HEALTH SERVICES RESEARCH

Reliability, Validity, and Cross-Cultural Adaptation of the Turkish Version of the Bournemouth Questionnaire

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Study Design. Validation of a self-report questionnaire.
Objective. The purpose of this study was to investigate adaptation, validity, and reliability of the Turkish version of the Bournemouth Questionnaire.
Summary of Background Data. Low back pain is one of the most frequent disorders leading to activity limitation. This pain affects most of people in their lives. The most important point to evaluate patient's functional abilities and to decide a successful therapy procedure is to manage the assessment questionnaires precisely.
Methods. One hundred ten patients with chronic low back pain were included in present study. To assess reliability, test-retest and internal consistency analyses were applied. The results of test-retest analysis were assessed by using Intraclass Correlation Coefficient method (95% confidence interval). For internal consistency, Cronbach alpha value was calculated. Validity of the questionnaire was assessed in terms of construct validity. For construct validity, factor analysis and convergent validity were tested. For convergent validity, total points of the Bournemouth Questionnaire were assessed with the total points of Quebec Back Pain Disability Scale and Roland Morris Disability Questionnaire by using Pearson correlation coefficient analysis.
Results. Cronbach alpha value was found 0.914, showing that this questionnaire has high internal consistency. The results of

test-retest analysis were varying between 0.851 and 0.927, which shows that test-retest results are highly correlated. Factor analysis test indicated that this questionnaire had one factor. Pearson correlation coefficient of the Bournemouth Questionnaire with Roland Morris Disability Questionnaire was calculated 0.703 and it was found with Quebec Back Pain Disability Scale is 0.659. These results showed that the Bournemouth Questionnaire is very good correlated with Roland Morris Disability Questionnaire and Quebec Back Pain Disability Scale.
Conclusion. The Turkish version of the Bournemouth Questionnaire is valid and reliable.
Key words: back pain, cross cultural, factor analysis, low back pain, outcome measurement, questionnaire, reliability, scales, translation, validity.
Level of Evidence: 3
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Low back pain (LBP) is one of the most common diseases accompanying with disability in activity level[1] and it is a widespread reason for consulting a doctor.[2] However, LBP does not only affect the physical status of the patient. It is also associated with social, psychological, and workplace-related factors.[3] The prevalence studies indicates that 60% to 90% of population have experienced LBP in a part of their lives.[4] For the Turkish population, the lifetime, 12-month, and point prevalence rates of LBP were found to be 44.1%, 34%, and 19.7%, respectively.[5] An analysis of LBP in terms of economic burden shows that direct health care costs and its related consequences are annually over three times higher than the costs for all cancers.[3] However, with these treatment costs and psychosocial effects of LBP, especially 10 to 15 years ago, it was thought to be a serious problem in only developed countries. Current studies have revealed that it is a severe problem also in low and middle-income populations.[6–10]

In general, spine mobility and muscle strength are the most commonly used physiologic evaluation parameters in clinical practice by researchers in patients with LBP.[11] However, the correlation of the reductions in symptoms, daily functional abilities, and working life with physiologic measurements is weak.[12,13] This has revealed the necessity and the importance of objective and functional subjective evaluation of the spine using validated questionnaires in patients with LBP.[12–15] The appropriate use of outcome measurements is one of the most important factors for the evaluation of functional abilities of the patient and in deciding a successful treatment protocol.[16] For this purpose, Bolton and Breen[17] created the Bournemouth Questionnaire (BQ) for back pain in 1999. The BQ is a multidimensional scale evaluating pain, daily-social life, depression-anxiety, pain control, and fear avoidance behaviors with seven questions.[17]

Calmels et al.[18] indicated that there is no gold standard questionnaire to evaluate disability in LBP patients. Therefore, increasing the number of questionnaires associated with back pain would provide a larger perspective for clinicians and researchers. Roland Morris Disability Questionnaire (RMDQ) and Quebec Back Pain Disability Scale (QBPDS) are valid, reliable, and widely used scales for back pain. Therefore, these tools were used in the present study to establish the construct validity of the BQ. Wang et al.[19] performed a content comparison of questionnaires and scales used in LBP on the basis of the International Classification of Functioning, Disability and Health (ICF). They found that the concepts of RMDQ, QBPDS, and BQ could be linked 100% to the ICF.[19] The advantage of the BQ is that it is a comprehensive, short, and easy-to-answer outcome measurement.[19–21] It was also found to be valid and reliable.[17] However, there are only two versions of this questionnaire (German and Dutch), and there is no Turkish version available.[22,23] Therefore, the aim of the present study was to investigate the validity and reliability of the Turkish version of the BQ.

MATERIALS AND METHODS

The study was approved by the Gazi University Ethics Commission (#77082166-604.01.02-6835). Written permission was obtained from Bolton and Breen for the Turkish version of the BQ and then translation and cultural adaptation were carried out according to the procedure established by Beaton et al.[24] One hundred twenty-two patients (18–65 years old) with LBP (at least for the previous 3 months) participated in the study. Pregnancy, rheumatologic or neurological diseases,

and history of operation for LBP were exclusion criteria. Twelve patients (out of 122) were excluded from the study because they incorrectly filled the questionnaire, and thus, the final number of participants was 110 patients. Test-retest analysis was performed with 30 of the 110 patients, and these patients received no treatment for 2 days.

Translation and Cultural Adaptation Steps

(1) First step: The original English form of the questionnaire was translated to Turkish by two native Turkish speakers with good command of English. One of them was a physiotherapist and aware of study, the other one was an English linguistic scientist, but unaware of the concepts.

(2) Second step: The two versions of the Turkish translation were combined into a single translation by the two translators.

(3) Third step: This combined Turkish version of the questionnaire was again translated back to English by two bilingual translators (back translation). Bilingual translators were unaware of the study.

(4) Fourth step: Following the evaluation of the resultant translations for English-Turkish language and cultural adaptation by the expert committee, the pre-final form of the questionnaire was created. The committee consisted of a physiotherapist, an English linguistic scientist, a Turkish philology specialist, and two bilingual translators.

(5) Fifth step: Comprehensiveness of the questionnaire was evaluated in a pilot group of 30 people (15 patients-15 healthy individuals) and they were asked about the comprehensibility of each item in the questionnaire (face validity).

(6) Sixth step: After the pilot group completed the questionnaire, the final form of the questionnaire was established by the committee based on the findings (Appendix 1, http://links.lww.com/BRS/B144).

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) version 22.0 was used for statistical analyses. Test-retest and internal consistency analyses were performed to determine the reliability of the BQ. Intraclass correlation coefficient (ICC) (95% confidence interval) was used for test-retest value and Cronbach alpha was used for internal consistency analysis. ICC values 0.80 and above were accepted as a high level of correlation.[25] Cronbach alpha value was considered excellent for above 0.80.[26] Construct validity of the questionnaire was assessed by factor analysis and convergent

TABLE 1. Demographic and Clinical Characteristic of Patients			
	Female	**Male**	**Total**
	X ± SD	**X ± SD**	**X ± SD**
Age (yrs)	43.84 ± 13.24	46.36 ± 12.58	44.92 ± 12.97
	Median (min-max)	**Median (min-max)**	**Median (min-max)**
Low back pain duration (mo)	24.00 (3–300)	24.00 (3–432)	24.00 (3–432)
Gender (n)	63 (%57.3)	47 (%42.7)	110 (%100)

validity. Kaiser Meyer Olkin (to determine the adequacy of the sample) and Bartlett's (to determine suitability of the sample) tests were used before factor analysis. Convergent validity of the questionnaire was determined using the Pearson correlation coefficient method after total scores obtained from BQ, RMDQ, and QBPDS.

For the Pearson correlation coefficient, 0.81 to 1.00, 0.61 to 0.80, 0.41 to 0.60, 0.21 to 0.40, and 0 to 0.20 were assumed to be indicating excellent, very good, good, poor, and no correlation, respectively.[27]

RESULTS

Demographic and clinical characteristics of the patients are summarized in Table 1. The mean age of the 30 patients selected for the test-retest reliability analysis was 45.46 ± 2.40 years. Cronbach alpha value of the BQ was recorded as 0.914. This value indicates that the questionnaire has a high internal consistency. Cronbach alpha value decreased when each question was excluded (except question 7) (Table 2). This indicates that the questions contribute to the internal consistency of the questionnaire. Test-retest ICC value (95% confidence interval) of each question varied between 0.851 and 0.927. Test-retest correlation of the total score of the questionnaire was recorded as 0.962 (Table 3). According to the ICC values, it was shown that the BQ has high test-retest results.

Kaiser Meyer Olkin and Bartlett tests values show that the sample was suitable and adequate for factor analysis (Table 4). As a result of the factor analysis, the questionnaire was found to have a single factorial structure by Scree Plot graph (Figure 1). According to the total variance analysis, the single factor of the BQ constitutes 66.63% of the total variance and also this result supports that the questionnaire have a single factorial structure (Table 5).

Convergent validity results showed that the correlation of the BQ was found very high with RMDQ (r = 0.703) and QBPDS (r = 0.659) (Table 6).

DISCUSSION

The aim of the present study was to investigate the validity and reliability of the Turkish version of the BQ in chronic LBP patients. Cross-cultural adaptation was successfully completed, and according to the statistical results, the BQ is a valid and reliable tool for the Turkish population.

TABLE 2. Cronbach Alpha Values of Bournemouth Questionnaire

Except for first question	0.901
Except for second question	0.895
Except for third question	0.897
Except for fourth question	0.895
Except for fifth question	0.904
Except for sixth question	0.899
Except for seventh question	0.914
Total	0.914

TABLE 3. Intraclass Correlation Coefficient Values of Bournemouth Questionnaire

Bournemouth Questionnaire	Intraclass Correlation Coefficient (95% Confidence Interval) Lower-Upper Bound
First question	0.885 (0.758–0.945)
Second question	0.926 (0.845–0.965)
Third question	0.927 (0.846–0.965)
Fourth question	0.851 (0.687–0.929)
Fifth question	0.919 (0.830–0.962)
Sixth question	0.851 (0.687–0.929)
Seventh question	0.927 (0.846–0.965)
Total points	0.962 (0.921–0.982)

In clinical practice, many questionnaires have been drawn up to be used for LBP and accompanying symptoms.[20] The presence of such a wide range of questionnaires makes it hard for the clinicians and researchers to select the suitable questionnaire when evaluating the patients with LBP.[28] Thus, the scale to be used should have some particular features.[20] It is stated that the parameter of pain is not sufficient on its own for the evaluation of the patients with LBP and an extensive questionnaire should also evaluate the biopsychosocial parameters.[29–32] A study by Sigl et al.[33] reports that the North American Spine Society (NASS) Lumbar Spine Outcome Assessment Instrument, Oswestry Disability Index (ODI), and RMDQ do not include emotional parameters, while the BQ includes a significant number of mental and emotional health concepts ignored by other questionnaires.[20] Furthermore, in ICF assessment, which enables researchers to compare health-related quality of life questionnaires, it is stated that the BQ includes many important concepts[20] and is clinically recommended for patients with LBP.[20,34] It has also been reported that the BQ is a more comprehensive scale than ODI[22,34] and, with its seven items, the BQ provides a significant advantage for the users, as it allows the questionnaire to be completed in a short time.[20,21]

In questionnaire validity studies, it is generally recommended to use other questionnaires that are validated, accepted as gold standard, and, if possible, context specific. However, it is indicated that no gold standard questionnaire is available among the questionnaires evaluating LBP.[18] Therefore, the RMDQ was preferred in the present study, as its validity and reliability have been proven in many languages including Turkish.[35–38] In addition, the parameters of scale evaluating are similar with the BQ.

TABLE 4. Kaiser Meyer Olkin and Bartlett Tests

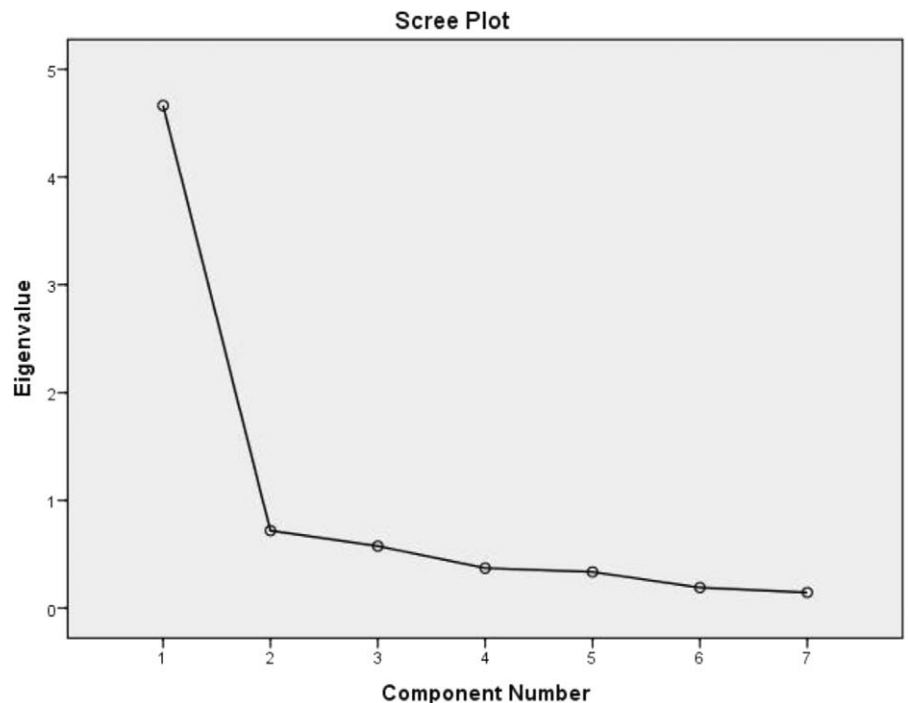| Bournemouth Questionnaire	Kaiser Meyer Olkin Test	Bartlett's Test	
		Chi-square	P
	0.875	531.136	<0.001

Figure 1. Scree plot graph of the Turkish version of the Bournemouth Questionnaire. Component number indicates the each item of the Bournemouth Questionnaire. Eigenvalue refers the measure of the amount of variance in all the tests that is accounted for by the factor.

Similarly, the QBPDS was chosen, as it is valid and reliable in Turkish and it is easy to administer with simple score calculation.[39]

LBP is classified as acute, subacute, and chronic according to the duration of pain. LBP lasting for less than 4 weeks is acute, between 4 and 12 weeks is subacute, and it is classified as chronic if it continues for more than 12 weeks.[40] Patients with chronic LBP were enrolled in this study to create a homogeneous group. Bolton and Breen,[17] who created the original version of the BQ, Hartvigsen et al.,[23] who made the Danish version, and Blum-Fowler et al.,[22] who created the German version, have not reported the status of patients for acute, subacute, or chronic LBP.

The internal consistency analysis of the Turkish version of the BQ was evaluated by Cronbach alpha value and it was found as 0.914. This rate indicates that the Turkish version of the BQ is quite reliable. In previous studies, Cronbach alpha values of the BQ were investigated and found as 0.87 and 0.91 by Bolton and Breen,[17] 0.86 and 0.94 by Blum-

Fowler et al.,[22] and 0.89 and 0.88 by Hartvigsen et al.[23] in pre- and post-treatment patients with LBP, respectively. As a result of the analysis, the Cronbach alpha value of the Turkish version of the BQ was found to be quite high similar to the versions in other languages. This result indicates that the Turkish version of the BQ has a high level of internal consistency.

In the literature, there has not been a specified exact time interval for test-retest analysis.[41] It was indicated that patients were more likely to remember the questions and the results might be relatively high in case of short time duration. On the contrary, the status of the patients might change when the time duration is long between the tests.[42] Marx et al.[41] reported that there was no statistically significant difference between the results of test-retest performed at a time between 2 days and 2 weeks. Therefore, in the present study, a 2-day time interval of test-retest was selected following Marx et al.[41] Bolton and Breen[17] performed test-retest analysis at the same day without

TABLE 5. Total Variance Analysis of Bournemouth Questionnaire						
	Initial Eigenvalues			**Extraction Sums of Squared Loading**		
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	4.664	66.629	66.629	4.664	66.629	66.629
2	0.719	10.273	76.902			
3	0.576	8.222	85.124			
4	0.371	5.302	90.425			
5	0.335	4.790	95.215			
6	0.190	2.715	97.930			
7	0.145	2.070	100.000			

TABLE 6. Convergent Validity of Bournemouth Questionnaire

	Quebec Back Pain Disability Scale (n = 110)		Roland Morris Disability Scale (n = 110)	
	r	P	r	P
Bournemouth Questionnaire	0.659	<0.001	0.703	<0.001

specifying the time interval, while Hartvigsen et al.[23] and Blum-Fowler et al.[22] reported test-retest interval as 2 hours. Fowler et al.[22] reported this situation as a limitation of their study. ICC value for each question of the Turkish version of the BQ varied between 0.851 and 0.927 and the ICC value was found to be 0.962 for total scores. Bolton and Breen[17] specified test-retest ICC results of the total score of the questionnaire as 0.95. Fowler et al.[22] reported that test-retest ICC results of each question varied between 0.91 and 0.97, while total score results were reported to be 0.99. Hartvigsen et al.[23] determined the test-retest ICC value of the total score as 0.96. Test-retest results of this study were similar with the ICC values of the previous studies. Considering the ICC values of each question and the total score of the questionnaire, it is possible to say that the Turkish version of the BQ is stable over time.

Kaiser Meyer Olkin and Bartlett tests results showed that the sample was suitable and adequate for factor analysis. The factor analysis reveals that the BQ has one factor. This analysis is the first factorial content analysis of the LBP version of the BQ. It was found in the neck pain version of the questionnaire as two factors.[43] We think that the single factorial structure of the questionnaire despite its inclusion of multiple contents in its questions is caused because the number of questions is insufficient to result in an adequate number of factors.

In the present study, the convergent validity of the total score of the BQ was assessed by the Pearson correlation coefficient. The convergent validity of the BQ with RMDQ was determined as 0.703 and 0.659 with QBPDS. These values suggest that the correlation of the Turkish version of the BQ with RMDQ and QBPDS was at a very high level. In previous studies, the convergent validity of the BQ was calculated and found as 0.77 with Chronic Pain Questionnaire, 0.78 with Modified Oswestry Low Back Pain Disability Index,[17] 0.67 with Short Form-36, and 0.59 with Modified Oswestry Low Back Pain Disability Index.[22] When compared with previous studies, these results support the validity of the Turkish version of the BQ.

The responsiveness analysis of the BQ, which is considered to be one of the important parameters of the questionnaires, reports that it is more responsive than Short Form-36 and ODI and with a similar responsivity with RMDQ.[22,23] This analysis finding reveals that the questionnaire is more sensitive to the clinical changes. However, we did not perform the responsiveness analysis. We suggest that it will be useful to evaluate the responsiveness in treatment groups, and also the validity and reliability of the Turkish version of the BQ should be analyzed in patients with acute and subacute LBP.

In conclusion, the BQ has high test-retest and internal consistency coefficient results. Factor analysis demonstrated that it has one factor. Convergent validity of the BQ was found to have very high levels of correlation with RMDQ and QBPDS. The Turkish version of the BQ is valid and reliable. Because it is short, easy-to-apply, and comprehensive as it contains biopsychosocial parameters,[19–21] the BQ might be a preferable scale in the clinical assessment of patients with LBP.

> ## ➤ Key Points

- ❏ One hundred ten chronic back pain patients enrolled in this study and sample was both adequate and suitable for factor analysis.
- ❏ The Turkish version of the Bournemouth Questionnaire has high internal consistency and test-retest values.
- ❏ The Bournemouth Questionnaire has one factor.
- ❏ The Turkish version of the Bournemouth Questionnaire has very good correlation with Roland Morris Disability Questionnaire and Quebec Back Pain Disability Scale.
- ❏ The Turkish version of the Bournemouth Questionnaire is valid and reliable.

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