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Uyku Kalitesi ile Mental ve Fiziksel Yorgunluğun Mekanik Boyun Ağrısına Etkisi

Effects of Sleep Quality and Mental and Physical Fatigue on Mechanical Neck Pain

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ÖZ

Amaç: Mekanik boyun ağrısı toplumda oldukça yaygın görülen ve engelliliğe yol açabilen bir problemdir. Modern toplumlarda iş, aile ve sosyal yaşamda bireylerden beklentilerin artması, uyku bozuklukları, mental ve fiziksel yorgunluğu beraberinde getirmiştir. Çalışmamızın amacı, uyku bozukluğu, mental ve fiziksel yorgunluğun mekanik boyun ağrısına etkilerini incelemekti.
Yöntem: Çalışmamıza yaş ortalaması 28,01±9,97 yıl olan 252 mekanik boyun ağrılı birey dahil edilmiştir. Tüm bireylere Boyun Özür İndeksi, Chalder Yorgunluk Ölçeği ve Pitssburgh Uyku Kalitesi İndeksi uygulanmıştır.
Bulgular: Yapılan regresyon analizi sonucuna göre, yalnızca Chalder Yorgunluk Ölçeği mental yorgunluk alt boyutu, artmış Boyun Özür İndeksi skoru ile ilişkiliydi (β=0,169, p=0,036). Pitssburgh Uyku Kalitesi İndeksi ve Chalder Yorgunluk Ölçeği fiziksel alt parametresinin Boyun Özür İndeksi skoruna anlamlı bir etkisinin olmadığı bulundu (p>0,05).
Sonuç: Mental yorgunluk, boyun özür durumunun bağımsız belirleyicileri arasında bulunmuştur. Bu nedenle mekanik boyun ağrısının tedavisinde zihinsel yorgunluğu içeren daha bütüncül bir yaklaşım benimsenmelidir.

Anahtar Kelimeler: Boyun Ağrısı, Uyku Kalitesi, Yorgunluk.

ABSTRACT

Objective: Mechanical neck pain is a very common problem in society and can lead to disability. In modern societies, increasing expectations from individuals in work, family and social life have brought along sleep disorders, mental and physical fatigue. The aim of our study was to examine the effects of sleep disorder, mental and physical fatigue on mechanical neck pain.
Method: Two hundred fifty-two individuals with mechanical neck pain having a mean age of 28.01±9.97 years were included in our study. Neck Disability Index, Chalder Fatigue Scale, and Pitssburg Sleep Quality Index were applied to all individuals.
Results: According to the regression analysis results, only the mental fatigue sub-dimension of the Chalder Fatigue Scale was associated with increased Neck Disability Index score (β=0.169, p=0.036). Pitssburgh Sleep Quality Index and the physical sub-dimension of Chalder Fatigue Scale were found not to have a significant effect on Neck Disability Index score (p>0.05).
Conclusion: Mental fatigue was found among the independent determinants of neck disability. Therefore, a more holistic approach including mental fatigue should be adopted in the treatment of mechanical neck pain.

Key words: Neck Pain, Sleep Quality, Fatigue.

1. INTRODUCTION

Mechanical neck pain is a biomechanical problem characterized by pain in the cervical spine, ligamentous structures of the spine, and neck muscles without root signs and neurological symptoms. Various factors such as posture problems, muscle imbalance, excessive muscle activity, and emotional stress lead to mechanical neck pain (1). Neck pain is a very common problem that approximately 70% of individuals experience at least once in their lifetime. Sixty

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percent of those with mechanical neck pain experience this problem periodically and repeatedly (2).

In a study conducted in eight different countries, the prevalence of sleep difficulty in the general population was 16.6% (3.9%-40%) (3). In another study, it was reported that the rate of inadequate sleep quality increased up to 38.2% (4). Sleep quality is a very important parameter that affects almost all physiological functions. Sleep disturbances are quite common in individuals with chronic pain; such as neck pain, chronic low back pain and temporomandibular joint dysfunction (5). Sleep difficulty both exacerbates musculoskeletal pain and reduces the pain threshold (6). Although it is thought that the relationship between impaired sleep quality and pain is bidirectional, some studies have reported that the effects of sleep problems on pain may be more primary (7,8).

The term fatigue has different meanings for different professions. While physiologists define fatigue as a condition related to the nervous and muscular systems, psychologists define it as an experience that negatively affects the motivation of the individual (8). Thirteen different types of fatigue have been defined in the literature (9). Physical fatigue refers to situations such as decreased muscle strength, feeling sluggish and heavy (10). Mental fatigue, on the other hand, is a type of fatigue that is felt after cognitive activities that require concentration, attention, endurance, and awareness, leading to declining in memory, concentration, and emotional state (11,12).

There are studies examining the effects of musculoskeletal pain on physical-mental fatigue and sleep quality (13,14). However, we could not reach any studies investigating the effects of physical-mental fatigue and sleep quality on mechanical neck pain. The aim of our study is to examine the effects of physical and mental fatigue and sleep quality on chronic mechanical neck pain.

2. METHOD

Individuals

This was a cross sectional study conducted with 252 individuals (142 female, 110 male) with a mean age of 28.01±9.97 years. Informed consent form was obtained from all individuals. Sample selection flowchart was presented in Figure 1. Ethics committee approval was obtained from Lokman Hekim University Non-Invasive Clinical Research Ethics Committee (Reference Number: 2021072).

Inclusion criteria were age between 18-65 years, having Neck Disability Index (NDI) score more than four points, being volunteer to participate in the study, and having sufficient cooperation to complete the surveys. Exclusion criteria were having any neurological or systemic disease, having cervical disc herniation or scoliosis, and history of surgery on head or neck region.

The study was carried out via online surveys which was conducted using Google Forms. The online survey link was shared using WhatsApp and email to potential participants.

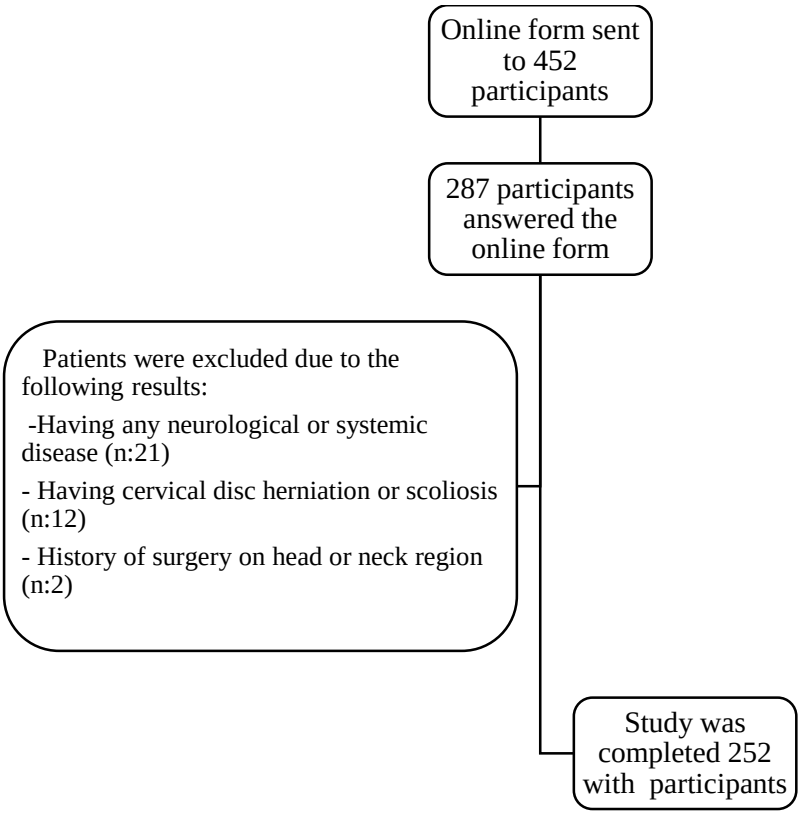

Figure 1. Sample selection flowchart.

Outcome measurements

Demographic data of the individuals were recorded. All participants completed NDI, Chalder Fatigue Scale (CFS) and Pittsburgh Sleep Quality Index (PSQI).

Turkish version of NDI was used to determine the pain experience and functional disability of the participants. NDI consists of 10 questions concern of the pain severity, ability for personal care, lifting weight, job capability headache intensity, concentration, quality of sleeping and driving and recreation activities. Total score ranges between 0 to 50 points. Zero to four points mean “no disability”, 5 to 14 points mean “light disability”, 15 to 24 points mean “moderate disability”, 25 to 34 points mean “severe disability”, and 35 to 50 points mean “complete disability” (15).

Pittsburgh Sleep Quality Index (PSQI) was developed by Buysse et al (16). In this scale consisting of 24 items, 19 items are filled in by the individual, while five items are filled in by the person's bedmate. Eighteen of the 19 items that need to be answered by the individual are scored and used to assess sleep quality, while the remaining six items are used to have clinical information. It has seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping pills, and daytime dysfunction. The total PUKI score is obtained by summing the scores of the components. The total score of each component varies between zero to three and the total score of PUKI ranges from 0 to 21. High scores indicate poor sleep quality. A total score of five or less indicates good sleep quality, while scores above 5 indicate poor sleep quality (16). The Turkish version of the questionnaire was used in the study (17).

Chalder Fatigue Scale (CFS) was developed in 1993 by Trudie Chalder et al (18). The CFS consists of 11 questions including a 7-item physical fatigue sub-dimension and a 4-item mental fatigue sub-dimension (19). 4-point Likert scale was used. The scoring of each item varies between zero to three points. The physical fatigue sub-dimension score ranges from 0 to 21, the mental fatigue sub-dimension score ranges from 0 to 12, and the total fatigue score ranges from 0 to 33. High scores indicate a greater fatigue level (18). The Turkish version of the questionnaire was used in the study (19).

Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS), version 22 (SPSS Inc., Chicago, IL, USA). Significance level was set at $p<0.05$. Normality tests (visual and analytical) was performed to determine whether the numerical data were normally distributed. Pearson correlation coefficients were calculated to determine the associations among NDI, PSQI, CFS mental, and CFS physical scores. A regression model was used to determine the independent variables that contributed significantly to the variance in NDI results. Multiple regression analysis was performed to determine the effects of PSQI, CFS mental, and CFS physical scores on NDI. To determine the power of the study, post-hoc power analysis was performed using the G*Power (Version 3.0.10 Universität Düsseldorf, Düsseldorf, Germany) program. The power of the study was found to be 92% for 252 individuals in the analysis performed on the regression analysis.

3. RESULTS

Two hundred fifty-two individuals participated in this study. Age distribution along with NDI, PSQI, CFS mental, and CFS physical scores of the participants were presented in Table 1.
Table 2 presents the frequencies of NDI classification of the participants. One hundred sixty-five participants had mild (55.5%), 71 participants had moderate (23.9%), and 16 participants had severe (5.3%) neck disability. There were no participants having no or complete disability. Correlation analysis exhibited significant positive correlations between NDI and Pittsburgh scores ($r=0.121$, $p=0.027$), NDI and CFS physical scores ($r=0.175$, $p=0.003$), NDI and CFS mental scores ($r= 0.215$, $p<0.001$), PSQI and CFS physical scores ($r=0.266$, $p<0.001$), PSQI and CFS mental scores ($r=0.211$, $p<0.001$), and CFS physical and mental scores ($r=0.636$, $p<0.001$) (Table 3).

Table 1. Demographic Characteristics

	N	
Age (years) (**Mean±SD)**	252	28.01±9.97
Sex (F/M)	252	142/110
NDI score (**Mean±SD)**	252	11.35±6.95
PSQI score (**Mean±SD)**	252	8.16±4.33
CFS Physical score (**Mean±SD)**	252	11.80±4.80
CFS Mental score (**Mean±SD)**	252	6.12±2.61

NDI: Neck Disability Index; PSQI: Pitssburgh Sleep Quality Index; CFS: Chalder Fatigue Scale, F: Female, M: Male

Table 2. Frequencies of NDI Classification

NDI Classification	N (%)
0-4: No Disability	0 (-)
5-14: Mild Disability	165 (55.5%)
25-34: Moderate Disability	71 (23.9%)
25-35: Severe Disability:	16 (5.3%)
Above 35: Complete Disability	0 (-)

NDI: Neck Disability Index

Table 3. Pearson correlational coefficients for correlations among NDI, PSQI, CFS mental, and CFS physical scores

	PSQI	CFS Physical	CFS Mental	NDI
PSQI		0.266**	0.211**	0.121*
CFS Physical			0.636**	0.175*
CFS Mental				0.215**

*p<0.05

**p<0.001

NDI: Neck Disability Index; PSQI: Pitssburgh Sleep Quality Index; CFS: Chalder Fatigue Scale

Table 4 presents the results of multiple regression analyses. The overall model explained 5.4 per cent of the variance (p=0.003). Examination of the beta values revealed that greater CFS mental score was uniquely associated with greater NDI score (β=0.169, p=0.036). PSQI and CFS physical scores were not significantly associated with NDI score (p>0.05).

Table 4. Multiple Regression analysis with NDI as the dependent variable.

Variables	R^2	F	Standardized β	t
PSQI			0.073	1.131
CFS Physical	0.054	4.688	0.049	0.597
CFS Mental			0.169	2.107*

*p<0.05

NDI: Neck Disability Index; PSQI: Pitssburgh Sleep Quality Index; CFS: Chalder Fatigue Scale

4. DISCUSSION

This study was conducted to investigate the effects of sleep quality, mental and physical fatigue on neck disability in individuals with mechanical neck pain. Mental fatigue was found to be an independent predictor of neck disability. However, sleep quality and physical fatigue were not significantly associated with neck disability.

Despite the studies reporting the adverse effects of sleep problems on chronic pain, our study revealed that sleep quality had no effect on neck disability. In a study by Thaedom et al. (20) emphasized that inadequate sleep quality adversely affected quality of life in individuals with chronic pain. Auvien et al. (21) reported that sleep disorders had negative effects on neck, shoulder and low back pain. Valenze et al. (22) showed that there was a significant association between mechanical neck pain and impaired sleep quality, but they did not reveal to what extent these two parameters affect each other. Inadequate sleep quality is thought to inhibit muscle relaxation and activate sympathetic nervous system, resulting in an increase in muscle tone and muscle spasms (23). Another hypothesis is that insufficient and poor-quality sleep increases

cortisol and cytokine levels, and enhanced concentration of these mediators increases the level of inflammation and pain (24,25). However, our result exhibited that even if inadequate sleep quality had an effect on chronic pain, this effect was not sufficient to influence neck-related disability. The reason for this may be that the levels of neck disability index scores of our participants were not very high.

Physical fatigue is known to be associated with decreased quality of life, physical disability, and chronic pain (26,27). Novaes et al. (28) stated that physical fatigue significantly provoked pain in patients with osteoarthritis. Vega et al. (29) indicated that physical fatigue was among the independent predictors of pain intensity in chronic neck and low back patients. In another study, Nicolas et al. (30) reported no association between fatigue and pain level in fibromyalgia patients. On the other hand, fatigue of scapula stabilizer muscles may lead to overactivity and spasm of those muscles in order to provide upper body posture and head stabilization resulting in neck pain (31). Physical fatigue can lead to muscle overactivity and pain, but according to the current study, that was not of the determinants of neck disability. Neck pain has a multifactorial structure. Physical fatigue alone may not have been sufficient to be an independent variable on neck pain.

There are studies indicating psychological fatigue and emotional stress increase the level of musculoskeletal pain (32,33). The meditative approach was reported to provide mental relief resulting in reduced pain in chronic low back pain (34). There are studies stating that emotional stress is closely related to mechanical neck pain and is among its important determinants (35-37). In another study evaluating mechanical neck pain from a psychosocial perspective, factors such as excessive job demands and burnout syndrome were revealed to increase the risk of mechanical neck pain (38). Casey et al. (37) also showed that emotional exhaustion is one of the predictors of mechanical neck pain. Considering that factors such as emotional stress, emotional exhaustion, and anxiety are closely related to mental fatigue, our results are in line with the literature. The mechanism of action of the psychological parameters on mechanical neck pain is based on the endocrine system and neurophysiological principles (39). It is emphasized that cortisol hormone increases and serotonin level decreases with negative psychological experiences, which is an important reason for reducing the pain threshold (40). In addition, increased cortisol hormone causes functional changes in areas such as the hippocampus, amygdala, and prefrontal cortex, which are closely related to pain sensation (41,42).

This study has some limitations. First of all, we did not use an instrumental evaluation method such as MRI in order to determine the etiology of mechanical neck pain. Besides, fatigue and sleep quality were evaluated by self-reported subjective scales.

5. CONCLUSION

In conclusion, the current study revealed that mental fatigue was an independent predictor of neck disability. Physical fatigue and sleep quality were not among determinants of neck-related disability. Therefore, we believe that psychosocial and emotional factors should be considered in mechanical neck pain rehabilitation.

Ethical Consideration of the Study

This study was approved by the local Ethics Committee of Lokman Hekim University (protocol no: 2021072).

Conflict of interest statement

The authors declare no conflict of interest.

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