FFI-A, Cronbach alpha was utilized. Cronbach alpha was 0.988, indicating high internal consistency reliability of FFI-A **table (2).**

Table (2) Cronbach alpha for foot function index

	Number of items	**Cronbach's Alpha**	**95% CI**
Activity limitation	5	0.964	0.959- 0.969
Disability	9	0.986	0.984- 0.988
Pain	9	0.973	0.970- 0.977
Total FFI	23	0.988	0.986-0.989

Cronbach's alpha if item deleted											
Q 1	**Q 2**	**Q 3**	**Q 4**	**Q 5**	**Q 6**	**Q 7**	**Q 8**	**Q 9**	**Q 10**	**Q 11**	**Q 12**
0.959	0.959	0.958	0.958	0.958	0.977	0.977	0.977	0.977	0.977	0.977	0.977
Q 13	**Q 14**	**Q 15**	**Q 16**	**Q 17**	**Q 18**	**Q 19**	**Q 20**	**Q 21**	**Q 22**	**Q 23**	
0.977	0.977	0.963	0.964	0.963	0.963	0.963	0.963	0.964	0.964	0.963	

CI: confidence interval

Test–Retest Reliability

After seven days, participants were invited to answer the questionnaire one more time to assess the FFI-A test-retest reliability. In total score, ICC was 0.998, with 95% CI (p<0.0001). The ICC value scores of the questionnaire show that FFI-A has high test-retest reliability (Tables 3,4,5 and 6).

Table (3) Test-Retest reliability of activity limitation domain

	ICC	(95% CI)		P value	SEM
		lower bound	upper bound		
Q 1	0.991	0.990	0.993	<0.001	0.27
Q 2	0.991	0.990	0.993	<0.001	0.27
Q 3	0.981	0.977	0.984	<0.001	0.27
Q 4	0.981	0.977	0.984	<0.001	0.27
Q 5	0.964	0.957	0.970	<0.001	0.36
Activity limitation domain	0.992	0.991	0.993	<0.001	1.94

ICC, Inter class correlation coefficient value; CI, Confidence Interval; SEM, standard error of measurement.

Table (4) Test-Retest reliability of disability domain

	ICC	(95% CI)		P value	SEM
		lower bound	upper bound		
Q 6	0.990	0.988	0.992	<0.001	0.19
Q 7	0.990	0.988	0.992	<0.001	0.18
Q 8	0.993	0.992	0.994	<0.001	0.14
Q 9	0.994	0.993	0.995	<0.001	0.14
Q 10	0.994	0.993	0.995	<0.001	0.14
Q 11	0.992	0.990	0.993	<0.001	0.16
Q 12	0.994	0.993	0.995	<0.001	0.14
Q 13	0.993	0.991	0.994	<0.001	0.15
Q 14	0.984	0.981	0.987	<0.001	0.20
disability domain	0.997	0.996	0.997	<0.001	0.92

ICC, inter class correlation coefficient value; CI, confidence interval; SEM, standard error of measurement.

Table (5) Test-Retest reliability of pain domain

	ICC	(95% CI)		P value	SEM
		lower bound	upper bound		
Q 15	0.983	0.979	0.986	<0.001	0.16
Q 16	0.997	0.997	0.998	<0.001	0.15
Q 17	0.997	0.996	0.997	<0.001	0.09
Q 18	0.996	0.995	0.997	<0.001	0.10
Q 19	0.990	0.988	0.991	<0.001	0.16
Q 20	0.985	0.982	0.988	<0.001	0.20
Q 21	0.976	0.971	0.980	<0.001	0.25
Q 22	0.979	0.975	0.983	<0.001	0.23
Q 23	0.994	0.993	0.995	<0.001	0.12
Pain domain	0.997	0.997	0.998	<0.001	0.86

ICC, inter class correlation coefficient value; CI, confidence interval; SEM, standard error of measurement.

Table (6) Test-Retest reliability of total score of FFI questionnaire

	ICC	(95% CI)		P value	SEM
		lower bound	upper bound		
FFI	0.998	0.998	0.998	<0.001	0.75

ICC, inter class correlation coefficient value; CI, confidence interval; SEM, standard error of measurement.

Effect of floor and ceiling

Floor and ceiling effect takes place in case a portion of the responders exceeding 15 % achieved bottom or top (0–10) score **(23).** The patient scores were not at the highest or lowest value, according to the answer ranges for each question, implying no indication of a floor or ceiling effect.

Discussion

The English version of FFI, in accordance with international standards, was translated into Egyptian Arabic and culturally adjusted **(20).** Content and face validity of FFI-A were excellent. The authors chose to assess the face validity since it entails expert endorsement that the test is a reliable indicator of the idea being measured solely by its external appearance **(24).** To raise the clarity index to the lowest permitted level of 80%, some alterations have been performed **(25).** The committee recommended the use of "500 meters" to measure distance as an equivalent to "4 blocks" to culturally adapt the questionnaire for use in Arabic speaking countries. Other translated versions reported the same adjustment **(14, 2,15,11,18).** The committee also suggested the use of a numeric line from 0 to 10 for scoring to enhance patient's comprehension and facilitate data analysis. Similarly, other translated versions reported the use of a numeric line **(12,16,14,11).**

Content validity is the degree to which the items in a questionnaire are representative of the larger theoretical topic the questionnaire is meant to assess **(26)**. The experts stated that the items of the Egyptian Arabic version of FFI were truly relevant to the construct of the questionnaire. The expert panel was highly qualified, and a major part of their work was with patients with different ankle and foot disorders, which contributed to a more precise review.

In the current study, patients with rheumatoid arthritis, ankle sprain, planter fasciitis, calcaneal spur and Achilles tendinopathy participated to ensure a wide range of disorders were represented. The FFI-A as identified by scree plot graph has two factors. However, the original English and French versions reported the extraction of 4 factors **(8,14).** Other translated versions reported the extraction of 3 factors **(16,12,19).** The authors of the current study recruited 460 patients. However, the other translated versions recruited far less participants than this study, which could be the reason why the factors extracted were different.

The Short form questionnaire of general health (SF-36) was chosen for comparability with FFI-A questionnaire. Since, it is a detailed questionnaire that evaluates eight various health factors **(27).** In the current study, all domains of FFI-A had higher associations with physical function (PF) and lower associations with mental health (MH) portions of the SF-36. This demonstrates that FFI-A is an indicator of physical function not of mental function. Since a high FFI score suggested a poor health state and a high SF-36 score suggested a finer health status, Pearson's correlation coefficient had a negative value. This study findings were equivalent to those from the Korean version. **(15).** However, other translated versions reported lower values for correlation **(10,7,18).** Removal of items may have contributed to the lower correlation values reported.

Cronbach's alpha values of FFI-A were high, indicating an excellent internal consistency between all items contributing to measure the same construct. No items were removed from the Egyptian Arabic version of the questionnaire, as removing items would decrease overall Cronbach alpha for all subscales. The values of the FFI-A were the same or slightly exceeding the results reported by the original English version and other translated versions **(10,19,2).**

Some previous studies disregarded the questions regarding orthotics and activity limitation subscale since the areas covered by these questions were not applicable to their participants. The authors of the current study came to the conclusion that both were crucial for evaluation of patients who need orthotic for pain alleviation and whose activity were limited because of their illness. Both were therefore deemed necessary and were included.

This study chose a one-week period to evaluate test–retest reliability to counteract the impact of shorter time periods. Where in a shorter time period the patient is more likely to recall his answers from the first measurement. Also, in a longer time period the condition of the patient may change considerably from the first measurement. The values of ICC of this study were equivalent to other translated versions **(13,19,16,10,9,2,14).** Both Saudi versions stated that only a portion of the participant undertaken the second test **(18,19)** Which may have contributed to lower ICC values reported**.** The FFI-A is seen as being constant overtime when taking into account the results of each question, the ICC results, and total score of FFI-A.

In this study, no ceiling or floor effect was found. Similarly, neither the Portuguese nor the Saudi versions reported ceiling or floor effects (**13,18,19)**. However, for the Danish and Persian versions floor and ceiling effects were reported **(9,17).** It might have happened as a result of the reduced sample size.

One of the shortcomings of this investigation was the lack of responsiveness of FFI-A. Another flaw was not examining the external longitudinal construct validity. It is advised that more research be done in treatment groups to evaluate external longitudinal construct validity and responsiveness.

Conclusion

Egyptian Arabic version of FFI is a valid and reliable tool demonstrated an excellent association with SF-36. Additionally, FFI-A got a high test–retest and internal consistency reliability. Therefore, it is advised that FFI be taken into account while evaluating Egyptian Arabic-speaking individuals with foot and ankle disorders.

List of abbreviations

CI	: Confidence Interval
FAOS	: Foot and Ankle Outcome Score
FAAM	: Foot and Ankle Ability Measures
FFI	: Foot Function Index
FFI-A	: Egyptian Arabic Version of Foot Function Index
I-CVI	: Item Content Validity Index
ICC	: Interclass Correlation Coefficient
MCS	: Mental Component Score
MH	: Mental Health
MSA	: Modern Standard Arabic
PCA	: Principal Component Analysis
PCS	: Physical Component Score
PF	: Physical Function
S-CVI	: Scale Content Validity Index
SF-36	: Short form 36 Health Survey Questionnaire

Declarations

Acknowledgment
The researchers are appreciative of everyone who took part in the study.

Availability of data and material
Datasets utilized in the course of this study are obtainable upon reasonable request from the corresponding author.

Conflict of interests
The authors did not disclose any conflicts of interest.

Consent for publication
N/A

Consent for participation and ethical approval
This study was granted approval (No: P.T.REC /012/002941) from the ethical committee review board of the faculty of physical therapy. Every participant who volunteered to partake in the research was required to sign a written consent that had details of the procedure.

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References

1. López-López D, Becerro-de-Bengoa-Vallejo R, Losa-Iglesias ME, Palomo-López P, Rodríguez-Sanz D, Brandariz-Pereira JM, et al. Evaluation of foot health related quality of life in individuals with foot problems by gender: a cross-sectional comparative analysis study. BMJ Open. 2018;8(10).
2. Bovonsunthonchai S, Thong-On S, Vachalathiti R, Intiravoranont W, Suwannarat S, Smith R. Thai version of the foot function index: a cross-cultural adaptation with reliability and validity evaluation. BMC Sports Sci Med Rehabil. 2020; 12:56.
3. Garratt A, Schmidt L, Mackintosh A, Fitzpatrick R. Quality of life measurement: bibliographic study of patient assessed health outcome measures. BMJ. 2002 Jun 15;324(7351):1417.
4. Jette DU, Halbert J, Iverson C, Miceli E, Shah P. Use of standardized outcome measures in physical therapist practice: perceptions and applications. Phys Ther. 2009;89(2):125-135.

5. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000;25(24):3186-3191.
6. Yu DS, Lee DT, Woo J. Issues and challenges of instrument translation. West J Nurs Res. 2004;26(3):307-320.
7. Wu SH, Liang HW, Hou WH. Reliability and validity of the Taiwan Chinese version of the Foot Function Index. J Formos Med Assoc. 2008;107(2):111-118.
8. Budiman-Mak E, Conrad KJ, Roach KE. The Foot Function Index: a measure of foot pain and disability. J Clin Epidemiol. 1991;44(6):561-570.
9. Jorgensen JE, Andreasen J, Rathleff MS. Translation and validation of the Danish Foot Function Index (FFI-DK). Scand J Med Sci Sports. 2015;25(4):408-413.
10. Naal FD, Impellizzeri FM, Huber M, Rippstein PF. Cross-cultural adaptation and validation of the Foot Function Index for use in German-speaking patients with foot complaints. Foot Ankle Int. 2008;29(12):1222-1228.
11. Martinelli N, Scotto GM, Sartorelli E, Bonifacini C, Bianchi A, Malerba F. Reliability, validity and responsiveness of the Italian version of the Foot Function Index in patients with foot and ankle diseases. Qual Life Res. 2014;23(1):277-284.
12. Paez-Moguer J, Budiman-Mak E, Cuesta-Vargas AI. Cross-cultural adaptation and validation of the Foot Function Index to Spanish. Foot Ankle Surg. 2014;20(1):34-39.
13. Martinez BR, Staboli IM, Kamonseki DH, Budiman-Mak E, Yi LC. Validity and reliability of the Foot Function Index (FFI) questionnaire Brazilian-Portuguese version. Springerplus. 2016;5(1):1810.
14. Pourtier-Piotte C, Pereira B, Soubrier M, Thomas E, Gerbaud L, Coudeyre E. French validation of the Foot Function Index (FFI). Ann Phys Rehabil Med. 2015;58(5):276-282.
15. In TS, Jung JH, Kim K, Jung KS, Cho HY. The reliability and validity of the Korean version of the foot function index for patients with foot complaints. J Phys Ther Sci. 2017;29(1):53-56.
16. Anaforoğlu Külünkoğlu B, Fırat N, Yıldız NT, Alkan A. Reliability and validity of the Turkish version of the Foot Function Index in patients with foot disorders. Turk J Med Sci. 2018;48(3):476-483.
17. Mousavian A, Mohammadi A, Seyed-Hosseinian SH, et al. Reliability and Validity of the Persian Version of the Foot Function Index in Patients with Foot Disorders. Arch Bone Jt Surg. 2019;7(3):291-296.
18. Khan S, Faulkner S, Algarni FS, Almalki A, Almansour A, Altowaijri AM. Foot Function Index for Arabic-speaking patients (FFI-Ar): translation, cross-cultural adaptation and validation study. J Orthop Surg Res. 2022;17(1):212.
19. Amri MI, Alzhrani MM, Alanazi AD, Alqahtani MM, Kashoo FZ. Cross-cultural adaptation and validation of the Arabic version of the foot function index in patients with chronic lateral ankle instability. J Foot Ankle Res. 2022;15(1):21.
20. Sousa VD, Rojjanasrirat W. Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. J Eval Clin Pract. 2011;17(2):268-274.
21. Schlösser TP, Stadhouder A, Schimmel JJ, Lehr AM, van der Heijden GJ, Castelein RM. Reliability and validity of the adapted Dutch version of the revised Scoliosis Research Society 22-item questionnaire. Spine J. 2014;14(8):1663-1672.
22. Weir JP. Quantifying test-retest reliability using the intraclass correlation coefficient and the SEM. J Strength Cond Res. 2005;19(1):231-240.
23. Lim CR, Harris K, Dawson J, Beard DJ, Fitzpatrick R, Price AJ. Floor and ceiling effects in the OHS: an analysis of the NHS PROMs data set. BMJ Open. 2015;5(7):7765.
24. Bolarinwa OA. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. Niger Postgrad Med J. 2015;22(4):195-201.
25. Borsa JC, Damasio BF, Bandeira DR. Cross-cultural adaptation and validation of psychological instruments: some considirations.Paideia(Ribeirao Preto).2012;22(35):423–432.
26. Tsang S, Royse CF, Terkawi AS. Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. Saudi J Anaesth. 2017;11(1):80-89.
27. Busija L, Pausenberger E, Haines TP, Haymes S, Buchbinder R, Osborne RH. Adult measures of general health and health-related quality of life: Medical Outcomes Study Short Form 36-Item (SF-36) and Short Form 12-Item (SF-12) Health Surveys, Nottingham Health Profile (NHP), Sickness Impact Profile (SIP), Medical Outcomes Study Short Form 6D (SF-6D), Health Utilities Index Mark 3 (HUI3), Quality of Well-Being Scale (QWB), and Assessment of Quality of Life (AQoL). Arthritis Care Res (Hoboken). 2011;63(11):383-412.