

Assessment of Head Awareness in Patients with Chronic Migraine Using the Fremantle Headache Awareness Questionnaire: Turkish Version, Validity, and Reliability Study

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ABSTRACT

Introduction: In chronic migraine (CM), patient-reported outcome measures (PROMs) are important, as headaches may be related to impaired proprioception and somatic bodily awareness in the chronicity. This study aimed to adapt the Fremantle Headache Awareness Questionnaire (FreHAQ) to Turkish.

Methods: Patients aged 18-70 were included in the study. After cross-cultural adaptation of the questionnaire, demographic-clinical information was recorded. Numeric Pain Rating Scale (NPRS), Migraine Disability Assessment (MIDAS), Headache Impact Test-6 (HIT-6), Hospital Anxiety and Depression Scale (HADS), Pain Catastrophizing Scale (PCS) and FreHAQ were evaluated for structural validity. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were also performed. Intraclass Correlation Coefficient (ICC) and Cronbach's α values were calculated for reliability.

Results: A total of 180 patients (mean age was 39.94±13.14 years) were included. Headache attacks occurred 17.12±4.53days/month, with 7.57±2.1 intensity. Item-

total correlations ranged from 0.079 to 0.673. Cronbach's α value was above 0.811. FreHAQ had good test-retest reliability (ICC=0.851, n=73) and high internal consistency (Cronbach's α =0.919). The absence of a significant difference between baseline and retest scores (p=0.06) supported the temporal stability of FreHAQ. FreHAQ correlated with NPRS, MIDAS, HIT-6, HADS, and PCS (p<0.01). EFA identified a two-factor structure, explaining 56.98% of the variance (proprioceptive-motor awareness (items 1-6,9) and shape-size awareness of the head (items 7,8)). CFA showed acceptable model fit.

Conclusion: The Turkish version of FreHAQ is a valid and reliable tool to assess perceptual impairments in CM and is significantly associated with psychosocial factors. Monitoring body awareness in chronic headache can be important for PROMs.

Keywords: Awareness, chronic pain, migraine, somatosensory, disability, psychometric

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INTRODUCTION

In the psychomotor domain, body awareness relates to consciousness of mental, emotional, and physical activity, while in neurophysiology, it is linked to proprioceptive and interoceptive sensations (1). The brain perceives internal and external stimuli, which over time become experiences, learned patterns, and habits. Initially processed consciously via the pyramidal system, this information shifts to unconscious behaviors controlled by the extrapyramidal system as it becomes habitual. Therefore, body awareness encompasses body consciousness, body management, and body experiences, enabling an individual to perceive their body and surroundings through internal and external stimuli (1, 2).

Wand et al. proposed a model suggesting cognitive and behavioral changes, along with structural and functional alterations in the central nervous system (CNS), in individuals with low back pain (LBP). Incorrect neuroplastic changes may contribute to LBP and its future consequences. Changes in the central nervous system may enhance nociceptive activity, affecting conscious and attentive arousal, thereby increasing pain and prolonging disability. As a result, an unconscious awareness develops while conscious perception deteriorates. Given that pain serves as a signal to protect the body, the conscious awareness of pain is crucial for developing body awareness (3, 4).

Highlights

- Turkish FreHAQ is valid and reliable in patients with chronic migraine.
- FreHAQ correlates with pain, disability, emotional distress, and catastrophizing.
- Using FreHAQ in clinics may improve strategies for body image-related care.

Several studies have demonstrated that in chronic pain conditions, alterations in body awareness are associated with painful body regions and that these disruptions further exacerbate chronic pain. For example, in disorders affecting the neck or lower back, pain can lead to sensory-motor dysfunctions due to impaired sensory input and the compensatory shift of deep muscle function to superficial muscles (5). These issues may cause abnormal perception of size, position, and movement of the affected body region due to asymmetry, tension, or dysfunction. To address problems such as pain, stress, asymmetry, and impaired position-movement perception, physiotherapists must assess, treat, and enhance body awareness at a conscious level, incorporating both internal and external body awareness (6-10). However, there is a lack of studies in the literature specifically focusing on headache awareness. Radiological studies confirm cortical changes (11-13), but there is a gap in methods that evaluate individuals both psychologically and verbally in clinics through subjective assessments. These types of evaluations often face cost and time constraints that limit their use. Therefore, a rapid and practical assessment method could be useful in clinical practice.

To our knowledge, no studies have evaluated perceptual levels and nociceptive awareness in chronic migraine (CM). The “Fremantle Headache Awareness Questionnaire,” (FreHAQ) adapted from its back-focused version, could serve as a practical clinical tool for objectively assessing treatment effectiveness. The first version of the Fremantle Awareness Questionnaire was developed for the back (3), and later neck (8, 14, 15), back (16-24), shoulder (25, 26) and knee (27-28) versions were studied. Validating this questionnaire in the Turkish population may offer an effective way to assess body perception and nociceptive awareness in CM patients, contributing to treatment programs that improve head and headache perception. This study aims to investigate the psychometric properties of the questionnaire and explore potential relationships between body perception, nociceptive sensitivity, and headache-related beliefs in Turkish-speaking CM patients.

METHODS

Study Design and Ethical Approval

This study was designed as a prospective, cross-sectional descriptive study and conducted between January 2025 - May 2025. Patients were enrolled at the Department of Neurology of Mersin University Faculty of Medicine and the Department of Neurology of Gazi University Faculty of Medicine, Department of Neurology of Zonguldak Bülent Ecevit University, Department of Neurology of Kütahya Health Sciences University, Department of Neurology of Gaziantep City Hospital, Department of Neurology of Silivri State Hospital, and Elite Research and Surgery Hospital.

Ethical approval was obtained from the Clinical Research Ethics Committee of Yozgat Bozok University Faculty of Medicine on 07.10.2024 with the approval number 2024-GOKAEK-2411_2024.10.16_191. The study was registered with ClinicalTrials.gov (NCT06857383). Informed consent was

obtained from all participants before their inclusion in the study. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki, ensuring the protection of participants' rights, safety, and well-being throughout the research process.

Participants and Eligibility Criteria

This study included one-hundred and eighty patients with CM. The inclusion criteria for the study were that all participants were diagnosed with CM by a neurologist specializing in headache disorders according to the International Classification of Headache Disorders, 3rd Edition (ICHD-3) (29), were between the ages of 18 and 70, and had the ability to read, write, speak, and understand Turkish to ensure accurate completion of the assessment tools. Participants were excluded if they had any other primary or secondary headache disorder besides CM, malignant conditions, neck or low back pain, pregnancy, or functional impairment from neurological or systemic diseases. Additionally, those who had recent surgery (within six months), acute infection, unhealed fractures, psychiatric disorders, were illiterate in Turkish, or refused to participate were excluded.

During the study, patients diagnosed with CM were informed about the study protocol during their clinic visit. Those who agreed to participate were required to sign an informed consent form before any data collection began.

Translation and Cultural Adaptation

The adaptation and translation processes of the FreHAQ were carried out following the guidelines proposed by Beaton et al. (30).

1. For translation and adaptation of the FreHAQ, permission was obtained from the original author.
2. Two independent translators (one physiotherapist and one linguist) translated the questionnaire into Turkish.
3. The translators created a harmonized Turkish version.
4. Two native English speakers with proficiency in Turkish then back-translated the questionnaire.
5. A committee of one physiotherapist, one linguist, and two sworn translators reviewed the translations for conceptual equivalence.
6. A pilot study was conducted to assess comprehension.

Outcome Measures

Demographic and Clinical Information Form

Sociodemographic and clinical data related to CM, such as gender, age, weight, height, diagnosis times, migraine triggers, symptoms, frequency, and duration, were collected with the demographic form.

Numeric Pain Rating Scale

The Numeric Pain Rating Scale (NPRS) is an assessment of pain intensity in which participants are asked to indicate the number representing the pain they are experiencing at the time of assessment; “no pain = 0” (left) and “worst pain = 10” (right) (31).

Migraine Disability Assessment Scale (MIDAS)

The MIDAS assessed migraine-related disability in the past three months in terms of work/school performance, household chores, family, social, and leisure activities. A higher score indicates increasing disability. The validity and reliability of the Turkish version were confirmed by Ertaş et al. (32).

Headache Impact Test-6 (HIT-6)

The HIT-6 assessed the impact of headaches on various aspects of life,

including vitality, pain, psychological distress, social functioning, role functioning, and cognitive function. The total score ranges from 36 to 78, with a higher score indicating a greater negative impact of headaches. The Turkish validity and reliability study was conducted by Dikmen et al. (33).

Hospital Anxiety and Depression Scale (HADS)

The HADS, which consists of 14 items (7 for anxiety, 7 for depression), assessed anxiety and depression. The total score for each subscale ranges from 0 to 21. Its Turkish adaptation was validated by Aydemir et al. (34)

Pain Catastrophizing Scale (PCS)

The PCS, which consists of 13 items scored from 0 (never) to 4 (always), with a total score of 0 to 52, assessed negative thoughts and feelings about pain. Higher scores indicate greater pain catastrophizing. The Turkish validity and reliability study was conducted by Uğurlu et al. (35)

Fremantle Headache Awareness Questionnaire (FreHAQ)

The FreHAQ is a 9-item Likert-type questionnaire assessing perceptual distortions related to the head and headaches. Each item is rated from 0 (Never) to 4 (Always). The original Fremantle Back Awareness Questionnaire was developed by Wand et al. (3). The retest FreHAQ was administered one week after the first FreHAQ (Supplement).

Sample Size and Statistical Analysis

Based on previous studies, the required sample size was set at 90 participants, following the standard rule of 10 times the number of questionnaire items (9 items × 10 = 90 participants). Since the questionnaire consists of 9 items, the minimum sample size will be 90 participants [8, 15, 36].

Statistical analyses were conducted using the Statistical Package for the Social Sciences version 22.0 (SPSS® 22.0, Chicago, Illinois, USA). Confirmatory Factor Analysis (CFA) was performed using JASP (version 0.19.2).

The reliability of the Turkish version of the FreHAQ was determined by assessing test-retest reliability and internal consistency. For these purposes, the Intraclass Correlation Coefficient (ICC) and Cronbach’s α values were calculated, respectively. An ICC greater than 0.75 and a Cronbach’s α greater than 0.80 are considered indicative of good reliability (36). A Bland-Altman plot was drawn to demonstrate the agreement between the measurements. In addition, the Standard Error of Measurement (SEM) and the Minimal Detectable Change (MDC)—which are other indicators of reliability and repeatability—were calculated using the following formulas (36):

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

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

Validity was assessed through content validity, face validity, construct validity, and structural validity. Structural validity was evaluated by examining the correlations between FreHAQ and NPRS, MIDAS, HIT-6, HADS, and PCS. Correlation coefficient values were interpreted as follows: 0.81–1.00 (excellent), 0.61–0.80 (very good), 0.41–0.60 (good), 0.21–0.40 (fair), and <0.20 (poor) (37). Both Exploratory Factor Analysis (EFA) and CFA were conducted for the assessment of structural validity. For EFA, the required criteria included a Kaiser-Meyer-Olkin (KMO) value greater than 0.50, a significant Bartlett’s Test of Sphericity (BTS) with $p < 0.05$, eigenvalues greater than 1, and factor loadings exceeding 0.40. Acceptable thresholds and the obtained values for model fit indices in CFA included the following: Chi-square/degree of freedom ratio (CMIN/

DF) (acceptable: <5, good: <3), Root Mean Square Error of Approximation (RMSEA) (good: < 0.08, moderate: 0.08–0.10, poor: > 0.10), Goodness-of-Fit Index (GFI: 0.90–0.95), Comparative Fit Index (CFI: 0.80–0.90), Normed Fit Index (NFI: 0.80–0.95), Standardized Root Mean Square Residual (SRMR: 0.05–0.10), Incremental Fit Index (IFI: > 0.80), and Parsimony-Adjusted Measures Index (PNFI: >0.50) (38). To assess floor and ceiling effects, the minimum and maximum scores of FreHAQ were identified, and their percentages were calculated. Floor or ceiling effects were considered absent if the rate of participants with minimum or maximum scores was less than 15% (39). A significance level of 0.05 was adopted for all statistical analyses.

RESULTS

The participants had a mean age of 39.94±13.14 years. They reported frequent headache episodes, averaging approximately 17.12±4.53 headache days and 7 attacks per month, with an average attack duration of 31.49 hours and moderate to severe pain levels (Table 1).

All items of the FreHAQ showed corrected item-total correlations, ranging from 0.079 to 0.694. Cronbach’s α values, calculated with each item deleted, remained below 0.811 (except for item 8), supporting the internal consistency of the scale and indicating that no single item significantly detracted from the overall reliability (Table 2).

The FreHAQ demonstrated good test-retest reliability (ICC = 0.851) and high internal consistency (Cronbach’s α = 0.919). The absence of a significant difference between baseline and retest scores ($p = 0.068$) further supports the temporal stability of the questionnaire (Table 3).

Table 4 presents the item-level distribution of responses and descriptive statistics for the FreHAQ. Among the nine items, the highest mean score was observed in Item 1 (mean = 2.89, SD = 1.08), followed by Item 2 (mean = 2.51, SD = 1.17). Conversely, Item 9 had the lowest mean score (mean = 1.19, SD = 1.28). The total FreHAQ score had a mean of 18.11 (SD = 7.37) and a median of 18.00 (IQR = 30.00).

The FreHAQ total score was significantly and positively weak to moderately correlated with MIDAS, HIT-6, HADS-Anxiety, HADS-Depression, and PCS scores ($p < 0.05$), suggesting that the FreHAQ is more closely associated with psychosocial factors than headache-related disability (Table 5).

Exploratory factor analysis revealed a two-factor structure explaining 56.983% of the total variance. Items 1 to 6 and 9 loaded strongly on the first factor, while items 7 and 8 formed a second factor, indicating a multidimensional construct underlying the Turkish version of the FreHAQ (Table 6) (Figure 1).

Table 1. Demographic and clinical characteristics of the participants (n= 180)

	Mean ± SD
Age (years)	39.94 ± 13.14
Weight (kg)	70.07 ± 12.83
Height (m)	1.65±0.087
BMI (kg/m2)	25.69 ± 4.48
Number of painkillers taken during an attack	2.66 ± 3.86
Number of headache days in a month	17.12 ± 4.53
Number of headache attacks in a month	6.73 ± 6.56
Headache attack duration (hours)	31.49 ± 33.15
Headache intensity (NPRS)	7.57 ± 2.10
Neck pain intensity (NPRS) (n=152)	6.97 ± 2.31

SD: Standard deviation; kg: kilogramme; m: meter; NPRS: Numeric Pain Rating Scale

Table 2. Mean scores, corrected item-total correlations, and Cronbach's α if item deleted results for the FreHAQ (n=180)

Item	Mean	SD	Corrected-item total correlation	Cronbach's α if the item is deleted
1	2.89	1.05	0.518	0.792
2	2.45	1.23	0.553	0.787
3	1.74	1.42	0.673	0.769
4	2.01	1.32	0.643	0.774
5	1.74	1.39	0.606	0.779
6	1.89	1.30	0.694	0.768
7	1.98	1.43	0.362	0.811
8	2.04	1.44	0.079	0.846
9	1.24	1.34	0.537	0.788
Cronbach's α total FreHAQ score				0.811

FreHAQ: Fremantle Headache Awareness Questionnaire; SD: Standard deviation

Table 3. Test-retest reliability and internal consistency of the FreHAQ (n= 73)

	Baseline Mean \pm SD	Retest Mean \pm SD	p	Test-retest (ICC and 95% CI)	SEM	MDC	Internal consistency (Cronbach's α)
FREHAQ	18.11 \pm 7.37	17.25 \pm 7.20	0.068	0.851 (0.772-0.904)	2.81	7.80	0.919

FreHAQ: Fremantle Headache Awareness Questionnaire; SD: Standard deviation; ICC: Intraclass Correlation Coefficient; CI: Confidence Interval; SEM: Standar Error Measurement; MDC: Minimal Detectable Change

Table 4. Response percent frequencies per item and mean \pm SD scores per item and total of the FreHAQ (n= 180)

Item	Never (%)	Rarely (%)	Occasionally (%)	Often (%)	Always (%)	Mean \pm SD	Median (IQR)
1	2.7	6.8	26.0	27.4	37.0	2.89 \pm 1.08	3.00 (4.00)
2	4.1	16.4	30.1	23.3	26.0	2.51 \pm 1.17	2.00 (4.00)
3	19.2	23.3	20.5	20.5	16.4	1.92 \pm 1.37	2.00 (4.00)
4	15.1	15.1	35.6	20.5	13.7	2.03 \pm 1.24	2.00 (4.00)
5	23.3	26.0	19.2	16.4	15.1	1.74 \pm 1.39	2.00 (4.00)
6	17.8	26.0	27.4	16.4	12.3	1.80 \pm 1.27	2.00 (4.00)
7	16.4	20.5	26.0	20.5	16.4	2.00 \pm 1.32	2.00 (4.00)
8	21.9	12.3	23.3	24.7	17.8	2.04 \pm 1.41	2.00 (4.00)
9	43.8	16.4	21.9	12.3	5.5	1.19 \pm 1.28	1.00 (4.00)
Total score						18.11 \pm 7.37	18.00 (30.00)

SD: Standard deviation; IQR: Interquartile range

Table 5. Correlations between FreHAQ and other questionnaires (n= 180)

	NPRS [§]	MIDAS [§]	HIT-6 [§]	HADS-Anxiety [§]	HAD-Depression [§]	PCS [§]
r	0.198	0.192	0.261	0.321	0.277	0.361
p	0.008	0.010	0.000	0.000	0.000	0.000

§: Spearman Correlation Analysis; §: Pearson Correlation Analysis; FreHAQ: Fremantle Headache Awareness Questionnaire; NPRS: Numeric Pain Rating Scale; MIDAS: Migraine Disability Assessment; HIT-6: Headache Impact Test-6; HADS: Hospital Anxiety and Depression Scale; PCS: Pain Catastrophizing Scale

Confirmatory factor analysis indicated an acceptable model fit, with CMIN/DF = 4.28, SRMR = 0.066, CFI = 0.91, NFI = 0.88, and IFI = 0.91. However, RMSEA (0.14), GFI (0.87), and PNFI (0.64) fell outside optimal ranges, suggesting that while the model is generally adequate, further refinement may be required to improve fit (Table 7) (Figure 2).

DISCUSSION

This study aimed to analyze the validity and reliability of the Turkish

version of the Fremantle Headache Awareness Questionnaire (FreHAQ) in individuals with chronic migraine. While other versions of the questionnaire were on spine pain, shoulder pain, and knee pain, our study is the first study on headache. The Turkish version of the FreHAQ had high internal consistency, good reliability over time, and construct validity. The results showed that the questionnaire was correlated with disability, anxiety, depression, pain catastrophizing, and headache impact. According to these correlations, the questionnaire was more strongly associated with psychosocial factors than disability.

Table 6. Exploratory factor analysis results for the Turkish version of the FreHAQ (n=180)

	Factor 1	Factor 2
1	0.632	
2	0.681	
3	0.782	
4	0.763	
5	0.737	
6	0.793	
9	0.630	
7		-0.596
8		0.904
Percent variance (%)	43.269	56.983

FreHAQ: Fremantle Headache Awareness Questionnaire; Kaiser-Meyer-Olkin measure of sampling adequacy: 0.799; Bartlett's Test of Sphericity Approx. Chi-Square: 576.717 (p= 0.000)

Table 7. Fit indices as a result of the FreHAQ's confirmatory factor analysis (n= 180)

	Acceptable value range	The value obtained
CMIN/DF (χ^2/df)	İyi 3 > and 5 > kabul edilebilir	(111.31/26) 4.28
RMSEA	İyi 0.08 >, orta 0.1-0.08 ve zayıf 0.1 <	0.14
GFI	0.90 ≤ GFI < 0.95	0.87
CFI	0.80 ≤ CFI ≤ 0.90	0.91
NFI	0.80 ≤ NFI ≤ 0.95	0.88
SRMR	0.05 < SRMR ≤ 0.10	0.066
IFI	0.80 < IFI	0.91
PNFI	0.90 < PNFI	0.64

CMIN/df: Relative Chi-square; RMSEA: Root Mean Square Error of Approximation; GFI: Goodness of Fit Index; CFI: Comparative Fit Index; NFI: Normed Fit Index; SRMR: Standardized Root Mean Square Residual; IFI: Incremental Fit Index; PNFI: Parsimonious Normed Fit Index

The internal consistency of the scale was found to be high (Cronbach's alpha = 0.919), a value consistent with previous versions of the questionnaire adapted for different populations in the neck (8, 14, 15), back (3, 16-24), knee (27-28) ve shoulder (25, 26) regions.

Corrected item-total correlations ranged from 0.079 to 0.694. Although most items were within the acceptable range, the low correlation values of some items, especially item 8, suggest that these items do not overlap sufficiently with the total scale. On the other hand, the fact that item 7 contains opposite expressions, such as "I feel my head expanded," and item 8 contains opposite expressions, such as "I feel my head shrunk," may cause individuals to exclude item 8 when they select item 7, resulting in low correlations in item 8 due to the general perception of expansion. In addition, the removal of no item significantly increased Cronbach's alpha, which supports the overall integrity of the scale.

Test-retest reliability was found to be high (ICC = 0.851), and there was no significant difference between test-retest applications. Thus, the scale is stable over time. In addition, the ICC value is consistent with the ICC values of different versions of the questionnaire previously adapted for the neck (8, 14, 15), back (3, 16-24), knee (27-28) ve shoulder (25, 26) regions in different populations. In conclusion, the FreHAQ reliably measures headache awareness in CM patients.

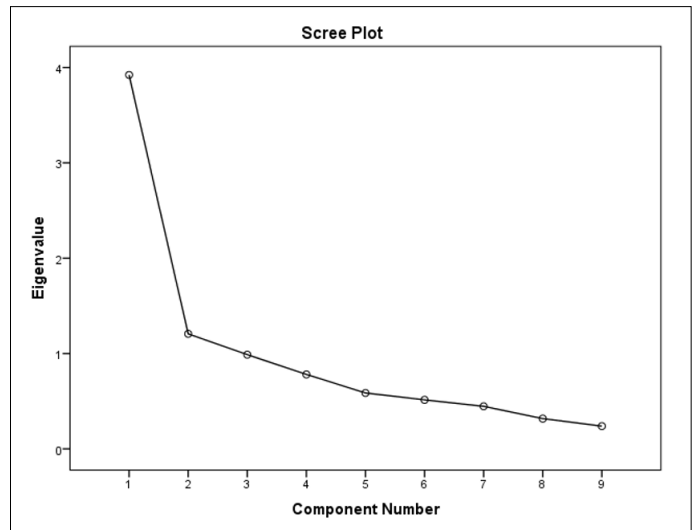


Figure 1. Scree plot of the Turkish version of the FreHAQ (n=180)

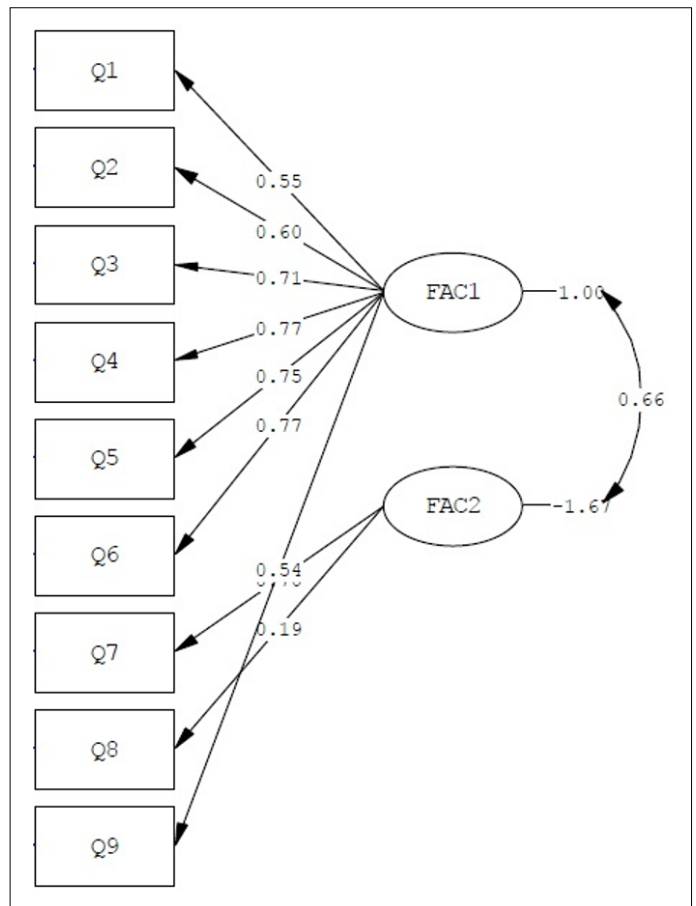


Figure 2. Diagram of the Turkish version of the FreHAQ according to CFA (n=180)

Exploratory factor analysis revealed a two-factor structure explaining 56.98% of the total variance. Items 1-6 and 9 loaded on the first factor, while items 7 and 8 loaded on the second factor. With this two-dimensional structure, we can consider that the questionnaire is compatible with the theoretical foundations of headache awareness. We interpreted items 1-6 and 9 as items related to proprioceptive and motor awareness of the head (head movement, perception of position in space), and items 7-8 as items pertaining to shape-size awareness of the head

(feeling my head enlarged or shrunken). Although it is not possible to compare the results since there is no validation study on headache in the literature, when the neck region, which is close to the head region, is considered, a one-dimensional structure was revealed in the Japanese and Turkish versions (8, 14) and a one-dimensional structure was revealed in the Greek version with the first 6 items (15). In previous shoulder and back studies, the first 3 items were interpreted as cognitive and motor neglect, items 4, 5 as proprioceptive awareness, and items 6, 7, 8, and 9 as impaired size-shape perception (25, 26, 40). We think that awareness of body parts may differ depending on the pain experienced, disability, and psychosocial conditions. Therefore, in our study, interpreting items 1–6 and 9 as items related to proprioceptive and motor awareness of the head (head movement, perception of position in space), and items 7–8 as items pertaining to shape-size awareness of the head (I feel my head enlarged-shrunken), may provide an insight into the similarities and differences in pain perception in headache and back pain.

Weak to moderately significant positive correlations were found between the total FreHAQ score and the headache pain intensity (NPRS), disability (MIDAS), headache impact (HIT-6), psychological status (HADS-Anxiety, HADS-Depression), and pain catastrophizing (PCS) scales. The correlation coefficient between disability and headache awareness was lower than that of the other variables. Moderate correlations were observed with disability awareness scores in the neck versions. However, one reason for these results may be that while the Neck Disability Index provides clear scores in terms of scoring (8, 14, 15), the MIDAS scores are somewhat more dependent on daily recall, which may have caused the correlation to be lower. Another reason may be that disability is less blunted by awareness in headache than by psychosocial factors. These findings suggest that the FreHAQ is more closely related to the psychosocial processes associated with headache than to the direct clinical features of headache. This may indicate that the concept of pain awareness includes cognitive-emotional representations related to the way an individual perceives and interprets a headache. Considering the course of chronic pain and migraine pathophysiology, our results indicate that good management of quality of life and psychosocial changes that may aggravate patients' symptoms play an important role in headache awareness (41). Patient-reported outcome measures (PROMs) provide essential information about the disease, and valid and reliable methods are frequently used by clinicians and researchers (42). Therefore, multidimensional evaluation of these variables and role players is essential for clinicians and researchers (15, 42). It is known that there are functional and structural changes in the brain following long-term chronic painful conditions. The somatosensory cortex is one of the structures affected in chronic painful conditions including migraine (43). It has been assumed that migraine patients show worse tactile acuity similar to other chronic pain populations and that this is due to structural and functional reorganization of the somatosensory cortex (44). In CM patients, laser thermal stimulation (LEPS) amplitude was reduced according to perceived stimulus intensity compared to healthy individuals and the expected decrease in LEPS amplitude was not observed when attention was distracted with a task. Therefore, pain signals are processed abnormally at the cortical level in CM patients and the inability of distracting tasks to suppress pain responses suggests that the flexibility of pain processing mechanisms in individuals with migraine is reduced (45). Kim et al. It was reported that somatosensory cortex thickening was positively correlated with the duration of migraine disease and headache frequency (46). In addition, decreased beta connections in pain-related cortical regions in migraine patients have been associated with chronicity of the process (47). The nature of pain also includes exaggerating and perceiving pain as too negative, i.e., catastrophizing it. In a systematic review examining MRI studies, pain catastrophizing was associated with structural and functional changes in brain regions such as the somatosensory cortices, anterior insula, anterior cingulate cortex, thalamus, and dorsolateral prefrontal cortex, which are related to pain

perception and modulation (48). The constant experience of pain in patients with chronic pain may cause these effects to become permanent in the brain (48). The continuous experience of pain in patients with chronic pain may cause these effects to become permanent in the brain (49). They explained the altered sensory experiences reported between migraine attacks in this way (49). Therefore, structural and functional somatosensory cortex changes in chronic migraine patients may play a role in the perception and processing of pain, causing the process to become chronic and, secondarily, complicating relationships with psychosocial factors (49). Proprioceptive-motor shape awareness disorders that may occur with the impairment of perceptual processes will require significant evaluation in the management of symptoms and chronicity. Our survey results support the literature studies and indicate that head awareness in chronic migraine patients should be addressed with psychosocial processes.

On the other hand, confirmatory factor analysis results showed a mixed fit table. Although CFI (0.91), IFI (0.91), and SRMR (0.066) values were at acceptable levels, some fit indices, such as RMSEA (0.14), GFI (0.87), and PNFI (0.64), were outside the recommended limits. Especially, the high RMSEA value suggests that there may be a possible incompatibility in the model and indicates that the factor structure or item contents should be reconsidered.

A review and meta-analysis of PROMs, commonly used in headache disorders, identified MIDAS, Pediatric MIDAS, HIT-6, Visual Analog Scale, The WHO Disability Assessment Schedule, and Headache-Disability Inventory as the most frequently used methods (50). While the use of these PROMs in clinics and research offers advantages such as providing rapid, objective, standardized, universal, and aggregated data-interpretable results, some drawbacks are also noteworthy in their real-world use in hospitals, clinics, and research. These outcome measures may have limited capacity to fully reflect patients' subjective emotional states and experiences of the symptoms of the investigated disorder. Factors such as the fluctuating course of pain, its susceptibility to psychosocial factors, individual differences in pain awareness and perception, attentional abilities (such as patients giving different answers to the same question within minutes), difficulties with retrospective recall, educational levels, and difficulty interpreting questions, all contribute to the reliability of these measures. Therefore, validated questionnaires and their accurate interpretation are needed. Because these PROMs assess different aspects of headache disorders, none of them objectively reflects the full spectrum of headache disorders. Therefore, multiple PROMs may need to be interpreted together. Because improvements in treatment outcomes are often assessed individually, it is also important to monitor actual clinical improvement (50).

Some of the obtained limiting findings should also be taken into consideration. Especially, the low performance of item 8 and the high RMSEA value indicate that some of the scale items may not be clear in terms of content. Therefore, it is recommended that some items (especially item 8) be revised conceptually and improvements be made to increase model fit. Kinesiophobia correlation was also addressed in other studies. It is essential to address fear of movement in terms of awareness in motor control and proprioception. There were moderate-to-high correlations in different versions. Migraine is a disease that can be triggered by physical activity. We could not evaluate kinesiophobia in our study because no valid and reliable questionnaire evaluates fear of movement on migraine. We did not include general fear of movement questionnaires in the evaluation because we thought that they would not contain questions appropriate to the nature of migraine. Therefore they may not yield accurate results. Finally, since it was the first questionnaire that evaluated awareness of headache, the existing results were limited in terms of interpreting our results. Therefore, we interpreted our study by examining the neck and back pain studies.

In future studies, it will be essential to conduct FreHAQ in different populations and to consider the results in their entirety cross-cultural validation studies will provide valid and reliable results to researchers and clinicians in terms of PROM results in the evaluation, treatment, and follow-up processes, they will be crucial. We believe that reporting patient feedback results related to body awareness will play an essential role in the management of chronic pain and will help to address and interpret awareness in different ways in different body regions. Additionally, future studies can guide treatment approaches according to the results. Approaches such as exercises, body awareness studies, and mindfulness targeting awareness may be beneficial.

CONCLUSION

In conclusion, the Turkish version of the FreHAQ appears to be a valid and reliable tool for assessing headache awareness in patients with chronic migraine. Our results represent the first step towards future studies, as they are currently the first tool to assess body awareness related to headache. However, adjustments to some items and factor structure of the scale may further improve the psychometric performance of the scale and enable it to be used more widely and effectively in both clinical and research settings.

SUPPLEMENTARY

https://www.noropsikiyatriarsivi.com/uploads/NPA_29190_EN_SUPPL.pdf

Ethics approval: Ethical approval was obtained from the Clinical Research Ethics Committee of Yozgat Bozok University Faculty of Medicine on 07.10.2024 with the approval number 2024-GOKAEK-2411_2024.10.16_191. The study was registered with ClinicalTrials.gov (NCT06857383).

Informed Consent: Informed consent was obtained from all participants before their inclusion in the study. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki, ensuring the protection of participants' rights, safety, and well-being throughout the research process.

Conflict of Interest: The authors declare no conflict of interest.

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