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Headache Disability Questionnaire: cross-cultural adaptation and validation of the Turkish version

Halime Arikan[1*]

Abstract

Background The Headache Disability Questionnaire (HDQ) evaluates pain intensity, daily activities, work/school disruptions, and the impact on recreational activities. It was aimed to translate the HDQ into Turkish and evaluate its reliability and validity.

Methods This study included 130 participants, consisting of 105 females and 25 males. The original HDQ was translated into Turkish language using Beaton guidelines. Reliability was assessed using internal consistency and Intraclass Correlation Coefficient. Exploratory (EFA) and Confirmatory Factor Analysis (CFA) were conducted to evaluate the structural validity. For convergent validity, the Turkish version of the HDQ, along with the Headache Impact Test-6 (HIT-6) and Migraine Disability Assessment Scale (MIDAS), was administered to individuals with headaches. The HDQ was retested one week later to assess its reliability.

Results The Turkish version of the HDQ demonstrated good reliability, with ICC and Cronbach's α values of 0.842 and 0.914, respectively. Standard error measurement (SEM) and Minimal Detectable Change (MDC) values were 5.89 and 16.33 units. Bland-Altman plots confirmed a high level of agreement between initial and retest scores EFA revealed a two-factor structure, clustering items into Factor 1 (items 1, 2, 5, 7, and 9) and Factor 2 (items 3, 4, 6, and 8), which was subsequently confirmed by CFA. Convergent validity was confirmed through good correlations with HIT-6, and MIDAS. No ceiling or floor effects were observed.

Conclusions The study demonstrates that the Turkish version of the HDQ is a valid and reliable instrument for evaluating the effect of headaches on daily living, exhibiting strong internal consistency and test-retest reliability, making it suitable for both clinical practice and research purposes.

Trial registration Trial registration date is January 30, 2021 (NCT04736654).

Clinical trials registration number NCT04736654.

Keywords Headaches, Headache disability questionnaire, Reliability, Validity

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Background

Physiotherapists address musculoskeletal dysfunctions in various headache types, such as migraine, tension-type headaches, and cervicogenic headaches [1]. Physiotherapists treat headaches caused by musculoskeletal disorders. Treatment approaches for headaches commonly target the thoracic and cervical spines, utilizing techniques like therapeutic exercise, manual therapy, electrotherapy, and patient education [2]. Accurate, reliable, and sensitive outcome measurements are imperative for assessing the effectiveness of any physiotherapy approach and ensuring appropriate treatment continuation. In clinical studies and practice, outcome measures for physiotherapy treatment of headaches typically include headache frequency, duration, and severity [3–5].

There are outcome measures used to assess headaches [6, 7]. The Migraine Disability Assessment Questionnaire (MIDAS) is well-regarded for its strong internal consistency, reproducibility, and validity specifically among migraine patients [8]. It is primarily designed to evaluate migraine-related disability, focusing on the impact of migraines on various aspects of daily functioning. However, MIDAS may not be ideal for assessing the quality of life related to headaches in a broader patient population seeking physiotherapy or in clinical practice where multiple types of headaches are encountered. In contrast, the Headache Disability Questionnaire (HDQ) was developed to assess disorder-related quality of life across a more diverse population undergoing physiotherapy for headaches. The HDQ evaluates pain intensity, daily activities, disruptions to work or school life, and the effect on recreational activities, making it a more comprehensive tool for general headache assessment [9].

Although several assessment tools, such as MIDAS, exist to evaluate specific types of headaches like migraines, there is a lack of comprehensive outcome measures for patients who experience headache complaints without a formal diagnosis. These patients may still require thorough evaluation, to assess the impact of their headaches on daily life and treatment effectiveness. While the HDQ has been developed in patients receiving physiotherapy, it fills an essential gap by providing a tool that can evaluate headache-related disability in individuals with or without a specific diagnosis. This study aimed to translate, culturally adapt, and evaluate the validity and reliability of the Turkish version of the HDQ for assessing the quality of life in Turkish patients with headache complaints, including those without a formal diagnosis, addressing an essential need for comprehensive assessment tools.

Methods

Individuals

To ensure the adequacy of the sample size, both pre-study and post-hoc power analyses were conducted with G*Power 3.1. Prior to the study, since the Intraclass Correlation Coefficient (ICC) value was not calculated in the original version of the HDQ a power analysis was performed based on literature recommendations, using an expected reliability level (0.75–0.90) ($\rho1=0.85$) [10] and a minimal acceptable reliability level ($\rho0=0.75$) [11], with $\alpha=0.05$ and $\beta=0.20$. This analysis indicated that a target sample size of 99 participants would be sufficient. For convergent validity, assuming a high correlation coefficient ($r=0.70$), the required sample size was determined to be 13 for the correlation of the HDQ with the one scale and 39 for the correlation of the HDQ with the three scales. These results confirmed that 99 participants would provide reliable and valid outcomes for the study.

Following the completion of the study, a post-hoc power analysis was conducted based on the obtained results. The observed reliability level ($\rho1=0.842$), with a minimal acceptable reliability ($\rho0=0.75$), $\alpha=0.05$, and $\beta=0.20$, indicated that a sample size of 122 participants was required. For convergent validity, with an observed correlation coefficient ($r=0.414$), the required sample size was 34 for the correlation of the HDQ with the one scale and 102 for the correlation of the HDQ with the three scales. The final sample size of 130 participants met these criteria, confirming the robustness of the study's findings and supporting the statistical validity of the cultural validation process.

The sample of the study consisted of 130 individuals over the age of 18 who had a headache complaint or had a diagnosis of headache at any time in their life. Since HDQ has not been developed for any specific headache diagnosis, no specific patient group is required. Individuals who had a diagnosis of headache or had a headache complaint for at least 3 months, who could speak, read, and write in Turkish, were older than 18 years old and who volunteered to participate in the study were included in the study. Individuals who were pregnant, had neurological or cognitive disorders, could not speak, could not read, or could not write Turkish were excluded from the study. To assess test-retest reliability, 91 individuals completed the inventory again after 7 to 14 days. This timeframe was chosen to balance the need for clinical condition stability and the minimization of memory effects [12]. Individuals were questioned about whether there was any change in their clinical condition and whether they received any treatment. 91 individuals were retested accordingly.

All participants were informed about the assessments before the study and signed an Informed Consent Form. They participated in the study on a voluntary basis in accordance with the Helsinki Declaration. Approval and

necessary permissions were obtained from the Tokat Gaziosmanpaşa University Faculty of Medicine Clinical Research Ethics Committee (22 September 2022 – decision no.: 83116987-569) and the study was registered in ClinicalTrials.gov (NCT04736654).

Translation stages

Primarily permission was obtained from the developer of the HDQ [9]. The adaptation of the Turkish version of the HDQ was conducted according to the guidelines set by Beaton et al. [13]:

I. Initial translation: The HDQ was translated into Turkish by two native Turkish speakers who are fluent in English.
II. Synthesis of the translations: The translators combined the two Turkish versions of the HDQ into a unified translation.
III. Back translation: The unified Turkish version of the HDQ was retranslated into English by two bilingual translators.
IV. Expert committee: Following the translation, the committee evaluated all versions.
V. Test of the prefinal version: The secondary version of the HDQ was assessed by a Turkish linguist to develop the preliminary test version.

In order to assess the comprehensibility and clarity of the Turkish translation of the HDQ, feedback was gathered from 15 healthy individuals and 15 individuals with headaches, and no negative feedback was reported. All participants found the questionnaire clear and easy to understand, confirming the suitability of the translation for use in this population. Based on their feedback, the Turkish version of the HDQ was finalized without any modifications.

Outcome measures

Headache disability questionnaire (HDQ)

The Headache Disability Questionnaire (HDQ) is a self-administered scale with 9 items that assesses pain intensity, work or school disruptions, and the effect on recreational activities in individuals with headache complaints. Higher scores reflect greater impairment [9].

Headache impact Test-6 (HIT-6)

The Headache Impact Test-6 (HIT-6) assesses the impact of headaches on pain, psychological stress, and social and cognitive functions. It consists of 6 items and each question contains 5 Likert-type answers [14]. The decreased score indicates a better situation. Turkish validity and reliability were established [15].

Migraine Disability Assessment Scale (MIDAS)

The Migraine Disability Assessment Scale (MIDAS) is a 5-item scale developed in 1999 to quantify the disability associated with headaches over a 3-month period in patients with migraine. The MIDAS assesses the number of days patients experience disruptions in work, household chores, and social activities due to headaches, providing an objective measure of headache-related disability. This tool is not designed to directly measure quality of life but rather the functional impact of migraines and other severe headaches on daily life [16]. It has widespread use. An increased score indicates a worsening disability associated with migraine. Turkish validity and reliability were established [17]. Since MIDAS items question headache in general, they were asked from all individuals.

Statistical analysis

Statistical analysis was conducted using SPSS version 22.0. Confirmatory Factor Analysis was performed with JASP. Data were presented as mean ± standard deviation, median, or percentage. The Kolmogorov-Smirnov test was used to determine whether the data followed a parametric or nonparametric distribution.

Reliability

Test-retest value was evaluated with Intraclass Correlation Coefficient (ICC) and internal consistency was analyzed with Cronbach's α value. The acceptable threshold for the ICC score was 0.75 or higher [11], while for Cronbach's alpha, it was 0.80 or higher [18]. To determine the 95% agreement limits, Bland-Altman plots were used, and a t-test assessed consistency and systematic differences between test and retest scores.

Reproducibility was evaluated by calculating the minimal detectable change (MDC) and standard error of measurement (SEM). The MDC and SEM values were calculated using the following formulas [19]:

$$\mathrm{MDC}_{95}\text{: } z * \mathrm{SEM} * \sqrt{2}; \text{where} z = 1.96$$

$$\mathrm{SEM}_{95}\text{: } \mathrm{SD}/\sqrt{1 - ICC}; \mathrm{SD} = \text{standard deviation}$$

Validity

The structural validity of the HDQ was assessed through both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity (BTS) values were evaluated, with a KMO value of 0.50 or higher considered acceptable for EFA suitability [20]. BTS values with a p-value less than 0.05 indicate a factorial structure of the matrix [21]. An explained variance of 50% or more is deemed acceptable [22]. Factors with eigenvalues greater

Table 1 Demographics of individuals

	Initial test group (*n* = 130)	Retest group (*n* = 91)
	Mean ± SD	**Mean ± SD**
Age (years)	30.20 ± 11.72	31.43 ± 12.36
Weight (kg)	67.27 ± 14.57	68.60 ± 14.73
Height (m)	1.66 ± 0.09	1.67 ± 0.09
BMI (kg/m^2)	24.29 ± 4.66	24.66 ± 4.92
Complaint duration	62.83 ± 60.03	64.15 ± 66.18
Pain intensity	68.56 ± 18.52	69.57 ± 18.91
HDQ	44.63 ± 14.42	44.00 ± 14.03
HIT-6	61.95 ± 6.13	61.77 ± 6.60
MIDAS	40.72 ± 35.34	43.81 ± 37.63
	n (%)	**n (%)**
Gender	105 (80.8)	72 (79.1)
Female	25 (19.2)	19 (20.9)
Male		
Presence of migraine	63 (48.5)	38 (41.8)
Yes	67 (51.5)	53 (58.2)
No		
Smoking	38 (29.2)	28 (30.8)
Yes	92 (70.8)	63 (69.2)
No		
Alcohol use	10 (7.7)	7 (7.7)
Yes	120 (92.3)	84 (92.3)
No		

SD: Standard deviation; kg: kilogram; m: meter; kg/m^2: kilogram/meter^2; HDQ: Headache Disability Questionnaire; HIT-6: Headache Impact Test-6; MIDAS: Migraine Disability Assessment Scale

than 1 were included [20], and loadings above 0.40 were deemed significant for the analysis [10]. Convergent validity of the HDQ was assessed using Pearson or Spearman correlation analysis based on the total scores from all questionnaires. The interpretations were categorized as follows: excellent (r=0.81–1.00), very good (r=0.61–0.80), good (r=0.41–0.60), poor (r=0.21–0.40), and weak (r=0–0.20) [23].

To evaluate potential floor and ceiling effects, the percentages of the minimum and maximum scores of the questionnaire were calculated after identifying these scores. Significant floor and ceiling effects are indicated if more than 15% of respondents score at the minimum (0 points) or maximum (90 points) levels [24].

The statistical significance value was accepted as $p<0.05$.

Results

The initial test was completed by 130 individuals, of whom 105 (80.8%) were female and 25 (19.2%) were male, with a mean age of 30.20±11.72 years. The retest was completed by 91 individuals, including 72 (79.1%) females and 19 (20.9%) males, with a mean age of 31.43±12.36 years. In the initial test group, 63 individuals (48.5%) had a diagnosis of migraine, while in the retest group, 38 individuals (41.8%) had a diagnosis of migraine. Descriptive information for both groups is provided in Table 1.

Reliability

The ICC and Cronbach's α values for the HDQ were 0.842 and 0.914, respectively, indicating good reliability. The SEM and MDC values were 5.89 and 16.33 units, respectively (Table 2). The Bland-Altman plot also supported a high level of agreement between the initial test and retest (Fig. 1). Additionally, Table 3 demonstrated that all items in the questionnaire should be included.

Validity

The EFA results revealed a two-factor structure for the HDQ. Items 1, 2, 5, 7, and 9 loaded on Factor 1, while items 3, 4, 6, and 8 loaded on Factor 2 (Table 4). Figure 2 illustrates this two-factor structure. Additionally, the CFA model plots also supported the two-factor structure (Fig. 3). The convergent validity of the HDQ was assessed by examining its relationships with HImQ, HIT-6, and MIDAS, all of which showed good levels of correlation (Table 5).

Floor and ceiling effects

Ceiling and floor effects were examined by calculating the lowest and highest scores, with both effects being found to be 0%.

Discussion

The results of this study indicate that the 9-item Turkish version of the HDQ is both valid and reliable for assessing individuals with headache complaints, whether or not they have a formal diagnosis. The Turkish version demonstrated structural validity through a two-factor model, differing from the three-factor structure identified in the original HDQ. This difference may stem from cultural and linguistic factors that influence how participants interpret and respond to the items. Such variations are common in cross-cultural adaptations of clinical tools

Table 2 Internal consistency and test-retest reliability and values of the HDQ (*n* = 91)

	ICC	SEM	MDC	Cronbach's α	Baseline mean ± SD	Retest mean ± SD	*p*
HDQ	0.842	5.89	16.33	0.914	44.00 ± 14.03	41.60 ± 15.54	0.013

ICC: Intraclass Correlation Coefficients; SEM: Standard Error Measurement; MDC: Minimal Detectable Change; SD: Standard deviation; HDQ: Headache Disability Questionnaire

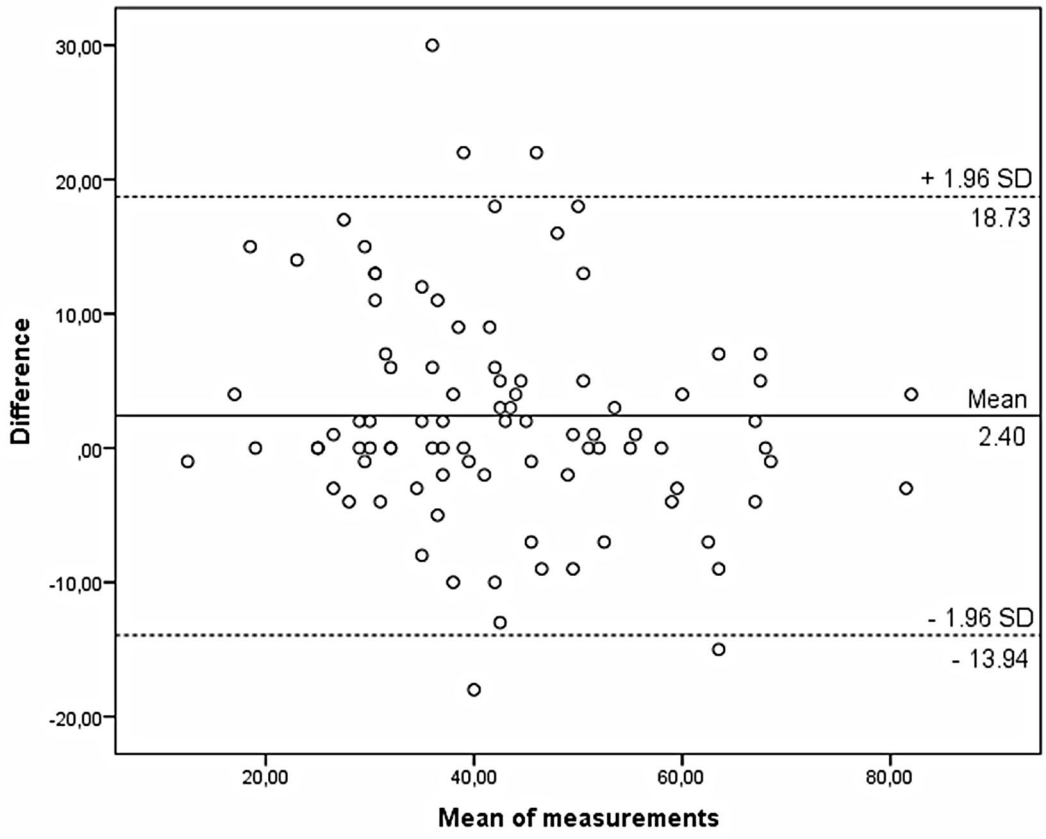

Fig. 1 Bland–Altman plots of the HDQ test-retest scores ($n = 91$)

and underscore the importance of validating instruments within their specific context.

The HDQ items differ from the five items in the MIDAS developed by Stewart et al. [8]. However, both questionnaires share four common items: missed days from work or school, missed days from household chores, and days with limited productivity in household chores/work and non-work/school activities (two items). Additionally, the HDQ comprises 9 items from the Headache Impact Questionnaire (HImQ), including [25]: pain severity, frequency of pain severity, pain-related rest/relaxation, missed days from work or school, work productivity, avoidance of household chores, productivity in household chores, missed days in non-work activities, and productivity in non-work activities. Thus, the HDQ is designed to be more practical than both the MIDAS and the HImQ, benefiting both the administrator and the respondent.

In this study, the reliability of the HDQ was rigorously evaluated using various methods, including test-retest reliability, internal consistency, SEM, MDC, and Bland-Altman plots. The scale exhibited good internal consistency, with a Cronbach's α of 0.852, higher than the original version's 0.80 [9], affirming the reliability of the Turkish HDQ. This level of internal consistency indicates that the items within the scale are coherent and contribute effectively to the overall measure. Additionally, the ICC for the Turkish version was found to be 0.842, reinforcing the test-retest reliability and demonstrating that the tool yields stable results across repeated administrations. The SEM was calculated as 5.89, reflecting the precision of individual scores, while the MDC was 16.33, suggesting that changes exceeding this threshold can be interpreted as significant and beyond measurement error. These findings collectively highlight the reliability of the Turkish HDQ and its suitability for both clinical and research applications.

The Turkish HDQ's structural validity was confirmed through EFA and supported by CFA, both of which identified a two-factor model consisting of pain intensity and activity limitation (items 1, 2, 5, 7, and 9) and activity prevention (items 3, 4, 6, and 8). This model differs from the original HDQ's three-factor structure, which included separate factors for activity limitation, activity prevention, and pain intensity. The observed two-factor structure may reflect the characteristics of the study sample, which included individuals with varying headache profiles. This highlights the importance of considering participant diversity when interpreting the results of validation studies. Convergent validity was assessed

Table 3 Item properties of the HDQ ($n = 130$)

Item	Mean	SD	Corrected item-total correlation	Cronbach's α if item deleted
1. Baş ağrınızın olağan ağrısını 0 ile 10 arasında bir skalada nasıl derecelendirirsiniz?	6.70	1.97	0.494	0.844
2. Başınız ağrıdığında, ağrı ne sıklıkla şiddetlidir?	6.25	1.94	0.479	0.846
3. Geçen ay kaç gün baş ağrınız nedeniyle bir saat veya daha fazla uzandınız?	3.71	2.33	0.527	0.841
4. Başınız ağrıdığında, günün bir kısmı veya tamamında işi (veya okulu) ne sıklıkla kaçırırsınız?	3.38	2.68	0.629	0.831
5. Çalışırken (veya okulda) başınız ağrıdığında, çalışma gücünüz ne kadar azalır?	6.04	2.29	0.667	0.828
6. Geçen ay kaç gün baş ağrınız nedeniyle günün en az yarısında ev işleri yapmaktan uzak durdunuz?	3.61	2.48	0.621	0.832
7. Başınız ağrıdığında, ev işlerini yapma gücünüz ne kadar azalır?	5.75	2.57	0.632	0.831
8. Geçen ay kaç gün baş ağrınız nedeniyle iş dışı aktivitelerden (aile, sosyal veya eğlence) uzak durdunuz?	3.59	2.42	0.525	0.842
9. Başınız ağrıdığında, iş dışı aktivitelerle (aile, sosyal veya eğlence) meşgul olma gücünüz ne kadar azalır?	5.62	2.51	0.581	0.836
Total Cronbach's α	-	-	-	0.852

SD: Standard deviation; HDQ: Headache Disability Questionnaire

Table 4 Results of factor analysis of the HDQ ($n = 130$)

Item	Factor 1	Factor 2
Q1	0.766	
Q2	0.709	
Q5	0.835	
Q7	0.713	
Q9	0.729	
Q3		0.835
Q4		0.603
Q6		0.845
Q8		0.836
Percent variance (%)	34.257	63.924

HDQ: Headache Disability Questionnaire

by comparing the Turkish HDQ with other established instruments, including the HIT-6 and MIDAS. The observed correlations with these tools were consistent with expectations and confirmed that the HDQ effectively measures headache-related disability. This finding supports the scale's use as a comprehensive and practical tool for evaluating the impact of headaches on daily life in Turkish-speaking populations.

While this study provides important insights into the validity and reliability of the Turkish HDQ, certain limitations should be acknowledged. Although the participant pool included a diverse range of individuals, it may not capture the full spectrum of headache subtypes and severities. This could influence the generalizability of the results to specific subpopulations. Furthermore, the study did not examine the sensitivity and specificity of the HDQ in differentiating between various headache types, a limitation that future studies should address to enhance the scale's diagnostic utility. The chosen test-retest interval of 7–14 days was appropriate for maintaining stability and minimizing recall bias; however, exploring alternative intervals could further verify the robustness of the tool's reliability.

Overall, this study underscores the potential of the Turkish HDQ as a reliable and valid instrument for assessing headache-related disability, offering an accessible and efficient option for clinical and research settings. Future research should focus on expanding the sample to include more diverse headache types and conducting additional analyses on diagnostic accuracy to further solidify the tool's applicability.

Conclusions

The outcomes of this study underscored the reliability and validity of the Turkish version of the HDQ for assessing the impact of headaches on individuals' daily lives. While these findings are promising, further research is essential to fully explore the scale's potential. Specifically, future studies should conduct sensitivity and specificity analyses to evaluate the HDQ's diagnostic accuracy in distinguishing different headache types. Additionally, expanding research to include various demographic and clinical subgroups would provide insight into how the HDQ performs across different populations. Longitudinal studies could also assess the tool's ability to detect changes over time and its effectiveness in monitoring treatment outcomes. These future directions would enhance the applicability of the HDQ and contribute to a deeper understanding of its utility in diverse clinical scenarios. Overall, the Turkish version of the HDQ is a valuable tool for assessing headache-related disability and has the potential to improve the clinical management of individuals with headache disorders. However, ongoing

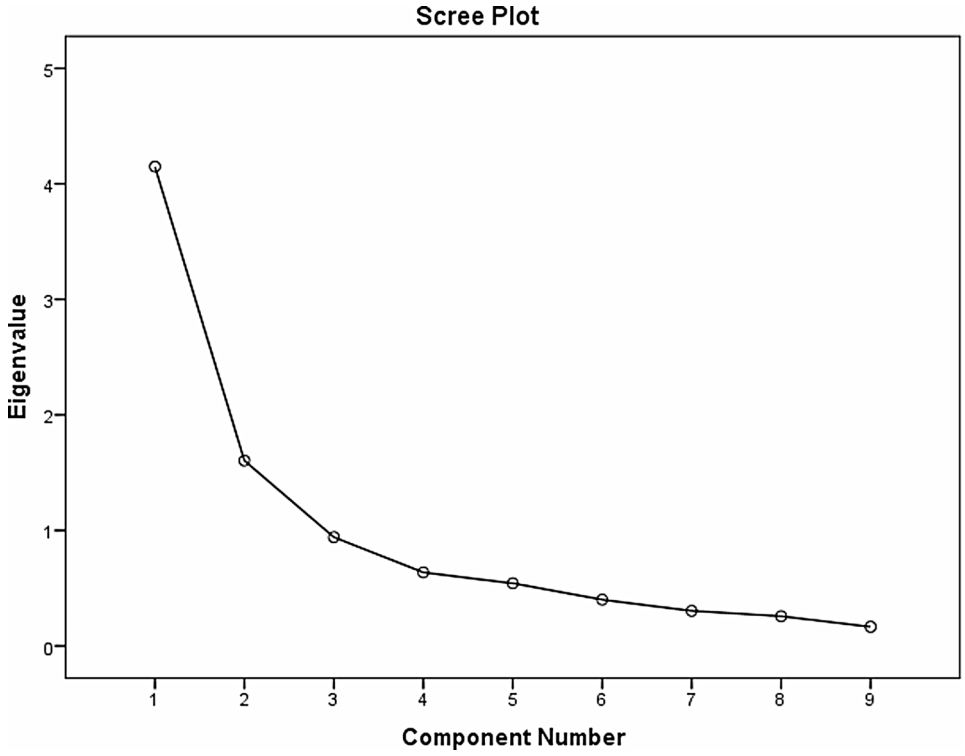

Fig. 2 Scree plot indicating an optimal 2-factor solution for the HDQ ($n=130$)

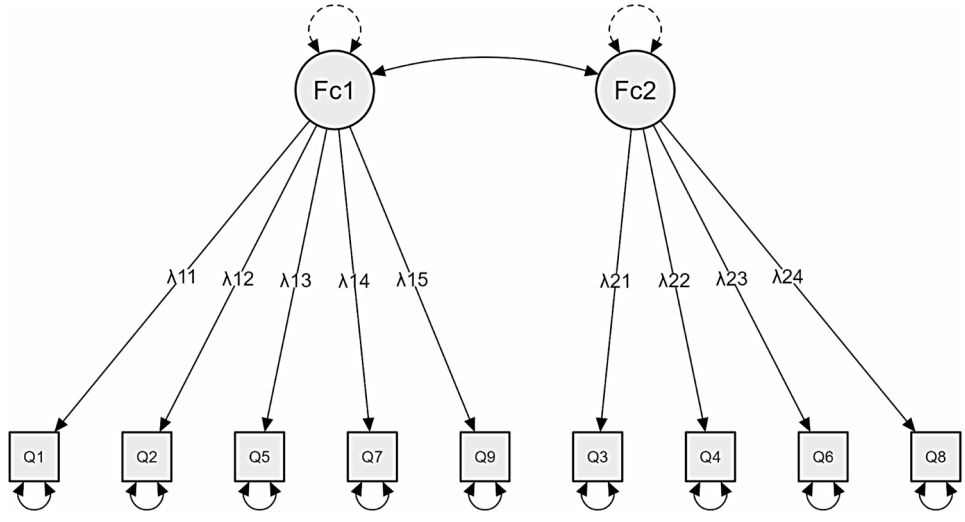

Fig. 3 The diagram illustrates the two-factor structure of the Turkish version of the HDQ ($n=130$)

Table 5 Correlations between HDQ and all other questionnaires ($n=130$)

	HIT-6	MIDAS
HDQ	0.650	0.414
r	0.000	0.000
p		

r=Correlation coefficients; p=Significance level; HDQ: Headache Disability Questionnaire; HIT-6: Headache Impact Test-6; MIDAS: Migraine Disability Assessment Scale

research is needed to further validate its use and optimize its application in comprehensive headache care.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12883-024-03987-4.

Supplementary Material 1

Supplementary Material 2

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Author contributions
HA: Concept, Design, Data collecting, Statistical analysis, Literature review, Writing, and Critical review.

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Data availability
Data can be shared by the author if requested.

Declarations

Ethics approval and consent to participate
All participants were informed about the assessments before the study, volunteered in accordance with the Helsinki Declaration, and signed the Informed Consent Form. Approval and permission were obtained from the Tokat Gaziosmanpaşa University Faculty of Medicine Ethics Committee for Clinical Investigations (22 September 2022 – decision no.: 83116987-569).

Consent for publication
None.

Competing interests
The authors declare no competing interests.

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