Foot and Ankle Surgery xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Foot and Ankle Surgery

journal homepage: www.journals.elsevier.com/foot-and-ankle-surgery

EFAS Score - validation of the Norwegien version by the Score Committee of the European Foot and Ankle Society (EFAS)

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ARTICLE INFO

Keywords:
Score
Foot
Ankle
Validation
Patient reported Outcome Measure (PROM)
Norwegian

ABSTRACT

Background: The Score Committee of the European Foot and Ankle Society (EFAS) developed, validated, and published the EFAS Score in 16 languages. Currently, the Norwegian version completed data acquisition and was further validated.
Methods: The data were collected pre-operatively and post-operatively at a minimum follow-up of 3 months and mean follow-up of 6 months. Item reduction, scale exploration, confirmatory analyses and responsiveness were performed using classical test theory and item response theory.
Results: The internal consistency was confirmed in the Norwegian version (Cronbach's Alpha 0.86). The Standard Error of Measurement (SEM) was 0.31 and is similar to other language versions. Between baseline and follow-up, 77% of patients showed an improvement on their EFAS score, with good responsiveness (effect size 1.05).
Conclusions: The Norwegian EFAS Score version was successfully validated in patients with a wide variety of foot and ankle pathologies. All score versions are freely available at www.efas.net.

1. Introduction

The Score Committee of the European Foot and Ankle Society (EFAS) developed, validated, and published the EFAS Score in 16 languages (English, German, French, Italian, Polish, Dutch, Swedish, Finnish, Turkish, Persian, Portuguese, Spanish, Estonian, Danish, Mandarin, Cantonese (in order of validation)) [1–7]. The EFAS score covers pain and physical function, and is internally consistent, unidimensional and responsive to change in samples of orthopaedic foot and ankle surgery patients [1]. The score contains six questions. The maximum score is 24 points (best possible), and the minimum 0 points (worst possible) [1]. Language-specific cross-cultural validation of a given score is necessary

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https://doi.org/10.1016/j.fas.2026.06.001
1268-7731/

Please cite this article as: M. Richter, P.-H. Agren, J.-L. Besse et al., EFAS Score - validation of the Norwegien version by the Score Committee of the European Foot and Ankle Society (EFAS), Foot and Ankle Surgery, https://doi.org/10.1016/j.fas.2026.06.001

because simple translation of a validated score does not necessarily result in an instrument that provides valid scores in the target language [1]. This issue is especially important for Europe, where numerous languages are spoken [1]. The most widely spoken mother tongues in Europe are German (20%), English (15%), Italian (15%), French (14%), Spanish (9%), Polish (9%), Romanian (6%), Dutch (5%), Hungarian (3%) and Portuguese, Greek, Swedish, Czech and Bulgarian (2% each) [7]. After having initially validated the EFAS Score in seven languages (English, German, French, Italian, Polish, Dutch, Swedish), the data acquisition in 17 other languages (Arabic, Cantonese, Catalan, Estonian, Finnish, Greek, Hungarian, Latvian, Norwegian, Mandarin, Persian, Portuguese, Slovak, Slovenian, Spanish, Turkish, Welsh) started at different timepoints. The Finnish and Turkish data acquisition, analysis and publication was completed in 2020, Persian in 2021, Portuguese in 2022, Spanish and Estonian in 2023, Danish in 2024, and Cantonese and Mandarin in 2025[1–7]. Data acquisition in Norwegian was currently completed, and the results of the validation process are presented.

2. Methods [1]

The EFAS patient-reported outcome measure (PROM), the 'EFAS Score', was developed and validated in three stages: 1) item identification, 2) item reduction and scale exploration, 3) confirmatory analyses and responsiveness [1]. Fig. 1

2.1. Type of score (initial score development) [1]

A questionnaire-based PROM, with a 5-point Likert scale (0–4) was chosen [1].

2.2. Questions - Item identification (initial score development) [1]

In the first stage of the initial validation, potentially relevant items from existing questionnaires were identified [1]. Given the low relevance of items related to sports activities for some diagnostic groups, it was decided at this point to develop two separate scores: a general item score and a sports-specific score [1]. In total, 31 general items and 7 sports-specific items were taken forward into the second phase of the project [1].

2.3. Item reduction and scale exploration (initial score development) [1]

Through a process of forward and backward translation performed by bilingual translators, the original English pool of 38 items was translated into German, French and Swedish [1]. These four language versions were then used for the Stage 2 data collection [1]. Participants were recruited from orthopaedic foot and ankle surgery departments [1]. Inclusion criteria for participants were clinical and imaging indications for foot and ankle surgery and age ≥ 18 years [1]. No exclusion criteria were used other than an inability to complete a written questionnaire [1]. Data collection was performed in France, Germany, Sweden and Ireland [1]. In addition to providing an answer to each item on a 5-point scale, all participants also rated the relevance of the item to their situation on a 5-point scale [1].

Following data collection, the following analytic steps were taken to reduce the item pool into one general PROM and one sports PROM [1].

1. Items with a ceiling effect, low perceived relevance and a high proportion of missing values were noted and shortlisted for exclusion in subsequent steps [1].

2. A principal component analysis (PCA) was performed [1]. At the end of this step, the remaining items in their respective principal components would provide optimal scale reliability according to classic test theory [1].
3. An item-response theory (IRT) analysis was performed for each of the identified scales (i.e., principal components) to further reduce the number of items and optimize scale unidimensional l [1].

2.4. Confirmatory analysis and responsiveness (initial score validation) [1]

Data collection for this final stage of the initial validation took place in the four original language versions, as well as Dutch, Italian and Polish [1].

2.5. Confirmatory analysis and responsiveness Norwegian version

Data collection stage of the validation was performed in Norway. Inclusion criteria for participants were being scheduled for foot and ankle surgery and age ≥ 18 years. No exclusion criteria were used other

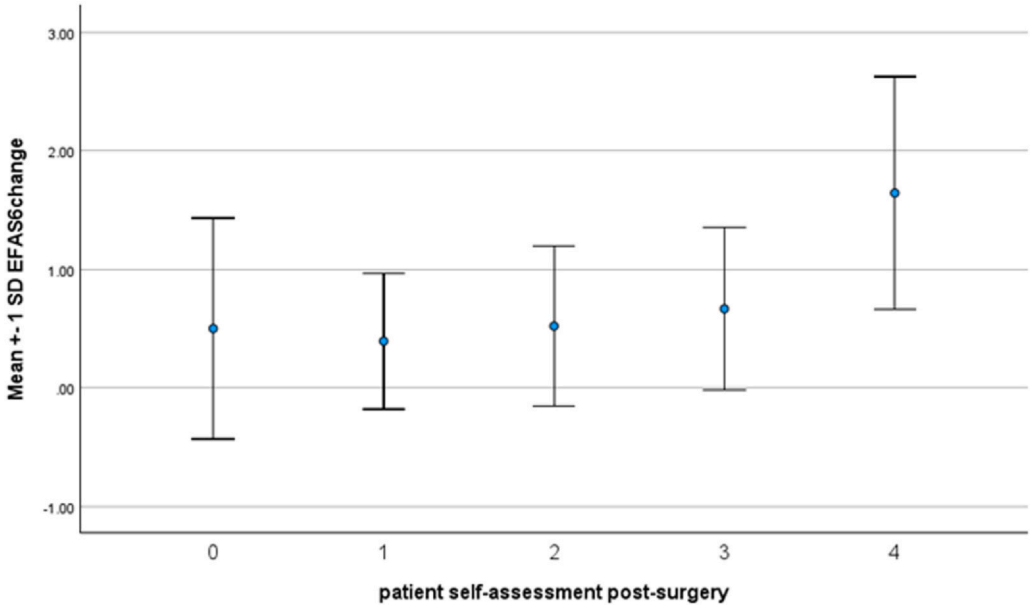

Fig. 1. Association between change in Norwegian EFAS Score version from pre- to post-surgery and patient self-reported improvement.

Table 1
Norwegian demographic data. N = sample size; F = Female; L/R/B = Left/Right/Both; N/A = not available.

n	Age (mean ± SD)	Sex(% F)	Affected side(% L/R/B)
100	48.8 ± 15.9	73.0	45.0/55.0/0.0

than an inability to complete a written questionnaire. Data were collected pre-operatively and at postoperative follow-up. A minimum postoperative follow-up of 3 months and mean follow-up of 6 months were planned, with a target of at least 100 completed score sheets. To confirm the internal consistency for each language version, Cronbach's Alpha of the EFAS Score was computed for each language version separately [1]. To establish the responsiveness of the EFAS Scores, both distribution-based and criterion-based analyses were used [1]. Distribution-based measures of responsiveness included the effect size (ES) and minimal important difference (MID) [1]. The criterion-based measure of responsiveness used was the linear association (Spearman correlation) between improvement on the EFAS Score and a 5-point Likert scale anchor question: did the surgery improve the foot and/or ankle problem? (0 = no, not at all; 4 = yes, very much) [1].

The ES was calculated as the difference between the baseline and three to six-month follow-up mean EFAS Score, divided by the standard deviation of the baseline EFAS Score [1].

The MID was considered to be equal to the standard error of measurement (SEM) of the baseline EFAS Score. The SEM was calculated as [1]:

$$SEM = SD^* \quad \sqrt{1 - r} \qquad (1)$$

where:

SD = standard deviation of the EFAS Score baseline score

r = value of Cronbach's Alpha for the EFAS Score at baseline.

To assess the responsiveness of the EFAS Score using the MID, the percentage of participants with an improvement in their EFAS Score between baseline and follow-up exceeding the MID was identified [1].

Statistical analyses were performed in SPSS (IBM SPSS Statistics 28.0.1, IBM, Armonk, NY, USA). The IRT modelling was performed in XCalibre 4 (Assessment Systems, Stillwater, MN, USA).

2.6. Ethics

Approvals from the relevant ethical committees in different contributing countries were obtained, adhering to local legislation.

3. Results

Table 1 shows the language-specific demographic data and Table 2 diagnoses for the patient samples.

3.1. Confirmatory analyses and responsiveness (Table 3)

The internal consistency was confirmed in the Norwegian version (Cronbach's Alpha 0.86). The Standard Error of Measurement (SEM) was 0.31 and is similar to other language versions. Between baseline and follow-up, 77% of patients showed an improvement on their EFAS score, with good responsiveness (effect size 1.05). Table 3

Table 3
Responsiveness of the EFAS Score Norwegian version.

Duration of follow up in days: mean (std)	209 (71)
DISTRIBUTION-BASED METRICS	
Effect Size	1.05
SEM (baseline)	0.31
% of patients improving > SEM	77.2
ANCHOR-BASED METRIC	
Pearson correlation between change in EFAS-PROM and patient-reported improvement	0.52

SEM, Standard Error of Measurement

4. Discussion

Following the results of the present study, we conclude that the EFAS Score was successfully cross-culturally validated. The internal consistency was high and comparable to other language versions [1–7]. The precision (SEM) was adequate and similar to other language versions. Between baseline and follow-up, 77% of patients showed an improvement on their EFAS score, which demonstrates that the Norwegian EFAS score has adequate responsiveness. Not all measurement properties of the EFAS Score have been established [1–7]. In particular test-retest reliability, i.e. reproducibility of the score in a stable (pre-surgery) population, was not included in the initial validation and the present study [1–7]. The MID as reported in this and the initial validation study was based on the internal consistency of the scale (Cronbach's Alpha) rather than test-retest reliability [1–7]. Should test-retest reliability data become available, this may lead to an adjustment in the SEM and therefore MID of the EFAS Scores.

During validation, the primary investigator noticed that question 3 could cause confusion. At the 6-month review, some patients chose to circle 0 instead of 4 because their gait had improved so much post-operatively. They interpreted the extreme change from a limping gait pre-operatively to a normal gait at follow-up. This is, however, the opposite of what is intended by the questionnaire. The primary investigator frequently had to clarify the patients´ understanding of this point. He observed this in about 10% of cases. [1–7]. Should test-retest reliability data become available, this may lead to an adjustment in the SEM and therefore MID of the EFAS Scores.

During validation, the primary investigator noticed that question 3 could cause confusion. At the 6-month review, some patients chose to circle 0 instead of 4 because their gait had improved so much post-operatively. They interpreted the extreme change from a limping gait pre-operatively to a normal gait at follow-up. This is, however, the opposite of what is intended by the questionnaire. The primary investigator frequently had to clarify the patients´ understanding of this point. This issue had not been observed in previous validations [1–7].

We identified some differences between the Norwegian cohort and the previous cohorts from other countries/languages [1–7]. The prevalence of osteoarthritis (International Statistical Classification of Diseases and Related Health Problems (ICD) M19) with 0% was lower than in all other cohorts [1–7]. The highest prevalence of osteoarthritis was observed in the German cohort with 37%. In contrast, the prevalence of soft-tissue disorders (ICD M60-M79) with 82% was higher than all other cohorts [1–7]. We interpret that the low prevalence of osteoarthritis and high prevalence of soft-tissue disorders in the Norwegian cohort reflects the type of practice and pathologies that were in focus in the included institutions rather than

Table 2
Prevalence of primary diagnoses, in %, based on ICD−10 codes Norwegian data.

Osteoarthritis(M19)	Deformities(M20−21, Q66)	Soft-tissue disorders(M60−79)	Other musculoskeletal (M)	Other diagnoses
0.0	2.0	82.0	7.0	9.0

international differences. Arthritic patients were transferred to another institution when surgery is indicated. These wide variances of pathologies reflect the international differences and differences of the included institutions, and also shows the robustness of the EFAS Score.

The process to develop the EFAS Sports Score was not successfully completed during the initial validation study [1]. The questions related to sports activities were not relevant to a large proportion of the patient samples, and suffered from a high proportion of missing values [1–7]. This implies that the IRT modelling did not result in a unidimensional EFAS Sports Score [1–7]. Based on the findings of the IRT model, a 4-item EFAS Sports Score could be considered, as this was the best-performing option [1–7]. The EFAS Sports Score was included in the data acquisition of all languages because this was part of the initially defined validation process that was decided not be changed during the process [1–7]}.

In conclusion, the Norwegian EFAS Score version was successfully validated in the foot and ankle surgery patients, including a wide variety of foot and ankle pathologies. All score versions are freely available at www.efas.net.

Acknowledgements

The EFAS Score Committee thanks Jeanette Nesee Kristiansen and Marianne Jenack, Majens Ortopedisk Kirurgi / Kase Klinikken, Moss, Norway for their valuable contribution to the study.

Appendices

Appendix 1, EFAS Score, Norwegian version

EUROPEAN FOOT AND ANKLE SOCIETY (EFAS)

www.efas.co

EFAS Score

Nedenfor finner du 6 spørsmål knyttet til fot- og / eller ankelproblemet ditt.

Vennligst svar på hvert spørsmål ved å velge svaret som best beskriver situasjonen din i forrige uke. Hvert spørsmål kan besvares på en 5-punkts skala, med beskrivelser gitt for de to endepunktene i skalaen.

Hvis et spørsmål ikke gjelder for deg, vennligst oppgi dette ved å merke U/A-boksen til venstre.

SPØRSMÅL

No.	Spørsmål	Svar
1 U/A ◯	Har du smerte i foten og / eller ankelen når du er i ro?	Alltid 0 1 2 3 Aldri 4
2 U/A ◯	Hvor langt kan du gå før du får smerte i foten og / eller ankelen	Umulig 0 1 2 3 Ingen begrensning 4
3 U/A ◯	Hvor mye har gangen din (dvs. måten du går) endret seg på grunn av fot- og / eller ankelproblemet ditt?	Uttalt endring av gangen 0 1 2 3 Ingen endring 4
4 U/A ◯	Har du problemer med å gå på ujevne overflater?	Alltid 0 1 2 3 Aldri 4
5 U/A ◯	Har du smerte i foten og / eller ankelen når du går?	Alltid 0 1 2 3 Aldri 4
6 U/A ◯	Hvor ofte opplever du smerte i foten og / eller ankelen under fysisk aktivitet?	Alltid 0 1 2 3 Aldri 4

SPORTSPØRSMÅL

Vennligst svar bare på disse spørsmålene hvis du regelmessig driver med sportsaktiviteter, hvis et bestemt spørsmål ikke gjelder din valgte sport, vennligst sjekk U/A-boksen

No.	Spørsmål	Svar
S1 U/A ◯	Kan du løpe??	Umulig 0 1 2 3 4 Ingen begrensning
S2 U/A ◯	Kan du jogge??	Umulig 0 1 2 3 4 Ingen begrensning
S3 U/A ◯	Har du problemer med å lande etter hopping?	Umulig 0 1 2 3 4 Ingen begrensning
S4 U/A ◯	Er du i stand til å utføre sportsaktiviteten din med vanlig teknikk?	Umulig 0 1 2 3 4 Ingen begrensning

Du er nå ferdig med denne undersøkelsen. Tusen takk for samarbeidet!

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