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Research Article / Araştırma

Does the smartphone addiction affect the neck disability, hand functions, and physical activity?

Akıllı telefon bağımlılığı boyun özür şiddetini, el fonksiyonelliğini ve fiziksel aktiviteyi etkiler mi?

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ABSTRACT

Aim: Smartphone has become an important tool in our stay-at-home mandates and quarantine days related to the pandemic. The aim of this study is to compare the neck disability, hand functionality and physical activity levels between smartphone addicts and non-addicted users. **Materials-Methods:** A total of 227 volunteer participants were included in this web-based study. Participants were separated into two groups as smartphone addictive (n=105) and non-addictive groups (n=122). Neck disability, hand functions, and physical activity levels were assessed with Neck Disability Index, Michigan Hand Questionnaire, and International Physical Activity Questionnaire, respectively, in both groups. **Results**: Significant differences were found between smartphone addicted and non-addicted groups ($p<0.05$). The addicted group had higher neck disability scores ($p<0.05$) and lower hand functionality ($p<0.05$), and lower physical activity levels than non-addicted groups($p<0.05$). **Conclusions**: This study showed that smartphone-addicted younger adults were more likely to have problems in the cervical region, hand functionality and physical inactivity symptoms during online learning.

ÖZ

Amaç: Akıllı telefon, pandemi ile ilgili evde kalma ve karantina günlerimizde önemli bir araç haline geldi. Bu çalışmada amaç gençlerde akıllı telefon bağımlısı ve bağımlısı olmayan kullanıcılar arasında boyun özür şiddeti, el fonksiyonelliği ve fiziksel aktivite düzeylerini karşılaştırmaktır. **Gereç - Yöntem:** Bu web tabanlı çalışmaya toplam 227 gönüllü katılımcı dahil edildi. Katılımcılar akıllı telefon bağımlısı (n=105) ve bağımlı olmayan (n=122) olmak üzere iki gruba ayrıldı. Her iki grupta da boyun özürlülüğü, el fonksiyonları ve fiziksel aktivite düzeyleri sırasıyla Boyun Özür İndeksi, Michigan El Anketi ve Uluslararası Fiziksel Aktivite Anketi ile değerlendirildi. **Bulgular**: Akıllı telefon bağımlısı olan ve olmayan gruplar arasında anlamlı farklılıklar bulundu ($p<0.05$). Bağımlı grubun boyun özür indeks skorları ($p<0.05$) daha yüksek, el fonksiyonelliği ($p<0.05$) ve fiziksel aktivite düzeyleri bağımlı olmayan gruplara göre daha düşüktü ($p<0.05$). **Sonuç**: Bu çalışma, akıllı telefon bağımlısı genç yetişkinlerin çevrimiçi öğrenme sırasında servikal bölge, el fonksiyonelliği ve fiziksel hareketsizlik semptomlarında sorun yaşama durumunun daha yüksek olduğunu gösterdi.

ARTICLE INFO/MAKALE BİLGİSİ

Key Words: Addiction, Hand, Physical Activity, Smartphone

Anahtar Kelimeler: Akıllı Telefon, Bağımlılık, El, Fiziksel Aktivite

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INTRODUCTION

Covid-19 forced governments to implement measures to decrease the spread of the diseases including lock down, banning social gatherings, sports events, and restricting travel. According to studies, spending a lot of time at home might result in sedentary habits. The use of internet increased approximately 70% during lockdown (1,2). It is reported that problematic smartphone use was related to Covid-19 anxiety among adolescent (3). A previous study, completed before Covid-19 breakout, stated that the smartphone use was 26.7% in males and 27.9% in females among university students (4).

Repetitive behavioural disorders that affect functionality and relationships should be assessed as addiction (5). The term “smartphone addiction” refers to a pattern of online browsing and mobile telephone usage. It might cause alterations in upper cervical posture and misalignment of shoulder, wrist, and hand (6).

Smartphone addiction has been reported to cause musculoskeletal problems predominantly in finger, neck, back, arm, and shoulder (7, 8). Prolonged usage of social network and decreased physical activity may result in forward head posture, rounded shoulders (9,10).

Furthermore, previous studies have suggested that smartphone addiction could be partly responsible for the aggravation of musculoskeletal problems (11,12). Smartphone use caused significant alterations in the thoracic and lumbar regions of the spine in healthy young individuals (10). Although numerous studies have conducted on smartphone addiction, there is no comprehensive study focusing on comparison of mental health, postural musculoskeletal pain and the neck disability, hand functions, and physical activity levels (10,13). Therefore, this study aimed to compare the neck disability, hand functions and physical activity levels between smartphone addicted users and non-addicted users in healthy young adults.

MATERIALS AND METHOD

Study Design

This crossectional study was conducted at the University of Health Science Turkey, between December 2020- December 2021. This study had an ethical permission from University of Health Science Turkey Gülhane Scientific Research Ethics Committee with protocol number 2020-454. Each participant supplied their verbal and written approval to participate with the option to revoke consent at any time. According to the guidelines of the Helsinki Declaration, this study was conducted.

Participants

Inclusion criteria were: i) being university student; ii) age between 18 and 50; iii) daily smartphone usage for more than 60 minutes. Exclusion criteria were: i) past physical or neurological conditions that affect smartphone usage; ii) having vision or/and hearing problems that affect the phone usage; iii) any trauma, fracture or disorder that could influence on cervical region or/and hand functions; iv) having physical or cognitive difficulties affecting phone usage.

Outcome Measures

Gender, age (in years), height (in cm), weight (in kg), daily online education time (in hours), online education equipment (a smartphone or computer), and headphone use status (yes/no) are all included in the demographic information. All participants completed the Michigan Hand Questionnaire (MHQ) for the hand functionality. The Neck Disability Scores (NDS) were calculated for neck region disability. International Physical Activity Short Form Questionnaire (IPAC) was applied to measure physical activity level. The smartphone addition scale (SAS) was used to evaluate smartphone addiction.

Kwon et al. (14) developed the Smartphone Addiction Scale Short Form (SAS) in 2013 to identify adolescent smart phone addiction risk. SAS is used to explain negative expectations, retreat, connections online, overuse, and tolerance. It also describes interruptions in daily living. On a six-point scale, all participants gave their opinions, with higher scores suggesting greater smartphone addiction. The Turkish validity and reliability of the SAS was determined by Noyan et al. (5) pre-determined cut-off values for dependents and non-dependents were taken as 33 for females and 31 for males.

Neck Disability Score (NDS) is a 10-item, 50-point index that assesses different aspects of daily functioning in patients with neck pain (15). The NDS evaluates four subjective symptoms (pain intensity, headache, concentration, and sleeping), four daily living activities (lifting, work, driving, and recreation), and two optional daily living activities (personal care, reading). Each item is scored from 0 to 5, with the total reported as either a raw score (0–50) or as a percentage score. Raw scores were used in this analysis (16).

Michigan Hand Outcome Questionnaire (MHQ) is a trustworthy and accurate tool for assessing hand function. It consists of 37 questions divided into 6 areas, such as general hand functioning, daily living activities, pain, work performance, appearance, and patients' happiness with hand functioning. Except for discomfort and work performance, each MHQ category is separated into questions specific to the right hand and left hand. A set of questions on both hand task performance is included in the activities of daily living (17). For accurate, consistent recording and comparability, the raw scores for each category were normalized to a scale of 0 to 100 using a domain-specific formula included in the MHQ scoring algorithm. Better hand performance is indicated by higher scores. Regarding to pain, poor scores show greater pain severity (18).

International Physical Activity Questionnaire (IPAQ) questionnaire takes recent physical activity into account, encompassing everything from strolling to intense exercise. The IPAQ questionnaire assesses the type of physical activity and sitting time to estimate total physical activity in metabolic equivalent of task (MET)-min/week and time spent sitting (19,20).

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) 21.0 (IBM SPSS Statistics for Windows, Version

21.0, IBM Corp., Armonk, NY, ABD) was used for all statistical analyses. The variables' normal distribution was demonstrated using the Kolmogorov-Smirnov/ Shapiro-Wilk test. Numerical data were displayed as median (minimum-maximum) or mean and standard deviation (SD). Categorical variables were shown as frequency percentage (%) in a descriptive analysis. As it was determined that age, height, weight, BMI, daily online education times, headphone use during phone use, and which devices they prefer for online education did not show normal distribution, individuals with and without smartphone addiction were compared using non-parametric statistical tests.

For the intergroup comparison of continuous variables, the Mann-Whitney U test was utilized. The chi-square test or Fisher's exact chi-square test was used to compare categorical variables between groups. In the study, descriptive statistics were given as arithmetic mean ± standard deviation for variables determined by measurement, descriptive statistics were shown as median (minimum-maximum) for variables using nonparametric tests, and descriptive statistics for categorical variables were given as percentage (%). In the analysis of the research data, a probability value of $p < 0.05$ was considered significant to interpret the differences between the groups.

Effect sizes were calculated using Cohen's d using measures of between-group differences. Cohen described a small effect size as 0.2, a moderate effect size as 0.5 and a large effect size as 0.8 (21).

RESULTS

227 volunteer students with a mean age of 20.13 years (SD 0.65) participated in the study. In the sample, 89.4% (n=203) were female. The average BMI was 21.58 kg/m2 (SD 3.20). The average weekly time of online education was 3.11 (SD 1.07) hours. 71.8% (n=163) of the online education equipment was mobile phone and 28.25% (n=64) were computer. The average daily screen time was 2.03-hours (SD1.18). Table 1 illustrates the comparison of demographic data of the groups. The age, gender, body weight, height, body mass index, time of weekly online education, equipment of online education and use of headphone status was similar between groups ($p>0.05$). There is statistically significant difference between groups in daily total screen time ($p< 0.05$). The mean of the smartphone addiction level is 39.21 (SD 5.14) and 26.89 (SD 3.88) in the addicted group and non-addicted group, respectively.

The comparison of Neck Disability Index Scores, Michigan Hand Questionnaire (MHQ) Daily Activity Scores, MHQ Work Scores, MHQ Pain Scores, MHQ Aesthetic Scores, MHQ Satisfaction Score, MHQ Hand Function and physical activity level scores which are included in Table 2. Statistically significant differences were found between smartphone addicted and non-addicted groups ($p<0.05$).

DISCUSSION

This research was conducted to compare neck disability, hand functionality and physical activity levels between smartphone addictive and non-addictive young adults. The results of this study indicated that there was a difference on neck disability, hand functionality and physical activity levels between groups. To our knowledge, this study is the first study in the literature comparing hand functionality, neck disability and physical activity between the smartphone addicted and non-addicted groups.

There is a growing number of evidence showing that smartphone overuse has a negative impact on the musculoskeletal system (10). Several studies have investigated the screen usage time among university students which was reported as 3,5-4 hours (22, 23). Our study sample is relatively small. However, our findings, total screen duration was related with smartphone addiction, support the literature.

Smartphones have an important place and take a great amount of time in younger individuals' life thanks to easy carrying and access to internet from anywhere. In this study, 105 of 227 Turkish younger adults (mean age= 20), 46 % of the sample, has smartphone addiction. 30.5% of the sample in a different study of 210 Korean female university students (mean age = 22 years) had a high risk of smartphone addiction (24). Aljomaa et al. (25) stated that the addiction percentage among participants was 48% in a group of King Said University in Saudi Arabia. 39.8% of Turkish university students (n=319, mean age = 20.5 years) in another study reported using their smartphones excessively (26). All these studies' findings show that smart phone addiction is quite common among university students and younger adults. Lepp et al. mentioned that students see their smartphones as an amusement tool and excessive usage becomes habitual (2).

Smartphone devices are used worldwide, which can result in poor posture. People usually position their neck in flexion and anterior tilt while focusing on the screen for a long time. Finally, smartphone use produces neck disability by increasing pain on the neck and shoulder region. In this study smartphone addicted group has higher neck disability level as 20.12 while non-addicted group has lower level as 18.10. Al Abdulwahab et al. (27) emphasized that NDI score of smartphones

Table 1. Comparison of the demographic features of the groups

Variables	Smartphone Addiction Median (Min- Max) N=105	No Smartphone Addiction Median (Min- Max) N=122	p	Cohen' d
Gender(n) Boy (%) Girl (%)	11(10.5) 94(89.5)	13 (10.7) 109 (89.3)	0.965	0.003
Age(year)	20.00(18-22)	20.00(18-22)	0.659	0.76
Height(cm)	164.00(145.00-194.00)	165.00(150-193)	0.670	0.62
Weight(kg)	56.00(42-97)	58.50(43-100)	0.178	0.76
BMI (kg/m2)	20.83(16.53-32.05)	21.03(14.88-34.60)	0.202	0.77
Daily Time of Online Education	3.00(1-5)	4(1-4)	0.211	0.07
Equipment of Online Education Mobile phone (%) Tablet (%)	71(67.6) 34(32.4)	92 (75.4) 30 (24.6)	0.194	0.08
Daily Total Screen Time (hour)	3.00(1-4)	1.00(1-4)	0.040*	0.11
Use of Headphone Yes (%) No (%)	44 (41.9) 61 (58.1)	53 (43.4) 69 (56.6)	0.816	0.01

* p<0.05; Mann Whitney U Test, Chi Squared; Min: Minimum, Max: Maximum, BMI: Body Mass Index

Table 2. Comparison of groups according to addiction status

Evaluations	Smartphone Addicted Group (n=105) Median (Min-max)	Non addicted Group (n=122) Median (Min-max)	p	Cohen's d
Neck Disability Index Scores	20.12(11-37)	18.10(10-39)	0.003*	0.19
MHQ Daily Activity Score	56.42(7.14-82.14)	63.90(14.28-82.14)	0.003*	0.19
MHQ Work Score	160 (50-205)	158.03(100-205)	0.128	0.10
MHQ Pain Score	53.76(-85-25)	-54.63(-105-80)	0.390	0.05
MHQ Aesthetic Score	90.77(25-193)	85.86(25-237.5)	0.027*	0.14
MHQ Satisfaction Score	36(-54.14-79)	48.56(-62.5-79.16)	0.006*	0.18
MHQ Hand Function	78.71(30-100)	84.14(30-100)	0.010*	0.17
IPAQ Levels Inactive Minimal Active Very Active	47 (44.7) 55 (52.3) 3 (2.8)	42(34.4) 75(31.4) 5 (4.09)	<0.001**	0.10

* p<0.05; **p< 0.001; Mann Whitney U Test, Min: Minimum, Max: Maximum, MHQ: Michigan Hand Questionnaire, IPAQ: International Physical Activity Questionnaire

addicted group 20.98. In another study, Bertozini et al. (28) showed that smartphone addicted group NDI level were 13.6. So, our results were similar with the literature. Smartphone usage cause musculoskeletal changes on head and neck posture. Therefore, excessive smartphone usage can lead neck disability.

Chronic smartphone use without frequent breaks leads to problems of the neck, shoulders, hands, and wrists from cumulative damage. Because using a smartphone often necessitates thumb and finger interactions on the screen, many diseases develop. In this study, the smartphone addicted group had lower MHQ scores. Radwan et al. (29) reported that hand and pinch-grip strengths were reduced in the dominant hands in high-frequency smartphone users. Additionally, among children who used smartphones frequently and infrequently, hand functioning in the dominant hands were impacted.

Baabdullah et al. (30). reported that there is a correlation between excessive smartphone use and hand pain. Either repetitive motion or holding in same static position of the hands occurs because of excessive smartphone use. This cause decrease in blood supply which leads pain and muscle fatigue.

Concerns have been shown that as time spent on smartphone increases, the time spent in physical activity decreases. This is a factor that causes to physical health problems (3,4). In this current study, there was more active persons in the smartphone non-addicted group than addicted group. Demirbilek et al. (6) evaluated the physical activity level with IPAQ questionnaire in 147 university students. In the study there was no significant difference between smartphone addicted and non-addicted groups in terms of physical activity level. Zhuang et al (10) found that exercise reduces smartphone addiction among teenagers, but Zhou et al (4) pointed out that such effects exist but are limited. Studies have shown that exercise therapies are useful and ought to be taken into consideration as a different non-pharmacological technique for treating those who are addicted to smartphones, despite mixed findings to some extent.

CONCLUSION

This study revealed that smartphone addiction increased the likelihood of cervical issues, impaired hand functionality, and indications of physical inactivity in adults. The findings of this study showed that smartphone-addicted users face increased risks of increased deformative loads on the cervical region and hand in everyday life. These findings support and extend the existing evidence.

Physical activity promotion, individual behavioural modification, environmental regulations, and policies eliminate the negative effects of smartphone addiction. There are a few studies in the literature which seek the relationship between smartphone addiction and physical activity level. Future studies should focus on smartphone use, neck disability and hand functionality.

Consent To Participate: Informed consent was obtained from all individual participants included in the study.

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