RESEARCH ARTICLE

ADAPTATION TO ARABIC LANGUAGE, VALIDITY AND RELIABILITY OF CONSTANT SCORE IN ADHESIVE CAPSULITIS PATIENTS

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ABSTRACT

Objective: To translate the English version of constant score to Arabic version, adapt and test its face validity, content validity, internal consistency reliability, feasibility and test retest reliability as it is a scoring system directed toward a numeric description of the quality of function of the shoulderin adhesive capsulitis patients.

Materials and Methods: 2 expert panels; each consists of 10 experts who evaluated and gave suggestions to the translated Arabic version. 111 sheets were filled out by 66 patients with adhesive capsulitis.Constant score was forward translated to Arabic language, compared and merged then back translated then the pre final version passed through the pilot study done by experts and the final version by patients. Clarity index, expert proportion of clearance, index of content validity, expert proportion of relevance, descriptive statistics, missed item index, Cronbach's alpha and Spearman's and Pearson rank correlation coefficient were conducted for statistical analysis.

Results: The Arabic version of Constant Score hadvery good face validity, excellent content validity, good feasibility, questionable internal consistency and strong test retest reliability.

Conclusion: The Arabic- language version of Constant Score had face and content validity, feasibility and internal consistency and test retest reliability enough to provide a numeric description of the quality of function of the shoulderin adhesive capsulitis patients.

INTRODUCTION

Adhesive capsulitis is an inflammation occurs particularly in the axillary fold and in the synovial membrane, the inner-lining of the joint then followed by adhesions and fibrosis of the synovial lining and capsular ligaments (Blanchard *et al*., 2009). In the early stages, there may be pain with specific movements, but movement may not be significantly restricted. As the disease becomes established, stiffness occurs and pain present at end of allowed range. External rotation is the most limited motion in adhesive capsulitis (Le *et al*., 2017). Typically, there is no weakness on muscle testing (Neviaser, and Hannafin, 2010).The pain may be severe and may persist throughout the night and lead to considerable distress.Adhesive Capsulitis is reported to affect 2% to 5% of the general population (Aydeniz *et al*., 2008).Patients are classified as having primary or idiopathic adhesive capsulitis if they have no history to explain the onset of disease. Secondary adhesive capsulitis develops from known causes of stiffness and immobility, such as previous shoulder trauma or surgery

and may represent an entirely different condition (Jason *et al*., 2011).There is a gradual onset of arm pain; the patient is unable to lie on the affected side. It is usually located in the deltoid region. Localized pain is perceived over the long head of the biceps. It may radiate down the lateral aspect of the upper arm into the forearm. Sleep deprivation may leads to the depression and irritability.Patients with advanced adhesive capsulitis may have lost the natural arm swing that occurs with walking. Common functional impairments include difficulty putting on a coat, reaching into the hip pocket for a wallet, or combing one's hair. Women frequently complain of inability to fasten garments behind their backs (Owens-Burkhart, 1991). Questionnaires are used as an assessment tool for pain and function of the shoulder. The Constant score is a 100-points scale composed of a number of individual items. These items provide a numeric description of the quality of function of the shoulderin adhesive capsulitis patients. In order to use any new assessment tool in researches and clinical application, it should be valid and reliable and feasible to minimize deviations in the study and to be used to determine the plan of treatment and help in the follow up (Kimberlinand wintrestein, 2008). It is important to mention that translation of a valid and reliable scale or questionnaire to any language doesn't mean that this

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translation is also valid and reliable as the original scale or questionnaire so validity and reliability testing of the translated version is a necessity.By adapting a tool, the researcher is able to equivalence data from different samples and from different backgrounds, which enables greater fairness in the evaluation because the same instrument assesses the conception based on the same theoretical and methodological views. The use of adapted instruments enables a greater ability to generalize results and enables one to investigate differences within an increasingly different population (Hambleton *et al.*, 2005).So this study was done totranslate the English version of constant score to Arabic version, adapt and test its face validity, content validity, internal consistency reliability, feasibility and test retest reliability as it is a scoring system directed toward a numeric description of the quality of function of the shoulderin adhesive capsulitis patients.

MATERIALS AND METHODS

Participants and design

A prospective observational study was conducted**.** Two expert panels; each consists of 10 experts participated in the study. 111 sheets were filled out by 66 patients with adhesive capsulitis (45 patients filled the sheets again after two days).Constant score was used. The score consists of 4 domains: pain (1 item), activities of daily living (ADL; 3 items for activity level, i.e., work, sports, sleep, 1 item for hand positioning, i.e., rotation), mobility (4 items: forward and lateral abduction/elevation, external and internal rotation), and power/strength (1 item). Pain and ADL 1–3 are interviewed from the patient (i.e., self-assessed); all other items are examiner assessed.

Procedure

The adaptation procedurefollowing the process postulated by Sousa and Rojjanasrirat (2011) includes forward translation of the English score to Arabic language to produce two forward-translated versions of the score, development of preliminary initial translated Arabic version, blind- back translation of preliminary initial translated version was translated to English to produce two back-translated versions, comparison of the two back-translated versions, pilot study of the pre-final Arabic version and pilot study of the final Arabic version.

Forward translation: translation of the original score into Arabic (forward translation or one-way translation)

- Score in English was translated to Arabic to produce two forward-translated versions of the score (A1 and A2).
- Two translators participated in forward translation, their mother language is Arabic, but they have distinct backgrounds then development of preliminary initial translated Arabic version. As both versions (A1 and A2) was compared and merged by the researchers who resolved ambiguities and discrepancies as shown in Table (1).

By comparison and merging (A1 and A2), correction of some words was done producing the preliminary initial translated Arabic version:

Blind-back translation (blind-back translation or blind double translation) of the preliminary initial translatedArabic version of the score.

Table 1. Corrections to produce the preliminary initial translated Arabic version

Before Correction	After Correction
Use of hand	The most used hand
Exercise	Do
Always	Continuous
Generally	in general
Daily activities	Daily life activities
Adhere	Affected
Recreation	Recreation activities
clear up	I remember
Scope of motion	Range of motion
Total	Total
Thigh side	Thigh from the outside
The buttocks	Automatic
the middle	Waist (lumbar paragraph 3)

The preliminary initial translated version of the score was translated to English to produce two back-translated versions (B1 and B2).The researchers compared two back-translated versions of the score B1 and B2, and also compare both B1 and B2 with the original English scale regarding instructions, items, response format, wording, sentence structure, meaning and relevance. The pre-final Arabic version of the score was developed by this comparison and merging between both B1 and B2.Pilot testing of the pre-final Arabic version of the score was done for testing face and content validity.The first expert panel (ten experts) were asked to evaluate each item of the tool for clarity (face validity) and provide suggestions to improve its clarity; dichotomous questions (clear\unclear) were used regarding instructions, items and response wordswith a total of 30 answer needed from each expert.

Then the second expert panel were asked to evaluate each item of the pre-final Arabic version of the score for content equivalence (content-related validity) using the following scale: 1= not relevant; 2= unable to assess relevance; 3= relevant but need minor alteration; 4= very relevant and succinct and give suggestions to improve its relevance (1 and 2 considered not relevant, 3 and 4 considered relevant).After the pre-final version have passed face and content validity test by scoring more than 80% which is the acceptable value, it was named the final version(Sousaand Rojjanasrirat,2011). Pilot test of the final Arabic version of the score was conducted on 66 patients with adhesive capsulitis.Each patient filled out data collection sheets which were used to collect demographic data (name, age, sex, occupation and dominance).Each patient filled out the first two domains (pain and activities of daily living) of the score by themselves.The second two domains of the score (range of motion and strength of abduction) were filled out by the investigator.

The range of motion domain measured forward flexion, abduction, external and internal rotation. Forward flexion and abduction were measured by electronic goniometer but external and internal rotations were determined by the hand position.Forward flexion and abduction measured from standing position by asking the patient to flex and abduct his arm as much as possible.Strength of abduction domain was measured by Lafayette Manual Muscle Test System (Model 01163) which provides comfortable grip against which counter resistance is provided.The Lafayette Manual Muscle Test System features a lightweight,microprocessor-control unit that measures peak force (kilograms); time to reach peak force, and total test time, while storing up to 52 tests. Test times can range from 1–10 s, and an audible tone indicates the end of the

preset time (Sisto and Hudson, 2007). Forty five patients completed the data collection sheet again after two days. Feasibility was evaluated by the assessment of the frequency of missing answers per item and administration time (Georgakellosand Marcis, 2009).

Statistical analysis

The demographic data of the patientsincluding age (years), weight (kg), height(m) and body mass index(kg/m2)were represented as the mean and standard deviation (SD) values .The data were explored for normality by checking data distribution. Calculation the mean, median and SD values were calculated**.** SPSS computer program (version 23) was used for data analysis.Face validity was tested by clarity index and expert proportion of clearance. Content validity was tested by content validity index (CVI) and expert proportion of relevance. Descriptive statistics of data collected from patientsincluding age (years), weight (kg), height (m) and body mass index and from sheets results were made using mean, median, SD, mode, minimum (min) and maximum (max). Feasibility index was calculated using missed item index and time taken to fill the questionnaire.

Internal consistency reliability was measured using Cronbach's coefficient alpha. Test retest reliability was measured using mean scores and Spearman's rank Correlation coefficient for all items of the score except the second question in pain section, average muscle strength and the total score are measured by Pearson rank Correlation because they are normally distributed.Power analysis test was done after the study has been done. A post-hoc power analysis at the completion of a study done to detect if the expected effect andactual effect align or not.Post hoc analysisis typicallyperformed aftera study has been conducted so that the sample size *N* is already a matter of fact. Given *N*, alphaand aspecified effect size, this type of analysis returns the power of the test (Susanne, 2007).Power analysis was conducted by using GPower 3.0.10 to calculate the power which was found to be 1 meaning that subjects were sufficient to detect the actual effect found.

RESULTS

The results includes descriptive statistics of patient general characteristics as shown in Table (2), descriptive statistics ofsheet general characteristics as shown in Table (3), clarity

Table 2. Descriptive statistics of patient general characteristics

	Age	weight	Height	BMI
Missing	0	0	0	0
Valid	66	66	66	66
Mean	59	79.96212	165.4697	29.28485
Median	57.5	76.75	165	28.4
SD	10.3756	12.49748	7.292187	4.495339
Min	26	58	150	21.3
Max	82	120	190	44.1

BMI: body mass index, SD: standard deviation, Min: Minimum, Max: Maximum

Table 3. Descriptive statistics of sheets general characteristics

	Who filled the score	Affected side	Test retest	Time
Missed	0	0	0	16
Valid	102= himself	65 right	66 test	3 min
	9= relevant	46 left	45 retest	6.5 max
Total	111	111	111	95

RT: right, LT: left, Min.: Minimum, Max.: Maximum

index, expert proportion of clearance of the final Arabic version to show the face validity, index of content validity and expert proportion of relevance to show the content validity, internal consistency reliability and test retest reliability.

Clarity index of the final Arabic version

The scale index of clarity equaled 93% and scale-level clarity index universal agreement (UA) equaled 50% as shown in table (4).

Table 4. Item index of clarity of the final version

Item	Number of Rater's Agreements(clear response)	Item Index of Clarity
Pain 1	10	100.00%
NO	10	100.00%
Mild	10	100.00%
Moderate	10	100.00%
Sever	10	100.00%
Pain 2	9	90.00%
Points	10	100.00%
ADL 1	10	100.00%
No	10	100.00%
Moderate	10	100.00%
Sever	10	100.00%
ADL 2	7	70.00%
No	9	90.00%
Moderate	9	90.00%
Sever	9	90.00%
ADL 3	10	100.00%
No	10	100.00%
Moderate	9	90.00%
Sever	10	100.00%
ADL 4	8	80.00%
Waist	9	90.00%
Xiphoid	8	80.00%
Neck	10	100.00%
Head	10	100.00%
Above Head	9	90.00%
ROM 1	8	80.00%
ROM 2	9	90.00%
ROM 3	9	90.00%
ROM 4	9	90.00%
Strength of abduction	8	80.00%
Mean	9.3	93.00%

Expert proportion of clearance of the final Arabic version
The mean of proportion of clearance (clear responses) equaled 93% as shown in Table (5).

Table 5. Expert proportion of clearance of the final Arabic version

Expert number	Number of agreements(clear responses)	proportion of clearance
1	30	100.00%
2	30	100.00%
3	30	100.00%
4	29	96.67%
5	29	96.67%
6	23	76.67%
7	28	93.33%
8	27	90.00%
9	30	100.00%
10	23	76.67%
Mean	27.9	93.00%

Index of content validity of the final Arabic version

The scale index of content validity (S-CVI) equaled 98% and scale index of content validity/universal agreement(S-CVI/UA) equaled 83.33%. Also, 25 items (representing 83.33%) had index of content validity (ICV) of 100% while

five items (representing 16.67%) had ICV of 90% as shown in Table (6).

Table 6. Item index of content validity of the final Arabic version

Item	Number of raters that agree (relevant responses)	I-CVI
Pain 1	10	100%
No	10	100%
Mild	10	100%
Moderate	10	100%
Sever	10	100%
Pain2	10	100%
Points	10	100%
ADL 1	9	90%
No	9	90%
Moderate	9	90%
Sever	9	90%
ADL 2	9	90%
No	10	100%
Moderate	10	100%
Sever	10	100%
ADL 3	10	100%
No	10	100%
Moderate	10	100%
Sever	10	100%
ADL 4	10	100%
Waist	10	100%
Xiphoid	10	100%
Neck	10	100%
Head	10	100%
Above Head	10	100%
ROM 1	10	100%
ROM 2	10	100%
ROM 3	10	100%
ROM 4	10	100%
Strength of abduction	10	100%
Mean	9.833333333	98%

I-CVI: Item Content Validity Index

Table 7. Expert proportion of relevance of the final Arabic version

Expert number	Number of agreements(relevant responses)	proportion of relevance
1	30	100.00%
2	30	100.00%
3	30	100.00%
4	30	100.00%
5	25	83.33%
6	30	100.00%
7	30	100.00%
8	30	100.00%
9	30	100.00%
10	30	100.00%
Mean	29.5	98.33%

Time needed to measure the questions

Invalid sheets were 22 and valid sheets were 89.The score needed in average about 4.58+-2 minutes to be answered as shown in Table (9).

Internal Consistency

Internal consistency calculated after excluding sheets that were not filled out by the patient himself, retest sheets and sheets with missed answers and found that Cronbach's alpha equals 0.650 with lower bound0.606 and upper bound 0.706.

Test retest reliability

Spearman's and Pearson correlations between test and retest calculated after excluding sheets that weren't filled out by the patient himself, retest sheets, sheets with missed answers in

Table 8. Missed index data

Item	1	2	3	4	5	6	7	8	9	10	11	Total missed items
Missed Data(not answered	0	0	0	31	0	0	0	0	27	0	0	58
Percentage of missed data	0	0	0	30.39	0	0	0	0	26.40	0	0	5.10

Table 9. Descriptive statistics of time of 89 sheets

Mean	Median	SD	Min	Max
4.58427	4.5	1.061292	3	6.5

SD: standard deviation

Expert proportion of relevance of the final Arabic version

The mean of proportion of relevance (relevant responses) equaled 98.33%. Also, 10% of experts had proportion of relevance 83% while 90% of experts had proportion of relevance of 100% as shown in Table (7).

Feasibility measures

A feasibility measure is related to the easy application of the score. To assess the feasibility, sheets that weren't filled out by the patient himself and sheets that didn't inform time were excluded and retest sheets were enrolled in data.

Missed item index

Invalid sheets were 9and valid sheets were 102.The scale items were filled out by 94.9% in all sheets. Missed data index represent not answered data in relation to the tool data as shown in Table (8).

test or retest and test sheets with retest sheet after 2 days and found that results were statistically significant as the correlation strength of total score was strong as shown in table (10,11).

Table 10. Comparison of scores of test with retest

Scores	Test	Retest
Median	50.7	45.9
Min	25	24.1
Max	61	72.4

Min: minimum, Max: Maximum

DISCUSSION

The present study was designed to translate the English version of constant score to Arabic version, adapt and test its face validity, content validity, internal consistency reliability, feasibility and test retest reliability as it is a scoring system directed toward a numeric description of the quality of function of the shoulderin adhesive capsulitis patients.

Table 11. Spearman's and Pearson rank correlation coefficients

Item no.	r value	p-value
1	0.629	0.001
2	0.504	0.012
3	0.523	0.009
4	0.669	<0.001
5	0.794	<0.001
6	0.515	0.010
7	0.496	0.014
8	0.399	0.054
9	0.743	<0.001
10	0.932	<0.001
11	0.650	0.001
Total score	0.669	<0.001

R: Spearman's andPearson's rank correlationcoefficient

Two expert panels (each consists of ten experts) and 66 patients with adhesive capsulitis were participated in this study. 111 sheets (including retest sheets) were filled out in this study. The Arabic version of Constant Score has very good face validity and excellent content validity. The results of the current study come in agreement withPolitand Beck (2006) who stated that as scale to be judged as having excellent content validity, it would be composed of items with item indexes of content validity (I-CVI) that meet the following criteria (I-CVI of 1.00 with 3-5 experts and a minimum I-CVI of 0.78 for 6-10 experts) and it would have S-CVI of 0.90 or higher. Also this came in agreement withWaltzet al. (2005)who stated that S-CVI/Ave of 0.90 or higher is the minimum acceptable index, and items that don't achieve the minimum acceptable indices are revised and re-evaluated.

Feasibility of Arabic version of Constant Score is good. The results of the current study determined according to Van et al. (2015) who stated that missing rate on the item level was considered acceptable if no single item had a missing rate exceeding 10% and completion time was considered acceptable if 95% of sheets were completed in less than 15 minutes.Internal consistency and test retest reliability of the Arabic version of Constant Score is questionable internal consistency and strong test retest reliability. These results come similar to that of the original score that showed internal reliability/consistency: Cronbach's α= 0.37 and 0.60, respectively and Test–retest reliability: intraclass correlation coefficient 0.80–0.96. Repeated strength measurements revealed high intratester but low intertester reliability (Angstet al., 2004).

These results strengthened by a study that conducted to test the convergent and construct validity, internal consistency of the Brazilian version of constant score. The preliminary version of (Constant Meurly Score- Barazilian) CMS-BR was extensively analyzed by physicians, orthopedic-trauma residents, physical therapists, a nurse and a statistician, comprising nine professionals with different backgrounds and was applied in 30 patients. Regarding internal consistency, a moderate to strong correlation was observed in each item-total correlation. The analysis showed that the CMS-BR presented a high internal consistency (Cronbach's alpha = 0.85). The internal consistency of the original CMS ranged from 0.60 to 0.75.A systematic review suggested that the low alpha values may indicate that the CMS items measure different aspects of shoulder function (Barreto et al., 2016). Also results come similar to that obtained byLivain, et al. (2007) who conducted a study to study the reliability and validity of the French version of constant score.

Fifty-three patients volunteered to participate in this study. Shoulder assessment was performed by three observers. Intraobserver reproducibility was determined for 102 tests and two series of 32 and 56 tests were used to determine interobserver reproducibility. The internal coherence was studied on a sample of 61 tests. The correlations were satisfactory (intraobserver 0.96; interobserver 0.91 and 0.89 with the Spearman test). Despite satisfactory internal coherence (Cronbach alpha=0.75), the reproducibility of the overall score did not correspond necessarily to the reproducibility of the constituent scores.

But these results slightly differ from results obtained byMoeller et al.(2014)who conducted a study to test reliability, agreement and construct validity of the Danish version of modified Constant Score.Results also slightly differ from that obtained by Çelik (2016) who conducted a study to translate and cross-culturally adapt the modified CMS and its test protocol, as well as define and measure its reliability and validity. A project to translate adapt and validate an instrument for a cross-cultural research may take several years , and it is normally conducted using more than one study to adhere to the recommended methodological approaches described above. One study might set as its initial goal to translate, adapt and cross-validate a research instrument using translation steps and pilot testing of the pre final version of the instrument in the target language with a monolingual sample: cognitive debriefing. In a second study the researchers might set a single goal to establish the preliminary psychometrics of the translated instrument with bilingual participants. Then, in a third study the researchers' goal might be to establish the initial full psychometric properties of a translated instrument in a sample of the target population of interest Sousaand Rojjanasrirat,(2011).

Conclusion

From the analysis of results of the present study it was concluded that Arabic- language version of Constant Score has face and content validity, feasibility and internal consistency and test retest reliability enough to measure the functional level, define the level of pain and the ability to carry out the normal daily activities of shoulder in frozen shoulder patients.

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