

HEALTH SERVICES RESEARCH

Cross-cultural Translation, Adaptation, and Psychometric Testing of the Roland-Morris Disability Questionnaire Into Modern Standard Arabic

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Study Design. Cross-cultural translation, adaptation, and psychometric testing.

Objective. To cross-culturally translate and adapt the Roland-Morris Disability Questionnaire (RMDQ) into Modern Standard Arabic and examine its validity with Arabic-speaking patients with low back pain (LBP).

Summary of Background Data. The English RMDQ is valid, reliable, and commonly used to assess LBP disability in clinical practice and research. There is no valid and reliable version of the RMDQ in Modern Standard Arabic.

Methods. The RMDQ was forward translated and back translated. An expert committee of musculoskeletal physiotherapists reviewed the translation. Eight patients with LBP evaluated item-by-item comprehensibility. Ten patients piloted the RMDQ for overall comprehensibility and acceptability. Seventeen bilingual patients tested the agreement of the Arabic and English RMDQs. Two-hundred one patients completed the RMDQ and the visual analogue scale. Sixty-four patients were followed-up for test-retest reliability.

Results. Translation of most items was uncontroversial. The expert committee found the Arabic RMDQ clinically and culturally appropriate. They reviewed item 11, addressing bending and

kneeling, because this has a clinical significance and cultural/religious implication regarding prayer positions. All patients reported that it was easy to understand and complete. The Arabic RMDQ had high overall agreement with the English RMDQ for the global score (intraclass correlation coefficient [ICC] = 0.925; 0.811–0.972). Kappa statistics showed good item-by-item agreement (none ≤ 0.30). Mean (SD) RMDQ and visual analog scale scores of 201 patients were 10.53 (4.80) and 5.11 (2.28), respectively. The RMDQ had a low correlation against pain intensity ($r = 0.259$; $P < 0.01$). A Cronbach α of 0.729 showed high internal consistency. Test-retest reliability of the Arabic RMDQ was good (ICC = 0.900; 95% confidence interval, 0.753–0.951). Kappa statistics were high for 18 items and fair for 6.

Conclusion. The Arabic version of the RMDQ has good comprehensibility and acceptability, high internal consistency and reliability, low correlation against pain intensity, and good agreement with the English RMDQ. We recommend its use with Arabic-speaking patients with LBP.

Key words: low back pain, disability, self-report, Roland Morris Disability Questionnaire, Arabic, VAS, validity, reliability, agreement, culture.

Level of Evidence: 3

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Low back pain (LBP) is a common source of musculoskeletal pain and disability. About 10% of patients with LBP experience activity limitations or restricted participation in daily life.^{1,2} The Roland-Morris Disability Questionnaire (RMDQ) is a condition-specific, patient-reported outcome commonly used to measure LBP disability in research and clinical practice.^{3–5} It was developed from the Sickness Impact Profile. Statements were chosen to cover multiple aspects of daily living and the phrase “because of my back” was added to each statement to specify that the limitation described was due to back problems.⁶ The English RMDQ (EnRMDQ) has adequate reliability, validity, and responsiveness.^{6–8} In addition, it is simple to understand and complete; therefore, guidelines have recommended its use with patients with LBP.^{9,10}

The RMDQ has been cross-culturally translated and adapted to many cultures and languages.^{3,11–16} To the authors'

knowledge, there is no version of the RMDQ in Modern Standard Arabic. Modern Standard Arabic (Arabic) is the modern form of literary Arabic and used in official written documents, the media, and public speaking in Middle East and North Africa.^{17,18} Translating and adapting a pre-existing valid and reliable outcome measure into Arabic would improve the assessment of self-reported LBP disability for Arabic-speaking patients and allow standardization of data collection across different countries and languages.^{3,13,19,20} The aims of this study were to cross-culturally translate and adapt the RMDQ into Arabic and to examine its validity and reliability for measuring disability associated with LBP in Arabic-speaking patients.

MATERIALS AND METHODS

Study Overview

The EnRMDQ was cross-culturally translated, adapted, and piloted by Arabic-speaking patients with LBP as recommended by Beaton *et al.*²¹ (Figure 1). The Arabic version (ArRMDQ) then underwent a validation study to determine its psychometric properties.

Cross-cultural Translation and Adaptation

Translation

The EnRMDQ was forward translated from the original to the target language (Arabic) by a bilingual physiotherapist and a translator of nonclinical background to produce versions T1 and T2, respectively. Discussions between the forward translators were coordinated by the first author (D.M.) who is bilingual in English and Arabic to produce one Arabic version (T12). In the case of disagreements between T1 and T2 translators, a third translator of a nonclinical background was consulted. The T12 version was back translated from Arabic to English by 2 nonclinical translators, producing versions BT1 and BT2.

The T1, T2, T12, BT1, and BT2 versions were discussed by an expert committee of 3 clinical and 2 academic physiotherapists and included 2 translators and the first author (D.M.). The main purpose of the expert committee was cultural adaptation.²¹ The ArRMDQ was produced after recommendations from the panel.

Participants

Patients aged 18 years or older with back pain, with or without leg symptoms lasting for more than 3 months, were recruited from 4 outpatient physiotherapy sites in Bahrain. Reasons for exclusion were a diagnosis of inflammatory disease, spinal fractures, or recent surgery (<1 yr ago), or pregnancy. Ethical approval was granted from the Ministry of Health (Bahrain) and King's College London (UK).

Comprehensibility and Acceptability

Participants described their understanding of each item on the ArRMDQ. In addition, patients completed the ArRMDQ in a clinical setting and commented on their experience.

Bilingual Testing

Bilingual participants completed the EnRMDQ and the ArRMDQ on the same day. The ArRMDQ had items in random order to minimize a recall effect.^{11,22} Participants were randomly assigned to complete the EnRMDQ and then the ArRMDQ, or vice versa.

Psychometric Properties

Participants completed the ArRMDQ, visual analogue scale (VAS)²³ for pain intensity, and sociodemographic information questionnaire. The participants were followed up 7 days later to repeat the outcome measures. This test-retest method was used to measure the short-term reliability of the ArRMDQ.

As there is no valid and reliable “gold standard” measure designed to evaluate self-reported LBP disability in Arabic, validity was examined by assessing construct validity. Construct validity is assessed by determining whether an outcome measure correlates appreciably with dimensions it is postulated to measure.^{14,24,25} The RMDQ intends to assess LBP disability in terms of pain-related limitations and disabilities, so it was measured against one of the dimensions it postulates to measure—pain intensity (VAS). The Pearson correlation coefficient was used to determine the Arabic RMDQ's construct validity against the VAS. Previous studies show that the RMDQ correlates moderately to pain intensity^{11,12,14,26}; therefore, a moderate association (of $r \geq 0.30$) is expected between pain and disability.

Data Analyses

The agreement of the Arabic translation to the English version and short-term test-retest reliability of the ArRMDQ was tested by kappa statistics of agreement for item-by-item analysis and intraclass correlation coefficient (ICC_{2,1}) for the global score. On the basis of previous test-retest reliability testing of the RMDQ,³ a sample size calculation estimated that 57 participants would detect an approximate value of ICC of 0.85 to 0.95 with 95% confidence interval (CI). Internal consistency using the Cronbach α was used to measure the internal association of the items to the total score in an outcome measure. The Cronbach α for if-item-deleted assessed the individual items contribution toward internal consistency and redundancy.

Kappa statistic and ICC values of 0.80 or more were considered high, 0.60 to 0.80 to be acceptable, 0.41 to 0.6 moderate agreement, and 0.21 to 0.4 fair agreement.²⁷ A high Cronbach α of 0.70 or more suggests that the items measure the same construct and support the construct validity.^{25,28} In addition, Bland-Altman plots were used to visually assess for agreement between the EnRMDQ and the ArRMDQ and for test-retest reliability of the ArRMDQ.²⁹ SPSS 19.0 (IBM UK Ltd., Portsmouth, Hampshire, United Kingdom) was used for analyses.

RESULTS

Cross-cultural Translation and Adaptation

Translation

There were no major discrepancies between forward translators and back translators. T1 and T2 translators used different

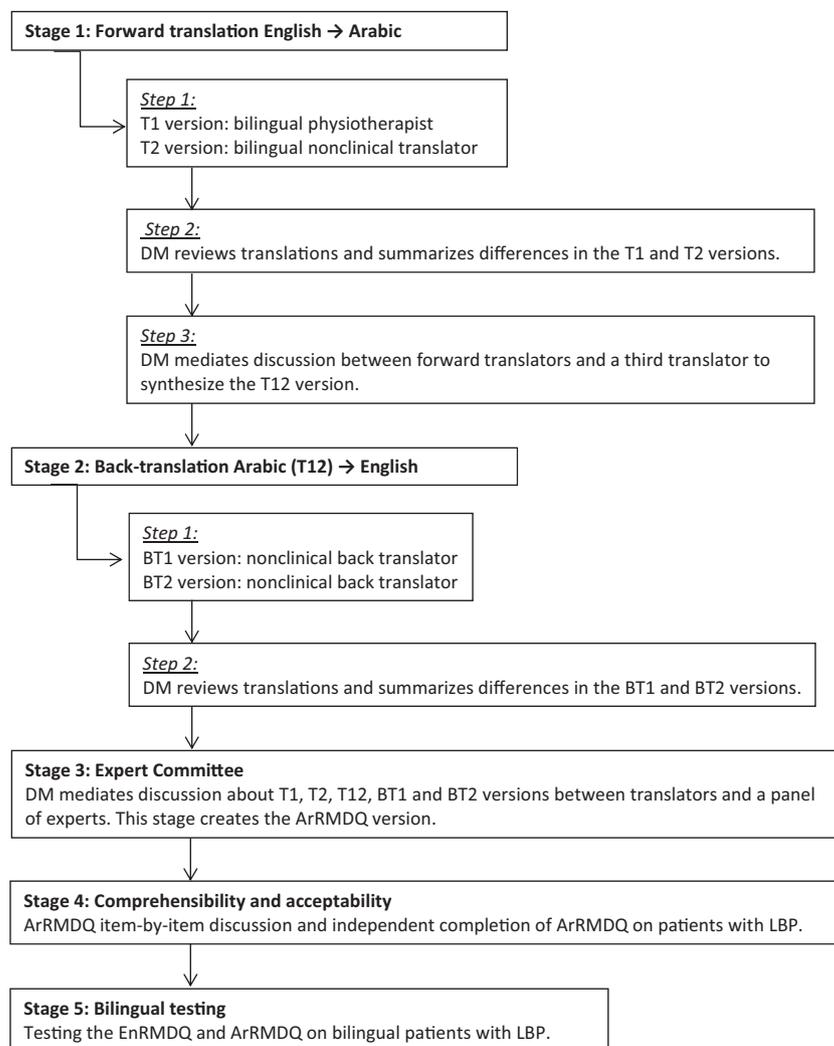


Figure 1. Cross-cultural translation and adaptation process. ArRMDQ indicates Arabic Roland-Morris Disability Questionnaire; EnRMDQ, English Roland-Morris Disability Questionnaire; LBP, low back pain.

sentence structures for some items. They were settled by consultation with a third translator. “Because of my back” translates better grammatically into “because of my back pain” in Arabic. The 3 translators decided to use “because of my back” as in the original version to allow the reader to reflect on all back-related symptoms.

The expert committee found the ArRMDQ generally clear. There were discussions regarding items 6, 11, and 18. In item 6: *Because of my back, I lie down to rest more often*, the frequency of “often” was discussed for an appropriate Arabic equivalent. Item 11 addressed kneeling: *Because of my back, I try not to bend or kneel down*. This item had a cultural religious significance when it comes to performing prayer. The expert committee was careful not to contradict common lifting and handling advice. Item 18, *I sleep less well because of my back*, was difficult to translate because of colloquialism in “less well”; therefore, it was decided to use Arabic equivalent of “not well.”

Comprehensibility and Acceptability

ArRMDQ items were read by 8 patients (2 males, 6 females) with mean (SD) age of 42.38 (8.28) to assess comprehensibility

(Table 1). They generally found it very clear, and their comments did not indicate a problem in comprehension. They found the statements gave them specific tasks to consider and stimulated discussion points. For example, patients found it difficult to answer based on their activity “today” because their back pain fluctuated. They also found that they do things “differently” as opposed to (*i.e.*, “slowly” in item 9: *I get dressed more slowly than usual because of my back*) or break tasks down rather than avoid them (*i.e.*, item 4: *Because of my back I am not doing any of the jobs that I usually do around the house*). Ten patients independently completed the ArRMDQ in a clinical setting. Two of the 10 patients were illiterate and items were read verbatim to them by a clinician. None of the 10 patients reported any comprehension problems. No further changes made to the RMDQ after the comprehensibility and acceptability testing.

Bilingual Testing

Seventeen patients (9 males, 8 females), bilingual in English and Arabic, completed the EnRMDQ and the ArRMDQ. Mean (SD) scores for the EnRMDQ was 7.41 (5.77) and for the ArRMDQ was 6.88 (5.67). Agreement of the global

TABLE 1. Participants' Characteristics Across the Different Stages of the Cross-cultural Translation and Adaptation Procedure

	Phases of the Cross-cultural Translation and Adaptation Procedure				
	Comprehensibility	Acceptability	Bilingual Testing	Validity	Reliability
n	8	10	17	201	64
Sex (M/F)	2/6	4/6	9/8	69/132	23/41
Age, yr					
Mean (SD)	42.38 (8.28)	39.7 (14.57)	36.47 (12.74)	44.55 (14.12)	43.11 (14.99)
Range	30–55	19–57	21–62	20–83	22–83
EnRMDQ					
Mean (SD)			7.41 (5.77)		
Range			0–22		
ArRMDQ					
Mean (SD)		6.70 (5.03)	6.88 (5.67)	10.53 (4.80)	10.61 (5.08)
Range		1–14	0–23	2–24	2–19
ArRMDQ retest					
Mean (SD)					9.47 (4.52)
Range					1–17

ArRMDQ indicates Arabic Roland-Morris Disability Questionnaire (0–24 points); EnRMDQ, English Roland-Morris Disability Questionnaire (0–24 points); F, female; M, male.

score was good (ICC = 0.925; 95% CI, 0.811–0.972). Kappa statistics showed that the EnRMDQ and the ArRMDQ had high item-by-item agreement for 10 items, acceptable for 6 items, and the remaining 8 were of moderate to fair agreement ($\kappa = 0.301$ – 0.549) (Table 2). The Bland-Altman plot (Figure 2) showed good reliability with a mean difference of 0.529 (+4.864, -4.334).

Psychometric Properties

Validity

A total of 201 participants completed the ArRMDQ and the VAS. Their mean (SD) scores for the ArRMDQ was 10.53 (4.80) and for the VAS was 5.11 (2.28). The ArRMDQ and the VAS had a low correlation ($r = 0.259$; $P < 0.01$).

Reliability

The ArRMDQ had high internal consistency ($\alpha = 0.729$). Internal consistency score if-item-deleted showed that the removal of items 2 or 19 could increase the score to 0.737 (Table 3). Sixty-four patients were followed up 7 days later to assess the short-term reliability of the ArRMDQ. Test-retest reliability showed a high ICC value of 0.900 (95% CI, 0.753–0.951). The Bland-Altman plot showed good agreement (Figure 3). The mean difference was 1.1406 (+4.817, -3.676). Kappa statistics showed that 18 items of the ArRMDQ had acceptable agreement ($\kappa = 0.608$ – 0.799). Six items (4, 17–19, 21, 23) had moderate agreement

($\kappa = 0.411$ – 0.590). Table 3 provides a summary of the psychometric properties of the ArRMDQ.

DISCUSSION

The EnRMDQ was not difficult to translate to Arabic. The study showed the ArRMDQ is comprehensible and acceptable by Arabic-speaking and bilingual English and Arabic-speaking patients. The ArRMDQ had good agreement with the EnRMDQ, high short-term test-retest reliability, high internal consistency, and acceptable item-by-item agreement for most of the items.

There were very few disagreements between the translators. Similar findings were reported during the development of the Greek³⁰ and the simplified Chinese³¹ RMDQs. In the case of the ArRMDQ, discrepancies between the translators were mainly related to grammatical sentence structure. The forward translators decided to retain “Because of my back” to preserve the intention of the original RMDQ to determine disability due to all back symptoms and not just pain.⁶

The expert committee found the ArRMDQ clear; however, they adapted items 11 and 18 to suit the clinical and cultural environment. The main purpose of the expert committee is adaptation.²¹ Therefore, they also amended colloquial phrases to suit the targeted patient population. Other translations have also had to amend colloquial phrases to maintain equivalence.²⁰ Consensus on changes was not difficult to reach, similar to other translation experiences.^{13,32}

Previous RMDQ cross-cultural translation and adaptation studies reported good comprehensibility and acceptability

TABLE 2. Global and Item-by-item Agreement of the EnRMDQ Versus ArRMDQ

Agreement of Global Score	
ICC	0.925
95% CI	0.811–0.972
Item-by-Item agreement	
Item	κ
1	1.000
2	1.000
3	0.628
4	0.549
5	0.463
6	0.648
7	0.549
8	0.638
9	0.850
10	0.742
11	0.764
12	0.850
13	0.303
14	1.000
15	1.000
16	1.000
17	0.549
18	0.866
19	0.938
20	0.301
21	0.534
22	0.717
23	0.876
24	0.463

ArRMDQ indicates Arabic Roland-Morris Disability Questionnaire; CI, confidence interval; EnRMDQ, English Roland-Morris Disability Questionnaire; ICC, intraclass correlation; κ, kappa statistic.

for different patients of different cultures, and this was also true for the ArRMDQ.^{13,26,30,33} The 8 patients participating in the item-by-item comprehension reported no comprehension problems. On the contrary, some expressed satisfaction because the ArRMDQ addressed topics not always discussed with the clinicians and prompted further discussion with the researcher. One patient thought that it would be interesting to use it as a treatment outcome measure.

None of the patients independently completing the ArRMDQ in a clinical setting reported any problems with

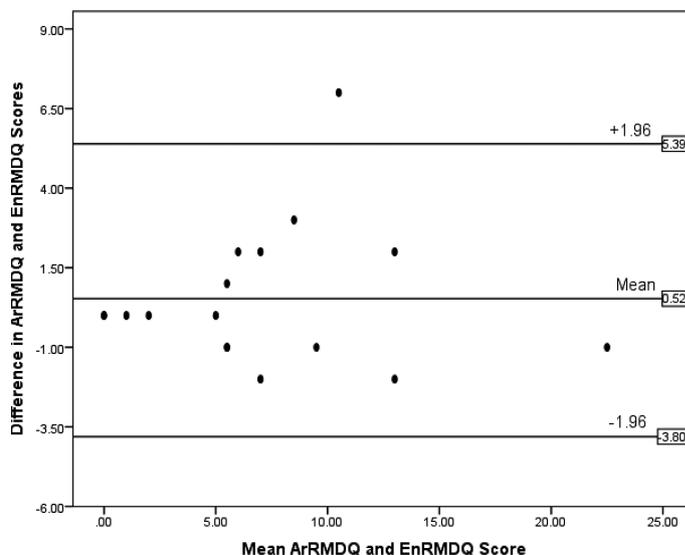


Figure 2. Bland-Altman plot for bilingual testing of the RMDQ: mean plotted against difference. ArRMDQ indicates Arabic Roland-Morris Disability Questionnaire; EnRMDQ, English Roland-Morris Disability Questionnaire.

comprehension. They found it quick and easy to complete. Illiterate patients found it easy to understand when read verbatim, as in other translations.^{26,31,34} Previous studies also found the RMDQ easy to administer, with few misunderstandings or declining participation, or requiring major adjustments.^{11,13,20,26,30,33} The simplified Chinese³¹ and Persian¹⁵ versions found missing data for the Oswestry Disability Index (ODI) when compared with the RMDQ particularly in the Sex Life subscale, which the RMDQ does not contain. The ODI was adapted to Tunisian Arabic. Patients did not find the Sex Life subscale acceptable, and the authors removed it.³⁵ Patients of more conservative cultures might not be comfortable with such topics.^{31,36} Thus, the RMDQ may be more culturally appropriate than the ODI in these cultures. In addition, the present study did not correlate the ArRMDQ against the ODI because of the aforementioned reasons and dialect.

To the authors' knowledge, this is the first study to assess the agreement of the cross-culturally adapted and translated RMDQ with the original as recommended by Beaton *et al.*²¹ There was high global agreement (ICC = 0.925; 95% CI, 0.811–0.972) and most item-by-item statistics between the EnRMDQ and the ArRMDQ. The mean difference at 0.529 is close to zero, indicating only slight differences between the first test and the retest.²⁰ The limits of agreement are within the estimates of minimal clinically important difference of 4 to 5,^{8,37} therefore showing good agreement. A small sample was used to assess this aspect of the cross-cultural procedure because of the difficulty of recruiting bilingual patients with LBP meeting the eligibility criteria. Regardless, the results give an insight into the agreement of the ArRMDQ with the EnRMDQ.

The ArRMDQ had good psychometric properties that were similar to other versions. The ArRMDQ demonstrated good reliability. Most of the items of the ArRMDQ had good item-by-item agreement, comparable with other versions:

TABLE 3. Psychometric Properties of the ArRMDQ

	Reliability	Validity
	Test Retest Agreement (ICC; 95% CI)	Internal Consistency α
Global score	0.900; 0.753–0.951	0.729
Item-by-Item	Test Retest Agreement (κ)	Internal Consistency if Item Deleted (α)
1	0.749	0.718
2	0.618	0.737
3	0.724	0.707
4	0.590	0.717
5	0.680	0.726
6	0.656	0.728
7	0.865	0.727
8	0.711	0.711
9	0.608	0.713
10	0.649	0.721
11	0.630	0.719
12	0.729	0.721
13	0.678	0.722
14	0.666	0.723
15	0.699	0.724
16	0.799	0.716
17	0.554	0.711
18	0.545	0.725
19	0.581	0.737
20	0.661	0.713
21	0.561	0.725
22	0.560	0.722
23	0.411	0.711
24	0.734	0.718

ArRMDQ indicates Arabic Roland-Morris Disability Questionnaire; CI, confidence interval; ICC, intraclass correlation; κ , Kappa statistic; α , Cronbach α .

Moroccan¹⁴ and Hong Kong Chinese.³⁸ The ArRMDQ had good overall agreement. The ICC value of 0.900 (95% CI, 0.753–0.951) is similar to the EnRMDQ 0.91⁶ and within the range reported in the literature for other versions of the RMDQ ranging from 0.83 for the Norwegian RMDQ³³ to 0.95 of the Brazilian-Portuguese RMDQ.³⁹ The Bland-Altman plot had limits of agreement (+4.817, -3.676) that are within the levels of minimal clinically important difference of 4 to 5 when the mean (SD) of the ArRMDQ of 10.53 (4.80) is taken into account showing good short-term repeatability.^{8,37}

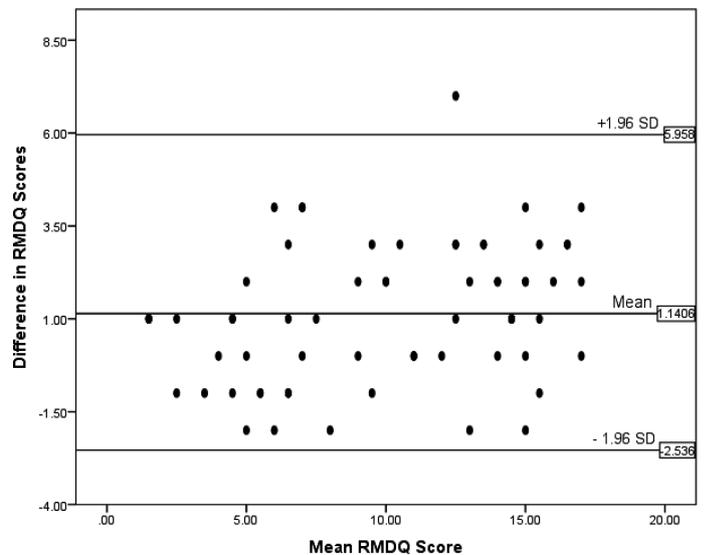


Figure 3. Bland Altman plot for test-retest reliability of the ArRMDQ: mean plotted against difference. ArRMDQ indicates Arabic Roland-Morris Disability Questionnaire; EnRMDQ, English Roland-Morris Disability Questionnaire.

Overall, the ArRMDQ had a good validity. It had a high Cronbach α of 0.729. It was lower than that reported for the EnRMDQ, between 0.84 and 0.93,⁹ and other RMDQ versions, between 0.81²⁰ and 0.94.^{26,33,40} The ArRMDQ had a lower correlation to pain intensity ($r = 0.259$; $P < 0.01$) than previous versions. A moderate association (of $r \geq 0.30$) was expected between pain and disability as seen from other Arabic patients with LBP lasting more than 3 months (Moroccan 0.32¹⁴ and Tunisian 0.33²⁶). The exclusion of patients with less than 3 months of pain could have contributed to the lower correlation value. Higher correlations were seen in studies that included patients with both acute and chronic LBP between the RMDQ and the VAS³¹ and other self-report measures for pain.^{30,39} Both lower internal consistency and low correlation coefficient of the ArRMDQ could be explained by the relevance of some RMDQ items. For example, it is not common for individuals of a conservative Islamic culture to accept help when dressing³⁶ (item 19, *Because of my back pain, I get dressed with help from someone else*). The α score would be slightly higher at 0.737 if item 19 was deleted. It was retained to maintain the standardization of the tool and because the α value was within recommended internal consistency values of 0.70 to 0.90.⁹

One limitation of this study was that ArRMDQ's construct validity was assessed against only one dimension that it postulates to measure (pain intensity) and was found to have a low correlation. We recommend that future studies measure its association with other constructs, such as the Bodily Pain or Physical Functioning subscales of the Short-Form (36) Health Survey (SF-36) or other scores measuring function^{16,20,33} in Arabic-speaking patients. In addition, the responsiveness of the ArRMDQ is yet to be explored.

In conclusion, the ArRMDQ has good comprehensibility and acceptability, high internal consistency and reliability in

patients with LBP, and good agreement with the EnRMDQ. Validity testing showed that the ArRMDQ had a low correlation to its pain intensity construct in this population. Overall, the psychometric properties are acceptable and comparable with other versions of the RMDQ. The creation of a Modern Standard Arabic version of the RMDQ could be useful across the Middle East and North African region or countries with Arabic-speaking migrants. The ArRMDQ could be used clinically as an outcome measure or for further research.

➤ Key Points

- ❑ Self-report measures are commonly used to assess outcomes in clinical practice and research. The RMDQ is a valid and reliable tool for measuring disability associated with LBP.
- ❑ The RMDQ was cross-culturally translated into and adapted to Modern Standard Arabic (ArRMDQ) by 3 forward and back translators and an expert committee.
- ❑ The ArRMDQ was tested for comprehensibility, acceptability, agreement with the EnRMDQ, reliability, and validity.
- ❑ The ArRMDQ has good comprehensibility and acceptability, high internal consistency and short-term reliability, low correlation against pain intensity, and good agreement with the EnRMDQ.
- ❑ The ArRMDQ is recommended for use with Arabic-speaking patients with LBP to assess for clinical or research outcomes.

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