TRANSLATION, CULTURAL ADAPTATION AND VALIDATION OF THE "AMERICAN ORTHOPAEDIC FOOT AND ANKLE SOCIETY'S (AOFAS) ANKLE-HINDFOOT SCALE"

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SUMMARY

Background: The use of outcome assessment scales in scientific studies is necessary so that different treatment forms can be compared among individuals with the same diagnosis. This study targeted the translation, cultural adaptation and validation of AOFAS' Ankle-Hindfoot scale into Portuguese language. Methods: The scale was applied to 50 patients with ankle-hindfoot joint conditions, twice by the interviewer # 1 and once by interviewer # 2. The patients were also assessed by using the SF-36 quality-of-life generic questionnaire and the visual analogue scale (VAS). Results: The Pearson Correlation Coefficient (PCC) and the Intra-Class Correlation Coefficient (ICC) were 0.93 (p<0.001) and 0.96, respectively, for intra-observer reliability and 0.92 (p<0.001) and 0.95, respectively, for inter-observer reliability. The functional capacity and pain components (SF-36) presented the highest correlations (0.67 and 0.64; p<0.001, respectively) at the AOFAS' Ankle-hindfoot scale. The PCC between VAS and AOFAS Ankle-Hindfoot scale was inversely proportional (- 0,68; p<0,001). Conclusions: We conclude that the version of AOFAS Ankle-Hindfoot scale for the Portuguese Language was successfully translated and culturally adapted for application to Brazilian patients, with satisfactory reliability and construct validity.

Keywords: *Questionnaires; Translations; Ankle injuries*

INTRODUCTION

Ankle and hindfoot joint injuries are common and may lead to functional impairment, disability, and exclusion from occupational activities. For this reason, new diagnostic, treatment – and, particularly – clinical and functional assessment methods have been suggested over the recent years.

A standardized method for assessing treatment outcomes in individuals with foot and ankle conditions is necessary in scientific literature, so that different treatment methods can be compared in patients living with the same disease, as well as to provide follow-up of an individual by a healthcare professional, in daily practice[1].

Outcome evaluation scales are usually written in English language and addressed to that population. In order to be used worldwide, the scales must be translated and culturally adapted into the language spoken in the country where they are going to be applied. Subsequently, its measurement properties must be assessed against standards pre-established in literature in order to assure that the same characteristics are maintained in the translated version[2,3]. In 1994, a committee of the *American Orthopaedic Foot and Ankle Society* (AOFAS) developed an evaluation system for different anatomic regions of the foot, giving rise to four different scales: one for ankle and foot, one of the midfoot, a scale for the metatarsophalangeal (MTP) and interphalangeal (IP) joint of the hallux, and a scale for the MTP and IP of the other foot toes, allowing them to be applied to different kinds of injuries and treatments[1]. The evaluation scale specific to the region of the ankle and hindfoot is easy to apply and understand, not requiring the use of imaging tests and sophisticated devices. The questionnaire is composed of nine items, distributed over three categories: pain (40 points), functional aspects

(50 points) and alignment (10 points) totaling 100 points. The authors of the AOFAS scale preferred not to correlate numeric values to Excellent, Good, Fair and Poor, because they cannot identify which criterion was used for providing the overall grade, and these names could give rise to confused results[1]. The use of a questionnaire for assessing quality of life is necessary for correlating specific aspects of a disease with the overall health status of an individual. The SF-36 (*The Medical Outcomes Study 36-item Short-Form Health Survey*) is a generic assessment instrument for quality of life, which means that it can be used for any disease, age or treatment group[4,5]. The SF-36 questionnaire is composed of 36 items, distributed over 8 categories: functional capacity, physical aspects, pain, overall health status, vitality, social aspects, emotional aspects, and mental health. Each category must be assessed separately, and, in the end, a score ranging from 0 to 100 is given, where zero corresponds to the worst health status, and 100 corresponds to the best health status. This instrument has been translated and validated into Portuguese in a previous study[6]. The high rate of injuries affecting the ankle joint in daily activities and, especially, in sports practice[7,8], as well as the need for an easy and not time-consuming assessment instrument in our language were the basis of our interest in translating a specific assessment scale for that anatomic region of the foot. The purpose of the present study was to translate and culturally adapt the assessment scale for ankle and hindfoot proposed by AOFAS into Portuguese, as well as to assess its reproducibility and validity, so that it could be used as an assessment instrument for clinical and functional aspects of Brazilian patients with foot and ankle conditions.

MATERIALS AND METHODS

Fifty Brazilian patients, with minimum age of 16 years and clinical diagnostic of ankle or hindfoot injuries confirmed by imaging tests were selected from the Foot Surgery and Clinics Group and from the Sports Trauma-Orthopaedics Center (CETE), both of the Department of Orthopaedics and Traumatology of the Federal University of São Paulo – Paulista Medical School (UNIFESP-EPM). The patients should maintain their current medications and not be submitted to any other procedures for a period of at least 15 days, due to the scale reproducibility analysis. All patients have signed the free and informed consent term. Patients with acute trauma, under plastered casts, with injuries on other lower limbs´ joints, and with cognitive changes that could preclude the proper application of the questionnaire were excluded from the study.

Sociocultural and clinical characteristics of the 50 patients with ankle and hindfoot conditions included on the reproducibility and validity evaluation of the Portuguese version of the AOFAS´ *Ankle-Hindfoot Scale* are described on Table 1. Most of the patients were males (56%). The mean age was 31 years old (ranging from 16 to 75 y.o.). Fifty-four percent had a high-school degree. The diagnosis of lateral ankle sprain was the most frequent one (72%) followed by tallus cartilage injuries (12%) and by postoperative follow-up of lateral ankle sprains (10%) (Table 2).

Sociodemographic and clinical characteristics	Absolute values
Gender Male (%)	28 (56)
Female (%)	22 (44)
Age (years)	
Average (SD)	31.54 (12.38)
Range	(16 - 75)
Ethnicity	
Caucasians (%)	43 (86)
Non-Caucasians (%)	7 (14)
Education level	
High school incomplete (%)	13 (26)
High school complete (%)	27 (54)
College degree (%)	10 (20)
Duration of injury (in months)	
Average (SD)	16.14 (38.17)
Range	(2 - 240)

Table 1 – *Sociodemographic and clinical characteristics of the 50 patients included on the translation and validation process of the AOFAS' scale for ankle and hindfoot*

Diagnosis	Frequency (%)
Lateral ankle sprain	36 (72)
Tallus cartilage injuries	06 (12)
Postop f.u. of lateral ankle sprains	05 (10)
Fibular tendonitis	01 (2)
Calcaneal fractures	01 (2)
Postop f.u. of calcaneus-navicular bone bar	01 (2)
Total	50 (100%)

Table 2 – *Distribution of the sample according to diagnosis frequency of the 50 patients included on the translation and validation process of the AOFAS' scale for ankle and hindfoot.*

The translation and cultural adaptation process was developed according to the rules proposed and standardized by literature[2]: *a) Primary translation*: the AOFAS *Ankle-Hindfoot Scale* was first translated into Portuguese by two independent Brazilian translators, one sworn-in translator and one health expert technical translator. Both translators were aware of the purposes of the study. A conceptual and not only literary translation was emphasized. Both translations were compared and discussed with the translators. Whenever necessary, changes were made until reaching to a consensus regarding the primary translation (Portuguese version # 1). *b) Assessment of the primary translation ("Back translation")*: the primary translation was translated back into English by an American native translator blinded to the purposes of the study. This version was compared to the original version by a committee composed by two orthopaedic doctors, two physical therapists, and a translator,

who, together, defined a second Portuguese version. *c) Cultural adaptation:* the 2nd Portuguese version of the questionnaire was randomly applied to a group of 10 patients with ankle and hindfoot conditions, selected from the Foot Surgery and Clinics Group and from the CETE (UNIFESP-EPM). The alternative "difficult to understand" was added to the questions not associated to physical examination with the purpose of assessing the understanding level or the inadequacy of these questions for the population in reference. Questions regarded as "difficult to understand" by over 10% of the population would be reassessed and re-written by the committee. As the questionnaire has questions requiring expertise of a healthcare professional, the scale has also been delivered to five orthopaedic doctors and five physical therapists with the same purpose of checking the understanding and applicability of the items, which should be accepted by 90% of those professionals.

Assessment of Reproducibility and Validity of the Portuguese version of the AOFAS Ankle-Hindfoot Scale

The reproducibility of the Portuguese version of the AOFAS Ankle-Hindfoot Scale was assessed in 50 patients diagnosed with ankle and hindfoot joint conditions by means of three interviews. The scale was applied by two independent and previously trained interviewers (interviewer # 1 and # 2) on the same day, at a time interval of approximately 30 minutes between each interview intending to check the inter-interviewer reproducibility. After a period not exceeding 14 days, a new assessment was made by interviewer # 1 in order to check for intra-interviewer reproducibility. The validation of the questionnaire was assessed by checking its score against the established diagnosis, with a quantitative pain scale (analogue visual scale, ranging from 0 = no pain to 10 = excruciating pain) and the generic questionnaire for quality of life (SF-36). The descriptive statistical analysis was performed to characterize clinical and demographic data of the assessed patients. The intra-interviewer reproducibility (test and re-test), inter-interviewer reproducibility, and validation were assessed by using the Pearson´s correlation coefficient. The intra-class correlation coefficient (ICC) was also employed to assess intra- and inter-interviewer reproducibility.

RESULTS

In the cultural adaptation phase, on both populations assessed – patients and professionals – the 10% limit for lack of understanding was not exceeded, which determined that the Portuguese version # 2 of the scale proposed by AOFAS was culturally appropriate. The final Portuguese version of the AOFAS *Ankle-Hindfoot Scale* is presented on the Appendix. The average time for questionnaire application was 7.5 minutes and the time interval between both interviews ranged from 7 to 14 days (average: 9 days). On Table 3, the mean values for each question of the AOFAS *Ankle-Hindfoot Scale* scored in the first interview by interviewer # 1 are listed. The analysis of intra- and inter-interviewer reproducibility is presented on Table 4. We noticed that the reproducibility for the 9 items was shown to be excellent and statistically significant, although the question addressing the walking surface presented lower

values compared to other items when assessing intra- and inter-interviewer reproducibility. Still regarding reproducibility, we compared the total score of the first interview to the other two subsequent interviews in two different moments, using the Pearson´s and the intra-class (ICC) correlation coefficient (Table 5). We noticed that the average was very similar between

APPENDIX

AOFAS ANKLE-HINDFOOT SCALE (100 POINTS TOTAL)
Pain (40 points) • No pain .... 0 • Mild, occasional .... 30 • Moderate, daily .... 20 • Severe, almost always present 0

Functional (50 points)
Restraints in activities, support required
• No restraints, no support 10
• No restraints in daily activities, restrained recreational
  activities, no support 7
• Restraints in daily and recreational activities, cane required .. 4
• Strong restraints in daily and recreational activities;
  walker, crutches, wheelchair, orthosis (ankle restraint,
  ankle immobilizer) 0

Maximum walking distance, in blocks • More than 6 .... 5 • 4 - 6 .... 4 • 1 - 3 .... 2 • Less than 1 0
Walking surfaces • No difficulties in any surface .... 5 • Some difficulty on irregular floors, stairs, steeps and hills ...... 3 • Strong difficulties on irregular floors, stairs, steeps and hills .. 0
Gait abnormality • No abnormality, mild .... 8 • Evident .... 4 • Strong 0
Sagittal mobility (flexion + extension) • Normal or slightly limited (30º or more) .... 8 • Moderate limitation (15º – 29º) .... 4 • Strong limitation (less than 15º) 0
Hindfoot mobility (inversion + eversion) • Normal or slightly limited (75- 100% of the normal mobility)... 6 • Moderate limitation (25 – 74% of the normal) .... 3 • Strong limitation (less than 25% of the normal) 0
Ankle-Hindfoot stability (anteroposterior, varus-valgus) • Stable .... 8 • Unstable 0

Alignment (10 points)
• Good, plantigrade foot, well-aligned forefoot and hindfoot 10
• Fair, plantigrade foot, some degree of misalignment of
  the ankle and hindfoot, asymptomatic 5
• Poor, non-plantigrade foot, strong and symptomatic
  misalignment 0

TOTAL SCORE: _____

Questions/ interviewer # 1	Average	SD	Minimum	Maximum
Pain (0 - 40)	24	8,57	0	40
Function (0 - 50)				
Restraints in activities (0 - 10)	5.54	2.78	0	10
Maximum walking distance (0 - 5)	4.40	1.22	0	5
Walking surface (0 - 5)	2.62	1.74	0	5
Gait abnormality (0 - 8)	7.20	2.13	0	8
Sagittal mobility (0 - 8)	7.48	1.55	0	8
Hindfoot mobility (0 - 6)	4.86	1.59	0	6
Stability (0 - 8)	7.52	1.91	0	8
Alignment (0 - 10)	9.0	2.02	5	10

The values in parenthesis correspond to a potential variation of each question.

Table 3 – *Values for averages, standard deviation (SD), minimum and maximum for each question of the AOFAS ankle-hindfoot assessment scale.*

Questions / interviewer # 1	Correlation Coefficient	
	Intra-interviewer	Inter-interviewer
Pain	0.865	0.911
Restraints in activities	0.865	0.826
Maximum walking distance	0.906	0.947
Walking surface	0.635	0.678
Gait abnormality	0.966	0.797
Sagittal mobility	0.932	1.0
Hindfoot mobility	1.0	0.967
Stability	1.0	0.938
Alignment	1.0	0.937

P<1

Table 4 – *Intra- and inter-interviewer reproducibility for each question of the AOFAS ankle-hindfoot assessment scale as assessed by Pearson's correlation coefficient.*

AOFAS / interviewer # 1	Intra-interviewer	Inter-interviewer
Pearson´s coefficient	0.932*	0.925*
Intra-class coefficient	0.961**	0.959***

* p < 0.01 -** CI = 95% (0.93; 0.97) - *** CI = 95% (0.92; 0.97)

Table 5 – *analysis of the reproducibility by means of the Pearson's correlation coefficient and of the intra-class correlation coefficient values and their corresponding p and confidence interval (CI) values of the total score of the AOFAS ankle-hindfoot assessment scale*

these conditions, as well as the variability of values, resulting in a highly satisfactory reproducibility. The validation of the AOFAS *Ankle-Hindfoot Scale* was assessed by comparing its result in the first interview to the eight domains of the SF-26 quality of life scale, as shown on Table 6. We noticed that the functional capacity and pain components showed the highest correlations (0.67 and 0.64; $p<0.01$, respectively). The other components showed good correlations, except for the emotional aspects item, which showed a not statistically significant value. By assessing total score values, as well as separately

for the Pain item of the AOFAS *Ankle-Hindfoot Scale* with the analogue visual scale (AVS) for pain, we found an inversely proportional and statistically significant coefficient (–0.685 and –0.668; $p<0.01$, respectively).

SF-36 domains	AOFAS
Functional capacity	0.670*
Physical aspects	0.517*
Pain	0.643*
Overall health status	0.425*
Vitality	0.442*
Social aspects	0.557*
Emotional aspects	0.263
Mental health	0.524*

* p < 0.01

Table 6 – *Analysis of the validation by means of the Pearson's correlation coefficient between the total score of the AOFAS ankle-hindfoot assessment scale and the different domains of the SF-36 questionnaire.*

DISCUSSION

There is currently a great concern not only towards the knowledge whether a given treatment or surgical technique provides positive or negative results, but also towards checking the impact of those treatments on patients´ quality of life, regarding how they feel about their conditions and how they perform their daily life activities. The great challenge for researchers lies in how to quantify subjective data and which questions should be addressed by the different instruments assessing health-related quality of life. These instruments are usually found in English; therefore, they must be translated and their measurement properties must then be assessed in a specific cultural context[3, 9]. In our study, we faced no problems in understanding the questions, because these reflect simple and daily life-related conditions of patients. Although our sample shows a good cultural level, because most of the subjects had completed high school education, we believe that because the AOFAS ankle-hindfoot scale is administered as interviews, potential interpretation errors are minimized[10]. The assessment questionnaires must be

reproducible over time; thus, they must produce similar, if not equal, results in two or more interviews with the same patient, providing his/her clinical status has not changed[11]. All patients in our sample presented any hindfoot or ankle condition for at least two months, thus justifying the excellent intra-interviewer consistency, since no significant changes were seen in the short-term. We found a lower score on AOFAS *Ankle-Hindfoot Scale* for cases of tallus cartilage injuries compared to ankle sprain cases and postoperative follow-up of ankle sprain cases. This can be explained by the fact that pain is the most common symptom in tallus cartilage injuries, especially in chronic cases[12]. Additionally, the Pain item corresponds to 40% of a total score of 100; therefore, the stronger the pain, the lower the score. The average score of patients with cartilage injuries in our study was 63.1. Similar scores were found in the studies by Sammarco et al.[13] and Scranton e t al.[14] both with average scores of 64 for the same condition. By assessing intra- and inter-interviewer reproducibility, we found an excellent consistency among all questions, because this is an objective numeric assessment. Furthermore, this instrument was shown to be easy to understand, both by patients and by healthcare professionals trained on it. The internal coherence of the Portuguese version of the AOFAS Ankle-Hindfoot Scale was assessed by the correlation between each question and the total score. We found a good correlation in seven items, with values between 0.46 and 0.83. The items Stability and Alignment had weak and insignificant correlations with the whole. Although no changes were made to the questions, we believe that the Alignment item has no direct correlations with the medical diagnostics included in the study; however, its reproducibility was excellent. In the validation phase of the AOFAS Ankle-Hindfoot Scale we compared the scale with the SF-36 questionnaire for quality of life. The components Functional Capacity and Pain (SF-36)

showed higher values for consistency, items assessed in both questionnaires. SooHoo et al.[15] assessed the correlation of the four AOFAS scales with the SF-36 questionnaire and, despite of the low correlation, they found a higher consistency between the Pain domain of the SF-36 and the AOFAS Ankle-Hindfoot Scale. Although Vitality, Social Aspects, and Mental Health domains presented statistically significant values, we suggest that such correlations are not taken into account, once there are no questions corresponding to these items in the AOFAS ankle-hindfoot assessment scale. The comparison between the AOFAS Ankle-Hindfoot Scale with the pain EVA was also made as a questionnaire validation measure. A good correlation was found, with an inversely proportional coefficient, showing the questionnaire´s ability to quantify that symptom in ankle and hindfoot conditions. In the past, evaluations of a certain intervention were made upon clinical and X-ray criteria. Today, there is a consensus about the need of standardized systems for assessing physical/ functional and quality of life-related aspects, allowing the comparison of the results of different treatment methods in patients with the same condition, and more reliably evaluating the effectiveness of a treatment modality[1,16]. The available specific assessment measurements are clinically sensitive, as noticed in our study, presenting a stronger ability to detect specific aspects of a disease, limited to the relevant domains to be assessed[17,18].

CONCLUSION

The translation of the AOFAS Ankle-Hindfoot Scale into Portuguese and its cultural adaptation to our population, as well as the demonstration of its reproducibility and validation criteria provides an additional specific instrument for assessing patients with ankle and hindfoot joint conditions both in the scientific and in the welfare scopes.

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