



ORIGINAL ARTICLE

The relationship between screen exposure and neck disability, headache, stress, depression, and anxiety in university students

Üniversite öğrencilerinde ekrana maruz kalma ile boyun sakatlığı, baş ağrısı, stres, depresyon ve anksiyete arasındaki ilişki

Halil YILMAZ,¹ Evrim GÖZ²

Summary

Objectives: In recent years, with the development of technology, screen exposure among university students has increased and caused various physical and psychological effects. The aim of this study is to investigate the relationship between screen exposure and neck disability, headache, stress, depression, anxiety, and sleep disorders in university students.

Methods: Two hundred and twenty-six students were evaluated online in this study. Study outcomes were headache, depression, anxiety, stress, neck disability, and sleep quality.

Results: When the screen exposure was examined, it was observed that the stress, anxiety, and depression levels of the students increased as the smartphone use increased ($p<0.05$). Headache severity ($p=0.028$) in those who use smartphones for 7 h or more; It was observed that the frequency of severe neck disability increased in those who used a smartphone or computer for 7 h or more ($p=0.005$, $p=0.026$).

Conclusion: To prevent physical and psychological problems that may arise due to the increase in screen use time in university students, it is necessary to monitor the frequency of screen use of the students, to organize trainings that explain the physical and psychological effects of long-term screen exposure and increase the level of awareness.

Keywords: Anxiety; depression; neck disability; screen exposure; stress.

Özet

Amaç: Son yıllarda teknolojinin gelişmesiyle üniversite öğrencileri arasında ekran maruziyeti artmış, çeşitli fiziksel ve psikolojik etkiler neden olmuştur. Bu çalışmanın amacı, üniversite öğrencilerinde ekran maruziyeti ile boyun sakatlığı, baş ağrısı, stres, depresyon, anksiyete ve uyku bozuklukları arasındaki ilişkiyi incelemektir.

Gereç ve Yöntem: Bu çalışmaya 226 öğrenci çevrim içi olarak dahil edildi. Çalışmanın sonucunda baş ağrısı, depresyon, anksiyete, stres, boyun sakatlığı ve uyku kalitesi değerlendirildi.

Bulgular: Ekran maruziyeti incelendiğinde akıllı telefon kullanımı arttıkça öğrencilerin stres, kaygı ve depresyon düzeylerinin arttığı gözlemlendi ($p<0,05$). Yedi saat ve üzeri akıllı telefon kullananlarda baş ağrısı şiddeti ($p=0,028$); 7 saat ve üzeri akıllı telefon veya bilgisayar kullananlarda ciddi boyun sakatlığı sıklığının arttığı görüldü ($p=0,005$, $p=0,026$).

Sonuç: Üniversite öğrencilerinde ekran kullanım süresinin artması nedeniyle ortaya çıkabilecek fiziksel ve psikolojik sorunları önlemek için öğrencilerin ekran kullanım sıklığının izlenmesi, uzun süreli ekran maruziyetinin ve bilgisayar kullanımının fiziksel ve psikolojik etkilerini anlatan eğitimler düzenlenmesi, farkındalık düzeyinin artırılması gerekmektedir.

Anahtar sözcükler: Ekrana maruz kalma; boyun sakatlığı; stres; depresyon; anksiyete.

Introduction

Today, the increase in the use of screens with the effect of technological developments has led to various physical and psychological problems in society. Most of the society, especially the youth, use devices such as smartphones, tablets, and comput-

ers for long periods of time during the day. With the increase in screen use, the incidence of musculoskeletal disorders is increasing in individuals.^[1,2] It has been reported that university students experience musculoskeletal problems in many parts of the body due to bad postures and adaptation

¹Division of Anatomy, Department of Basic Science, Ordu University Faculty of Medicine, Ordu, Türkiye

²Department of Physiotherapy and Rehabilitation, Tarsus University Faculty of Health Sciences, Mersin, Türkiye

Submitted (Başvuru) 19.12.2022 Revised (Revizyon) 13.04.2023 Accepted (Kabul) 22.05.2023 Available online (Online yayımlanma) 20.10.2023

Correspondence: Dr. Halil Yılmaz. Ordu Üniversitesi Tıp Fakültesi, Temel Bilimler Anabilim Dalı, Anatomi Kliniği, Ordu, Türkiye.

Phone: +90 - 452 - 226 52 00 / 5216 **e-mail:** halilyilmaz855@gmail.com

© 2023 Turkish Society of Algology

to devices such as smartphones, tablets, and computers. Problems related to screen use in university students occur most frequently in the neck and the severity of the problems increases as the usage time increases.^[3-6]

Neck problems negatively affect university students' regular attendance and academic success. Students spend a long time in front of the screen due to social activities such as the use of social media as well as course-related activities such as literacy. This situation causes students to be in the risk group for neck pain and disability. In the literature, it has been reported that depression and anxiety are the biggest psychosocial risk factors, and increased muscle tension is also a physical risk factor for neck pain.^[7] Psychosocial factors cause musculoskeletal pain by increasing both pain awareness and muscle activity in bad posture, increasing mechanical load.^[8] It has been shown in previous publications that psychological stress negatively affects neck disability in university students.^[9]

While intensive screen use is common among university students, the incidence of insomnia and various psychological disorders caused by this situation is increasing day by day. Sleep is an important and necessary period for the brain to rest, which is constantly exposed to information flow throughout the day. Therefore, sleep problems cause various behavioral disorders.^[10] In addition, intense stress causes sleep disorders and musculoskeletal pain occurs as a result of long-term insomnia.^[11]

Students often experience headaches due to anxiety, stress, inadequate sleep, and academic factors. It has been observed that as the duration of screen exposure increases in university students, all these psychosocial risks also increase and accordingly the prevalence of headache and migraine has increased in recent years.^[12,13]

The fact that university students are exposed to high levels of screen especially during periods of excessive use of smartphones and computers, and due to this, the emergence of physical and psychological problems has led us to carry out our research on the student population. Studies in this area have shown that screen exposure is associ-

ated with physical symptoms such as headaches and neck pain, or with psychological symptoms such as stress, anxiety, depression, and sleep disorders. However, as far as we know, although there are many cross-sectional studies examining neck pain and disability in university students, there is no study examining all factors such as screen exposure, neck disability, depression, stress, anxiety, sleep disorders, and headaches. Therefore, in this study, we aimed to investigate the relationship between screen exposure and neck disability, headache, stress, depression, anxiety, and sleep disorders in university students.

Material and Methods

The research was carried out with students studying at Nevşehir Hacı Bektaş Veli University (NEVU), Kozaklı Vocational School, Therapy and Rehabilitation Department, Occupational Therapy and Physiotherapy program. Within the scope of the research, the main objectives of the research were explained to all participants in the informed consent forms prepared online before the scales were applied. Volunteer participants filled out the questionnaires online. The study is in the structure of a cross-sectional research.

The population of the research consists of those over the age of 18 who are students of NEVU, Kozaklı Vocational School, Therapy and Rehabilitation Department (n=301). Two hundred and twenty-six students voluntarily filled out the questionnaires to participate in the research. Reached 75% of the universe.

Data Collection Tools and Actions

Within the scope of this research, demographic information, screen exposure time, and headaches of vocational school students were questioned. Headaches of the students were evaluated with the Numeric Pain Rating Scale (NPRS), their psychological status was evaluated with the Depression-Anxiety-Stress Scale 21 (DASS 21), neck pain and disability were evaluated with the Neck Disability Index (NDI), and their sleep quality was evaluated with the Pittsburgh Sleep Quality Index (PSQI) online.

Screen Exposure

The devices used by the students and the duration of use during the day were questioned.

Headache

NPRS was used to subjectively evaluate the headaches of individuals. The NPRS is a scale used to assess pain. The patient is asked to rate the severity of the pain out of 10. The patient chooses the appropriate value among the zero no pain and 10 worst pain scores. In the literature, the validity and reliability of the use of NPRS to assess chronic pain have been reported with face-to-face and online evaluation methods.^[14,15]

DASS 21

The Turkish version of this scale with validity and reliability studies was used. The scale consists of 21 questions in 4-point Likert type. There are seven questions each evaluating depression, anxiety, and stress sub-dimensions. Each item; zero "not suitable for me," one "somewhat suitable for me," two "usually suitable for me," and three "completely suitable for me." A minimum of zero and a maximum of 21 points are obtained. Getting five points or more from the depression sub-dimension, four points or more from anxiety, and eight points or more from stress indicates that they have a related problem.^[16,17]

NDI

The questionnaire consists of 10 items: Pain intensity, headache, concentration, sleep, personal care, lifting, reading, work life, driving, and leisure activities. Each item has six options scored from 0 to 5. The total score constitutes the test score. In the questionnaire, 0–4 points are evaluated as no disability, 5–14 points as mild disability, 15–24 points as moderate disability, 25–34 points as severe disability, and over 35 points as complete disability. The Turkish validity and reliability study of the scale was conducted.^[18,19]

PSQI

It is a self-report scale consisting of 19 items that evaluates sleep quality and sleep disturbance in the last month. It is a valid and reliable scale in Turkish. By scoring 18 questions of the scale, 7 components are formed, and these seven components are scored between 0 and 3, and the total PSQI score is obtained by summing the scores of the components. The total score ranges from 0 to 21, and a total score higher than 5 indicates poor sleep quality.^[20,21]

Statistical Analysis

The data in the study were analyzed for normal distribution by considering five parameters (Skewness-Kurtosis, Std/Mean, Q-Q Plots, Histogram, and Shapiro-Wilk Test). Normally distributed data were shown as mean±SD and Independent Samples T-Test was applied in pairwise comparisons and One Way ANOVA test was performed in multiple comparisons (post hoc levene test<0.05 tamhane; levene test>0.05 tukey test). Independent variables that showed non-normal distribution were shown as median (minimum-maximum). In the statistical analysis, Mann-Whitney U-Test was performed in paired groups. In the statistical comparisons of multiple groups, the Kruskal-Wallis test was performed, and in post hoc comparisons, the Mann-Whitney U-Test was performed with Bonferoni correction. Since the independent variables did not show normal distribution, the relationship between the variables was analyzed using Spearman Rho's correlation analysis. SPSS 23.00 program was used in the statistical analysis of this study.^[22]

Ethical Approval

Our study was approved by NEVU Non-Invasive Clinical Research Publication Ethics Committee with the decision number 468 on December 28, 2021. The study was conducted in accordance with the Declaration of Helsinki, and written consent was obtained from the participants online.

Results

In the study, the data of 226 students were analyzed. The results of the comparison of demographic data and digital device use according to the DASS and PSQI questionnaires are given in Table 1. The level of anxiety is higher in women than in men. It was observed that those living in rural areas had higher levels of stress and depression than those living in city and district centers. When screen exposure was examined, it was observed that as smartphone use increased, students' stress, anxiety, and depression levels increased (Table 1).

The correlation results between the DASS21, NDI, and PSQI scale scores are shown in Table 2. Anxiety, depression, and stress data were found to be highly correlated with each other. Neck disability was moderately positively correlated with all psychological findings such as anxiety, depression, and stress, and the PSQI value (Table 2).

Table 1. Comparison of demographic data and digital tools used according to DASS 21 and PSQI scales

	Age Mean±SD	Sig (p)	Sleep time	Sig (p)	Anxiety	Sig (p)	Depression	Sig (p)	Stress	Sig (p)	PSQI	Sig (p)
Gender												
Female	20.5±1.64	0.246	7.8±1.58	0.407	14 (0-44)	0.003	16 (0-42)	0.539	16(0-42)	0.603	8 (0-19)	0.210
Male	20.9±1.9		7.6±1.32		6(0-32)		17 (0-42)		18 (0-42)		7.50 (1-16)	
Department												
Physiotherapy	20.5±1.66	0.348	7.9±1.54	0.097	14 (0-44)	0.041	18 (0-42)	0.345	18 (0-40)	0.358	8 (1-19)	0.578
Occupational therapy	20.7±1.73		7.6±1.52		10 (0-38)		15 (0-42)		17 (0-42)		7.50 (0-18)	
Class												
1. class	20.3±1.88	0.002	7.6±1.38	0.069	10 (0-36)	0.100	14 (0-38)	0.499	16 (0-42)	0.165	7 (1-18)	0.358
2. class	21.0±1.36		7.9±1.68		14 (0-44)		16 (0-42)		18 (0-42)		9 (0-19)	
Living place												
City center	20.8±1.93	0.112	7.7±1.61	0.213	12 (0-40)	0.591	15 (0-40) ^a	0.007	16 (0-40) ^a	0.007	8 (1-19)	0.719
District	20.4±1.49		7.8±1.35		10(0-44)		14 (0-42) ^a		7 (0-16)			
Town/village	20.2±1.14		7.7±1.65		14 (2-30)		22 (4-42) ^b		8 (2-18)			
Tablet												
None	20.8±1.32	0.456	8.3±1.80	0.308	16 (0-30)	0.165	13 (0-36)	0.071	13 (0-42)	0.071	12.50 (1-18)	0.167
1-3 h	20.3±1.33		7.8±1.53		12 (0-40)		16 (0-38)		16 (0-40)		8 (1-16)	
4-6 h	20.5±1.62		7.8±1.42		12 (0-38)		14 (0-42)		16 (0-42)		7 (1-19)	
7 h or higher	20.9±2.17		7.5±1.65		14 (0-44)		19 (0-42)		18 (0-42)		8 (0-18)	
Smartphone												
1-3 h	20.4±1.58	0.172	7.6±1.41	0.847	8 (0-32) ^a	<0.01	14 (0-40) ^a	0.007	14 (0-42) ^a	0.007	7 (1-17)	0.197
4-6 h	20.5±1.80		7.8±1.42		14 (0-44) ^b	18 (0-42) ^b	19 (0-42) ^b	8 (0-19)	16 (0-40)			
7 h or higher	21.0±1.62		7.8±1.93		16 (0-34) ^b	20 (0-42) ^b	18 (0-42) ^b	9 (1-18)	16 (0-42)			
Computer												
None	20.6±1.21	0.272	8.0±1.62	0.182	14 (0-34)	0.066	14 (0-42)	0.558	16 (0-42)	0.558	9 (1-18)	0.59
1-3 h	20.6±1.73		7.8±1.53		10 (0-40)		18 (0-42)		18 (0-40)		7 (0-19)	
4-6 h	20.4±1.59		7.4±1.24		13 (0-44)		15 (0-42)		16 (0-42)		8 (1-18)	

DASS 21: Depression-Anxiety-Stress Scale 21; PSQI: Sleep Quality Index; SD: Standard deviation; a, b: Different letters indicate a statistically significant difference.

Table 2. Correlation analysis between scales

	Anxiety	Depression	Stress	NDI	PSQI
Anxiety					
r	1	0.704	0.757	0.635	0.482
Sig		<0.01	<0.01	<0.01	<0.01
Depression					
r	0.704	1	0.844	0.531	0.422
Sig	<0.01		<0.01	<0.01	<0.01
Stress					
r	0.757	0.844	1	0.590	0.450
Sig	<0.01	<0.01	<0.01	<0.01	<0.01
NDI					
r	0.635	0.531	0.59	1	0.628
Sig	<0.01	<0.01	<0.01	<0.01	<0.01
PSQI					
r	0.482	0.422	0.45	0.628	1
Sig	<0.01	<0.01	<0.01	<0.01	<0.01

NDI: Neck Disability Index; PSQI: Sleep Quality Index. Spearman Rho's correlation was performed because the independent variables did not show normal distribution.

The frequency analysis results between the digital communication tool and the scales are presented in Table 3. It has been determined that the frequency of moderate, high, and very severe depression is reduced in those who use smartphones very little. On the other hand, it was found that the frequency of moderate and severe anxiety increased in those who used a smartphone for 4–6 h, and the frequency of stress increased in those who used a computer for 4–6 h. In addition, it was observed that the rate of high-severe stress increased in those who used tablets for 7 h or more (Table 3).

It was determined that the severity of headache increased in those who used a smartphone for 7 h or more (Table 4). In addition, the frequency of severe neck disability increased in those who used a smartphone for 7 h or more (Table 5).

Discussion

Due to technological developments in recent years, digital devices such as smartphones, computers, and tablets have become an indispensable part of our lives. With the increase in the frequency of use of these devices, the time that individuals are exposed to the screen during the day has also increased considerably, and this has created various physical and

psychological problems.^[23] In this study, in which we examined the effects of screen exposure in university students, we showed that long-term screen use is associated with neck disability, stress, depression, anxiety, and headache.

As the duration of daily smartphone use increases, the incidence of psychological problems such as stress, anxiety, and depression increases. In studies examining the relationship between smartphone use and psychological disorders in university students, it has been shown that as smartphone use increases, the severity of depressive symptoms and the severity of anxiety increase.^[24,25] In our study, it was observed that as the use of smartphones increased, the stress, anxiety, and depression levels of the students increased. In addition, the decrease in the prevalence of moderate, high, and very severe depression in those who use smartphones very little and the increase in the incidence of moderate and severe anxiety in those who use smartphones for more than 4 h a day support the view that long-term smartphone use increases the symptoms of stress, anxiety, and depression. However, whether students experience more stress, anxiety, and depression because they use smartphones frequently, or they need to use smartphones more because their stress and anxiety levels are high, this issue is still not fully

Table 3. Frequency analysis between digital communication tool and scales (Chi-square test)

	Depression					
	Normal	Mild	Moderate	Severe	Ext severe	Chi-square
Tablet						
None	31.30%	18.80%	31.30%	6.30%	12.50%	Value: 11.169 p=0.515
1–3 h	34%	9.40%	18.90%	17%	20.80%	
4–6 h	30.10%	12.60%	29.10%	13.60%	14.60%	
7 h or higher	16.70%	11.10%	25.90%	18.50%	27.80%	
	Stress					
	Normal	Mild	Moderate	Severe	Ext severe	Chi Square
Tablet						
None	12.5% ^a	6.3% ^a	43.8% ^a	6.3% ^a	31.3% ^a	Value: 17.01 p=0.049
1–3 h	18.9% ^a	1.9% ^a	28.3% ^a	9.4% ^a	41.5% ^a	
4–6 h	17.5% ^a	6.8% ^a	24.3% ^a	10.7% ^a	40.8% ^a	
7 h or higher	13% ^{a,b}	1.9% ^{a,b}	13% ^b	13% ^a	48.1% ^{a,b}	
	Anxiety					
	Normal	Mild	Moderate	Severe	Ext severe	Chi-square
Tablet						
None	50%	12.50%	25%	12.50%	0%	Value: 13.087 p=0.363
1–3 h	67.90%	13.20%	9.40%	7.50%	1.90%	
4–6 h	65%	13.60%	12.60%	3.90%	4.90%	
7 h or higher	55.60%	9.30%	13%	16.70%	5.60%	
	Depression					
	Normal	Mild	Moderate	Severe	Ext severe	Chi Square
Smartphone						
1–3 h	38.8% ^a	8.8% ^{a,b}	30% ^a	15% ^{a,b}	7.5% ^b	Value: 25.966 p=0.011
4–6 h	22.9% ^a	12.5% ^a	27.1% ^a	15.6% ^a	21.9% ^a	
7 h or higher	20.4% ^a	14.3% ^a	18.4% ^a	14.3% ^a	32.7% ^a	
	Stress					
	Normal	Mild	Moderate	Severe	Ext severe	Chi Square
Smartphone						
1–3 h	20% ^{a,b}	6.3% ^{a,b}	33.8% ^b	11.3% ^{a,b}	28.7% ^a	Value: 21.651 p=0.023
4–6 h	15.6% ^a	4.2% ^a	17.7% ^a	12.5% ^a	50% ^a	
7 h or higher	12.20%	2%	18.4% ^a	18.4% ^a	49% ^a	
	Anxiety					
	Normal	Mild	Moderate	Severe	Ext severe	Chi Square
Smartphone						
1–3 h	77.5% ^a	11.3% ^a	6.3% ^a	5% ^a	0% ^a	Value: 38.232 p=0.000
4–6 h	58.3% ^{a,b}	11.5% ^{a,b}	18.8% ^{a,b}	4.2% ^b	7.3% ^a	
7 h or higher	46.9% ^a	14.3% ^{a,b}	12.2% ^{a,b}	22.4% ^b	4.1% ^{a,b}	
	Depression					
	Normal	Mild	Moderate	Severe	Ext severe	Chi Square
Computer						
None	28.70%	18.8% ^a	23.80%	12.50%	16.30%	Value: 9.982 p=0.618
1–3 h	28.70%	7.4% ^a	27.70%	17%	19.10%	
4–6 h	26.20%	11.90%	26.20%	16.70%	19%	

Table 3 (devami). Frequency analysis between digital communication tool and scales (Chi-square test)

	Stress					Chi Square
	Normal	Mild	Moderate	Severe	Ext severe	
Computer						
None	18.8% ^a	3.8% ^a	23.8% ^a	20% ^a	33.8% ^a	Value: 13.32 p=0.346
1–3 h	13.8% ^a	3.2% ^a	24.5% ^a	12.80%	45.7% ^a	
4–6 h	8% ^{a,b}	9.5% ^b	21.4% ^{a,b}	2.40%	47.6% ^{a,b}	
	Anxiety					Chi Square
	Normal	Mild	Moderate	Severe	Ext severe	
Computer						
None	55%	16.30%	15%	12.50%	1.30%	Value: 18.225 p=0109
1–3 h	69.10%	8.50%	13.80%	5.30%	3.20%	
4–6 h	59.50%	16.70%	9.50%	4.80%	9.50%	

The multi-eyed Chi-square test was performed in the expected and observed frequency analysis of the data. Same letters denote the same frequency, different letters have different frequency.

Table 4. Comparison of headache in demographic and digital communication tool users

	Headache	Sig. (p)
Smartphone		
1–3 hours	4 (0–7) ^a	0.028
4–6 h	5 (0–8) ^a	
7 h or higher	6 (1–9) ^b	
Gender		
Female	6 (0–9)	0.252
Male	5 (0–8)	
Department		
Physiotherapy	5 (0–9)	0.627
Occupational therapy	6 (0–9)	
Class		
1. class	5 (0–9)	0.542
2. class	6 (0–9)	
Living place		
City center	6 (0–9)	0.923
District	5 (0–9)	
Town/village	5 (1–9)	
Tablet		
None	6 (1–9)	0.193
1–3 h	5 (1–9)	
4–6 h	6 (0–9)	
7 h or higher	5.50 (0–9)	
Computer		
None	5 (0–9)	0.106
1–3 h	6 (0–9)	
4–6 h	6 (2–9)	

a, b: Different letters indicate a statistically significant difference. Independent variables that did not fit the normal distribution analysis were shown as median (minimum–maximum). In the statistical analysis, Mann–Whitney U-test was performed in paired groups. In the statistical comparisons of multiple groups, Kruskal–Wallis test was performed, and in post hoc comparisons, the Mann–Whitney U-test was performed with Bonferroni correction.

explained in the literature. For this reason, studies on the negative psychological effects of the widespread use of smartphones are very important.

Tablets and computers, which provide virtual interaction between people and have an important place in academic studies, are also digital devices that students frequently use after smartphones. In studies, it has been reported that psychological problems increase with the increase in total screen exposure time, which includes not only smartphones but also other devices.^[1,26] Among the students included in our study, the rate of experiencing a very high level of severe stress for those who use tablets longer than 7 h a day; we found that the rate of stress is higher in those who use computers for 4–6 h. When the duration of screen use is examined, it is seen that as the duration of use of these electronic devices increases, all psychological findings increase.^[23]

In a study conducted with 83 individuals working at a computer, it was reported that computer users experienced musculoskeletal problems in various body parts, including the neck (77.1%), the back (69.9%), and the shoulders (67.5%). It has been stated that these problems are related to the duration of computer use and neck pain is more common in those who use the computer for more than 6 h a day.^[1] The frequent use of devices such as tablets and smartphones in positions that require long-term neck flexion increases the mechanical load on the muscles around the neck, causing spasm, reducing the cervi-

Table 5. Analysis of categorized neck disability frequency according to tablet use with Chi-square test

	Neck disability					Chi-square
	Normal	Mild	Moderate	Severe	Ext severe	
Tablet						
None	18.8% ^a	36.3% ^a	31.3% ^a	6.6% ^a	6.3% ^a	Value: 12.30 p=0.422
1–3 h	18.9% ^a	47.2% ^a	26.4% ^a	7.5% ^a	0% ^a	
4–6 h	17.5% ^a	54.4% ^a	23.3% ^a	4.9% ^a	0% ^a	
7 hours or higher	14.8% ^a	44.4% ^a	27.8% ^a	11.1% ^a	1.9% ^a	
Smartphone						
1–3 h	22.5% ^a	48.8% ^a	25% ^a	3.8% ^a	0% ^a	Value: 22.17 p=0.005
4–6 h	16.7% ^a	53.1% ^a	25% ^a	3.1% ^a	2.1% ^a	
7 hours or higher	10.2% ^a	40.8% ^a	28.6% ^a	20.4% ^b	0% ^{a,b}	
Computer						
None	17.5% ^a	40% ^a	30% ^a	11.3% ^a	1.3% ^a	Value: 23.15 p=0.026
1–3 h	21.5% ^a	54.8% ^a	22.6% ^{a,b}	1.1% ^a	0% ^{a,b}	
4–6 h	4.8% ^a	52.4% ^a	31% ^a	9.5% ^a	2.4% ^a	

The multi-eyed Chi-square test was performed in the expected and observed frequency analysis of the data. Same letters denote the same frequency, different letters have different frequency.

cal lordosis, and impairing proprioception, and this results in neck pain. Continuing the use of devices causes neck pain to continue and become chronic, which causes neck disability. In studies conducted with university students, neck pain, and disability are the leading problems of the musculoskeletal system that occur due to the use of smartphones.^[6,27] Similarly, severe neck disability was observed in those who used smartphones for 7 h or more in our study, and our findings support the literature. However, we know that psychological factors such as stress, anxiety, and depression are also serious risk factors for neck pain, and in our study, we showed that there is a relationship between neck disability and stress, anxiety, depression, and sleep problems.^[7] Since there is a relationship between neck disability and psychological problems and it is assumed that the cause of this neck disability is excessive screen use, we think that students should receive both ergonomic and psychological counseling regarding screen use to protect their physical and psychological health.

Since individuals are exposed to radiofrequency fields during smartphone use and the blood-brain barrier and dopamine opioid systems of the brain are affected by this situation, it is assumed that increased smartphone exposure causes headaches in individuals.^[11] However, it is thought that the use of smart-

phones disrupts the head and neck position, which causes tension-type headaches due to mechanical effects.^[28] Demirci et al.^[29] examined the effect of smartphone use on headache in 325 university students and reported that headache complaints were higher in those who used smartphones at a high rate. In our study, we also showed that as smartphone use increases, headache increases. Examining the relationship between not only smartphone use but also whole screen exposure and headache in university students, Hashish et al.^[12] found the prevalence of headache in students as 65.72% and the prevalence of high exposure to the screen as 52.69%. Therefore, he stated that the increase in the duration of screen exposure was related to the increase in headaches. Since headache can affect the performance, academic success, and productivity of the individual, it is important to explain the relationship between headache and screen use in university students and to raise the awareness of the students on this issue.

Among the digital tools used by young adults, smartphones are becoming more prominent than tablets. The main reason for this is that social media platforms can be accessed most easily with smartphones. Social media use has also been reported to increase depression in previous studies. Since social media use is more intensive on smartphones, the relation-

ship between depression and smartphones is more obvious. In this study, people who used tablets for 7 h or more showed an increase in stress parameters, but not in depression or anxiety. Those who used smartphones for 7 h or more showed an increase in both depression and anxiety. We think there are two main reasons for this. First, access to social media was through smartphones rather than tablets. In addition to the duration of use of digital devices, we believe that the purpose for which they are used also affects the parameters of depression, anxiety, and stress. Second, tablets were generally used at home due to their disadvantages in terms of average charging time and portability compared to smartphones. We believe that the use of smartphones in environments outside the home increases technology dependence and thus leads to depression and anxiety.

Limitations

The fact that only one part of a single school was conducted on students constitutes the limitation of this study.

Conclusion

As the screen exposure increases in university students, neck disability, headache, stress, depression, and anxiety levels increase. For this reason, to prevent these physical and psychological problems of university students who have high screen use for both academic and social purposes, it is necessary to monitor the frequency of screen use of the students, to organize trainings that explains the physical and psychological effects of long-term screen exposure and increase the awareness level of the students.

Peer-review: Externally peer-reviewed.

Ethics Committee Approval: The Nevşehir Hacı Bektaş Veli University Non-Interventional Clinical Research Ethics Committee granted approval for this study (date: 28.12.2021, number: 468).

Conflict-of-interest issues regarding the authorship or article: None declared.

References

- Gün İ, Özer A, Ekinçi E, Öztürk A. Declared health problems and computer use characteristics of computer users. *Erciyes Med J* [Article in Turkish] 2004;26:153–7.
- Osama M, Ali S, Malik RJ. Posture related musculoskeletal discomfort and its association with computer use among university students. *J Pak Med Assoc* 2018;68:639–41.
- Noack-Cooper KL, Sommerich CM, Mirka GA. College students and computers: Assessment of usage patterns and musculoskeletal discomfort. *Work* 2009;32:285–98. [CrossRef]
- Yağcı N, Çalık BB. Üniversite öğrencilerinde masaüstü bilgisayar kullanımının boyun ağrısına olan etkisinin incelenmesi. *Ergoterapi Rehabilitasyon Derg* [Article in Turkish] 2014;2:65–72.
- Gerr F, Marcus M, Ensor C, Kleinbaum D, Cohen S, Edwards A, et al. A prospective study of computer users: I. Study design and incidence of musculoskeletal symptoms and disorders. *Am J Ind Med* 2002;41:221–35. [CrossRef]
- Günal A, Pekçetin S. Relationship between smartphone addiction and the pain in cervical region-upper extremity among university students. *Sürekli Tıp Eğitimi Derg* [Article in Turkish] 2019;28:114–9.
- Kim R, Wiest C, Clark K, Cook C, Horn M. Identifying risk factors for first-episode neck pain: A systematic review. *Musculoskelet Sci Pract* 2018;33:77–83. [CrossRef]
- Bonzini M, Bertu' L, Veronesi G, Conti M, Coggon D, Ferrario MM. Is musculoskeletal pain a consequence or a cause of occupational stress? A longitudinal study. *Int Arch Occup Environ Health* 2015;88:607–12. [CrossRef]
- Daher A, Halperin O. Association between Psychological Stress and Neck Pain among College Students during the Coronavirus Disease of 2019 Pandemic: A questionnaire-based cross-sectional study. *Healthcare (Basel)* 2021;9:1526. [CrossRef]
- Thomé S, Dellve L, Härenstam A, Hagberg M. Perceived connections between information and communication technology use and mental symptoms among young adults - a qualitative study. *BMC Public Health* 2010;10:66.
- Vinstrup J, Jakobsen MD, Calatayud J, Jay K, Andersen LL. Association of stress and musculoskeletal pain with poor sleep: Cross-sectional study among 3,600 hospital workers. *Front Neurol* 2018;9:968. [CrossRef]
- Abou Hashish EA, Baatiah NY, Bashaweeh AH, Kattan AM. The online learning experience and reported headaches associated with screen exposure time among Saudi health sciences students during the COVID-19 pandemic. *BMC Med Educ* 2022;22:226. [CrossRef]
- Montagni I, Guichard E, Carpenet C, Tzourio C, Kurth T. Screen time exposure and reporting of headaches in young adults: A cross-sectional study. *Cephalalgia* 2016;36:1020–7. [CrossRef]
- Mani S, Sharma S, Omar B, Paungmali A, Joseph L. Validity and reliability of Internet-based physiotherapy assessment for musculoskeletal disorders: A systematic review. *J Telemed Telecare* 2017;23:379–91. [CrossRef]
- Hjermstad MJ, Fayers PM, Haugen DF, Caraceni A, Hanks GW, Loge JH, et al. Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: A systematic literature review. *J Pain Symptom Manage* 2011;41:1073–93. [CrossRef]
- Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck depression and anxiety inventories. *Behav Res Ther* 1995;33:335–43. [CrossRef]

17. Yılmaz Ö, Boz H, Arslan A. Depresyon anksiyete stres ölçeğinin (DASS 21) Türkçe kısa formunun geçerlilik-güvenilirlik çalışması. *Finans Ekonomi Sosyal Araşt Derg* 2017;2:78–91.
18. Vernon H. The Neck Disability Index: state-of-the-art, 1991-2008. *J Manipulative Physiol Ther* 2008;31:491–502. [\[CrossRef\]](#)
19. Aslan E, Karaduman A, Yakut Y, Aras B, Simsek IE, Yagly N. The cultural adaptation, reliability and validity of neck disability index in patients with neck pain: A Turkish version study. *Spine (Phila Pa 1976)* 2008;33:E362–5. [\[CrossRef\]](#)
20. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Res* 1989;28:193–213. [\[CrossRef\]](#)
21. Agargun M. Pittsburgh uyku kalitesi indeksinin geçerliliği ve güvenilirliği. *Turk Psikiyatri Derg* [Article in Turkish] 1996;7:107–15.
22. Hayran M. Sağlık araştırmaları için temel istatistik. 1st ed. Ankara: Omega Araştırma; 2011.
23. Pandya A, Lodha P. Social connectedness, excessive screen time during COVID-19 and mental health: A review of current evidence. *Front Hum Dyn* 2021;3:684137. [\[CrossRef\]](#)
24. Özen S, Topcu M. The relationship of smartphone addiction with depression, obsession-compulsion, impulsivity, alexithymia among medical faculty students. *J Depend* [Article in Turkish] 2017;18:16–24.
25. Hwang KH, Yoo YS, Cho OH. Smartphone overuse and upper extremity pain, anxiety, depression, and interpersonal relationships among college students. *J Korea Contents Assoc* 2012;12:365–75. [\[CrossRef\]](#)
26. Majumdar P, Biswas A, Sahu S. COVID-19 pandemic and lockdown: Cause of sleep disruption, depression, somatic pain, and increased screen exposure of office workers and students of India. *Chronobiol Int* 2020;37:1191–200. [\[CrossRef\]](#)
27. Kalirathinam D, Manoharlal MA, Mei C, Ling CK, Sheng TWY, Jerome A, et al. Association between the usage of smartphone as the risk factor for the prevalence of upper extremity and neck symptoms among university students: A cross-sectional survey based study. *Res J Pharm Technol* 2017;10:1184. [\[CrossRef\]](#)
28. Lee JI, Song HS. The correlation analysis between hours of smartphone use and neck pain in the Gachon university students. *J Acupunct Res* 2014;31:99–109. [\[CrossRef\]](#)
29. Demirci S, Demirci K, Akgonul M. Headache in smartphone users: A cross-sectional study. *J Neurol Psychol* 2016;4:5.