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Cross-cultural adaptation and psychometric properties of the Lithuanian version of the Simple Shoulder Test

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Background. There are no valid patient-based assessment tools for the shoulder joint in Lithuania. Development of one more new instrument for a small country is unnecessary. This work is not easy and requires considerable investment of both mental and fiscal resources; it will hardly be better than the existing tools and may add more confusion in the literature. The purposes of this study were to perform cross-cultural adaptation of the Simple Shoulder Test (SST) and to test psychometric properties of the Lithuanian version of the Simple Shoulder Test (SST-LT).

Materials and methods. The SST was culturally adapted following recommendations of American Academy of Orthopaedic Surgeons. Psychometric properties of the SST-LT were determined for preoperative patient group with rotator cuff injury (n = 108), and for the ambulatory patient group (80 of the 108 preoperative patients) after surgery.

Results. The internal consistency in both groups was not high (Cronbach's alpha 0.722 and 0.844). Intraclass correlation coefficient for test-retest reliability was 0.96 with the 95% confidence interval (0.94–0.98). The SST-LT scores were compared with the Lithuanian SF36v2 and the Constant scoring scale. Correlations between the SST-LT scores, patient-based and observer-based measures were from 0.492 to 0.881 ($p < 0.001$).

Conclusion. The SST-LT can be used as shoulder joint specific and office-based patient self-assessment tool for the Lithuanian speaking population.

Key words: cross-cultural adaptation, Lithuanian version of the Simple Shoulder Test, psychometric properties, rotator cuff tears

INTRODUCTION

During the last three decades there was significant development in the field of outcome measurements in medicine. Since then orthopaedic surgeons started to develop and introduce shoulder joint specific measuring tools for scientific research and clinical practice. The main reason for developing new instruments was the opinion that the existing scales have one or more limitations and their use in clinical practice may be problematic (1–4). These limitations can be related to instrument's quality (psychometric properties) or / and to the complexity of the instrument. The University of California at Los Angeles (UCLA) shoulder score (5) has been criticized for the development of the instrument without direct patient input, selection of improper ("double-barrelled") items or for the item ("overall satisfaction") that allows the instrument to be used only after the intervention. These problems may lead to poor psychometric properties of the instrument (2). The Constant (CS) (1) and the American Shoulder and Elbow Surgeons (ASES) shoulder scales (6) require experienced examiner to administer the test, additional instruments to measure range of motion and muscle strength. These scoring systems are time-consuming and may preclude their use in clinical practice (3).

There are no valid patient-based assessment tools for the shoulder joint in Lithuania. Development of one more new instrument for a small country is unnecessary. This work is not easy and requires considerable investment of both mental and fiscal resources; it hardly will be better than the existing tools and may add more confusion in the literature (7).

The Simple Shoulder Test (STT) was developed and first published in 1992 as a quick, practical and inexpensive patient-based and joint specific measurement instrument (3). Test-retest reliability, construct validity, responsiveness of the SST have been studied in several studies (8–14), and the SST proved to be simple and effective tool for measuring the results of treatment. For this reason we decided to make the SST available for the Lithuanian speaking population. Use of simple, valid and widely accepted outcome assessment tool will help us improve the quality of scientific research in shoulder surgery. The purposes of this study were: 1. to perform cross-cultural adaptation of the SST, 2. to test psychometric properties of the Lithuanian version of the SST (SST-LT) in both hospitalized and ambulatory patient groups.

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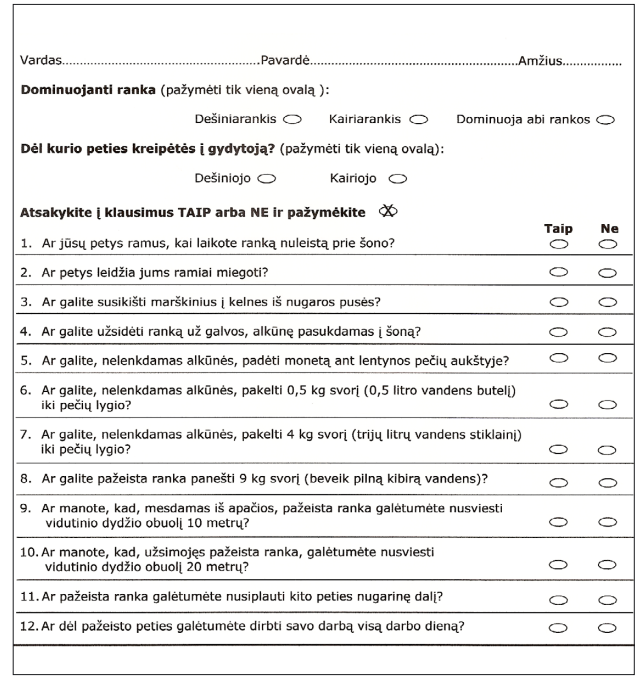
MATERIALS AND METHODS

The SST is a joint specific and patient-based outcome assessment tool. The original English version of the SST contains 12 questions derived from Neer's evaluation, the American Shoulder and Elbow Surgeons Form evaluation, and the most frequent complaints of patients observed in the shoulder practice. The questions require only "yes" or "no" response (3, 15). Score for individual patient may be calculated in two ways: 1. the total score is the total number of "yes" responses (the highest possible score is 12 and the lowest possible score is 0), 2. the total number of "yes" responses transforming into a 100-points scale, with 0 points representing the worse result or 0 "yes" responses, and 100 points representing the best result or 12 "yes" responses. Each question weighs equally for 8.33 points on a 100-points scale.

Cross-cultural adaptation of the Simple Shoulder Test was performed according to the recommendations of the American Academy of Orthopaedic Surgeons for the cross-cultural adaptation of health status measures (16). The SST was initially translated from English into the Lithuanian language by two independent translators whose mother tongue was Lithuanian. During this process the translators had the task to transform all the measures into metric system (i. e. pounds to kilograms, yards to meters, gallons and pints to litres). The first translator was aware of the process, the intent of each item and of the questionnaire as a whole. The other translator was neither aware nor informed of the concepts being quantified and she had no medical background. Two translators and a recording observer prepared one common translation (synthesized version). The back-translations into the original language were produced by two independent translators whose native tongue was English. They used the synthesized version of the questionnaire and were blind to the original version. They were neither aware of nor informed about the concepts explored in the questionnaire and had no medical background. Our expert committee consisted of a methodologist, orthopaedic surgeons, a language professional and translators. After reviewing the original questionnaire (15) and all the translated versions together with the written reports, we detected some problematic words and phrases that should be revised. In the first and second questions the word "comfortable" may cause confusion, if translated directly for an average Lithuanian person. In order to avoid this polysemantic word the expert committee decided to use a simple word "ramus" which is comparable to the English word "calm". After revision of the questions 9 and 10, we had to change "soft ball" to another object. The game softball is not played in Lithuania, and nobody knows what a "soft ball" looks like. We decided to replace "soft ball" to "medium sized apple" („vidutinio dydžio obuolys") because every ordinary Lithuanian person knows what it is. In the questions 8, 9, 10 and 11 the term "extremity" ("galūnė"), which is usually used in scientific language, may not be understood correctly by our patients. We decided to use simple word "ranka" which is an analogous word to the "upper extremity" and very similar to the English word "arm" in order to avoid possible jargon terms (7) in the SST-LT. During the transformation of all the measures into metric system we rounded the numbers received down to the nearest whole numbers or to the nearest most suitable numbers for practical use. We think that this final calculation is acceptable and will not affect the intent of the given items because the meanings of the numbers received are very close to those cited in the original version of the SST. The expert committee stated that the equivalence between the English and the Lithuanian pre-final version of the SST was reached in four areas: semantic, idiomatic, experiential and conceptual equivalence. The Lithuanian pre-final version was tested by 20 Lithuanian speaking persons with rotator cuff injury (n = 7), subacromial impingement (n = 5), calcifying tendonitis (n = 2), arthrosis (n = 2), shoulder instability (n = 3) and posttraumatic shoulder stiffness (n = 1) at the upper extremity clinics. Each person completed the questionnaire and had a short interview. Each respondent explained how he or she understood the meaning of every item, in what way they were going to perform every activity and whether they were familiar with all the objects included in the questionnaire. After testing of the pre-final version we did not make any revisions and concluded that the SST-LT was completed (Figure).



Vardas.....Pavardė.....Amžius.....

Dominuojanti ranka (pažymėti tik vieną ovalą):

Dešiniarankis ⬭ Kairiarankis ⬭ Dominuoja abi rankos ⬭

Dėl kurio peties kreipėtės į gydytoją? (pažymėti tik vieną ovalą):

Dešiniojo ⬭ Kairiojo ⬭

Atsakykite į klausimus TAIP arba NE ir pažymėkite ⊗

	Taip	Ne
1. Ar jūsų petys ramus, kai laikote ranką nuleistą prie šono?	⬭	⬭
2. Ar petys leidžia jums ramiai miegoti?	⬭	⬭
3. Ar galite susikišti marškinius į kelnes iš nugaros pusės?	⬭	⬭
4. Ar galite užsidėti ranką už galvos, alkūnę pasukdamas į šoną?	⬭	⬭
5. Ar galite, nelenkdamas alkūnės, padėti monetą ant lentynos pečių aukštyje?	⬭	⬭
6. Ar galite, nelenkdamas alkūnės, pakelti 0,5 kg svorį (0,5 litro vandens butelį) iki pečių lygio?	⬭	⬭
7. Ar galite, nelenkdamas alkūnės, pakelti 4 kg svorį (trijų litrų vandens stiklainį) iki pečių lygio?	⬭	⬭
8. Ar galite pažeista ranka panešti 9 kg svorį (beveik pilną kibirą vandens)?	⬭	⬭
9. Ar manote, kad, mesdamas iš apačios, pažeista ranka galėtumėte nusviesti vidutinio dydžio obuolį 10 metrų?	⬭	⬭
10. Ar manote, kad, užsimojęs pažeista ranka, galėtumėte nusviesti vidutinio dydžio obuolį 20 metrų?	⬭	⬭
11. Ar pažeista ranka galėtumėte nusiplauti kito peties nugarinę dalį?	⬭	⬭
12. Ar dėl pažeisto peties galėtumėte dirbti savo darbą visą darbo dieną?	⬭	⬭

Figure. The final Lithuanian version of the Simple Shoulder Test

Test of the final version

The original patient group consisted of 108 prospectively evaluated consecutive patients diagnosed with chronic rotator cuff tears who were admitted to hospital for the operative treatment between April 2007 and January 2008. All these patients were included in the hospitalized patient Group A (Table 1). Eighty patients from the original patient group were evaluated at the follow-up examination from 12 to 18 weeks (mean 13.53) after surgery. These patients were included in the ambulatory patient Group B (Table 1). This investigation was approved by research ethic board. The patients were informed about the study and signed an informed consent.

Table 1. **Group demographics and type of rotator cuff injury**

Parameters	Group A (hospitalized)	Group B (ambulatory)	Group C (test-retest)
n	108	80	63
Gender [n (%)]:			
Male	67 (62.0)	53 (66.3)	39 (61.9)
Female	41 (38.0)	27 (33.8)	24 (38.1)
Age (y):			
Mean	56.5	56.3	57.6
Minimum	33	33	39
Maximum	78	78	78
Std. deviation	9.6	9.0	8.9
Rotator cuff injury [n (%)]:			
Full-thickness	90 (83.3)	71 (88.8)	53 (84.1)
Partial	14 (13.0)	6 (7.5)	6 (9.5)
Massive	4 (3.7)	3 (3.8)	4 (6.4)

All the patients in both hospitalized and ambulatory groups were examined by one shoulder surgeon. The shoulder joint and general health status was evaluated using shoulder joint specific measurement instruments: the Constant scoring scale (CS) (1), the SST-LT and valid generic health instrument the Lithuanian Short form-36 version 2 (Lithuanian SF-36v2) which was received from the Quality Metric Incorporated Company. All items of the CS (pain, activities of daily life, active external and internal rotation) were evaluated and documented during an interview, and the active range of motion (forward flexion, abduction) was measured with a goniometer as recommended (1). The abduction strength was measured in the scapular plane with the arm abducted 90° and the elbow extended using Kern digital dynamometer (Kern & Sohn GmbH, Balingen, Germany. Weighing range max. 15 kg, readout d = 20 g, reproducibility 20 g, linearity 0.5%) following reliable technique (17). After observer-based evaluation, all the patients completed the patient-based questionnaire without assistance. In Group A five patients left one or more items in the SST-LT unanswered. In each case these items were different. We gave back these questionnaires for the patients and asked to review and fill in the blank items. After that we received all questionnaires without any data missing.

Test-retest reliability was calculated for Group C (Table 1) which included 63 patients from the original patient group who completed the SST-LT again next day (one day interval). Internal consistency and validity of the SST-LT were evaluated for hospitalized patient Group A and ambulatory patient Group B. The content validity was evaluated by calculating floor (the lowest possible score) and ceiling effects (the highest possible score) for the overall SST-LT (10). The construct validity was tested by comparing the overall SST-LT scores to the overall CS scores, the domain "physical functioning" of the Lithuanian SF-36v2, shoulder related pain, shoulder muscle strength, forward flexion and abduction. We tested six developed hypotheses:

1. Patients with lower CS scores will have lower SST-LT scores.

2. Patients with lower "physical functioning" scores of the Lithuanian SF-36v2 will have lower SST-LT scores.

3. Patients with greater shoulder related pain will have lower SST-LT scores.

4. Patients with less strength of the injured arm will have lower SST-LT scores.

5. Patients with less forward flexion in the injured shoulder will have lower SST-LT scores.

6. Patients with less abduction in the injured shoulder will have lower SST-LT scores.

For testing hypotheses number 3 to 6 we used separated scores from the CS for the pain, shoulder strength, forward flexion and abduction. Table 2 summarizes data of the SST-LT, CS and "physical functioning" scores of the Lithuanian SF-36v2 for Groups A and B.

Table 2. **Scores for the two groups of patients evaluated using the shoulder joint-specific and generic health instruments**

Assessment tool	Scores	Group A (n = 108)	Group B (n = 80)
Simple Shoulder	Mean	34.88	56.67
Test-LT	Minimum	0.0	0.0
	Maximum	83.33	100.0
	Std. deviation	21.68	27.54
Constant scoring	Mean	42.89	51.50
Scale	Minimum	0.00	9.00
	Maximum	80.00	90.00
	Std. deviation	18.9	19.7
Subscales for:			
Pain	Mean	5.80	9.33
	Std. deviation	2.70	3.16
Forward flexion	Mean	6.70	7.38
	Std. deviation	2.9	2.37
Abduction	Mean	6.14	6.75
	Std. deviation	3.00	2.47
Strength	Mean	6.42	6.76
	Std. deviation	5.45	4.3
Physical functioning	Mean	60.04	73.19
(Lithuanian SF-36v2)	Std. deviation	20.21	20.67

For statistic analysis we used raw CS scores (0–100 point scoring) without adaptation to the patient's age and gender, 0–100 point scoring (transformed scores) for the Lithuanian SF-36v2 and 0–100 point scoring (transformed scores) for the SST-LT. We used the one-way ANOVA test at the $\alpha = 0.05$ level of significance to compare differences between age, gender, pathology in our patient groups. Cronbach's alpha, item-total correlations and item-removal analysis were used to assess internal consistency. The intraclass correlation coefficient (ICC) with 95% confidence interval was determined for test-retest reliability of the overall SST-LT. We determined correlation significance for all the constructs using Spearman correlation test. All data analyses were performed by use of SPSS software (version 13.0 for Windows; SPSS, Chicago, IL).

RESULTS

There were no significant differences in age (0.019, $p = 0.890$), gender (0.350, $p = 0.555$) and pathology (0.411, $p = 0.522$) between Groups A and B. The Cronbach's alpha value in Group A

was 0.722. Analysis of the item-total correlation revealed that the questions number 1 and 2 had very low correlation (0.210 and 0.128) with the total SST-LT score. After item-removal analysis and deleting items number 1 and 2 from the SST-LT Cronbach's alpha increased to 0.724 and 0.729. The Cronbach's alpha value in Group B was 0.844. Question number 1 had the lowest correlation (0.326) with the total SST-LT score. After deleting this item from the scale Cronbach's alpha remained unchanged (Table 3). The ICC between the two tests in Group C was 0.96 with the 95% confidence interval (0.94–0.98).

Table 3. **Item-total analysis of the Simple Shoulder Test-LT**

The SST questions	Group A (n = 108)		Group B (n = 80)	
	Item-total correlations	Cronbach's alpha if item deleted	Item-total correlations	Cronbach's alpha if item deleted
1.	0.210	0.724	0.326	0.844
2.	0.128	0.729	0.515	0.832
3.	0.321	0.709	0.600	0.825
4.	0.472	0.686	0.561	0.829
5.	0.540	0.675	0.467	0.836
6.	0.470	0.686	0.515	0.833
7.	0.520	0.682	0.552	0.829
8.	0.258	0.719	0.464	0.836
9.	0.444	0.691	0.580	0.827
10.	0.259	0.718	0.528	0.832
11.	0.390	0.701	0.563	0.828
12.	0.256	0.716	0.462	0.837

Table 4. **Correlations by construct with the overall scores of the Simple Shoulder Test-LT**

Constructs	Group A (n = 108)	Group B (n = 80)
1. Constant score	0.730	0.881
2. Physical functioning (Lithuanian SF-36v2)	0.492	0.715
3. Pain	0.506	0.607
4. Strength	0.610	0.611
5. Forward flexion	0.580	0.786
6. Abduction	0.535	0.765

Note. Spearman correlation, all p values <0.001.

In Group A seven patients had the lowest (floor effect 6.5%) and no patient had the highest possible score in the SST (ceiling effect 0.0%). In Group B one patient had the lowest (floor effect 1.3%) and 7 patients had the highest possible score in the SST (ceiling effect 8.8%). In both patient groups correlations by construct were moderate (from 0.506 to 0.786 ($p < 0.001$) except two cases: 1. correlation was high (rho = 0.881, $p < 0.001$) with the shoulder joint specific instrument CS in the patient Group B and 2. correlation was weak (rho = 0.492, $p < 0.001$) with the domain "physical functioning" of the Lithuanian SF-36v2 in Group A. All correlations in Group B were higher (from 0.607 to 0.881, $p < 0.001$) than those in Group A (from 0.492 to 0.735, $p < 0.001$) (Table 4).

DISCUSSION

The SST was designed as shoulder joint specific instrument to asses shoulder pain and function in a busy clinical setting. The authors recommend using the SST as office-based patient self-assessment tool in a population of individuals with a primary glenohumeral degenerative joint disease (3, 12). There was no recommendation to use it in selected patient groups (e. g. hospitalized patients selected for rotator cuff repair). Since ambulatory and hospitalized patients are equally important we decided to investigate psychometric properties of the SST-LT in both groups. After reviewing the literature we found limited data about internal consistency of the SST, and no publications available concerning the item-total and item-removal analysis of the scale. Previous studies investigating validity of the SST had limitations as well. These investigations were performed in patient groups with: 1. various shoulder pathology except rotator cuff tears (9), 2. rotator cuff tears only (14), 3. rotator cuff tears and instability (10) and 4. where definite shoulder pathology was not documented (12, 13).

During the review of the literature we found only one study in which Cronbach's alpha value was calculated for the SST. Roddey et al. (13) investigated a patient group (n = 192) with various shoulder pathologies at private office. That group included 46% patients after surgery and the other part of the group included patients who had no surgery on their shoulder. The true pathology was not documented. They found Cronbach's alpha value to be 0.85 which was similar to our findings in ambulatory patient Group B. Item-total correlation and item-removal analysis revealed that the questions number 1 and 2 had the weakest correlation (0.210 and 0.128) with the total SST-LT score and was not useful in hospitalized patient Group A. The same question number 1 had the weakest correlation (0.326) with the SST-LT and also was not useful in the ambulatory patient Group B. Without these questions the number of useful items in the SST-LT decreased from 12 to 11 or 10, resulting in the differences between Cronbach's alpha values in two patient groups.

Test-retest reliability of the SST was evaluated in two studies (8, 10) and the authors reported very good retesting results in 1 week (ICC = 0.98) and in 4 weeks (ICC = 0.97) intervals. Our patient Group C was tested in 1 day interval and we received similar results (ICC = 0.96) confirming the fact that the SST-LT is reliable. Marx et al. (18) revealed that there was no difference in test-retest reliability for four knee-rating scales and SF-36 after retesting at 2 days or 2 weeks intervals. We think that our results might not be lower if we had used longer test-retest intervals. One day interval was also used to test reliability of patient-based instruments for other chronic musculoskeletal pathology (19).

Construct validity of the SST was evaluated previously using the constructs related to the patient's self-assessed and to the observer-based evaluation of impairment of the shoulder function. Beaton and Richards (9) revealed moderate correlation (rho = 0.58, $p \leq 0.05$) between SF-36 domain "physical functioning" and the overall SST score in the patient group (n = 90, mean age 48 years) treated conservatively for impingement syndrome (61%), osteoarthrosis (19%), instability (6%),

humeral malunion (4%) and various other shoulder abnormalities (10%). Godfrey et al. (10) compared SF-12 domain "physical functioning" with the SST scores for the preoperative patient group (n = 28, age > 60 years) with rotator cuff injury. The authors revealed very weak correlation for this patient group (rho = 0.337, p = 0.58). We found weak correlation between SF-36 domain "physical functioning" and the overall SST score in Group A (rho = 0.492) and moderate correlations in the patient Group B (rho = 0.715). Such variability of the results may be due to the differences in age, shoulder pathology and sample size between these patient groups. Romeo et al. (14) compared the SST scores with the CS in the patient group (n = 72) after rotator cuff repair. Correlation between the overall CS scores and the SST scores was moderate (rho = 0.70) and comparable to our results in Group A (rho = 0.730) but weaker than that in Group B (rho = 0.881). In the same study the authors also tested correlations of forward flexion and abduction to the SST scores. The SST correlated moderately well (rho = 0.55) with abduction and weakly (rho = 0.40) with forward flexion. These results are comparable to the results in preoperative patient Group A, but in Group B correlation was stronger for both abduction (rho = 0.765) and forward flexion (rho = 0.786). Two other constructs (pain and strength) also demonstrated moderate correlation in both groups. Our study revealed differences in construct validity between Groups A and B that could be explained by the differences in reliability coefficient Cronbach's alpha of the SST-LT between the two groups (7). In the patient Group B the SST-LT had higher reliability coefficient ($\alpha = 0.844$), and correlations by construct were higher than those in Group A where Cronbach's alpha value was 0.722.

Limitation of our study was that we tested psychometric properties of joint specific evaluation instrument in patient groups with only one shoulder pathology (rotator cuff injury). In the different population with the patients suffering from other shoulder pathology and receiving different treatment (conservative) psychometric properties of the SST-LT may be different. Strengths of this study were that we performed cross-cultural adaptation and testing of the psychometric properties of the SST-LT using standard approach as described in the literature (7, 16). The investigation was performed in the patient groups with definite shoulder pathology confirmed intraoperatively. We used valid generic health instrument Lithuanian SF-36v2 and widely used the Constant scoring scale to which the SST-LT was compared in establishing validity.

CONCLUSIONS

The SST-LT can be used as shoulder joint specific and office-based patient self-assessment tool in a population of individuals with a primary glenohumeral degenerative joint disease for the Lithuanian speaking population. We reported additional information about the psychometric properties of the SST that can be useful for orthopaedic surgeons and various health care specialists in other countries.

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LIETUVIŠKA PAPRASTO PETIES KLAUSIMYNO VERSIJA: JOS PATIKIMUMO BEI PAGRĮSTUMO ĮVERTINIMAS

Tikslas. Originalus angliškas Paprastas peties klausimynas (PPK) yra skirtas įvertinti peties sąnario būklę. Šio darbo užduotys: pritaikyti PPK klausimyną Lietuvai, ištirti jo psichometrines savybes – patikimumą ir pagrįstumą.

Metodai ir medžiaga. PPK kalbinis ir kultūrinis pritaikymas atliktas pagal Amerikos ortopedų akademijos rekomendacijas. Psichometrinės lietuviškos PPK versijos (PPK-LT) savybės buvo ištirtos apklausus pacientus, atvykusius operuotis plyšusių peties sukamųjų raumenų sausgyslių (n = 108), ir ambulatorinius pacientus po operacijos (n = 80). Formuluočių pagrįstumas buvo ištirtas palyginus PPK-LT su Konstanto peties vertinimo skale ir lietuviška Gyvenimo kokybės klausimyno SF-36 antrąja versija. Buvo ištirtas klausimyno vidinis nuoseklumas ir stabilumas laiko atžvilgiu.

Rezultatai. Parengtas PPK-LT atitinka visus kalbinio ir kultūrinio pritaikymo reikalavimus. PPK-LT psichometrinės savybės priešoperacinių ir ambulatorinių pacientų grupėse: vidinis nuoseklumas (Cronbach $\alpha = 0{,}722$ ir 0,844), visų formuluočių koreliacija siekė nuo 0,492 iki 0,881 ($p < 0{,}001$). Vertinant PPK-LT stabilumą laiko atžvilgiu, nustatytas vidinis klasės koreliacijos koeficientas su 95% pasikliautinumo intervalu buvo 0,96 [0,94–0,98].

Išvados. PPK-LT gali būti naudojamas vertinant peties sąnario būklę lietuviškai kalbantiems pacientams.

Raktažodžiai: Paprasto peties klausimyno lietuviškas variantas, psichometrinės savybės