Original paper

Adaptation and validation study of the Polish version of the Oxford Shoulder Instability Score

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Abstract

Introduction: The diagnostic process of individuals with shoulder instability (SI) should include patient-reported outcome measures (PROMs).
Aim of the research: The aim of this study was to perform a translation and cultural adaptation of the Oxford Shoulder Instability Score (OSIS) for the Polish population (PL) and to evaluate its psychometric properties.
Material and methods: This was a prospective cohort study with a repeated-measures design. Patients after arthroscopic repair for SI (n = 75) were tested three times to assess the following: internal consistency, reliability, and responsiveness. Construct validity was assessed by comparing the OSIS-PL with the 36-item Short Form Health Survey (SF-36) and the Disabilities of Arm, Shoulder, and Hand Questionnaire (QuickDASH). To confirm the one-dimensional structure of the OSIS-PL, confirmatory factor analysis (CFA) was performed. Responsiveness of the ULFI-PL was assessed using effect size (ES) and standardised mean response (SMR).
Results: The OSIS-PL demonstrated excellent internal consistency (Cronbach's α = 0.93) and test–retest reliability (ICC2,1 = 0.99). Five out of six hypotheses (83.33%) formulated a priori were confirmed ($p < 0.05$), which suggests high construct validity of the OSIS-PL. The CFA identified a one-dimensional structure of the OSIS-PL (chi-squared: χ^2 = 11.592, $p > 0.999$; all the defined fit indices showed adequate values). The OSIS-PL showed from moderate (ES = 0.412) to high (SRM = 1.307) degree of responsiveness.
Conclusions: The OSIS-PL is a simple, user-friendly PROM, which demonstrates high reliability, validity, and responsiveness in Polish populations following arthroscopic SI repair.

Introduction

Shoulder instability (SI) is the inability to maintain the humeral head centred on the glenoid fossa during movement. It is the most commonly dislocated joint, responsible for over 50% of all dislocations, with a 2–8% prevalence in the general population [1, 2]. SI mainly affects active people under 30 years old, especially in overhead sports, causing pain, limited mobility, joint damage, and reduced quality of life [1, 3]. Due to high healthcare costs and productivity loss [4], assessment should include patient-reported outcome measures (PROMs) that capture the patient's perspective on symptoms and function [5, 6].

Among PROMs for SI, the Oxford Shoulder Instability Score (OSIS), developed by Dawson *et al.*, is one of the most used short, self-reported questionnaires. The original validation demonstrated strong reliability, responsiveness, and construct validity [7, 8]. Because most PROMs originate from English-speaking countries, accurate translation and cultural adaptation are essential for use in different cultural contexts [9]. The OSIS has been validated in various countries including Italy [10], Iran (Persian version) [11], Kuwait (Arabic version) [12], the Netherlands (Dutch version) [13], and Turkey [14].

Aim of the research

The aim of this study was to adapt the OSIS into a Polish version (OSIS-PL) and to assess its psychometric properties according to the Consensus-Based Standards for the Selection of Health Measurement Instruments (COSMIN) guidelines [15].

Material and methods

Stage 1. Translation and cultural adaptation

The OSIS was translated and culturally adapted to the Polish version using the guidelines specified by Oxford University Innovation [16] (Figure 1).

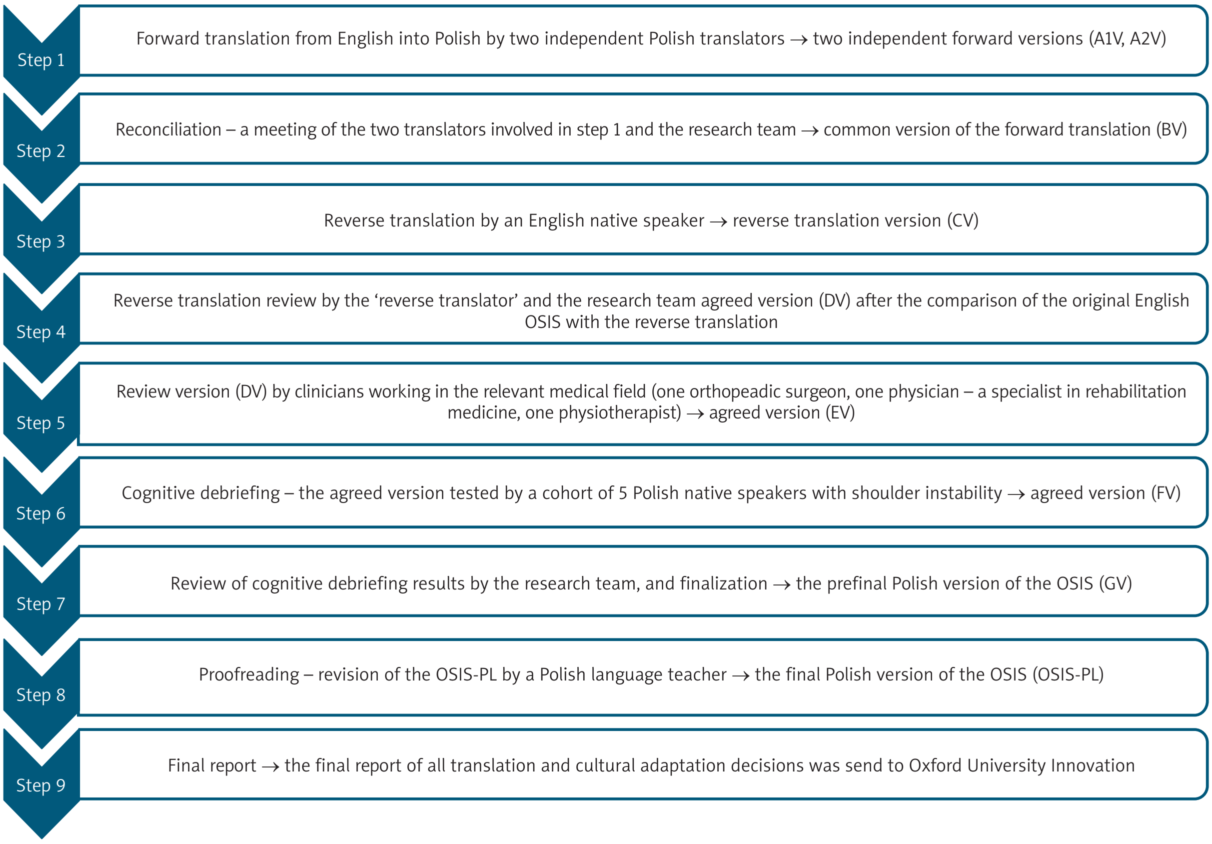

Figure 1. Flow chart of the translation and cultural adaptation process of the Oxford Shoulder Instability Score (OSIS) from English to Polish

OSIS-PL – Polish version of the Oxford Shoulder Instability Score.

Stage 2. Validation study

Participants

The study covered native Polish patients over 18 years of age, who were receiving treatment in the the Holy Family Specialist Hospital in Rudna Mała, with interventions involving arthroscopic repair for SI. The following exclusion criteria were applied: a history of shoulder or upper limb surgery; a diagnosed condition, other than SI, possibly contributing to shoulder dysfunction (i.e. cervical spine disease); and any co-existing rheumatic or neurological conditions, psychiatric or cognitive disorders potentially affecting the patient's quality of life, or their ability to understand or complete the questionnaires.

Study design and data collection

This prospective cohort study with a repeated-measures design evaluated the measurement properties of the OSIS-PL. Assessments were conducted at three time points: baseline Test 1 (> 12–16 weeks post-surgery) with the OSIS-PL, the 36-item Short Form Health Survey, version 2.0 (SF-36 v.2.0), and the Abbreviated Version of the Disabilities of the Arm, Shoulder, and Hand Questionnaire (QuickDASH); Test 2 (48–72 h later, no treatment) with the OSIS-PL only; and Test 3 (8 weeks later, post-physiotherapy) with the OSIS-PL, QuickDASH, and a 7-point Global Rating of Change Scale (GRC).

Research tools

The *OSIS* is a disease-specific PROM assessing outcomes of physiotherapy or surgery for SI. The 12-item questionnaire covers instability episodes, pain, daily and work activities, social life, sports, concern about the shoulder, and activity avoidance. Each item is rated 0–4, with total scores from 0 (most impaired) to 48 (least impaired) [7, 8].

The QuickDASH assesses upper limb function using 11 items: three addressing symptoms and eight reflecting functional limitations in daily, work, and social activities. Responses use a 5-point Likert scale, with final scores (0–100); higher scores indicate greater dysfunction [17, 18].

The *SF-36 v.2.0* is a generic health-related quality of life (HRQOL) tool containing eight domains, each scoring 0–100 (higher scores = better quality of life), with two summary scores: Physical (PCS) and Mental (MCS) [19, 20].

The *Seven-Point GRC scale* assesses perceived changes in symptoms over time. Patients rate their condition after physiotherapy on a 7-point scale, from 1 (completely recovered) to 7 (very much worse) [21].

Sample size

A post hoc power analysis based on the Intraclass Correlation Coefficient (ICC) with 71 participants (Tests 1 and 2), ICC = 0.7 and $p = 0.05$, showed a test power > 99.9% for the total OSIS score, confirming sufficient sample size [22–24]. An adequate sample size followed COSMIN guidelines, requiring 5–7 participants per item for CFA (60–84 for OSIS-PL) and at least 50 for other analyses [25].

Reliability analysis

Internal consistency

Internal consistency was assessed using Cronbach's alpha (α), with 0.70–0.95 considered satisfactory [23, 26].

Reliability (test–retest)

The test–retest reliability was assessed using $ICC_{2,1}$ with a 95% confidence interval (CI), with ICC ≥ 0.70 indicating good reliability [23, 26].

Measurement error (test–retest)

Error of repeated measurement was assessed using the standard error of measurement (SEM) and minimum detectable change (MDC) at a 95%CI [27, 28].

Validity analysis

Construct validity – hypotheses testing

A priori hypotheses were formulated to assess construct validity of the OSIS-PL, expecting the following: strong negative correlation with QuickDASH(1), moderate positive with SF-36(PCS/MCS2), stronger with QuickDASH than SF-36(PCS/MCS2), and weaker with SF-36 MCS than PCS [1]. Spearman's correlation coefficients (SCC) were used (≤ 0.30 = weak, 0.3–0.7 = moderate, > 0.70 = strong) [29]. Construct validity was rated as high, moderate, or low when < 25%, 25–50%, or > 50% of hypotheses were rejected, respectively [23].

Structural validity

Confirmatory factor analysis (CFA) was performed with the implementation of a polychoric matrix and the robust diagonally weighted least squares (RDWLS) extraction method [30]. The goodness-of-fit was assessed using the chi-squared test (χ^2), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Standardised Root Mean Square Residual (SRMR). Based on Hu and Bentler, model fit was considered good when specific index values met the recommended thresholds: RMSEA < 0.06, CFI, TLI > 0.95, and SRMR < 0.08, and if $p > 0.05$ in the χ^2 test. In CFA, factorial loadings greater than or equal to 0.40 were considered adequate for one dimension of the OSIS-PL [31].

Responsiveness analysis

The correlation between changes in the OSIS-PL and the QuickDASH

Correlations between changes in the OSIS-PL and the QuickDASH (Test 1–3) were evaluated using Spearman's correlation (SCC) [29].

The standard effect size (ES) and standardised response mean (SRM)

Responsiveness was also measured using effect size (ES) and standardised response mean (SRM). Values ≤ 0.20, 0.21–0.79, and ≥ 0.80 indicated low, moderate, and high responsiveness, respectively [32].

Interpretability analysis – The minimal clinically important difference (MCID)

MCID, the smallest change perceived as beneficial, was estimated using two methods. The anchor-based method calculated MCID (with 95% CI) as the mean OSIS-PL change (Test 1–3) in patients reporting improvement (GRC 1–3). The distribution-based method used the SEM of OSIS-PL changes in those without improvement (GRC 4–6) [33].

Statistical analysis

Statistical analysis was performed using R statistical package (v. 4.2.2) [22] with significance at $p \leq 0.05$. Floor and ceiling effects were defined as > 15% of lowest or highest scores [23].

Results

Stage 1. Translation and cultural adaptation

During the OSIS translation and cultural adaptation to Polish, several changes were made: minor differences in forward translations were resolved (Step 2), and discrepancies in the back-translation were addressed (Step 4). Experts suggested a wording change in item 9 (Step 5), while cognitive debriefing confirmed full comprehension (2.0/2.0) with one suggestion to better differentiate response categories (Step 6). Consequently, "Very rarely" and "Some days" were adopted (Step 7). A language expert made

Table 1. Baseline patient characteristics

Characteristic (*n* = 75)	***n* (%)**	**$\bar{x}$ ±SD/(range)**
Gender		
Male	64 (85.33)	
Female	11 (14.67)	
Age [years]		30.05 ±9.01 (18–50)
Handedness		
Right-handed	69 (92.00)	
Left-handed	6 (8.00)	
Operated side		
Dominant	61 (81.33)	
Non-dominant	14 (18.67)	
Time from arthroscopy [weeks]		14.49 ±1.12 (13–16)

n – number, $\bar{x}$ – mean, SD – standard deviation, % – percent.

minor grammatical edits to the final version (Step 8), resulting in the finalised OSIS-PL.

Stage 2. Validation study

Participants characteristics

Seventy-five subjects following arthroscopic repair for shoulder instability, who met the inclusion criteria, completed questionnaires during Test 1. Patient characteristics are presented in Table 1. Subsequently, to enable test-retest reliability assessment, OSIS-PL questionnaires were completed again after 48–72 hours (Test 2) by 71 participants (94.67%). Finally, 51 (68.00%) patients who had received physiotherapy (2–7 weeks) participated in Test 3 (Figure 2).

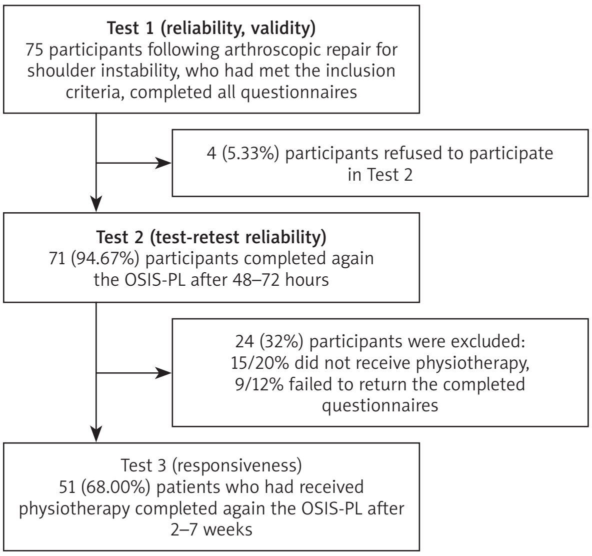

Figure 2. Flow diagram for participants

OSIS-PL – Polish version of the Oxford Shoulder Instability Score.

Table 2 presents the values of the OSIS-PL, SF-36, and QuickDASH data from baseline evaluation. No floor and ceiling effect for OSIS-PL was found.

Reliability analyses

Internal consistency

Internal consistency was excellent, with a Cronbach's a value of 0.926 (n = 75). Furthermore, each item correlated positively with the remaining items of the OSIS-PL ($p < 0.05$), which reflects a positive discriminatory power (Table 3).

Test–retest reliability and measurement error

The value of ICC2,1 ($n = 71$) for the OSIS-PL was excellent and amounted to 0.993 (95% CI: 0.988–0.995), the SEM value was 0.942, and MDC95% was 2.611.

Validity analyses

Construct validity – hypotheses testing

Table 4 shows SCC values for the OSIS-PL and the reference questionnaires used in the study. One hypothesis formulated a priori, which was disproved, anticipated that there would be moderate positive correlations between the OSIS-PL total and the SF-36 (PCS). Five out of 6 hypotheses formulated a priori (83.33%) were confirmed, which suggests high construct validity of OSIS-PL.

Structural validity

Structural validity met the a priori requirements. The CFA identified a one-dimensional structure of the OSIS-PL. No statistical significance ($p > 0.999$) was shown by χ^2 test, whereas all the defined fit indices were found to be very good, based on the criteria proposed by Hu and Bentler, which confirmed the one-dimensional character of the OSIS-PL (Table 5). All CFA-implied item-total correlations were appropriate,

Table 2. Data from baseline evaluation for all the questionnaires

Questionnaire	*n*	Missing	$\bar{x}$	SD	Median	Min	Max	Q1	Q3
OSIS-PL	75	0	32.85	10.88	32	6	48	24	44
QuickDASH	75	0	24.91	21.74	18.18	0	81.82	6.82	38.64
SF-36: PF	75	0	82.27	14.01	85	25	100	75	95
SF-36: RP	75	0	65.58	24.37	68.75	0	100	50	81.25
SF-36: BP	75	0	66.07	23.17	66.67	0	100	44.44	88.89
SF-36: GH	75	0	65.4	17.18	65	0	95	55	77.5
SF-36: VT	75	0	61.33	18.4	62.5	6.25	100	50	75
SF-36: SF	75	0	76	23.05	75	12.5	100	62.5	100
SF-36: RE	75	0	80.89	22.42	91.67	0	100	66.67	100
SF-36: MH	75	0	71	17.26	75	15	100	65	85
SF-36: PCS	75	0	70.73	16.63	69.23	7.69	96.92	61.54	83.08
SF-36: MCS	75	0	71.07	17.36	76.79	10.71	100	60.71	82.14

OSIS-PL – the Oxford Shoulder Instability Score – Polish version, QuickDASH the Abbreviated Version of the Disabilities of Arm, Shoulder, and Hand Questionnaire; SF-36 the 36-item Short Form Health Survey: PF – physical functioning, RP – role physical, BP – bodily pain, GH – general health, VT – vitality, SF – social functioning, RE – role emotional, MH – mental health, PCS – Physical Component Summary, MCS – Mental Component Summary, n – number, $\bar{x}$ – mean; SD – standard deviation, Min – minimum value, Max – maximum value, Q1 – 1st quartile, Q3 – 3rd quartile.

Table 3. Item – total score correlations within the Polish version of the Oxford Shoulder Instability Score

Item of the OSIS-PL	Item-total correlation
1	0.575
2	0.88
3	0.814
4	0.797
5	0.741
6	0.886
7	0.768
8	0.879
9	0.902
10	0.845
11	0.873
12	0.815

OSIS-PL – the Oxford Shoulder Instability Score – Polish version.

ranging from 0.583 to 0.923, and they were statistically significant ($p < 0.001$) (Table 6).

Responsiveness analyses

Correlation between changes in the OSIS-PL and the QuickDASH

A strong, significant negative correlation between changes in the OSIS-PL and the QuickDASH was found (SCC = 0.761; $p < 0.001$).

Table 4. Correlations between the Polish version of Oxford Shoulder Instability Score and Reference Questionnaires

Questionnaire *n* = 75	OSIS-PL	
	SCC	*P*-value
SF-36: PF	0.782	< 0.001*
SF-36: RP	0.645	< 0.001*
SF-36: BP	0.747	< 0.001*
SF-36: GH	0.612	< 0.001*
SF-36: VT	0.324	0.005*
SF-36: SF	0.406	< 0.001*
SF-36: RE	0.414	< 0.001*
SF-36: MH	0.316	0.006*
SF-36: PCS	0.777	< 0.001*
SF-36: MCS	0.415	< 0.001*
QuickDASH	–0.846	< 0.001*

*OSIS-PL – the Oxford Shoulder Instability Score – Polish version, QuickDASH the Abbreviated Version of the Disabilities of Arm, Shoulder, and Hand Questionnaire, SF-36 the 36-item Short Form Health Survey: PF – physical functioning, RP – role physical, BP – bodily pain, GH – general health, VT – vitality, SF – social functioning, RE – role emotional, MH – mental health, PCS – Physical Component Summary, MCS – Mental Component Summary, SCC – Spearman's correlation coefficient, n – number, *statistically significant (p < 0.05).*

Table 5. Data from confirmatory factor analysis of the Polish version of the Oxford Shoulder Instability Score

χ^2	D*f*	*P*-value	RMSEA	CFI	TLI	SRMR
11.592	54	> 0.999	< 0.001	> 0.999	> 0.999	0.046

OSIS-PL – the Oxford Shoulder Instability Score – Polish version, χ^2 – chi-squared test, df – degrees of freedom, p – statistical significance, RMSEA – Root Mean Square Error of Approximation, CFI – Comparative Fit Index, TLI – Tucker-Lewis Index, SRMR – Standardised Root Mean Square Residual.

Standard effect size (ES) and standardised response mean (SRM)

We calculated ES (0.412) and SRM (1.307) for the OSIS-PL, and the findings, based on Husted *et al.* [32], showed, respectively, moderate and high degrees of responsiveness (Table 7).

Interpretability analysis – minimal clinically important difference (MCID)

The MCID for OSIS-PL was 1.76 (anchor-based) and 3.22 points (distribution-based) (Table 7).

Practical characteristics

No responses were missing in the OSIS-PL questionnaires. Mean completion time was 3 min 43 s, and scoring took 26 sec.

Table 6. Confirmatory factor analysis – implied item – total score correlations within the Polish version of the Oxford Shoulder Instability Score

Item OSIS-PL	Loading	*P*-value
1	0.583	< 0.001
2	0.891	< 0.001
3	0.831	< 0.001
4	0.795	< 0.001
5	0.756	< 0.001
6	0.901	< 0.001
7	0.785	< 0.001
8	0.904	< 0.001
9	0.923	< 0.001
10	0.856	< 0.001
11	0.891	< 0.001
12	0.824	< 0.001

OSIS-PL – the Oxford Shoulder Instability Score – Polish version, p – statistical significance.

Discussion

To our knowledge, the study has produced a new contribution to the Polish literature, as it is the first one to focus on the adaptation of the OSIS into Polish and its validation. All predefined hypotheses were confirmed, demonstrating that the OSIS-PL is reliable, valid, and responsive. Its properties are consistent with the original and other language versions [7, 8, 10–14].

The translation and adaptation followed international guidelines, with minor adjustments to ensure conceptual equivalence [16]. During the second stage of the study, the reliability of the OSIS-PL questionnaire was assessed by measuring its internal consistency and repeatability. The Cronbach's α was found to be 0.93 (n = 75), which confirms good internal consistency [23, 26]. This result is similar to the value reported for the original version of the questionnaire, as reflected by Cronbach's α = 0.91 at pretreatment stage (n = 92) and 0.92 at follow-up (n = 64) [7]. Very good values of this parameter were also reported for other language versions of OSIS (α = 0.82–0.90) [10–14]. In our study, the OSIS-PL showed excellent repeatability ($ICC_{2,1}$ = 0.99) over a 2–3-day interval. Dawson *et al.* reported similarly high repeatability for the original version (PCC = 0.97; 24-hour interval) [7]. Slightly lower results than ours were reported by the authors of other adaptations (ICC = 0.81–0.94) with 48-hour–14-day interval [10–13]. These findings reflect very good repeatability of the cultural versions. We have shown that the SEM associated with the OSIS-PL was 0.94 points. Our MDC value shows that one must find a difference of at least 2.61 points to identify a true change in the patient's condition. The current study has shown lower SEM and MDC values than those reported for the Dutch (SEM = 3.3; SDC = 9 points) [13] and Italian (SEM = 2.8; MDC = 7.9 points) versions [10].

Construct validity analysis confirmed 5 out of 6 hypotheses (83.33%), indicating high construct validity of the OSIS-PL, consistent with Terwee *et*

Table 7. Results of the responsiveness analysis of the Polish version of the Oxford Shoulder Instability Score

OSIS-PL n = 51	Test 1		Test 3		ES	SRM	MCID (95% CI) Anchor-based method	MCID (95% CI) Distribution-b ased method
	$\bar{x}$ ± SD	Me	$\bar{x}$ ± SD	Me				
	30.27 ±9.62	28	34.75 ±8.02	33.5	0.412	1.307	1.76 (1.23–2.3)	3.22 (2.57–4.3)

OSIS-PL – the Oxford Shoulder Instability Score – Polish version, n – number, $\bar{x}$ – mean, SD – standard deviation, p – Wilcoxon paired test, ES – effect size, SRM – standardised response mean, MCID – minimal clinically important difference, CI – confidence interval.

al. [23]. Dawson *et al.* also reported good construct validity, demonstrated by the agreement between OSIS scores, clinical data, and SF-36 scores [7]. Other adaptations showed similar validity, using tools like the DASH, Western Ontario Instability Score (WOSI), Simple Shoulder Test (SST), SF-36, and SF-12, with stronger correlations observed for related constructs and weaker ones for less related measures [10–14].

Like in the earlier studies [10, 11, 13], floor or ceiling effect was not identified in the OSIS-PL. The calculated values of ES = 0.412 and SRM = 1.31 showed moderate and high degrees of responsiveness, respectively. Similarly, the original tool showed high responsiveness (ES = 0.80) [7], while the Arabic version demonstrated moderate responsiveness (SRM = 0.68) [12]. The MCID for OSIS-PL was estimated at 3.22 points, indicating a clinically significant change 4 months post-surgery. Foong *et al.* reported higher MCID values (7.7–8.6), but for patients 12 months postoperatively [34].

The study's limitations include not assessing the OSIS-PL's psychometric properties in patients receiving treatments other than arthroscopic SI repair, limiting its scope. The small sample size and single-hospital setting may affect the generalisability of the findings. Future research should validate the tool in diverse patient groups, with various treatments, ages, symptom severities, and upper limb functions. Furthermore, a larger study population, according to the COSMIN recommendations – 7 times the number of items and ≥ 100 (very good sample size), can be used to definitively clarify the factor structure using the CFA [25].

Conclusions

The OSIS-PL, accurately translated and culturally adapted, demonstrates high reliability, validity, and responsiveness after arthroscopic SI repair. It is suitable for scientific research, enabling international studies and reliable comparisons. As a concise and user-friendly PROM, is well-suited for clinical use to assess patient functioning, track progress, and guide treatment.

Acknowledgments

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Ethical approval

The research project was approved by the Bioethics Committee of the *Collegium Medicum* of the University of Rzeszów (Resolution No. 1/6/2017).

Conflict of interest

The authors declare no conflict of interest.

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