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RESEARCH REPORT

Cross-cultural adaption, reliability and validity of an Indian (Tamil) version for the Shoulder Pain and Disability Index

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Abstract The objective of the study was to cross-culturally adapt the Shoulder Pain and Disability Index (SPADI) into a regional Indian language (Tamil) and to test the reliability and linguistic validity of the index in Tamil-speaking Indian participants. Cross-cultural adaptation and psychometric testing of SPADI was undertaken at the Outpatient Physiotherapy Department of the Sri Ramachandra University Hospital in Chennai, India. The Test-retest reliability was quantified using the interclass correlation coefficient (ICC) and Cronbach alpha was calculated to assess internal consistency of the Tamil questionnaire. The construct validity was assessed using Spearman rank correlation coefficients. The reliability of the total Tamil SPADI and its subsets (Intraclass correlation coefficient >0.90) were found to be higher than that of the English SPADI and the German SPADI in this population. The internal consistency of the Tamil SPADI (Cronbach's alpha >0.95) was slightly higher than the English and the German versions. Thus, the cross-culturally adapted version of the English SPADI into a regional Indian language (Tamil) is easy to use and is a reliable and valid measure of shoulder pain and disability in the Tamil speaking population.

Introduction

The shoulder is one of the most common sites of musculoskeletal pain. Whilst pain and dysfunction at the shoulder may not be life threatening, it can adversely affect the

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performance of functional activities. In a World Health Organization (WHO) collaborated study, there was a crude prevalence rate of 30.13% of musculoskeletal pain in a South Indian community of which 28.05% was shoulder pain [1]. The burden of musculoskeletal disorders, including at the shoulder, can be measured in terms of the problems associated with them, which include pain and impaired function [2]. It has been observed in the developing world that complex factors such as modernization and socioeconomics would influence people to bear, adapt and manage the pain and disability arising from musculoskeletal disorders [3,4].

Shoulder performance is conventionally evaluated by measuring range of motion (ROM) and muscle strength. According to Bot et al. [5], objective measures can be impractical in some settings as they are time consuming and also require face-to-face contact. Clinical objective measures, moreover have no direct implication for patients who would just want to be free of pain and go about with their activities of daily living. Currently, efficiency of treatment is more often evaluated with outcome measures that are directly relevant to the patient [6].

A systematic review done by Bot et al. [5] identified and evaluated the clinometric properties of the 16 shoulder disability questionnaires designed to measure physical functioning in individuals with shoulder problems. The Shoulder Pain and Disability Index (SPADI) [7], Disability of the Arm, Shoulder and Hand Questionnaire (DASH), [8], and the American Shoulder and Elbow Surgeons Questionnaire (ASES) [9] were the most extensively used questionnaires. The SPADI was easy to administer, responsive, agreeable, and interpretable with good construct validity and a minimal ceiling and flooring effects. It was concluded that DASH and SPADI could be used for evaluation purposes in the outpatient department.

The SPADI is one of the most commonly used shoulder specific self-report questionnaires that are available to evaluate patients with shoulder pathology. Developed by Roach and colleagues in 1991, the initial validation work was based on 37 men with shoulder pain. High internal consistency (0.86 to 0.95) was observed, and moderate test–retest reliability was reported (interclass correlation coefficient (ICC) = 0.65) on a subgroup of 23 patients. Principal components factor analysis—with and without varimax rotation—were conducted which supported two subscales: pain and disability. Validity was established by correlating SPADI total and subscale scores with shoulder ROM.

The SPADI is the most widely used shoulder specific questionnaire and is available in both English and German . Although there is evidence to support the reliability and the validity of the English language SPADI, these properties do not automatically extend to a translated version used in a different cultural context [10]. The SPADI has been validated in several western sociocultural contexts but there have been no published studies on its validity either in Asia or specifically in India. Some patients in India experience difficulties understanding any English questionnaires due to the language barrier. India has one national language (Hindi), but there are 28 states and seven union territories, all of which have their own regional languages. This hinders the use of SPADI as a clinical evaluation tool in India. Any outcome measure used to quantify the impact of shoulder pain and disability on patients in India and to assess the efficacy of treatments should be validated for their use in the Indian sociocultural context. Therefore, cross-cultural adaptation, including reliability testing and validation, in regional Indian languages is essential for its use in that particular region. There is no evidence of the SPADI being translated into any Indian language. Hence this study aims to fulfill the process of cross-cultural adaptation and to establish the reliability and validity of the translated SPADI into one of the regional Indian languages (Tamil).

Methods

Participants and criteria

The sample for this study was drawn from participants with shoulder pain and dysfunction who were referred for physiotherapy to the inpatient and outpatient services at the Sri Ramachandra Hospital in Chennai, India. Both men and women with symptomatic shoulder pain and restriction of ROM, older than 21 years, and able to read and understand Tamil were included. Participants with previous shoulder surgeries, neck pathology, disabling upper-limb osteoarthropathic and neuropathic conditions along with the inability to read and understand Tamil were excluded from the study. Initially the sample comprised of 172 participants and was reduced to 143 after screening for the inclusion criteria. Ethical approval was obtained from the Institution and written informed consent was provided by every patient who took part in the study.

Tool description and scoring

SPADI was developed for use in an outpatient setting. It was designed to measure the impact of shoulder pathology in terms of pain and disability for both current status and change in status over time. The score has two subscales, namely, pain and disability with five and eight questions, respectively. Each question was scored using a visual analogue scale, with no pain or no difficulty in doing an activity at one end and unbearable pain or unable to do an activity at the other end. The scale was equally divided into 12 parts and the scores are calculated according to the guidelines that were given by the author. This scale has been widely used and become a standard outcome measure for clinical trials. Owing to its standard validity and reliability, there was a need for cross-cultural adaptation into a regional Indian language (Tamil) and thus this widely used functional outcome scale chosen for this study.

To facilitate the use of SPADI in regional languages, the original SPADI was taken up for cross-cultural adaptation, translation and linguistic validation for its use in Tamil speaking participants with shoulder pathology.

Tool procurement

As it is strongly recommended that the users should reply only on the original authorized version, prior permission was obtained from the author of the SPADI to use the scale

for this study. The permission for cross-cultural adaptation of SPADI and to assess its reliability and validity of the Tamil scale were also granted by the original author.

Procedure

Participants were briefed about the procedure before responding to the scale. The study participant's age, sex, duration of shoulder problem and pain, educational level, and presence of comorbidities were recorded from the interview and medical records.

Translation and cross-cultural adaptation of the SPADI was performed following the guidelines of the American Association of Orthopedic Surgeons (AAOS) outcomes committee [11]. This process consists of six steps, each of which is documented with a written report:

- *Stage I*: Forward translation (English to Tamil) by an informed translator (i.e., health professional, T1) and uninformed translator (T2).
- *Stage II*: Synthesis of T1 and T2, resolving any discrepancies, leading to version T-12.
- *Stage III*: Back-translation (Tamil to English) of the version T-12 by two native English-speaking back-translators (BT1 and BT2) who were unaware of the purpose of the instrument.
- *Stage IV*: Expert committee review consisting of all four translators, one methodologist, and one language professional to reach a consensus on discrepancies or ambiguities, and to establish a prefinal version (Tamil).
- *Stage V*: Pre-testing of the target language version to examine the layout, wording, ease of understanding, and ease of completion of the questionnaire.
- *Stage VI*: Submission of the documentation of stages I—V to the developers of the original questionnaire or the AAOS to ensure that the process has been carried out correctly and that a reasonable translation has been achieved.

A pilot study including 50 patients was done using the pre final version (Stage 5). These participants were later included in the final analysis. While testing the cross-culturally adapted versions in Tamil, the participants were seated comfortably. Tamil Questionnaire was given and they were asked to mark the appropriate point on the scoring system, which represented their status of shoulder pain and disability.

The SPADI is a self-administered questionnaire and does not require the presence of an investigator [7]. The presence of an investigator offers several advantages and disadvantages. In this study, an investigator was present during scale administration without influencing the subject's scoring on the questionnaire. Most of the participants answered more than two-thirds of the questions in the questionnaire. The investigator accepted this as the number of answered questions from which one could calculate the total SPADI score because if two thirds of the total questions are answered, the score can be calculated and final result can be achieved [7]. After the completion of the Tamil questionnaire, the active ROM of the shoulder was measured using a standard universal goniometer [12]. The standard test positions were used for the goniometric measurements. These values were used to analyze the criterion validity of the questionnaire. In order to assess test-retest reliability, a second assessment session was scheduled at least 24 hours after the first session. The same investigator was involved in both sessions.

Statistical analyses

Data were analyzed using SPSS for Windows version 11.5 (Statistical package for Social Sciences, IBM Inc. USA www.spss.com). The test—retest reliability test of the total Tamil SPADI, pain, and disability subscales was assessed using intraclass correlation coefficients. The Cronbach alpha value was also determined. Reliability testing was done individually for pain score, disability score and total SPADI score at 95% confidence interval levels. The construct validity was assessed using Spearman rank correlation coefficients. A total of 21 participants did not complete the repeat questionnaire and were excluded from the final analysis. Data analysis was performed for 122 participants for all three scores.

Results

The mean age and standard deviation of the group were 49.194 years and 12.758, respectively. The sample consisted of 75 female and 68 male participants with the right shoulder being affected in 81 participants and left shoulder being affected in 61 participants (Tables 1 and 2). A chi squared analysis was used to determine the male versus female ratio along with the incidence of shoulder dysfunction (right versus left). The two-tailed p value was determined to be 0.5583 and 0.1121. This failed to reveal a significant difference in both comparisons.

Table 1 Descriptive statistics

Gender	
Male	68 (48%)
Female	75 (52%)
Affected shoulder	
Right	81 (57%)
Left	62 (43%)
Educational status	
Primary school	20 (14%)
Secondary school	49 (34%)
High school	55 (39%)
University	19 (13%)
Comorbidites	
Diabetes	42 (29%)
Hypertension	15 (10%)
Hypertension and diabetes	10 (07%)
Others	76 (54%)

Table 2 Participant characteristics

Characteristics	Mean	Standard deviation
Age, y	49.2	12.8
Shoulder flexion, deg	132.4	32.8
Shoulder extension, deg	40.0	13.2
Shoulder abduction, deg	103.3	33.3
Shoulder internal rotation, deg	46.1	20.5
Shoulder external rotation, deg	51.9	19.5
SPADI Pain score	56.2	20.8
SPADI Disability score	50.4	22.9
SPADI Total score (pain plus disability)	52.6	21.5

Reliability

The Cronbach alpha values for the pain score (.908), disability score (.952) and total SPADI (.933) were all high (Table 3).

Validity

Face validity was established in the original English version of the SPADI and was considered adequate for the Tamil SPADI after discussions within the expert committee (Stage 4), i.e., the content of the translated items were understandable and they are related to activities of the shoulder in daily living and could be used in the assessment of shoulder pain and function. Criterion validity was assessed using Pearson correlation between the initial total SPADI score, individual pain score and individual disability score and the baseline active range of motion of shoulder.

There was a moderately strong negative correlation between Shoulder range of motion and pain score (Correlations ranged from −.455 to −.585), Shoulder range of motion and disability score (Correlations ranged from −.350 to −.588) and Shoulder range of motion and total SPADI score (Correlations ranged from −.373 to −.577). This is shown in Table 4. The predictive criterion validity showed that it had a strongly high negative correlation.

Discussion

The process of cross-cultural adaptation of the SPADI was done through discussions and consultations with the original forward and backward translators who had translated the English questionnaire, the primary researcher, and a linguistic specialist. This was done using the guidelines of the AAOS outcome committee for cross-cultural adaptations. There were no major problems encountered in the cross-cultural adaptation into the Tamil language. There are two traditional methods of translating questionnaires, namely literal (word-for-word translation) and liberal (translation involving the use of colloquial terms). The prefinal version of SPADI was an amalgam of both liberal and literal methods. However, there was a discussion for phrases such as "at its worst," "high shelf," "buttoning shirts," "washing the neck and back," and "back pocket."

Translating the questionnaire did not pose many difficulties apart from a few words which have synonyms, such as the first leading questions Tamil word "aadigam" can be interpreted as excessive, bad, or extent. In the same way the first question in the pain domain the Tamil word "miga mosamaga" can be interpreted as very bad or worse as the first backward translator translated it. Later, it was deliberated that "mega adigamaga unarpadum" will be used to translate "at its worst." A few words had been adapted for both sexes, for example buttoning the shirt. In Indian culture most women wear saris with a blouse piece that can be hooked both in the front as well as the back. Therefore, the Tamil question was adapted accordingly.

The translators reached a consensus for the selection of appropriate words to be used in the questionnaire and that could was easily understandable by the Tamil-speaking participants. There are many different intrastate variations of the Tamil language and a lot of influence by English on the colloquially spoken Tamil language. This was taken into consideration when the pre final version was finalized.

Following the translation, a pilot study was conducted using the pre final version of the translated questionnaire. The pilot study involved a set of 50 participants and the validity and reliability was analyzed. This process showed consistency and did not reveal any further difficulties with the questionnaire. The cross-cultural adaptation process and the final version were approved and authenticated by the author, who developed the original English SPADI.

Most of the questions are short and easy to understand. The total time taken to complete the questionnaire is about 3 minutes. The reliability and internal consistency was excellent in both subscales and also the overall total score.

Table 3 Reliability of tamil language SPADI

SPADI scale	ICC	95% CI	
		Lower bound	Upper bound
Pain scale			
Single measure	.908	.871	.935
Disability scale			
Single measure	.952	.932	.966
Total score			
Single measure	.933	.906	.953

CI = Confidence Interval; ICC = Interclass Correlation Coefficient; SPADI = Shoulder Pain and Disability Index.

Table 4 Relationship between SPADI scales and shoulder ROM

$N = 143$	Pain score[a]	Disability score[a]	Total score[a]
Shoulder flexion	−.585	−.588	−.577
Shoulder extension	−.462	−.482	−.443
Shoulder abduction	−.560	−.580	−.569
Shoulder internal rotation	−.455	−.350	−.373
Shoulder external rotation	−.470	−.488	−.464

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

[a] Correlation is significant at .0.01 level (2-tailed).

The criterion validity of the Tamil SPADI shared a moderately strong negative correlation in pain; disability and total score which was comparable to the original English version [7], which had a moderate to high correlation in negative direction.

The reliability of the total Tamil SPADI had an ICC value 0.933, which was higher than the total English SPADI (ICC = 0.6552) [7] but was similar to the total German (ICC = 0.94) [13]. This pattern was also true for the sub scores. The Tamil SPADI pain score had an ICC value 0. 908, which was higher than that of the English SPADI pain score but comparable to that of the German SPADI pain score (ICC = 0.6377, ICC = 0.89 respectively). The Tamil disability score had an ICC value of 0.952, which was higher than that of English disability score but similar to that of the German SPADI disability score (ICC = 0.6441, ICC = 0.93 respectively). According to Bot and colleagues, 2004, an ICC value of greater than or equal to 0.90 allows the reliable assessment of individual participants. This is clearly observed in the current study for the total score and both subscores in the Tamil SPADI. However it is recommended that the ICC values presented here should be interpreted with caution due to minor differences in the test–retest protocol of the studies.

The internal consistency of the Tamil SPADI was slightly higher than the English and the German version. The results of a previous study done by [14] revealed that the internal consistencies of the total SPADI ($\alpha > 0.95$), its pain subscale ($\alpha > 0.92$) and disability subscale ($\alpha > 0.93$) was very high. This was in conjunction with the present study.

Rodney [15] compared the reliability and validity of the University of California–Los Angeles Shoulder Scale, the Simple Shoulder Test, and the SPADI. All the scales demonstrated good internal consistency, suggesting that all items for each scale measure the same construct. This was in accordance with the current study and thereby supporting the results. The face and criterion validity were as good as the English SPADI.

The Tamil SPADI proved to be a valid and reliable measure of shoulder pain and function that can be implemented in clinical practice. The steps followed in cross-culturally adapting the English SPADI and establishing the validity and reliability of the Tamil SPADI is as per the well-accepted norms followed among researchers. This gives added strength to the use of Tamil SPADI among Tamil speaking participants in a clinical setup. This is the first study to be done in adapting English SPADI into a regional Indian language. SPADI is shoulder specific and only relates to pain and disability; hence affections of the shoulder and specific diagnosis do not affect the process of cross-cultural adaptation validity and reliability as all comparisons was made in the same patient and not between different patients.

Study limitations

There are different dialects, slang terms, and intraregional variations, which are used in all languages that may limit the generalizability of a translation across all speakers of the language. This also applies to Tamil language. The study was limited to only one health center. Statistically, factor analysis of individual questions was not performed as was done in the original study and other related studies. This would further helped to substantiate the progress of the study and its positive results. It would be recommended that one numerical rating scale be used instead of a visual analogue scale, as it would be easier for patients to mark their exact score. It was noted that around 40% of participants wanted to mark a particular score but they marked, either less or more than what they wanted to mark.

Conclusion

It is concluded that the cross-culturally adapted version of the English SPADI into a regional Indian language (Tamil) is a reliable and valid measure of shoulder pain and disability and also an easy measure to be applied in the Tamil speaking population. The scope for further research needs to address the limitations and also cross-culturally adapting the English SPADI into a national Indian language.

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