JERN Journal of Education and Research in Nursing

Original Article
DOI:10.14744/jern.2021.21197
J Educ Res Nurs. 2023;20(2):121-126

The Turkish Adaptation of Mental Fatigue Scale: A Validity and Reliability Study

Betül Güven[1], Özlem İbrahimoğlu[2], Sevinç Mersin[3]

[1]Department of Nursing, Bezmialem Vakıf University, Faculty of Health Sciences, İstanbul, Türkiye
[2]Department of Nursing, Faculty of Health Sciences, Istanbul Medeniyet University, Istanbul, Türkiye
[3]Department of Nursing, Faculty of Health Sciences, Bilecik Şeyh Edebali University, Bilecik, Türkiye

Abstract

Background: Mental fatigue has effects on many aspects of daily life. It causes many problems such as stress, anxiety, burnout, and depression in individuals. Therefore, it is important and necessary to determine mental fatigue. There is no detailed and multidimensional scale that can evaluate mental fatigue in Türkiye.

Aim: The aim of this study was to determine the psychometric properties of the Turkish version of Mental Fatigue Scale.

Methods: This methodological study was conducted with 171 nurses in Türkiye between March and April 2021. Data were collected using an information form, the Mental Fatigue Scale, and the Chalder Fatigue Scale. Language validity and content validity were studied for regarding the adaptation. The construct validity of the scale was evaluated by confirmatory factor analysis. The reliability of the scale was evaluated by internal consistency reliability coefficient and item-total score correlation, tested with similar measurement tools, and test-retest reliability method was performed for time invariance.

Results: As a result of confirmatory factor analysis, the 12-item and a single-factor structure of the Mental Fatigue Scale was determined. The factor loads of the items were between 0.40 and 0.75. The fit indices of the Confirmatory Factor Analysis were $\chi^2/df=1.723$; standardized root-mean-square residual=0.054; goodness of-fit index=0.928; normed fit index=0.916; comparative fit index=0.935, and root mean square error of approximation=0.065. Internal consistency reliability coefficients of the scale were 0.844. A strong positive correlation was found between the Chalder Fatigue Scale and the Mental Fatigue Scale.

Conclusion: The Turkish version of Mental Fatigue Scale is a valid and reliable scale that can be used to evaluate the mental fatigue level.

Keywords: Mental fatigue, reliability, validity

Introduction

Fatigue is a multifactorial phenomenon with various effects on cognitive, psychomotor, and emotional state. It can be physical or mental. While physical fatigue is a physical weakness that can occur due to repetitive muscle activity, mental fatigue is a psychobiological change caused by periods of prolonged and demanding cognitive activity.[1-3]

Mental fatigue has subjective, behavioral, and physiological effects. Subjectively, it has been reported that there is an increase in feelings of fatigue and lack of energy and a decrease in motivation. Behaviorally, a decrease in performance is described when performing a cognitive task. Changes in brain activity are accepted as physiological indicators of mental fatigue. However, it is not necessary to have changes in all 3 areas in determining mental fatigue.[3-5]

Mental fatigue has effects on many aspects of daily life. Even after adequate sleep, it can affect attention, working memory, and full control of movements. It may cause difficulties in showing the desired level of job performance and increase the risk of error.[3,5,6] Studies have shown that mental fatigue causes psychiatric disorders such as stress, anxiety, burnout, and depression.[5,7] Health-care professionals working in hospital environments are exposed to high levels of physical and mental demands that can affect their fatigue and stress levels, which adversely affects the attention, memory, and performance.[8-11]

Cite this article as: Güven B, İbrahimoğlu Ö, Mersin S. The turkish adaptation of mental fatigue scale: A validity and reliability study. *J Educ Res Nurs.* 2023;20(2):121-126.

Corresponding author: Betül Güven
E-mail: beguven@yahoo.com

Received: August 5, 2021
Accepted: October 10, 2021
Publication Date: June 1, 2023

Copyright@Author(s) - Available online at www.jer-nursing.org
Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Nurses constitute the largest group of health professionals in almost all countries. As a result of their role in providing the majority of patient care, nurses' performance has a direct impact on the quality and safety of care provided. Fatigue is an important factor that has been identified as affecting performance.[12] At the same time, it is one of the major factors affecting nurses' decisions to absent and leave from work.[8,9,13,14] The response times, attention to detail, and problem-solving abilities of nurses who feel fatigue may decrease, and as a result, the risk of error and injury may increase.[8,9,15,16] There are many studies in the literature examining fatigue in nurses.[17,18] One study determined that the prevalence of fatigue in clinical nurses was approximately 92% and did not differ according to the clinical field.[14] Barker and Nussbaum[12] found that 75% of nurses experienced acute fatigue, and physical, mental and total fatigue levels were quite high in nurses, and mental fatigue was higher than physical fatigue. Steege et al[19] determined that tasks that cause mental fatigue include organizing the flow of patient care, having to work in long shifts or undesirable shift schedules, conflict in teamwork, staying between the patient and the doctor, communication difficulties, and roles and responsibilities in training new nurses. In a study conducted in Türkiye, it was found that the factor causing the most medical errors in nurses was fatigue.[13]

There are various valid and reliable scales for fatigue assessment in Türkiye. There are one-dimensional scales such as the Fatigue Severity Scale and the Brief Fatigue Inventory, which evaluate fatigue only in terms of severity or impact. The Chalder Fatigue Scale, the Fatigue Impact Scale, the Revised Piper Fatigue Scale, the Multidimensional Assessment of Fatigue, and the Multidimensional Fatigue Inventory are among the multidimensional scales that evaluate fatigue in more than one dimension (such as physical, mental, and emotional). In these scales, mental fatigue is evaluated as a sub-dimension. However, there is no detailed and multidimensional scale to evaluate mental fatigue in Türkiye. Therefore, the aim of this study was to adapt the Mental Fatigue Scale (MFS) developed by Johansson et al.[20]

Materials and Methods

Study Design and Participants

This methodological study was conducted through Google Forms between March and April 2021. In the literature, it is recommended that the sample size can be taken as 5-10 times more than the number of items in the scale in validity and reliability studies.[21,22] Since there were 14 items in the Mental Fatigue Scale, the scale was applied to a total of with 171 nurses in Türkiye. Inclusion criteria were working as a nurse for at least 1 year and volunteering to participate in the research.

Data Collection Tools

Data were collected with the Information Form, the Mental Fatigue Scale, and the Chalder Fatigue Scale (CFS).

Information Form

It is a questionnaire prepared by the researchers and includes questions about the age, gender, education level, marital status, and work environment of the nurses.

Mental Fatigue Scale

The scale was developed by Johansson et al.[20] in 2010 and was adapted from Rödholm et al.[23] The scale consists of 15 items and the first 14 items are used in the evaluation. These 14 items in the scale include cognitive, emotional and sensory symptoms, sleep duration, and daytime variation in symptom severity. The questions assess fatigue in general, lack of initiative, mental fatigue, mental recovery, concentration difficulties, memory problems, slowness of thinking, sensitivity to stress, increased tendency to become emotional, irritability, sensitivity to light and noise, and decreased or increased sleep. Each question has 4 descriptive rating options (0-3). The fifteenth item is about 24-hour changes in symptoms. The 14 questions in the scale are based on the individual's evaluation of his/her status in the last month as 0=no problem, 1=slight problems, 2=fairly serious problems, and 3=serious problems. There are also items such as 0.5, 1.5, and 2.5 for choosing when the person falls between 2 items. The total score is calculated by summing the scores of 14 items. A high score indicates a high level of mental fatigue. The 15th item in the scale, on the other hand, indicates that 0: There is no change at certain times, 1: There is a clear difference at certain times, 2: it is always felt badly. In addition, when 24-hour changes occur, the person is asked to choose the times when he/she feels the best and the worst. The Cronbach's alpha value of the scale is 0.944. It was found to be 0.844 in this study.

Chalder Fatigue Scale

It was developed by Trudie Chalder in 1993.[24] Turkish validity and reliability study was conducted by Adın in 2019.[25] In the 4-point Likert-type scale, there are 11 items in total, including 7-item physical fatigue subscales and 4-item mental fatigue subscales. As the total score obtained from the scale increases, the level of fatigue also increases. The physical and mental subscales and the total Cronbach's alpha values of the scale were 0.893, 0.764, and 0.897, respectively.[25] The Cronbach's alpha value of Chalder Fatigue Scale in this study was determined as 0.92.

Language and Content Validity of the Scale

Before starting the research, the necessary permission to adapt the scale into Turkish was obtained from the first author of the original scale. Researchers reached online nurses working in different clinics in different provinces and districts, gave information about the purpose of the study, and sent the survey link. Nurses who wanted to participate in the study were required to mark the approval button in the questionnaire. For the test-retest study, participants were asked to identify a nickname they could remember. Four people who created the same nickname were excluded from the study. For the test-retest reliability study, the scale was readministered to 61 participants 15 days after the first measurement.

Language validity of the scale was made according to the method recommended by the World Health Organization to translate and adapt tools developed in different languages.[26] First, the original scale was translated into Turkish by 4 nurse faculty members. These translations were then checked by the researchers and a common text was created. The Turkish translation obtained was translated back into English by 3 different faculty members who were not included in the study and the consistency between the 2 texts was evaluated. Finally, all translations were evaluated by the research team and 2 experts (nurse faculty member and specialist doctor in the field of psychiatry), and the final version of the scale was created.

Data Analysis

Data were analyzed with the Statistical Package for the Social Science 21.0 (IBM SPSS Corp., Armonk, NY, USA) program and Analysis

of Moment Structures (AMOS) 22.0 package program. For the descriptive statistics of the variables, number, percentage, mean, and standard deviation were used. Language and content validity were studied during the adaptation process. Confirmatory factor analysis within the scope of validity studies of the scale, item-total correlation within the scope of reliability study, Cronbach's alpha, test-retest, and equivalent form analyzes were performed. Confirmatory factor analysis (CFA) is a highly advanced technique based on testing theories about latent variables and used in advanced research. It is an analysis in which a previously defined and constrained construct is tested whether it is validated as a model. CFA is one of the structural equation models, and in these models, model fit must be ensured first.[21] In the evaluation of model fit, "the ratio of Chi-square statistics to degrees of freedom (χ^2/df)," "statistical significance of individual parameter estimates (t value)," "standardized root-mean-square residual" (SRMR), "goodness of-fit index" (GFI), "non-normed fit index" (NNFI), "comparative fit index" (CFI), and "root mean square error of approximation (RMSEA)" were used. Pearson correlation analysis was performed to determine the relationship between the scales. The path diagram of the validated model was created. $P < .05$ was considered statistically significant.

Ethical Aspects of the Research

To carry out the study, ethical approval was obtained from Demiroğlu Bilim University Clinical Research Ethics Committee (Approval No: 44140529/3680, Date: 16.02.2021). The study was conducted in according to the Declaration of Helsinki and online consent was obtained from the nurses who volunteered to participate in the study.

Results

Sociodemographic Characteristics

A total of 95.3% of the participants who participated in the study were women and 50.3% were undergraduates, with a mean age of 30.94 ± 6.87 (min: 22, max: 51). The mean period of nursing experience was 9.32 ± 7.16 (min: 1, max: 34) years (Table 1).

Table 1. Sociodemographic Characteristics of Nurses

Variables	n	%
Gender		
Female	163	95.3
Male	8	4.7
Education		
High school	14	8.2
University	86	50.3
Master's degree and higher	71	41.5
Marital status		
Single	88	51.5
Married	83	48.5
Having children		
Yes	71	41.5
No	100	58.5
Departments		
Internal medicine departments	29	17.0
Surgical departments	40	23.4
Operating room	13	7.6
Intensive care units	33	19.3
Special branch units	36	21.1
Policlinics	20	11.7
Position		
Nurse	134	78.4
Head nurse	37	21.6
Number of night work per month		
0 day	39	22.8
1-3 days	41	24.0
4-6 days	22	12.9
7 days and above	68	39.8

Validity Findings

The findings obtained in the CFA conducted with the 14 items and one-dimensional structure of the Mental Fatigue Scale are given in Table 2. According to the CFA results, since it was determined that the item factor loads of 2 items (1, 13) were not at an appropriate level and the model fit indices did not fit well, these 2 items were removed from the scale and the fit index was tried to be improved with covariance connections in line with the modification suggestions. After removing 2 items from the scale and 3 covariance connections (2-3, 9-10, 9-14), it was determined that model fit indices reached good and very good levels, and factor loads remained within appropriate ranges (Table 2).

The results of the validity analysis consisting of factor loading and t values obtained as a result of confirmatory factor analysis of the scale are shown in Table 3. As a result of confirmatory factor analysis, it was seen that the factor loads of the remaining 12 items in the scale were higher than 0.40 and the t values of the items were significant ($P < .01$). According to the results obtained, it was determined that the mental fatigue scale is a valid scale with 12 items and one-dimensional structure. The CFA diagram of the validated model is shown in Figure 1.

Reliability Findings

Cronbach's alpha coefficient was evaluated to determine the internal consistency of the scale. In the reliability analysis, the Cronbach alpha coefficient of the scale was determined as 0.844. The item-total score correlations of the scale were between 0.385 and 0.652, and the correlation coefficients were positive and statistically significant ($P < .001$) (Table 4).

The lowest and highest scores that can be obtained from MFS are 0 and 36, and the mean score was determined as 11.62 ± 5.47. In addition to the first 12 items used in calculating the scores in MFS, the 15th item for clinical use in the original scale was evaluated as 0-1-2 points, and in this study, it was determined that 55.6% of the nurses gave 1 point to the 15th item. Nurses reported that the time they felt

Table 2. Model Fit Indices Obtained in the Confirmatory Factor Analysis of the Mental Fatigue Scale

Model Fit Indices	The First CFA 14 Items One Dimension	The Last CFA* 12 Items One Dimension	Perfect Fit**
χ^2/SD	2.529	1.723	<3
SRMR	0.077	0.054	<0.05
GFI	0.857	0.928	>0.95
NFI	0.782	0.916	>0.95
CFI	0.816	0.935	>0.95
RMSEA	0.095	0.065	<0.08
Factor load	0.34/0.72	0.40/0.75	

CFI, comparative fit index; GFI, goodness of-fit index; NFI, normed fit index; RMSEA, root mean square error of approximation; SRMR, Standardized root-mean-square residual.
*With covariance connections. **Reference: 27.

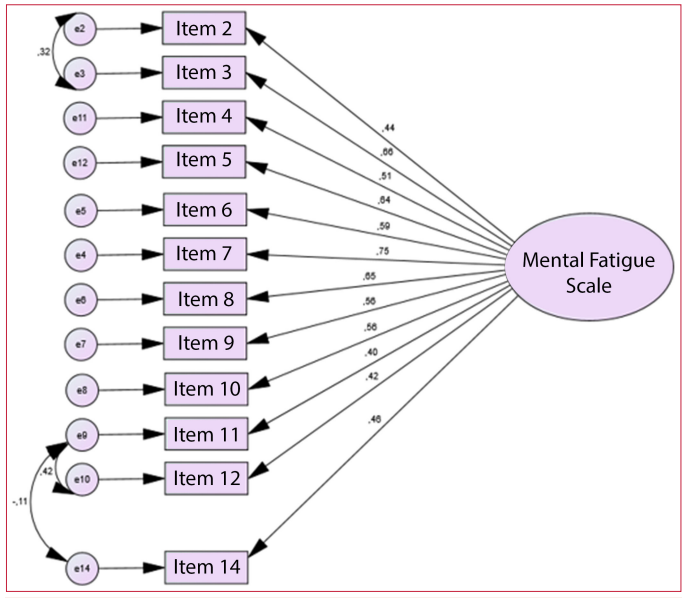

Figure 1 . Confirmatory factor analysis diagram of mental fatigue scale.

the best and worst in the 24-hour period was in the morning. The lowest and highest scores that can be obtained from CFS are 0 and 33, and the mean score is 17.42 ± 6.13. The lowest and highest scores that can be obtained from the physical and mental sub-dimensions of CFS are 0-21 and 0-12, respectively. The mean score of the physical sub-dimension of CFS was 11.88 ± 4.22 and the mean score of the mental sub-dimension was 5.54 ± 2.42.

Within the scope of the reliability analysis, the correlation results between MFS and CFS are given in Table 5. When the correlation between MFS and CFS included in this study for equivalent form reliability was examined, the correlation between total scores was 0.736, the correlations of the sub-dimensions were found to be 0.699 and 0.646, and statistically significant ($P < .01$). The statistical significance obtained by the correlation between the 2 test scores shows the consistency of MFS.

Discussion

Mental fatigue is an important condition that can lead to physical, psychological, and social problems in nurses such as lack of attention, burnout, lack of motivation, and leaving work. Internal and external factors such as biological and personality traits, thoughts, experiences, and workloads affect the mental fatigue of nurses.[15,17-19] Although these characteristics and experiences affect the level of mental fatigue, the Turkish validity and reliability of the Mental Fatigue Scale was evaluated in this study, since there is not a comprehensive

Table 3. Confirmatory factor analysis (CFA) Results of Mental Fatigue Scale

Items and Sub-dimensions	Std. β	*t*
Item 2	0.44	
Item 3	0.66	5.99**
Item 4	0.51	4.53**
Item 5	0.64	5.04**
Item 6	0.59	4.85**
Item 7	0.75	5.34**
Item 8	0.65	5.07**
Item 9	0.56	4.74**
Item 10	0.56	4.74**
Item 11	0.40	3.91**
Item 12	0.42	4.03**
Item 14	0.46	4.27**

**$P < .01$.

Table 4. Reliability Analysis Results of Mental Fatigue Scale

Items and Sub-dimensions	*r*	α
Item 2	0.446	0.844
Item 3	0.629	
Item 4	0.472	
Item 5	0.574	
Item 6	0.533	
Item 7	0.652	
Item 8	0.575	
Item 9	0.526	
Item 10	0.542	
Item 11	0.401	
Item 12	0.443	
Item 14	0.385	

r, item total correlation; α, Cronbach alfa.

Table 5. Correlation results between the scales

	1	2	3	4	$\bar{X}$	SD	S	K
Mental fatigue scale (1)	1	0.736**	0.699**	0.646**	11.62	5.47	0.41	-0.01
Chalder fatigue scale (2)		1	0.957**	0.863**	17.42	6.14	0.30	-0.34
Physical fatigue (3)			1	0.681**	11.88	4.22	0.10	-0.50
Mental fatigue (4)				1	5.54	2.42	0.43	-0.16

**Pearson correlation; $P < .01$, S, skewness; K, kurtosis.

tool that can be used to assess mental fatigue in nurses. This study was conducted with 171 nurses in total. In the literature, it is recommended that the sample size should not be <5-10 times more than the number of items in the scale to perform factor analysis in scale studies.[21,22] For this reason, at least 10 times participant rule was provided for the 14 items used in the assessment.

Validity

In this study, the construct validity of MFS was determined by factor loads, and items 1 and 13 were excluded from the scale because their factor loads were lower than 0.40. As a result of confirmatory factor analysis, it was determined that the model fit indexes of the remaining 12 items in the scale were $\chi^2/df = 1.723$; SRMR = 0.054; GFI = 0.928; NFI = 0.916; CFI = 0.935, and RMSEA = 0.065. The results of this study meet the perfect fit criteria specified in the model fit index results in the literature.[27,28] In addition, factor loads of the items in this study were found to be between 0.40 and 0.75. It is recommended that factor loads be greater than 0.40 in statistical studies.[21] In this study, it was found that the one-dimensional structure of the scale was similar to the original scale developed by Johansson et al[20] and the study of Johansson and Ronnback.[1]

Reliability

The Cronbach's alpha coefficient, which was used to evaluate the internal consistency of this scale, was calculated as 0.844. In scale validity and reliability studies, it is recommended to calculate the Cronbach's alpha coefficient to determine the reliability of the Likert-type scale.[29] The Cronbach's alpha coefficient of the original scale was reported as 0.944.[23] Since the Cronbach's alpha value was found to be higher than 0.70 in the Turkish version of the MFS, it can be said that the scale is a very reliable instrument. According to the literature, if the Cronbach alpha value of a scale is $0.00 < \alpha < 0.40$, it is not reliable; if it is $0.40 < \alpha < 0.60$, it has low reliability; if it is $0.60 < \alpha < 0.80$, it is reliable, and if it is $0.80 < \alpha < 1.00$ it is quite reliable.[21] Another test used to evaluate internal consistency is item-total score correlation. Statistically, it is stated that the total score correlation of an item should be at least 0.30.[30] In this study, since each of the item-total correlation coefficients of the Turkish version of the scale was determined above the recommended minimum level (0.385-0.652), it can be said that the internal consistency of the scale and all its items is high.

The mean total score of MFS was 11.62 ± 5.47 (0-36) and the total mean score of CFS was 17.42 ± 6.13 (0-33). In addition, the correlation value between the MFS and CFS total mean scores was found to be 0.736 and statistically significant ($P < .001$). When the correlation values are evaluated as 0-0.2 = very weak, 0.2-0.4 = weak, 0.4-0.6 = moderate, and 0.6-0.8 = strong,[29] it can be said that there is a strong and significant positive relationship between the 2 scales. The Turkish version of the scale was readministered to 61 nurses 15 days later to evaluate the invariance of MFS over time. In the literature, it is recommended that the sample size should be carried out with at least 50 people for retesting in scale validity and reliability studies.[31] The correlation values between the mean scores in test-retest reliability of MFS were 0.726 and a statistically significant positive correlation was determined ($P < .001$). It is important to evaluate the reliability of the scale that the correlation coefficient between the 2 applications is high and positive in assessing the test-retest reliability.[21,30] The results of this study also show that this scale can be used to evaluate the mental fatigue of nurses. (Table 6)

Table 6. Test-Retest Reliability

Mental fatigue scale	*n*	$\bar{X}$	SD	S	K	*r*
The first test	171	11.62	5.47	0.41	−0.01	**0.726****
Re-test	61	12.85	6.92	0.53	−0.37	

**$P < .01$; S, skewness; K, kurtosis.

Conclusion

The MFS showed high reliability in Cronbach's alpha internal consistency coefficient, item-total correlation, test-retest analysis, and equivalent form analysis. Although the original scale had 14 items and a single factor structure, 12 items and a single factor structure were determined in this study. The evaluation of the 15th item in the original scale was not used to analyze the validity and reliability of the scale. In the original scale, mental fatigue was evaluated with the first 14 items. The 15th item was discussed separately for use in patients in the clinic and it was suggested that those with problems should be evaluated differently from the total score obtained. In this study, mental fatigue status of nurses was evaluated with 12 items. MFS can be accepted as a valid and reliable tool to assess mental fatigue in nurses and adults in Türkiye. It can be recommended to apply the scale to different and wider populations in Türkiye.

Ethics Committee Approval: This study was approved by Ethics Committee of Demiroğlu Bilim University (Approval No: 44140529/3680, Date:16.02.2021).

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

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – B.G.; Design – B.G., Ö.İ.; Supervision – B.G., Ö.İ., S.M; Resources – B.G., Ö.İ., S.M.; Materials – B.G., Ö.İ., S.M.; Data Collection and/

or Processing – B.G., Ö.İ. S.M.; Analysis and/or Interpretation – Ö.İ., S.M.; Literature Search – B.G., Ö.İ.; Writing – B.G., Ö.İ, S.M.; Critical Review – B.G., Ö.İ., S.M.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support.

References

1. Johansson B, Rönnbäck L. Mental fatigue and cognitive impairment after an almost neurological recovered stroke. *ISRN Psychiatry*. 2012;*2012*:686425. [CrossRef]
2. Micklewright D, St Clair Gibson A, Gladwell V, Al Salman A. Development and validity of the Rating-of-Fatigue Scale. *Sports Med*. 2017;*47*(11):2375-2393. [CrossRef]
3. Stiegler M. Cognitive aids for perioperative emergencies. *Uptodate*. Accessed April 24, 2021. https://0-www-uptodate-com.libunix.ku.edu.tr/contents/cognitive-aids-for-perioperativeemergencies?search=zihinsel%20fatigue&source=search_result&selectedTitle=14~150&usage_type=default&display_rank=14
4. Martin K, Meeusen R, Thompson KG, Keegan R, Rattray B. Mental fatigue ımpairs endurance performance: a physiological explanation. *Sports Med*. 2018;*48*(9):2041-2051. [CrossRef]
5. Van Cutsem J, Marcora S, De Pauw K, Bailey S, Meeusen R, Roelands B. The effects of mental fatigue on physical performance: a systematic review. *Sports Med*. 2017;*47*(8):1569-1588. [CrossRef]
6. Boksem MA, Meijman TF, Lorist MM. Effects of mental fatigue on attention: an ERP study. *Brain Res Cogn Brain Res*. 2005;*25*(1):107-116. [CrossRef]
7. Li X, Li Y, Liang H, et al. The relationship between fatigue and depression and anxiety symptoms among front-line clinical workers during the COVID-19 pandemic. *Lancet Psychiatry*. 2020. [CrossRef]
8. Bakhshi E, Mazlomi A, Hoseini SM. Relationship between mental fatigue and mental workload among nurses. *Zahedan J Res Med Sci*. 2019;*In*(Press): e83082. [CrossRef]
9. Liu Y, Wu LM, Chou PL, Chen MH, Yang LC, Hsu HT. The influence of work-related fatigue, work conditions, and personal characteristics on intent to leave among new nurses. *J Nurs Scholarsh*. 2016;*48*(1):66-73. [CrossRef]
10. McClelland L, Holland J, Lomas JP, Redfern N, Plunkett E. A national survey of the effects of fatigue on trainees in anaesthesia in the UK. *Anaesthesia*. 2017;*72*(9):1069-1077. [CrossRef]
11. Ornell F, Halpern SC, Kessler FHP, Narvaez JCM. The impact of the COVID-19 pandemic on the mental health of healthcare professionals. *Cad Saude Publica*. 2020;*36*(4):e00063520. [CrossRef]
12. Barker LM, Nussbaum MA. Fatigue, performance and the work environment: a survey of registered nurses. *J Adv Nurs*. 2011;*67*(6):1370-1382. [CrossRef]
13. Er F, Altuntaş S. Hemşirelerin tıbbi hata yapma durumları ve nedenlerine yönelik görüşlerinin belirlenmesi. *Sağlık Hemşirelik Yönetimi Derg*. 2016;*3*(3): 132-139. [CrossRef]
14. Raftopoulos V, Charalambous A, Talias M. The factors associated with the burnout syndrome and fatigue in Cypriot nurses: a census report. *BMC Public Health*. 2012;*12*:457. [CrossRef]
15. Parhizi S, Steege LM, Pasupathy KS. Mining the relationships between psychosocial factors and fatigue dimensions among registered nurses. *Int J Ind Ergon*. 2013;*43*(1):82-90. [CrossRef]
16. Steege LM, Rainbow JG. Fatigue in hospital nurses - 'Supernurse' culture is a barrier to addressing problems: A qualitative interview study. *Int J Nurs Stud*. 2017;*67*:20-28. [CrossRef]
17. Ghasemi F, Samavat P, Soleimani F. The links among workload, sleep quality, and fatigue in nurses: a structural equation modeling approach. *Fatigue: Biomedicine Health & Behavior*. 2019;*7*(3):141-152. [CrossRef]
18. Zhang YY, Zhang C, Han XR, Li W, Wang YL. Determinants of compassion satisfaction, compassion fatigue and burn out in nursing: a correlative meta-analysis. *Med (Baltim)*. 2018;*97*(26):e11086. [CrossRef]
19. Steege LM, Drake DA, Olivas M, Mazza G. Evaluation of physically and mentally fatiguing tasks and sources of fatigue as reported by registered nurses. *J Nurs Manag*. 2015;*23*(2):179-189. [CrossRef]
20. Johansson B, Starmark A, Berglund P, Rödholm M, Rönnbäck L. A self-assessment questionnaire for mental fatigue and related symptoms after neurological disorders and injuries. *Brain Inj*. 2010;*24*(1):2-12. [CrossRef]
21. Büyüköztürk Ş. *Sosyal bilimler İçin veri analizi el kitabı*. 16. Baskı. Ankara: Pegem Yayınları; 2012.
22. Karakoç FY, Dönmez PDL. Ölçek geliştirme çalışmalarında temel ilkeler. *Tıp Eğitimi Dünyası*. 2014;*13*(40):39-49. [CrossRef]
23. Rödholm M, Starmark JE, Svensson E, Von Essen C. Astheno-emotional disorder after aneurysmal SAH: reliability, symptomatology and relation to outcome. *Acta Neurol Scand*. 2001;*103*(6):379-385. [CrossRef]
24. Chalder T, Berelowitz G, Pawlikowska T, et al. Development of a fatigue scale. *J Psychosom Res*. 1993;*37*(2):147-153. [CrossRef]
25. Adın RM. *Chalder Yorgunluk Ölçeği'nin Türkçe'ye Uyarlanması ve genç yetişkin Bireylerde Psikometrik Özelliklerinin İncelenmesi* [Yüksek Lisans Tezi]. Hacettepe Univ Sağlık Bilimleri Enstitüsü. 2019.
26. World Health Organization. *Process of translation and adaptation of instruments*. Accessed April 05, 2021. http://www.who.int/substance_abuse/research_tools/translation/en/
27. Çokluk Ö, Şekercioğlu G, Büyüköztürk Ş. *Sosyal Bilimler İçin Çok Değişkenli İstatistik*. Ankara:PEGEM Yayıncılık; 2010.
28. Meydan CH, Şeşen H. *Yapısal Eşitlik Modellemesi AMOS Uygulamaları*. Ankara: Detay Yayıncılık; 2011.
29. Karagöz Y. *SPSS 23 ve AMOS 23 Uygulamalı Istatistiksel Analizler*. Ankara: Nobel Akademik Yayıncılık; 2016.
30. Gozum S, Aksayan S. Guidelines for cross-cultural scale adaptation II: Psychometric properties and cross-cultural comparison. *Turk J Nurs Res Dev*. 2002;*5*:3-14.
31. Yaşlıoğlu MM. Sosyal bilimlerde faktör analizi ve geçerlilik: Keşfedici ve doğrulayıcı faktör analizlerinin kullanılması. *Istanb Univ İşletme Fak Derg*. 2017;*46*:74-85.