

## Research Paper

# Validity and Reliability of the Turkish Version of the Mig-Scog Scale in Migraine Patients

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### ABSTRACT

**Objectives:** This study assesses the validity and reliability of the Turkish version of the Mig-SCog scale used to determine and monitor the cognitive functions of migraine patients during attacks. **Methods:** After completion of the translation process, for this validity and reliability study the Mig-SCog was administered to a total of 154 migraine patients (91 without aura, 32 with aura, and 31 chronic migraine patients) presenting to the Neurology Clinic of İstanbul Medipol University. Internal consistency of the factors and the instrument as a whole were evaluated using Cronbach's alpha coefficient and an alpha value >0.60 was considered acceptable. **Results:** As in the original, the result of factor analysis found a good fit for a 4-factor structure of the Turkish version (KMO = 0.82 and Chi-square  $P = 0.409$ ), and the factor structure was similar to the original. The factors of the instrument were evaluated as consistent (Cronbach's alpha >0.60), and an overall Cronbach's alpha of 0.8485 was calculated. **Conclusions:** The Mig-SCog showed sufficient validity and reliability to be used in Turkish society.

**KEYWORDS:** Burden of migraine, cognitive, migraine

## INTRODUCTION

Migraine is a common disease affecting millions of people worldwide. In American society, an overall prevalence of 14.6% was determined (20.2% in women, 9.4% in men),<sup>[1]</sup> while a study carried out in Turkey found a migraine prevalence of 12.4%.<sup>[2]</sup> The condition particularly affects young and active adults, causing a loss of labor and constituting a significant economic burden for health-care systems. The impairment of cognitive function associated with migraine attacks leads to a reduction in patients' performance at the workplace, in school, and during other activities. Therefore, there is a serious clinical impact regarding migraine-related disability and the loss of workforce.<sup>[3,4]</sup> Before and during migraine attacks, many patients complain not only about pain but also about cognitive deterioration,<sup>[5]</sup> including increased reaction time, attention deficit, impaired concentration and visuospatial processing, episodic memory deficits, and problems with verbal learning.<sup>[6]</sup> In addition, other reasons (sleeping quality, comorbid depression, and anxiety) may have an effect on the impairment of cognitive

functions in migraine.<sup>[7]</sup> Patients report that treatment applied during attacks resolves pain and nausea, while cognitive problems persist. Even though the pain during the attack may stop, ongoing cognitive effects in migraine cause disability.<sup>[8,9]</sup>

Effective attack treatment in migraine means improvement of cognitive impairment with pain. To determine and monitor patients' cognitive state during an attack, in 2011 Gil-Gouveia *et al.* developed the Mig-SCog scale. This scale is a patient-centered, illness-related, self-administered instrument not requiring any education beyond literacy that can be used quickly and is easy to understand and offers intercultural applicability.<sup>[10,11]</sup> As there was no Turkish version of the scale available previously, aim of the present study was to perform a Turkish validity and reliability study in Turkey.

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## METHODS

After corresponding electronically with one of the original authors of the instrument, Dr. Raquel Gil-Gouveia, we received permission for this study. Subsequently to getting the author's permission, we obtained approval from the Ethics Committee of XXX University's Medical Faculty. The ensuing steps were carried out in the following order:

1. The Mig-SCog questionnaire was translated to Turkish independently by two translators who had no connection with the clinical topic. Afterward, the two translators discussed a final version of the translation
2. The meaning of individual terms was checked by a member of the study group, Prof. Dr. AO, specialist in neurology and headache
3. The Turkish text was retranslated to English by a language expert with no connection to the clinical topic and without knowledge of the original text
4. This translation was examined by an expert group consisting of at least one study group member for each aspect of the research topic, a language expert, and a specialist who knew the sociocultural specificities of the study population
5. The final Turkish version emerging from the results of comparing translation and back-translation was administered to 30 volunteers who had given written consent. Thoughts of the target group, such as "what is this question supposed to mean" or "is the meaning of this question understood correctly?" were evaluated
6. As the Mig-SCog questionnaire contains nine variables, it was decided to administer the test to at least 90 individuals to reach a sufficient strength for statistical evaluation (The number of participants was determined by statistical methods and a literature review with the recommendation of a biostatistics specialist). In total, the measure was administered to 154 migraine patients
7. The resulting data were assessed with factor analysis. The reliability and validity of the scale were determined with Cronbach's alpha, test-retest, split-half, and item-total correlation methods. Statistical analyses were carried out using R 3.5.0 (R Core Team, 2018) and TIBCO Statistica 13.5.0 (TIBCO Software, 2018 (CA, USA))
8. Participants were selected randomly by computer among patients receiving a definitive diagnosis of migraine according to the diagnostic criteria of the ICHD-3 (The International Classification of Headache Disorders, 3<sup>rd</sup> edition) of 2018. In the first consultation, patients' complete general and neurological histories were received

and physical examinations carried out. Clinical information was established, including type of migraine, duration of illness, frequency of pain, visual analog scale (VAS), migraine disability assessment scale (MIDAS), and the use of prophylactic medication, as well as demographic information regarding age, sex, and level of education. Exclusion criteria were being <18 years of age, illiteracy, suffering from headache not definitively diagnosed according to the ICHD-3 of 2018, suffering from more than one type of headache, headache from drug abuse, or an uncontrolled psychiatric condition.

### Mig-SCog test [Appendix 1]

In 2011, Raquel Gil-Gouveia *et al.* developed a specific instrument to measure and assess subjective cognitive symptoms during migraine attacks, which they called Mig-SCog. It is a Likert-type scale consisting of 9 items scored between 0 and 18. This scale is simple, reliable, and internally consistent and has good temporal stability. The first three questions relate to the areas of attention/processing speed/orientation; questions 4 and 5 correspond to planning/attention; 6 and 7 to language, and 8 and 9 refer to language: naming. Eventually, Mig-SCog investigates the areas that are causing the most complaints in patients during an attack, namely, executive functions (attention, planning, and orientation) and language (naming and language). A high Mig-SCog score indicates a high frequency of cognitive symptoms.<sup>[10]</sup> Some of the cognitive functions affected during a migraine attack can also be established by objective neuropsychological tests.<sup>[12,13]</sup>

### Statistical analysis

The validity of the Turkish version of the original scale was assessed by factor analysis with a varimax rotation. The sufficiency of the factor number was evaluated with Kaiser–Meyer–Olkin test and Chi-square goodness of fit test. In addition, percentages of variance explained for the sub factors and variance explained for the 4-factor model were obtained. The model was considered acceptable if the percentage of total variance explained was >60%. In the 9-item scale, items were assigned to a factor with a loading >0.40. Internal consistency of factors and the scale as a whole were assessed with Cronbach's alpha, with a coefficient >0.60 being considered acceptable.

Before assessing the correlation between scale scores and clinical and demographic variables, data were summarized as mean  $\pm$  standard deviation (SD) and number (%). Normalcy of continuous values and scores was tested with Shapiro–Wilk test. Correlations between scale scores and level of education, age, duration of illness, and number of attacks were analyzed using the Pearson correlation coefficient, while correlations with

sex and prophylaxis were assessed using independent *t*-test. The Mig-SCog score differences between MIDAS scores were evaluated using Kruskal–Wallis test, differences between migraine subtypes (without aura, with aura, chronic) by ANOVA and *post hoc* Bonferroni test. Statistical analyses were carried out using R 3.5.0 and TIBCO Statistica 13.5.0.

## RESULTS

This study is based on the data from 154 migraine patients with a mean age of 34.7 years (SD: 8.4), 116 females and 38 males. The mean duration of illness was 12.6 years (SD: 8.6). The mean level of education was 11.5 years (SD: 4.4).

As in the original, the result of factor analysis found a good fit for a 4-factor structure of the Turkish version (KMO = 0.82 and Chi-square  $P = 0.409$ ), and the factor structure was similar to the original [Table 1]. The factors of the instrument were evaluated as consistent (Cronbach’s alpha >0.60), and an overall Cronbach’s alpha of 0.8485 was calculated.

No statistically significant linear relationship with the total score was found for education ( $P = 0.516$ ), age ( $P = 0.374$ ), and duration of illness ( $P = 0.778$ ), while there was a significant positive linear relation for the total score with number of attacks (unit size 0.296) and VAS score (unit size 0.302) ( $P < 0.001$ ). Regarding the total score, there was no statistically significant difference between the sexes ( $P = 0.90$ ) or between the prophylaxis groups ( $P = 0.522$ ) or the MIDAS groups ( $P = 0.731$ ). A statistical difference between groups originates from the difference between chronic migraine and migraine without aura, where the results of a comparison by *post hoc* Bonferroni test found a value for  $P = 0.002$ . There was a statistically significant difference between migraine type groups regarding the total score ( $P = 0.002$ ). A statistical difference between the groups originates from the difference between chronic migraine and migraine without aura, where the results of a comparison by *post hoc* Bonferroni test found a value for  $P = 0.002$  [Table 2 and Figure 1].

In our migraine group, the use of prophylactic medication was not found to be correlated with any complaint, item on the scale, or Mig-SCog total score. In the chronic migraine group, 58.3% of respondents answering “frequently” to the 1<sup>st</sup> item (“During your headaches, do you feel confused?”) were women ( $P = 0.012$ ). A significant relation was found in the chronic migraine group between answers given to item 9 (“During your headaches, do you have trouble remembering the correct names of objects?”) and the MIDAS score ( $P = 0.033$ ). No statistically significant difference was found

between MIDAS scores regarding the Mig-SCog total score ( $P = 0.676$ ).

## DISCUSSION

The impairment of cognitive function associated with migraine attacks leads to a reduction in patients’ performance at the workplace, in school, and during other activities. Therefore, there is a serious clinical impact in the form of migraine-related disability and loss of workforce. In migraine patients, the use of the Mig-SCog scale as a reliable and valid instrument to assess the severity of cognitive symptoms occurring during migraine attacks can be recommended.<sup>[10,11,14]</sup> For this reason, we translated the scale to Turkish. The study shows that the Turkish version of the Mig-SCog has sufficient qualifications for validity and reliability to be used in measuring and monitoring cognitive symptoms in migraine patients whose native language is Turkish.

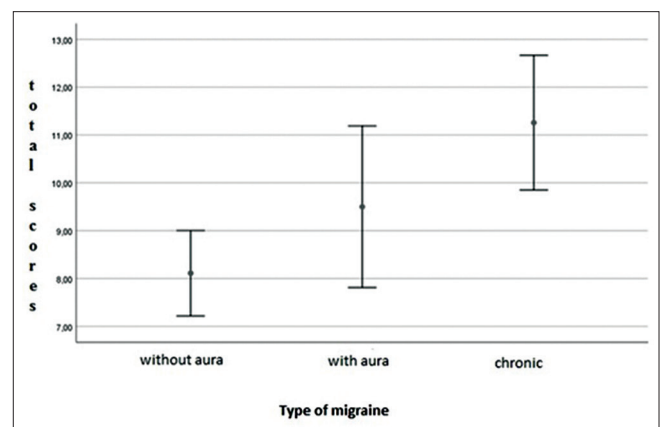
**Table 1: Results of factor analysis**

Factor	Items	Variance explained (%)	Cronbach’s alpha
1	8	19.7	0.659
	9		
2	4	17.1	0.859
	5		
3	1	14.3	0.707
	2		
	3		
4	6	12.4	0.835
	7		

**Table 2: Mig-SCog mean scores by type of migraine**

Variables	Type of migraine, mean±SD			P
	Without aura (n=91)	With aura (n=32)	Chronic (n=31)	
Total score	8.10±4.25	9.50±4.68	11.25±3.83	0.002

SD: Standard deviation



**Figure 1: Mig-SCog mean scores by migraine types**

While migraine patients consistently report cognitive impairment during attacks, it is not possible to ascertain this type of dysfunction objectively through neuropsychological tests in a similar manner. In evaluating migraine-related disability and response to attack treatment, subjective cognitive symptoms are being used. Although there is ample evidence for the occurrence of subjective cognitive complaints during an attack, objective data supporting attack-related manifestation of cognitive dysfunction are still insufficient; due to small sample sizes and different study designs, they are hard to analyze.<sup>[5,8,15]</sup> Due to the methodological limitations of the studies and the small number of patients, further studies are needed to say that there is a specific cognitive impairment model in acute migraine attacks. Furthermore, it is not practical to administer detailed neuropsychological tests during migraine attacks and currently available tests are too long for everyday clinical application, and in addition, they are not specific.

Pain and cognitive dysfunction during migraine attacks are connected with attack-related disability. In the perception of migraine patients, the most important attack-related problem contributing to disability after the pain is cognitive impairment, even more so than nausea, photophobia, phonophobia, and kinesiophobia. In clinical drug studies for migraine, cognitive performance needs to be assessed as a secondary outcome.<sup>[14,15]</sup> According to studies, cognitive impairment related to migraine attacks can be resolved with an effective attack treatment (with sumatriptan).<sup>[12,13]</sup>

The Mig-SCog scale can be useful in monitoring patients' cognitive complaints and assessing response to pharmacotherapy, particularly during attacks. There had not been a Turkish version of this instrument to be used to determine and monitor those cognitive symptoms. The original questionnaire was in Portuguese, and until now, validity and reliability studies have not been done in any other language except for Turkish. In our validity and reliability study, internal consistency of factors and the scale as a whole was considered acceptable if Cronbach's alpha coefficient was  $>0.60$ . The result of factor analysis showed that, as in the original instrument, 4 factors were adequate for the Turkish version and the factor structure was similar to that of the original. Interrater reliability was quite adequate. Cronbach's alpha overall was 0.84, which can be considered reliable.

Between the migraine groups, a statistically significant difference was found in the total scores. According to our data, the instrument discriminated well between migraine patients without and with aura and chronic migraine, and scores increased with chronification of

migraine. MigSCog scores during migraine attacks were higher than in attack-free periods.<sup>[11,14]</sup> These findings, which are consistent with data from studies carried out with other modalities found in the literature, confirm that cognitive impairment occurs during migraine attacks.<sup>[16]</sup> In our migraine group, the use of prophylactic medication was not found to be related to any complaint, scale item, or total Mig-SCog score. The more frequent the attacks, the higher was the total score. A just significant linear positive correlation was found with the VAS score. In the chronic migraine group, most of the participants replying "frequently" to the 1<sup>st</sup> item ("During your headaches, do you feel confused?") were women. Despite the low patient number, these results allow us to state that women with chronic migraine experienced more "confusion," showing "attention deficit." In the chronic migraine group, a significant correlation was found between the answers to the 9<sup>th</sup> item ("During your headaches, do you have trouble remembering the correct names of objects?") and the MIDAS score. In the light of these findings, we can say that women with chronic migraine received higher scores, indicating that they experienced a significant cognitive impairment during attacks. However, these findings need to be confirmed with greater sample sizes.

The basic limitation of this scale is its reliance upon patients' subjective perception and sensations. Evidently, an objective evaluation during a migraine attack is problematic.<sup>[10,14]</sup> Another limitation lies in the low number of patients involved in generating this data. Therefore, we are preparing to carry out a multi-center real-life study using this scale with migraine patients.

## CONCLUSIONS

Ours is the first validity and reliability study for the Mig-SCog scale in the Turkish language. The scale is easy to understand for the patients and can be answered easily. Our results confirm the validity and reliability of the instrument in migraine patients. We are confident that more clinicians will begin to use this scale as a simple, fast, and practical tool first to establish cognitive effects on migraine patients during an attack and then to monitor their response to migraine specific treatment.

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Nil.

## Conflict of interest

There are no conflict of interest.

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## APPENDIX

### Appendix 1: Mig-SCog English and Turkish Version

During your headaches:

1. Do you feel confused?  
# Often # Sometimes # No
2. Do you have trouble performing tasks at your normal speed?  
# Often # Sometimes # No
3. Do you have trouble following a route (by driving or walking)?  
# Often # Sometimes # No
4. Do you have trouble thinking?  
# Often # Sometimes # No
5. Do you have trouble maintaining the thread of your thoughts?  
# Often # Sometimes # No
6. Do you have trouble in understanding when being spoken to?  
# Often # Sometimes # No
7. Do you have difficulty organizing a sentence or a conversation?  
# Often # Sometimes # No
8. Do you have trouble speaking other people's names?  
# Often # Sometimes # No
9. Do you have trouble remembering the correct names of objects?  
# Often # Sometimes # No
1. Başağrınız olduğunda,  
Kafa karışıklığı yaşıyor musunuz?  
Sıklıkla Bazen Hayır
2. Başağrınız olduğunda,  
İşlerinizi normal hızınızda yapmakta sorun yaşıyor musunuz?  
Sıklıkla Bazen Hayır
3. Başağrınız olduğunda,  
Bir rotayı veya yolu izlemekte (araç kullanırken ya da yürürken) zorlanıyor musunuz?  
Sıklıkla Bazen Hayır
4. Başağrınız olduğunda,  
Düşünmekte sorun yaşıyor musunuz?  
Sıklıkla Bazen Hayır
5. Başağrınız olduğunda,  
Bir düşünceyi devam ettirmekte sorun yaşıyor musunuz?  
Sıklıkla Bazen Hayır
6. Başağrınız olduğunda,  
Size söylenen sözleri anlamakta zorluk çekiyor musunuz?  
Sıklıkla Bazen Hayır
7. Başağrınız olduğunda  
Cümle kurmakta ya da konuşmada zorluk çekiyor musunuz?  
Sıklıkla Bazen Hayır

8. Başađrınız olduđunda,  
Diđer insanları isimleriyle çağırmakta sorun yaşıyor musunuz?  
Sıklıkla Bazen Hayır
9. Başađrınız olduđunda,  
Eşyaların isimlerini doğru olarak hatırlamakta zorlanıyor musunuz?  
Sıklıkla Bazen Hayır