

Health Effects of Smartphones in 14-19 Age Young People

Akıllı Telefonların 14-19 Yaş Gençlerde Sağlık Açısından Etkileri

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ABSTRACT

Objective: Mobile technologies have been rising and expanding rapidly since the COVID-19 pandemic. This study aims to determine high school students' smartphone use and related health problems (attention deficit, kyphosis, myopia) with a new approach.

Materials and Methods: Using smartphones in high school students, including the ages of 14-19, and its effects on health were examined by creating two groups over the Google form survey system (Group I: Less than three hours and Group II: three hours or more). This descriptive study was conducted between November 10 and December 16, 2022. Cronbach's alpha ($\alpha = 0.84$) value was calculated with the SPSS 25.0 program to observe the reliability of the questionnaire.

Results: A total of 242 students participated in the survey study. The average age of the students is 15.94. The age of using a smartphone for the first time was lower in Group II compared to Group I ($p=0.013$). In Group II, distance vision impairment (myopia) ($p=0.047$), attention deficit (DI) ($p=0.001$) and postural impairment (kyphosis) ($p=0.004$) were found to be significantly higher.

Conclusions: Although using smartphones for educational purposes is seen as favourable in high school students, they cannot ignore the health problems (myopia, kyphosis, lack of attention) caused by them.

Keywords: Attention deficit, kyphosis, myopia, smartphones

ÖZ

Amaç: Mobil teknolojiler, COVID-19 pandemisinden bu yana hızla yükseliyor ve genişliyor. Bu çalışma, lise öğrencilerinde akıllı telefon kullanımı ve buna bağlı sağlık sorunlarının (dikkat eksikliği, kifoz, miyop) yeni bir yaklaşımla belirlenmesini amaçlamaktadır.

Materyal ve Metot: 14-19 yaş dahil olmak üzere lise öğrencilerinde akıllı telefon kullanımı ve sağlık üzerine olan etkileri, Google form anket sistemi üzerinden, iki grup oluşturularak, incelenmiştir (Grup I: Üç saatten az ve Grup II: Üç saat ve üzeri). Tanımlayıcı tipteki bu araştırma 10 Kasım -16 Aralık 2022 tarihleri arasında gerçekleştirilmiştir. Anketin güvenilirliğini gözlemlemek için SPSS 25.0 programı ile Cronbach's alpha ($\alpha = 0,84$) değeri hesaplanmıştır.

Bulgular: Anket çalışmasına toplam olarak 242 öğrenci katılmıştır. Öğrencilerin yaş ortalaması 15.94'tür. Grup II'de ilk kez akıllı telefon kullanma yaşı Grup I'e göre daha düşüktü ($p=0,013$). Grup II'de; uzağı görme bozukluğu (miyopi) ($p=0,047$), dikkat eksikliği (DE) ($p=0,001$) ve postür bozukluğu (kifoz) ($p=0,004$) anlamlı olarak daha yüksek bulundu.

Sonuç: Lise öğrencilerinde akıllı telefonların eğitim amaçlı kullanımı olumlu olarak görülse de yol açtığı sağlık sorunları (miyop, kifoz, dikkat eksikliği) göz ardı edilemez.

Anahtar Kelimeler: Akıllı telefon, dikkat eksikliği, kifoz, miyopi

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INTRODUCTION

It is seen that smartphones are used seriously by individuals of all ages in our country. Additionally, it is stated that this use has reached the level of addiction, especially among young people.¹ On the other hand, the contribution of the coronavirus disease (COVID-19) to this increase in recent years worldwide and, of course, in our country, cannot be ignored. For example, social media, education, telemedicine consultations and others are the first examples that come to mind.² It should be considered that the abnormal increase in mobile device use in children has essential adverse health consequences. On the other hand, it should not be forgotten that smartphone applications do a great job in the fight against COVID-19.^{3,4} Technology advancements have led to increased handheld devices, presenting slightly different visual challenges than desktop displays.⁵ This increase has led to more research to understand better the symptoms of health problems associated with using mobile devices.^{6,7} These health problems occur broadly, including all pathological symptoms (psychiatric, orthopaedic, ocular, and others) from young to advanced ages.^{8,9} With the widespread use of smartphones, significant increases were observed in usage times.¹⁰ Of course, there were symptoms brought about by this increase in smartphones. Among these, some ocular symptoms and related health problems draw attention.¹¹ Another symptom detected in research on smartphone use is posture and position disorder. Ergonomic risk assessment studies have been conducted, especially in the upper extremities.¹² Studies are ongoing to evaluate the possible harmful effects of long-term smartphone use on spinal posture and to develop preventive measures.¹³ In addition, one health problem arising from excessive use of mobile devices is sleep disorders and related distractions. In this context, Understanding the role of sleep and inner perception may further elucidate the sleep-health link.¹⁴ Many hormonal changes can underlie emotional disorders.¹⁵ The effect of night sleep on serotonin and melatonin hormones is so essential that there are many dietary recommendations to balance these two hormones. Because these two hormones positively contribute to antioxidant capacity and good mood, that is good behaviour.¹⁶⁻¹⁸ Poor sleep quality, for example, sleeping with the smartphones active, can produce many distractions and behavioural disorders. Excessive use of mobile devices can cause sleep disturbances, and daily life problems may occur due to this situation.¹⁹

Our research will create awareness in society, especially among young people, about achieving a healthy life. In addition, we would like to point out that Our study brings a new perspective to this issue by using the term "double-edged sword" for smartphone usage.

MATERIALS AND METHODS

Ethics Committee Approval: Ethical approval for the research was obtained from the Ethics Committee of Sakarya University, Medical Faculty (Dated 5.11.2022, decision no: E-12833-118), and the Declaration of Helsinki conducted the study.

Study Design: We conducted a cross-sectional study of 14 questions (Appendix 1) using an electronic questionnaire (Google form) from students from three private high schools in Sakarya, Türkiye. The surveys were filled online between November 10, 2022, and December 16, 2022.

Data Collection: We compared the negative health consequences of smartphones in two groups according to students' usage hours (Group I: Less than three hours and Group II: three hours or more). Before the questionnaires were filled, the school administration and families were interviewed, and the correct data flow was ensured. It was emphasised that for the participants to mark the clinical symptoms, they must have previously been diagnosed by the relevant physician.

Statistical Analysis: Statistical analysis and study findings were evaluated with the Independent Samples t-test, Fisher's exact test and Pearson X² Test using the SPSS 25.0 program and p<0.05 was accepted for significance.

RESULTS

There were 242 students in this study, with a mean age of 15.9 years. 170 (70.2%) are boys, and 72 (29.8%) are girls (Table 1). The distribution of students according to the duration of smartphone use was de) terminated as Group I: 82 people, Group II: 159 people. While 235 (97.1%) of the students had their smartphones, 7 (2.9%) did not have a smartphone. While the mean age of starting to use a smartphone was 10.95 in Group I, it was 9.89 in Group II (Independent Sample Test, p=0.013). While 231 (95.5%) participants had a smartphone usage restriction at school, 8 (3.3%) did not. Again, while 63 (26%) of the students had a family restriction on smartphone use, 175 (72.3%) did not. While 192 (79.3%) of them knew conscious use of smartphones, 49 (20.2%) did not (Figure 1).

Table 1. Socio-demographical characteristics of students.

	14	15	16	17	18	19	Missingg	Total
%	12.4	23.666	29.333	22.77	9.1	0.8	2.1	100
N	30	57	71	55	22	2	5	242

Gender of the Students

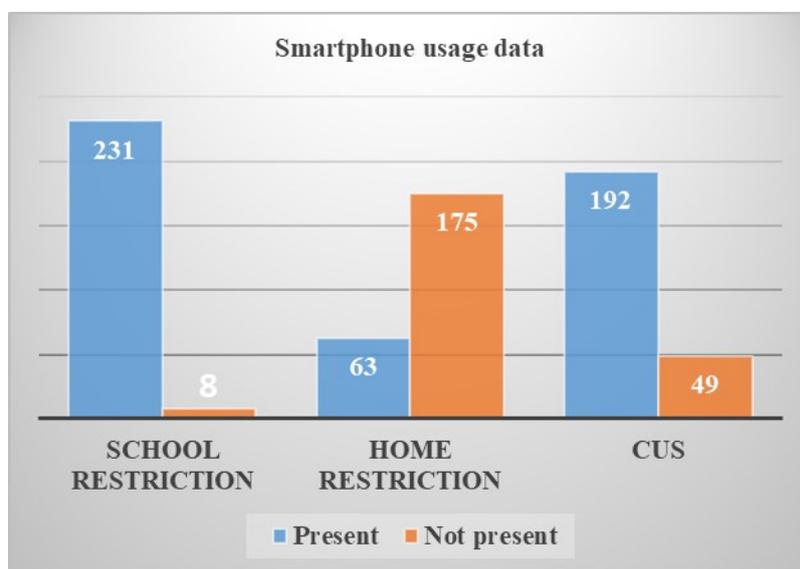


Figure 1. Smartphone usage data among high school students.
CUS: Conscious use of the smartphone.

The evaluation of the participants according to their smartphone usage time is shown in Figure 2. There was a statistically significant difference between

Group I and Group II. Like Group I and II data, Myopia was 22 and 63; AD: was 34 and 101; Kyp-hosis was found as 18 and 67, respectively.

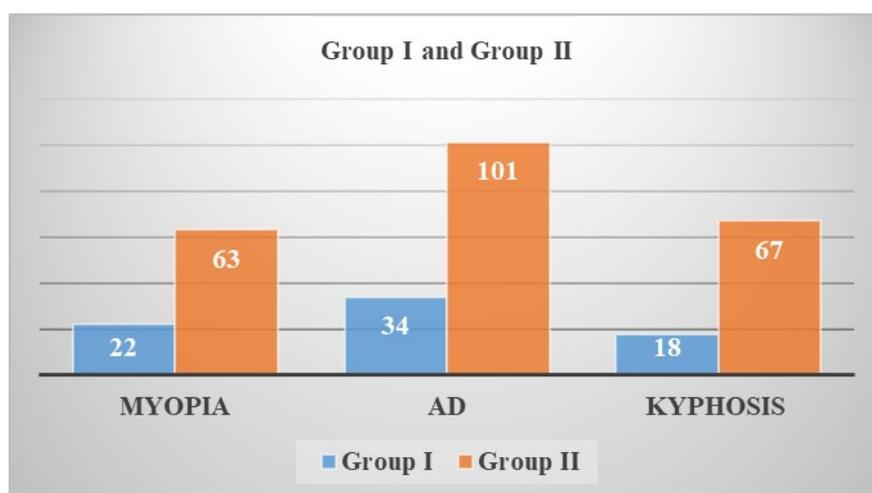


Figure 2. Evaluation of the participants according to their smartphone usage time.
AD: Attention deficit; Group I: less than three hours; Group II: equal to or more than three hours. Group I and II data were determined as Myopia: 22 and 63; AD: 34 and 101; Kyphosis: 18 and 67, respectively. There was statistical significance between the groups ($p < 0.05$).

As seen in Table 2, there was no significant relationship between students' school success and the duration of smartphone use. In groups, distance vision impairment (UGB, myopia), near vision impairment (hyperopia), blurred vision, dry eye, itc-

hing in the eye, watering in the eye, redness, headache, not being able to sleep at night, napping during the day in the classroom, distraction, forgetfulness, postural disorders (kyphos) were detected at different rates.

Table 2. Comparison of symptom rates related to smartphone use between Group I and Group II students.

Symptoms	Group I n (%)	Group II n (%)	OR	CI (%95)	p
Myopia	22(29.3%)	63(41.7%)	1.73	0.95-3.12	0.047*
Hyperopia	5(6.9%)	8(5.8%)	0.82	0.26-2.59	0.47
Blurred vision	18(24.3%)	32(22.4%)	0.89	0.46-1.73	0.43
Dry eye	11(15.3%)	20(14.2%)	0.97	0.41-2.03	0.49
Itchy eyes	19(26%)	42(29.4%)	1.18	0.62-2.22	0.36
Watery eyes	18(25%)	42(29.4%)	1.25	0.65-2.37	0.36
Eye redness	20(27.4%)	44(31.2%)	1.2	0.64-2.24	0.34
Headache	42(56%)	93(64.6%)	1.43	0.81-2.53	1.37
NSN	27(37.5%)	71(48.6%)	1.57	0.89-2.81	0.08
SDC	31(43.1%)	70(49%)	1.27	0.71-2.24	0.25
AD	34(45.9%)	101(70.1%)	2.76	1.55-4.94	0.001*
Forgetfulness	30(40.5%)	71(48.6%)	1.39	0.79-2.45	0.16
Kyphosis	18(26.1%)	67(45.9%)	2.4	1.28-4.5	0.004*

OR: Odds ratio; CI: Confidence Interval; NSN: Not being able to sleep at night; SDC: Sleeping during day in class; AD: Attention deficit. Group I: less than three hours; Group II: equal to or more than three hours. *: There was statistical significance between the groups (p<0.05).

DISCUSSION AND CONCLUSION

This study aims to identify students' health problems, especially ocular symptoms, regarding smartphone use. As smartphones apply quickly in the community, especially with the contribution of the COVID-19 process, further attention is needed. We should also evaluate the use of the phrase "double-edged knife in our study from this perspective. So, using this expression, We mean that it is beneficial if used appropriately and harmful if misused. Although the term "double-edged sword" has been used in many studies, our results show that we are using it for the first time for smartphones.^{20-22.}

One study examined smartphone addiction symptoms, important lifestyles, and other variables.²³ According to the survey's findings, 35.9% of the participants felt tired during the day due to smartphone use late at night, 38.1% agreed that their sleep quality decreased, and 35.8% slept less than four hours due to multiple smartphone use.²³ In another study on smartphone use among university students, sleep quality and depression were examined.²⁴ Although they examined university students, we examined high school students; in both studies, daily smartphone usage time was relatively high (7.85 ± 4.55 hours). On the other hand, it would not be an objective approach to state the purely negative aspects of smartphone use. For example, in an experimental study on 44 students for the feasibility of smartphone application and social media-based intervention, it was seen that health education tips

were applied 1-3 times a week. The study also stated that a well-integrated social media-based intervention could engage students and improve selected health behaviours and outcomes.²⁵ Therefore, it is inevitable that smartphones, our research subject, will make a similar positive contribution. However, users must comply with the duration and healthy physical position conditions; otherwise, many health problems, predominantly ocular, await them. Indeed, in a study examining smartphone use from the perspective of myopia, Primary, secondary, and higher education students were evaluated through a questionnaire. In this study, which included 418 students, it was shown that there is a relationship between myopia and smartphone data usage.²⁶ Similar findings were obtained in our study. Considering the ocular health risks associated with myopia, further investigation of this relationship is recommended in both studies. It was revealed in a study conducted in the years when the use of mobile devices was not expected that young people spending more time in the open area reduced the occurrence of myopia.²⁷ Similarly, our study used smartphones indoors, and myopia was significantly higher in group II. A new study investigating the relationship between smartphone use and refractive error was conducted on 525 young people aged 12 to 16.²⁸ The study found that Dutch teenagers spent about 4 hours a day on their smartphones, and with 20-minute episodes of continuous use, those with low exposure to the outdoors had more myopia defects.²⁸ From this point of view,

it was suggested that frequent breaks in open spaces should be a recommendation for young people to use smartphones. Young people have been suggested to go out more often to open spaces while using smartphones.

A study of adolescents with low back pain and normal adolescents using smartphones in sitting posture evaluated the relationship between changes in thoracolumbar kyphosis, lumbar lordosis, and pelvic asymmetry.²⁹ The study instructed them to sit in a height-adjustable chair with their hips and knees bent 90° for 30 minutes. Subsequently, thoracic kyphosis and lumbar lordosis angles increased as sitting time increased in both groups.²⁹ According to their results, smartphone use caused posture disorders, just like our findings. On the other hand, while mobile devices were accused of causing kyphosis, Android-based smartphones were used to measure thoracic kyphosis.³⁰

In conclusion, although smartphones help students access information, long-term use in closed environments can harm their health. Myopia, kyphosis and AD come to the fore among these health problems. On the other hand, providing information and awareness training to students for the intended and correct use of mobile technology, in general, will solve many problems before they begin. While the mobile phone usage information of the students participating in the research was collected retrospectively, it was necessary to determine how long they had been using it (for example, how many years they had been using it). In addition, if students using smartphones indoors were examined, and another group (control) using smartphones outdoors had been created, reaching more accurate results would have been possible.

Ethics Committee Approval: The study was obtained from the Sakarya University Faculty of Medicine Ethics Committee (dated 5.11.2022, E-12833-118), and the Declaration of Helsinki conducted the study. Informed Consent. The electronic questionnaire (Google Drive) filled out by the students of three private high schools in Sakarya, Türkiye, was used as a data source.

Conflict of Interest: No conflict of interest was declared by the authors.

Author Contributions: Concept – AY, HY; Supervision – HY, AY; Materials – AY, HY; Data Collection and/or Processing – HY, AY; Analysis and/or Interpretation – AY, HY; Writing –HY, AY.

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Appendix 1. Questions.

1. Write your age (indicate as a number, for example, 12)
2. Student gender
 - Girl
 - Male
3. Please specify your school.
 - Kindergarten
 - Primary school
 - Middle school
 - High school
4. Write your height and weight values (Example: Height 110cm, Weight 45 kg)
5. Do you have your mobile device (cell phone or tablet)?
 - Yes
 - No
6. At what age did you start using a mobile device (cell phone or tablet)? (specify with a number, for example,
7. Is using mobile devices (cell phones or tablets) allowed at school?
 - Yes
 - No
8. Does your family restrict mobile device use at home?
 - Yes
 - No
9. How many hours a day do you use a mobile device?
 - Less than half an hour
 - Half an hour or less than 1 hour
 - 1 hour or less than 2 hours
 - 2 hours or less than 3 hours
 - 3 hours or less than 4 hours
 - 4 hours or more
10. How is your school success?
 - Very good
 - Good
 - Middle
 - Bad
11. Do you have any information about the effects of mobile devices on health and how they are used correctly? (e.g. distance from the eye, time of talking on the phone, distance from the body)
 - Yes
 - No
12. Where did you learn about healthily using mobile devices?
 - From my teacher
 - From my family
 - By reading it myself
 - Other
13. For what purpose do you often use your mobile phone? (You can choose more than one option.)
 - Social media (such as Facebook and Twitter)
 - Watching videos online (like Youtube)
 - Distance education activities (such as watching lectures and exams)
 - Watching movies and music videos loaded on the phone
 - For communication purposes
14. Please mark any eye, sleep or posture (hunchback) disorders you have had or are continuing today.x

I have never had it	I have had it/I am fine	It is still ongoing
<input type="checkbox"/> Difficulty seeing far		
<input type="checkbox"/> The problem with near vision		
<input type="checkbox"/> Blurred vision		
<input type="checkbox"/> Dry eyes		
<input type="checkbox"/> Itchy eye		
<input type="checkbox"/> Watery eyes		
<input type="checkbox"/> Eye redness		
<input type="checkbox"/> Headache		
<input type="checkbox"/> Not being able to sleep at night		
<input type="checkbox"/> Sleeping during the day in class		
<input type="checkbox"/> Attention deficit		
<input type="checkbox"/> Forgetfulness		
<input type="checkbox"/> Posture disorder (kyphosis)		

xNOTE: For participants to mark the clinical symptoms in survey question 14 as having experienced or continuing, they must be diagnosed by a physician beforehand.