

Translation and Cross-cultural Adaptation of the Fremantle Back Awareness Questionnaire into Persian language and the assessment of reliability and validity in patients with chronic low back pain

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Background: Chronic low back pain (LBP) causes some neuroplastic changes in the brain, which result in body perception impairment. The Fremantle Back Awareness Questionnaire (FreBAQ) is a suggested tool for the diagnosis and evaluation of back perception in people with LBP. The aim of this study is to translate and cross culturally adapt the FreBAQ into Persian language and to assess its reliability and validity in patients with chronic LBP (CLBP). **Materials and Methods:** Fifty people with CLBP and fifty healthy people participated in this study. To evaluate the discriminant validity, we assessed the ability of the FreBAQ to discriminate between people with and without LBP. After an interval of 1 week, 25 patients with CLBP completed the questionnaire in the retest session. Data obtained from the first test administration were used for internal consistency and data obtained from repeated testing were used for test–retest reliability. Construct validity was assessed by investigating a correlation between the FreBAQ with the Roland–Morris Disability Questionnaire (RDQ), Visual Analog Scale, Pain Catastrophizing Scale (PCS), Hospital Anxiety and Depression Scale, and Tampa Scale of Kinesiophobia. In addition, the construct validity of Persian FreBAQ was measured by factor analysis. **Results:** The test–retest reliability of the questionnaire was confirmed by intraclass correlation coefficient = 0.96. Cronbach’s alpha was 0.74 for Persian FreBAQ. The standard error of measurement and minimal detectable change were 0.91 and 2.52, respectively. Construct validity was demonstrated by statistically significant relationship between the Persian FreBAQ and questionnaires of PCS ($P < 0.001$) and RDQ ($P = 0.01$). **Conclusion:** The Persian version of FreBAQ is a valid and reliable measurement tool for evaluating back perception changes in Persian-speaking patients with LBP.

Key words: Body image, Fremantle Back Awareness Questionnaire, Persian, reliability, validity

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INTRODUCTION

Sixty to eighty percent of people experience low back pain (LBP) at some stage in their life.^[1] Most LBP resolves in a short time, but about 80%–90% of attacks resolve in about 6 weeks. Up to 85% of the remaining sufferers may progress to chronic, recurrent

symptoms.^[2] Chronicity and recurrence of LBP may affect people’s lives adversely, causing activity limitation, particularly in people below the age of 45 years.^[2] A body of evidence discussed the mechanism of chronicity of LBP.^[3–6] Chronic pain has been attributed to abnormal nociceptive/antinociceptive function at different levels in the central nervous system.^[7]

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Chronic pain may cause changes in different parts of the brain, similar to those detected in patients suffering from phantom limb pain.^[8,9] The neuroplastic changes include structural, chemical, and functional changes.^[10-12] The study of brain morphology in chronic LBP (CLBP) patients shows reduced gray matter volume in somatosensory cortex, brainstem, and right anterior thalamus regions, resembling brain atrophy in these areas.^[13-16] Chemical changes occur with ion channel reorganization and neurotransmitter alteration.^[17-19] One of the clinical manifestations of the functional reorganization of cortical areas is body perception impairment.^[10,20,21]

An individual's sense of body is called body perception.^[20] The disturbed tactile acuity, proprioception,^[22,23] and the position of the body in space^[24] are the result of the change in body perception. In addition, the decline of it causes poor graphaesthesia,^[25] inaccuracy in localizing tactile stimuli on the back,^[26] decreased motor imagery,^[27] and altered size perception and awareness of the back^[28] in people with CLBP.

Recent findings suggest that treatments aimed at improving perception of lower back have had positive effects on CLBP.^[29] However, this is not a part of clinical evaluation among Iranian physiotherapists. This may be due to the lack of an appropriate outcome measure.

The Fremantle Back Awareness Questionnaire (FreBAQ) measures body perception alteration in people with CLBP.^[30] It is a tool that could be used for both therapeutic and research purposes. As racial, linguistic, cultural, and geographical differences between societies can affect the administration of the questionnaire, it is necessary to translate, cross culturally adapt, and validate the FreBAQ for use with Iranians. Therefore, the aim of this study is to translate, culturally adapt, and evaluate the reliability and validity of the Persian version of the FreBAQ.

MATERIALS AND METHODS

This cross-sectional psychometric research was performed between Spring 2014 and Winter 2015. This study was approved by the Ethics Committee of Isfahan University of Medical Sciences (Ethics Code: IR.MUI.REC.1395.2.219). The approval for translation and cultural adaptation of the original version into Persian was obtained from the developer of the FreBAQ. All participants signed the informed consent form.

Participants

In this study, the participants were recruited from patients who were referred to physiotherapy clinics in Isfahan, Iran. Inclusion and exclusion criteria for healthy and LBP group

were more or less similar to the original version.^[30] Inclusion criteria for LBP group included being aged between 18 and 60 years, having a history of nonspecific LBP for at least 6 months, declaring LBP as the main complaint, being a resident in Iran, speaking Persian as the mother language, and having the ability to read and write Persian. Exclusion criteria for patients with LBP were nerve root involvement; specific pathologies such as cancer, infection, fractures, and inflammatory diseases; lumbar spine surgery or invasive procedures in the past 12 months; and pregnancy and delivery during the last 6 months. The specific pathologies were realized with magnetic resonance imaging (MRI) and X-ray.

Inclusion criteria for the healthy group were being aged between 18 and 60 years, no history of back pain, no onset of back pain that has limited working or living in the past 2 years, residency in Iran, and speaking Persian as the native language. Exclusion criteria for this group were pregnancy, delivery during the last 6 months, and suffering from a major deformity in the spine. Fifty participants were enrolled per group.^[31]

Translation

The FreBAQ was translated into Persian by two professional translators who were Persian natives. The translations were compared and discussed in a session with both translators and members of the research team to prepare the provisional version. Content validity was evaluated by experts in the field. In order to assess the face validity, the preliminary version of the questionnaire was completed by ten individuals with CLBP to find if there were any difficult and confusing phrases. The preliminary version was then translated back into English by a third translator whose mother language was English. The translated version was sent to the developer of the FreBAQ to confirm the similarity of the translated and original versions.

Instruments

Fremantle Back Awareness Questionnaire

This tool has been designed for quantitative evaluation of back-specific self-perception in individuals with nonspecific CLBP. It is a self-report questionnaire which contains nine items. Each item is scored on a 5-point Likert scale ranging from 0 (never) to 4 (always). The total score ranges from 0 to 36, with higher score indicating the greater disorder in the body's perception of back pain patients.^[30]

Roland-Morris Disability Questionnaire

This is a questionnaire for measuring the disability in patients with LBP, which includes 24 items. The total score ranges from 0 (no disability) to 24 (severe disability), in which higher score indicates greater disability.^[32] Reliability (Cronbach's $\alpha = 0.83$, intraclass

correlation coefficient [ICC] = 0.86) and validity ($P = 0.0001$) of the Persian version have been previously assessed.^[33]

Visual Analog Scale

This scale is a horizontal line of 10 cm in length, with anchor statement on the left (0) representing no pain and anchor statement on the right (10) representing most severe pain experienced. The patient marks their pain at the time of examination on this line. The distance from the mark to the left anchor (0) is considered as pain severity in millimeters.

Pain Catastrophizing Scale

This is a 13-item questionnaire that measures catastrophic pain. Items on a 5-point Likert scale are rated from 0 (not at all) to 4 (all the times). The range of scores is from 0 to 52, with the higher score showing more serious pain catastrophizing.^[34] The validity and reliability of the Persian version (Cronbach's $\alpha = 0.93$) has been reported.^[35]

Hospital Anxiety and Depression Scale

This questionnaire consists of 14 items assessing the rate of depression and anxiety in outpatients. The items are scored on a 4-point Likert type scale from 0 to 3 and the total score is between 0 and 42. The rates of depression and anxiety are classified between 0 and 7 (normal), 8–10 (abnormal borderline), and 11–21 (abnormal).^[36] The validity and reliability of the Persian version (Cronbach's $\alpha = 0.78$ for anxiety subscale and Cronbach's $\alpha = 0.86$ for depression subscale) had been evaluated previously.^[37]

Tampa Scale of Kinesiophobia

It is a common tool that measures the amount of fear of pain and injury in patients with LBP. The questionnaire includes 17 items ranked from 1 (completely opposite) to 4 (totally agree), and the total score ranges from 18 to 68.^[38] The reliability (ICC = 0.86, Cronbach's $\alpha = 0.80$) and validity of the Persian version of Tampa Scale of Kinesiophobia (TSK) have been documented.^[39]

Procedure

During the first visit, a blinded physical therapist checked the inclusion and exclusion criteria and reviewed the MRI and X-rays for eligibility. Then, the FreBAQ, Roland–Morris Disability Questionnaire (RDQ), Visual Analog Scale (VAS), PCS, Hospital Anxiety and Depression Scale (HADS), and TSK were administered to all patients. FreBAQ was re-administered to 25 patients 1 week after the first visit.^[40,41] The FreBAQ was administered to healthy controls for discriminant validity.

Statistical analysis

Reliability was assessed in two forms, internal consistency (which is a method of reliability in which we judge how well the items on a test that are proposed to measure the same construct produce similar results) and

test–retest reliability (stability of scores over time). Data obtained from the first test administration were used for internal consistency and data obtained from repeated testing were used for test–retest reliability. The discriminant validity (the ability of a questionnaire to differentiate between two known groups on a particular variable) and construct validity (the degree to which a questionnaire or a test measures what it claims to measure) were evaluated for the Persian FreBAQ. The correlation between the FreBAQ questionnaire score and the RDQ, VAS, PCS, HADS, and TSK was used to estimate the construct validity. The Persian FreBAQ had positive rating for construct validity if at least 75% of the results were in correspondence with these questionnaires.^[31] Data acquired from the first test administration were used to assess construct validity.

The data were analyzed using SPSS software (SPSS, version 22, SPSS Inc. Chicago, IL, USA) at the significance level of 0.05. Internal consistency was assessed using Cronbach's alpha. Cronbach's $\alpha \geq 0.70$ was considered satisfactory for internal consistency.^[31] Test–retest reliability was calculated using a two-way random effects model of ICC (ICC2, 1) with 95% confidence interval (95% CI). $ICC \geq 0.70$ is indicative of acceptable test–retest reliability.^[42] Standard error of measurements (SEM) was calculated as the square root of the mean square error term derived from the analysis of variance. The minimal detectable change (MDC) was defined as 95% CI of the SEM ($\pm 1.96 * \sqrt{2} * SEM$).^[31,42]

The normal distribution was analyzed with Shapiro–Wilk test. The data did not have a normal distribution, therefore for discriminant validity, Mann–Whitney U-test was used to examine the difference in FreBAQ score between healthy and patients groups. The association between the FreBAQ and other measures was assessed using Pearson's correlation coefficients. The correlation coefficients >0.50 were defined strong, between 0.35 and 0.50 medium, and <0.35 weak.^[43] Factor analysis with principal component extraction and varimax orthogonal rotation was performed to determine the structure of Persian FreBAQ. The Keiser–Meyer–Olkin (KMO) and Bartlett's test were used for assessment of the sampling adequacy and sphericity of correlation matrix, respectively.

RESULTS

The demographic characteristics of both healthy groups and patients with LBP are presented in Table 1. Thirty-four patients were female. The mean duration of patients with LBP was 32.24 ± 31.3 months. The healthy controls consisted of 37 females and 13 males.

Table 2 represents the mean, SD, range, and the proportion of patients scoring for the Persian FreBAQ and other

outcome measures. There was no statistically significant difference in age, sex, weight, and height between the two groups ($P > 0.05$).

Floor and ceiling effects

All items of the Persian FreBAQ were completed by the participants. There were no significant floor and ceiling effects for Persian FreBAQ. Two patients with LBP (4%) scored 0 on the Persian FreBAQ. No patient attained maximum possible score of 36.

Reliability

The internal consistency was acceptable with Cronbach's $\alpha = 0.74$ [Table 3]. The test-retest reliability was confirmed by ICC = 0.96. Table 4 represents Cronbach's α if an item of Persian Fre BAQ was deleted. The SEM was 0.91. The MDC was calculated as 2.52.

Validity

There was a significant difference in Persian FreBAQ scores between healthy and patients groups ($P = 0.001$). The results of the Pearson's correlation test showed a statistically significant relationship between FreBAQ and PCS ($r = 0.6, P = 0.001$). The correlation between FreBAQ and RDQ was statistically significant ($r = 0.33, P = 0.01$) [Table 5].

Factor analysis

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.65. Bartlett's test of sphericity was statistically significant at $P = 0.001$. Three factors (proprioception, back size, and back shape) were extracted which represented 23.2, 19.34, and 17.63 of the variances, respectively. Overall, they represented 60.18% of variances [Table 6].

DISCUSSION

The present study aimed to perform a cross-cultural adaptation of the FreBAQ into Persian and validate it in patients with CLBP. The results indicated acceptable reliability and validity of the Persian FreBAQ similar to the original English version.^[30]

Test-retest reliability

Test-retest reliability refers to the consistency of measurements when administered twice with an interval between test administrations. In the current study, the interval between two times of evaluation was 1 week, and the ICC coefficient was calculated for test-retest reliability. The test-retest reliability coefficient for Persian version of FreBAQ was satisfactory, in line with the original (0.74)^[30] and the other translated versions of Japanese, Turkish, and German (all ~ 0.8).^[40,41,44,45] The ICC

Table 1: Mean (standard deviation) for demographics of the low back pain patients and healthy controls

	Age (year)	Weight (kilogram)	Height (meter)
LBP patients (n=50)	37.76 (9.23)	71.68 (12.86)	1.64 (7.99)
Healthy controls (n=50)	38.70 (8.61)	68.76 (10.79)	1.64 (25.76)

LBP=Low back pain

Table 2: Descriptive statistics for the Fremantle Back Awareness Questionnaire and other outcome measures

Measures	Mean±SD	Minimum	Maximum
Fre BAQ	10.56±6.46	0	24
VAS	70.80±1.51	5	10
RDQ	12.18±4.59	2	23
TSK	45.40±8.16	26	66
HADS	17.24±6.44	3	36
PCS	30.46±9.57	12	51

SD=Standard deviation; Fre BAQ=Fremantle Back Awareness Questionnaire; VAS=Visual Analog Scale; PCS=Pain Catastrophizing Scale; TSK=Tampa Scale of Kinesiophobia; RDQ=Roland-Morris Disability Questionnaire; HADS=Hospital Anxiety and Depression Scale

Table 3: Internal consistency (n=50), test-retest reliability (n=25), standard error of measurements, and minimal detectable change for the Fremantle Back Awareness Questionnaire

	Cronbach's α	ICC (95% CI)	SEM	MDC
Fremantle Back Awareness Questionnaire	0.74	0.96 (0.61-0.83)	0.91	2.52

SEM=Standard error of measurements; MDC=Minimal detectable change; ICC=Intraclass correlation coefficient; CI=Confidence interval

Table 4: Cronbach's α for Persian Fremantle Back Awareness Questionnaire if an item deleted

FreBAQ items	Cronbach's α
1. I feel my back is not part of me	0.71
2. I need to focus all my attention on my back so that I can move it the way I want	0.70
3. I sometimes feel my back moves involuntarily and uncontrollably	0.74
4. while doing daily tasks, I do not know how my back moves	0.69
5. while doing daily tasks, I am not quite certain my back is in what position	0.69
6. I cannot recognize the exact range of my back	0.74
7. I feel that my back is enlarged	0.73
8. I feel like my back is shrunk	0.74
9. I feel my back is asymmetric	0.69

FreBAQ=Fremantle Back Awareness Questionnaire

value found for the Persian version of FreBAQ indicates its stability over time.

Absolute reliability measure

The absolute reliability was evaluated by SEM and MDC. The SEM determines the accuracy of individual's score relative to the true test score of individual. The MDC is used to analyze the patients' scores on the target questionnaire representing the minimal amount of change that is due to

real change and not from chance or measurement error. The MDC was found 2.52 for Persian FreBAQ. Thus, for an individual patient who underwent treatment, there should be at least 2.5 points change on Persian FreBAQ to be defined as a real and valid change, improved, or worsened. The MDC for Dutch version was reported as 10.8. The MDC is not reported for the other versions of FreBAQ.

Internal consistency reliability

Similar to the original English version of FreBAQ, the internal consistency for Persian FreBAQ was acceptable. The Cronbach's alpha of 0.74 was slightly higher compared to other translated versions.^[40,41,44,45] Internal consistency reliability was used to assess the interrelationship among the questionnaire items. High Cronbach's alpha indicates the homogeneity of Persian FreBAQ items measuring the same construct. The result of Cronbach's alpha if an item was deleted is useful for determining which item from among a set of items contributes to the total alpha. The internal consistency of the questionnaire was not significantly affected by deletion of any item. The correlations of ~ 0.7 were found between each item with the total score, which indicates that all the items display equal correlations with the total score.

Floor and ceiling effects

The current study found no floor and ceiling effects for Persian FreBAQ. Floor or ceiling effects are present if more than 15% of individuals get the lowest or highest possible

score.^[31] The presence of significant floor or ceiling effects implies the lack of content validity. In addition, the reliability is reduced because patients with the lowest or highest score are not distinguishable from each other. Moreover, the improvement or deterioration cannot be measured, and therefore the responsiveness of the questionnaire is limited.^[31] The lack of floor and ceiling effects found for Persian FreBAQ was comparable to Japanese and German versions.^[40,45] The Dutch^[41] and Turkish^[44] versions had not reported the floor and ceiling effects.

Discriminant validity

The ability of the Persian FreBAQ to differentiate between healthy individuals and LBP patients was assessed by discriminant validity. The Persian FreBAQ total scores for the LBP patients were significantly higher than that of the healthy group. The difference between healthy and patients with LBP on the Persian FreBAQ indicates the ability of the Persian version in distinguishing between patients from healthy individuals. This finding was consistent with the original,^[30] German,^[40] and Dutch^[41] versions of the FreBAQ. The Turkish^[44] and Japanese^[45] versions have not evaluated the discriminant validity.

Construct validity

To assess the construct validity, the Persian FreBAQ scores of patients were correlated to the instruments that measure the same concept. The significant correlation indicates that the Persian FreBAQ questionnaire is construct valid. There was no significant correlation between Persian FreBAQ and VAS score. Dutch version of the FreBAQ showed no significant correlation between the pain score and disturbed body perception,^[41] while the original and other translated versions demonstrated significant relationships.^[30,40,44-46] The original version measured average pain intensity over the past week.^[46] The Japanese and Turkish versions assessed pain in rest and motion.^[44,45] In addition, LBP severity and interference was measured by the German version.^[40] The present study and Dutch version^[41] evaluated current pain intensity of the LBP patients. The differences observed

Table 5: Pearson's correlation coefficient between the Fremantle Back Awareness Questionnaire and outcome measures (n=50)

	Correlation coefficient	P
VAS	0.03	0.42
RDQ	0.33	0.01
PCS	0.60	0.00
TSK	0.17	0.11
HADS	0.16	0.12

VAS=Visual Analog Scale; PCS=Pain Catastrophizing Scale; TSK=Tampa Scale of Kinesiophobia; RDQ=Roland-Morris Disability Questionnaire; HADS=Hospital Anxiety and Depression Scale

Table 6: Principle component analysis and rotated component matrix of Persian Fremantle Back Awareness Questionnaire*

Item	Back proprioception	Back size	Back shape
1. I feel my back is not part of me	0.88		
2. I sometimes feel my back moves involuntarily and uncontrollably	0.48		
3. while doing daily tasks, I do not know how my back moves	0.64		
4. I need to focus all my attention on my back so that I can move it the way I want	0.53		
5. I feel that my back is enlarged		0.74	
6. I cannot recognize the exact range of my back		0.89	
7. While doing daily tasks, I am not quite certain my back is in what position	0.44		
8. I feel like my back is shrunk			0.94
9. I feel my back is asymmetric			0.63

**FreBAQ. FreBAQ=Fremantle Back Awareness Questionnaire

might be due to the methodology used for assessing pain in various studies.

The original FreBAQ measured the body perception disturbance. Previous research demonstrated that the body perception disturbance is related to psychological distress.^[46] In order to evaluate the construct validity, the relation between Persian FreBAQ and HADS was calculated. Similar to Wand *et al.*,^[30] there was no significant correlation between Persian FreBAQ and HADS. The further evaluation of original FreBAQ reported significant correlation between the back awareness disturbance and psychological distress;^[46] symptoms of psychological distress (depression, anxiety, and stress) were assessed with the Depression Anxiety Stress Scales 21, and the average score for the three subscales had been used for analysis. Nishigami *et al.* found significant relationship between Japanese FreBAQ and anxiety part of the HADS.^[45] The Turkish^[44] and German^[40] versions of FreBAQ had positive relationships with both anxiety and depression parts of the HADS. Persian FreBAQ score significantly correlated with RDQ. This finding was in line with the results of the original^[30] and all versions of FreBAQ.^[40,41,44,45]

There was no significant relationship between Persian FreBAQ and TSK. As well, the original^[30] and Dutch^[41] versions found no significant correlation between back awareness disturbance and kinesiophobia. The further evaluation of original FreBAQ^[46] evaluated pain-related fear using the Fear Avoidance Beliefs Questionnaire and reported a significant correlation between back self-perception and fear avoidance beliefs. The Turkish^[44] version showed significant relationship with TSK.

There was a significant relationship between Persian FreBAQ and pain catastrophization scale scores. The original,^[30] Turkish,^[44] and Japanese^[45] versions of FreBAQ also demonstrated similar significant correlations. Catastrophizing means an overmagnification of experienced pain in the individual's mind^[48] that is a subgroup of the psychologic aspect of body awareness. Body awareness has various aspects such as interoception, proprioception, and physical (body perception) and physiological conditions of the body.^[49] Therefore, our results indicate that the Persian version is capable of measuring body awareness.

Factor analysis

The structural validity of Persian FreBAQ was measured by factor analysis. Factor analysis attempts to identify the underlying variables or factors in order to explain the pattern of correlation between the observed variables. The result of factor analysis showed that all items loaded on the three factors confirmed the structural validity of Persian FreBAQ. The original version of FreBAQ was designed

as a unidimensional scale to evaluate a single concept. Nevertheless, the original version reported a possible second dimension consisting of the items 4, 5, and 6.^[30] In addition, principal component analysis of the Dutch^[41] and Japanese^[45] versions had shown a second dimension. The Turkish^[44] and German^[40] versions had not evaluated the dimensionality.

CONCLUSION

The Persian version of FreBAQ has acceptable psychometric properties of reliability and validity in the evaluation of back perception changes in Persian-speaking people with LBP and can be useful for use in future research and clinical trials.

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Conflicts of interest

There are no conflicts of interest.

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