The Effect of Smartphone Addiction on Neck Pain and Disability in University Students

Üniversite Öğrencilerinde Akıllı Telefon Kullanımı Bağımlılığının Boyun Ağrısı ve Disabilite Üzerine Etkisi

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ABSTRACT

Aim: This study was planned to investigate the relationship between neck pain and disability with smartphone use addiction.

Material and Method: 501 students from Kars Kafkas University and Istanbul Biruni University were included in the study. Inclusion criteria were being a university student, being a smartphone user, and not having any history of systemic, neurological or psychiatric diseases. All participants were evaluated with smartphone addiction scale (SAS), Visuel Analogue Scale (VAS) and Neck Disability Index (NDI) for neck pain.

Results: The mean age of the 501 university students included was 21.0±1.9.57.7% of the participants were female and 42.3% were male. The mean VAS of the neck pain was 3.8 (±2.2), the mean SAS was 94.6 (±27.1), and the mean NDI was 10.6 (±7.0). Significant difference was not found between the genders in terms of SAS scores (p>0.05). The VAS and SAS scores were significantly higher in the moderate-severe-totally disability group than the mild disability and non-disability group (p>0.05). According to spearman correlation analysis, there was a significant positive correlation between SAS and VAS and NDI scores (p value 0.005, 0.001, respectively).

Conclusion: Addiction to smartphone use was associated with neck pain and disability in healthy young adults. These results reveal the importance of informing the society about the physical risks of smartphone addiction. Individuals should strive to reduce the time spent using a smartphone and try to maintain a proper posture during use.

Key words: *neck pain; smartphone addiction; student*

ÖZET

Amaç: Bu çalışma akıllı telefon kullanımı bağımlılığı ile boyun ağrısı ve disabilite arasındaki ilişkiyi araştırmak amacıyla planlandı.

Materyal ve Metot: Kars Kafkas Üniversitesi ve İstanbul Biruni Üniveristesi'nde öğrenim gören 501 öğrenci çalışmaya dahil edildi. Üniversite öğrencisi olmak, akıllı telefon kullanıcısı olmak, herhangi bir sistemik, nörolojik ve psikiyatrik hastalık öyküsü olmaması dahil edilme kriterleriydi. Tüm katılımcılar akıllı telefon bağımlılığı ölçeği (SAS), boyun ağrısına ilişkin Visuel Analog Skala (VAS) ve Neck Disability Index (NDI) ile değerlendirildi.

Bulgular: Dahil edilen 501 üniversite öğrencisinin yaş ortalaması 21,0±1,9 idi. Katılımcıların %57,7'si kadın, %42,3'ü erkekti. Katılımcıların boyun ağrısı VAS ortalaması 3,8 (±2,2), SAS ortalaması 94,5 (±27,2), NDI ortalaması 10,6 (±7,0) olarak bulundu. Cinsiyetler arasında SAS skorları açısından anlamlı farklılık saptanmadı (p>0,05). Orta-şiddetli-tamamen özürlülük olan grupta VAS skoru, SAS skoru hafif özürlülük ve özürlülük olmayan gruptan anlamlı (p>0,05) olarak daha yüksekti. Yapılan spearman korelasyon analizine göre SAS ile VAS ve NDI skoru arasında anlamlı pozitif korelasyon mevcuttu (p değeri sırasıyla 0,005, 0,001).

Sonuç: Akıllı telefon kullanımına bağımlılığın sağlıklı genç erişkinlerde boyun ağrısı ve disabilite ile ilişkili olduğu görüldü. Bu sonuçlar akıllı telefon kullanımı bağımlılığının yaratacağı fiziksel riskler konusunda toplumun bilgilendirilmesinin önemini ortaya koymaktadır. Bireyler bir akıllı telefon kullanarak harcanan zamanı azaltmak için çaba sarf etmeli ve kullanımı sırasında uygun bir duruş sürdürmeye çalışmalıdır.

Anahtar kelimeler: *akıllı telefon bağımlılığı; boyun ağrısı; öğrenci*

Introduction

Today, smartphones developed in parallel with the advancements in technology have caused global transformations in our societies. These devices enable us to connect to the internet and listen to music, accesses e-mails, searched the internet, perform searches, take high quality photographs, play games, enjoy shopping and perform many more transactions[1,2]. Such opportunities have enabled users to gain access to information with great speed, improve their time-dependent tasks, benefit from the ease of sharing information and generally save time[2]. Recently, the frequency and duration of smartphone use has been increasing[3] and it has been reported that people spend more than 20 hours a week messaging, sending e-mails, using social networks and communicating, and that this may indicate a serious dependence on smartphones[4]. Although there are no exact definitions of smartphone addiction, the problematic use of the phone can be defined as having continuous control of the phone, leading to disruption of responsibilities or daily tasks. Certainly, smartphones are among the most important non-drug addictions in today's world[1].

A study conducted in our country reported that the rate of smartphone dependency among university students is 26.7% in men and 27.9% in women[5]. This situation has resulted in many negative outcomes, such as a weakening of face-to-face communication, increased individualization, addictive practices and psychological problems to name a few[2,6]. In addition, musculoskeletal problems have reportedly increased with the expanded use of smartphones[7,8]. Therefore, health professionals should be aware of the impact of smartphone use on physical health problems[9,10].

It has been reported that long and frequent smartphone use causes postural changes and proprioception deficits in cervical vertebrae[8]. The use of such devices, usually below the eye level, is the main factor contributing to the increase in the prevalence of neck pain and neck problems[9,11,12].

As far as we were able to determine, there exists no studies examining the relationship between neck pain and disability related to smartphone use addiction in our country. This study was therefore designed and conducted in order to investigate this potential correlation.

Material and Method

Five hundred one (501) university students, from two institutions in two different regions, were included in this cross-sectional study, on a voluntary basis. Students from these different cities with different socio-cultural characteristics, habits and lifestyles were included in order to reflect the wider community. The research protocol was approved by the local ethics committee (date of acceptance: 27.02.19, decision no: 09). After all participants were informed about the study, written, informed consent was obtained and all stages of the study were sustained in accordance with the Declaration of Helsinki. Three (3) inclusion criteria applied were that the participants be enrolled in university, that they be smartphone users, and that they did not have any history of systemic, neurological or psychiatric diseases.

The age and gender of all participants were recorded. All participants were evaluated with Visual Analogue Scale (VAS) in terms of the severity of neck pain, Neck Disability Index (NDI) in terms of the effect of neck pain on daily living activities and Smartphone Addiction Scale (SAS) in terms of smartphone use dependence. Participants were divided into three groups defined as "non-disability", "mild disability", and "moderate-to-complete disability".

Visual Analogue Scale (VAS)

Pain and numbness for daytime and night were evaluated with the use of a visual analogue scale (VAS). The patient was asked to mark the severity of pain on a 100 mm line using "no pain" on one end and "most unbearable pain" on the other end. The distance from the starting point of the pain to the point marked by the patient was recorded.

Neck Disability Index (NDI)

The Neck Disability Index (NDI), the Turkish validity and reliability of which was performed by Telci et al., was used to evaluate neck pain and functional disability[13]. This is a self-rating Likert-type questionnaire consisting of 10 items (neck pain, self-care, load lifting, reading, headache, concentration, work, driving, sleeping, and free-time activities), each scored between 0 and 5. The total score ranges from 0 to 50, and higher scores demonstrating the worse disability[14]. According to the test results, there would be no disability between 0–4, a mild disability between 5–14, a moderate

Table 1. *Demographic characteristics of participants*

		Min-Max	Median	Avg ± s.d	n - %
Age		18.0-40.0	21.0	21.0 ±1.9	
Gender (n-%)	Female				289 - 57.7%
	Male				212 - 42.3%
VAS		0.0-10.0	4.0	3.8 ± 2.2	
SAS		35.0-180.0	93.0	94.6 ± 27.1	
NDI		0.0-35.0	9.0	10.6 ± 7.0	
No disability (n - %)					99 - 19.8%
Mild disability (n - %)					279 - 55.7%
Moderate disability (n - %)					97 - 19.4%
Severe disability (n - %)					25 - 5.0%
Comlete disability (n - %)					1 - 0.2%

Min, minimum; Max, maximum; avg, average; sd, standart deviation; VAS, visual analogue scale; SAS, smartphone addiction scale; NDI, neck disability index

disability between 15–24, a severe disability between 25–34, and a complete disability at 35 and over. As indicated earlier, participants were divided into three groups defined as "non-disability", "mild disability", and "moderate-to-complete disability".

Smartphone Addiction Scale (SAS)

The Smartphone Addiction Scale (SAS) is a self-rating scale consisting of 33 items and developed by Kwon et al.[8]. Each item is evaluated with a Likert-type scale ranging from 1 (definitely not) to -6 (absolutely yes). The distribution of points to be obtained from this scale is between 33 and 198 points, whereas the scale consists of 6 subscales: daily life disorders (5 items), positive anticipation (8 items), withdrawal (6 items), cyberspace-oriented relationship (7 items), overuse (4 items), and tolerance (3 items). Higher scores indicate a more serious smartphone addiction and a cut-off value is not given in its original form. The developers of the scale found that the internal consistency of the scale was Cronbach α=0.967[8]; the Turkish validity and reliability was performed by Demirci et al[15].

Statistical Analysis

Mean, standard deviation, median, lowest, highest, frequency and ratio values were used in the descriptive statistics of the data. The distribution of variables was measured using the Kolmogorov Simirnov test and the Kruskal-Wallis, Mann-Whitney U test was used for the analysis of the quantitative independent data. The Chi-square test was used for the analysis of qualitative independent data. The Spearman correlation analysis was used to determine the relationship between SAS, NDI and VAS. SPSS 22.0 software for Windows program (SPSS, Chicago, IL, US) was used for the analysis. The statistical significance level was accepted as p<0.05.

Results

The results regarding the demographic characteristics of the students participating in the research are given in Table 1. As indicated previously, the mean age of the 501 university students included was 21±1.9 years (min 18, max 40) and 57.7% of the participants were female, whereas 42.3% were male (Table 1).

The mean VAS of the neck pain of the participants was 3.8±2.2, the mean SAS score was 94.6±27.2, and the mean NDI score was 10.6±7.0. There was no significant difference between the genders in terms of NDI and SAS scores (p>0.05) (Table 1); neck disability levels of the participants, according to the NDI, are summarized in Table 2.

Table 2. *Comparison of SAS and NDI scores in terms of gender*

	Gender		P
	Female	Male	
SAS (Mean ± sd)	92.9 ± 26.8	96.9 ± 27.4	0.099[t]
NDI (Median (Min-Max))	9 (0-35)	9 (0-30)	0.235[m]

SAS, smartphone addiction scale; NDI, neck disability index; sd, standart deviation; t, student t test; m, Mann-Whitney U test.

Table 3. Comparison of groups according to neck disability

		Neck Disability									
		No disability (n=99)			Mild disability (n=279)			Modarete-severe-comlete (n=123)			p
		Avg. ± s.d	n - %	Median	Avg. ± s.d	n - %	Median	Avg. ± s.d	n - %	Median	
Age		21.0 ± 2.0		21.0	21.1 ± 2.0		21.0	20.9 ± 1.7		21.0	0.391 ^{K}
Gender	Female		50 - 50.5%			170 - 60.9%			69 - 56.1%		0.181 $^{X^2}$
	Male		49 - 49.5%			109 - 39.1%			54 - 43.9%		
VAS		2.7 ± 1.8		3.0	3.7 ± 1.9		4.0	4.9 ± 2.4		5.0	*0.001* ^{K}
SAS		81.4 ± 24.8		83.0	96.3 ± 25.7		94.0	101.3 ± 28.6		99.0	*0.001* ^{K}

Avg, average; sd, standart deviation; VAS, Visual Analogue Scale; SAS, Smartphone Addiction Scale; ^{K}, Kruskal Wallis test (Mann Whitney U); X^2, chi-square test (Pearson).

Participants were divided into the three predefined groups ("non-disability", "mild disability", and "moderate-to-complete disability") according to their NDI scores. We found no significant difference between the groups in terms of age and gender (p>0.05) (Table 3), however when these three groups were compared in terms of the VAS scores, a statistically significant difference was found between them: in the "moderate-to-complete disability" group, the VAS score was significantly higher than in the "mild disability" and "non-disability" groups (p=0.001) (Table 3).

According to the spearman correlation analysis, there was a significant positive correlation between SAS with VAS and NDI scores (p=0.005, 0.001, respectively). No significant correlation was found between age and VAS, age and NDI, age and SAS scores (p>0.05) (Table 4).

Discussion

In this study, the effect of smartphone use on neck pain and disability was evaluated in university students. Addiction to smartphone use was found to be associated with neck pain and disability in healthy young adults. There was a significant correlation between the SAS and NDI scores which evaluated neck disability and these results are consistent with previous studies showing the frequency of musculoskeletal symptoms associated with computer use and that smartphone use causes physical health-related problems[8,16–19].

Smartphones have become an inseparable part of daily life with the increase in the conveniences it provides to individuals. However, in addition to these, smartphone addiction, which may develop due to excessive use, is an issue that needs to be addressed in a significant way, such as has been done for alcohol, cigarette and drug addictions[20,21]. In studies published in recent years, it was reported that musculoskeletal symptoms increased with the addiction of smartphones[10,22]. The most frequent musculoskeletal pain region being accounted in these studies was neck[10,22,23]. Although previous studies have found a correlation between computer use and neck pain[24], recent studies have found that the frequency and severity of neck problems is higher in smartphone use, compared to computer use[25].

Recurrent and prolonged neck flexion is one of the factors that increase the risk of neck pain and disability[26,27]. A frequent, recurrent neck flexion posture affects natural angle of the cervical spine, increases the stress to which the cervical spine is exposed[28], leads to proprioception losses in the cervical vertebra[29] and leads to spasm in muscles and ligaments[30]. In some studies, it was reported that in addition to neck flexion angle, the head tilt angle and forward head shifting increased with the use of smartphones[31,32]. These

Table 4. Correlation of age, VAS, NDI and SAS scores

		VAS	SAS	Age
NDI	r	0.326	0.237	-0.018
	p	*0.000*	*0.001*	0.685
VAS	r		0.124	-0.057
	p		*0.005*	0.200
SAS	r			0.042
	p			0.353

Spearman test; VAS, visual analogue scale; SAS, smartphone addiction scale; NDI, neck disability index.

conditions are associated with an increased risk of chronic neck pain[33] and may explain the relationship found between the NDI and SAS[9,10,18]. A study conducted in 2017 showed that smartphone addiction was associated with neck problems and disability in healthy young people[18]. In support of these results, this study being the first carried out in our country in this regard, we obtained a positive correlation between the VAS, NDI and SAS scores and at the same time, the SAS scores of the patients with moderate-severe-complete neck disability were found to be significantly higher.

In a study conducted on 289 nursing students in a public university, it was reported that gender factors did not affect the level of smartphone addiction[34]. A result which was sustained by another study, this time conducted with the participation of 367 university students, showing that there was no difference in terms of smartphone addiction levels between female and male students[35]. We have found similar result in our study.

The importance of this study stems from the fact that it is the first to investigate the relationship between smartphone addiction and neck disability in Turkey and that the participants were free from any systemic, neurological or psychiatric illnesses. We also believe that the inclusion of students from two institutions found in different geographical regions, Kars and Istanbul, is significant.

While further large-scale studies are needed to more deeply examine the scientific facts on this subject, as a result of our study, a significant relationship was found between smartphone addiction and neck pain level and neck disability. Posture disorders associated with smartphone use can indeed reveal neck disabilities; minimally, these results highlight the importance of informing users about the physical risks associated with smartphone addiction, who should be encouraged to make efforts to reduce the time spent with the smartphone and maintain proper posture while using it.

Limitations

The cross-sectional design of our study constitutes a limitation, as were unable to create a causal link the relationship between smartphone addiction and neck pain and disability. Another limitation may be found in the fact that we did not examine the possibility that other reasons may have affected neck disabilities in our participants, such as computer screen usage, television viewing positions, backpack usage and desk work.

Therefore, well-controlled prospective studies are required to confirm the results of this study.

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