Cross-cultural adaptation of the upper limb functional index in Arabic

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Abstract. *Background and aim:* The upper limb functional index (ULFI) is a widely used self-reported outcome measure questionnaire with robust psychometric properties to assess the upper limb musculoskeletal disorders (UL-MSDs). This study aimed to adapt the ULFI cross-culturally in Arabic (ULFI-Ar) and to examine its face validity, content validity, internal consistency, criterion validity, and interpretability. *Methods:* In this observational cross-sectional study, the English version of ULFI was cross-culturally adapted to the Arabic language through double forward and backward translations, following the recommended guidelines. Interviews with participants and reviews by experts were used to assess the face and content validity of the prefinal version of ULFI-Ar. Internal consistency was determined by Cronbach's alpha coefficient (α). Criterion validity was analyzed by correlating the ULFI-Ar with the Arabic version of the Disabilities of the Arm, Shoulder, and Hand (DASH-Arabic) using Pearson's correlation coefficients. *Results:* A total of 54 participants reported no major language barriers or difficulties in completing the ULFI-Ar. The participants' interview demonstrated adequate face validity. The review by experts showed that the content validity was excellent (content validity index = 0.81 − 1.00 for each item and 0.96 for the scale). The ULFI-Ar showed high internal consistency ($\alpha = 0.88$). For criterion validity, there was strong correlation with the DASH-Arabic ($r = -0.802$, $p < 0.0001$) and moderate correlation with NPRS-Arabic ($r = -0.502$, $p < 0.0001$). *Conclusions*: The ULFI-Ar was easy to complete with no linguistic difficulties. The results demonstrate the suitability of using the ULFI-AR for Arabic-speaking patients with UL-MSD. (www.actabiomedica.it)

Key words: Cross-culture, adaptation, translation, functional index, outcome measure, upper limb

Introduction

Musculoskeletal disorders (MSD's) are commonly encountered by healthcare providers including physical therapists. These disorders have a 12-months prevalence of 60% for the back, 51% for the neck, 50% for the shoulder, and 42 for the wrist (1). Most upper-limb work-related MSDs (UL-WMSDs) are highly prevalent in the shoulder (60%), wrist/hand (52%), and elbow (40%). The incidence ratio of UL-WMSDs ranges from 0.04 to 0.26 (1). In Saudi Arabia, the prevalence of upper limb injuries in general

population is 24 to 45.6% (2,3). The prevalence rates of MSDs in teachers and dental practitioners are reportedly 37% and 70.5%, respectively (4,5). Thus, upper limb MSDs (UL-MSDs) have negative impact on healthcare resources and quality of life (1,3).

Several self-reported outcome measures can be used for UL-MSDs to detect alterations in health status, function level, health-related quality of life of patients (6–8), and biopsychosocial components associated with disability or impairment (9). Compared with other self-reported outcome measures, the upper limb functional index (ULFI) is concise, easy to

understand, can be completed and scored quickly, and has psychometric properties that are practical and can be used clinically without bias. The ULFI was designed to evaluate limitation in activity and restrictions in participation that result from UL-MSDs (10). The original ULFI was found to have high reliability, criterion validity, internal consistency, and good responsiveness (11).

ULFI has been widely used in several countries. It has been translated and validated in many languages, including Spanish (12), French Canadian (13,14), Turkish (15), Italian (16), Korean (17), and Persian (18). To the best of our knowledge, an Arabic version of the ULFI (ULFI-Ar) is not yet available. Therefore, this study aimed: 1) to cross-culturally adapt the English ULFI for Arabic-speaking population (ULFI-Ar) and 2) to examine its face and content validity, internal consistency, criterion validity with the Arabic version of Disabilities of the Arm, Shoulder and Hand (DASH-Arabic), and interpretability in a clinical setting in patients with UL-MSDs.

Methods

This observational cross-sectional study that was conducted at the King Fahad Hospital of the University, Saudi Arabia between March 1,2021 and September 28, 2021. Ethical approval was obtained from the Institutional Review Board of Imam Abdulrahman bin Faisal University, Saudi Arabia (IRB No: IRB-PGS-2021-03-063; date: 22/02/2021). The study followed the Strengthening the Reporting of Observational studies in Epidemiology (STROBE). guidelines

Measurement instrument

The ULFI consists of a single page with 25 items. It is a valid, reliable, and responsive measure for assessing individuals with UL-MSDs (10,11). It offers three-point response options of 'Yes = 1', 'Partly = 0.5', and 'No = 0' (11). The total score ranges from 0 (maximum limitation) to 100 (full function) and is calculated by using the following formula: $[\text{ULFI}_{\text{Score}} = \{(\text{sum of the 25 items points}) \times 4\} - 100]$ The ULFI permits two missing responses to validate scoring.

Procedure

The study composed of two phases.
Phase I: Translation:
This study applied Beaton et al. (19) guidelines for translation and cross-cultural adaptation (**Figure 1**). Initially, two persons, a bilingual physician (T1) and a professional English professor (T2), were recruited to produce the first draft of the ULFI by forward translation. Both translators were instructed to translate the complete form individually, including the instructions, 25 statement statements, and the scoring sections from English to Arabic. The primary researcher and both translators then performed a forward translation committee to produce a consensus Arabic version (T12) from the two translated versions of the ULFI. This consensus version overcame the discrepancies between the initial two drafts.

The next step involved the backward translation of the consensual Arabic version (T12). Two native English-speaking translators with no knowledge of the ULFI, a professional English professor (BT1) and a senior administrative (BT2), performed the backward translation. A synthesizing session was conducted to resolve backward translation discrepancies and produce a unified version of the ULFI (BT12). After completion of this step, a review committee of the two forward translators (T1 and T2), the two backward translators (BT1 and BT2), and the primary researcher aimed to establish the prefinal version of the ULFI-Ar from the two backward translations, the consensual ULFI-Ar and the original English ULFI. The committee reviewed each report in terms of conceptual, semantic, idiomatic, and experiential equivalence to ensure a satisfactory Arabic version and facilitate the determination of face and content validity. Table 1. shows the discrepancies that were found with the adapted tool and the recommended changes on which all committee members agreed before the final version.
Phase II: Pilot testing:
Pre-testing of the ULFI-Ar was conducted among participants and experts to examine the comprehensiveness, comprehensibility, and relevance of the ULFI-Ar to patients to verify the face and content validity (20,21). The recommended sample size for pilot testing is at least 30-40 participants (19). Participants were eligible
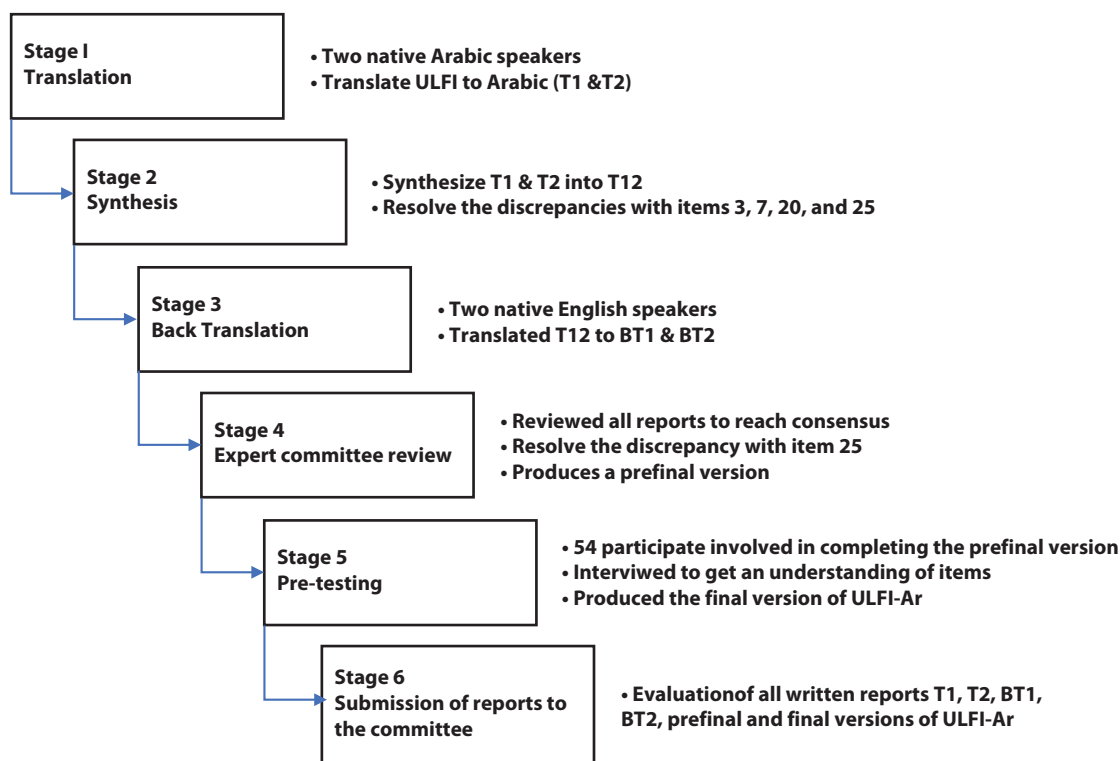
Figure 1. Stages of cross-cultural adaptation of ULFI-Ar. *ULFI-Ar, Arabic Upper Limb Functional Index.*

Table 1. The problematic items of the Arabic upper limb functional index and how they were resolved.

Instructions/items	Problem(s)	Solution(s)
Item 3 and item 7	The value '10 Ibs' is not familiar to Arab population	The ponds value has been deleted and only the value 5 kg. was kept
Item 20	The "chopsticks" is not an available option for utensils.	The term has been removed from the examples list.
Item 25	The term "triggers" was misunderstanding in the translation as a stand-alone word	The term has been modified as "gun trigger" to clarify the example more.
Item 25	The word "lever" was confused in the translation. The forwards translators chose the word crane. However, it gives a different meaning of the action.	Elaborating the example more instead of the general term. The example which agreed upon was "Car transmission levers"

for the study if they were adults aged between 18 to 60 years old, diagnosed with upper limb acute, subacute, or chronic injury (shoulder, elbow, wrist, or hand), and able to read and understand Arabic. Patients were excluded if they had any recent upper limb surgery, cognitive impairment, infectious disease, neurological disease, tumor, or other systematic diseases affecting the upper limb. Each participant completed a written informed consent form. All participants were referred to the physical therapy department and recruited consecutively.

Fifty-four participants were asked to complete a paper-based version of the final adapted ULFI-Ar. The primary researcher then explained to them the meaning of the ULFI-Ar items and their answers. Then they were asked to reveal the following areas of interest:

- Assessing the instrument overview including organization, instruction, and response options.
- Detecting any ambiguous item, instructions, or difficulties in understanding responses.

- Evaluating the relevance of each item towards their condition and problems.
- Encouraging any hesitation about any items.
- Ensuring the respect of privacy from any violation.

For the content validity, the ULFI-Ar was sent to 11 experts (five physical therapists, three occupational therapists, two physiatrists, and one rehabilitation nurse) to complete the content validity questionnaire. They were asked to rate each item on a 4-point scale of relevance: 4 = high; 3 = good but needs rewording; 2 = somewhat; and 1 = not relevant. The face and content validity method was selected based on the COnsenus-based Standards for the Selection of Health Measurement INstrument (COSMIN) (20).

Data and statistical analysis

Data were analyzed using IBM SPSS Statistics for Macintosh, Version 26.0. (IBM Corp. Armonk, NY, USA) with a level of significance p < 0.05. A descriptive analysis was conducted to determine the mean and standard deviation (SD) of the demographic variables. Data normality of the ULFI-Ar was investigated using the Shapiro-Wilk test (22). The data was normally distributed (p > 0.05).

Content validity was determined by calculating the content validity index (CVI) through the content validity questionnaire using the following equation

$$\left(CVI = \frac{\text{number of raters scroing an item with 3 or 4}}{\text{Total paneltists}} \right)$$

The average of all items was computed to obtain the ULFI-Ar content validity. For each item, the adequate level of CVI is > 0.78 and high content validity is indicated by CVI > 0.90 (20,22).

Internal consistency was determined using Cronbach's alpha coefficient (α). The accepted level of Cronbach's alpha ranges from 0.70 to 0.95 (23). Criterion validity was analyzed by correlating the ULFI-Ar with the gold standard tool (DASH-Arabic) using Pearson's correlation coefficients with negligible (< 0.1) and very strong (> 0.9) relationships (24). The interpretability of the ULFI-Ar was investigated by measuring missing responses, timing of completion and scoring, and easy to use (21).

Results

Table 2. presents the demographic and clinical characteristics of the participants. The most affected joint was the shoulder (67%) and majority of the cases were chronic (85%). All participants returned the questionnaire (response rate: 100%). The mean ± standard deviation and range of ULFI-Ar was 38 ± 20.05 and 8 to 86, respectively.

The three-point English ULFI was translated and back-translated to culturally adapt Arabic-speaking population without major language barriers or conceptual misunderstanding. During the pilot test, none of participants faced any difficulties in completing the ULFI-Ar. All participants reported that the ULFI-Ar was relevant to their condition as an UL-MSD, supporting the face validity of the ULFI-Ar. Regarding content validity, the CVI was 0.81 for items 1, 8, and 13; 0.91 for items 2, 6, 7, 9, 11, 12, 14, 15, and 16; and for the remaining items, it was 1. The average CVI for all items was 0.96, indicating excellent content validity. The experts reached a consensus concerning the relevance and comprehensives of the ULFI-Ar to patients with UL-MSDs.

The internal consistency of the ULFI-Ar was high (α = 0.88), indicating no item redundancy. The criterion validity, as determined from the relationship between the total score of the ULFI-Ar and DASH-Arabic, was inverse and strong (r= − 0.802, *p* < 0.0001). There was a moderate negative correlation between the ULFI-Ar and NPRS-Arabic (r = - 0.502, *p* < 0.0001).

For interpretability, the average time required to complete the ULFI-Ar was 86.53 ± 13.20 s without aid, whereas the mean scoring time was 30.58 ± 15.96 s with no need for considering aids. The DASH-Arabic needed 122.60 ± 28.67 s to complete and 105 ± 26.98 s to score using a calculator. No floor or ceiling scores, and no missing responses were recorded. There were no missing responses for ULFI-Ar. The 'half' response option was used by 94% of the participants in a total of 20% of their responses.

Table 2. Participants' characteristics (n= 54).

Variable	Frequency (%)
Age (years)*	41.72 ± 13.9
Gender	
Male	37 (68.5%)
Female	17 (31.5%)
Occupational Status	
Student	4 (7.4%)
Employed	33 (61.1%)
Non-employed	8 (14.8%)
Retired	9 (16.7%)
Dominant hand	
Right	50 (92.6%)
Left	4 (7.4%)
Affected side	
Right	27 (50%)
Left	27 (50%)
Pain duration (weeks)	58.73 ± 41.78
Diagnosis	
Shoulder	36 (66.7%)
Adhesive capsulitis	8 (14.8)
Impingement	7 (13)
Rotator Cuff Syndrome	11 (20.4)
Instability	10 (18.5)
Elbow	5 (9.3%)
Tendinitis	1 (1.8)
Fractures	4 (7.4)
Wrist & Hand	7 (12.9%)
Fractures	6 (11.1)
Carpal tunnel syndrome	1 (1.8)
Trigger finger	2 (3.7)
Multiple joints	4 (7.4%)
Chronicity	
Acute (0-4 days)	1 (1.8%)
Sub-acute (5-14 days)	7 (13%)
Chronic (> 14 days)	46 (85.2%)
Work-related injury	
Yes	5 (9.2%)
No	46 (85.2%)
Don't Know	3 (5.6%)
Post-surgery	
Yes	2 (3.7%)
No	52 (96.3%)

* All data are expressed as frequency (percentage), except age and pain duration, which are expressed as mean ± standard deviation.

Discussion

This study aimed to translate and cross-culturally adapt the 3-points English ULFI into the Arabic language. The results revealed that the ULFI-Ar items are equivalent to the English ULFI items. The ULFI was easily translated into Arabic by following the procedure of cultural adaptation recommended by previous studies (19), which have used for different scales in the Arabic context (25,26). A few changes were made during the cultural adaptation stage as suggested by the expert committee and participants. Similar cultural-specific changes were found in the Turkish (15) and Persian (18) versions in items 3, 7, and 20 that suggested removal of "Ibs" and "chops sticks". These findings suggest similar cultural properties between the Arabic, Turkish, and Persian populations.

Face validity was ensured during the participants report upon the simplicity and clearness of the tool. The CVI for each item of the ULFI-Ar exceeded the minimum required level. Content validity, as revealed by excellent CVI (0.96) was assessed through clinical expert feedback. ULFI-Ar demonstrated to be a self-administered, clear, and simple tool for UL-MSD's.

The Cronbach's alpha coefficient computed for ULFI-Ar in this study was identical to that of the Turkish study ($\propto$ = 0.88) (15), suggesting a high internal consistency with no item redundancy. Although the optimal value for Cronbach alpha coefficient is debatable (13), the accepted range is between 0.70 and 0.95 (23). Our results are comparable to those of English ($\propto$ = 0.92) (11), Brazilian ($\propto$ = 0.89) (27), Italian ($\propto$ = 0.90) (16), Persian ($\propto$ = 0.91) (18), French-Canadian ($\propto$ = 0.93) (13), Spanish and Korean studies ($\propto$ = 0.94) (12,17) studies.

Criterion validity determined by the relationship between the ULFI-Ar and the DASH-Arabic questionnaire (r = - 0.802) indicated a strong correlation. The criterion validity of the DASH-Arabic is higher than that of the Turkish (r = 0.72) (15) and Persian (r = 0.71) (18) versions, and lower than that of the English (r = 0.85) (11), French-Canadian (r = 0.85) (13), and Italian (0.81) (16) versions. The inconsistency in the findings among the versions may be due to the differences in the characteristics of the participants, affected limbs, and chronicity of the condition (15).

In our study, there were no missing responses for the ULFI-Ar, a result comparable to that of the English, Spanish, and Turkish versions (11,12,15). The results showed that 94% of the participants who filled out the ULFI-Ar used the 'half' option in 20% of the responses. The proportion of participants who used the "half" option was higher in our study than that among English participants (83%) but our participants used the half option in a lower proportion of total responses than English participants (69%) (11). This suggests a cultural difference in the use of the "half" option. To overcome this issue, three separate box options may be provided, which needs further investigation. (11,15). No floor or ceiling effects were observed among respondents. This helps identify whether any improvements occurring following assessment and treatment are authentic (22).

The ULFI-Arabic met the clinician's requirement in the term of interpretability. This questionnaire is self-administered, and its average completions time (86.53 ± 13.20) and scoring time (30.58 ± 15.96) were low. The completion time is lower than that of the English (117 ± 47 s) (11) and French-Canadian (383 ± 197) (13). Moreover, the scoring time higher than that of English (16 ± 4) (11), and French-Canadian (20 ±42) (13). The inconsistency in the finding among the versions may due to the language structure and the cultural difference of the participants.

The cross-culturally adapted ULFI-Ar enables Arabic-speaking clinicians to simply evaluate the progression of a patient's condition and compare the outcome of treatment in patients with UL-MSDs. Although the application of valid and reliable measures is critical, these measures must be culturally and linguistically appropriate (12). The strength of this study is that it complied with the recommendations of translation and cultural adaptation of self-report measures and with the guidelines to conducting observational studies.

In summary, this study demonstrated that the ULFI-Ar has excellent content validity and is equivalent to English version. The ULFI-Ar also showed high internal consistency, strong criterion validity, and adequate applicability for Arabic-speaking patients with UL-MSDs. Further investigation is needed to determine construct validity, test-retest reliability, precision, clinically meaningful change, and responsiveness of the ULFI-Ar for patients with UL-MSDs.

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A P P E N D I X   A .   S U P P L E M E N T A R Y   D A T A

Supplementary data: Appendix A. Upper limb functional Index -Arabic (ULFI-Ar).

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المؤشر الوظيفي للطرف العلوي

التاريخ: □ الذراع الأبيسر

الإصابة: □ الذراع الأيمن

الاسم:

إنّ الإصابة في طرفك العلوي (الذراع) تجعل من الصعب عليك القيام ببعض الأشياء التي تقوم بها عادة. تحتوي هذه القائمة على جُمل يستخدمها الناس لوصف حالاتهم عندما يواجهون بعض المشاكل. فكّر في حالتك خلال الأيام القليلة الماضية، ثم ضع علامة (√) على (نعم) عندما يكون العنصر يصفك، وعلى (لا) عندما يكون العنصر لا يصفك، وعلى (1/2) عندما يصفك جزئياً.

	بسبب ذراعي:	لا	1/2	نعم
١	أبقى في بيتي معظم الوقت.			
٢	أغيّر وضعيتي باستمرار من أجل الراحة.			
٣	أتجنب الأعمال الشاقة مثل التنظيف ورفع أكثر من ٥ كجم والقيام بأعمال الزراعة وما إلى ذلك.			
٤	غالباً آخذ فترات استراحة.			
٥	أجعل الآخرين يقومون بشؤوني بدلاً مني.			
٦	أعاني من الآلام / المشاكل في معظم الأوقات.			
٧	أجد صعوبة في رفع وحمل الأشياء مثل الحقائب أو أكياس التسوق التي تزن ٥ كجم.			
٨	تأثرت شهيتي للطعام مؤخراً.			
٩	تأثرت مقدرتي على ممارسة المشي أو نشاطي الترفيهي أو الرياضي.			
١٠	أجد صعوبة في القيام بالأعمال المنزلية الاعتيادية أو الواجبات العائلية.			
١١	أنام بشكل أقل.			
١٢	أحتاج مساعدة للقيام بالعناية الشخصية كالاغتسال والنظافة.			
١٣	تأثرت أنشطتي الاجتماعية اليومية المنتظمة (مثل: العمل – التواصل الاجتماعي).			
١٤	أنفعل بسرعة و/أو مزاجي سيء.			
١٥	أشعر بضعف أكبر و/أو بتصلب أكثر.			
١٦	تأثرت مقدرتي على التنقل منفرداً (مثل: القيادة – استخدام النقل العام).			
١٧	أجد صعوبة في وضع ذراعي في أكمام القميص أو أحتاج مساعدة عند ارتداء ملابسي.			
١٨	أجد صعوبة في الكتابة أو استخدام لوحة المفاتيح أو فأرة الكمبيوتر.			
١٩	لا أستطيع القيام بالأعمال التي في مستوى الكتف أو فوقه.			
٢٠	أجد صعوبة في الأكل أو استخدام أدواته (مثل: السكين – الشوكة – الملعقة).			
٢١	أجد صعوبة في حمل الأشياء أو تحريكها (مثل: الأكواب - العلب).			
٢٢	لدي قابلية لإسقاط الأشياء و/أو التعرض لحوادث طفيفة بشكل متكرر.			
٢٣	أستخدم الذراع الأخرى في أكثر الأحيان.			
٢٤	أجد صعوبة في التعامل مع الأزرار، أو المفاتيح، أو العملات المعدنية، أو صنابير المياه، أو الحاويات، أو الأغطية اللولبية.			
٢٥	أجد صعوبة في فتح، أو إمساك، أو رفع، أو ضغط (مثل: زناد المسدس - ناقل حركة السيارة – الأبواب الثقيلة).			

درجة المؤشر الوظيفي للطرف العلوي: اجمع المربعات المؤشر عليها (نعم = ١، 1/2 = نصف درجة، لا = صفر)

إجمالي المؤشر للطرف العلوي □ (٤×) = □ مقياس منوي   الإجمالي النهائي = ١٠٠ - الإجمالي (٤×) = □ %

</div>