



Indian (Marathi) version of the Shoulder Pain and Disability Index (SPADI): Translation and validation in patients with adhesive capsulitis

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Background: The Shoulder Pain and Disability Index (SPADI) is the most commonly used self-administered questionnaire which is a valid and reliable instrument to assess the proportion of pain and disability in shoulder disorders. There is no evidence of SPADI questionnaire being translated into regional Indian language (Marathi).

Objective: This study aims to translate and culturally adapt and validate the Marathi version of the SPADI questionnaire. This was done as per the AAOS outcomes committee guidelines.

Methods: Cross-cultural adaptation and psychometric testing of SPADI was done in the Outpatient Physiotherapy Department of Tertiary Care Hospital, Ahmednagar, India.

Results: The internal consistency was assessed by calculating Cronbach alpha value for the pain score (0.908), disability score (0.959), and total SPADI (0.969) which were all high. The Test–retest reliability was assessed using the intraclass correlation coefficient (ICC) values for the pain score (0.993), disability score (0.997), and total SPADI (0.997) which showed excellent reliability. The criterion validity was assessed using Pearson correlation coefficient. In Males, weak to strong negative correlation was observed except for shoulder

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extension and in females, moderate negative correlation was observed between baseline shoulder range of motion and initial total SPADI scores and individual pain and disability except for shoulder internal rotation. The internal consistency of the Marathi SPADI (Cronbach's alpha >0.99) was higher than the original English version. The reliability of the total Marathi SPADI and its subscale (Intraclass correlation coefficient >0.90) were found to be higher than that of the English SPADI and were consistent with the German, Brazilian, Slovene and Greek versions.

Conclusion: The translated and culturally adapted Marathi version of the SPADI questionnaire is a reliable and valid tool for the assessment of pain and disability in Marathi population.

Keywords: Cross cultural adaptation; Marathi version; psychometric; reliability; SPADI; validity.

Introduction

Shoulder pain or dysfunction is the third most common musculoskeletal condition among the general population with a lifetime prevalence of 70%.^{1,2} Periarthritis, subacromial impingement, rotator cuff injury, acromioclavicular arthritis, etc. are some of the common causes of shoulder pain and disability which interferes in the social & working aspects of living of patients, affecting the overall quality of life.^{3,4}

Adhesive capsulitis is one of the common causes of shoulder pain & disability, with a prevalence of around 43.1% among the shoulder cases reported.³ This condition is characterized by pain, stiffness and limited range of motion of glenohumeral joint due to chronic inflammation of capsule which affects the upper extremity function and performance.⁵

A comprehensive evaluation of the shoulder joint generally involves the assessment of pain, clinical evaluation of shoulder range of motion, strength and joint play using standard protocols. Besides, shoulder specific self-reported questionnaires or patient-reported outcome measures (PRO) and performance-based outcome measures are also some of the simplest ways to obtain information about musculoskeletal pain and were used to evaluate disability associated with it.⁴ The appropriate selection of outcome parameter is essential to confirm the efficacy of specific treatment protocol for shoulder pain & disability.⁶

More than 30 different questionnaires are available in the literature to assess pain and function of shoulder.⁷ The clinometric properties of the 16 shoulder questionnaires which were designed to measure physical functioning in individuals with shoulder problems were analyzed and its clinometric properties were identified and evaluated in a systemic review⁸ and they found that the Shoulder

Pain and Disability Index (SPADI),⁹ Disability of the Arm, Shoulder and Hand Questionnaire (DASH),¹⁰ and the American Shoulder and Elbow Surgeons Questionnaire (ASES)¹¹ were the most extensively used questionnaires to assess disability associated with shoulder dysfunction.

SPADI is the most commonly used instrument in research around the shoulder joint to assess the proportion of disability. It is easy to administer, responsive, agreeable, and interpretable with objectivity with good construct validity and a minimum ceiling and flooring effects which have been tested in many clinical settings. It is self-administered and assesses both shoulder pain and disability during the important functional tasks of daily living.⁹

Roach and colleagues developed the original SPADI questionnaire in 1991. The initial validation of the questionnaire was done on 37 men with shoulder pain. They reported high internal consistency (0.86 to 0.95), and moderate test-retest reliability (interclass correlation coefficient (ICC = 0.65) on a subgroup of 23 patients. Principal components factor analysis was conducted which supported two subscales: pain and disability. The validity of the questionnaire was established by correlating SPADI total and subscale scores with shoulder ROM.⁹

Although enough evidence supports the reliability and the validity of the English language SPADI, these properties do not extend to a translated version used in a different cultural context.¹² The SPADI questionnaire has been translated and culturally adapted into many other languages but there very few published studies on its validity either in Asia or specifically in India.

Patients in India experience difficulties in understanding English questionnaires due to the language barrier. Before using any outcome

measure, which quantifies the impact of shoulder pain and disability on patients and assesses the efficacy of treatments in Indian scenario, it should be validated for their use in the Indian socio-cultural context for more accurate interpretation. Therefore, cross-cultural adaptation, reliability testing and validation of the questionnaire, which is translated in Indian regional languages, is essential for the questionnaire to be used in that particular region. Moreover, there is no evidence of the SPADI questionnaire being translated into Marathi, which is a widely used language in the Maharashtra state of India. Therefore, this study aimed to translate and culturally adapt the Marathi version of the SPADI questionnaire and to validate it in Indian patients with Adhesive capsulitis.

Materials and Methods

Shoulder Pain and Disability Index (SPADI) (English version)

The SPADI is a self-administered questionnaire that assesses shoulder pain and dysfunction.¹⁰ It consists of 13 items. The first five items measure the pain, and the next eight items assess patients' disability.¹⁴ This version of the SPADI questionnaire has a ten-point numerical rating scale (NRS).¹⁵ The patient has to answer the questions according to the level that corresponds to their pain and difficulty in movement, on a numerical rating scale ranging from 0, i.e., no pain and difficulty to 10, i.e., maximum pain and such difficulty so that the patient needs help.^{10,15} The calculation of final score was done by summing the individual responses and converting them into a percentage (%).¹⁵

Procedure

The commencement of study was done after obtaining approval by the Institutional Ethics Committee. The linguistic validation process was initiated after prior permission was obtained from the original developer of the questionnaire through the mail, to acquire their consent.

Steps Followed for Translation & Validation

As per the guidelines provided by the American Association of Orthopaedic Surgeons (AAOS)

outcomes committee, translation and cross-cultural adaptation of the SPADI questionnaire was performed.¹⁵

- (1) First, forward translation of the questionnaire from English to Marathi was done by an informed (T1) and uninformed translator (T2).
- (2) In the second step, the two translations (T1 and T2) were taken into consideration and the discrepancies were resolved, and a final form of the Marathi questionnaire was made (version T-12).
- (3) In the third step, Back-translation (Marathi to English) of the version T-12 was obtained from the two back-translators (BT1 and BT2).
- (4) Then Expert committee consisting of all four translators (T1, T2, BT1, BT2), one methodologist (researcher), and one language professional (having a good knowledge of both English and Marathi languages) reviewed the two back translated questionnaire (BT1 & BT2) to find out any discrepancies in interpretation/meaning and established a prefinal Marathi version of the questionnaire.
- (5) Pretesting of prefinal Marathi version of the questionnaire was done by administering in 31 patients with adhesive capsulitis selected with a purposive sampling method attending our physiotherapy outpatient department of Tertiary Care Hospital, Ahmednagar.

While testing the cross-culturally adapted version in Marathi for its validity, written informed consent was obtained from each patient who satisfied the inclusion criteria for this study. The patients of both the genders aged between 40–60 years and medically diagnosed with adhesive capsulitis were included in the study. Patients reported gradual onset and progressive worsening of pain (VAS ranging in between 3 and 8) and stiffness at shoulder at least from three months duration affecting functional activities related to shoulder. Patients having history of trauma, surgery or fracture of affected shoulder, Shoulder joint instability or dislocation, systemic illness like rheumatoid arthritis, Reiter's syndrome, osteoarthritis of the affected shoulder joint, Shoulder pain of cervical origin, patients with neurological diseases or other severe medical or psychiatric disorders, inability to read and understand Marathi were excluded from the study.

After a brief clinical examination, patients were explained about the procedure to fill the questionnaire before responding. The patients were seated comfortably and the questionnaire was given to them and they were asked to mark the point on the scoring system, which best represented their status of shoulder pain and disability.

The researcher noted the layout and wording of the questionnaire, its ease of understanding, and ease of completion of the questionnaire during the administration of questionnaire among patients. The patients stated no trouble in understanding and answering the questions effectively, therefore without making major alterations the SPADI questionnaire — Marathi version was then validated further to ensure consistency between the source (English) and target version of the questionnaire (Marathi).

- (6) The documentation of the above steps was submitted to the developers of the original questionnaire so as to ensure that the process has been carried out properly and that a reasonable translation has been achieved.¹⁶

After the patients completed the Marathi version of the questionnaire (Step 5), the active ROM of the shoulder was measured using a standard universal goniometer in the standard test positions.¹⁷ These ROM values were then used to analyze the criterion validity of the questionnaire. The test-retest reliability was also assessed by taking a second assessment session which was at least 24 hours after the first session (ICC).

Statistical analysis: Statistical analysis was done using SPSS version 20.0. Unpaired *t*-test was used for comparison of the baseline characteristics of males and females. The internal consistency was determined using Cronbach alpha value. The test-retest reliability of the Marathi total SPADI, pain and disability subscales were assessed using intra-class correlation coefficient (ICC). The criteria validity was assessed using Pearson correlation coefficient.

Results

The sample consisted of 17 male and 14 female participants with the right shoulder being affected in 16 participants and left shoulder being affected

in 15 participants. The mean age of males and females was 46.29 and 50.5 years, respectively. There was no statistical significant difference between males and females at baseline ($p > 0.05$) (Tables 1 and 2).

Reliability

The ICC values for the pain score (0.993), disability score (0.997), and total SPADI (0.997) were all high, showing excellent reliability (Table 3).

Internal consistency

The Cronbach alpha value for the pain score (0.908), disability score (0.959), and total SPADI (0.969) was all high. Removal of any question except questions 1, 10 and 13 would lead to lower Cronbach alpha compared to that of the total

Table 1. Descriptive statistics.

Gender	Male	17 (54.83%)
	Female	14 (45.16%)
Affected side	Right	16 (51.61%)
	Left	15 (48.38%)
Comorbidities	Diabetes	10 (32.25%)
	Hypertension	8 (25.80%)
	Hypertension and diabetes	5 (16.12%)

Table 2. Patient baseline characteristics.

Characteristics	Male	Female	<i>p</i> -value
	Mean ± SD	Mean ± SD	
Age (Years)	46.29 ± 7.47	50.5 ± 5.57	0.092
Shoulder flexion (degree)	115.64 ± 27.38	116 ± 23.10	0.96
Shoulder extension (degree)	31.76 ± 5.76	33.21 ± 3.33	0.41
Shoulder abduction (degree)	91.11 ± 19.2	93.92 ± 15.67	0.66
Shoulder internal rotation (degree)	51.23 ± 11.46	53.64 ± 13.52	0.59
Shoulder external rotation (degree)	36 ± 8.73	33.71 ± 8.95	0.47
SPADI pain score (%)	63.64 ± 14.92	65.28 ± 14.79	0.76
SPADI disability score (%)	53.48 ± 19	58.77 ± 16.10	0.42
Total SPADI score (%)	57.36 ± 17.2	61.21 ± 15.22	0.51

Table 3. Reliability of Marathi language SPADI.

SPADI ^c scale	ICC ^b value	95%CI ^a	
		Lower bound	Upper bound
Pain score			
average measure	0.993	0.985	0.996
Disability score			
average measure	0.997	0.995	0.999
Total score			
average measure	0.997	0.994	0.999

Notes: ^aCI = Confidence Interval; ^bICC = Intraclass Correlation Coefficient; ^cSPADI = Shoulder Pain and Disability Index.

Table 4. Redundancy of each individual item (by computing Cronbach alpha if item was deleted).

Questions	Cronbach alpha if item deleted
Question 1	0.972
Question 2	0.965
Question 3	0.965
Question 4	0.966
Question 5	0.965
Question 6	0.965
Question 7	0.963
Question 8	0.964
Question 9	0.965
Question 10	0.973
Question 11	0.964
Question 12	0.964
Question 13	0.972

SPADI score. Removal of questions 1, 10, 13 leads to small improvement in the Cronbach alpha (Table 4).

Validity

The face validity of the questionnaire was established with the original English version of the SPADI and was considered adequate for the Marathi SPADI after discussions within the expert committee, i.e., the content of the translated items was understandable and could be used in the assessment of shoulder pain and function as they depict activities of the shoulder in daily living (stage 4).

Criterion validity between the initial total SPADI score, individual pain score, and individual disability score and the baseline active range of motion of shoulder for males and females was assessed using Pearson correlation (Tables 5 and 6). For males, there was a weak to strong negative correlation between shoulder range of motion and pain score (Correlations ranged from 0.309 to 0.850) except for shoulder extension; shoulder range of motion and disability score correlation ranged from 0.474 to 0.869 except for shoulder extension, indicating weak to strong negative correlation; shoulder range of motion and total SPADI correlation scores ranged from 0.426 to 0.874) except for shoulder extension indicating weak to strong negative correlation (Table 5). For females, there was a moderate to strong negative correlation between shoulder range of motion and pain score (Correlations ranged from 0.639 to 0.770), except for shoulder internal rotation; shoulder range of motion and disability score correlation ranged from 0.611 to 0.692 except for shoulder internal rotation, indicating negative correlation; shoulder range of motion and total SPADI correlation scores ranged from 0.648 to 0.697) except for shoulder internal rotation, indicating moderate negative correlation (Table 6).

Table 5. Relationship between SPADI scale and shoulder ROM in males.

N = 17	Pain score	Disability score	Total score
Shoulder flexion	-0.851**	-0.869**	-0.874**
Shoulder extension	-0.263	-0.241	-0.251
Shoulder abduction	-0.832**	-0.814**	-0.829**
Shoulder internal rotation	-0.309	-0.475	-0.426
Shoulder external rotation	-0.777**	-0.820**	-0.816**

Notes: ROM = Range of motion; SPADI = Shoulder Pain and Disability Index.

**Correlation is significant at 0.01 level (2-tailed).

*Correlation is significant at 0.05 level (2-tailed).

Table 6. Relationship between SPADI scale and shoulder ROM in females.

<i>N</i> = 14	Pain score	Disability score	Total score
Shoulder flexion	-0.675**	-0.611*	-0.649*
Shoulder extension	-0.718**	-0.646*	-0.684**
Shoulder abduction	-0.770**	-0.629*	-0.697**
Shoulder internal rotation	+0.015	-0.086	-0.042
Shoulder external rotation	-0.639*	-0.693**	-0.684**

Notes: ROM = Range of motion; SPADI = Shoulder Pain and Disability Index.

**Correlation is significant at 0.01 level (2-tailed).

*Correlation is significant at 0.05 level (2-tailed).

Discussion

The SPADI is a self-administered questionnaire that assesses shoulder pain and dysfunction. The reliability and validity of the English language SPADI were established earlier and had enough documented evidence.⁹ But patients in Maharashtra (India) experience difficulties in understanding the English version of the questionnaire due to the language barrier. Therefore, this questionnaire was administered in patients by translating questions in the local language. So, there may be some variations in administration and interpretation of this questionnaire among different researchers in the Maharashtra region. Therefore, there is a need for translation of the SPADI questionnaire in the local language — Marathi in our set up.

Most widely used language in the Maharashtra state of India is Marathi, and hence we have translated the English version of SPADI questionnaire into Marathi version for ease in administration among patients. The SPADI questionnaire was Translated and culturally adapted into Marathi language according to the guidelines of the AAOS outcome committee for cross-cultural adaptations.¹⁵ The pre-final version of the SPADI Marathi version was administered to 31 patients with Frozen shoulder. Most of the patients understood every item from the questionnaire except the 1st and the 9th item of the questionnaire, which was then reformulated accordingly. During translation, some words in the questionnaire were adapted, keeping in mind the clothing differences of the patients in India and also according to gender. For example, “Putting on a shirt that buttons down the front” and “Putting on your pants”. In Indian culture, as women mostly wear sarees with a blouse piece that hooks in the front or at the back and

instead of pant they wear underskirt under sarees, so the Marathi version of the questionnaire was slightly modified accordingly.

On comparing the internal consistency of Marathi version with the original English version of SPADI (Roach KE), we observed that the Cronbach alpha values for pain subscale (0.908) were higher than the pain subscale score for English version (0.86) and the Cronbach alpha value for disability (0.959) was almost similar to disability score (0.93) of English version and the Cronbach alpha value for the total SPADI score (0.969) was also similar to that of the original English version (0.95), and also previous literature reported that the values greater than 0.7 is considered reliable having good internal consistency.¹⁷ Therefore, the Marathi version is considered a reliable tool. These results are also comparable to the previous study of translation in another Indian language — Tamil version.²⁴

Further, the reliability of the Marathi version was also analysed and the intraclass correlation coefficient (ICCs) was >0.90 for the pain score, disability score, and total SPADI showing excellent reliability indicating that the questionnaire is suitable for individual assessment of patients.⁸ These results are similar to those which were obtained when the original English version of the questionnaire was tested for reliability.^{14,18,19}

Additionally, when our results of reliability were compared with the original author’s study (Roach E), the reliability of the total Marathi SPADI had an ICC value (0.997), which was higher than the total English SPADI (ICC = 0.6552).⁹ Comparison of the ICC values for the pain and the disability subscale score and the total Marathi SPADI score with the values obtained by testing the questionnaires in German, Brazilian, Slovene and

Greek versions showed consistent results.^{20–23} Our results also demonstrated a good face and criterion validity of the Marathi version of the SPADI questionnaire analysed by calculating the correlation between the initial total SPADI score, individual pain score, individual disability score and the baseline degree of active range of motion of shoulder using Pearson correlation.

There was gender difference observed in the correlation between the initial total SPADI score, individual pain, disability score and baseline shoulder range of motion. The hypothesized mechanism behind these findings may be as the pain threshold level and pain tolerance is lower in females than in males which would affect the achieved shoulder range of motion.²⁵

This study demonstrated that the Marathi version of an SPADI Questionnaire had a satisfactory test–retest reliability, internal consistency, and face and criterion validity. Therefore, it is a reliable and valid tool to record the quality of life affected due to pain and disability in the Maharashtrian population.

Study Limitation

The main limitation of our study is that the sample size was small, and factor analysis of individual items of the questionnaire was not done.

Conclusion

The results of our study concluded that the translated and culturally adapted Marathi version of the SPADI questionnaire is a reliable and valid tool for the assessment of pain and disability in Marathi population.

Conflict of Interest

The author(s) have no conflicts of interest relevant to this paper.

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Author Contributions

All the authors contributed to the conception and design of study and approval for the submission to publication. A J Pahade & Wani S K contributed to the data analysis and interpretation. Mullerpatan R P contributed to the manuscript drafting. Roach K E contributed to the manuscript revision.

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