

Systematic Review

Foot and Ankle Ability Measure (FAAM) Questionnaire: A Systematic Review

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Abstract

Background: The Foot and Ankle Ability Measure is frequently used by clinicians and researchers to assess the effectiveness of therapeutic interventions for patients with foot and ankle pathologies. This paper aims to review different versions of the FAAM and to evaluate the methodological quality of studies published in this respect. **Methods:** A search was conducted in the PubMed, SCOPUS, PEDro, PROSPERO and SPORTDiscus databases by applying the following inclusion criteria: validation studies of the Foot and Ankle Ability Measure, in different languages, with no time limit, in a population aged ≥ 18 years. Two of the present authors independently assessed the quality of the studies located and extracted the relevant data. The COSMIN checklist was employed to assess methodological quality. **Results:** Thirteen instruments met the inclusion criteria for this review. In many cases, significant methodological flaws were detected, mostly regarding criterion validity and measurement error. **Conclusions:** Only the Spanish-language cultural adaptation of the FAAM presents adequate methodological quality. Further studies, with greater methodological rigour, are required of the cultural adaptations of this measurement instrument.

Keywords: measurement properties; foot and ankle; questionnaire; ability

1. Introduction

Foot and ankle injuries often reflect the presence of alterations in alignment, movement, load distribution and/or general condition, which may be apparent both statically and dynamically [1]. Clinical problems in the foot have a significant impact on functional ability and can provoke emotional distress, anger or depression [2]. Accordingly, practitioners need diagnostic instruments that will facilitate the early, effective and reliable evaluation of related parameters, whether obtained by medical personnel or by the patients themselves [3].

Many patient-reported outcome measures (PROMs) have been proposed to evaluate foot and ankle status, addressing aspects such as functionality, pain and ability [4]. Some, moreover, have been designed and validated for use with specific populations [5–7]. Although PROMs were initially developed for use in clinical trials, they are now increasingly used in both clinical practice and research because of their ability to collect information efficiently [8,9].



Received: 19 April 2024

Revised: 8 July 2024

Accepted: 28 August 2024

Published: 21 April 2026

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The physical function and activities of daily living for individuals with foot and ankle-related impairments can be evaluated by PROMs such as the Foot Function Index (FFI) [10], the Foot Health Status Questionnaire (FHSQ) [11] or the Rheumatoid and Arthritis Outcome Score (RAOS) [12]. In this respect, too, the Foot and Ankle Ability Measure (FAAM) presents good methodological quality [13] and is frequently used by clinicians and researchers to assess the effectiveness of therapeutic interventions for patients with foot and ankle pathologies and associated impairments of body function and structure [14].

The FAAM consists of 29 questionnaire items, divided into two subscales: (i) activities of daily life (ADL), measured by 21 items, and (ii) sports activities, assessed by eight items. Each item is scored on a scale ranging from 4 (without any difficulty) to 0 (total inability to perform the action in question). An alternative response, “Not applicable”, may also be given [15].

Hence, the potential total score obtained by the FAAM is 84 for the ADL subscale and 32 for the sports activities. Each subscale reflects an assessment ranging from 0%, representing total inability to perform the exercises described, to 100%, indicating complete functionality.

This questionnaire has been formally cross-culturally adapted into Italian [16], Persian [17], French [18], German [19], Japanese [20], Brazilian [21], Thai [22], Turkish [23], Chinese [24], Dutch [25], Spanish [26] and Danish [27]. Although all these versions have been clinimetrically validated, there is a lack of comprehensive reviews that critically evaluate the methodological quality and measurement properties of the FAAM.

The aim of the present study is to review the different versions of FAAM (including the original and successive cultural adaptations) and to evaluate their methodological quality. So, the aim is to critically evaluate, compare and summarise the measurement properties’ quality of all the self-administered questionnaires that assess foot and ankle ability in patients with or without pathologies for ADL and/or sports activities.

2. Material and Methods

The review protocol was registered at the International Prospective Register of Systematic Reviews prior to the identification of articles and data extraction (<https://www.crd.york.ac.uk/PROSPERO/view/CRD42022318563>, accessed on 16 April 2022). The PRISMA 2020 checklist is provided in Supplementary Material S1.

The review design: A systematic review of the methodological quality of the FAAM questionnaire.

2.1. Search Strategy

The study selection process was based on the PRISMA statement for systematic reviews [28]. The database search was carried out by examining five databases: PubMed, Scopus, PROSPERO, Physiotherapy Evidence Database and SPORTDiscus, from inception until August 2022.

The search strategy followed the structure proposed by Terwee et al. [29] for the PubMed database: construct search (patient-reported outcomes specific to the foot and ankle); population search (non-pathological population); instrument search (questionnaires, scales, etc.); measurement properties (filters and exclusion filters).

The following search terms were used, together with the operators “OR” and “AND”: “Foot” [MeSH Terms], “Ankle” [MeSH Terms], “ability [MeSH Terms]”, “surveys, questionnaires, index” [MeSH Terms], cross-cultural, reliability, validity.

“foot” [Title/Abstract] AND “ankle” [Title/Abstract] AND “ability” [Title/Abstract] AND (“survey s” [All Fields] OR “surveyed” [All Fields] OR “surveying” [All Fields] OR “surveys and questionnaires” [MeSH Terms] OR (“surveys” [All Fields] AND “ques-

tionnaires" [All Fields]) OR "surveys and questionnaires" [All Fields] OR "survey" [All Fields] OR "surveys" [All Fields] OR ("questionnaire" [All Fields] OR "questionnaire s" [All Fields] OR "surveys and questionnaires" [MeSH Terms] OR ("surveys" [All Fields] AND "questionnaires" [All Fields]) OR "surveys and questionnaires" [All Fields] OR "questionnaire" [All Fields] OR "questionnaires" [All Fields]) OR ("abstracting and indexing" [MeSH Terms] OR ("abstracting" [All Fields] AND "indexing" [All Fields]) OR "abstracting and indexing" [All Fields] OR "index" [All Fields] OR "indexed" [All Fields] OR "indexes" [All Fields] OR "indexing" [All Fields] OR "indexation" [All Fields] OR "indexations" [All Fields] OR "indexe" [All Fields] OR "indexer" [All Fields] OR "indexers" [All Fields] OR "indexes" [All Fields]) OR "cross-cultural" [All Fields]) AND ("reliabilities" [All Fields] OR "reliability" [All Fields] OR "reliable" [All Fields] OR "reliability" [All Fields] OR "reliably" [All Fields]) AND ("valid" [All Fields] OR "validate" [All Fields] OR "validated" [All Fields] OR "validates" [All Fields] OR "validating" [All Fields] OR "validation" [All Fields] OR "validational" [All Fields] OR "validations" [All Fields] OR "validator" [All Fields] OR "validators" [All Fields] OR "validities" [All Fields] OR "validity" [All Fields])

2.2. Inclusion and Exclusion Criteria

The following inclusion criteria were applied:

Types of participants: Patients aged ≥ 18 years. The studies should be specifically focused on the validity and reliability of the FAAM questionnaire.

Types of study: Original questionnaire and transcultural adaptation of the FAAM.

The types of outcomes considered should be based on the CONsensus-based Standards for the selection of health Measurement Instruments (COSMIN) [30] (structural validity, internal consistency, reliability, measurement error, hypothesis testing for construct validity, cross-cultural validity/measurement invariance, criterion validity and responsiveness).

Exclusion criteria:

Studies that used the FAAM as an outcome measurement instrument or in which it was used in a validation study of other instruments or studies published in languages other than English were excluded.

2.3. Quality Appraisal

The updated COSMIN checklist was used to evaluate the methodological quality of the studies performed to investigate the measurement properties of each patient-reported outcome measure [31]. This standard can be used both to assess the methodological quality of studies of patient-reported outcome measures and to compare the measurement properties of various instruments, in a systematic review. Each of the properties observed was rated as sufficient ('+'), insufficient ('-') or doubtful ('?'). Measurement properties were considered with respect to four domains: reliability, validity, responsiveness and interpretability. The quality of each study on a measurement property was evaluated on a 4-point Likert scale as very good, adequate, doubtful or inadequate.

2.4. Study Selection

Two blinded reviewers evaluated all the studies obtained. Decisions on inclusion were based on consensus; in the case of disagreement, two further reviewers decided the issue.

2.5. Data Extraction

The study titles, abstracts and full texts were screened independently by two reviewers. The same reviewers undertook the second stage of screening, reading the full text of the articles selected. If any information was missing or uncertain, the study authors were to be contacted, but this was not necessary in this event. The following data extracted from the eligible studies were included: full title (original questionnaire or transcultural adaptation);

author and year of publication; population used for the validation process; subscales and items; and COSMIN criteria. No meta-analysis was carried out, due to the heterogeneity of the outcomes included in these studies.

3. Results

In the first stage of the review, 425 potential studies were identified, of which 318 were duplicated among the different databases and hence excluded. The remaining 107 were then screened, starting with an appraisal of the titles and abstracts. A total of 94 studies failed to meet the inclusion criteria and were discarded. Thus, we finally examined 13 full-text articles, all of which fully met the inclusion criteria. The flow of the process for study selection was based on the PRISMA statement for systematic reviews [28] (Figure 1).

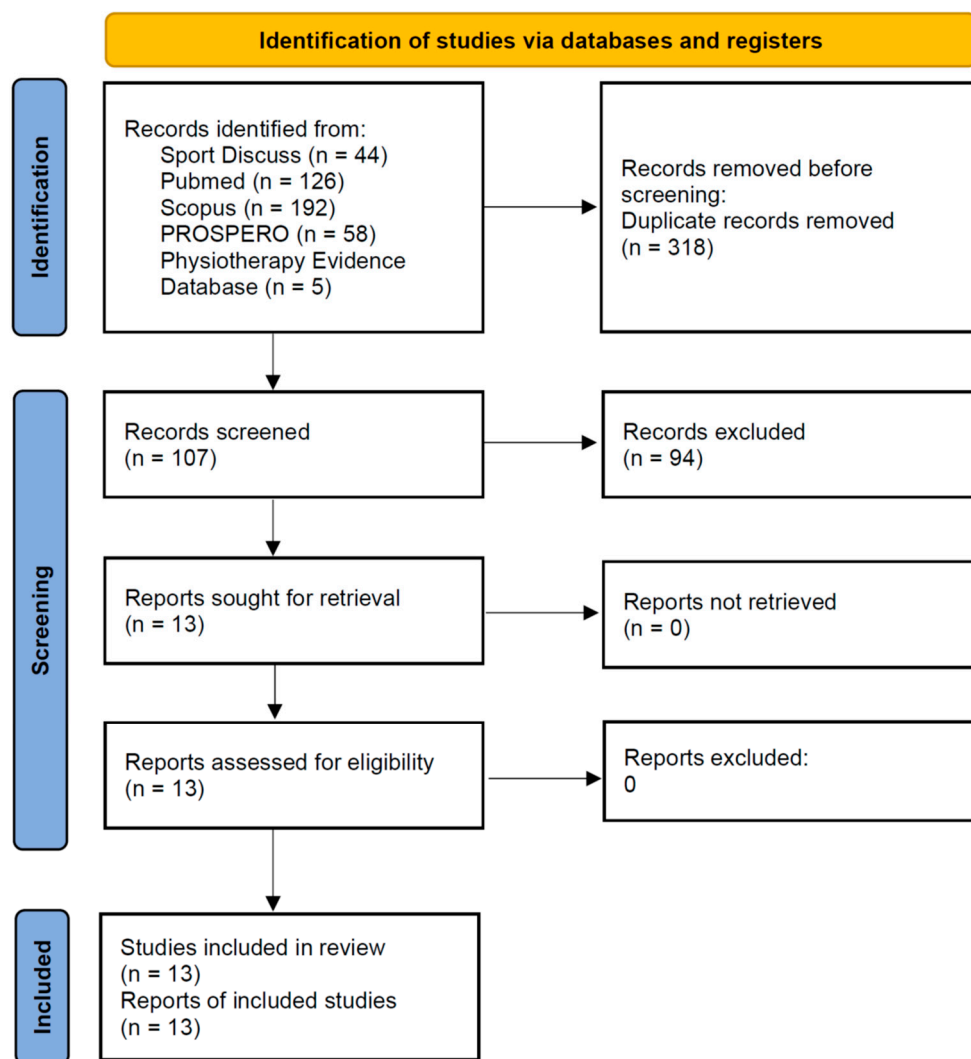


Figure 1. The PRISMA 2020 flow diagram.

3.1. Study Characteristics

The FAAM is a self-administered instrument which has been culturally adapted into twelve different languages (Table 1).

Table 1. Characteristics of the Foot and Ankle Ability Measure.

Title	Author(s)	Year of Publication	Country of Publication	Dimension and Structure	Population Used for Validation
Evidence of validity for the Foot and Ankle Ability Measure (FAAM)	Martin et al.	2005	USA	Two dimensions: ADL: 21 items; Sports: 8 items. Total: 29 items.	1027 patients: 391 Male (38.1%); 629 Female (61.2%); 7 No gender reported (0.7%). Mean age: 42 years (range: 8–83). Group 1 (Expected to change): 97 Male (59.15%); 67 Female (40.87%). Mean age: 41.2 years. Group 2 (Expected to remain stable): 47 Male (59.5%); 32 Female (40.5%). Mean age: 45.2 years.
Dual panel translation to Danish and Rasch validation of the Foot and Ankle Ability Measure (FAAM-Dk)	Obionu et al.	2021	Denmark (Cross-cultural adaptation)	Two dimensions: ADL: 15 items; Sports: 7 items. Total: 22 items.	206 patients of the 293 recruited initially (70%): 86 Male (41.7%); 120 Female (58.3%). Mean age: 49.5 years (range: 19–91). 99 patients with forefoot or midfoot pathology. 71 with hindfoot or ankle pathology. 36 with lower leg pathology.
Cross-cultural adaptation and validation of the Spanish version of The Foot and Ankle Ability Measure (FAAM-Sp)	Cervera-Garvi et al.	2017	Spain (Cross-cultural adaptation)	Two dimensions: ADL: 15 items; Sports: 8 items. Total: 23 items.	194 patients of the 204 recruited initially: Male: 64; Female: 130. Mean age: 38.45 years.
Foot and Ankle Ability Measure: cross-cultural translation and validation of the Italian version of the ADL module (FAAM-I/ADL)	Sartorio et al.	2014	Italy (Cross-cultural adaptation)	One dimension: ADL: 21 items; Total: 21 items.	67 subjects in two groups. Group 1 (Cross-cultural adaptation): 10 subjects: Male: 7 (70%); Female: 3 (30%). Average age: 43 years (range: 23–56). Group 2 (validation of FAAM-I): 57 subjects: Male: 33 (58%); Female: 24 (42%). Mean age 48.6 years (range: 18–78).
Reliability and validity of the Persian version of Foot and Ankle Ability Measure (FAAM) to measure functional limitations in patients with foot and ankle disorders.	Mazaheri et al.	2010	Iran (Cross-cultural adaptation)	Two dimensions: ADL: 14 items; Sports: 6 items. Total: 20 items.	93 patients (78.5%) diagnosed with lateral ankle sprain: Male: 74 (79.6%); Female: 19 (20.4%). Average age 27.58 years.

Table 1. *Cont.*

Title	Author(s)	Year of Publication	Country of Publication	Dimension and Structure	Population Used for Validation
Evidence for validity and reliability of a French version of the FAAM	Borloz et al.	2011	France (Cross-cultural adaptation)	Two dimensions: ADL: 21 items; Sports: 8 items. Total: 29 items.	105 patients of the 139 recruited initially (76%): Male: 41 (39%); Female: 64 (61%). Average age 50.5 years (range: 18–82). 55 patients (52%) with hindfoot pathology. 35 patients (33%) with forefoot pathology. 6 patients (6%) with midfoot pathology. 6 patients (6%) with non-specific pathology of the foot. 3 patients (3%) not specified.
Translation, cross-cultural adaptation and validation of the German version of the Foot and Ankle Ability Measure for patients with chronic ankle instability	Nauck et al.	2011	Germany (Cross-cultural adaptation)	Two dimensions: ADL: 21 items; Sports: 8 items. Total: 29 items.	109 participants. Group 1 (24 pre-surgical patients): Male: 13; Female: 11. Average age 23.8 years (range: 16–46). Group 2 (17 patients treated conservatively): Male: 10; Female: 7. Average age: 29.8 years (range: 13–49). Group 3 (31 sports students): Male:14; Female: 17. Average age 24.7 years (range: 20–35). Group 4 (37 volleyball players): Male:18; Female: 19. Average age years 25.8 (range: 17–35).
Evidence of validity for the Japanese version of the Foot and Ankle Ability Measure	Uematu et al.	2015	Japan (Cross-cultural adaptation)	Two dimensions: ADL: 21 items; Sports: 8 items. Total: 29 items.	83 participants: Male: 59 (71%); Female: 24 (29%). Average age 20.3 years (range: 18–24). 63 patients (76%) with pathology of the ankle. 19 patients (23%) with pathology of the foot. 1 patient (1%) with pathology of the toe.
Translation, cross-cultural adaptation and validity of the Brazilian version of the Foot and Ankle Ability Measure questionnaire.	Moreira et al.	2016	Brazil (Cross-cultural adaptation)	Two dimensions: ADL: 18 items; Sports: 8 items. Total: 26 items.	90 participants: Male: 43 (47.78%); Female: 47 (52.22%). Average age 37.05 years (range: 18–58).
Validity and reliability of Thai version of the Foot and Ankle Ability Measure (FAAM) subjective form.	Arunakul et al.	2015	Thailand	Two dimensions: ADL: 21 items; Sports: 8 items. Total: 29 items.	60 participants: Male: 18 (30%); Female: 42 (70%). Average age 47 years (range: 18–75).

Table 1. *Cont.*

Title	Author(s)	Year of Publication	Country of Publication	Dimension and Structure	Population Used for Validation
Evidence for reliability, validity and responsiveness of Turkish foot and ankle ability measure (FAAM)	Celik et al.	2016	Turkey (Cross-cultural adaptation)	Two dimensions: ADL: 21 items; Sports: 8 items. Total: 29 items.	176 participants. Group 1: ADL dimension: 98 participants: Male: 39; Female: 59. Average age 35 years (range: 16–71). Group 2: Sports dimension: 78 participants: Male: 33; Female:45. Average age 31.9 years (range: 17–64).
Foot and Ankle Ability Measure to measure functional limitations in patients with foot and ankle disorders: a Chinese cross-cultural adaptation and validation.			China (Cross-cultural adaptation)	Two dimensions: ADL: 21 items; Sports: 8 items. Total: 29 items.	294 participants: Male: 130; Female: 164. Average age 43.28 years.
Validity and reliability of a Dutch version of the Foot and Ankle Ability Measure.			Netherlands	Two dimensions: Total: 32 items.	369 participants: Male: 171 (46.3%); Female: 198 (53.7%). Average age 40.5 years (range: 23.4–50.9).

The studies considered included a total of 2673 participants. Of this population, 53.8% of the male patients and 62.3% of the female patients took part in transcultural adaptations. These persons were not classified according to the presence or absence of foot/ankle injuries. The average age of the participants was 38.38 years.

All the cross-cultural adaptations of the FAAM except the Italian version adapt both the ADL and the Sports activity subscales. Regarding the number of items incorporated in the cross-cultural adaptation, the Iranian version has the fewest, with 20 (ADL and Sports), and the Dutch has the most, with 32 (ADL and Sports).

3.2. Methodological Quality

The Spanish and original versions of FAAM achieved the best ratings for methodological quality according to the COSMIN criteria (Tables 2 and 3). Nevertheless, in general all the versions presented poor methodological quality. Thus, negative values were obtained for criterion validity in all cases except the German version, which correlated with the gold standard at ≥ 0.70 ($\rho = -0.819$ to -0.861 , $p = 0.00$). Other criteria that obtained poor or doubtful results due to missing or unknown data were measurement error (failure to define values of the minimal important change (MIC), smallest detectable change (SDC) or limits of agreement (LoA)), and structural validity and cross-cultural validity (in the latter case, with the exception of the Spanish version, which did record a positive value).

Table 2. Measurement properties of all versions of the FAAM.

Measurement Property	Structural Validity			Internal Consistency	Reliability	Measurement Error		Criterion Validity	Responsiveness
	Factor Structure	Variance %	CFA	Cronbach’s Alpha	ICC	SDC	MIC	Correlation	AUC
FAAM-original	ADL subscale: Group 1, one factor. Group 2, two factors.	ADL Group 1: 80.46% Group 2: 78.37%		0.98 Group 1 0.96 Group 2 (ADL) 0.98 Both groups (Sports)	0.89 (ADL) 0.87 (Sports)	ADL subscale: 5.7 points Sports subscale: 12.3 points	ADL subscale: 8 points Sports subscale: 9 points	SF-36: function subscale (0.84, 0.78), and physical component summary score (0.84,0.80) for ADL and Sports respectively.	(ADL) 0.80 (Sports) 0.72
FAAM-Danish								Inter-item correlation after extracting the Rasch factor: positive >0.3 of the total correlation of the mean.	
FAAM-Spanish	ADL subscale: 3 factors. Sports subscale: 1 factor.	ADL: 76.70%	ADL: (x 2/df) of 2.46, GFI 0.90 CFI 0.95, NFI 0.93 and RMSEA 0.08. Sports: (x 2/df) of 0.80, GFI 0.99 CFI 1.00, NFI 0.99 and RMSEA 0.00 (90% CI 0.00 to 0.75)	0.95 (ADL)	0.95 (ADL) 0.97 (Sports)			EuroQol-5D: ADL (-0.596) and Sports (-0.472).	
FAAM-Italian				0.96 (ADL)	0.98 (ADL)	ADL subscale: 7.5 points		LEFS: (0.66) for ADL subscale.	

Table 2. Cont.

Measurement Property	Structural Validity			Internal Consistency	Reliability	Measurement Error		Criterion Validity	Responsiveness
	Factor Structure	Variance %	CFA	Cronbach's Alpha	ICC	SDC	MIC	Correlation	AUC
FAAM-Persian				0.97 (ADL) 0.94 (Sports)	0.98 (ADL)	ADL subscale: 8.67 points Sports subscale: 9.78 points		SF-36: Physical function subscale (0.60, 0.53) and Physical health summary (0.61, 0.48) for ADL and Sports respectively.	
FAAM-French				0.97 (ADL)	0.97 (ADL) 0.94 (Sports)	ADL subscale: 7 points Sports subscale: 18 points		SF-36: Physical function subscale: (0.85, 0.72) and Physical health summary: (0.81, 0.72) for ADL and Sports, respectively.	
FAAM-German				From 0.492 to 0.947. Minimum value on the ADS subscale, Group 3.	0.590 to 0.998. (ADL)	ADL subscale: 3.73 points Sports subscale: 6.57 points		Good et al. ankle laxity classification system (−0.819 to −0.861) for ADL.	
FAAM-Japanese				0.99(ADL) 0.98 (Sports)	0.87 (ADL) 0.91 (Sports)	ADL subscale: 6.8 points Sports subscale: 13.7 points		SF-36: Physical function scale (0.86, 0.75) and Mental health subscale (r = 0.29 and 0.27) for ADL and Sports, respectively.	

Table 2. Cont.

Measurement Property	Structural Validity			Internal Consistency	Reliability	Measurement Error		Criterion Validity	Responsiveness
	Factor Structure	Variance %	CFA	Cronbach's Alpha	ICC	SDC	MIC	Correlation	AUC
FAAM-Brazilian				0.93 (ADL) 0.90 (Sports)	0.88 (ADL) 0.82 (Sports)	ADL subscale: 18.59 points Sports subscale: 32.45 points		SF-36: Physical function subscale: (0.78, 0.65) for ADL and Sports respectively.	
FAAM-Thai				0.94 (ADL) 0.88 (Sports)	0.80 (ADL) 0.77 (Sports)			SF-36: Physical functioning subscale: (0.59,0.53), Physical component summary: (0.54,0.5) for ADL and Sports, respectively.	
FAAM-Turkish				0.95 (ADL) 0.91 (Sports)	0.90 (ADL) (Sports)	ADL subscale: 15.5 points Sports subscale: 6.6 points		FFI: (0.70, 0.63) for the ADL and Sports subscales, respectively. SF-36: physical function (0.71,0.70) and physical component subscale (0.51,0.55), for ADL and Sports, respectively.	

Table 2. Cont.

Measurement Property	Structural Validity			Internal Consistency	Reliability	Measurement Error		Criterion Validity	Responsiveness
	Factor Structure	Variance %	CFA	Cronbach's Alpha	ICC	SDC	MIC	Correlation	AUC
FAAM-Chinese	ADL and Sports subscales: 2 factors.	>10%		0.879 (ADL) and 0.901 (Sports)	0.758 to 0.946 (ADL) 0.911 to 0.970 (Sports)	.		FFI: (0.861, 0.834) for ADL and Sports respectively. SF12v12: (0.298–0.842) for ADL and (r = 0.333–0.779) for Sports. EuroQoL-5D: ADL (0.775 [EQ5D] and 0.764 [EQ_VAS]). Sports (0.735 [EQ5D] and 0.715 [EQ_VAS]).	
FAAM-Dutch				0.97 (ADL) (Sports)	0.62 (Sports) 0.86 (ADL)	ADL subscale: 2.77 points Sports subscale: 4.32 points			

FAAM: Foot and Ankle Ability Measures; CFA: Confirmatory factor analysis; ICC: Intraclass correlation coefficient; SDC: Smallest detectable change; LoA: Limits of agreement; MIC: Minimal important change; AUC: Area under the curve; ADL: Activities of daily life; SF-36: Short Form-36; SF-36 PF: Short Form-36 physical function; GFI: Goodness of fit; CFI: Comparative fit index; NFI: Normed fit index; RMSEA: Root mean square error of approximation; FFI: Foot Function Index; FAOS: Foot and ankle outcome score; QoL: Quality of life; NRS: Numeric rating scale.

Table 3. COSMIN Rating FAAM.

	Structural Validity	Internal Consistency	Reliability	Measurement Error	Hypothesis Testing for Construct Validity	Cross-Cultural Validity	Criterion Validity	Responsiveness
Spanish	+	+	+	?	+	+	-	+
Italian	?	+	+	?	?	?	-	?
French	?	+	+	?	+	?	-	+
German	?	-	-	?	+	?	+	+
Japanese	?	+	+	?	?	?	-	?
Chinese	?	+	+	?	?	?	-	?
Thai	?	+	+	?	?	?	-	?
Persian	?	+	+	?	+	?	-	+
Brazilian	?	+	+	?	?	?	-	?
Danish	-	?	?	?	?	?	-	?
Dutch	?	+	-	?	+	?	-	+
Turkish	?	+	+	?	+	?	-	+
Original	?	+	+	-	+	+	-	+

Rating: “+”: Positive; “?”: Doubtful; “-”: Negative.

3.3. Methodological Quality According to Measurement Properties

In addition to the above, we evaluated the methodological quality of the best-rated patient-reported outcome measures, using COSMIN criteria to classify this quality as very good, adequate, doubtful, or inadequate (see Table 4). In this respect, the Spanish and original-language versions of the FAAM achieved positive scores. The next best were the French, Persian and Turkish versions. In the context of the low overall score, the FAAM-Sp was rated highest, with “Very good” ratings for structural validity, internal consistency, cross-cultural validity and criterion validity. However, it obtained a ‘Doubtful’ rating for measurement error.

Table 4. Methodological quality scores per PROM.

PROMs	PROM Development	Content Validity	Structural Validity	Internal Consistency	Cross-Cultural Validity	Reliability	Measurement Error	Criterion Validity	Hypothesis Testing for Construct Validity	Responsiveness
FAAM-French	Inadequate	Inadequate	Not applicable	Very good	Doubtful	Adequate	Doubtful	Very good	Doubtful	Doubtful
FAAM-Persian	Inadequate	Inadequate	Not applicable	Very good	Doubtful	Adequate	Doubtful	Very good	Doubtful	Doubtful
FAAM-Turkish	Doubtful	Doubtful	Not applicable	Very good	Doubtful	Adequate	Doubtful	Very good	Doubtful	Doubtful
FAAM-Spanish	Adequate	Adequate	Very good	Very good	Very good	Adequate	Doubtful	Very good	Adequate	Adequate
FAAM-Original	Doubtful	Doubtful	Adequate	Very good	Doubtful	Adequate	Doubtful	Very good	Adequate	Adequate

FAAM: Foot and Ankle Ability Measures; PROMs: Patient-reported outcome measures.

4. Discussion

The purpose of this review is to evaluate the methodological quality of the original version of the FAAM and that of its successive cultural adaptations.

According to our findings, the Spanish version of the FAAM [26] had the best methodological quality, followed by the original version [15] although the latter was only classed as 'Adequate' or 'Doubtful' for most measurement properties.

The original FAAM consists of two subscales, ADL and Sports, with a total of 29 items. It is intended for use with patients presenting foot and/or ankle injuries, without specifying any in particular. Most of the cross-cultural adaptations made of the FAAM differ in the number of total items (ADL and Sports), ranging from 20, in the Persian [17] and Thai [22] versions, to 32 in the Dutch [25] version. None include a group factor analysis to detect differences in factors such as age, gender or language. The populations addressed vary among the different versions, although in most cases female patients are in the majority. A similar variety can be observed in the foot/ankle pathologies presented. Some versions, such as the Danish [27] and French [18], categorise patients according to the location of the injury (forefoot, rearfoot or midfoot), while the Persian and German versions include patients with pathologies specifically affecting the ankle (mainly sprains and chronic ankle instability). The Italian [16], Persian [17], Brazilian [21], Turkish [23] and Chinese [24] versions record which limb was affected (i.e., left or right). Only the Italian version performs a cross-cultural adaptation of the ADL subscale. Regarding the time needed to complete the questionnaire, only the Spanish, Turkish and Brazilian versions stipulate the exact time required, this being shortest for the Spanish version (3.83 min, SD 0.99, for 29 items) and longest for the Brazilian version (7 min for 26 items).

The COSMIN classification shows that all versions of the FAAM, in general, are of low methodological quality. Only the Spanish version obtained positive values for six criteria (having failed on criterion validity and measurement error, which were classed as negative and doubtful, respectively). The remaining versions also obtained negative or doubtful values for these criteria, with one exception, that of the German version [19], which scored positively for criterion validity. The latter aspect is significant, as it is important to ensure exactly what is being measured, because if the criterion is influenced by other conditions affecting the leg/foot, it can be difficult to determine the degree of injury. Another critical aspect is that of the cross-cultural validity criterion, since if this validity is not achieved, there is no guarantee that the FAAMs physical function in the same way as in the other cultures. And in this respect, all of the versions except the Spanish one were classed as 'Doubtful'. On the other hand, most of the versions obtained a positive rating for internal consistency (Cronbach's $\alpha \geq 0.70$ for each of the subscales). The only exceptions to this were the Danish and German versions, which were rated 'Doubtful' and 'Negative', respectively. Most of the versions also obtained a positive score for responsiveness, which indicates that the instrument is sufficiently sensitive to change. This is particularly important in clinical practice, since a patient-reported outcome measure must be able to determine whether the patient is experiencing important changes during the recovery process, as this information may influence the intensity and duration of treatment.

In terms of measurement properties, the Spanish version of the FAAM presented the best quality. The next best was the original version. The latter only scored 'Doubtful' for PROM development and content validity, and 'Adequate' for structural validity, while the Spanish version was rated as 'Adequate' or 'Very good' for all these properties.

Regarding the clinical implications considered, the FAAM is an instrument of fundamental importance for assessing the physical function in patients presenting musculoskeletal injuries to the foot and/or ankle. Accordingly, any cross-cultural adaptation must be performed with methodological rigour in order to ensure the results obtained are valid,

reliable and sensitive to change, and thus fully suitable for assessing the patient's condition. Our review reveals the deficiencies present in many of the cross-cultural adaptations made of this instrument, highlighting the need for caution in their use.

The main strength of the present study is the rigorous method employed for the systematic review, which included a blinded peer-review and quality appraisal using a standard method, COSMIN. Nevertheless, our review also has certain limitations, which should be acknowledged. The first is the incompleteness, in some cases, of the data obtained. Furthermore, there was some heterogeneity among the studies considered regarding the type of subjects included. Some included only healthy volunteers while others selected both healthy persons and patients with specific pathologies. Moreover, many studies were characterised by a male/female imbalance among the participants.

In conclusion, according to the COSMIN criteria, the Spanish-language adaptation of the FAAM presented the best quality, and can be considered valid, reliable and sensitive to change.

5. Conclusions

The Spanish-language cultural adaptation of the FAAM presents adequate methodological quality. Further studies, with greater methodological rigour, are required of the cultural adaptations of this measurement instrument.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/japma1160224070/s1>, PRISMA 2020 Checklist.

Author Contributions: Conceptualisation, A.B.O.-A., S.S.-M. and P.C.-G.; methodology, P.C.-G. and A.B.O.-A.; validation, S.S.-M., J.G.-M and M.H.G.-H.; formal analysis, S.S.-M. and J.G.-M.; investigation, S.S.-M. and J.G.-M.; resources, A.M.-R.; data curation, A.B.O.-A. and P.C.-G.; writing—original draft preparation, S.S.-M. and J.G.-M.; writing—review and editing, A.B.O.-A. and P.C.-G.; visualisation, A.M.-R.; supervision, A.B.O.-A.; project administration, A.B.O.-A.; funding acquisition, A.B.O.-A. All authors have read and agreed to the published version of the manuscript.

Funding: This study received external funding, from the University of Málaga to this project, for the paper translation (Project B1-2019-09). In addition, this work is part of a government-funded project supported by the University Teacher Training Programme (FPU) of the Ministry of Science, Innovation and Universities of Spain. Grant number FPU22/03736, ISCED code 091.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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