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Validation and evaluation of the Russian version of the SEFAS questionnaire for assessing foot and ankle in surgically treated patients with forefoot disorders

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Abstract

Introduction The Self-reported Foot and Ankle Score (SEFAS) is one of the foot health assessment tools in Sweden. Validation procedures, reliability, validity, sensitivity, approval are essential for the Russian version of the questionnaire with a new language environment.

The objective was to validate the Russian version of the SEFAS questionnaire and approve the tool in the Russian surgical patients with foot disorders.

Material and methods The questionnaires the patients completed preoperatively included SEFAS, SF-36, a general health survey questionnaire, and the Lower Extremity Functional Scale (LEFS). Patients were requested to complete the SEFAS questionnaire at 2 months of surgery to assess the sensitivity of the instrument. Based on the case histories clinical researcher recorded general and physical parameters of the patients to include gender, age, socio-demographic data, nature of the foot disorder, a dorsiflexion angle of the first metatarsophalangeal joint. To assess the reproducibility of the Russian version of the questionnaire, some patients were requested to complete the SEFAS questionnaire twice preoperatively with an interval of one day.

Results The questionnaire was characterized by good internal consistency and reproducibility indicating acceptable reliability of the Russian version of SEFAS. Statistically significant correlations of varying strength were seen between the SF-36 scores and nearly all the selected questions of the SEFAS Russian version. Statistically significant correlations (moderate to weak) were observed between the LEFS total score and the selected SEFAS questions. Minimal clinically significant changes in MCID scored 3 in the assessment of clinical interpretability of the Russian version of SEFAS.

Discussion The study demonstrated the reliability, validity and sensitivity of the Russian version of the SEFAS questionnaire. The questionnaire appeared to be an informative and clinically interpretable instrument for assessing foot in surgical adult patients with foot disorders.

Conclusion The SEFAS questionnaire can be recommended for Russian trauma and orthopaedic practice to learn the patient's opinion of the condition.

Keywords: foot and ankle function assessment, questionnaire, validation, testing, quality of life

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INTRODUCTION

The foot performs the most important functions of support and locomotion and can be more susceptible to pathological changes associated with external and internal causes as compared to other musculoskeletal components [1–5]. Surgery is an effective treatment option for patients with a foot pathology [6–8]. In addition to clinical and radiological examination the patient's opinion regarding the effect of orthopaedic condition and the treatment on daily activities and various aspects of life is essential for management of patients with musculoskeletal disorders at the decision-making stage in accordance with modern international recommendations determining the effectiveness of surgical treatment and rehabilitation [9–11]. Self-reported Foot and Ankle Score (SEFAS) is one of the tools recommended by the international orthopedic community to assess foot and/or ankle joint in various pathologies, including evaluations after surgical treatment. SEFAS, the national quality register for foot and ankle surgery was developed in Sweden [12]. The SEFAS questionnaire developed by M. Coster et al. in 2007, based on the General Ankle Function Questionnaire, demonstrated good psychometric properties of the instrument [12–14]. The questionnaire contains 12 items, with 5 response options. Patients score each question on a five-point Likert scale scored from 0 to 4, with 0 representing the worst stage and the sum of 48 representing normal function. The structure of the questionnaire also allows us to assess such aspects as pain, function and limitation of function, which are not in separate scales [12]. Language versions of the SEFAS questionnaire have been developed for use in Germany, Denmark, Spain and France [15–18]. The results of linguistic and cultural adaptation of the Russian SEFAS version were published earlier [19]. As recommended by international methodological standards [20, 21], development of a new language version of the questionnaire to be used in research and clinical practice with a new language environment suggests a validation procedure to assess the psychometric properties: reliability, validity and sensitivity and testing to determine the applicability and clinical interpretability of the questionnaire for a population of patients with a specific pathology. Clinical interpretability of the questionnaire suggests the analysis of the minimal clinically important changes (MCIC) [22] identified during its use and demonstration of their presence in the focal population of patients after treatment.

The purpose of the work was to validate the Russian version of the SEFAS questionnaire and test the instrument in the domestic population of surgical patients with foot pathology.

MATERIAL AND METHODS

The study was performed between April and July 2023 at the trauma department No. 2 of the Pirogov High Medical Technologies Clinic of the St. Petersburg State University. The study protocol was approved by the Biomedical Ethics Committee of the Pirogov High Medical Technologies Clinic of the St. Petersburg State University (protocol No. 07/22 dated 07/07/2022). The study included adult patients with foot pathology requiring surgical treatment, provided they were able to complete the questionnaires. The patients signed informed consent. The study did not include patients with cognitive impairments that prevented adequate completion of the questionnaires. Three questionnaires the patients completed before surgery included SEFAS, health-related quality of life questionnaire SF-36, and the Lower Extremity Functional Scale (LEFS). Patients were requested to fill out the SEFAS questionnaire at 2 months of surgery to assess the sensitivity of the instrument. General and clinical parameters a research physician recorded for each patient included gender, age, socio-demographic data, the nature of the foot pathology and the dorsiflexion (DF) angle at the first metatarsophalangeal joint (MTP1). Some patients were requested to fill out the SEFAS questionnaire twice before the surgery with an interval of one day to assess the reproducibility of the Russian version.

The RAND SF-36 is the most widely used health-related quality of life (HRQoL) survey instrument that can be used to measure the HRQoL in healthy individuals, patients with chronic diseases, including orthopaedic conditions [23]. The survey was constructed for self-administration by persons 14 years

of age and over and consisted of 36 items tapping eight health concepts: physical functioning (PF), physical role functioning (PRF), bodily pain (BP), general health perceptions (GHP), vitality (V), social role functioning (SRF), emotional role functioning (ERF), mental health (MH). Each of the items include 2 to 10 questions with response choices from 2 to 6 offered. Patients can state their answers on a 3-point Likert scale. The weighted answers are calculated into a score between 0 and 100 for each scale. Higher scores indicate better health status.

LEFS is a lower extremity functional assessment scale developed in 1999 by J.M. Binkley et al. [24].It is a 20-item self-report measure in which each item is scored on a five-point gradient: 0, extreme difficulty or unable to perform activity; and 4, no difficulty. The total score may vary from 0 to 80 points, with higher scores indicating better levels of lower extremity function.

The methods chosen for validating the Russian version of the SEFAS questionnaire are based on the approaches used in testing the psychometric properties of the original version of the instrument [13] and developing versions in other languages [15–18], and modern expert recommendations for the use of new language versions of questionnaires [20]. Validation suggested solution of the following tasks:

— reliability analysis was performed through assessment of the internal consistency of the questionnaire by calculating the Cronbach's α coefficient, of the reproducibility of the questionnaire using the test-retest method: for this, patients who had no treatments being in a stable condition were requested to fill out the questionnaire twice with an interval of one day (n = 20) to compare the total SEFAS score at two study points and assess correlations between its values at two study points;

— review of **validity** suggested assessment of the several types:

- assessment of *criterion validity* was based on the correlation of the total SEFAS score and the dorsiflexion angle (DA) in the first metatarsophalangeal joint (MTP1);
- analysis of *discriminant validity* was performed using the "known groups" method based on comparison of SEFAS scores in groups of patients with intact range of motion/mild impairment and with moderate/severe impairment in range of motion according to measurements of the TS angle in MCP1;
- analysis of *convergent validity* was based on the assessment of correlations between SEFAS scores, and SF-36 and LEFS scores;

— *sensitivity* analysis was based on determining the effect size (ES) of changes in the questionnaire filled out by patients before surgery and at 2 months of operation.

Feasibility of the Russian version of SEFAS in the focal population of patients was examined based on an assessment of the understandability and ease of its completion by patients, analysis of the quality of data, and the percentage of minimum and maximum values of the total preoperative SEFAS score. The clinical interpretability of the Russian version of the questionnaire was also determined by calculating the minimum clinically important differences (MCID) in the total SEFAS score. After this, the proportion of patients who had MCID after surgical treatment was analyzed in the overall sample and separately in the group of athletes and in the group of patients who were not athletes.

Statistical analysis. Data are presented as numbers of observations, arithmetic means, standard deviations, 95 % confidence intervals (95 % CI) and percentages. Pattern of distribution was identified with the Shapiro – Wilk and Kolmogorov – Smirnov tests with choice of a criterion for testing the statistical significance of differences between the parameters. Student's t-test was used to compare two unrelated groups with a comparison criterion for two samples. The nonparametric Wilcoxon signed rank test was used to compare two related groups. The intraclass correlation coefficient (ICC) was used to assess the relationship between parameters at two points of questionnairing within the test-retest method. Spearman r correlations were used to assess the relationship

between the parameters of different questionnaires. The strength of the correlation was considered by the *r* value: with $0.1 < r < 0.39$ indicating weak connection, with $0.4 \leqslant r < 0.69$ showing moderate connection and with $r \geqslant 0.7$ indicating strong connection [25]. Cronbach's α coefficient was calculated to identify the internal consistency of the questionnaire. Effect sizes (ES) were determined to examine changes in scores over time using the SEFAS questionnaire. Effect sizes were considered small with ES = 0.2–0.5, medium with ES = 0.5–0.8, and large with ES > 0.8 [26]. The magnitude of minimal clinically important differences (MCID) according to the SEFAS questionnaire was determined based on the calculation of the standard error of the mean (SEM) [27]. Formula for calculation: $SEM = SD \times \sqrt{1-\alpha}$, where SD was the standard deviation, α was the value of the Cronbach alpha coefficient for SEFAS. All tests were two-sided, differences between the groups were considered statistically significant at $p < 0.05$. Statistical analysis was performed using SPSS 23.0 software.

RESULTS

Characterization of the sample

The study included 100 patients with foot pathology. Table 1 presents general characteristics of the sample. The majority of patients were females (92 %). The median age was 55.7 years with a wide range from 25 to 75 years. Hallux valgus was the unbderlying condition for the majority of the patients (97 %). Pathology of the foot of the right limb was detected in 51 %, of the left limb in 47 %, and two patients had involvement of both sides.

Professional athletes made up one quarter (23 %) of the sample. Of these, there were swimmers (5), Nordic walker (4), dancers (4), cross-country skiers (2), cyclers (2), runners (1), horse riders (1), multisport competitors (1), table tennis players (1), artistic gymnastics (1), weightlifters (1).

The mean (standard deviation) of th TC angle at MCP1 before surgery was 34.9 (20.3)°, range 0–60°. As to the extent of impaired range of motion in the MCP1, patients were distributed as follows: no impairment was recorded in 38 % of patients, mild impairment was seen in 8 %, moderate involvement observed in 13 % and 40 % showed severe impairment. The mean preoperative LEFS foot function scored 61.3 ± 14.3. The mean score on the SF-36 scales before surgery ranged from 54.7 ± 18.3 (vitality) to 74 ± 21.2 points (social functioning). Preoperative low values were noted in role functioning with 55.3 ± 41.1 scores for emotional role functioning and 56.8 ± 43.2 for physical role functioning.

Table 1

Patient characteristics

Description		Values
Gender, %	Male	8
	Female	92
Age, years	Mean (standard deviation)	54 (12)
	Median (interquartile range)	56 (44; 64)
	Range	25–75
Marital status, %	Married	81
	Single	10
	Divorced	4
	Widowed person	5
Education, %	Higher	48
	Vocational secondary	33
	Secondary level	18
	Some college	1
Employment, %	Employed	55
	Unemployed	45
Engagement in sports, %	No	77
	Yes	23
Disability, %	No	97
	Granted, from them:	3
	Group 2	1
	Group 3	1
	Group 3	1
Comorbidity, %	None	21
	There is/are	79
Principal diagnosis, %	Hallux valgus	97
	Pes planus	2
	Keller 2	1
Limb, %	Right	51
	Left	47
	Both	2
Localization, %	Forefoot	98
	Mid- and hindfoot	2

Psychometric properties of the SEFAS questionnaire

Reliability

The Cronbach's α coefficient for the total score was 0.846. With items being removed one by one, the Cronbach's α value decreases slightly indicating the consistent structure of the questionnaire. Assessment of the reproducibility of the questionnaire showed no change in the total SEFAS score in patients who were in a stable condition and filled out the questionnaire again (33.53 ± 5.55 vs. 34.06 ± 6.24; ES = 0.1), and a statistically high coefficient was obtained with intraclass correlation ICC 0.962 (95 % CI: 0.906–0.985) between the SEFAS total score with first and repeat completion of the questionnaire. In general, the questionnaire was characterized by good internal consistency and reproducibility indicating acceptable reliability of the Russian version of SEFAS.

Validity

To assess criterion validity, correlations between the total SEFAS score and the TC angle in MCP1 were examined. The Spearman's r correlation coefficient between the total SEFAS score and the TC angle in MCP1 was 0.424 (95 % CI 0.249–0.578, $p < 0.001$). There was a statistically significant positive moderate correlation between the total SEFAS score and the TC angle in MCP1. Assessment of discriminant validity with the known groups method showed statistically significant differences in the total SEFAS score in patients with no/mild impairment in the range of motion in the MCP1 joint compared to the group of patients with moderate and severe impairment in the range of motion in the MCP1 joint (Fig. 1).

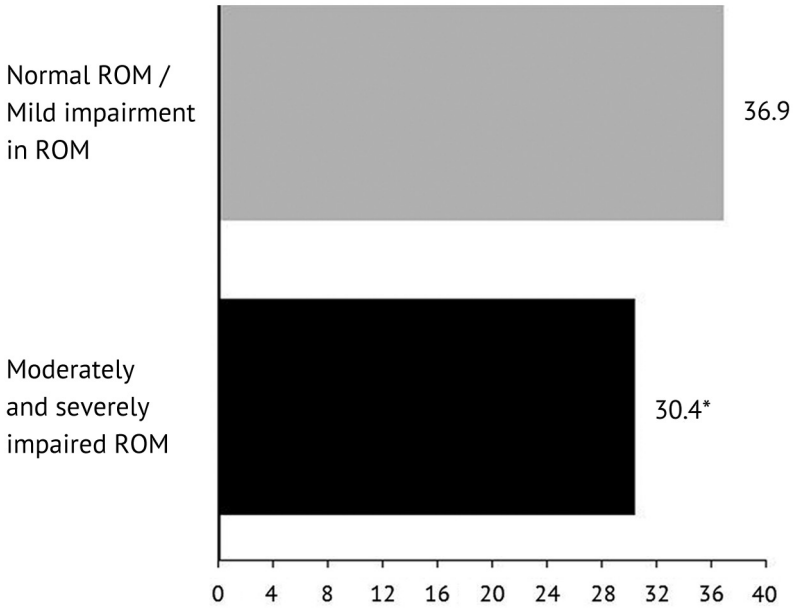

Fig. 1 Mean values of the total SEFAS score in patients grouped according to the extent of impaired range of motion (ROM) based on the TC angle in MCP1; * Student's t test, $p < 0.001$

The total SEFAS score was lower (worse foot condition) in patients with moderately and severely impaired ROM than that in patients with normal ROM and mild impairment (30.42 versus 36.89 scores; $p < 0.001$). The results indicated good discriminant validity of the Russian version of the instrument. Convergent validity analysis was performed by assessing correlations between individual questions, the total SEFAS score and the "external criterion". The "external criterion" included the RAND SF-36

score and the total score on the LEFS questionnaire. Spearman's correlation coefficients between item scores and the SEFAS total score with the SF-36 scores and the LEFS total score are presented in Tables 2 and 3.

Table 2

Correlations between Individual Questions, SEFAS Total Score, and SF-36 Scale Scores

SEFAS questions	SF-36	*r* Spearman*	95 % CI
1. How would you describe the pain you usually have from the foot/ankle in question?	PF	0.311**	0.143–0.42
	PRF	0.239*	0.107–0.366
	BP	0.627**	0.524–0.701
	GHP	0.204*	0.049–0.304
	V	0.215*	0.077–0.376
	SRF	0.269**	0.105–0.383
	ERF	0.193	0.023–0.312
	MH	0.236*	0.079–0.381
2. For how long have you been able to walk before severe pain arises from the foot/ankle in question?	PF	0.264**	0.132–0.394
	PRF	0.222*	0.088–0.383
	BP	0.435**	0.323–0.548
	GHP	0.228*	0.063–0.373
	V	0.111	–0.032–0.286
	SRF	0.247*	0.113–0.387
	ERF	0.047	–0.104–0.185
	MH	0.120	–0.062–0.281
3. Have you been able to walk on uneven ground?	PF	0.559**	0.132–0.394
	PRF	0.404**	0.088–0.383
	BP	0.427**	0.323–0.548
	GHP	0.257**	0.063–0.373
	V	0.232*	–0.032–0.286
	SRF	0.301**	0.113–0.387
	ERF	0.281**	–0.104–0.185
	MH	0.141	–0.062–0.281
4. Have you had to use an orthotic, shoe insert, heel lift, or special shoes?	PF	0.423**	0.311–0.516
	PRF	0.349**	0.206–0.496
	BP	0.317**	0.17–0.457
	GHP	0.141	–0.041–0.265
	V	0.207*	0.065–0.36
	SRF	0.225*	0.037–0.36
	ERF	0.223*	0.049–0.36
	MH	0.168	0.014–0.355
5. How much has the pain from the foot/ankle in question interfered with your usual work including housework and hobbies?	PF	0.514**	0.372–0.637
	PRF	0.394**	0.266–0.558
	BP	0.498**	0.37–0.624
	GHP	0.319**	0.162–0.454
	V	0.196	0.046–0.375
	SRF	0.388**	0.229–0.528
	ERF	0.307**	0.17–0.426
	MH	0.193	0.386–0.65

Continuation of table 2

Correlations between Individual Questions, SEFAS Total Score, and SF-36 Scale Scores

SEFAS questions	SF-36	*r* Spearman*	95 % CI
6. Have you been limping when walking because of the foot/ankle in question?	PF	0.607**	0.504–0.697
	PRF	0.533**	0.414–0.647
	BP	0.595**	0.488–0.68
	GHP	0.170	–0.015–0.313
	V	0.159	–0.038–0.31
	SRF	0.267**	0.109–0.4
	ERF	0.275**	0.128–0.382
	MH	0.091	–0.069–0.239
7. Have you been able to climb a flight of stairs?	PF	0.635**	0.513–0.718
	PRF	0.370**	0.219–0.509
	BP	0.395**	0.251–0.487
	GHP	0.358**	0.194–0.457
	V	0.222*	0.065–0.357
	SRF	0.451**	0.289–0.55
	ERF	0.348**	0.171–0.456
	MH	0.129	–0.043–0.275
8. Have you been troubled by pain from the foot/ankle in question in bed at night?	PF	0.180	–0.002–0.309
	PRF	0.309**	0.161–0.458
	BP	0.227*	0.051–0.338
	GHP	0.084	–0.119–0.214
	V	0.244*	0.082–0.404
	SRF	0.162	–0.01–0.267
	ERF	0.359**	0.198–0.454
	MH	0.251*	0.099–0.388
9. How much has the pain from the foot/ankle in question affected your usual recreational activities?	PF	0.442**	0.279–0.56
	PRF	0.363**	0.24–0.506
	BP	0.551**	0.434–0.641
	GHP	0.132	–0.029–0.267
	V	0.186	0.029–0.35
	SRF	0.323**	0.17–0.445
	ERF	0.187	0.043–0.297
	MH	0.213*	0.04–0.367
10. Have you had swelling of your foot?	PF	0.286**	0.148–0.434
	PRF	0.244*	0.13–0.409
	BP	0.152	0.041–0.291
	GHP	0.243*	0.125–0.39
	V	0.093	–0.035–0.293
	SRF	0.144	0.007–0.313
	ERF	0.201*	0.075–0.364
	MH	0.127	–0.004–0.279
11. After a meal (sat at table), how painful has it been for you to stand up from a chair because of the foot/ankle in question?	PF	0.465**	0.319–0.577
	PRF	0.329**	0.2–0.466
	BP	0.414**	0.28–0.504
	GHP	0.316**	0.151–0.435
	V	0.138	–0.052–0.307
	SRF	0.241*	0.088–0.351
	ERF	0.252*	0.098–0.362
	MH	0.145	–0.014–0.289

Continuation of table 2

Correlations between Individual Questions, SEFAS Total Score, and SF-36 Scale Scores

SEFAS questions	SF-36	*r* Spearman*	95 % CI
12. Have you had a severe sudden pain shooting, stabbing, or spasm from the foot/ankle in question?	PF	0.281**	0.067–0.129
	PRF	0.227*	0.076–0.065
	BP	0.378**	0.07–0.221
	GHP	0.122	0.067–0.048
	V	0.230*	0.074–0.057
	SRF	0.166	0.085–0.022
	ERF	0.207*	0.062–0.063
	MH	0.133	0.073–0.011
Total SEFAS	PF	0.649**	0.536–0.72
	PRF	0.527**	0.421–0.642
	BP	0.685**	0.604–0.737
	GHP	0.304**	0.144–0.406
	V	0.280**	0.142–0.428
	SRF	0.400**	0.251–0.486
	ERF	0.369**	0.205–0.471
	MH	0.247*	0.104–0.386

Note: * correlation coefficients are statistically significant at $p < 0.001$; ** correlation coefficients are statistically significant at $p < 0.05$. SF-36 scales: physical functioning (PF), physical role functioning (PRF), bodily pain (BP), general health perceptions (GHP), vitality (V), social role functioning (SRF), emotional role functioning (ERF), mental health (MH)

The measurements showed statistically significant correlations of varying strength identified between all SF-36 scales and nearly all individual questions of the Russian version of SEFAS, with the total SEFAS score indicating good convergent validity of the Russian version.

Table 3

Correlations between individual questions, SEFAS total score, and LEFS total score

Decription	*r* Spearman*	95 % CI
1. How would you describe the pain you usually have from the foot/ankle in question?	0.370**	0.25–0.483
2. For how long have you been able to walk before severe pain arises from the foot/ankle in question?	0.263**	0.17–0.362
3. Have you been able to walk on uneven ground?	0.600**	0.484–0.702
4. Have you had to use an orthotic, shoe insert, heel lift, or special shoes?	0.246*	0.118–0.373
5. How much has the pain from the foot/ankle in question interfered with your usual work including housework and hobbies?	0.618**	0.531–0.702
6. Have you been limping when walking because of the foot/ankle in question?	0.651**	0.574–0.724
7. Have you been able to climb a flight of stairs?	0.557**	0.449–0.662
8. Have you been troubled by pain from the foot/ankle in question in bed at night?	0.261**	0.132–0.4
9. How much has the pain from the foot/ankle in question affected your usual recreational activities?	0.534**	0.442–0.631
10. Have you had swelling of your foot?	0.362**	0,24–0.495
11. After a meal (sat at table), how painful has it been for you to stand up from a chair because of the foot/ankle in question?	0.457**	0,37–0.551
12. Have you had a severe sudden pain shooting, stabbing, or spasm from the foot/ankle in question?	0.403**	0,278–0.523
Total SEFAS	0.693**	0,624–0.758

Note: *correlation coefficients are statistically significant at $p < 0.001$; ** correlation coefficients are statistically significant at $p < 0.05$.

Table 3 indicates statistically significant correlations (moderate to weak) between the LEFS total score and all individual SEFAS questions indicating acceptable convergent validity of the Russian version of the SEFAS questionnaire.

Sensitivity

The sensitivity analysis of the Russian version of the SEFAS questionnaire was based on changes in the total SEFAS score at 2 months of surgery compared with the preoperative value (Table 4). The total score increased significantly after surgery (33.17 versus 45.22; $p < 0.001$). The effect size (ES) was calculated based on the data in the table.

Table 4

Mean total scores with SEFAS completed before and after surgery ($n = 92$)

Description	Pre-op		Post-op		p*
	Mean	Standard deviation	Mean	Standard deviation	
Total SEFAS	33.17	7.49	45.22	2.63	< 0.001

* nonparametric Wilcoxon signed rank test.

The effect size ES was 1.6, being characteristic of a large effect of change. The Russian version of SEFAS demonstrated high sensitivity to changes in the foot in patients after surgery.

Evaluation of the Russian version of SEFAS

The questionnaire took 5 minutes for the patient to complete. The questionnaires were completed with no gaps (0.04 % missing data for SEFAS). The floor-ceiling effect of the total SEFAS score before surgery was 1 %. The findings indicated the high quality of the data, the ease of understanding the questions causing no discomfort and posing no difficulties when choosing a response, and also reflecting the absence of bias in the sample regarding the total parameter of foot condition. The testing suggested analysis in changes in the total questionnaire score evaluated post surgery separately in athletic and non-athletes. The mean total SEFAS scored 33.0 ± 8.1 in athletes ($n = 23$) preoperatively and 45.5 ± 2.5 postoperatively ($p = 0.001$). The mean total SEFAS scored 31.1 ± 7.4 in non-athletes ($n = 77$) preoperatively and 45.1 ± 2.7 postoperatively ($p = 0.001$). Figure 2 shows the mean total SEFAS score measured in the groups preoperatively and at 2 months.

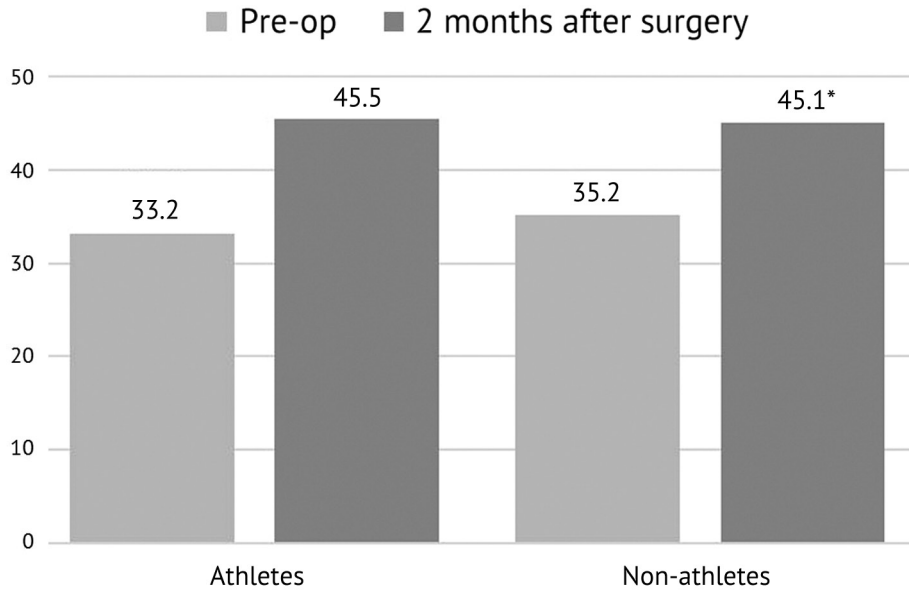

Fig. 2 Mean total SEFAS scores measured in athletes and non-athletes preoperatively and at 2 months (* $p = 0.001$)

MCID was determined as part of the assessment of the clinical interpretability of the Russian version of SEFAS and scored three. The majority of patients (89 %) after surgery demonstrated improved total SEFAS score postoperatively being increased by 3 or more points indicating clinically significant improvement in quality of life seen in 85 % of athletes and in 90 % in non-athletes. MCID scored 3 for the Russian version of the SEFAS questionnaire. The majority of patients experienced significant improvement in the foot condition postoperatively.

DISCUSSION

Questionnaires filled out by the patients were used for comprehensive assessment of orthopaedic patients with musculoskeletal disorders to determine the effectiveness of surgical treatment and rehabilitation [7, 9, 10, 28, 29]. The SEFAS questionnaire is is a patient–reported outcome measure used to evaluate foot and ankle disorders [12–14, 30–32]. There are versions of the questionnaire issued in different languages [14–18]. There has been no validated Russian version of the SEFAS questionnaire. As a result of this study, the Russian version of SEFAS was validated and tested in a Russian sample of patients with foot pathology. The study was conducted in accordance with current international recommendations [20, 21]. The design was based on an algorithm for assessing the psychometric properties of the original version of SEFAS [13], and the works aimed at creating versions of the instrument in other languages [16–18]. The sample included patients with forefoot pathology, with 23 % being athletes. The inclusion of athlete patients in the study was an important advantage of the study to learn characteristics of foot function in individuals participating in sports. Determination of the psychometric properties of the instrument and its testing in a clinical setting with the participation of surgical patients, both related and not related to professional sports, contributed to a more adequate assessment of the reliability, validity and sensitivity of the questionnaire, and allowed us to demonstrate its clinical interpretability in the groups of patients.

The process of validating the Russian version of SEFAS demonstrated various aspects of the reliability, validity and sensitivity of the instrument to changes in the condition of the foot after surgical treatment. With the high Cronbach's α coefficient (0.846) we can conclude that the Russian version of SEFAS has good internal consistency. The parameter is slightly inferior to that obtained during the development of the original version of the instrument (0.96) [13], and is comparable to those in other language versions (0.89 for the German version, 0.93 for the Danish version) [16–18]. With regard to reproducibility, the study demonstrated high intraclass correlations between individual SEFAS questions filled out by the patients twice before surgery in a stable condition with an interval of one day with the ICC measuring 0.962 and satisfying the condition of reproducibility and being comparable with data from other studies for other languages [16–18]. Thus, acceptable reliability of the Russian version of SEFAS characterized by good internal consistency and satisfactory reproducibility was demonstrated.

Validity assessments were performed in three ways. Criterion and discriminant validity was assessed in addition to the analysis of convergent validity by analogy with the validation of language versions of SEFAS by other authors to allow a more detailed psychometric analysis of the Russian version of the questionnaire. The assessment of convergent validity was based on a correlation analysis between SEFAS and SF–36 with the presence of significant correlations between SEFAS and some SF-36 scales reflecting physical aspects of quality of life and indicating the reliability of the Russian version of SEFAS. More pronounced correlations were established between the total score of the Russian version of SEFAS and the physical, role-physical functioning

and pain scales of the SF-36 questionnaire. The least pronounced were found for the mental health and general health scales and role-emotional functioning. These findings were similar to those obtained with testing the psychometric properties of the Swedish and German language versions of the instrument [13, 16]. The total SEFAS score relative to the dorsiflexion angle in the MCP1 was additionally analyzed to demonstrate the validity of the instrument. The correlations between the total SEFAS score and the angle were identified with the total SEFAS score being compared in different groups of patients according to the degree of impairment in range of motion in the MCP1 joint. Statistically significant correlation between the total SEFAS score and the TS angle in MCP1, differences in the total SEFAS score between groups of patients with varying degrees of impairment in range of motion in MCP1, shown in our series characterizes the Russian version of SEFAS as a tool with good criterion and discriminant validity. The sensitivity of the Russian version of SEFAS based on the effect size ES of changes of the foot in the total score of the questionnaire post surgery was evaluated. The ES values exceeded similar parameters reported by the authors of the questionnaire in the original study [13] and in the development of other language versions [16–18]. The ES value in our series was 1.6 versus 1.44 for the Swedish (original) version. The questionnaire period post surgery was shorter in our series and amounted to 2 months, and it was reported as 6 months in other studies. The parameter corresponded to a large effect size and indicated good sensitivity of the Russian version of SEFAS reflecting changes in the condition of the foot after treatment, and the instrument can be recommended for use in assessing the effect of treatment from the patient's point of view.

The results of clinical testing of the Russian version of SEFAS deserve special attention. The questionnaire was well completed indicating high quality of data and the informativeness for monitoring the condition of the foot in orthopaedic patients during treatment. The tool provides additional information from the patient in a convenient format, compactly, with little time spent, and can be used for a comprehensive assessment of the patient's condition and monitoring the effect of the operation. Clinical interpretability in the Russian patient population was performed as part of the testing of the questionnaire. A change in the total score of 3 points was registered as the minimum clinically significant change. Clinically significant improvement in the foot occurred after surgery in the majority of patients (89 %). Significant changes were noted in athletes and non-athletes. The limitations of the study included patients with one type of orthopaedic pathology (forefoot) with the majority of patients being females. The study demonstrated the reliability, validity and sensitivity of the Russian version of the SEFAS questionnaire. The questionnaire showed to be an informative and clinically interpretable tool for assessing the condition of the foot in adult surgical patients with foot pathology. The Russian version of the SEFAS questionnaire can be recommended for research and clinical practice in Russian traumatology and orthopaedics.

CONCLUSION

The Russian version of the SEFAS questionnaire is a reliable, valid, sensitive and informative tool for assessing the foot function in orthopaedic patients. MCID was established in the total score of the questionnaire filled out by the Russian sample of patients to assess the effect of treatment in clinical trials and clinical practice. The SEFAS questionnaire can be recommended for use in Russian traumatology and orthopedics considering the patient's opinion on the condition of the foot at the preoperative stage, after surgical treatment and during rehabilitation to monitor foot function recovery.

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