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RESEARCH ARTICLE

Validity and Reliability of the Turkish Version of the Plantar Fasciitis Pain / Disability Scale

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Abstract

Purpose: The objective of this study is to create a Turkish adaptation of the Plantar Fasciitis Pain/Disability Scale (PFPS) and to evaluate its construct validity and internal consistency. **Method:**The Turkish version of the PFPS was developed in accordance with the established translation and back-translation processes. The translated version of the scale was administered to a sample of 138 patients diagnosed with plantar fasciitis (PF). Validity was also evaluated using the Turkish version of the Foot Function Index (FFI). The test-retest reliability of the PFPS was determined by administering the scale to 138 patients on two occasions. **Findings**:The test-retest reliability was investigated through the utilisation of a paired t-test, an intraclass correlation coefficient analysis (ICC), and a Cronbach's alpha score. Construct validity was investigated through the utilisation of Pearson's correlation analysis. The Turkish version of the PFPS exhibited high internal consistency and test-retest reliability (Cronbach's alpha = 0.844, ICC = 0.997), as well as good construct validity, demonstrating a significant correlation with the FFI ($p < .001$). Furthermore, a notable difference was observed between the lower and upper 27% groups ($p = 0.000$). **Conclusion:** The Turkish version of the PFPS has been demonstrated to be a reliable, valid, and responsive instrument for patients with PF. Nevertheless, further studies involving a greater number of age groups, genders and languages are required to confirm the responsiveness of the PFPS and to provide further evidence of its full validity.

Keywords
Plantar Fasciitis, Foot, Pain Measurement, Validation Studies

INTRODUCTION

Plantar Fasciitis (PF) is recognized as the most frequently occurring cause of chronic pain in the anteromedial process of the calcaneus (Tahririan et al. 2012; Cutts et al.2012). PF is one of the most common overuse injuries resulting in heel pain, affecting 10% of the general population at some point in their lives. Therefore, it is also reported to be a significant cause of increased health expenditures (Song, 2024). It has been reported that chronic weight bearing and repetitive overloading of the foot in daily activities or sports can result in the development of PF. This condition is reported to be prevalent in both those who are physically active and those who are sedentary (Menon & Jain, 2018).

The most fundamental symptom of PF is characterized by an abrupt, intense pain in the heel upon waking or upon the initial ambulation following a period of prolonged inactivity (Trojian & Tucker,2019; Landorf, 2015). In general, patients describe heel pain as non-radiating, throbbing, scorching or piercing without paresthesia (Johnson et al. 2014).

A variety of treatment modalities are employed in the management of PF, including non-invasive, invasive, conservative, and surgical approaches. Although PF is a prevalent condition across ethnicities and cultures, there is currently no universally accepted standard of treatment (Agudiez-Calvo et al. 2021). Various conservative treatments such as activity modification, oral analgesics, shoe modifications, night splints,

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exercise approaches, injections, and extracorporeal shock wave therapy has been reported in the literature to be effective in relieving pain in PF (Song, 2024).

As the specific cause of PF is not fully understood and is multifactorial, early and accurate prognostic evaluation of patients with PF is important for the selection of the optimal treatment pathway. In the literature, questionnaires translated into Turkish such as the Foot Function Index (FFI) and the Foot and Ankle Outcome Survey (FAOS) are used to assess PF. These questionnaires assess foot and ankle problems without taking into account specific changes in pain due to PF. Despite the assessments used, Willis et al. developed the Plantar Fasciitis Pain/Disability Scale (PFPS) in 2009 (Willis et al., 2009). This questionnaire provides a detailed examination and analytical analysis of patients' pain due to PF. The PFPS examines symptomatic questions used in the differential diagnosis of PF and its impact on activities of daily living.

Considering the prevalence of PF, there is a need for adaptation of the PFPS into Turkish and validation studies for its use in the clinical evaluation of PF patients in Türkiye. In view of the fact that this scale is used in many fields and applications, the purpose of this study was to investigate the validity and reliability of the Turkish version of the PFPS.

MATERIALS AND METHODS

Subjects

The study cohort comprised 138 volunteers aged between 18-65 years, who had been diagnosed with plantar fasciitis and had experienced pain for a minimum of six weeks. Participants with cognitive, mental, or psychological disorders, as well as those who had undergone foot and ankle surgery were excluded. In the initial phase of the study, the researchers gathered data pertaining to the participants' demographic characteristics. The participants were required to read and sign the study information and informed consent forms.

This research has met ethical rules. Research ethical approval was obtained Research Ethics Committee with project number E-10840098-772.02-845, dated 03/02/2022. Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures. The study was conducted as a cross-sectional study between April 2022 and May 2023.

Translation and cross-cultural adaptation

Once the requisite permissions had been obtained from the authors, the Turkish version of the PFPS was conducted in accordance with the cultural adaptation algorithm by Beaton et al. (Beaton et al., 2000). The original of PFPS was in English. The PFPS was translated from English to Turkish by two different professionals who are native English speakers with a good command of Turkish. Subsequently, a single Turkish text was produced from the two translated texts. Two native Turkish speakers with proficiency in English translated the Turkish text back into English. The results of both texts were compared with each other, after which the final version of the translation was evaluated by translators who were fluent in both Turkish and English (Epstein et al., 2015). The scale was found to be readily comprehensible, with no difficulty encountered in understanding any of the questions posed. No cultural adaptation was undertaken, as the activities included in the scale did not necessitate any culturally specific modifications.

Description of the questionnaires

The PFPS is comprised of 19 items. Twelve items pertain to pain, while seven items pertain to functioning. The maximum score that can be attained from the questionnaire is 100, with a minimum score of 0. A higher score indicates a greater degree of pain and disability (Willis et al., 2009). In accordance with the findings of the validity and reliability research, the PFPS was re-administered to the participants after a period of three days with the objective of assessing the test-retest reliability.

The 23-item Foot Function Index (FFI), comprising three sections, was employed as a reference questionnaire. The first section assesses foot pain resulting from foot pathologies, the second section the degree of difficulty in performing various functional activities, and the third section activity limitations. The 9-item pain subscale is employed to quantify the level of foot pain experienced in a range of situations, whereas the 9-item disability subscale is utilized to ascertain

the degree of difficulty encountered when undertaking various functional activities as a consequence of foot-related issues. The five-item activity limitation subscale is employed to assess limitations to activity resulting from foot problems. Each item is assigned a score on a scale of 0 to 10,difficulty). The values collected for each sub-section are divided by the number of questions in the section and subsequently multiplied by 100, thus enabling the calculation of the section scores. In order to arrive at the total score, the scores awarded to each question in the index are aggregated, divided by the total number of questions, and then multiplied by 100 (Budiman-Mak et al., 2013).

Statistical Analysis

The sample size was calculated using the sampling formula, resulting in a value of $n = (1.96)^2(0.1)(0.1)/(0.05)^2 = 138$ for this non-homogeneous population. In the context of scale adaptation, it is recommended that the number of individuals represented should be five times the number of scale items included. The number of participants has been deemed sufficient for the purposes of scale development and statistical procedures in descriptive research. The data obtained from the study were subjected to evaluation in a computer environment utilizing the statistical software packages SPSS 22.0 and AMOS.

Reliability

The reliability of the scale was evaluated in accordance with the criteria of test-retest reliability and internal consistency. To determine the test-retest reliability, the scale was administered to the participants with a three-day interval between each administration, and the scores were subsequently compared. The test-retest reliability was calculated using a paried t-test and an intraclass correlation coefficient analysis (ICC). An ICC above 0.70 is generally accepted as an indicator of excellent reproducibility (Weir, 2005). The internal consistency of the data was evaluated by calculating the Cronbach's alpha coefficient. A value of 0.7 and above is generally considered to indicate satisfactory internal consistency (Tsang et al., 2017).

Validity

In order to ascertain the validity of the scale, it was subjected to an assessment of construct validity. This refers to its behaviour in relation to other assessment tools. Construct validity was determined through a comparative analysis of the PFPS results with those obtained from the FFI. Pearson's correlation analysis was employed to evaluate the interrelationship between the variables.

In terms of content validity, the scale is expected to demonstrate a clear distinction between two distinct groups, namely those falling within the lower and upper 27% ranges, at the two extremes of the measurement spectrum, namely the floor and ceiling (Hozo et al., 2005). The existence of differences between two groups is indicative of their distinctiveness. The absence of a difference between the two groups indicates that the range encompassing the lowest and highest scores is narrow. The scale distinctiveness was evaluated through the implementation of an independent samples t-test, which was conducted between the lower and upper 27% groups.

RESULTS

The study included 138 participants (25 Males/113 Females) with a mean age of 49.066 ± 10.796 years and a mean body mass index of 31.293 ± 5.619 kg/m² who met the inclusion criteria. Table 1 illustrates the test-retest reliability and internal consistency of the PFPS scale. The Intraclass Correlation Coefficient (ICC) correlation values pertaining to the concordance between test-retest measurements were found to be statistically significant ($p < 0.05$). In light of these findings, it can be concluded that the scale is a reliable instrument for making measurements over a short period of time.

The correlation analysis between PFPS and FFI, as a means of evaluating the scale's validity, is presented in Table 2. The results of the correlation analysis with FFI in relation to scale validity were statistically significant ($p < 0.05$).

The differentiation of the scale according to the lower-upper 27% groups, the results of the content validity assessment, are presented in Table 3. A significant difference was identified between the lower and upper 27% groups ($p < 0.05$), thereby confirming the capacity of the scale to discriminate between different distinctions.

Table 1. Descriptive items and test-retest reliability of the plantar fasciitis pain/disability scale

No	ICC (95% CI) (n=138)	α	p
Item1	0.937 (0.913-0.954)	0.824	0.000
Item 2	0.996 (0.994-0.997)	0.836	0.000
Item 3	0.987 (0.982-0.99)	0.843	0.000
Item 4	1 (1-1)	0.845	
Item 5	0.972 (0.961-0.98)	0.838	0.000
Item 6	0.998 (0.997-0.999)	0.837	0.000
Item 7	1 (1-1)	0.836	
Item 8	0.979 (0.971-0.985)	0.846	0.000
Item 9	0.997 (0.996-0.998)	0.844	0.000
Item 10	0.997 (0.996-0.998)	0.841	0.000
Item 11	0.991 (0.987-0.993)	0.836	0.000
Item 12	0.987 (0.983-0.991)	0.841	0.000
Item 13	0.986 (0.98-0.990)	0.837	0.000
Item 14	1 (1-1)	0.846	
Item 15-1	0.997 (0.996-0.998)	0.837	0.000
Item 15-2	0.979 (0.972-0.985)	0.831	0.000
Item 15-3	0.933 (0.907-0.951)	0.847	0.000
Item 15-4	0.988 (0.984-0.991)	0.833	0.000
Item15-5	0.972 (0.962-0.980)	0.833	0.000
Item15-6	0.959 (0.943-0.970)	0.834	0.000
Item15-7	0.975 (0.965-0.982)	0.834	0.000
Item15-8	0.978 (0.969-0.984)	0.834	0.000
Item15-9	0.993 (0.991-0.995)	0.833	0.000
Item15-10	0.955 (0.938-0.968)	0.846	0.000
Item15-11	0.984 (0.978-0.988)	0.861	0.000
Item16	0.997 (0.996-0.998)	0.839	0.000
Item17	0.998 (0.997-0.999)	0.844	0.000
Item18	0.992 (0.989-0.994)	0.839	0.000
Item19	0.961 (0.946-0.972)	0.840	0.000
PFPS Total	0.997 (0.996-0.998)	0.844	0.000

α:Cronbach's alpha; ICC: Intraclass correlation coefficient; PFPS: Plantar Fasciitis Pain/Disability Scale

Table 2. Correlation between plantar fasciitis pain/disability scale and foot function ındex

			PFPS Total
FFI	**Pain**	r	0.464**
		p	0.000
	Disability	r	0.463**
		p	0.000
	Activity limitation	r	0.307**
		p	0.000
	Total	r	0.408**
		p	0.000

*<0.05; **<0.01; Pearson's correlation analysis; FFI: Foot Function Index; PFPS: Plantar Fasciitis Pain/Disability Scale

Table 3. Differentiation of plantar fasciitis pain/disability scale scores according to lower-upper 27% groups

Groups	Lower 27% (n=37)	Upper 27% (n=37)	t	sd	p
	Mean±SD	Mean±SD			
PFPS	45.406±7.845	71.189±4.652	-17.196	72	**0.000**

Independent Groups T-Test; SD: Standard Deviation; PFPS: Plantar Fasciitis Pain/Disability Scale

DISCUSSION

The study demonstrated that the Turkish version of the PFPS exhibited satisfactory reliability and validity in the assessment of patients with PF. Moreover, the scale was found to be sensitive to the changes that occur in individuals with PF. The Turkish psychometric features of the PFPS were found to be comparable to those of the first version of the PFPS.

A review of the literature revealed that PFPS was a frequently employed method for assessing pain in numerous studies. Karagounis et al. proposed that PFPS can be applied in any setting and can differentiate between plantar fascia pain and other pathologies that cause heel pain (Karagounis P et al.,2011). The effect of conservative treatment on pain in plantar fasciitis has also been evaluated by other studies using PFPS (Sheridan et al.,2010;Boonchum et al.,2020). Additionally, an analysis of existing literature reveals a prevalence of studies on plantar fasciitis in female subjects compared to males (Hashmi et al.,2021).

In our study, a comparison was made with the Spanish validation study conducted by Agudiez-Calvo et al. and the FFI results (Agudiez- Calvo et al. 2021). Statistical analyses should demonstrate no difference between the validity of a scale and the reliability and repeatability of the measurement method. Furthermore, the results reflect the validity of the scale, and the detection of changes between repeated measures shows the sensitivity of the scale. Willis et al., who developed the PFPS, assessed 400 people with complaints of heel pain of various etiologies. They reported that the PFPS was effective in measuring PF-specific pain, that there were significant differences between patients with other heel pain and patients with PF, and that this questionnaire may be an effective method in the diagnosis and assessment of PF-specific pain (Willis et al., 2009). Although it has been used in many studies since the publication of this study (Gupta, 2012; Boonchum et al., 2020), only one study has translated the scale into Spanish and assessed its validity. In their study, Agudiez-Calvo and colleagues reported that the Cronbach's alpha coefficient demonstrated satisfactory reliability in the adaptation of the scale into Spanish. The lowest question, number 2, had a value above 0.7, while the remaining questions had values above 0.9 (Agudiez-Calvo et al. 2021). The results of this study indicate that the Turkish version of the PFPS is a valid and reliable scale. The Cronbach's alpha coefficient exceeded 0.8 for all items in our study, which yielded comparable outcomes to the aforementioned study. This was due to the internal consistency analysis of the Turkish version of the PFPS.

In the existing literature, it is emphasized that the time between the applications of the scale should be taken into account in the evaluation of test-retest reliability (Tsang et al., 2017). Accordingly, in our study, the retest was conducted three days later to ensure that the participants could recall their responses to the scale items, prevent fatigue, and enhance sensitivity to changes. In the present study, the internal consistency of the scale was evaluated, as were the test-retest reliability of the items and the overall reliability of the scale. The results of all evaluations indicated that the scale exhibited good reliability. Furthermore, the scale demonstrated good reliability when evaluated through ICC, with the majority of values exceeding 0.9. The assessment of sensitivity to changes confirmed that the scale is sensitive to changes and may be useful for objectively recording changes in individuals with a diagnosis of PF prior to a specific

treatment. In light of these findings, it was concluded that the Turkish version of the PFPS is an effective instrument for discerning differences in our study.

The results of the correlation analyses conducted with the FFI to evaluate the construct validity of the Turkish version of the PFPS were found to be statistically significant. In light of the aforementioned results, it was concluded that the Turkish version of the PFPS is a valid scale. The limitations of this study is that the majority of participants were women. It was not possible to generalise the statistical results due to the limited number of male participants. The second limitation is that the application of the PFPS is limited to self-reports by participants.

Conclusion

The current pain scales are effective in measuring general pain; however, they lack the capacity to include questions that would allow for specific, objective, and analytical measurement of change in PF-specific symptoms. PFPS serves to illustrate the distinction between patients with plantar fasciitis and those with other pathologies that present with heel pain. In conclusion, the results of our study demonstrate that the Turkish version of the PFPS is a reliable and valid scale for patients with plantar fasciitis. Nevertheless, further studies involving participants from different age groups, genders and languages are required to confirm the responsiveness of the PFPS and to validate its full validity.

Conflict of Interest

We affirm that the article we have authored does not involve any conflict of interest.

Ethics Statement

The study was conducted in accordance with the Principles of the Declaration of Helsinki and was found ethically appropriate. Approval from the Istanbul Medipol University Non-Interventional Ethics Committee was obtained (file number E-10840098-772.02-845, dated 03/02/2022).

Author Contributions

Conception and design of the study, SÖG, EA; Data collection, SÖG, NHY,BNK; Data analysis and interpretation, SÖG, NHY; drafting the article and/or its critical revision, SÖG, NHY, EA. All authors have read and approved the published version of the manuscript.

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