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Research Article

The Turkish version of the brief Michigan hand outcomes questionnaire: cross-cultural adaptation, validity, and reliability testing

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ABSTRACT

Objective: This study aimed to develop the Turkish version of the Brief Michigan Hand Outcomes Questionnaire (B-MHQ) and to demonstrate its reliability and validity for evaluating hand function in the Turkish population with hand/wrist disorders.

Methods: This study was conducted in accordance with Beaton et al.'s Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures. A total of 54 patients with various hand and wrist problems were included in the study. The B-MHQ and Quick Disabilities of the Arm, Shoulder, and Hand (Q-DASH) were used to evaluate hand function, and the visual analog scale (VAS) was used for the assessment of pain, which were completed by the subjects at baseline and 7 days later.

Results: The Turkish version of the B-MHQ showed good internal consistency, as evidenced by Cronbach alpha coefficients ranging from 0.895 to 0.876, and excellent test–retest reliability with an intraclass correlation coefficient of 0.968. In addition, B-MHQ was strongly correlated with Q-DASH (r=−0.878) and moderately correlated with VAS (r=−0.445).

Conclusion: The Turkish version of the B-MHQ seems to be a reliable and valid tool for assessing hand function in Turkish-speaking patients with hand disorders.

Level of Evidence: Level III, Diagnostic Study.

Introduction

Hand function has a significant impact on an individual's quality of life. Measurement methods assessing hand function are used as important indicators of quality of life.[1] There are several questionnaires available in the literature to evaluate the function and disability of the hand. These tools are able to assess objective parameters such as grip strength and normal joint movement as well as more subjective parameters including quality of life and patient satisfaction.[2,3] The 36-item Short Form Health Survey (Short Form 36), Quick Disabilities of the Arm, Shoulder and Hand (Q-DASH), and Michigan Hand Outcomes Questionnaire (MHQ) are among the commonly used surveys to evaluate hand function.[4] The large number of items included in the current questionnaires has prompted clinicians to develop abbreviated versions such as Q-DASH and SF-12. This resulted in time saving and minimization of missing data.[5]

The MHQ is a hand-specific subjective measurement tool that assesses not only an individual's perception of function but also measures pain, satisfaction with hand function, and hand appearance.[6] The validity and reliability of the MHQ have been demonstrated in a variety of disorders with hand involvement.[7-9] The Brief Michigan Hand Outcomes Questionnaire (B-MHQ) survey was developed using the data prospectively obtained from patients with distal radius fracture, rheumatoid arthritis, carpal tunnel syndrome, and thumb carpometacarpal arthritis.[1] The B-MHQ offers a number of advantages compared to the long version, including being more time efficient, reducing the burden on the respondents, and minimizing missing data. Moreover, the brief version has similar psychometric properties as the long MHQ and demonstrates excellent validity and reliability.[10] In many countries around the world, the MHQ and B-MHQ were translated into different languages and employed in several conditions involving the hand, such as nerve compression syndromes, several arthritic disorders, and trauma.[11-13]

There is a need for validated surveys to ensure comparison of results across different cultures, populations, and countries. To the best of our knowledge, there is no Turkish version of this questionnaire, which is the most reliable and sensitive measurement tool used worldwide for individuals with hand disorders.[11,14] Appropriate translation and cross-cultural adaptation of the B-MHQ are needed for non-English-speaking patients. This study aimed to develop the Turkish version of the B-MHQ through translation and cross-cultural adaptation of self-report measures and to demonstrate its reliability and validity for use in patients with various hand disorders.

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Material and methods

Ethical approval

The study protocol was approved by the Institutional Review Board of Gaziantep University (No. 2023/66, date: 05.04.2023). Prior to enrollment, all subjects were informed in detail about the nature and scope of the study and signed a written informed consent form.

Adaptation of the Brief Michigan Hand Outcomes Questionnaire to Turkish language and culture

Prior to the study, the copyright holders of the B-MHQ were contacted, and written permission was obtained for the use of their material in this study. The Turkish translation of the B-MHQ that will be used in the Turkish population was performed in accordance with the Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures.[15] To create the cross-cultural version of the questionnaire, it was translated into Turkish by a physiotherapist with an advanced level of English who has published studies on hand function, is a healthcare professional with expertise in the English language, and is a certified English teacher with no health-specific education. These translations were merged into a single text through the consensus of all experts taking part in the translation process to obtain the Turkish B-MHQ. Subsequently, the Turkish version of the questionnaire was back-translated into English by a native English speaker who is fluent in Turkish. The consistency of the Turkish version with the original B-MHQ was discussed. Then, the draft questionnaire was subjected to pilot testing on 20 patients with different types of hand disorders. After minor revisions were made and approved through consensus, the Turkish version of the B-MHQ was finalized.

Participants

This cross-sectional study was conducted between March and April 2023. A total of 60 patients presenting to the Hand Surgery Clinic at Dr. Ersin Arslan Research and Training Hospital due to various hand problems were included in the study. Turkish individuals aged 18 years or older who had an orthopedic hand/wrist disorder and those without a history of surgical procedure within the past 6 weeks were recruited for the study. Individuals with neurological hand/wrist problems (e.g., stroke or brachial plexus injury), acute trauma to the hand or wrist, and those with comprehension problems that could impair the ability to complete the questionnaires were excluded from the study. Six patients failing to meet the inclusion criteria were excluded. Assessments were conducted by a physiotherapist. After collecting demographic data of the patients, the B-MHQ and Q-DASH were used for the assessment of hand function, and the visual analog scale (VAS) for evaluating pain severity. The questionnaires were repeated 7 days later. Throughout the study, the patients did not receive any medical intervention that could significantly affect their clinical condition.

HIGHLIGHTS

- This study aimed to develop and culturally adapt the Turkish version of the Brief Michigan Hand Outcomes Questionnaire (B-MHQ) to provide a reliable and valid tool for evaluating hand function in Turkish-speaking patients with hand and wrist disorders.
- The Turkish B-MHQ demonstrated excellent internal consistency and test-retest reliability, along with strong correlations with the Q-DASH and moderate correlations with the VAS.
- The results indicate that the Turkish version of the B-MHQ is a reliable and valid instrument for assessing hand function in Turkish-speaking patients with hand disorders, making it a useful tool for clinical and research settings.

Brief Michigan Hand Outcomes Questionnaire

The B-MHQ consists of 12 items regarding various aspects of hand function which are rated on a 1 to 5 Likert scale. The responses to a total of 8 items (items 1, 2, 3, 4, 8, 9, 11, and 12) are reversed (1=5, 2=4, 4=2, 5=1). All scores are summed and then normalized to obtain a score between 0 and 100. Higher scores indicate better hand functioning. The questionnaire does not distinguish between hands.[1]

Normalization formula is as follows:=100 × (brief MHQ raw score − 1)/4.

Quick Disabilities of the Arm, Shoulder and Hand

Quick Disabilities of the Arm, Shoulder and Hand is an 11-item questionnaire that quantitatively assesses an individual's difficulty when performing activities of daily living due to upper extremity problems. Each item is assigned a score between 1 and 5. The possible total score ranges from 0 to 100, with higher scores indicating greater disability. The reliability and validity of the Turkish version have been demonstrated by Düger et al.[16]

Visual analog scale

The subject is asked to rate the severity of their pain on a 10-cm ruler, where 0 denotes no pain and 10 indicates severe pain.[17]

Statistical analysis

The study data were analyzed using SPSS, version 26.0 (IBM SPSS Corp.; Armonk, NY, USA). A *P*-value less than .05 was considered significant. Intraclass correlation coefficient (ICC) and Cronbach's alpha coefficient were used to analyze test–retest reliability and internal consistency, respectively. An ICC of "0" indicates no correlation, whereas an ICC of "1" denotes perfect correlation. Cronbach's alpha values were interpreted as excellent if >0.9, good if 0.7-0.9, acceptable if 0.6-0.7, poor if 0.5-0.6, and unacceptable if <0.5.[18] To examine construct validity, the correlation of B-MHQ with similar questionnaires (Q-DASH, VAS) was analyzed. The Pearson correlation test was used for this purpose, and correlation coefficients (r) were reported. This coefficient ranges between −1 and 1 and indicates the strength of an association, which was interpreted as follows: strong if $r > 0.6$, medium if r 0.3-0.6, and weak if $r < 0.3$.[19]

Results

Patient characteristics

Among 54 patients, 31 were male and 23 were female. The dominant hand was the right hand in 51 patients and the left hand in 3 patients.

Table 1. Physical characteristics of the study sample

	Total (n=54)	
Physical characteristics	**$X \pm$ SD**	**(Min-Max)**
Age (years)	34.85 ± 15.78	18-78
Height (cm)	165.42 ± 9.51	140-180
Body weight (kg)	72.74 ± 17.64	45-120
BMI (kg/m²)	33.55 ± 16.11	12.82-84.78

BMI, Body Mass Index; $X \pm$ SD, mean ± SD; Min, minimum; Max, maximum.

Table 2. Mean B-MHQ, Q-DASH, and VAS scores of the patients

	Total (n=54)	
	Baseline $X \pm$ SD	**Follow-up X± SD**
B-MHQ	57.32 ± 19.47	55.96 ± 19.94
Q-DASH	34.78 ± 19.79	35.49 ± 20.48
VAS	4.01 ± 2.92	4.33 ± 3.25

B-MHQ, Brief Michigan Hand Outcomes Questionnaire; Q-DASH, Quick Disabilities of the Arm, Shoulder, and Hand; VAS, Visual Analog Scale.

Table 3. Test–Retest Reliability and Internal Consistency of the B-MHQ

	Total (n=54)			
	Baseline $X \pm SD$	Follow-Up $X \pm SD$	ICC	95% CI
Item 1	3.35 ± 0.75	3.33 ± 0.84	0.963	0.935-0.978
Item 2	3.85 ± 0.68	3.64 ± 0.82	0.863	0.763-0.920
Item 3	3 ± 1.19	3 ± 1.24	0.954	0.920-0.973
Item 4	3.51 ± 1.37	3.48 ± 1.41	0.949	0.912-0.970
Item 5	3.01 ± 1.22	2.98 ± 1.20	0.987	0.978-0.993
Item 6	2.96 ± 1.18	2.98 ± 1.21	0.983	0.971-0.990
Item 7	3.68 ± 1.45	3.61 ± 1.41	0.938	0.892-0.964
Item 8	3.64 ± 1.34	3.57 ± 1.39	0.970	0.948-0.982
Item 9	3.09 ± 0.99	3.11 ± 1.01	0.966	0.941-0.980
Item 10	3.37 ± 0.95	3.46 ± 0.92	0.877	0.789-0.929
Item 11	3.05 ± 1.07	3.01 ± 1.12	0.968	0.945-0.981
Item 12	2.98 ± 1.17	3.01 ± 1.21	0.966	0.941-0.980
B-MHQ (total)	57.32 ± 19.47	55.96 ± 19.94	0.968	0.944-0.981
Cronbach's α (V1, V2)		0.895-0.876		

B-MHQ, Brief Michigan Hand Outcomes Questionnaire; CI, Confidence Interval; ICC, Intraclass Correlation Coefficient; V1, Visit-1; V2, Visit-2

There were 12 patients with ganglion cysts, 8 patients with hand/wrist fractures, 5 patients with nerve injury, 5 patients with arthrosis, and 4 patients with carpal tunnel syndrome. The remaining 20 patients had various hand/wrist problems, including hand burns, ligament failure, tendon injury, tendinitis, trigger finger, contracture, and edema. Forty-five of the patients had an education level below a bachelor's degree, 4 had a university degree, and 5 were postgraduates. Table 1 shows the age, height, body weight, and BMI (body mass index) of the study sample.

The mean B-MHQ, Q-DASH, and VAS scores of the patients obtained at baseline and 7 days later are presented in Table 2.

All ICC values showed excellent correlation between the responses, except for ICCs for "Items 2 and 10," which showed a lower correlation. Cronbach's alpha coefficients revealed good internal consistency between the items at the initial (0.895) and second (0.876) evaluations (Table 3).

It was found that B-MHQ was strongly correlated with Q-DASH but moderately correlated with VAS (Table 4).

Discussion

Hand function is crucial for performing routine daily tasks and work-related activities. Impairment of hand function due to any reason affects the individual's quality of life.[20] Therefore, accurate assessment of changes in hand function is very important for the rehabilitation of the hand. Our study demonstrated that the Turkish version of the B-MHQ is a reliable and valid questionnaire for the evaluation of patients with various hand/wrist disorders.

In a study examining the validity and reliability of the German version of the B-MHQ in patients with Dupuytren's contracture, the ICC value of 0.87 showed good test–retest reliability, and a Cronbach alpha value of 0.88 revealed good internal consistency. In addition, a strong correlation was reported between B-MHQ and Q-DASH (r=−0.82).[21] A study aiming to determine the reliability and validity of the Persian version of the B-MHQ for patients with different hand/wrist disorders demonstrated excellent test–retest reliability with an ICC of 0.94 and excellent internal consistency with a Cronbach α of 0.891-0.910.[4] Similarly, the Thai version of the B-MHQ showed excellent test–retest reliability and internal consistency, as demonstrated by an ICC of 0.94 and a Cronbach α of 0.97.[22] As discussed above, cross-culturally adapted, reliable versions of the B-MHQ in several languages such as Thai, Persian, and German have been reported in the literature. In line with previous reports, excellent test–retest reliability and good internal consistency were found in the current study for the Turkish B-MHQ, as shown by an ICC value of 0.968 and a Cronbach α of 0.895-0.876 respectively.

Table 4. Pearson Correlations of B-MHQ with Q-DASH and VAS

	Q-DASH		VAS	
	r	*P*	*r*	*P*
B-MHQ	−0.878	.000	−0.445	.001

B-MHQ, Brief Michigan Hand Outcomes Questionnaire; Q-DASH, Quick Disabilities of the Arm, Shoulder, and Hand; VAS, Visual Analog Scale

In our study, the Turkish version of the Q-DASH validated by Düger et al.[16] as well as VAS was utilized to examine the validity of the Turkish B-MHQ. According to the results of the statistical analysis, the Turkish version of the B-MHQ was strongly correlated with Q-DASH (r=−0.878) and moderately correlated with VAS (r=−0.445). In the study investigating the reliability and validity of the Persian version of the B-MHQ, the scale was strongly correlated with Q-DASH (r=−0.781) and VAS (r=−0.731).[4] The total scores from the validated Persian MHQ showed correlation coefficients of r=0.74 and r=−0.19 with DASH and VAS, respectively.[13] In a study testing the Korean version of the MHQ, a high correlation (r=−0.63) was reported between the MHQ pain subscale score and the DASH score. In addition, correlation coefficients ranging from −0.32 to −0.61 were observed between the scores from the other MHQ subscales (overall hand function, activities of daily living, work performance, esthetics, and satisfaction) and the DASH score.[23] These findings are consistent with our results.

The B-MHQ version translated into Brazilian Portuguese was reported to be suitable for use in patients with a low level of education, with the advantages of saving respondent time and minimizing missing data.[10] In our study, although the majority of the patients had less than a university degree, they were able to respond to the questions without any problems. This indicates that the Turkish version of the B-MHQ is easy to complete for patients with varying education levels.

As reported in the literature, a sample size of 30 individuals is not sufficient to demonstrate the reliability and validity of a questionnaire.

Statistically, a smaller sample size may result in a wider confidence interval, leading to greater uncertainty in the estimation of reliability coefficients (ICC).[24,25] Terwee et al. suggested that a sample size of at least 50 subjects would be required for studies assessing measurement properties.[25] In light of these data, the sample size used in this study was considered to be adequate for the assessment of the reliability and validity of the Turkish B-MHQ.

A number of limitations should be noted for this study. Our study relies on the accuracy of the responses provided by the participants. Any survey can be influenced by response bias. Correspondingly, responses to our questionnaire might have been affected by respondent characteristics such as age and education level. The validity and reliability of this questionnaire need to be demonstrated in a wider range of diseases such as congenital hand deformities (e.g., ulnar club hand), carpal tunnel syndrome, wrist arthritis, and peripheral nerve and tendon injury. In our study, hand function was evaluated in a variety of conditions such as hand/wrist fractures, carpal tunnel syndrome, cystic lesions, and arthritis. Further studies involving an assessment of the psychometric properties of the questionnaire are warranted before it is used for other hand problems.

In conclusion, the Turkish version of the B-MHQ demonstrated excellent internal consistency and test–retest reliability for use in the Turkish population with various hand disorders. Therefore, we believe that the availability of a validated Turkish version of the B-MHQ is important and will certainly be useful for both patients and physicians in Turkish-speaking countries. This questionnaire can be reliably used in patients with hand problems to evaluate the effectiveness of treatment and rehabilitation provided by healthcare professionals such as hand surgeons and physiotherapists.

Data availability statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics committee approval: This study was approved by the Ethics Committee of Gaziantep University (Approval No: 2023/66, Date: 05.04.2023).

Informed consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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Appendix I. The Turkish Version of the B-MHQ

MICHIGAN EL SONUÇLARI ANKETİ - KISA FORMU

Tarih: _____ _____ _____ _____ _____

Gün-Ay-Yıl

Talimatlar: Bu anket elleriniz ve sağlığınızla ilgili görüşlerinizi öğrenmeyi amaçlayan sorular içermektedir. Bu bilgiler, kendinizi nasıl hissettiğinizi ve olağan günlük aktivitelerinizi/işlerinizi ne derece iyi gerçekleştirebildiğinizi anlamamıza yardımcı olacaktır.

TÜM soruları belirtildiği gibi işaretleyerek yanıtlayınız.

Bir soruyu nasıl cevaplayacağınızdan emin değilseniz, lütfen verebileceğiniz en iyi cevabı veriniz. **Elinizde veya el bileğinizde herhangi bir sorun yaşamıyorsanız bile lütfen bütün soruları cevaplayınız**.

Bazı sorular belirli işleri/aktiviteleri tamamlama becerinizle ilgilidir. Eğer belirli bir işi hiç yapmıyorsanız, lütfen bu görevi yapmanız halinde karşılaşacağınız zorluğu tahmin ederek cevap veriniz. İşle ilgili sorular mesleki/işle ilgili aktiviteleri, ev işlerini ve okul ödevlerini içermektedir. Lütfen her soru için tek bir cevabı daire içine alınız.

1. Genel olarak, geçen hafta iş yaparken el(ler)iniz ne derece iyi işlev gösterdi?

1. Çok iyi 2. İyi 3. Orta 4. Kötü 5. Çok Kötü

2. Geçen hafta boyunca el(ler)inizdeki duyu (his) nasıldı?

1. Çok iyi 2. İyi 3. Orta 4. Kötü 5. Çok Kötü

3. Geçen hafta boyunca tava tutmak sizin için ne kadar zordu?

1. Hiç zorluk yok 2. Çok az zor 3. Biraz zor 4. Orta derecede zor 5. Çok zor

4. Geçen hafta bir gömleği veya bluzu iliklemek sizin için ne kadar zordu?

1. Hiç zorluk yok 2. Çok az zor 3. Biraz zor 4. Orta derecede zor 5. Çok zor

5. Son 4 haftada, elinizde/el bileğinizdeki (sağ, sol veya her ikisi) problemler nedeniyle ne sıklıkla işinizi yapamadınız?

1. Her zaman 2. Sıklıkla 3. Bazen 4. Nadiren 5. Hiç

6. Son 4 haftada, elinizde/el bileğinizdeki (sağ, sol veya her ikisi) problemler nedeniyle işinizdeki görevleri tamamlama süreniz ne sıklıkla uzadı?

1. Her zaman 2. Sıklıkla 3. Bazen 4. Nadiren 5. Hiç

7. Geçen hafta elinizdeki/el bileğinizdeki (sağ, sol veya her ikisi) ağrı günlük aktivitelerinizi (örn., yemek yeme veya banyo yapma) gerçekleştirmenizi hangi sıklıkta engelledi?

1. Her zaman 2. Sıklıkla 3. Bazen 4. Nadiren 5. Hiç

8. Geçen hafta elinizde/el bileğinizde (sağ, sol veya her ikisi) yaşadığınız ağrıyı tarif ediniz.

1. Çok az 2. Az 3. Orta 4. Şiddetli 5. Çok şiddetli

9. El(ler)imin görünümünden memnunum.

1. Kesinlikle katılıyorum 2. Katılıyorum 3. Kararsızım 4. Katılmıyorum 5. Kesinlikle katılmıyorum

10. Geçen hafta, ellerimin görünümü normal günlük aktivitelerimi olumsuz etkiledi.

1. Kesinlikle katılıyorum 2. Katılıyorum 3. Kararsızım 4. Katılmıyorum 5. Kesinlikle katılmıyorum

11. Geçen hafta içerisinde parmaklarınızın hareketliliğinden ne derece memnundunuz?

1. Çok memnunum 2. Memnunum 3. Kararsızım 4. Memnun değilim 5. Hiç memnun değilim

12. Geçen hafta içerisinde el bileğinizin hareketliliğinden ne derece memnundunuz?

1. Çok memnunum 2. Memnunum 3. Kararsızım 4. Memnun değilim 5. Hiç memnun değilim

KISA MHQ SKORU NASIL HESAPLANIR?

Genel Bakış

MHQ'nun kısa versiyonu el işlevinin çeşitli yönleriyle ilgili 12 madde içerir. Bu maddelere verilen yanıtlar 1'den 5'e kadar Likert ölçeği üzerinde derecelendirilmiştir. Maddelerden 8'i için aşağıda gösterilen şekilde ters puanlama ve ters kodlama yapılır. Tüm maddeler toplanır ve 0-100'lük ölçek üzerinde bir özet skor elde etmek üzere normalleştirilir. Daha yüksek skorlar daha iyi genel işlevselliği ve memnuniyeti gösterir. Kısa MHQ özet skorunun hesaplanabilmesi için, ankete katılanların tüm soruları cevaplaması gerekir. Kısa MHQ, sağ ve sol el arasında ayrım yapmaz.

Ters Kodlama

Daha yüksek skorlar daha iyi işlevselliği gösterir. Bu nedenle, özet skor elde etmek için aşağıdaki maddelerde ters puanlama yapılması gerekir:

1. Genel olarak, geçen hafta iş yaparken el(ler)iniz ne derece iyi işlev gösterdi?

2. Geçen hafta boyunca el(ler)inizdeki duyu (his) nasıldı?

3. Geçen hafta boyunca tava tutmak sizin için ne kadar zordu?

4. Geçen hafta bir gömleği veya bluzu iliklemek sizin için ne kadar zordu?

8. Geçen hafta elinizde/el bileğinizde (sağ, sol veya her ikisi) yaşadığınız ağrıyı tarif ediniz.

9. El(ler)imin görünümünden memnunum.

11. Geçen hafta içerisinde parmaklarınızın hareketliliğinden ne derece memnundunuz?

12. Geçen hafta içerisinde el bileğinizin hareketliliğinden ne derece memnundunuz?

Bu maddelere verilen yanıtlar için aşağıda gösterilen şekilde ters puanlama yapılmalıdır:

$$1=5,\ 2=4,\ 4=2,\ 5=1$$

Puanlama

Minimum skor (en kötü işlev) = 1

Maksimum skor (ideal işlev) = 5

Maddelerin ortalaması alındıktan sonra, ham skor 0 (en kötü işlev) - 100 (ideal işlev) aralığında ölçeklendirilen bir skor elde etmek için normalleştirilir.

Normalizasyon = $100 \times (\text{kısa MHQ ham skoru} - 1)/4$