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Adaptation and validation of the Persian version of the foot Health Status Questionnaire in patients with plantar pain: evaluation of test-retest

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ABSTRACT

Background: The Foot Health Status Questionnaire (FHSQ) is a foot health psychometric tool for measuring foot health status that consists of eight dimensions. Currently, the FHSQ has been adapted to several languages. It was considered necessary to translate and adapt the FHSQ to the Persian language. Thus, the aim of this study was to assess the repeatability and reliability of the Foot Health Status Questionnaire (FHSQ) translated into Persian.

Method: The translation into Persian and test-retest reliability methods came from the English version of the questionnaire. The questionnaire was distributed to 88 individuals diagnosed with plantar heel pain, who were recruited from a podiatry clinic in Iran. To assess test-retest reliability, the instrument was administered on two separate occasions, with a five-day interval between the initial and follow-up assessments.

Results: As regards the total mark for each dimension, internal consistency and reliability were determined with the Cronbach α and intraclass correlation coefficient (ICC) with a confidence interval (CI) of 95%. High internal consistency was shown for the eight dimensions: (a) foot pain, with a Cronbach α of 0.773; (b) foot function and (c) general foot health with 0.788 and 0.776 respectively; (d) shoe with 0.793; (e) general health with 0.784; (f) physical function with 0.795; (g) social function with 0.801 and (h) vigour with 0.748. Excellent test-retest reliability (ICC = 0.911 [95% CI = 0.844–0.949]) was shown for the total score.

Conclusions: The Persian version of the FHSQ was shown to be a valid and reliable tool for acceptable use in the Iran population.

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Foot Health Status Questionnaire; FHSQ; foot health; quality of life; reliability analysis; questionnaire validation

Introduction

Our feet are the base and foundation of our bodies, facilitating bipedalism and ensuring our mobility. Considered and defined as a perfect work of art and engineering masterpiece, we know that foot problems are frequent [1–3], and foot pain is common, even in young people. One in four adults will suffer from foot pain during their lives [4], with a consequent negative impact on foot health-related quality of life. It is important to consider that the health status of the feet influences our quality of life and overall well-being [5,6] and that foot problems are a recurring reason for

consultation with doctors, physiotherapists and podiatrists [7].

Researchers, such as Budiman, Bennett, Morley, and Obilor & Adejumo, have suggested various assessment tools for measuring foot pain and quality of life [8–11]. One of these is the Foot Health Status Questionnaire (FHSQ), which has several specific items related to foot health, and which shows remarkable validity and reliability (ICC = 0.74–0.92) [11–13]. It is an instrument that was developed and validated by Bennett et al. in Australia, specific to the Anglo-Saxon culture, which has been used in various foot diseases [11,12,14,15]

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although initially it was used to evaluate patients undergoing surgery and with plantar heel pain [4].

It is currently used to assess foot health-related quality of life. The questionnaire is divided into three sections. The first section, comprising 13 questions, evaluates four key domains of foot health: pain, function, footwear, and general foot health. Pain and function focus on physical aspects, while the footwear domain addresses the comfort and availability of appropriate shoes. General foot health is based on the patient's self-perception of the condition of their feet. Each domain measured by the FHSQ has specific relevance. Pain and physical function are crucial as they directly affect the individual's mobility and functional capacity, negatively impacting their quality of life. The footwear evaluation is essential to understand the patient's ability to find suitable shoes that provide support and comfort, which is particularly important for individuals with foot deformities or pain. Lastly, the general foot health domain captures the patient's overall perception of their podiatric well-being. The second section consists of 20 items and uses Likert scales to assess four domains of general health: general health, physical function, social function, and vitality. Each domain is scored from 0 to 100, with 0 representing the worst health status and 100 the best. The third section collects sociodemographic data from the patients, such as medical history, socioeconomic status, lifestyle habits, and educational level, providing a broader context for interpreting the results. The structure of the FHSQ facilitates the comparison of findings across different studies, as it not only measures foot health but also evaluates the impact of foot conditions on the patient's overall quality of life [15].

Similarly, the FHSQ has significant practical implications. Firstly, it aids healthcare professionals in evaluating the health of an individual's feet by identifying specific issues and designing personalised treatments. Secondly, it enables patients to communicate their symptoms and concerns regarding their foot health, monitor treatment progress, and make necessary adjustments. Furthermore, it can enhance overall quality of life by addressing foot problems that hinder daily activities [3,16–18].

This questionnaire has been translated, adapted and validated for different languages and populations such as Spanish, Portuguese, Danish, Dutch and Arab [4,15,16,19,20]. Persian is the language of conversation in some Middle Eastern countries, including Iran, Afghanistan, Tajikistan, and parts of Pakistan and Iraq [2]. Therefore, we deemed it necessary to translate and adapt the FHSQ into this language to ensure its widespread utilisation in these countries. The aim of this

study was to evaluate the repeatability and reliability of the Foot Health Status Questionnaire (FHSQ) translated into Persian.

Material and methods

Design and sample

A descriptive study was conducted in a podiatry clinic in Iran between February and April 2023, fulfilling all the criteria of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [21]. A high-quality translation was performed by two researchers from very different educational backgrounds, and the test-retest investigation was conducted according to the Patient-Reported Outcome Measures (PROMs) and Principles of Good Practice Statement and Checklist [11,22]. The validation and translation were completed using the clinimetric tool [23]. This process followed the recommended guidelines for cross-cultural adaptation, involving forward translation, reconciliation, back-translation, and expert committee review. The translated version was then evaluated for its cultural appropriateness and relevance to the target population through cognitive interviews with patients with plantar pain [24].

The cross-cultural adaptation and translation process to adapt the FHSQ into the Persian version was developed in 4 stages:

1. Translation of the FHSQ from the original English version into Persian: this version was performed by two native and independent translators who were blinded to each other.
2. The translated versions were compared to perform the preliminary version of the Persian FHSQ.
3. A back-translation into the original language was performed by two independent translators, who were native Persian speakers.
4. The preliminary version was reviewed by an expert committee of five researchers who discussed any discrepancies between versions.

A pilot test was developed with 15 subjects using the obtained version before reaching the final version.

The process of selecting and ensuring the representativeness of the sample in the pilot study is essential for the study's validity and the generalizability of its findings. In the case of the adaptation and validation of the Persian version of the Foot Health Status Questionnaire in patients with plantar pain, the

researchers followed a systematic approach to ensure the appropriate selection and representation of the study participants.

To assess the psychometric properties of the Persian version, a test-retest reliability study was conducted. Participants were asked to complete the questionnaire at two different time points, with a two-week interval. The internal consistency of the questionnaire was evaluated using Cronbach's alpha, and the stability of the instrument was assessed through intraclass correlation coefficients.

The study also included an evaluation of the construct validity of the Persian version.

The inclusion criteria were being over 18 years of age, speaking Persian, and presenting pain in the plantar area of the heel of the foot. People with a lack of total autonomy in daily tasks, people with cognitive disabilities, who did not sign their consent to participate in the study, or those who did not understand the guidelines to participate were excluded.

Procedure

The study subjects with plantar heel pain were recruited from a private podiatry clinic in Iran, and all patients voluntarily agreed to participate after being fully informed about the procedure.

According to the recommendations of the COSMIN guidelines, all the study subjects initially completed the Persian version of the FHSQ. Subsequently, to perform the test-retest reliability analysis and to assess the internal consistency levels, the participants filled out the Persian FHSQ again five days after the first completion. The two stages of data collection were completed both face to face with the main researcher for the questioner validated scales and also using electronic means.

Two blinded researchers were responsible for data collection and analysis.

Sample size estimation

G * Power 3.1.9.2 (Heinrich-Heine-Universität Düsseldorf; Düsseldorf, Germany) was used to determine the sample size of this research.

The sample size calculation was revised considering that the study employed intraclass correlation coefficients (ICC) to assess reliability. For an ICC value of 0.80 with a 95% confidence interval (CI), an α error of 0.05, and a desired power of 80% (β error = 20%), the estimated final sample size was 46 participants.

Ethical considerations

The study was conducted according to the Declaration of Helsinki, as last modified [25] and approved by the ethics committee of the University of Valencia with code number 1243612. Participants authorised and signed the informed consent form. The privacy of the subjects' information was guaranteed.

Statistical analysis

All the variables were tested for normal distribution using the Shapiro Wilks test, and all data were considered normally distributed if $p > .05$.

Quantitative variables were conveyed as mean \pm SD (IC95%). The socio-demographic features were recorded.

Depending on the distribution of the data, parametric or non-parametric tests were used to assess differences between the test and retest groups: (1) For normally distributed data, the independent Student's t-test was applied; (2) For non-normally distributed data, the Mann-Whitney *U* test was used; (3) To assess systematic differences between test and retest (within-group comparisons), the following tests were employed: the paired t-test for parametric data, and the Wilcoxon signed-rank test for non-parametric data.

The internal consistency of the items within each sub-scale was evaluated using Cronbach's α coefficient. A Cronbach's α value greater than 0.7 was considered indicative of acceptable internal consistency. Additionally, correlations between individual items and the total score were assessed using: Spearman's correlation for non-parametric data and Pearson's correlation for parametric data.

The intraclass correlation coefficient (ICC) was used to assess the reliability between the test and retest. The analysis was conducted using a two-way random effects model (2.1), and individual scores were calculated to express the agreement between measurements. ICC values were interpreted according to the benchmarks proposed by Landis and Koch: <0.20 (slight agreement), 0.21–0.40 (fair agreement), 0.41–0.60 (moderate agreement), 0.61–0.80 (substantial agreement), and >0.81 (almost perfect agreement).

A p value of <.05 was considered statistically significant for all tests, with a 95% confidence interval. All analyses were performed using SPSS software version 25.0 (IBM Corp., Armonk, NY, USA).

Results

Eighty-eight subjects (61 women and 27 men) from Iran were recruited in this research.

The demographic information is shown in Table 1.

The results of reliability, pre-test and post-test and systematic differences of the FSHQ by sub-scales are shown in Table 2. A very good degree of agreement was shown for all subscales: social capacity a Cronbach α of 0.801, on the subscale physical activity 0.795 and shoe 0.793, foot pain with 0.773; the foot function domain with 0.788; the general foot health sub scale with 0.776, and a total score 0.745.

Excellent reliability (ICC = 0.909 [95% CI = 0.837–0.946]) was shown for the total, and each domain such as the items about foot pain ($\alpha=0.773$; ICC = 0.894 [95% CI = (0.814–0.939)]), foot function ($\alpha=0.788$; ICC = 0.674 [95% CI = (0.424–0.814)]), and shoe ($\alpha=0.796$; ICC = 0.850) [95% CI = (0.736–0.914)], general foot health ($\alpha=0.776$; ICC = 0.859) [95% CI (0.753–0.919)], general health ($\alpha=0.784$; ICC = 0.893 [95% CI (0.809–0.937)]), physical activity ($\alpha=0.795$; ICC = 0.745 [95% CI = 0.843 (0.849–0.853)]), social capacity ($\alpha=0.801$; ICC = 0.943 [95% CI = (0.902–0.967)]) and vigour ($\alpha=0.748$; ICC = 0.910 [95% CI = (0.943–0.948)]) The test-post-test reliability was excellent for the items social capacity

Table 1. Demographic information.

	Total group N=88 Mean \pm SD range
Age (years)	38.788 \pm 11.299 (36.313–41.264)
Weight (kg)	71.172 \pm 13.945 (68.251–74.092)
Height (m)	1.683 \pm 0.091 (1.663–1.702)
BMI (kg/m ²)	25.068 \pm 4.233 (24.181–25.954)

BMI: body mass index; SD: standard deviation; Kg: kilograms; m: meters; m²: square meter.

(ICC 95%): 0.943 (0.902–0.947), vigour 0.910 (0.843–0.948), and general health, 0.893 (0.809–0.937).

Spearman's correlations (r_s) between test-retest were adequate for foot pain ($r=0.873$), social capacity ($r=0.912$) and vigour ($r=0.920$), and total ($r=0.918$). There was no differences for each sub-domain and general score ($p>.05$).

Discussion

The aim of this study was to perform an adaption and validation of the FHSQ to produce a Persian FHSQ and, thus providing clinicians in Persian speaking environments with a useful instrument to assess patients' quality of life related to foot health. Our findings directly contribute to meeting this aim by demonstrating the reliability and validity of the adapted questionnaire.

This study aimed to translate the FHSQ into Persian and was conducted among Iranian adults. Subjects completed the electronic questionnaire within 10 min. Although in this study both sexes participated, women account for the majority of cases and nearly 70% of the sample recruited were women. The FHSQ has been applied in several countries and cultures. In addition, several studies have investigated the reliability and validity of the FHSQ in patients with foot disorders [26–29]. For example, Riel et al. have researched on 'Translation and cultural adaptation of a Danish version of the Foot Health Status Questionnaire' and they reported that the FHSQ has both face and construct validity [4]. Also, other foot questionnaires have

Table 2. Results of test-retest analyses.

Domain	Cronbach's Alpha if item deleted	r (p)*	ICC (IC95%)	Systematic differences test-retest
Foot Pain	0.773	0.873 (<.01)	0.894 (0.814–0.939)	0.316
Foot Function	0.788	0.668 (<.01)	0.674 (0.424–0.814)	0.186
Shoe	0.793	0.844 (<.01)	0.850 (0.736–0.914)	0.784
General Foot Health	0.776	0.798 (<.01)	0.859 (0.753–0.919)	0.762
General Health	0.784	0.804 (<.01)	0.893 (0.809–0.937)	0.526
Physical Activity	0.795	0.588 (<.01)	0.743 (0.849–0.853)	0.143
Social Capacity	0.801	0.912 (<.01)	0.943 (0.902–0.967)	0.845
Vigor	0.748	0.920 (<.01)	0.910 (0.843–0.948)	0.348
Total	0.745	0.918 (<.01)	0.909 (0.837–0.946)	0.372

Item–total correlation and systematic differences of the FSHQ according to each domain. ICC: Intraclass Correlation Coefficient; * Spearman test; p value <.05 are considered significant.

been translated and adapted to the Persian language [2,6,30,31].

The participant makeup in our study, with approximately 70% women participants, reflects the typical patient population that seeks treatment for foot health issues in clinical settings. Previous research indicates that women are more likely to experience and report foot pain, particularly heel pain, and are therefore overrepresented in studies related to foot health [32,33]. This distribution is consistent with clinical observations in the region where the study was conducted, where a higher proportion of women typically present with foot health concerns.

In this study, a lower ICC value was detected for the foot function subscale compared to other parameters, which could be attributed to the subjective nature of this domain. Since foot function evaluates the feet in terms of their impact on physical function, it may be perceived differently by study participants depending on external factors such as recent physical activity or temporary discomfort at the time of the questionnaire. In the study by Sirera et al. [15] of the translation and cross-cultural adaptation of this questionnaire to Spanish, there was a similarity in this same domain of foot function. On the contrary, in the design and validation of this questionnaire carried out by Bennett in 1998 in Australia [14] it was in this domain where the pre-post ICC value obtained the highest value of all the domains. This discrepancy could be due to cultural or environmental factors that affect how participants perceive foot function.

This study has some limitation, for example: the small sample size; in future studies, it would be ideal to expand the sample to obtain more robust and generalisable results; and the lack of longitudinal data regarding other psychometric properties is another limitation of this research.

While a sample size of 88 may be considered adequate for a psychometric validation study, it is important to consider the implications of this sample size and whether future studies with larger samples are planned.

Appropriate sample size calculation is a crucial aspect of study design, as it ensures that the study has sufficient statistical power to detect meaningful differences or associations. In the case of a psychometric validation study, a larger sample size is generally preferred to ensure the stability and reliability of the factor structure, internal consistency, and other psychometric properties of the instrument [34].

Regarding the inclusion of only patients with plantar pain, while this could be considered a limitation, it was a deliberate decision to ensure the

homogeneity of the study group. We focused on patients with this specific condition because it is one of the most common pathologies related to foot health, allowing us to evaluate the utility of the questionnaire in this particular population. We acknowledge that the inclusion of patients with other foot conditions could have provided a broader perspective on the applicability of the FHSQ in different groups. Lastly, the age of the subjects was another limitation in this research as we recruited adults over the age of 18.

Conclusions

The Persian version of the FHSQ was shown to be a consistent tool for assessing foot health status and health-related quality of life in the Persian population, with good test-retest reliability. However, future studies will be needed to more thoroughly assess its validity and examine the success of the cultural adaptation and translation of this version.

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Ethics statement

Institutional Review Board Statement: An ethics committee of University of Valencia approved our research (number 1243612).

Authors contributions

CRedit: **Leila Ahmadnezhad**: Conceptualization, Data curation, Resources, Software, Writing – original draft, Writing – review & editing; **Daniel López-López**: Conceptualization, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing; **Ricardo Becerro-de-Bengoa-Vallejo**: Formal analysis, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Ana María Jiménez-Cebrián**: Conceptualization, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Marta Elena Losa-Iglesias**: Investigation, Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing; **Israel Casado-Hernández**: Visualization,

Writing – original draft, Writing – review & editing; **Lisa Alves-Gomes**: Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing.



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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. 'The data that support the findings of this study are available from the corresponding author (A.M.J.-C).'

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