JETR

JOURNAL OF
EXERCISE THERAPY
AND REHABILITATION

Journal of Exercise Therapy and Rehabilitation. 2026;13(1):78-87. DOI: 10.15437/jetr.1738932

ORIGINAL ARTICLE

Psychometric properties of the Turkish version of Brighton Musculoskeletal Patient-Reported Outcome Measure

Brighton Musculoskeletal Hasta Bildirimli Sonuç Ölçeği'nin Türkçe versiyonunun psikometrik özellikleri

Fatma EKEN[1], Mehmet Gürhan KARAKAYA[2], Mine ARĞALI DENİZ[3], İlkim ÇITAK KARAKAYA[2]

Abstract

Purpose: The study aimed to evaluate the reliability and validity of the Turkish cross-cultural adaptation of the Brighton Musculoskeletal Patient-Reported Outcome Measure (BmPROM).

Methods: The BmPROM was translated into Turkish (BmPROM-TR) in accordance with standardized guidelines. A total of 25 patients and 20 physiotherapists participated in the assessment of the BmPROM-TR's comprehensibility and content validity. To assess reliability, Cronbach's alpha coefficient was used for internal consistency and intraclass correlation coefficients (ICC) were used for test-retest reliability. Validity was assessed using exploratory factor analysis and correlation analysis with the subscales of the Short Form-36 Health Survey (SF-36).

Results: A total of 122 individuals with musculoskeletal problems participated in the study. Cronbach's alpha values for the functionality and well-being subscales scores were 0.721 and 0.766, respectively. The scale's functionality (ICC= 0.866) and well-being (ICC= 0.844) scores demonstrated good test-retest reliability. The Kaiser–Meyer–Olkin was 0.753 and Bartlett's sphericity test was significant (X2= 247.635, p<0.001). The BmPROM-TR was explained by bifactorial structures and 57.7% of the variation. Low to moderate positive correlations were found between the subdimensions of the SF-36 and the functionality and well-being scores (p<0.001).

Conclusion: BmPROM-TR is a reliable and valid patient reported outcome measure for assessing physical function and psychosocial factors in individuals with musculoskeletal problems.

Keywords: Patient reported outcome, Musculoskeletal diseases, Reliability.

Öz

Amaç: *Bu çalışma, Brighton Muskuloskeletal Hasta Bildirimli Sonuç Ölçeği'nin (BmHBSÖ) Türkçe kültürlerarası uyarlamasının güvenirlik ve geçerliğini değerlendirmeyi amaçlamıştır.*

Yöntem: *BmHBSÖ, standartlaştırılmış kılavuzlara uygun olarak Türkçe'ye çevrildi. BmHBSÖ'nün anlaşılabilirliği ve içerik geçerliği 25 hasta ve 20 fizyoterapist üzerinde değerlendirildi. İç tutarlılık için Cronbach alfa katsayısı, test-tekrar test güvenilirliği için ise sınıf içi korelasyon katsayıları (ICC) kullanıldı. Geçerlik, açıklayıcı faktör analizi ve Kısa Form-36 Sağlık Anketi'nin (KF-36) alt ölçekleri ile yapılan korelasyon analizi kullanılarak değerlendirildi.*

Bulgular: *Muskuloskeletal problemi olan toplam 122 kişi çalışmaya katıldı. İşlevsellik ve iyilik hali alt ölçeklerinin Cronbach alfa değerleri sırasıyla 0.721 ve 0.766 olarak bulundu. Ölçeğin işlevsellik (ICC= 0.866) ve iyilik hali (ICC= 0.844) puanları iyi düzeyde test-tekrar test güvenirliği gösterdi. Kaiser–Meyer–Olkin değeri 0,753 ve Bartlett küresellik testi anlamlı bulundu (X^2= 247,635, p<0,001). BmHBSÖ, iki faktörlü yapıyla açıklanmış olup, varyansın %57,7'sini kapsamaktadır. KF-36'nın alt boyutları ile işlevsellik ve iyilik hali puanları ile arasında pozitif düşük ile orta düzeyde anlamlı korelasyon belirlendi (p<0,001).*

Sonuç: *BmHBSÖ, muskuloskeletal problemi olan hastalarda fiziksel fonksiyon ve psikososyal faktörleri değerlendirmek için güvenilir ve geçerli bir hasta bildirimli sonuç ölçeğidir.*

Anahtar Kelimeler: *Hasta bildirimli sonuç, Kas-iskelet sistemi hastalıkları, Güvenirlik.*

1: Afyonkarahisar Health Sciences University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Afyonkarahisar, Türkiye.
2: Muğla Sıtkı Koçman University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Muğla, Türkiye
3: Süleyman Demirel University Research and Application Hospital, Physical Therapy and Rehabilitation Unit, Isparta, Türkiye
Corresponding Author: Fatma Eken : fatmaeken08@gmail.com
ORCID IDs (order of authors): 0000-0003-2975-7480; 0000-0002-2395-649X; 0000-0001-8055-9530; 0000-0003-0233-4533.
Received: July 27, 2025. Accepted: October 13, 2025.

INTRODUCTION

Musculoskeletal problems (MSPs) are significant health problems with physical, economic, and psycho-social consequences. An estimated 1.7 billion people worldwide are affected by MSPs that range in severity from acute to chronic, including common disorders like osteoarthritis, osteoporosis, and low back pain.[1,2] As obesity and inactive lifestyle, which are risk factors for MSPs increase, the health cost burden of MSPs on societies is expected to increase significantly.[3]

The patient-reported outcome measures (PROMs) have been widely used to guide clinical interventions and evaluate their effectiveness.[4] These instruments are also used by clinicians and researchers to gain insight into patients' health status and to determine how effective treatments are from the patient's viewpoint.[5] Utilizing reliable and valid instruments to evaluate the efficacy of interventions is crucial. Capturing condition-specific data for multiple MSPs is challenging in routine clinical practice. Several PROMs,[6] have been widely used to assess musculoskeletal function and pain. While these instruments are valuable for assessing specific aspects of musculoskeletal health, they often focus on either functional limitations or pain intensity, with limited consideration of psychosocial factors. Given the high prevalence of MSPs, a patient-centered tool that captures both functional and psychosocial aspects is of enormous importance. This dual perspective may support clinicians in tailoring more comprehensive rehabilitation strategies. In addition, there is an increasing need in clinical practice for assessment tools that are brief, easy to administer, and capable of providing a broad perspective by evaluating both functional and psychosocial aspects. The Brighton Musculoskeletal Patient-Reported Outcome Measure (BmPROM) is a reliable and valid instrument to assess physical function and psychosocial factors in individuals with musculoskeletal problems.[7] The BmPROM has not yet been translated into another language, nor has its reliability and validity been investigated in any other language, including Turkish.

There is a lack of PROMs that can evaluate MSPs within a biopsychosocial framework without targeting a specific body part or a specific disease, and there is a need for a multidimensional scale that can be used by the Turkish-speaking population with MSPs. Therefore, the study aimed to conduct the cultural and linguistic adaptation of the BmPROM into Turkish and investigate its psychometric properties.

METHODS

This prospective methodological study was conducted in accordance with the Consensus-based Standards for the Selection of Health Measuring Instruments (COSMIN) checklist.[8] Following permission from the original scale's authors for its translation into Turkish, ethical and administrative approval was obtained from the Ethics Committee of Muğla Sıtkı Koçman University (01.07.2020) and Süleyman Demirel University Research Hospital (date 19.08.2020, document number: 30856962-044-107693), respectively.

Translation and Adaptation Process

The translation of the BmPROM into Turkish was carried out in accordance with the protocols proposed by Guillemin et al.[9] and Beaton et al.[10] Two independent clinicians (ICK and BUT) translated the BmPROM into Turkish. These two translations were evaluated by an expert committee, considering the characteristics of Turkish culture. Afterward, a common Turkish draft was created. A native English speaker (RFM) who was blind to the original document and was not a medical expert, back-translated this common draft into the original language. To ensure conceptual equivalence, the back-translation was forwarded to the scale's original author for review against the source version. Upon reviewing the back-translated version, the original developers noted that the eighth question included the phrase "depressed and broken" and requested a revision, indicating that it expressed a more severe condition than intended in the original version. Therefore, it was revised to give a "demoralized and broken down" meaning. Following comparison and approval of equivalence by the expert committee, the Turkish version of the BmPROM (BmPROM-TR) was finalized.

The comprehensibility of the BmPROM-TR was tested on 25 participants with MSPs by scoring each item with a 4-point Likert system (1=Not comprehensible, 2=A little comprehensible, 3=Quite comprehensible, 4=Completely comprehensible). The percentage of items rated as 3 or 4 points was found to be 89%, which confirms the sufficient comprehensibility of the scale.[11] To determine the content validity, 20 physiotherapists with a mean 7.7 years of professional experience (2-25 years) were interviewed. They were asked to evaluate the relevancy of each item using a 4-point Likert system (1=Not relevant, 2=Somewhat relevant, 3=Very relevant, 4=Completely relevant). The scoring indicated that the scale-level content validity index (CVI) was 0.96, indicating high content validity.[11] Overall, the high scores for comprehensibility and content validity suggest that the Turkish version is acceptable for use within the relevant patient population.

Participants

The G-Power (Mac version: 3.1.9.6) was used to calculate the sample size, and it was found that at least 97 participants would be sufficient (one-tailed dependent samples t-test, d=0.30, α level=0.05, and power level=90%). This rate was increased by 20% considering the possibility of dropping out. The study was conducted voluntarily following the Declaration of Helsinki and included patients from the Physical Therapy Department of Süleyman Demirel University who provided both verbal and written informed consent and met the inclusion criteria. Participants aged over 18 who were literate in Turkish, diagnosed with MSPs, and referred for a home exercise program were included in the study. Exclusion criteria included having any orientation, perception, or communication issues that would hinder cooperation, a history of neurological diseases, or the presence of red flag symptoms (such as fever, severe pain, sudden weight loss, etc.).

Data collection

The age (years), height (m), body weight (kg), and body mass index (BMI) (kg/m^2) of the participants were recorded as physical characteristics; and sex, educational status, working status, occupation, and marital status were recorded as the sociodemographic characteristics.

After recording the diagnosis of the participants, the body regions which they had trouble in and which interfered with carrying out daily life activities (job, housework, hobbies, etc.) during the last year, as well as the body regions with trouble in the last week were evaluated by the Nordic Musculoskeletal Questionnaire (NMQ). Since our study included a wide range of musculoskeletal issues, the NMQ was used to gather information about the participants' MSPs. This scale, which was developed by Kuorinka et al.[12] and translated into Turkish by Kahraman et al.[13] includes 27 items, each rated as 'yes/no' to explore the presence of musculoskeletal symptoms at nine different parts of the body (neck, shoulder, elbow, wrist, upper body, lower body, hip, knee, and ankle).

To assess the consistency of the BmPROM-TR, participants filled out the scale twice, ten days apart. Following their diagnosis, due to the constraints of the pandemic period, the patients were referred to the home exercise program and completed the scale on the same day. In addition, they were provided with a blank version of the scale in a sealed envelope, dated 10 days later. After 10 days, the patients were contacted again by phone, and their responses were recorded. The original scale consists of eight questions and two subscales (functionality and well-being) to evaluate the individuals with MSPs in a multidimensional way including the quality of life (QoL) (Item-1), pain (Item-2), leisure or social activities (Item-3), activities of daily living (Item-4), medication use (Item-5), sleep (Item-6), anxiety (Item-7) and mood levels (Item-8). The responses to these questions are rated on an 11-point Likert scale (0-10), respectively. When rating, the scores of the 2nd, 6th, 7th, and 8th items are reversed. The scores of the 1st, 3rd, and 4th items are used to calculate the 'functionality' score, and the 2nd, 5th, 6th, 7th, and 8th items are used to calculate the 'well-being' score. Both subscale scores are rated between 0 and 10, with higher values representing a more favorable health status. The original scale demonstrated internal consistency with Cronbach's alpha values of 0.85 for functionality and 0.80 for well-being.[7] At the end of the scale, there are optional pre-treatment and post-treatment sections where individuals can list their expectations from physiotherapy treatment and physiotherapists.

These sections were not included in the analysis. It takes an average of 5 minutes to complete the scale.

The Short Form-36 Quality of Life Scale (SF-36), which was developed by Ware et al.[14] and translated into Turkish by Koçyiğit et al.[15] was used to analyze the convergent validity of the Bm-PROM-TR. The SF-36 assesses the health-related QoL of patients in eight dimensions of health under two general subheadings (physical and mental components). While the physical component consists of the general health, physical function, physical role difficulty, and body pain subscales, the mental component consists of the mental health, emotional role difficulty, energy/vitality, and social function subscales. Since the scale does not have a single scoring system, scores are calculated separately for each of the eight dimensions and range between 0 and 100. Overall health improves as the score increases.

Statistical analysis

All statistical analyses were performed using SPSS 28.0.1.1(14) MacOSx (IBM Corp., Armonk, NY). Data normality was assessed by examining skewness and kurtosis values, along with histogram plots. The descriptive quantitative data of the study were expressed as mean and standard deviation (Mean±SD), whereas qualitative data were expressed as numbers (n) and percentages (%).

The reliability of the BmPROM-TR was evaluated through test-retest reliability and internal consistency analyses. To evaluate internal consistency, Cronbach's α coefficient and item-total correlation analyses were performed. Cronbach's α was considered 'high' if >0.80, 'moderate' if between 0.60-0.79, and 'low' if <0.59. The item-total correlation for each item and the Cronbach's alpha coefficient upon deletion of each item were computed. The intraclass correlation coefficient (ICC) and a 95% confidence interval (CI) were used to analyze the scale's test-retest reliability. The reliability values of the ICC at a 95% CI were classified as follows: poor (<0.50), moderate (0.50 to 0.74), good (0.75 to 0.90), or excellent (>0.90).[16] To assess test-retest reliability, the scale was reapplied 10 days later. The floor and ceiling effects were investigated by analyzing the percentage of participants who scored highest or lowest.[17] To avoid floor and ceiling effects, the lowest and highest-scoring participants should be less than 15%.[18]

Exploratory Factor Analysis (EFA) was used to investigate the construct validity of BmPROM-TR. The varimax method was chosen for EFA. Principal component analysis was used to determine the factors of the scale. Initially, Kaiser–Meyer–Olkin (KMO) test values were calculated to check whether the data were suitable for factor analysis. The KMO values range from 0 to 1, and values >0.50 are considered suitable for factor analysis.[19,20] To determine whether the data were appropriate for factor analysis, Bartlett's Test of Sphericity was conducted[21] and a significant Bartlett Test of Sphericity indicated that the scale was suitable for factor analysis.[20] A scree plot and eigenvalues ≥1 were used to decide the number of factors.[22,23]

The convergent validity was analyzed by Spearman's correlation analysis using the scores of the BmPROM-TR and the Turkish version of SF-36 as in the original study. The correlation coefficients were interpreted as strong if r>0.60, moderate if r= 0.30-0.59, and low if r<0.29.[24] Statistical significance was set at the 95% CI and the p<0.05 level.

RESULTS

The study included 122 participants (78 women and 44 men), aged between 18–74 years (43.13±14.05). As presented in Table 1, women had higher mean age and BMI values, and a lower rate of paid employment compared to men. The educational level of the sample was low, and only 27.1% had a university degree (p>0.05). The majority of participants were married. The participants' mean scores from the functioning and well-being subscales were 5.83±2.29 and 4.82±2.36, respectively.

The most common diagnoses of the participants were cervical/lumbar disc hernia (27.05%), gonarthrosis/patellofemoral pain syndrome (13.1%), tendinitis (13.1%), and myofascial pain/fibromyalgia (9.8%). These diagnoses were related to the MSP complaints in the low back (23%), knee (18.9%), shoulder (13.9%), upper back (13.1%) neck (9.8%), and other body regions (21.3%). According to the NMQ data (Table 2), the participants have experienced MSP mostly in the lower back

Table 1. The demographic and clinical characteristics of patients (N=122).

		Mean±SD
Age (year)		43.13±14.05
Body Mass Index (kg/m²)		27.57±5.71
BmPROM-TR	Functionality	5.83±2.29
	Functionality Re-test	6.10±2.25
	Well-being	4.82±2.36
	Well-being Re-test	5.57±2.32
SF-36	Physical function	60.86±25.79
	Role function	31.35±34.40
	Role emotion	41.25±41.78
	Energy/Vitality	44.95±23.34
	Mental health	56.75±23.57
	Social function	56.04±27.56
	Bodily pain	38.75±21.21
	General health	49.67±22.13
		n (%)
Gender	Women	78 (63.9)
	Men	44 (36.1)
Educational status	Primary education	56 (45.9)
	High school	33 (27)
	Bachelor's degree	33 (27)
Working status	Not working	72 (59)
	Working	50 (41)
Occupation	Housewife/Retired	59 (48.4)
	White-collar worker	19 (15.6)
	Blue-collar worker	31 (25.4)
	Student	7 (5.7)
	Unemployment	6 (4.9)
Marital status	Married	88 (72.1)
	Single	34 (27.9)

BmPROM-TR: The Turkish version of the Brighton Musculoskeletal Patient-Reported Outcome Measure. SF-36: Short-Form36-Item Health Survey.

Table 2. Regional distribution of musculoskeletal problems according to the Nordic Musculoskeletal Questionnaire (NMQ) (N=122).

	Q1 (Yes)	Q2 (Yes)	Q3 (Yes)
	n (%)	n (%)	n (%)
Neck	78 (44)	48 (39.3)	67 (54.9)
Shoulders	76 (62.3)	39 (32)	59 (48.4)
Elbows	48 (39.3)	26 (21.3)	36 (29.5)
Wrists/hands	54 (44.3)	36 (29.5)	44 (36.1)
Upper back	79 (64.8)	43 (35.2)	60 (49.2)
Low back	85 (69.7)	55 (45.1)	76 (62.3)
Hips/tights	64 (52.5)	42 (34.4)	51 (41.8)
Knees	83 (68)	62 (50.8)	69 (56.6)
Ankles/feet	62 (50.8)	41 (33.6)	49 (40.2)
Above the waist	106 (86.9)	82 (67.2)	26 (21.3)
Below the waist	109 (89.4)	79 (64.8)	28 (23)
Axial skeleton	108 (88.5)	77 (63.1)	32 (26.2)

Q1: Have you at any time during the last 12 months had trouble (ache, pain, discomfort)? Q2: Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble? Q3: Have you had trouble at any time during the last 7 days?

Table 3. Internal consistency of the BmPROM-TR's items and subscales.

	Item-total correlation (r)	Cronbach's α if item deleted	Cronbach's α
BmPROM-TR			0.739
BmPROM-TR-Functionality			
BmPROM-TR 1	0.387	0.721	
BmPROM-TR 3	0.217	0.751	0.721
BmPROM-TR 4	0.448	0.709	
BmPROM-TR-Well-being			
BmPROM-TR 2	0.326	0.731	
BmPROM-TR 5	0.513	0.696	
BmPROM-TR 6	0.573	0.681	0.766
BmPROM-TR 7	0.468	0.705	
BmPROM-TR 8	0.522	0.693	

BmPROM-TR: Turkish version of the Brighton Musculoskeletal Patient-Reported Outcome Measure.

(69.7%), knees (68%), upper back (64.8%), and shoulders (62.3%) at any time in the last 12 months. During this period, knees (50.8%), lower back (45.1%), neck (39.3%) and upper back (35.2%) were reported as the most common regions with MSP, which interfered with carrying out everyday activities. The most common body regions with trouble in the last week were the low back (62.3%), knees (56.6%), neck (54.9%), and upper back (49.2%).

Internal consistency

Internal consistency of the BmPROM-TR was evaluated using Cronbach's α coefficient and item-total correlation analyses. The overall internal consistency of the BmPROM-TR was quite reliable, with a Cronbach's alpha coefficient of 0.739. Item-total correlations varied from 0.217 to 0.573. The third question had the lowest item correlation (0.217), so the third item was deleted and the internal consistency analysis was redone. As there was no significant change in Cronbach's α value (α=0.739) as a result of the analysis, no changes were made. The pre-treatment and post-treatment sections considered optional in the BmPROM-TR were not included in the analysis.

The Cronbach's α values of the BmPROM-TR were 0.721 for the functioning subscale and 0.766 for the well-being subscale. The item-total correlations of functionality and well-being subscales are shown in Table 3.

Test-retest reliability

Test-retest reliability was assessed by re-administering the BmPROM-TR to 67 patients 10 days after the initial assessment. The ICC values of test-retest reliability for each item of the BmPROM-TR ranged from 0.646 to 0.859. For the subscales of the BmPROM-TR, a good level of test-retest reliability was found using the ICC and a 95% CI (Table 4).

Floor and ceiling effects

The lowest and highest scoring participants should be less than 15% to avoid floor and ceiling effects.[18] In the functionality score, 1 participant (0.81%) received 0 points, and 5 participants (4.09%) received 10 points. In the well-being score, 3 participants (2.46%) received 0 points, while 1 participant (0.81%) received 10 points. Therefore, no ceiling or floor effect was found in the functionality and well-being scores.

Construct validity

The KMO (0.753) and Bartlett's test of sphericity ($\chi^2 = 247.635$, $p < 0.001$) indicated the adequacy of the sample size and suitability of the data for factor analysis. Eigenvalues for two factors were found to be greater than 1. The BmPROM-TR questions' factor loadings range between 0.52 and 0.82 (Table 5).

Researches suggest that variance rates for factor analysis range between 40% and 70%.[25,26] Exploratory factor analysis showed that BmPROM-TR had two-factor structures explaining 57.7% of the total variance, which is acceptable. The first factor, which explains 36.09% of the common variation, consists of five well-being-related items (BmPROM-TR 2, 5, 6, 7, and 8). The second factor consists of three items (BmPROM-TR 1, 3, and 4) that are related to Functionality and explain 21.6% of the

common variance.

Convergent validity

Spearman's correlation analysis was conducted to evaluate the convergent validity of the BmPROM-TR with the SF-36 scores (see Table 6). The functionality score showed a low level of positive correlation with the physical and emotional role difficulty subscales of the SF-36. The well-being score showed a moderate positive correlation with all subscales of the SF-36 (p<0.01).

Table 4. Test–retest reliability of the BmPROM-TR items and subscales.

	ICC (%95 CI)
BmPROM-TR-Functionality	0.866 (0.782-0.918)
BmPROM-TR 1	0.646 (0.424-0.782)
BmPROM-TR 3	0.755 (0.601-0.849)
BmPROM-TR 4	0.737 (0.572-0.838)
BmPROM-TR-Well-being	0.844 (0.746-0.904)
BmPROM-TR 2	0.768 (0.623-0.857)
BmPROM-TR 5	0.859 (0.771-0.914)
BmPROM-TR 6	0.776 (0.635-0.862)
BmPROM-TR 7	0.712 (0.531-0.823)
BmPROM-TR 8	0.682 (0.483-0.805)

BmPROM-TR: Turkish version of the Brighton Musculoskeletal Patient-Reported Outcome Measure. ICC: The intraclass correlation coefficient. CI: Confidence interval.

Table 5. Factor loadings of the Turkish version of the Brighton Musculoskeletal Patient-Reported Outcome Measure (BmPROM-TR).

	Factor Loading	
	Factor 1	Factor 2
BmPROM-TR 1		0.78
BmPROM-TR 2	0.52	
BmPROM-TR 3		0.78
BmPROM-TR 4		0.80
BmPROM-TR 5	0.64	
BmPROM-TR 6	0.72	
BmPROM-TR 7	0.80	
BmPROM-TR 8	0.82	
Eigenvalues	1.732	2.888
Variance (%)	21.650	36.098
Total Variance (%)	57.748	

Table 6. Correlation analysis results of the Turkish version of the Brighton Musculoskeletal Patient-Reported Outcome Measure (BmPROM-TR) and subsections of Short Form-36 Quality of Life Scale (SF-36).

	BmPROM-TR	
	Functionality	Well-being
SF-36	r	r
General health	0.496*	0.508*
Physical function	0.559*	0.421*
Role function	0.293*	0.384*
Bodily pain	0.466*	0.520*
Mental health	0.392*	0.469*
Role emotion	0.244*	0.376*
Energy/Vitality	0.441*	0.519*
Social function	0.408*	0.501*

* p<0.001.

DISCUSSION

According to the study results, the BmPROM-TR is a reliable and valid outcome measure for Turkish-speaking individuals with MSPs. As no validity or reliability studies have been conducted in other languages to date, the findings were compared only to the original English version of the scale. Given the lack of studies in different languages or populations, these results provide initial evidence of the scale's reliability in a Turkish-speaking population.

Given the multifaceted nature of musculoskeletal pain, its assessment is recommended to include physiological, behavioral, neuroimaging, and patient-reported measures.[27] In this context, the use of PROMs is of great importance. While the literature includes various patient-reported outcome measures developed for specific MSPs or body regions,[28,29] there is a lack of instruments that can be used across all MSPs within a biopsychosocial framework. The BmPROM-TR is a concise and practical instrument that captures both functional and psychosocial aspects—a feature it shares with the Musculoskeletal Health Questionnaire (MSK-HQ-TR).[30] This dual perspective supports clinicians in tailoring individualized rehabilitation strategies while maintaining the

brevity necessary for clinical practice. However, a significant distinction exists in their validation samples. While the MSK-HQ-TR was validated in a sample restricted to patients with axial spondyloarthritis, the BmPROM-TR was specifically tested in a broader population of individuals with different MSPs. This difference highlights the strength of the BmPROM-TR in offering a more generalizable tool for clinical and research settings where diverse patient populations are encountered.

Cronbach's α for the functionality and well-being subscales of the BmPROM-TR was found to be 0.721 and 0.766, respectively. In the original version study, Cronbach's α for the functionality and well-being subscales was reported as 0.85 and 0.80, respectively. Cronbach's α values for the functionality and well-being subscales in this study are lower than those in the original version but are still considered acceptable according to the literature. Items may be answered differently based on participants' overall health perceptions and health literacy, which are influenced by demographic and socioeconomic factors. These factors have been shown to affect how patients complete and interpret PROMs.[31] Although the original study did not report participants' educational levels, the current study population included a relatively lower education level, which may affect health literacy and, in turn, influence how individuals interpret the functional and psychosocial constructs, potentially explaining the observed difference in internal consistency compared to the original, likely higher-literacy sample. However, as no other studies have evaluated the BmPROM-TR in different languages or populations, direct comparisons are limited, and further research is needed to confirm the consistency of these findings.

Unlike the original version study, item-total correlations were examined in this study. The lowest item-total correlation value was observed in the third question (0.217). This question encompasses activities such as dining out, sports, and social gatherings, which are highly dependent on social participation and environmental circumstances. Moreover, many participants in the study had lower educational attainment and lower socioeconomic status, factors that have been associated with reduced engagement in social and leisure activities.[32] Consequently, these demographic, socioeconomic, and cultural characteristics may have contributed to lower scores on this item, potentially explaining its lower item–total correlation. Although Cronbach's α was recalculated considering this item, it was not removed from the scale, as the resulting value remained very close to the overall internal consistency coefficient.

The test-retest method involves applying the scale to the same participants at different time points to evaluate its consistency over time.[33] To assess the test-retest reliability of the BmPROM-TR, the scale was re-administered to the patients 10 days after the initial evaluation. The literature suggests that involving 25-50% of the participants from the initial measurement is adequate for evaluating test-retest reliability.[34] Hence, test-retest reliability was evaluated using the ICC with 67 patients. The ICC values ranged from 0.646 to 0.859 for all items, indicating good reliability.[16] The ICC values for the functionality and well-being subscales of the BmPROM-TR were determined to be 0.866 and 0.844, respectively. In the original version study, the ICC value for the functionality and well-being subscales was 0.84. These results were found to be quite similar to those of the original version.

The EFA revealed that the current study exhibited a two-factor structure, consistent with the original version, comprising 'functionality' (items 1, 3, and 4) and 'well-being' (items 2, 5, 6, 7, and 8). As a result of the rotational component varimax, each item was loaded with a single factor and factor loads for all items were greater than 0.30. In the literature, factor loadings greater than 0.30 are generally considered significant.[35] Therefore, no items were removed from the Turkish version. The confirmation of the two-factor structure observed in the original version strongly supports the construct validity of the BmPROM-TR, suggesting the Turkish version maintains the intended conceptual framework across cultures. Furthermore, no other studies are available for direct comparison.

To evaluate convergent validity in this study, the correlation between the subscales of the BmPROM-TR and the total scores from the subscales of the SF-36 was analyzed. Significant moderate positive correlations were observed, particularly in the domains of General

Health, Physical Function, Pain, Energy/Vitality, and Social Function, indicating that higher functionality and well-being are associated with better physical health and reduced pain. Compared with the original study, the overall trends were similar, though correlations were generally lower for Physical Function and Social Function, possibly reflecting cultural and demographic differences between the populations. These results suggest that while the scales assess related constructs, the BmPROM-TR likely captures unique, musculoskeletal-specific aspects of a patient's condition that are not fully reflected in the SF-36. This finding is consistent with the conceptualization of the BmPROM-TR as a musculoskeletal-specific measure rather than a generic health tool. Nonetheless, further studies involving diverse populations are needed to validate the consistency and applicability of these results across different cultural contexts.

Limitations

This study has some limitations. First, there is no other cross-cultural version of the BmPROM available for comparison, which limits contextualization of our results. Second, the MSPs were not homogeneously distributed across body regions, and participants' educational levels varied. Third, the COVID-19 pandemic necessitated a single-center design, potentially limiting generalizability. Finally, confirmatory factor analysis was not performed and should be considered in future studies.

Conclusion

To the authors' knowledge, this study is the first to investigate the psychometric properties of the BmPROM in a language other than the original. The BmPROM-TR was found to be a valid and reliable scale for evaluating pain, physical function, and psycho-social factors in the multidimensional assessment of MSPs. Given its simple language, ease of completion in a short time, and straightforward scoring process, the BmPROM-TR is likely to be favored by healthcare professionals and is expected to lead to significant time and labor savings.

Acknowledgement: The authors thank Baki Umut Tugay, PT. Ph.D., for contributions to the scale's translation process, Feray Cinevre Soyupek, M.D. Ph.D., and Emel Taşvuran Horata, PT. Ph.D., for their support throughout the study.

Authors' Contributions: FE: Study conception and design, data collection, analysis and interpretation of results and draft manuscript preparation; **MGK:** Study conception and design, analysis and interpretation of results and draft manuscript preparation; **MAD:** Data collection; **İÇK:** Analysis and interpretation of results and draft manuscript preparation.

Funding: *None*

Conflicts of Interest: *None*

Ethical Approval: After obtaining permission to translate the scale into Turkish from the developers of the original scale, ethical and administrative approvals were obtained from the Ethics Committee of Mugla Sitki Kocman University (date: 01.07.2020) and Suleyman Demirel University Research Hospital (date 19.08.2020, document number: 30856962-044-107693), respectively.

REFERENCES

1. Cieza A, Causey K, Kamenov K, et al. Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet. 2020;396:2006-17.
2. Gomez-Galan M, Perez-Alonso J, Callejón-Ferre ÁJ, et al. Musculoskeletal disorders: OWAS review. Ind Health. 2017;55:314-337.
3. Blyth FM, Briggs AM, Schneider CH, et al. The global burden of musculoskeletal pain—where to from here? Am J Public Health. 2019;109:35-40.
4. Alvarez-Nebreda ML, Heng M, Rosner B, et al. Reliability of proxy-reported patient-reported outcomes measurement information system physical function and pain interference responses for elderly patients with musculoskeletal injury. J Am Acad Orthop Surg. 2019;27:e156-165.
5. Kyte D, Calvert M, Van der Wees P, et al. An introduction to patient-reported outcome measures (PROMs) in physiotherapy. Physiotherapy. 2015;101:119-125.
6. Goldsmith ES, Taylor BC, Greer N, et al. Focused evidence review: psychometric properties of patient-reported outcome measures for chronic musculoskeletal pain. J Gen Intern Med. 2018;33:61-70.
7. Bryant E, Murtagh S, Finucane L, et al. The Brighton musculoskeletal Patient-Reported Outcome Measure (BmPROM): an assessment of validity, reliability, and responsiveness. Physiother Res Int. 2018;23:e1715.
8. Mokkink LB, de Vet HC, Prinsen CA, et al.

COSMIN risk of bias checklist for systematic reviews of patient-reported outcome measures. Qual Life Res. 2018;27:1171-1179.
9. Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. J Clin Epidemiol. 1993;46:1417-1432.
10. Beaton DE, Bombardier C, Guillemin F, et al. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25:3186-3191.
11. Davis LL. Instrument review: getting the most from a panel of experts. Appl Nurs Res. 1992;5:194-197.
12. Kuorinka I, Jonsson B, Kilbom A, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon. 1987;18:233-237.
13. Kahraman T, Genç A, Göz E. The Nordic Musculoskeletal Questionnaire: cross-cultural adaptation into Turkish assessing its psychometric properties. Disabil Rehabil. 2016;38:2153-2160.
14. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30:473-483.
15. Koçyiğit H, Aydemir Ö, Fişek G, et al. Form-36 (KF-36)'nın Türkçe versiyonunun güvenilirliği ve geçerliliği. İlaç Tedavi Derg. 1999;12:102-106.
16. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med. 2016;15:155-163.
17. Lim CR, Harris K, Dawson J, et al. Floor and ceiling effects in the OHS: an analysis of the NHS PROMs data set. BMJ Open. 2015;5:e007765.
18. McHorney CA, Tarlov AR. Individual-patient monitoring in clinical practice: are available health status surveys adequate? Qual Life Res. 1995;4:293-307.
19. Shrestha N. Factor analysis as a tool for survey analysis. Am J Appl Math Stat. 2021;9:4-11.
20. Williams B, Onsman A, Brown T. Exploratory factor analysis: a five-step guide for novices. Australas J Paramed. 2010;8:1-13.
21. Bartlett MS. Tests of significance in factor analysis. Br J Psychol. 1950;3:77-85.
22. Piedmont RL. Eigenvalues. In: Michalos AC, ed. Encyclopedia of Quality of Life and Well-Being Research. Dordrecht: Springer Netherlands; 2014:1847-1848
23. Larsen R, Warne RT. Estimating confidence intervals for eigenvalues in exploratory factor analysis. Behav Res Methods. 2010;42:871-876.
24. Bland JM, Altman DG. Measuring agreement in method comparison studies. Stat Methods Med Res. 1999;8:135-160.
25. Kılıç A, Uysal I, Burcu A. Comparison of confirmatory factor analysis estimation methods on binary data. Int J Assess Tools Educ. 2020;7:451-487.
26. Matsunaga M. How to factor-analyze your data right: do's, don'ts, and how-to's. Int J Psychol Res. 2010;3:97-110.
27. Rosenberg N. Objective measurement of musculoskeletal pain: a comprehensive review. Diagnostics. 2025;15:1581.
28. Howe TE, Dawson LJ, Syme G, et al. Evaluation of outcome measures for use in clinical practice for adults with musculoskeletal conditions of the knee: a systematic review. Man Ther. 2012;17:100-118.
29. Şahinoğlu E, Ergin G, Ünver B. Psychometric properties of patient-reported outcome questionnaires for patients with musculoskeletal disorders of the shoulder. Knee Surg Sports Traumatol Arthrosc. 2019;27:3188-3202.
30. Akkubak Y, Külünkoğlu BA. Reliability and validity of the Turkish version of arthritis research UK musculoskeletal health questionnaire. Arch Rheumatol. 2019;35:155-161.
31. Trotter TJ, Bumpass DB, Mears SC, et al. Does patient health literacy affect patient reported outcome measure completion method in orthopaedic patients? Geriatr Orthop Surg Rehabil. 2025;16:1-7.
32. Feng Z, Cramm JM, Jin C, et al. The longitudinal relationship between income and social participation among Chinese older people. SSM Popul Health. 2020;11:100636.
33. Vilagut G. Test-retest reliability. In: Michalos AC, ed. Encyclopedia of Quality of Life and Well-Being Research. Dordrecht: Springer Netherlands; 2014:6622-6625.
34. Alpar R. Validity and reliability. In: Alpar R, ed. Applied Statistics and Validity-Reliability. 6th ed. Ankara: Detay Publishing; 2020:528-638.
35. Tavakol M, Wetzel A. Factor analysis: a means for theory and instrument development in support of construct validity. Int J Med Educ. 2020;11:245.