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RESEARCH ARTICLE / ARAŞTIRMA MAKALESI

The Association Between Smartphone Addiction Severity and Cervical Posture and Neck Muscle Endurance in Healthy Young Adults

Sağlıklı Genç Yetişkinlerde Akıllı Telefon Bağımlılığının Şiddeti ile Servikal Postür ve Boyun Kasları Dayanıklılığı Arasındaki İlişki

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ABSTRACT

Objective: This study aimed to examine the association between smartphone addiction severity, neck muscle endurance and cervical posture in healthy young adults.

Material and Methods: A total of 65 participants (29 females, 36 males) completed a researcher-designed descriptive data form, the Smartphone Addiction Scale-Short Version, and the Neck Disability Index. Subsequently, cervical muscle endurance tests were performed, and cervical posture parameters were assessed using standardized lateral photographic analysis.

Results: Participants were classified into smartphone addiction and non-addiction groups based on Smartphone Addiction Scale-Short Version scores. Daily smartphone use was significantly higher in the smartphone addiction group ($p=0.014$), and Neck Disability Index scores were also significantly higher in this group ($p=0.044$). A significant group difference was identified for the head tilt angle ($p<0.05$). Correlation analyses showed significant associations between cervical extensor muscle endurance and daily smartphone use ($p<0.05$) as well as smartphone addiction severity ($p<0.05$). Cervical flexor muscle endurance was significantly associated with the craniovertebral angle ($p<0.05$), and Neck Disability Index scores were also significantly associated with the craniovertebral angle ($p<0.05$).

Conclusion: Smartphone addiction severity is associated with increased smartphone use, higher neck-related disability, and selected alterations in cervical posture and neck muscle endurance in healthy young adults. These findings underscore the importance of preventive and educational strategies, including ergonomic awareness and posture-oriented interventions, to reduce potential musculoskeletal strain related to prolonged smartphone use.

Keywords: Neck Posture, smartphone addiction, neck disability, muscle endurance

ÖZ

Amaç: Bu çalışma, sağlıklı genç erişkinlerde akıllı telefon bağımlılığı şiddeti, boyun kas dayanıklılığı ve servikal postür arasındaki ilişkiyi incelemeyi amaçlamıştır.

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Gereç ve Yöntemler: Toplam 65 katılımcı (29 kadın, 36 erkek) araştırmacı tarafından hazırlanmış tanımlayıcı veri formunu, Akıllı Telefon Bağımlılığı Ölçeği-Kısa Formu'nu ve Boyun Özürlülük İndeksi'ni doldurmuştur. Ardından servikal kas dayanıklılık testleri uygulanmış ve servikal postür parametreleri standartlaştırılmış lateral fotoğrafik analiz kullanılarak değerlendirilmiştir.

Bulgular: Katılımcılar, Akıllı Telefon Bağımlılığı Ölçeği-Kısa Formu puanlarına göre akıllı telefon bağımlılığı olan ve olmayan gruplar olarak sınıflandırılmıştır. Günlük akıllı telefon kullanımı, akıllı telefon bağımlılığı olan grupta anlamlı olarak daha yüksek bulunmuştur (p=0,014) ve Boyun Özürlülük İndeksi puanları da bu grupta anlamlı olarak daha yüksek saptanmıştır (p=0,044). Baş eğim açısı için gruplar arasında anlamlı bir fark belirlenmiştir (p<0,05). Korelasyon analizleri, servikal ekstansör kas dayanıklılığı ile günlük akıllı telefon kullanımı (p<0,05) ve akıllı telefon bağımlılığı şiddeti (p<0,05) arasında anlamlı ilişkiler olduğunu göstermiştir. Servikal fleksör kas dayanıklılığı kraniyovertebral açı ile anlamlı olarak ilişkili bulunmuştur (p<0,05) ve Boyun Özürlülük İndeksi puanları da kraniyovertebral açı ile anlamlı olarak ilişkili bulunmuştur (p<0,05).

Sonuç: Akıllı telefon bağımlılığı şiddeti, artmış akıllı telefon kullanımı, daha yüksek boyunla ilişkili özürlülük ve servikal postür ile boyun kas dayanıklılığında seçilmiş değişikliklerle ilişkilidir. Bu bulgular, uzun süreli akıllı telefon kullanımına bağlı olası kas-iskelet sistemi zorlanmasını azaltmak için ergonomik farkındalık ve postür odaklı girişimler de dâhil olmak üzere önleyici ve eğitici stratejilerin önemini vurgulamaktadır.

Anahtar Sözcükler: Boyun Postürü, akıllı telefon bağımlılığı, boyun özürlülüğü, kas dayanıklılığı

INTRODUCTION

Smartphones have become an indispensable element of contemporary daily life, fundamentally transforming communication, information retrieval, and social interaction [1]. According to the Mobile Communications Sector Report (2023), 6.9 billion individuals worldwide-approximately 86% of the global population-own smartphones, with penetration rates in Türkiye exceeding 95%. Their extensive functions, including social networking, online gaming, shopping applications, and rapid information access, have rendered smartphones inseparable from daily life and contributed to prolonged usage durations [2].

Excessive use, however, has raised global concerns due to the emergence of smartphone addiction, a behavioural addiction sharing features with internet and gaming disorders [3]. According to the DSM-5 criteria for behavioural addictions, addiction is defined by impaired control, continued engagement despite negative outcomes, craving, and notable disruption in functional capacity [4]. In line with these criteria, individuals with smartphone addiction often spend increasing amounts of time on their devices and experience withdrawal-like stress when deprived of access [5].

The negative impacts of problematic smartphone use extend beyond psychosocial domains. Prior research has linked smartphone addiction to attention deficits, social isolation, reduced academic performance, heightened anxiety, and depressive symptoms [6, 7]. In addition to these psychosocial effects, heavy smartphone use corresponds with heightened prevalence of neck and back pain, visual fatigue, headaches, sleep irregularities, and musculoskeletal issues [8, 9].

A specific musculoskeletal manifestation, described as "text neck" in the literature is characterized by sustained forward head posture, which alters cervical spine alignment and increases loading on supportive muscles, tendons, and ligaments [10]. Prolonged forward head positioning induces muscular imbalances, including overactivation of superficial cervical muscles and weakness of deep cervical flexors [11].

Despite extensive literature on the psychosocial outcomes of smartphone addiction, evidence focusing specifically on cervical posture and neck muscle endurance remains limited. The present investigation aimed to examine the relationship between smartphone addiction and cervical posture and neck muscle endurance in healthy young adults.

MATERIAL AND METHODS

Ethics

This cross-sectional study investigates how smartphone addiction severity affects cervical posture and neck muscle endurance in healthy young adults. The study received ethics approval from the Suleyman Demirel University Clinical Research Ethics Committee on December 5, 2023 (approval number 15/257).

Sample Size Determination

We used G*Power (version 3.1.9.4; Heinrich Heine University, Düsseldorf, Germany) to conduct an a priori power analysis for sample size estimation. Assuming 95% statistical power, a two-sided type I error of 5%, and an effect size of 0.82 based on prior research [12]. Results of the power analysis suggested a minimum sample of 60 participants. The present study included 65 participants (29 female, 36 male), all of whom were university students.

Participant Recruitment and Informed Consent

Participants were recruited from university students through voluntary participation using convenience sampling. Recruitment was conducted via announcements made on campus. Following detailed explanation of the study aims and protocol, participants gave written and oral informed consent.

The participants then individually completed the demographic questionnaire, the Smartphone Addiction Scale-Short Version (SAS-SV), and the Neck Disability Index (NDI). The estimated time for completing the questionnaires was approximately 10 minutes per individual. Following the completion of the questionnaires, participants' addiction status was determined based on their scores from the SAS-SV. Subsequently, neck muscle endurance tests, along with cervical posture measurements were conducted.

Descriptive Data Form

The descriptive data form included items regarding participants' age, gender, height, weight, body mass index, smoking habits, purpose of smartphone use, history of mobile phone use, and daily smartphone usage time.

Smartphone Addiction Scale-Short Version

The SAS-SV, developed by Kwon et al., consists of 10 items measuring a single underlying dimension of smartphone overuse tendency among adolescents [2]. A total score between 10 and 60 is obtained by rating each item on a scale of one to six (1-6); higher scores imply a higher risk of addiction. Male and female cutoff levels are 31 and 33, respectively. Among university students, the Turkish version was confirmed to be reliable and valid [13].

Neck Disability Index

The NDI evaluates ten domains, including pain, personal care, lifting, reading, and work. Each item is rated on a ranging from 0 (indicating no functional limitation) to 5 (indicating maximum disability). The cumulative score reflects the overall level of disability, categorized as follows: 0-4 points = no disability, 5-14 = mild, 15-24 = moderate, 25-34 = severe, and ≥35 signifies complete disability [14, 15].

Cervical Posture Evaluation

The alignment of cervical and upper thoracic regions was evaluated through a side-view photographic technique (Figure 1a). Reflective markers were affixed to four anatomical landmarks: the outer corner of the eye (canthus), the ear tragus, C7 and T4 spinous process. Participants were instructed to look straight ahead until the test was completed. Photos were taken with an iPhone 15 Pro (Los Altos, California, USA) set on a tripod at a 90° right-side angle from a distance of about 1.5 meters, with the camera lens aligned to the acromion, images were captured and transferred to a computer. Using Kinovea (version 0.9.5), lines connecting the anatomical markers were drawn to compute the Craniovertebral Angle (CVA), Cervicothoracic Angle (CTA), and Head Tilt Angle (HTA) [16].

The CVA refers to the angular relationship between a horizontal reference line intersecting the C7 vertebra and a line drawn from C7 to the tragus of the ear. This metric is commonly utilized to quantify forward head posture (Figure 1b). The HTA was measured between a vertical through the tragus and the line extending from the lateral canthus to the tragus. This metric is commonly utilized to quantify forward head posture (Figure 1b). The CTA represents angle formed between the line connecting tragus and the C7 spinous process and the line extending through spinous processes of C7 and T4 (Figure 1c) [17].

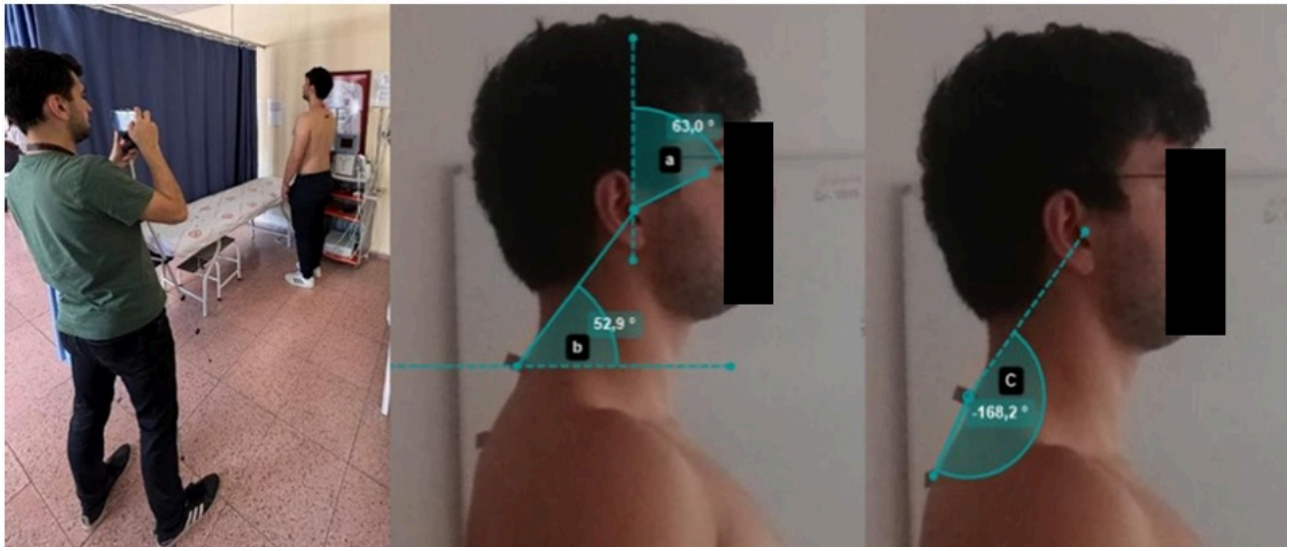

Figure 1. Cervical posture evaluation: (a) standardized side-view photographic setup; (b) head tilt angle (HTA) and craniovertebral angle (CVA) measurements; and (c) cervicothoracic angle (CTA) measurement.



Figure 2. Cervical Flexor-Extensor Muscle Endurance Tests

Cervical Flexor-Extensor Muscle Endurance Tests

Cervical flexor endurance was evaluated by positioning participants in a supine posture with knees bent and hands resting over the abdomen. A 0.5 kg load was secured to the forehead via an elastic strap positioned superior to the ears. Individuals were then guided to perform a slight chin tuck and elevate the head minimally from the surface. The evaluator placed their hand under the participant's occiput to help maintain this position and to monitor changes in the flexion angle. Using a chronometer, the participant's ability to hold this position for a set amount of time was measured and recorded in seconds (Figure 2a).

To assess cervical extensor muscle endurance, participants were asked to lie face down with their arms at their sides and to let their heads hang off the edge of the bed. A 2 kg was applied at level of the upper ear margin for females and 4 kg for males. Participants were asked to raise their heads to a neutral position and maintain it. Duration for which they could hold this position was measured using a chronometer and recorded in seconds (Figure 2b).

Before starting both tests, participants received standardized instructions to retain the test posture for as long as tolerable. The evaluation was to be discontinued in cases where severe pain (≥7 cm on the Visual Analog Scale) radiated toward the cervical spine, dorsal region,

or upper extremities, or if participants reported marked fatigue. Correct test positions were reminded during measurements, but no motivational speaking was provided. To ensure clarity of the instructions, practice trials were conducted for both positions, and each test was performed only once [18].

Statistical Analysis

All statistical analyses were conducted using IBM SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive data were summarized as frequencies (n), percentages (%), means ± standard deviations (SD), and medians with interquartile ranges (25th-75th percentiles). The normality of distributions was evaluated with the Shapiro-Wilk test and skewness-kurtosis values. Independent samples t-test was used when assumptions of normality and homogeneity were satisfied; otherwise, the Mann-Whitney U test was applied. Associations between non-normally distributed variables were examined via Spearman's rank correlation coefficient. A p-value below 0.05 was considered statistically significant.

RESULTS

The sample comprised 65 university students aged 21-23 years. Smartphone addiction was assessed using the total scores on the Smartphone Addiction Scale-Short Version (SAS-SV). Applying the recommended cut-off scores (≥31 for males and ≥33 for females), 27 participants (41.5%) were classified as having smartphone addiction, while 38 (58.5%) were classified as non-addicted. Statistical analysis revealed a statistically significant difference in total SAS-SV scores between the two groups (p = 0.001), confirming a clear distinction in addiction status. No significant differences were observed between the groups in height, weight, or body mass index (BMI), indicating that the groups were comparable with respect to these variables. Demographic and descriptive characteristics are presented in Table 1.

Table 1. Demographic and descriptive data of the participants

	$Group_{Addiction}$ (n=27) X±SD	$Group_{Non\text{-}Addiction}$ (n=38) X±SD	p value
Smartphone Addiction TotalScore	38.15±6.11	23.55±5.03	**0.001***
**Age	23 (21-23)	22 (21-23)	0.64
Height (cm)	169.62±10.21	173.47±9.33	0.12
Body weight (kg)	66.15±15.73	72.42±14.54	0.10
BMI (kg/m_2)	22.78±3.94	23.9±3.56	0.24

*BMI: Body Mass Index, *p<0.05 significance value, **Since the age variable does not follow a normal distribution, it is presented as the Median (25p-75p).*

When smartphone addiction scores were compared by sex, female participants had significantly higher total scores than male participants (p = 0.013). Similarly, analysis of the Neck Disability Index (NDI) revealed a significant sex-based difference, with female participants reporting higher disability scores than male participants (p = 0.012). These findings suggest that female participants experienced greater neck-related functional limitations than male participants (Table 2).

Table 2. Smartphone addiction status of participants by gender

	Female (n=29) X±SD	Male (n=36) X±SD	p value
Smartphone Addiction Total Score	32.90±10.85	26.97±6.35	**0.013***
Neck Disability Index Total Score	8.97±4.63	6.31±3.24	**0.012***

**p<0.05 significance value*

When participants were categorized according to smartphone addiction status, females accounted for 59.3% of the addicted group, compared with 34.2% of the non-

addicted group. The prevalence of smartphone addiction was 55.17% among female participants and 30.56% among male participants. Regarding smartphone usage patterns, 89.2% of participants reported that social networking was their primary purpose for smartphone use.

Table 3 presents the distribution of participants according to sex, smoking status, presence of chronic disease, and primary purpose of smartphone use, stratified by smartphone addiction status.

Table 3. Distribution of participants according to descriptive value

		$Group_{Addiction}$ (n=27) n (%)	$Group_{Non\text{-}Addiction}$ (n=38) n (%)	Total (n=65) n (%)	
Gender	Female	16 (55.17)	13 (44.82)	29 (44.60)	65 (100.00)
	Male	11 (30.56)	25 (69.44)	36 (55.40)	
Smoking Status	Smoker	10 (47.62)	11 (52.38)	21 (32.30)	65 (100.00)
	Non-Smoker	17 (38.64)	27 (61.36)	44 (67.70)	
Chronic Diseases	Present	1 (25.00)	3 (75.00)	4 (6.20)	65 (100.00)
	Absent	26 (42.62)	35 (57.38)	61 (93.80)	
Purpose of Smartphone Usage	Research	1 (33.33)	2 (66.67)	3 (4.60)	65 (100.00)
	Game	1 (100.00)	0 (0.00)	1 (1.50)	
	Social Networks	23 (39.66)	35 (60.34)	58 (89.20)	
	Phone Call	1 (50.00)	1(50.00)	2 (3.10)	
	Internet	1 (100.00)	0 (0.00)	1 (1.50)	

Table 4 presents smartphone use history, daily smartphone use duration, and total Neck Disability Index (NDI) scores for the two groups. Significant differences were observed in daily smartphone use duration (p = 0.014) and total NDI scores (p = 0.044).

Table 4. Comparison results between two groups

	Group Addiction (n=27) X±SD	$Group_{Non\text{-}}$ Addiction (n=38) X±SD	p value
Smartphone Usage History (Year)	5.7±0.61	5.37±0.79	0.57
Daily Smartphone Usage Time (Hours)	5.0±0.83	4.39±1.03	**0.014***
Neck Disability Index Total Score	8.59±4.53	6.42±4.32	**0.044***
Cervical Flexor Muscles Endurance Test (seconds)	61.55±38.94	84.66±57.90	0.076
Cervical Extensor Muscles Endurance Test (seconds)	304.93±134.76	332.29±162.59	0.48
Head Tilt Angle	67.79±4.83	71.02±4.94	**0.01***
Craniovertebral Angle	48.76±5.18	50.33±5.29	0.23
Cervicothoracic Angle	163.29±7.09	163.42±5.50	0.56

$p<0.05$ significance value

The cervical muscle endurance test results are presented in Table 4. Neck flexor muscle endurance was lower in the smartphone addiction group than in the non-addiction group.However, the difference was not statistically significant (p = 0.076).

Cervical posture measurements are also presented in Table 4. No significant between-group differences were observed in the craniovertebral or cervicothoracic angles (p > 0.05). In contrast, the head tilt angle differed significantly between the groups (p = 0.010), with lower values in the smartphone addiction group.

Significant, moderate positive correlations were observed between cervical extensor muscle endurance and both daily smartphone use duration (ρ = 0.451, p < 0.05) and total smartphone addiction scores (ρ = 0.480, p < 0.05). Cervical flexor muscle endurance showed a moderate negative correlation with the craniovertebral angle (ρ = −0.589, p < 0.05). Furthermore, total Neck Disability Index (NDI) scores were moderately and positively correlated with the craniovertebral angle (ρ = 0.411, p < 0.05). These findings suggest associations among smartphone use patterns, cervical posture para-

meters, and muscle endurance within the smartphone addiction group.

DISCUSSION

This study demonstrates that individuals with smartphone addiction exhibit significant differences in daily usage time, cervical functions, muscle endurance, and postural parameters. When participants were classified according to smartphone addiction severity, the addiction group exhibited higher daily smartphone use and greater neck-related disability. With respect to cervical posture, no clear differences were observed between groups for the craniovertebral or cervicothoracic angles, whereas a distinct group difference was identified for the head tilt angle. Cervical flexor muscle endurance was lower in the smartphone addiction group, although this difference was not statistically meaningful; however, correlation analyses revealed that cervical extensor muscle endurance was positively associated with both daily smartphone use and overall smartphone addiction severity. In addition, cervical flexor muscle endurance demonstrated an inverse relationship with the craniovertebral angle, while Neck Disability Index scores were positively associated with the craniovertebral angle. The findings reveal that smartphone addiction is not merely a psychological condition but also a problem that profoundly affects physical health.

We observed a significantly longer daily smartphone usage time in the addiction group. Elvan and colleagues reported that smartphone use exceeding four hours per day was associated with increased neck pain and reduced cervical muscle endurance, both of which were associated with increased addiction scores [19]. In line with these findings, our results indicate that increased daily smartphone use distinguishes individuals with smartphone addiction, supporting the relevance of usage duration as a behavioral marker of addiction-related physical outcomes.

Likewise, Bavli et al. demonstrated that university students who used smartphones >9 hours/day had significantly greater addiction scores, and daily use was strongly, positively correlated with addiction intensity [20]. Although the usage durations observed in our study were lower than this threshold, the presence of significantly longer daily use in the addiction group suggests that smartphone addiction may be identifiable even at comparatively lower usage levels.

Additionally, Gezgin demonstrated that daily smartphone usage time, especially for social media purposes, was one of the strongest predictors of smartphone addiction among adolescents, further emphasizing the behavioral dimension of addiction development [21]. Consistent with this observation, our findings support prolonged daily engagement as a key behavioral characteristic of smartphone addiction, independent of specific usage purposes.

It is noteworthy that female participants exhibited higher smartphone addiction scores and greater levels of neck dysfunction compared to their male counterparts. This finding suggests that gender may play a role in both the development of smartphone addiction and its physical manifestations. Chen et al. reported that women experience greater activation and fatigue in the neck and shoulder muscles, leading to more frequent and intense physical discomfort in these regions [22]. In agreement with these findings, the higher neck-related disability observed among female participants in our study supports the notion that women may be more vulnerable to cervical musculoskeletal strain associated with prolonged smartphone use.

Similarly, Mukherjee and Pandey found that female individuals demonstrated higher levels of smartphone addiction compared with males, attributing this difference partly to gender-related variations in emotional regulation strategies and personality traits, such as a higher tendency toward neuroticism in females [23]. Our findings are consistent with this behavioral perspective, as higher addiction scores among female participants may reflect differences in usage patterns and psychosocial characteristics that increase susceptibility to smartphone addiction.

In addition, a study conducted in 2018 reported significantly higher rates of both smartphone addiction and neck and upper-extremity discomfort among female

physical therapy students compared with males, emphasizing increased sensitivity to prolonged screen exposure and ergonomic strain [24]. Parallel to this observation, the greater neck dysfunction identified in female participants in the present study suggests that prolonged smartphone use may impose a higher ergonomic and musculoskeletal burden on women, even within a healthy young adult population.

In our study, the head tilt angle was found to be significantly lower among individuals with smartphone addiction. This suggests that smartphone addiction may be associated with alterations in head position, which can be identified through HTA measurements even in the absence of significant differences in craniovertebral angle. In line with Bauer's findings, posture patterns associated with smartphone use may affect not only CVA but also HTA and shoulder angle. Bauer further emphasized that alterations in head position may increase biomechanical stress on the musculoskeletal system [25].

From a clinical perspective, a decrease in head tilt angle (HTA) should not be viewed solely as a postural variation; rather, it may reflect alterations in head alignment and load distribution, particularly within the cervicothoracic region. Such postural changes may influence cervical muscle function. Studies have shown that forward head posture increases activation and fatigue of superficial cervical flexor muscles, potentially leading to early muscle exhaustion during sustained postural tasks [26]. In the present study, the significant difference observed in HTA between individuals with and without smartphone addiction supports the clinical relevance of this parameter, suggesting that changes in head position may represent an indicator of postural adaptation associated with prolonged smartphone use. Although cervical flexor endurance did not differ significantly between groups, its relationship with postural parameters in our findings is consistent with the proposed mechanism linking altered head position to cervical muscle function.

Consistent with prior evidence, we observed lower cervical flexor endurance in the addiction group relative to controls; however, this difference did not attain statistical significance. This decreasing trend aligns with the findings of Torkamani-Mokhtarinia and collegues, who reported diminished endurance in both flexor and extensor muscles in smartphone-addicted individuals, and linked these impairments to postural deviations such as FHP [27].

In support of these outcomes, Chovatiya et al. identified a significant inverse relationship between smartphone addiction and cervical musculature strength. Their study suggested that muscle weakening is not only a consequence of poor posture but may also contribute to the development and persistence of postural imbalances such as FHP [28].

This study also highlighted several notable correlations between postural and functional parameters. Specifically, a positive correlation was found between neck extensor muscle endurance time and both daily smartphone usage and addiction scores, suggesting that prolonged use may initially induce compensatory adaptations in the extensor muscle group. In contrast, the inverse relationship between cervical flexor muscle endurance with craniovertebral angle indicates that worsening posture may reduce the effectiveness of deep flexor muscles. Additionally, the positive correlation between CVA and NDI indicates that worsening cervical posture is associated with greater functional limitation and symptom severity.

These findings are in line with previous literature. Torkamani-Mokhtarinia and colleagues reported that individuals with smartphone addiction exhibited significant postural impairments-such as decreased CVA and forward head posture (FHP)-as well as reduced extensor muscle endurance [27]. Similarly, Kubal and Dsouza reported strong negative correlations between problematic smartphone use and neck muscle endurance, affecting both cervical flexor and extensor muscle groups under prolonged usage conditions [29]. In the present study, although group differences in cervical flexor endurance were not statistically significant, the observed associations between smartphone use characteristics and cervical muscle endurance support the notion that

omuscular performance even in the absence of overt endurance deficits.

Additionally, Heneidy and colleagues found that daily smartphone use exceeding four hours was associated with markedly reduced endurance of the deep cervical flexors, suggesting an increased risk of cervical instability over time [30]. While our findings did not demonstrate a comparable threshold effect, the relationships observed between cervical posture parameters and muscle endurance indicate that postural alterations may precede measurable declines in deep cervical flexor endurance in healthy young adults.

Lee and colleagues identified a strong association between deep cervical flexor endurance and craniovertebral angle, highlighting the tendency for postural deterioration to coexist with weakening of these muscles [31]. Consistent with this perspective, our study demonstrated an inverse relationship between cervical flexor muscle endurance and craniovertebral angle, reinforcing the interaction between postural alignment and cervical muscle function.

Several limitations should be acknowledged. Foremost, the sample was restricted to a small group of university students within a narrow age range, potentially constraining external validity. Second, the cross-sectional design precludes conclusions regarding causality or long-term effects. Further long-term studies are required to clarify the enduring biomechanical impacts of smartphone use on the cervical, thoracic, and shoulder regions.

CONCLUSION

This study provides evidence that smartphone addiction is not only a psychological issue but also a physical health concern affecting cervical posture, muscle endurance, and neck function. Individuals in the addiction group exhibited significantly higher daily usage time and neck dysfunction levels, along with a significantly lower head tilt angle, indicating an association between addiction and alterations in cervical posture and function. Furthermore, gender emerged as a significant factor influencing both addiction severity and physical impact. The observed correlations between muscle endurance, postural parameters, and clinical symptoms highlight the importance of targeted interventions for improving both posture and functional outcomes. In this context, posture-focused exercise programs and early intervention strategies may serve as valuable preventive health approaches.

Ethics Committee Approval / Etik Komite Onayı

The study was approved by the Clinical Researches Local Ethics Committee (Decision no: 15/257, Date: December 5, 2023). This study was conducted by the Social Responsibility Working Group of the Turkish Sports Medicine Association.

Conflict of Interest / Çıkar Çatışması

The authors declared no conflicts of interest with respect to authorship and/or publication of the article.

Financial Disclosure / Finansal Destek

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Dissemination

This research was presented orally at the 1st Project and Science Days (I. Proje ve Bilim Günleri), organized by the Faculty of Medicine at Süleyman Demirel University in Isparta, Türkiye, in May 2024.

Author Contributions / Yazar Katkıları

Concept: ASU, SE; design: EA, ASU, SE; supervision: SE; materials: ASU, MÇ, MEY, EÇ; data collection and/or processing: EÇ, MÇ, MEY, ETA; analysis and interpretation: ASU, EA, SE; literature review: EÇ, MÇ, MEY, ETA; manuscript drafting: ASU, ETA; critical review: EA, ASU. All authors discussed the results, contributed to the final version of the manuscript, and approved it for publication.

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