The Impact of Smartphone Use on Musculoskeletal System Pain and Mental Health

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Abstract - **Introduction and purpose:** Long-term use of the smartphone may cause many physical discomforts such as visual impairment, numbness and tingling in the hands, neck, back, hip, knee pain. In addition, excessive use of smartphones is thought to be associated with conditions such as anxiety, depression, loneliness, low self-esteem, social maladjustment, and impulse control disorder. Because of these, we aimed to investigate the impact of smartphone usage time on musculoskeletal system and mental health.

Methods: A total of 245 participants were included in this cross-sectional study. The Neck Disability Index was used to evaluate the musculoskeletal system problems and Beck Depression Scale was used to evaluate mental health of participants.

Results: The mean age and BMI of the participants in the study were 22.47 ± 4.66 years and 22.37 ± 3.95 kg/m^2. There was a statistically significant difference in the smartphone use time with neck pain and mental health scores ($p<0.001$ and $p=0.034$, respectively). It was determined that the significant difference in musculoskeletal pain was caused using smartphones for 2-4 hours, 4-8 hours and more than 8 hours.

Conclusion: As the smartphone usage time increased, we saw that the negative impact of the musculoskeletal system increased. Similarly, we observed that there was a direct proportional increase between depression scores. We think that the increase in smartphone usage time has a negative effect on musculoskeletal system and mental health.

Keywords – Smartphone, Mental Health, Musculoskeletal System Pain

I. INTRODUCTION

According to the research, as of July 2022, 5.34 billion people use smartphones, and 5.03 billion people use the internet. The number of active social media users was recorded as 4.7 billion. When we look at the data on an annual basis, the rate of smartphone users increased by 1.8 percent and the rate of internet users increased by 3.7 percent [1]. Internet in Turkey 86.4% of the entrepreneurs declared that they use the Internet over mobile phone networks through a device such as a portable computer or smart phone provided by the enterprise [2]. Long-term use of the smartphone can cause many physical discomforts such as visual impairment, numbness and tingling in the hands, neck, back, hip, knee pain [3]. In addition, in the studies examining the effects of people, the smartphone more often used anxiety, depression, loneliness, low self-esteem, social mismatch and impulse control disorder [4]. Additionally, poor postures lead to fatigue, which can have negative effects, such as reduced physiological function, disruption of the autonomic nervous system, creation of problems in daily life, and effects on both the visual and the musculoskeletal systems, leading to headaches and stress. Therefore, we

aimed to investigate the impact of smartphone usage time on musculoskeletal system pain and mental health.

II. MATERIALS AND METHOD

The study was conducted with 245 university students studying Physical Therapy and Rehabilitation Department. The neck disability questioning questionnaire was used to evaluate the musculoskeletal system. Beck depression scale was used to evaluate mental health. All participants signed a personal data confidentiality and data sharing form. Statistical analysis of the data obtained from the study was performed using the statistical program "Statistical Package for Social Sciences" (SPSS) Version 22.0 (SPSS inc., Chicago, IL, USA). Whether the data were suitable for normal distribution was determined by the "One way-ANOVA". According to the analysis results of this test, parametric tests were used in the analysis of data conforming to the normal distribution, and nonparametric tests were used in the analysis of the data that did not conform to the normal distribution. In the statistical analysis of the study, the evaluated variables were defined with mean (Mean), standard deviation (SD), number and percentage values. In the study, the correlation of the data was evaluated with the Spearman Correlation test. The results were considered significant at the $p < 0.05$ level of significance.

A. Smartphone usage

The Smartphone Addiction Scale-Short Form was used to evaluate the duration of smartphone use. It is a 10-item scale, developed by Kwon et al. to measure the risk of smartphone addiction in adolescents, and evaluated with a six-point Likert scale. Scale items were scored from 1 to 6. Scale scores range from 10 to 60. As the score obtained from the test increases, it is considered that the risk for addiction increases [5]. Noyan et al. conducted the Turkish validity and reliability study of the scale [6].

B. Musculoskeletal system

The Neck Disability Index (NDI), the Turkish validity and reliability of which was performed by Kesiktas et al., was used to evaluate neck pain and functional disability [7]. This is a self-rating Likert-type questionnaire consisting of 10 items (neck pain, self-care, load lifting, reading, headache, concentration, work, driving, sleeping, and free-time activities), each scored between 0 and 5. The total score ranges from 0 to 50, and higher scores demonstrating the worse disability [8].

C. Mental health

Beck depression scale, Beck et al. It was developed by Adolescents and adults in 1961 to measure the behavioral findings of depression [9]. In 1978, the entire scale was revised, and duplications defining severity were excluded, and patients were asked to mark their status for the last week, including today [10]. The severity level in the scale; It is interpreted as 0-9= Minimal, 10-16= Mild, 17-29= Moderate, 30-63= Severe. The scale was translated into Turkish as two separate forms, the Beck depression scale and the Beck Depression Inventory, and its validity and reliability studies were conducted [11][12].

D. Figures and Tables

Table 1. Comparison of smartphone use with neck pain

	Neck Disability Index		
	Mean±SD	**Post hoc Bonferroni**	
1-2 hours	7.56±3.33	2-4 hours	1.000
		4-8 hours	0.370
		8 hours >	0.048
2-4 hours	7.49±4.27	1-2 hours	1.000
		4-8 hours	0.003**
		8 hours >	0.001**
4-8 hours	9.78±4.78	1-2 hours	0.370
		2-4 hours	0.003**
		8 hours >	0.658
8 hours >	11.22±6.38	1-2 hours	0.048
		2-4 hours	0.001**
		4-8 hours	0.658
P value	**<0.001***		

*p <0.05 statistical significance
** p <0.16 post hoc statistical significance

Table 2. Comparison of smartphone use with mental health.

	Mental health		
	Mean±SD	**Post hoc Bonferroni**	
1-2 hours	10.56±7.30	2-4 hours	1.000
		4-8 hours	0.586
		8 hours >	0.061
2-4 hours	12.79±8.78	1-2 hours	1.000
		4-8 hours	0.711
		8 hours >	0.035
4-8 hours	14.76±9.11	1-2 hours	0.586
		2-4 hours	0.711
		8 hours >	0.466
8 hours >	17.86±12.02	1-2 hours	0.061
		2-4 hours	0.035
		4-8 hours	0.466

P value	0.034*

*p <0.05 statistical significance
** p <0.16 post hoc statistical significance

III. RESULTS

The average age and BMI averages of the university students participating in the study were 22.47±4.66 years and 22.37±3.95 kg/m^2. There was a statistically significant difference in the use of smartphone use and neck pain scores (p<0.001) (see Table 1). There was a statistically significant difference in the use of smartphone and mental health (p=0.034) (see Table 2). It was seen that the significant difference in the musculoskeletal system was caused by 2-4 hours of use of smartphone use 4-8 hours and over 8 hours (see Table 1).

IV. DISCUSSION

In our study, we aimed to investigate the effect of the duration of smart phone use on the musculoskeletal system pain and mental health. We observed an increase in complications as the duration of use increased. It was found that there are more negative effects on the musculoskeletal system and mental health, especially with the increase in the duration of use, compared to the low-term use.

A steady increase in the use of digital technology at home and in school environments has been reported to cause an increase in musculoskeletal problems [13, 14]. In another study conducted with university students using smartphones, neck and shoulder pain were shown as the most common musculoskeletal pain [15]. In a recent study investigating the effect of smartphone use on spinal posture and pelvic position while standing and walking, it was shown that smartphone use caused significant changes in sagittal and frontal spine parameters such as lumbar lordosis [16]. Smartphone use significantly affects postural stability in healthy young adults [17]. As the use of smartphones increases in many areas of life, it seems inevitable that functional losses of the musculoskeletal system will develop. In our study, we observed that there is a direct correlation between the increase in the duration of phone use and the musculoskeletal system disorders, similar to the results of the literature.

In a study conducted in China in which 1016 medical school students participated, it was found that there was a significant relationship between problematic smartphone use and sleep disturbance and increased levels of physical and mental fatigue [18]. In other study conducted by Hadlington, it was found that the BDI score average of individuals with high-level problematic smartphone use was 67.00 and 53.43 significantly higher than the average of BDI score of individuals with low-level problematic smartphone use [19]. Similarly, in our study, we observed that as the duration of smartphone use increases, its effect on mental health also increases.

V. CONCLUSION

As the smartphone usage time increased, we saw that the negative impact of the musculoskeletal system increased. Similarly, we observed that there was a direct proportional increase between depression scores. We think that the increase in smartphone usage time has a negative effect on musculoskeletal system and mental health.

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