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Original Article

Cross-cultural adaptation and validation of the Behavioral Avoidance Test-Back Pain (BAT-Back) to the Turkish language

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ABSTRACT

Objective: Pain-avoidance is considered to be one of the major leading factors to develop a chronic low back pain (CLBP). In this study, we aimed to translate the Behavioral Avoidance Test-Back Pain (BAT-Back) into Turkish and evaluate its psychometric properties in patients with CLBP.
Methods: 115 patients with CLBP filled the provided socio-demographic information form, the "Oswestry Disability Index (ODI)", the "Fear-Avoidance Beliefs Questionnaire (FABQ)", the "Tampa Scale for Kinesiophobia (TSK)", and the "Hospital Anxiety Depression Scale (HADS)". All patients and 40 pain free controls (PFC) were administered the Turkish version (TrBAT-Back) of the "Behavioral Avoidance Test-Back Pain" test. The internal consistency was evaluated with Cronbach's α coefficient. The test-retest reliability was assessed with the intraclass correlation coefficient (ICC). To evaluate the structural validity of TrBAT-Back, its correlation with FABQ, TSK, ODI, and HADS was examined.
Results: The internal consistency of TrBAT-Back was excellent (Cronbach's $\alpha = 0.97$) and its test-retest reliability was good (ICC = 0.87). Its high correlation with the FABQ-physical activity scores and moderate correlation with the TSK scores supported the structural validity. The TrBAT-Back scores showed a statistically significant moderate correlation with the higher level of pain and disability. Despite the low degree of positive correlation, a high level of anxiety (HADS-anxiety) is potentially associated with avoidance behaviour. CLBP patients and controls differed significantly on TrBAT-Back avoidance scores.
Conclusion: We are of the opinion that, compared to the self-report scales, TrBAT-Back will provide more objective data in detecting avoidance behaviour associated with pain in Turkish speaking patients with CLBP.

1. Introduction

Low back pain is one the most common public health issues, leading to disability and loss of work by causing deficiencies in the musculoskeletal system functions [1]. Despite its high prevalence, chronic low back pain (CLBP) develops only in a small portion of these patients. However, it is of major importance to gain insight into the underlying mechanisms in order to treat the pain and disability of the patients and to reduce the heavy economic burden on the healthcare system. Despite the efforts spent by several studies, an underlying physical pathology has not been demonstrated yet in most of the patients with CLBP [2].

The fear-avoidance model explains that avoidance from physical activities is a major factor in the maintenance of pain-related fear, disability, depression, and poorer physical fitness. Changing the behavioral pattern of the patient from avoidance to a more confrontative form is remarkably important to prevent the development of these types of problems. Confronting the patient with the avoided types of movements and activities in a repeated manner may help them be freed of the fear of pain and of the beliefs about being injured [3].

Avoidance is described as a mode of behaviour preventing or delaying the emergence of an unpleasant stimulus. An increase in the lower back pain creates this stimulus in CLBP, causing the individual to refrain from performing the respective movements. Besides not performing a specific activity at all, performing the movement in a more controlled way, with the purpose of preventing or delaying the emergence of the unpleasant stimulus, is a safety-seeking behaviour and a mild form of avoidance [4].

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Behavioral Avoidance Tests (BATs) have been specifically developed to measure the degree of avoidance associated with several conditions. These scales were first introduced to clinical use to measure the intensity of the avoidance behaviour associated with psychological disorders including the obsessive-compulsive disorder [5] or specific phobias [6]. During the BAT, the patient is asked to confront with the feared stimulus in a standardized environment allowing for the assessment of the associated reactions simultaneously. Thus, the bias potentially occurring with the use of self-report scales is prevented, and the fear-related patient reactions are assessed based on more objective data [3]. Because most patients with CLBP are unaware of their avoidance and safety-seeking behaviours, the observation becomes even more important [7].

Holzapfel et al. developed the Behavioral Avoidance Test—Back Pain (BAT-Back) in 2016 to quantify the pain-associated avoidance in patients with CLBP [3]. This test requires the patients to perform activities of the daily living so that the subsequent avoidance behaviours are analysed. This method is considered to be a more beneficial and objective evaluation compared to the self-report scales.

Our aim in this study is to translate BAT-Back into Turkish, perform the required cross-cultural adaptations, and to validate the new version in the Turkish language.

2. Materials and methods

This research has been approved by the Ethics Committee of the authors' affiliated institutions. The study was conducted in accordance with the principles of the Declaration of Helsinki. All participants were informed of the study and were asked to sign a written consent form.

2.1. Translation and cross-cultural adaptation

The translation and cross-cultural adaptation were conducted in compliance with the method suggested by Beaton et al. [8]. This process was as follows:

1) **Forward Translation:** The original text in English was translated into Turkish by two professional bilingual translators, whose native languages were Turkish.
2) **Combination:** The two versions of BAT-Back in Turkish were integrated into a single version by the two translators.
3) **Backward Translation:** Two new bilingual translators, who were native speakers in English, translated the Turkish version into English independently and individually, creating 2 new versions in English. These translations were presented to a committee (four translators and two physicians).
4) **Final evaluation:** The committee assessed all translated versions. The Turkish version of BAT-Back was evaluated to be compatible with the original English version both semantically and holistically and it was named as TrBAT-Back.
5) **Pilot study:** The TrBAT-Back was tested on 20 patients with CLBP. The patients were questioned for the scale's comprehensibility and applicability, and also for its relevance for their disorders. The pilot study confirmed that the TrBAT-Back was easily understandable and can be easily answered by the patients.
6) **Finalization:** The test was reviewed for the last time and revised for minor grammar corrections to improve the semantic integrity. Finally, the final TrBAT-Back version was created.

2.2. Participants and data collection

TrBAT-Back was tested on a total of 115 Turkish-speaking patients with CLBP who presented to the Physical Medicine and Rehabilitation outpatient clinics of Istanbul Bezmialem University and Istanbul Metin Sabancı Baltalimanı Bone Diseases Training and Research Hospital between January 2018 and November 2018. Patients aged between 18 and 65 years with low back pain for more than 3 months were included in the study. Exclusion criteria included diagnosis of "red flags" [9] (fracture, tumour, infection, radiculopathy/neuropathy), back surgery in the last 6 months, pregnancy, or inability to stand up without support. The patients filled in the standard patient information forms to provide sociodemographic data. In addition, the patients were also asked to fill in the Fear-Avoidance Beliefs Questionnaire (FABQ), the Hospital Anxiety-Depression Scale (HADS), Oswestry Disability Index (ODI), and Tampa Scale for Kinesiophobia (TSK). 40 pain free controls (PFC) were also included in the study. Inclusion criteria for PFC group were age 18–65 years and ability to understand Turkish.

Exclusion criteria for PFCs included history of low back pain, pregnancy, or difficulty in walking due to any reason. The PFCs filled in the standard patient information form and tested with TrBAT-Back.

2.3. Instruments

2.3.1. TrBAT-Back

TrBAT-Back consists of 3 stages: (1) informing the participant and giving instructions; (2) demonstration of the movements by the investigator (bending forward, lifting a crate, rotating the body); and (3) the performance of these movements by the participant. The test is terminated after repeating each movement 10 times. The patients' current pain scores and the mean scores of pain over the last four weeks were assessed with the Numerical Rating Scale (NRS-P) before starting the sequence of movements (0–10). It was also noted whether the patients had taken analgesics before the test.

Materials: A crate of water bottles (~8 kg), and an examination table (heights ~ 68 cm) are sufficient to meet the requirements to perform the TrBAT-Back test. We used a crate containing 14 water bottles each weighing 0.5 kg, making a total weight of 7.9 kg.

Scoring: The study participants were observed while they were performing the described sequence of movements and the scoring was made as follows:

0 points: The movement was performed as shown by the investigator. The participant did not avoid or engage in safety behaviours.

1 Point: The movement was performed however the participant engaged in safety-seeking behaviours. These behaviours included bending the knees or keeping the lower back straight while bending forward or lifting, moving the feet while rotating, breathing deeply, taking analgesic medications before the procedure, drinking water, using a supportive device (brace, etc.), or seeking support (requesting help from the investigator, etc.).

2 Points: The study participant avoided performing the movement. If the participant repeated the movement less than 10 times, the omitted movements would be evaluated as avoidance. The detailed English and Turkish version of BAT-Back manuals are available online in supplementary materials.

The participant can achieve a score in the range from 0 to 60 depending on her/his performance. Video images were recorded during the test to increase the objectivity. Then these videos were evaluated by the researchers together, and definite scores were

determined. The level of inter-rater agreement was measured with Cohen's kappa coefficient.

The level of low back pain-associated avoidance is closely related to pain intensity, disability, and kinesiophobia. Therefore we have selected the previously validated scales to evaluate these parameters in the correlation study. Although there was not a significant relationship in the English version [3], the correlation of the pain with anxiety and depression scores was also examined. The following scales were used to measure these parameters:

2.3.2. Disability

Disability was assessed with the ODI. The ODI was developed to evaluate the degree of functional loss in the lower back [10]. The validity and reliability in Turkish were reported in 2004 [11].

2.3.3. Pain-related Fear

The TSK is a 17-item self-report questionnaire which is used for assessing the fears regarding the movements/(re) injuries [12]. The Turkish version was translated and validated by Yılmaz et al. [13].

2.3.4. Avoidance Behaviour

FABQ was developed to assess the fear-avoiding beliefs associated with physical activities and their impacts on low back pain [14]. The questionnaire was translated into Turkish and validated in 2013 [15]. FABQ consists of 16 questions and comprises two subscales, evaluating fear-avoidance beliefs about work and physical activity.

2.3.5. Anxiety and Depression

The HADS was developed in 1983 [16] and consists of 7 items for depression and 7 items for anxiety, comprising a total of 14 items. The translation into Turkish and the validity of the scale was performed by Aydemir et al., in 1997 [17].

2.4. Statistical analysis

The internal consistency of TrBAT-Back was tested using Cronbach's coefficient α for three basic movement scores [18]. After the first administration of the test, 30 patients took the test once more after one week, and the differences between the two measurements were analysed. No treatment was applied to the patients in this period to avoid any biases. The short-term test-retest reliability of TrBAT-Back was estimated using the Intraclass Correlation Coefficients (ICC) [19]. For the validation, the total scores of TrBAT-Back were compared with the patient scores of NRS-P, TSK, FABQ, ODI, and HADS. These relationships were assessed using the Spearman's correlation coefficient [19]. Exploratory factor analysis was also conducted for evaluating the construct validity of TrBat-Back. Principal axis factoring method was used for this purpose. The sample size was calculated on the basis of the lowest significant correlation coefficient [20]. The demographic data and the variables of the statistical analyses were expressed as means ± standard deviation (SD). The ordinal and nominal data were expressed as numbers and percentages. The data were analysed with the IBM SPSS Statistics 24.

3. Results

A total of 115 patients with CLBP and 40 PFC were included in the study. The descriptive statistical data is presented in Table 1.

The mean and the median TrBAT-Back avoidance scores for CLBP patients were 19.3 ± 17.9 and 12, for PFCs were 4.1 ± 3.5 and 3 respectively. The mean TrBAT-Back scores were compared for both groups. The scores of the CLBP group were statistically significantly higher for all 3 movement sequences and total scores. The comparison of the mean scores between the two groups is presented in Table 2.

Table 1
Demographic and clinical characteristics of the study participants.

Variables	CLBP (N = 115)	PFC (N = 40)	p value
Age (years)	44.4 ± 13.2	42.8 ± 12.9	0.53[a]
Gender			1.000[a]
Male	59 (51.3%)	23 (57.5%)	
Female	56 (48.7%)	17 (42.5%)	
BMI	26.2 ± 2.8	27.6 ± 3.8	0.15[a]
Underweight = <18.5	0	0	
Normal weight = 18.5–24.9	38 (33.0%)	10 (25%)	
Overweight = 25–29.9	64 (55.7%)	21 (52.5%)	
Obesity = BMI of 30 or greater	13 (11.3%)	9 (22.5%)	
Marital status			1.000[a]
Single	33 (28.7%)	17 (42.5%)	
Married	82 (71.3%)	23 (57.5%)	
Education level			1.000[a]
Primary	28 (24.3%)	6 (15%)	
Secondary	24 (20.9%)	7 (17.5%)	
Tertiary	41 (35.7%)	16 (40%)	
University	22 (19.1%)	11 (27.5%)	
Professional activity			1.000[a]
Student	7 (6.1%)	2 (5%)	
Employed	53 (46.1%)	18 (45%)	
Unemployed	36 (31.3%)	15 (37.5%)	
Retired	19 (16.5%)	5 (12.5%)	
Duration of low back pain (months)			
3-6	31 (27.0%)	–	
7-12	38 (33.0%)	–	
13-18	11 (9.6%)	–	
19-24	16 (13.9%)	–	
>24	19 (16.5%)	–	
Treatment for low back pain			
None	33 (28.7%)	–	
NSAIDs and/or myorelaxants	34 (29.6%)	–	
Gabapentinoids	17 (14.8%)	–	
Weak opioid analgesics	4 (3.5%)	–	
Antidepressants	7 (6.1%)	–	
Multiple Medications	20 (17.4%)	–	
NRS-P			
Before the test	6.1 ± 2.2	–	
For the last 4 weeks	5.4 ± 2.0[b] $p < 0.01$	–	
After the test	7.5 ± 2.1[b] $p < 0.01$	–	

CLBP, Chronic Low Back Pain; PFC, Pain Free Controls; SD, Standard deviation; BMI, Body Mass Index; NSAID, nonsteroidal anti-inflammatory drug; NRS-P, Numeric Rating Scale-Pain.
Probability values were determined using the Mann–Whitney *U* test and Wilcoxon signed rank test.
The mean NRS-P scores just before the test were statistically significantly different from those obtained after the test, and from the mean scores of the last 4 weeks.
[a] Mann-Whitney *U* test.
[b] Wilcoxon signed rank test.

3.1. Internal consistency and test-retest reliability

The internal consistency was considered excellent (Cronbach α = 0.97). The Cohen's kappa score for the inter-rater agreement

Table 2
Comparison of TrBAT-Back scores between groups.

	CLBP Mean ± SD	PFC Mean ± SD	p-value
Bending	7.2 ± 5.7	1.5 ± 1.3	0.00
Lifting	6.6 ± 6.4	1.3 ± 1.2	0.00
Rotating	5.5 ± 6.2	1.3 ± 1.3	0.03
Total Scores	19.3 ± 18.0	4.1 ± 3.5	0.00

Probability values were determined using the Mann–Whitney *U* test.
TrBAT-Back, The Turkish version of Behavioral Avoidance Test-Back pain; SD, Standard deviation; CLBP, Chronic Low Back Pain; PFC, Pain Free Controls.

was strong with 0.86 (0.73–0.96 CI) value. Examining the individual movements performed, the test-retest reliability was found to be good in bending forward (ICC = 0.86, p < 0.01), lifting (ICC = 0.84, p < 0.01), and rotating (ICC = 0.87, p < 0.01). The total TrBAT-Back scores showed good test-retest reliability, too (ICC = 0.87, p < 0.01).

3.2. Construct validity for the TrBAT-Back avoidance score

TrBat-Back showed a single factor structure. This factor accounted for 95.7% of the total variance. A Spearman correlation analysis was performed to examine the association of the TrBAT-Back with the scores of ODI, TSK, FABQ, HADS, and NRS-P. There was a high correlation of the TrBAT-Back scores with the FABQ-physical activity scores (r = 0.70, p < 0.01). The correlation of the TrBAT-Back scores with the FABQ-Work (r = 0.56, p < 0.01), FABQ-Total (r = 0.65, p < 0.01), TSK (r = 0.71, p < 0.01), NRS-P (r = 0.55, p < 0.01), and ODI (r = 0.50, p < 0.01) scores was moderate. There was a weak correlation of the TrBAT-Back scores with the HADS-Anxiety (r = 0.42, p < 0.01) and HADS-Depression (r = 0.34, p < 0.01) scores. The correlation coefficients between the TrBAT-Back avoidance scores and those of the other scales are presented in Table 3.

3.3. Distribution of the scores in regards to the socio-demographic features

For the CLBP group; the mean scores were significantly higher in females (p < 0.05). Although the scores of patients with high BMI were higher, the difference was not statistically significant. There was not a correlation between the TrBAT-Back scores with the age, level of education, marital status or duration of pain. The scores of the unemployed patients and of the patients taking more than one medication were significantly higher in CLBP group (p < 0.05). The scores of the unemployed participants were significantly higher in the PFC group too (p < 0.05). There was no significant correlation with other parameters in the PFCs. The distribution of the mean TrBAT-Back scores according to the socio-demographic characteristics of the participants is shown in Table 4.

4. Discussion

Self-report scales are commonly used in clinical studies as they are easy to administer and provide faster results. However, these data reflect the subjective patient views solely. This may lead to challenges to obtain objective data especially about the conditions, in which patients are not fully aware of their experiences or would like to avoid doing so. BATs have partly allowed for overcoming this issue in the clinical psychology field. The self-report scales to determine the avoidance behaviour in CLBP have long been used; however, a BAT for these patients could be more beneficial in the daily clinical practice or in clinical studies to overcome the limitations explained previously.

TrBAT-Back showed an excellent internal consistency and good test-retest reliability similar to the original test. The validation procedures were performed taking the recommended guidelines into consideration [21–24]. Especially high and moderate levels of correlation of the TrBAT-Back scores with those of the FABQ-physical activity and TSK supported its structural validity. The scores were higher in the patients with more intense levels of pain

Table 3
Spearman rank correlations between TrBAT-Back and other indices.

	Correlation coefficient
NRS-P	0.55*
ODI	0.50*
TSK	0.71*
FABQ physical activity	0.70*
FABQ work	0.56*
FABQ Total	0.65*
HADS Anxiety	0.42*
HADS Depression	0.34*

TrBAT-Back, The Turkish version of The Behavioral Avoidance Test-Back pain; NRS-P, Numeric Rating Scale-Pain; ODI, Oswestry Disability Index; TSK, Tampa Scale for Kinesiophobia; FABQ, Fear-Avoidance Beliefs Questionnaire; HADS, Hospital Anxiety and Depression Scale.
*p < 0.01.

Table 4
The distribution of TrBAT-Back scores by demographic characteristics.

	CLBP (N = 115) Mean ± SD	PFC (N = 40) Mean ± SD
Gender		
Male	14.3 ± 15.4	3.3 ± 3.5
Female	24.5 ± 19.0	5 ± 3.3
p value	0.002[a]	0.11[a]
Age		
18-25	14.4 ± 18.5	5 ± 4.1
26-35	21.5 ± 16.3	2.8 ± 3.2
36-45	19.7 ± 19.2	3.8 ± 3.7
46-55	23.5 ± 15.9	4.8 ± 3.9
56-65	16.0 ± 18.9	3.4 ± 2.0
p value	0.17[b]	0.77[b]
BMI		
Underweight = <18.5	None	None
Normal weight = 18.5–24.9	16.6 ± 16.3	2.7 ± 3.3
Overweight = 25–29.9	20.7 ± 18.6	4.0 ± 3.9
Obesity = BMI of 30 or greater	19.8 ± 19.5	5.6 ± 2.2
p value	0.75[b]	0.08[b]
Marital status		
Single	19.4 ± 20.4	4.6 ± 3.3
Married	19.2 ± 17.0	3.6 ± 3.6
p value	0.54[a]	0.30[a]
Education level		
Primary	21.8 ± 20.1	3.7 ± 3.7
Secondary	17.5 ± 16.8	5.1 ± 3.6
Tertiary	18.2 ± 16.5	4.6 ± 4.0
University	20.0 ± 19.5	2.6 ± 2.1
p value	0.98[b]	0.55[b]
Professional activity		
Student	15.8 ± 20.9	0.5 ± 0.7
Employed	16.2 ± 15.1	3 ± 2.9
Unemployed	27.2 ± 19.6	6.3 ± 3.6
Retired	14.2 ± 17.1	2.4 ± 1.3
p value	0.01[b]	0.01[b]
Duration of low back pain (months)		
3-6	16.8 ± 16.6	–
7-12	16.4 ± 14.8	–
13-18	18.3 ± 20.2	–
19-24	29.0 ± 23.5	–
>24	21.4 ± 17.7	–
p value	0.57[b]	
Treatment for low back pain		
None	7.4 ± 6.1	–
NSAIDs and/or myorelaxants	20.3 ± 17.5	–
Gabapentinoids	20.2 ± 16.4	–
Weak opioid analgesics	25.2 ± 17.1	–
Antidepressants	18.5 ± 15.4	–
Multiple Medications	35.5 ± 21.4	–
p value	0.04[b]	

Probability values were determined using the Mann–Whitney *U* test and Kruskal–Wallis one-way analysis of variance.
TrBAT-Back, The Turkish version of Behavioral Avoidance Test-Back pain; SD, Standard deviation; CLBP, Chronic Low Back Pain; PFC, Pain Free Controls; BMI, Body Mass Index; NSAID, nonsteroidal anti-inflammatory drug.
[a] Mann-Whitney *U* test.
[b] Kruskal-Wallis one-way analysis of variance.

(NRS-P) and with higher levels of disability (ODI). Although the correlation of the TrBAT-Back scores with increased scores of anxiety (HADS-anxiety) occurred at a lower degree, the positive correlation between these two parameters suggests their association with the avoidance behaviour. Similar to our study, the BAT-Back avoidance scores were correlated with the pain intensity ($r = 0.52$), disability [$r = 0.44$ (Pain Disability Index) and $r = 0.54$ (Quebec Back Pain Disability Scale)], pain-induced fear ($r = 0.39$), and self-reported avoidance behaviour scores ($r = 0.24$ to 0.33 for three different scales) in the original study, however, the correlation with the disability was at a higher level compared to the other parameters. Unlike our study, there was not a correlation with HADS anxiety ($r = 0.05$) or depression ($r = -0.1$) scores in the original study [3]. These differences may be due to the following reasons; the use of different scales in the assessment of disability, the inclusion of patients in different geographies and the relatively small size of patient populations. The relationship between these parameters may be clarified in the future with more comprehensive studies. The scores by the socio-demographic features [3] were not correlated with the age, BMI, and the duration of pain, similar to the original study.

Being completed approximately in 10 min, the BAT-Back is a test which can be favourably used both in the daily clinical practice and in academic studies. Both the original study and our current study have demonstrated that it successfully evaluates the avoidance behaviour induced by pain in the patients with CLBP.

The most important limitation of the BAT-Back is that the sequenced movements are not individually independent of each other. For instance, if a person does not bend forward, it is impossible for this individual to perform the following sequence of movements. In conclusion, the investigator would evaluate the consequent movements as avoidance, leading to higher scores. Independent movement sequences to be developed by future studies may overcome this limitation.

Another limitation is the lack of evaluation of the underlying causes leading to the emergence of avoidance behaviour. Pincus et al. [7] reported that individuals might show different types of avoidant behaviour. For example, people might avoid performing certain movements or might seek safety if they were told that the particular movement would be harmful. Another limitation is that the actual physical limitations (shortness of muscles, spine stiffness, etc.) may lead to higher BAT-Back scores. A detailed physical examination, especially if performed at the eligibility phase of the clinical studies, will help exclude the patients with these latter limitations.

The BAT-Back may be beneficial for the patients with the CLBP especially if an exercise therapy is scheduled. Moreover, it may be a useful indicator to evaluate the results of the treatment. According to the approach proposed by Campbell and Fiske [25] a combination of diverse sources of information (self-reports, direct observations, and performance scorings) is remarkably important to build a construct validity. Therefore, developing other kinds of BATs as well as the other self-report scales may provide additional benefits to evaluate several different clinical problems.

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Conflicts of interest

The authors declare no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jos.2019.04.001.

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