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Araştırma Makalesi

Does Smartphone Addiction Affect Respiratory Capacity and Physical Activity Level in Young Adults?

Genç Erişkin Bireylerde Akıllı Telefon Bağımlılığı Solunum Kapasitesi ve Fiziksel Aktivite Düzeyini Etkiler mi?

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ÖZ

Amaç: Genç erişkin bireylerdeki akıllı telefon bağımlılık düzeyinin bireylerin solunum kapasitesi ve fiziksel aktivite düzeylerine etkisini incelemek. **Gereç ve Yöntem:** Çalışmaya 18 yaş ve üzeri bireyler dahil edildi. Bireylere demografik veri formu, Akıllı Telefon Bağımlılığı Ölçeği Kısa Formu ve Uluslararası Fiziksel Aktivite Anketi Kısa Formu uygulandı. Ek olarak bireylerin solunum kapasitelerini değerlendirmek için Tepe Ekspirasyon Akış Hızı ölçümleri yapıldı. Gruplar arası karşılaştırmalar için Mann-Whitney U testi, korelasyon analizi için Pearson testi, kategorik değişkenler için Ki-kare testi kullanıldı. **Sonuçlar:** Akıllı telefon bağımlılığı açısından cinsiyet farkı bulunmazken, erkek katılımcılarda beden kitle indeksi ve tepe ekspiratuar akım hızı açısından anlamlı fark saptandı (sırasıyla p= 0,001, p=0,0001). Akıllı telefon kullanım düzeyi ile fiziksel aktivite düzeyi ve tepe ekspiratuar akım hızı arasında anlamlı ilişki bulunmadı (p>0,05). Akıllı telefon bağımlılık durumu sigara kullanımı açısından değerlendirildiğinde istatistiksel olarak anlamlı fark saptandı (p=0,0001). Sigara kullanmayan bireylerin aynı zamanda akıllı telefon bağımlısı da olmadığı görüldü. **Tartışma:** Sigara alışkanlıkları ve cinsiyet faktörlerinin etkili olabileceği akıllı telefon bağımlılığı toplumsal tarama ve eğitim ile önlenebilir. Bireylerin bilinçlendirilmesi, basit postüral eğitim ve solunum egzersizlerle bu bağımlılığın minimale indirilmesi açısından fizyoterapistlere büyük sorumluluklar düşmektedir.

Anahtar Kelimeler: Bağımlılık; Solunum; Akıllı Telefon

ABSTRACT

Purpose: To examine the effect of smartphone addiction levels on respiratory capacity and physical activity levels in young adults. **Materials and Methods:** Individuals aged 18 and over were included in the study. Participants completed a demographic data form, the Short Form of the Smartphone Addiction Scale, and the Short Form of the International Physical Activity Questionnaire. Additionally, Peak Expiratory Flow Rate (PEFR) measurements were performed to assess respiratory capacity. Mann-Whitney U test was used for group comparisons, Pearson test for correlation analysis, and Chi-square test for categorical variables. **Results:** No gender difference was found in smartphone addiction levels, while male participants showed a significant difference in body mass index and PEFR (p=0.001, p=0.0001, respectively). No significant relationship was found between smartphone use, physical activity level, and PEFR (p>0.05). A significant difference was observed in smartphone addiction status regarding smoking (p=0.0001). Non-smokers were also found not to be addicted to smartphones. **Conclusion:** To mitigate the negative effects of smartphone addiction, smoking habits and gender-related factors should be considered, and physiotherapists have an essential role in social screening, awareness, and postural training to reduce predisposition to addiction.

Keywords: Addiction; Respiration; Smartphone

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The development of technology has made smart phones an indispensable part of our lives. These devices are internet-based and have many functions, and they are used in many different areas from video calls to games, from banking transactions to shopping, and thanks to these advantages, the number of users is increasing day by day (Mok, Choi, Kim et al., 2014). The convenience and various functions of smart phone use have increased its popularity all over the world, and according to TURKSTAT data, the rate of household smart phone usage has increased to 96.9% in Turkey (Güler, Şahinkayası and Şahinkayası, 2017) In addition to the high use of smartphones, there is a significant increase in daily usage time. One of the main reasons for this is that smartphones allow more internet use than computers and tablets due to its accessibility regardless of time and place. As a result, addiction to smart phone use is reinforced due to excessive internet use or internet addiction (Montag, Wegmann, Sariyska et al., 2021). In a meta-analysis study, it was found that the prevalence of smartphone addiction in adolescents was about 39%-40% (Davey and Davey, 2014). Similarly, studies conducted in Turkey reveal comparable findings; for instance, a study among high school students in İzmir and Eskişehir reported a smartphone addiction prevalence of 36.9% (Cagan and Koca, 2020). It seems that smartphone addiction has become a common problem among young people (Kim, Lee, Lee et al., 2014). It is assumed that smartphone addiction brings with it some social, emotional, mental, and physical problems. It has been determined that an increase in the duration of smartphone use can reduce real-life social interaction, decrease academic performance, and adversely affect relationships (Kuss and Griffiths, 2011). Related to the emotional and mental effects of smartphone addiction, studies have reported a positive correlation with problems such as depression, anxiety, and difficulty concentrating (Demirci, Akgönül and Akpinar, 2015). Smartphone addiction also causes symptoms related to the musculoskeletal system such as wrist syndrome, pain in the thumb joints, stiffness in the neck muscles, and postural disorders, as well as symptoms that negatively affect general physical health such sore eyes, fatigue, and dryness (Kuyucu, 2017). In addition, adverse effects on physical health such as respiratory system problems and insufficient physical activity have been shown (Lepp, Barkley, Sanders et al., 2013).

The basis of the negative effects of smartphone use addiction at the level of physical activity is that it causes people to have a more sedentary and stationary life. Functions such as calling, sending and receiving messages, social networking, and surfing the Internet causes a sedentary life (Rosenberg, Norman, Wagner et al., 2010). Since it leads to a decrease in the amount of energy spent during the day, activity level has been associated with various health problems such as obesity or metabolic syndrome (Hamilton, Hamilton and Zderic, 2007; Owen, Healy, Matthews et al., 2010; Kautiainen, Koivusilta, Lintonen et al., 2005) In addition, they reported a dose-response relationship between prolonged inactivity and death from all types of cardiovascular disease (Katzmarzyk, Church, Craig et al., 2009). Similarly, it is thought that smartphone usage addiction may lead to a decrease in cardiorespiratory fitness as it reduces physical activity level by encouraging sedentary behaviors. Respiratory capacity refers to the lungs' ability to take in oxygen and expel carbon dioxide effectively, a vital aspect of overall health and physical performance (Kattainen, Lindahl, Vasankari et al., 2022)

There exists no study in the literature that directly examines the relationship between smartphone screen addiction and respiratory functions in young adults. However, it was observed that studies examining smartphone addiction and its effects on physical activity generally cover childhood and adolescence, and studies that include young adults are scarce (Azam, Ali, Mattiullah et al., 2020).

Our study was planned to examine the effect of smartphone usage addiction, which has become an important issue, on respiratory capacity and physical activity level in adults. Our hypothesis for the study was that smartphone addiction negatively affects respiratory capacity and physical activity level in young adults with smartphone addiction. In addition, it was among our hypotheses that there is a difference between male and female participants and that there might be a relationship between phone addiction levels and respiratory function and physical activity levels.

MATERIAL AND METHODS

Our study was carried out with the approval of the Social and Human Sciences Research Ethics Committee (E-45428382-050.99-257157; Date: 27.05.2022). At the beginning of our study, all participants were informed in detail about the study, and the participants signed informed consent forms stating that they agreed to participate.

While determining the number of individuals to be included in the study, the study conducted by Erdoğanoğlu and Arslan in 2019 was taken as a basis, and the sample size was calculated as 87 with 0.05 error and 95% power using the G-Power power analysis program (Erdoğanoğlu and Arslan, 2019).

Individuals over 18 who voluntarily gave written

permission to participate in our study and filled out the relevant forms were included in our study, which collected data between June 1 and August 1, 2022. The necessary interviews and assessments were conducted by a physiotherapist researcher at the Faculty of Health Sciences, Ondokuz Mayıs University, twice a week (Tuesday and Wednesday) over a 2-month period. All assessments were face-to-face and took an average of 15 minutes. Individuals over the age of 18 who could understand and fully implement the commands in the test protocol were included in the study. Individuals with chronic diseases that may affect respiratory capacity and substance abuse, excluding smoking, were excluded from the study. Data for the study were obtained from 107 volunteer participants, 30 men and 77 women.

Age, height, body weight, and cigarette consumption information were obtained about the socio-demographic information of the participants. Body Mass Index (BMI) was calculated from the data obtained.

The Smartphone Addiction Scale Short Form (SAS-SF) was used to measure the duration of smartphone use and the addiction level of individuals. The Turkish validity and reliability study of the SAS-SF scale was conducted by Noyan et al. in 2015. The scale has ten items in a 6-point Likert scale, and the score range of the scale is 10-60 points (Noyan, Enez Darçın, Nurmedov et al., 2015). As the score increases, the risk of smartphone addiction also increases. According to the Korean sample, the cut-off points of 33 for women and 31 for men were used to classify the participants as "smartphone addicts" and "non-smartphone addicts" (Chun, Lee and Kim, 2012).

The Peak Expiratory Flow Rate (PEFR) (Mesilife Meter DL-F03, Canada) tool was used to evaluate the respiratory capacity of the individuals. They were asked to stand up and take a deep breath by thoroughly filling their lungs for accurate measurement. They were instructed to place the device's mouthpiece in their mouths, not placing their tongue in it, and to blow quickly and hard in a single action. This process was performed thrice, and the highest score was recorded (Schilling, Kozian, Kretzschmar et al., 2007).

The International Physical Activity Questionnaire: Short Form (IPAQ-SF) (MET) was used to determine the physical activity levels. Öztürk conducted a validity and reliability study in Turkey on university students (Öztürk, 2005). With the questionnaire, the duration of vigorous physical activity (min), duration of moderate physical activity (min), and walking and one-day sitting times (min) in the previous week were questioned. The total physical activity score (MET-min/week) was calculated by converting vigorous and moderate activity and walking times to METs corresponding to the basal metabolic rate.According to the total physical activity score, the participants' physical activity levels were classified as "low, medium, and high." Below 600 MET-min/week is determined as a low level, 600-3000 MET-min/week as a medium level, and over 3000 MET-min/week as a high level (Craig, Marshall, Sjöström et al., 2003).

Statistical Analysis

Statistical analysis was performed using the IBM SPSS Statistics for Windows Version 22.0 (Statistical Package for the Social Sciences, IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean and standard deviation and categorical variables are presented as numbers and percentages. The conformity of the variables to the normal distribution was tested with the Kolmogorov-Smirnov test. The Mann-Whitney U test was used to compare the differences in data obtained from individuals with and without smartphone addiction. The Pearson correlation analysis analyzed Relationships between measured parameters, and differences between categorical variables were analyzed with the Chi-square test. The statistical significance level for the study was determined as 0.05.

RESULTS

Out of 107 participants (30 males, 28%; 77 females, 72%), 48 (44.9%) of the 68 participants in the non-addict group were female and 20 (18.7%) were male. Of the 39 patients in the addict group, 29 (27.1%) were female and 10 (9.9%) were male.

In all participants, the SAS-SF mean score was 52.30±3.03 points; the mean PEFR score was 431.96±80.77 lt/sec; and the mean physical activity level score was 1707.02±996.96 MET-min/week. According to the IPAQ-SF, 39 (36.4%) participants were inactive and minimally active, and 68 (63.6%) were active. Twenty-two participants (20.5%) were smokers, and 85 (79.4%) were non-smokers. The data and the intergroup comparison results are shown in Table 1.

The Addict and Non-addict groups were similar in terms of parameters obtained, except for the SAS-SF and smoking parameters ($p<0.005$). When the smartphone addiction status was evaluated in terms of smoking, a statistically significant difference was found ($p=0.0001$). When the data obtained from the participants were compared between genders, it was found that although female participants had higher scores, there was no difference between genders in terms of SASS-SF score ($p>0.05$). However, male participants had statistically higher scores than female participants regarding BMI and PEFR ($p= 0.001$, $p=0.0001$, respectively) (Table 2).

Tablo 1. Data and intergroup comparison results.

		Smartphone Addicts n=68	**Non-Smartphone Addicts n=39**	
		Mean±SD (Min.-Max.)		p**
Age (year)		20.19±1.11 (18-23)	20.44±1.07 (17-23)	0.33
Height (cm)		165.69±9.45 (155-193)	167.08±8.08 (146-189)	0.33
Weight (kg)		61.44±14.23 (42-111)	60.72±9.93 (47-83)	0.77
BMI (kg/m²)		22.19±3.63 (18-27)	21.66±2.49 (17-33)	0.81
SAS-SF (score)		23.85±5.02 (14-32)	39.59±6.49 (31-60)	0.0001*
PEFR (lt/sec)		427.94±102.7 (190-640)	423.97±111.6 (250-660)	0.89
IPAQ-SF (MET)		3260.46±2728.30 (231-13758)	2658.79±2171.03 (240-8904)	0.25
Sex			n (%)	p*
	Female	48 (44.9)	29 (27.1)	0.68
	Male	20 (18.7)	10 (9.3)	
IPAQ-SF	Inactive and Minimal Active	28 (26.2)	11 (10.03)	0.18
	Very Active	40 (37.4)	28 (26.2)	
Smoker		9 (8.4)	13 (12.1)	0.0001*
Non-smoker		59 (55.1)	26 (24.3)	

** Chi-Square Test, ** Mann-Whitney U Test, BMI: Body Mass Index, SASS-SF: Smartphone Addiction Scale-Short Form, PEFR: Peak Expiratory Flow Rate, IPAQ-SF: International Physical Activity Questionnaire - Short Form.*

Tablo 2. Gender comparison results in terms of evaluated parameters

	Female n=77	**Male n=30**	**p***
	Mean±SD (Min.-Max.)		
Age (year)	20.23±1.37 (18-22)	20.67±1.37 (18-23)	0.028
BMI (kg/m²)	21.36±2.96 (17-33)	23.64±3.46 (18-33)	0.001
SAS-SF (10-60)	30.2±9.63 (14-60)	28.10±8.86 (16-53)	0.301
PEFR (lt/second)	382.08±73.02 (190-610)	540.5±89.75 (350-660)	0.0001
IPAQ-SF (MET)	2905.70±2282.81 (231-10878)	3388.83±3138.81 (347-13758)	0.884

*BMI: Body Mass Index, SAS-SF: Smartphone Addiction Scale - Short Form, PEFR: Peak Expiratory Flow Rate, IPAQ-SF: International Physical Activity Questionnaire - Short Form, *: Mann-Whitney U Test.*

It was found that there was no statistically significant relationship between the level of smartphone use, physical activity level, age and BMI except PEFR in females (p=0,03). There was no statistically significant relationship between the level of smartphone use, physical activity level, age, BMI and PEFR in males (p>0.05). The with in-group correlation results are presented in Table 4.

Tablo 3. The relationship between smartphone usage levels and physical activity levels and respiratory capacity of all participants

n=107	**Smartphone Usage Level**	
	r	p*
Age	0.05	0.63
IPAQ-SF (MET)	-0.12	0.21
PEFR (lt/second)	-0.08	0.39
BMI	-0.07	0.44

*BMI: Body Mass Index, PEFR: Peak Expiratory Flow Rate, IPAQ-SF: International Physical Activity Questionnaire - Short Form, *: Pearson Correlation Analysis.*

Tablo 4. The relationship between smartphone usage levels and physical activity levels and respiratory capacity of smartphone addicts and non-smartphone addicts

	Smartphone Usage Level			
	Smartphone Addicts n=68		Non-Smartphone Addicts n=39	
	r	p*	r	p*
Age	-0.235	0.5	0.048	0.698
IPAQ-SF (MET)	0.317	**0.049**	0.002	0.989
PEFR (lt/second)	-0.209	0.20	-0.047	0.705
BMI	0.019	0.91	-0.04	0.744

*BMI: Body Mass Index,PEFR: Peak Expiratory Flow Rate, IPAQ-SF: International Physical Activity Questionnaire - Short Form, *: Pearson Correlation Analysis.*

DISCUSSION

We evaluated the effect of smartphone addiction on physical activity level and respiratory capacity in young adults and found no effect of phone addiction on respiratory capacity and physical activity level; however, a significant difference was found in favor of the non-addict group in the comparison made in terms of smoking.

The current significant increase in the time young adults spend with smartphones has introduced the term "smartphone addiction." With the increasing use of technology, the duration of individuals in active social environments has shortened, and different ways have emerged to meet their needs, such as socializing and shopping. The venues accessed via smartphones have become an important option, especially for young adults in this period. The increase in the duration of smartphone use by young adults negatively affects their physical activity levels (Çiçek, Şahin and Erkal, 2021).

Kim et al. determined that the level of physical activity decreased with the increase in the level of smartphone addiction (Kim, Huh, Cho et al., 2014). In our study, however, no effect of smartphone addiction on the level of physical activity was demonstrated. This result, which is different from the literature, may be due to the difference in the number of participants in both groups.

Regarding respiratory capacity, it has been noted in recent research that excessive smartphone use may impair pulmonary function due to poor posture, such as forward head posture and thoracic flexion, which can limit thoracic expansion and reduce lung capacity (Eitivipart, Viriyarojanakul and Redhead, 2018; Alonazi, Almutairi, Bains, et al., 2021). Additionally, decreased

respiratory efficiency has been associated with prolonged sedentary behaviors often linked to smartphone addiction (Ratan, Parrish, Zaman, et al., 2021). Contrary to these findings, our study found no significant difference in respiratory capacity between addicted and non-addicted participants. However, the gender comparison revealed higher respiratory capacity in males, consistent with physiological differences. The lack of association in our study may stem from the limited sample size and the non-homogeneous distribution of male and female participants.

In studies on smartphone addiction in Turkey, the difference between genders in terms of smartphone addiction was evaluated. Although the mean scores of smartphone addiction questionnaires were higher in females, no significant difference was found between the groups (Erdoganoglu and Arslan, 2019). Similar to the literature, we found no gender difference regarding smartphone use.

In the literature, it was stated that smartphone addiction is associated with personality disorders and the use of substances such as alcohol and cigarettes (Kim et al., 2014). It was found that internet addiction and substance use are associated with adolescents and adults (Ünal, 2015). Our study identified a significant association between smartphone addiction and smoking status. The smoking rate was found to be lower in the non-addicted group; however, not all non-smokers belonged to the non-addicted group.

With the increase in smartphone usage time, pain and postural changes may occur in the musculoskeletal system. Long-term flexion position of the cervical and upper thoracic region while using the phone may adversely affect thoracic expansion and respiratory capacity (De-Sola Gutiérrez, Rodríguez de Fonseca, and Rubio, 2016; Eitivipart, Viriyarojanakul and Redhead, 2018). In a study conducted with children addicted to smartphones, it was concluded that smartphone addiction is associated with low lung capacity (Alonazi, Almutairi, Bains et al., 2021). Unlike the literature, our study found no difference between respiratory capacities regarding smartphone addiction. However, when the respiratory capacities of the genders were compared, a significant difference was found in favor of men. The inability to find a difference between respiratory capacities in terms of smartphone addiction in our study can be explained by the fact that the number of male participants in the groups was not homogeneously distributed.

Among our study's limitations was that individuals' daily smartphone usage duration, cigarette consumption amount (year, pack/day), musculoskeletal pain levels, and aerobic capacity were not evaluated in our study. In addition, the fact that the cases did not show a homogeneous distribution in terms of gender in the total number of participants and the groups. Future studies should consider include diverse categories, use a stratified randomization method, and measure evaluation parameters with multiple objective methods.

In the era of rapid digitalization, which affects the whole world, smartphone usage has become indispensable for urban life on the one hand. On the other hand, we are worried about its social, mental, and physical secondary effects. The results of this study, in which we planned to examine the effect on respiratory capacity and physical activity level in young adults, revealed no difference in respiratory capacity and physical activity level between groups with and without smartphone addiction. Different study designs are needed to reveal the possible secondary adverse effects of smartphone addiction, which has become a part of new lifestyles. In order to reduce the adverse effects of smartphone addiction, where smoking habits and gender-related attitudes can also be effective, physiotherapists have significant responsibilities in terms of conducting social screening and education studies, raising awareness in patients, and minimizing the predisposition of individuals with simple postural precautions and breathing exercises.

Ethics Approval

The study was approved by the Ondokuz Mayıs University Social and Human Sciences Research Ethics Committee
(E-45428382-050.99-257157; Date: 27.05.2022).

Author Contribution

Hüseyin Gerdan; concept, data collection, analysis, writing, review. Gözde Kesikbaş Kurt; concept, data collection, writing, review. Elif Asan: concept, data collection, writing, review. Mine Pekesen Kurtça; data analysis, editing, review, proofreading. Nilgün Bek; concept, writing, editing, review, proofreading.

Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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