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American Shoulder and Elbow Surgeons Standardized Assessment Form: Russian Cross-Cultural Adaptation and Validation

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Abstract

American Shoulder and Elbow Surgeons Standardized Assessment Form (ASES) is one of the most widely used shoulder outcome reporting measure. However, it has not been validated in the Russian language. ***Purpose*** of this study is a cross-cultural adaptation and validation of the ASES. ***Materials and Methods.*** The group of 93 patients with various shoulder pathology (39 males and 54 females) with median age of 49 years was included into the study. In the first stage the authors performed language and cultural adaptation of the ASES questionnaire to obtain a Russian version maximally matching the original. Further the authors studied the psychometric properties of the questionnaire (reliability, validity, responsiveness), the effects of maximum and minimum values (floor and ceiling effects) and estimated the coefficients of internal consistency of Cronbach's alpha and reproducibility. 20 patients were selected to assess reproducibility by test-retest method, those patients filled out the ASES questionnaire at first appointment with an orthopedic trauma surgeon and repeatedly in 7 days; the obtained data was evaluated by an intra-class correlation coefficient (ICC). In the framework of the present research the authors assessed the validity of the obtained scale, including the correlation of the scores of the examined questionnaire with the scores by the DASH questionnaire validated in the Russian Federation to check criteria validity. ***Results.*** The study resulted in obtaining the assessment scale fully matching the original ASES version with minor linguistic and cultural features. The ASES median results was Me = 68.7 [32.6; 93.8]; no maximum and minimum scores were obtained. The Russian version of the questionnaire has good psychometric properties with internal consistency of Cronbach alpha 0.72. The overall intra-class correlation coefficient (ICC) of the ASES questionnaire was 0.95 ($p<0.05$). There were no statistically significant differences between the general group and the test-retest group by gender, age and type of shoulder pathology. Correlation coefficient obtained in the scope of the present research between the ASES and DASH scales was 0.9, and the GRI index was 2.8. ***Conclusion.*** Russian version of the ASES questionnaire has good psychometric properties and may be recommended to evaluate functional status of patients with shoulder joint pathology and treatment dynamics.

Keywords: shoulder joint pathology, assessment scale, ASES, DASH.

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Introduction

Pain and functional impairments in the shoulder are the most common complains for locomotor system taking third place after low back pain and neck pain [1]. Frequently it affects not only the function of the upper extremity but also life quality of patients. According to World Health Organization state of health should be evaluated taking into account the impact of disease or injury on daily living and social activity of patients. Along with objective methods applied to evaluate health and efficiency of treatment, the key importance has the information obtained from patients in process of self-assessment survey. Questionnaires elaborated by experts of the leading world clinical institutions in accordance with principles of evidence medicine allow to quantify the physical health and social adaptation for each particular individual.

Disability of the Arm, Shoulder and Hand outcome measure (DASH) questionnaire underwent cross-cultural adaptation in the Russian language in 2004 [2]. This questionnaire is a reliable evaluation scale reflecting a patient's opinion on daily living limitations due to certain functional disorders in the upper extremity. Various studies dedicated to evaluation of reliability and validity of DASH questionnaire included many patients with a wide range of pathologies in the upper extremity but not involving shoulder joint [3].

The purpose of the present study was a cross-cultural adaptation and validation of the ASES standardized assessment form widely used in foreign research. This questionnaire was adapted for use in many languages and its excellent psychometric properties were proven by many studies [4, 5, 6, 7, 8, 9, 10, 11, 12]. It is user-friendly, contains few questions that effectively capture the subjective evaluation of the shoulder joint status.

Patients and Methods

ASES is a questionnaire for patients covering the following parameters:

– pain intensity from 0 to 10;
– level of daily living and sports activity;
– degree of activity limitations for daily living and for sports.

Maximal ASES score is 100, whereof 50 points are obtained from pain scale, and another 50 — from questions describing function of shoulder joint in daily living, work and sports activities. The following scaling is used for results: >80 points — excellent clinical outcome; 70–79 points — good; 50–69 — satisfactory, and less than 50 points — unsatisfactory outcome [4].

Cultural adaptation and validation of ASES assessment form was performed in accordance with international guidelines [13] and preliminary designed algorithm (Fig. 1).

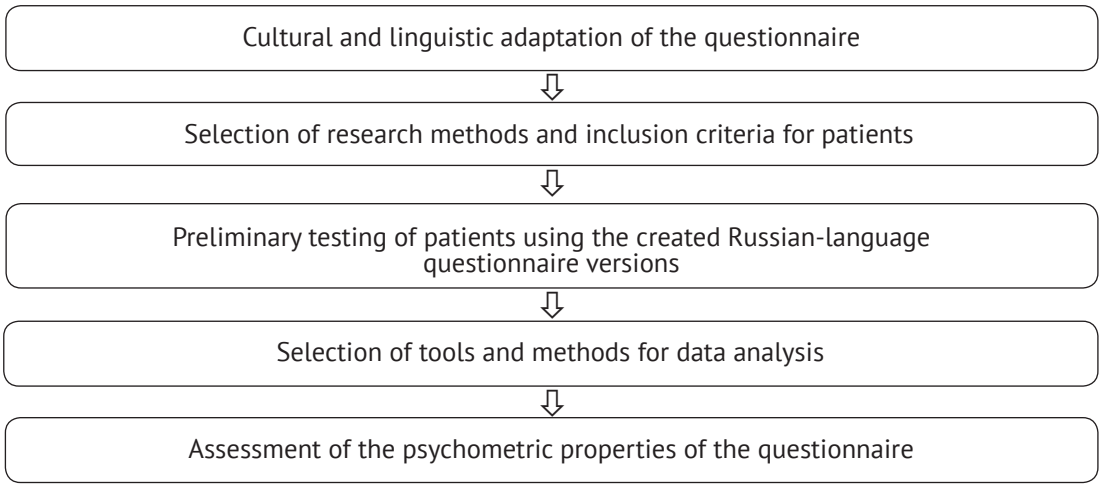

Fig. 1. The algorithm of cultural adaptation and validation of the ASES

Language and cultural adaptation of the questionnaire was carried out according to below approach [10]:

1. Two translators being native Russian speakers with higher medical education and unfamiliar with ASES score made independent direct translations of the form from English into Russian language.

2. These translated versions were reconciled with expert committee, and preliminary Russian language version of questionnaire was created.

3. Independent reverse translation of preliminary Russian language questionnaire into English was done by other two translators, being native English speakers with higher medical education and fluently speaking Russian language. Those translators were not involved into the previous stage of language adaptation.

4. The resulting questionnaire underwent evaluation by an expert committee consisting of three independent experts knowing both Russian and English languages (one linguist, one medical professional, one coordinator from the development team).

5. Test version of questionnaire was created which underwent pretest surveying of 30 patients to check plausibility, acceptability and clarity of questions.

6. Results of pretesting were analyzed and no questionnaire adjustments were needed.

Thus, the authors obtained an assessment form approximated as much as possible to cultural and language traditions and specifics of the Russian-speaking population.

The study included 93 patients with various shoulder joint diseases and injuries (Table 1): 42% of patients were males [95% CI: 31,97; 52,03] and 58% — females [95% CI: 47,97; 68,3]; age median was 49 years with interquartile range (IQR) from 37 to 55 years.

Table 1

Structure of shoulder joint pathologies

Diagnosis	Share of patients (% of sample)	95% CI
Subacromial impingement syndrome	46,24	[36,10; 56,37]
Rotator cuff tear	22,58	[14,08; 31,08]
Tendinopathy/subluxation of tendon of long head of biceps	12,90	[6,09; 19,72]
Shoulder joint arthrosis	10,75	[4,46; 17,05]
Adhesive capsulitis	7,53	[2,16; 12,89]

Inclusion criteria:

– patients who provided written informed consent to participation in the study;

– patients over 18 years old;

– patients with shoulder pathology;

– patients whose diagnosis was confirmed clinically and instrumentally (roentgenography, MRI);

– patients fluent in oral and written Russian language.

Patients with concomitant elbow or wrist pathologies were excluded from the present study.

Evaluation of psychometric properties of questionnaire was done by the following criteria: reliability, validity and sensitivity. The authors studied effects of maximum and minimum values (floor and ceiling effects) in respect of patients' assessment by ASES scale. Reliability of the questionnaire is the ability to provide constant and precise measurements. Reliability was evaluated by studying reproducibility and calculating the Cronbach's alpha [14]*. Reproducibility of questionnaire is the ability to provide the same constant assessment of status for the same patient for a certain period of time provided there are no changes in patients' health. Reproducibility was evaluated by test-retest method. 20 patients were selected for test-retest assessment who were asked to fill out ASES questionnaire at their primary visit to trauma and orthopaedic surgeon and to refill the form in 7 days. This group included 11 (55%) males [95% CI: 33,20; 76,80] and 9 (45%) females [95% CI: 23,20; 66,80].

Selected patients did not report any changes in the shoulder joint within one week. Primary and repeated (one week later) scores were analyzed for correlation. Obtained results were assessed by intra-class correlation coefficient (ICC) (Table 2).

Table 2

Intra-class correlation

Measure	Intra-class correlation	95% CI	
		Lower limit	Upper limit
Isolated	0,917	0,751	0,974
Average	0,957	0,858	0,987

* Cronbach's alpha coefficient is the degree of internal consistency for a measurement scale.

ASES validity is the criteria allowing to understand how precisely the questionnaire reflects life quality of patients with shoulder joint pathology. There several types of validity: external, informative, criterion and construct. The expert group consisting of specialists in traumatology and orthopaedics evaluated the external and informative validity taking into account literature sources and results of patients surveying during pretesting for correspondence of ASES questions to pathology symptoms. To evaluate construct validity the correspondence of questions to sections of questionnaire was analyzed and known-group validity was assessed. Known-group validity was assessed by identifying availability of correlation of test results for ASES pain intensity subscale to DASH questionnaire sections describing patients' limitations in daily living, social and sports activity. The authors assumed that patients with higher pain score have larger limitations in daily living and in sports activity and, consequently, have lower life quality score according to the overall score of validated DASH scale. To evaluate criterion validity the authors examined availability of relationship between testing results by the studied scale and test results by DASH. Both scales (ASES and DASH) were used to evaluate function of shoulder joint in the patients at the same time, and then correlation for obtained score for the studied scales was calculated.

DASH questionnaire consists of 31 questions and each question stipulates a reply with scoring from 1 to 5 points. Total count can range from 0 to 100. The lowest score reflects the best functional outcome of the upper extremity. Russian language version of ASES subjective questionnaire was provided to patients for filling along with officially approved DASH questionnaire.

Sensitivity of questionnaire to clinical changes characterizes its ability to reflect changes in scores according to changes in the health status of patients during treatment. The authors formed two groups of patients for sensitivity evaluation. First group included 34 patients who demonstrated statistically significant improvement in shoulder joint function and quality of life upon 6 weeks of treatment basing on Russian language DASH questionnaire (p<0,05), second group included 20 patients who in process of treatment featured no significant functional changes in the shoulder joint between the tests (p>0,05). Groups were comparable by main parameters of gender, age, intensity of symptoms and functional disorders. The authors used statistical analysis for two dependent samples and calculation of sensitivity index by Guyatt Responsiveness Index (GRI) for evaluation of changes in function of the shoulder joint for patients prior to and after treatment. GRI was calculated as the ratio of mean score variances between tests by ASES scale in the first group of patients (with improvement of upper extremity function and quality of life) to standard deviation of score variances in the second group where patients had no significant changes after treatment.

Statistical analysis

Statistical processing of the data was done in IBM SPSS Statistics 21 (IBM corp., USA) software. Correspondence analysis of the type of data distribution in the sample to the normal distribution law was performed using Kolmogorov-Smirnov test. Critical level of statistical significance was taken as 5% (p = 0.05)

For describing the sample with normal distribution, quantitative data was represented as $M(s)$ where M is the arithmetic mean of variables, s — standard deviation. Central trends and variance of quantitative characters with other than normal distribution were described by median (Me) and IQR (25^{th} and 75^{th} percentile). The qualitative data in the study is represented by relative frequencies in a percentage of the total sample. The authors calculated 95% con-

fidence interval for each character in the sample indicating lower (5%) and upper (95%) limits. Wilson score method was used for calculation of 95% CI for nominal data.

Qualitative data (DASH and ASES scores) for patients prior to and after treatment were compared by Student t-test for dependent samples due to normal distribution. Variance of quantitative samples for independent samples was evaluated by Student t-test in case of normal distribution and Mann-Whitney U-test for other than normal distribution. Contingency tables and Pearson's chi-squared test (χ^2) was used to compare qualitative characters.

Spearman's rank correlation coefficient (*r*) was applied for evaluation of magnitude and pattern of correlation dependence between sections and scales while scores distribution obtained in result of patients survey by DASH and ASES scales did not follow normal distribution law.

For a more informative reflecting of results of correlation analysis the authors indicated 95% CI in addition to significance of the correlation coefficients. The Fisher transformationwas used to approximate the exact correlation coefficient. CI was calculated in Microsoft Excel 2008 (Microsoft corp., USA). Confidence intervals for frequencies and correlation coefficients are given as CI [lower limit; upper limit].

Results

There were no difficulties in the process of reverse translation of the assessment form and the obtained version fully corresponded to the original questionnaire with minor linguistic and cultural differences. Question related to lifting the weight of 10 pounds over the shoulder was adapted to local metric system — 10 pounds were replaced by 4,5 kg. Pretesting did not repot significant drawbacks in the structure and content of questionnaire. Assessment form was favorably received by the patients; nobody found it difficult to fill it out. Patients spent about 5 minutes for filling each form and considered majority of questions in ASES assessment form clear and corresponding to status of their shoulder joint.

In the process of cultural adaptation and validation the forms were filled out by patients of varying age, gender and shoulder pathology.

Median of ASES score in the total group of 93 patients was 68,7 [32,6; 93,8], in the test-retest group of patients Me = 49 [42; 55] after primary testing and Me = 51 [41; 58] after repeated testing. In the group of patients with improvements in shoulder function and quality of life M = 49 (24) prior to treatment, and M = 75 (16) after treatment. In the group of patients with no reported changes M = 48 (15) prior to treatment, and M = 49 (16) after treatment.

Russian version of ASES assessment form demonstrated high reliability in the present study. Internal consistency reached the Cronbach alpha value of 0.72. Reproducibility test-retest yielded good results. Overall intra-class correlation coefficient of ASES form (ICC) was 0,95 (p<0,05) (Table 3).

Table 3

Evaluation of ASES sensitivity to changes in functional status of upper extremity and life quality of patients with shoulder pathology

Group of patients	Criteria of paired samples				
	M	*s*	95% CI for difference	*t*	*p*
With improvements	13,6	25,5	[5,5; 21,9]	3,4	0,002
Stable	2,3	5,6	[0,3; 4,9]	1,9	0,038

The authors did not observe statistically significant differences (p>0,05) between the overall group of patients in the study, test-retest group of 20 patients, and between groups formed to evaluate sensitivity in respect of certain qualitative features (gender, age, type of shoulder joint pathology).

Student t-test for dependent samples (prior to and after treatment) demonstrated statistically significant increase in ASES score (p<0,01) for the group of patients with improvements, and no statistically significant changes in ASES score (p>0,05) for patients with no progress in shoulder joint function or quality of life. Evaluation of test results for changes in a stable group of patients (no changes) and for group of patients with clinical improvement is given in Table 4.

Table 4

Studies dedicated to cultural adaptation and validation of ASES scale

Study	Number of cases, *n*	Language	Test-retest interval, days	Coefficient of Cronbach alpha	ICC reproducibility	Correlation with other scales, *r*
Piitulainen et al. [10]	105	Finnish	14	0,88	0,83	SST 0,73
Yahia et al. [12]	80	Arab	1–3	0,76	0,96	SPADI -0,80
Padua et al. [9]	50	Italian	7	0,85	0,91	DASH -0,92
Goldhahn et al. [6]	118	German	7	0,96	0,93	SPADI 0,92 DASH 0,84
Kocher. et al. [18]	1066	English (validation evaluation)	28	0,61	0,94	–

Calculated GRI index statistically significant varied from 0 (p<0,05), its value of 2,8 indicates high sensitivity of this measurement scale capturing changes in functional status of patients who suffer shoulder joint pathology.

When investigating construct validity the authors established a correlation between ASES pain intensity subscale to DASH questionnaire. Strong correlation (Spearman's coefficient 0,50–0,62, p<0,01) was observed with subscale "daily living limitations" — r = 0,62 [0,47; 0,73], with "sports limitations" — r = 0,50 [0,3; 06] and with "symptoms intensity" — r = 0,58 [0,42; 0,70]. Medium correlation (Spearman's coefficient 0,4 [0,21; 0,55], p<0,05) was observed with "social limitations" subscale.

So, in the result of correlation analysis the authors confirmed their assumption on relationship between ASES section on "pain intensity" and DASH sections describing limitations in daily living, social and sports activity which reflects construct validity of the scale. ASES and DASH scales correlation coefficient was -0,9 [0,85; 0,93] demonstrating good criterion validity for ASES scale. Results of both scales testing are presented as a scatter diagram in Figure 2.

GRI index was 2,8 which corresponds to high sensitivity for changes in health status of the patients.

Discussion

In the scientific community ASES is one of the most widely used orthopaedic scale intended for self-assessment by patients [15]. This scale features simplicity in filling, high sensitivity towards changes in health status of patients in result of treatment and high correlation to other questionnaires for the shoulder joint [7, 16].

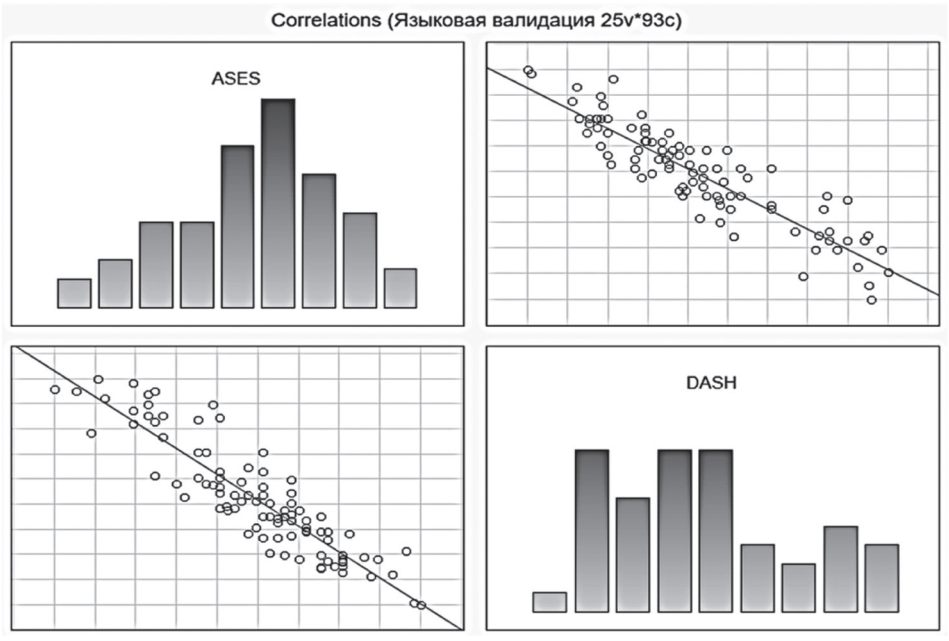

Fig. 2. Scatter plot of patients' test results for ASES and DASH

The present paper presents the results of cultural adaptation and validation of ASES assessment form into Russian language. Evaluation of reliability and validity of Russian language version was also performed — high values for those criteria were observed. The study proved strong correlation with DASH scale (correlation coefficient was -0.9) which reflects good construct and criterion validity of ASES questionnaire, sufficient approximation of results of this survey to earlier culturally adapted and validated DASH questionnaire. Similar outcomes were obtained in other research of foreign colleagues [6, 9, 12].

According to literature a scale can't be considered consistent if the number of maximum and minimal scores exceeds 15% [13]. No maximum and minimal values for patients in the present study were observed when exploring Russian language version of ASES form.

ICC for reproducibility of scale under test-retest method is considered high at values of 0.9 and above (0.95 in the present paper). According to Portney and Watkins ICC > 0.75 is already acceptable [17]. In other preceding research this parameter was equal or over 0.84 which indicates sufficient reproducibility of ASES results for use in all languages studied.

Cronbach alpha coefficient is considered acceptable with values for group studies equal to or above 0.70 [14] for questionnaires on quality of life. In the present study the Cronbach alpha was 0,72 which is slightly lower than in other research on validation of the present questionnaire and cultural adaptation to various languages with comparable number of cases, however higher than in the study with overall 1066 cases [18]. In general, the obtained level of internal consistency of the questionnaire is sufficient to confirm its reliability.

The adapted Russian language version of ASES assessment form has good psychometric properties and can be recommended to evaluate functional status of patients with shoulder joint pathology and dynamic changes during treatment.

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Authors' contribution

D.O. Il'in — collection of material, formulation of idea and hypothesis, defining scientific provisions.

O.V. Makarieva — statistical analysis of material.

M.N. Makariev — statistical analysis of material.

A.N. Logvinov — analysis of literature sources, formulation of hypothesis, defining scientific provisions.

N.E. Magnitskaya— analysis of literature sources, collection of material and preparing database.

M.S. Ryazantsev — analysis of literature sources, preparing database.

M.E. Burtsev — analysis of literature sources.

A.R. Zaripov — collection of material.

A.V. Frolov — collection of material, formulation of idea and hypothesis, defining of scientific provisions.

A.V. Korolev — setting aim of the study, selection of study subject, defining idea and hypothesis, defining scientific provisions.

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