

Smartphone Addiction and Chronic Spinal Pain among University Students: A Cross-Sectional Study

Maria Eduarda Oliosi^{a, b} Cláudia Silva^{c, d} Daniela Simões^e
Ana Rita Pinheiro^{a, f}

^aSchool of Health Sciences (ESSUA), University of Aveiro, Aveiro, Portugal; ^bResearch Centre in Physical Activity, Health and Leisure (CIAFEL-FADEUP), Faculty of Sport, University of Porto, Porto, Portugal; ^cDepartment of Physiotherapy, School of Health of Polytechnic of Porto (ESS-P.Porto), Porto, Portugal; ^dCenter for Rehabilitation Research, Polytechnic of Porto (ESS-P.Porto), Porto, Portugal; ^eSanta Maria Health School (ESSSM), Porto, Portugal; ^fInstitute of Biomedicine (iBiMED), University of Aveiro, Aveiro, Portugal

Keywords

Smartphone addiction · Chronic spinal pain · Prevalence · Disability · Public health

Abstract

Introduction: Current smartphones are highly versatile, and their use is embedded in people's daily lives, particularly among university students. Their overuse does not seem to be harmless, being associated with adverse effects, including musculoskeletal dysfunction. Moreover, chronic spinal pain (CSP) is increasing among university students. This study aimed to assess the prevalence of self-reported smartphone addiction (SA) and CSP among university students and analyze the association between both. A cross-sectional study was performed. **Methods:** Data were obtained from a sample of university students through an online self-reported questionnaire, which included the Smartphone Addiction Scale Short Version, the Numerical Pain Rating Scale, the Neck Disability Index, and the Oswestry Disability Index. **Results:** Of 465 students who responded, 31% showed SA, and 26% reported CSP.

Students with SA evidenced a greater prevalence of neck, thoracic, and low back pain when compared to university students without addiction. Logistic regression analysis showed a significant association between SA and CSP (OR = 2.48, 95% CI = 1.55–3.98). However, longitudinal studies are needed to establish causal relationships.

Discussion/Conclusion: This study concludes that SA and CSP are both prevalent among university students, and their association should be further analyzed and considered in preventive measures.

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Dependência de smartphones e dor crónica na coluna entre estudantes universitários: um estudo transversal

Palavras Chave

Dependência de smartphones · Dor crónica · Prevalência · Incapacidade · Saúde pública

Resumo

Introdução: Os smartphones atuais são altamente versáteis e o seu uso está profundamente integrado no quotidiano das pessoas, particularmente entre os estudantes universitários. O seu uso excessivo parece não ser inofensivo, estando associado a efeitos adversos, incluindo disfunções musculoesqueléticas. Além disso, a dor crónica na coluna (DCC) está a aumentar entre estudantes universitários. Este estudo teve como objetivo avaliar a prevalência da dependência de smartphones (DS) auto-relatada e da DCC entre estudantes universitários, e analisar a associação entre ambas. Foi realizado um estudo transversal. **Métodos:** Os dados foram obtidos de uma amostra de estudantes universitários através de um questionário online auto-preenchido, que incluiu a versão curta da Escala de Dependência de Smartphones, a Escala Numérica de Avaliação da Dor, o Índice de Incapacidade do Pescoço e o Índice de Incapacidade de Oswestry. **Resultados:** Dos 465 estudantes que responderam, 31% apresentaram DS e 26% relataram DCC. Estudantes com DS evidenciaram uma maior prevalência de dor cervical, torácica e lombar, em comparação com os estudantes universitários sem dependência. A análise de regressão logística mostrou uma associação significativa entre DS e DCC (OR = 2.48, 95% CI = 1.55–3.98). No entanto, são necessários estudos longitudinais para estabelecer relações causais. **Discussão/Conclusão:** Este estudo conclui que a DS e a DCC são prevalentes entre os estudantes universitários e que a sua associação deve ser analisada e considerada em medidas preventivas.

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Introduction

Smartphones exhibit great technological versatility, allowing users to perform complex functions that assist various daily tasks and habits. Recently, a high or even excessive use of these devices has been observed, with a pattern of dependence [1]. According to Lopez-Fernandez (2017), there appears to be potential smartphone overuse, measured by addiction to smartphone use, in 12.5% to 21.5% of the students [2]. Though its overuse starts at young ages, such as adolescence, university students in their twenties are the primary smartphone users, more than any other age group [3]. A study of over 50,000 people from 195 countries found that women scored higher on the Smartphone Addiction Scale Short Version than men. As age increased, scores decreased. The highest scores were in Southeast Asia,

and the lowest were in Europe [4]. This phenomenon of addiction and overuse has been associated with adverse effects, including musculoskeletal dysfunction and chronic pain [1, 5, 6].

According to a recent study on university students, smartphone use is associated with significantly higher degrees of flexion in the cervical and upper thoracic spine than when not using a smartphone. During smartphone use, these students also presented significantly less postural variability (i.e., more static posture) in all 4 spinal regions than when not using a smartphone. In this study, self-reported smartphone use time and increased neck flexion angle during smartphone use were significant factors associated with self-reported neck and upper back pain scores over the last 3 months [7].

Chronic spinal pain (CSP) is an increasingly prevalent condition in the general population [8–10], usually with a more significant impact and related disability on the neck and lower back segments [9, 10]. Though its etiology is complex and multifactorial, involving biological, psychological, or social factors [11, 12], it has been described that extended periods in the sitting position, combined with poor ergonomics, appear to be related to spinal pain [12].

Given the above, this study aimed to assess the prevalence of self-reported smartphone addiction (SA) and CSP among university students in Portugal and explore the association between both, assuming the hypothesis that they are positively associated. This study aimed to contribute to a deeper knowledge about the Portuguese scenario of these two conditions, which are increasing worldwide and may become an emerging disabling problem in the future, allowing for the planning of strategies to minimize their impact, if necessary.

Materials and Methods

Design and Participants

A cross-sectional correlational study was conducted. Students in higher education institutions in Portugal, who used smartphones and were 18 years or older, participated in this study. Exclusion criteria were working students, athletes or former athletes, and students with a history of neurological, cardiorespiratory, rheumatic, orthopedic, or oncological disease, and some severe accident resulting in fractures, among other injuries. The sample was obtained through electronic disclosure of the study by email, carried out by institutional communication departments of three higher

education institutions, selected by convenience, from the North and Center Regions: the Polytechnic of Porto, Santa Maria Health School, and University of Aveiro.

Instruments

To Ascertain Eligibility Criteria and Characterize the Sample

Though inclusion and exclusion criteria were explicit prior to accessing the survey, a few questions were developed and introduced at the beginning of the survey in order to ensure that only those who fulfilled the criteria would go further in the survey. Some questions were also used to characterize the sample regarding age, academic background, and academic level. Still, on sample characterization, questions to identify gender, weight, and height (the latter two for BMI calculation) were also included, as well as the short version of the International Physical Activity Questionnaire (IPAQ-SF) to characterize the level of physical activity. This instrument (short version) comprises 7 items, with open-ended questions on the physical activity of the last 7 days. The final score can be stratified into categories, classifying populations into high-, moderate-, and low-activity groups [13].

Smartphone Use and Addiction

According to Giraldo-Jimenez and colleagues [14], self-reported information could provide insights into predicting SA. Therefore, the Portuguese short version of the Smartphone Addiction Scale (SAS-SV) [15] was used to assess self-reported SA. The SAS-SV consists of 10 self-reported questions, answered from a 6-point scale ranging from (1) strongly disagree to (6) strongly agree. Originally developed and validated by Kwon and collaborators [16], SAS-SV was validated for the Portuguese population, and good internal consistency values ($\alpha = 0.86$) were found [15]. SAS-SV showed good reliability and validity, with a Cronbach's alpha of 0.911, presenting cut-off values according to gender: males have a cut-off value of 31 (sensitivity: 0.867; specificity: 0.893), and females have a cut-off value of 33 (sensitivity: 0.875; specificity: 0.886) [16]. To further characterize how students use their smartphones, they were asked about their average daily usage time, how long they have used a smartphone, what functions they prefer, and how they usually hold it throughout the day.

Pain

To characterize pain, questions were designed to ascertain its presence, location, and intensity. The main question aimed to assess whether the participant had spinal pain without apparent injury (also called "nonspecific"), persistent or recurrent, for at least 3 months [17]. Having

answered yes, the participant had to identify the pain site(s), namely, the neck, thoracic, and lumbosacral, henceforth referred to as lower back, and the intensity of the pain (through the Numeric Pain Rating Scale [NPRS]). The NPRS consists of a numeric scale from 0 to 10 to assess pain intensity, where 0 corresponds to no pain and 10 to the maximum pain imaginable, also having an intermediate score of 1–3 = mild pain, 4–6 = moderate pain, and 7–10 = severe pain. Mentioned by the International Association for the Study of Pain as a standard of good practice to quantify pain intensity [17], its use shows high construct validity ($r = >0.86$) in individuals with chronic pain [18].

Disability

The Neck Disability Index (NDI) is a widely used instrument that measures the disability associated with neck pain. It corresponds to a ten-item scale: seven on daily activities, two on pain (intensity and frequency), and 1 on concentration. Each item corresponds to 6 hypothetical answers, from zero to five points, totaling between zero and fifty (total score). The interpretation of the NDI score is based on the following: 0–4 = no disability; 5–14 = mild; 15–24 = moderate; 25–34 = severe; more than 34 = complete disability. This instrument, developed by Vernon and Mior [19, 20], was validated for the European Portuguese version by Cruz and collaborators [21], having presented good psychometric properties in individuals with chronic neck pain, with test-retest reliability of 0.90, internal consistency of 0.95, and good correlation with pain intensity ($r = 0.525$, $p < 0.01$) [19, 21].

Oswestry Disability Index (ODI) 2.0 was used to assess the functional disability caused by low back pain. It comprises ten items: pain intensity; personal care; lifting; walking; sitting; standing; sleeping; sexual life, if applicable; social life; and traveling. Each item corresponds to six response hypotheses: zero corresponds to the minimum, and six corresponds to the maximum. Thus, the highest possible score (100%) is 50, and interpretation of the score is based on the following: 0–20, minimal disability; 21–40, moderate disability; 41–60, severe disability; 61–80, crippling back pain; 81–100, these patients are either bed-bound or have an exaggeration of their symptoms. The ODI 2.0 [22] results from an update of the ODI, developed in 1980. It was adapted to the Portuguese population, with a Cronbach's score for internal consistency of 0.95 and reproducibility of 0.90 [23].

Data Analysis

Descriptive statistics were used, i.e., means and standard deviation (if normal distribution) or medians and interquartile ranges (IQRs), to characterize the

numerical variables, and absolute frequency and percentage, to describe the categorical variables. For comparison of independent groups, the *t* test (if normal distribution) or the Mann-Whitney U test was used for numerical variables. Pearson Correlation was also included. For categorical variables, the chi-square and Fisher's exact tests were used. To estimate the association between SA and CSP, logistic regression models were utilized, with the reference category being the one with the lowest expected risk for the outcomes in question. Possible confounders were identified a priori based on previous research. A forced entry method was employed, where all variables were entered into the equation simultaneously. Crude and adjusted odds ratios (ORs) with 95% confidence intervals (95% CIs) were calculated, with all estimates considering age, gender, education, BMI, physical activity levels, and smartphone demands (posture and time). Additionally, a univariate logistic model with the independent variables (SA and the time per day using the smartphone) and their interaction were performed to examine the dependent variable CSP more deeply. The analysis was performed using SPSS version 27.

Results

Participants

Of 1,797 who accessed the questionnaires, 1,428 consented to participate. Despite the consent, 2 were excluded because they did not own a smartphone; 741 were excluded for reasons such as being athletes, workers, having had recent surgery, or having another illness; 134 respondents gave up. Considering that SAS-SV's current interpretation is based only on female versus male gender, 2 participants who did not identify themselves with this binary stratification were excluded. After exclusions, 465 eligible participants were identified. Of these, 38 (8.2%) were PhD students, 96 (20.6%) were master's students, 312 (67.1%) were bachelor students, and 19 (4.1%) were students from another course (technical course/integrated master's). There were 321 (69.0%) females and 144 (31.0%) males, with an age of 20.0 ± 5.00 years and a BMI of 21.64 ± 4.25 and 22.91 ± 0.25 , respectively (shown in Table 1).

Smartphone Use and Addiction

According to the results obtained by SAS-SV, 320 (68.8%) of the 465 students did not show self-reported addiction to smartphone use (group without smartphone addiction [WITHOUT-SA]), and 145 (31.2%) showed to

have it (group with smartphone addiction [WITH-SA]) (shown in Table 2). Students generally reported using this device for about 8.00 ± 4.00 years, with no statistically significant differences between the WITH-SA group (8.00 ± 3.00 years; median and IQR) and the WITHOUT-SA group (8.00 ± 4.00 years; median and IQR, $p = 0.655$).

The majority of students WITHOUT-SA (55.9%) spent 1–3 h per day using their smartphones, whereas the majority of students WITH-SA (57.6%) reported using their smartphones for more than 3 h. These findings were statistically significant, as confirmed by Pearson's chi-square test and Fisher's exact test ($p < 0.001$). Among WITHOUT-SA, 28.7% of students used their phones for Internet and social media equally. However, students WITH-SA primarily used their phones for social networking (35.2%), followed by Internet access (31.7%). The study also looked at the postures students adopted while using their smartphones. Both groups reported using their phones primarily in a sitting position, with no significant difference between the two groups in terms of posture ($p = 0.275$) (shown in Table 2).

In addition, self-reported physical activity was, in general, predominantly moderate and high levels, being high in 40.6% of students WITHOUT-SA and 33.1% of students WITH-SA, moderate in 34.7% of students WITHOUT-SA and 40.7% of students WITH-SA, and low in 24.7% of students WITHOUT-SA and 26.2% of WITH-SA students. No statistically significant differences were found between the groups ($p = 0.273$).

Self-Reported CSP and Related Disability

Among the 465 students who participated, 123 (26.5%) reported CSP. CSP was reported by 20.9% and 38.6% of students WITHOUT-SA and WITH-SA. Statistically significant differences were found between the groups ($p < 0.001$, chi-square and Fisher's exact tests).

Analyzing the prevalence of CSP locally, neck pain was reported by 16.9% of the students WITHOUT-SA and 31% of the students WITH-SA, thoracic pain was reported by 8.1% of the students WITHOUT-SA and 19.3% of the students WITH-SA, and pain in the low back region was reported by 15.9% of the students WITHOUT-SA students and 30.3% of the students WITH-SA. Statistical significance was observed between the two groups either for the presence of neck pain ($p < 0.001$) or for thoracic pain ($p < 0.001$) or pain in the lower back region ($p < 0.001$), according to chi-square and Fisher's exact tests (shown in Table 3).

Table 1. Characterization of the participants about gender, age, BMI, and SA (measured through SAS-SV)

Variable	Mean±SD or ^a median±IQR or percentage (absolute number) as applicable
Female	69.0% (321)
Male	31.0% (144)
Age, years	20.0±5.00 ^a
Female	20.0±5.00 ^a
Male	20.0±5.00 ^a
BMI general, kg/m ²	22.03±4.23
Female	21.64±4.25 ^a
Male	22.91±0.25
SAS-SV score	27.14±8.53
With addiction	31.2% (145)/36.00±5.50 ^a
Without addiction	68.8% (320)/23.00±8.00 ^a

SD, standard deviation; IQR, interquartile range; SAS-SV, Smartphone Addiction Scale Short Version. ^aMedian±IQR.

Table 2. Characterization of smartphone use

Variable	WITHOUT-SA (n = 320) percentage (absolute number)	WITH-SA (n = 145) percentage (absolute number)	p value
Time spent daily			<0.001*
≤1 h	9.4% (30)	2.8% (4)	
Between 1 and 3 h	55.9% (179)	39.6% (57)	
≥3 h	34.7% (111)	57.6% (83)	
Functions more used			0.342
Social media	28.3% (91)	35.4% (51)	
Internet	29.3% (94)	31.3% (46)	
Send message	21.8% (70)	20.8% (30)	
Oral communication	13.1% (42)	8.3% (12)	
Take photos	2.8% (9)	2.1% (3)	
Other	4.7% (15)	2.1% (3)	
Posture during use			0.247
Sitting	69.7% (223)	76.6% (111)	
Lying	15.3% (49)	13.1% (19)	
Standing	15.0% (48)	10.3% (15)	

WITHOUT-SA, without smartphone addiction; WITH-SA, with smartphone addiction; h, hour. * $p < 0.05$.

The independent sample *t* test revealed that the pain intensity mean was not significantly different between groups in the three spine regions (neck: $p > 0.05$; thoracic: $p > 0.05$; lower back: $p > 0.05$) (shown in Table 3). Moreover, both groups demonstrated equal pain intensity in classification; i.e., the most common category was moderate level (Table 3).

Regarding the disability related to neck pain, NDI was found to be severe for students WITH-SA (34, 75.6%) and WITHOUT-SA (43, 79.6%), without significant statistical differences between the two groups ($p > 0.05$). Never-

theless, a poor positive and statistically significant correlation was found (Pearson $R = 0.211$, $p = 0.038$) between SAS-SV and NDI. Though no differences were found between groups for the disability related to low back pain, as indicated by the ODI ($p > 0.05$), the level found for this variable was mild (WITHOUT-SA 42, 82.4%, and WITH-SA 31, 70.5%). Moreover, no correlation was found between SAS-SV and ODI (Pearson $R = 0.131$, $p = 0.206$).

To examine the potential factors that predict CSP, univariate and multivariable logistic regressions were

Table 3. CSP characterization

Variable	WITHOUT-SA (n = 320) percentage (absolute number) or mean±SD or ^a median±IQR as applicable	WITH-SA (n = 145) percentage (absolute number) or mean±SD or ^a median±IQR as applicable	p value
Pain location			
Neck	16.9% (54)	31% (45)	<0.001*
Thoracic	8.1% (26)	19.3% (28)	<0.001*
Lower back	15.9% (51)	30.3% (44)	<0.001*
Pain intensity (0–10)			
Neck	4.43±2.13	4.91±2.03	0.252
Thoracic	4.31±2.05	4.50±1.91	0.723
Lower back	4.73±1.86	4.84±2.11	0.778
Pain intensity levels, neck			0.568
Mild	35.2% (19)	24.4% (11)	
Moderate	42.6% (23)	51.1% (23)	
Severe	22.2% (12)	24.4% (11)	
Pain intensity levels, thoracic			0.936
Mild	38.5% (10)	32.1% (9)	
Moderate	46.2% (12)	50.0% (14)	
Severe	15.4% (4)	17.9% (5)	
Pain intensity levels, lower back			0.771
Mild	27.5% (14)	29.5% (13)	
Moderate	52.9% (27)	45.5% (20)	
Severe	19.6% (10)	25.0% (11)	
NDI score	28.89±7.00 ^a	34.78±12.00 ^a	0.069
NDI levels			0.376
Mild	0.0% (0)	4.4% (2)	
Moderate	20.4% (11)	20.0% (9)	
Severe	79.6% (43)	75.6% (34)	
ODI score	13.33±12.00 ^a	12.00±18.22 ^a	0.973
ODI levels			0.145
Mild	82.4% (42)	70.5% (31)	
Moderate	15.7% (8)	22.7% (10)	
Severe	0.0% (0)	6.8% (3)	
Crippling	2.0% (1)	0.0% (0)	

WITHOUT-SA, without smartphone addiction; WITH-SA, with smartphone addiction; SD, standard deviation. Mean ± standard deviation. ^aMedian ± IQR. **p* < 0.05.

performed (shown in Table 4), which revealed that being addicted to smartphones was associated with CSP (OR = 2.38, 95% CI = 1.54–3.65; OR = 2.49, 95% CI = 1.55–3.98, respectively). Being male significantly decreased the odds of reporting CSP (OR = 0.56, 95% CI = 0.33–0.94). A significant association between daily smartphone use and CSP, when comparing more than 3 h to 1 to 3 h (OR = 0.55, 95% CI = 0.34–0.88) but not when comparing up to 1 h, was also found. Academic degree, posture, and BMI were not significant predic-

tors (*p* > 0.05). Moreover, the combination (interaction) of SA and smartphone time demonstrated a nonsignificant effect.

Discussion

The purpose of this study was to contribute to a better understanding of the prevalence and association between smartphone use and musculoskeletal dysfunctions, with

Table 4. Association among CSP, SA, smartphone usage, sociodemographic factors, and anthropometric data in university students

	OR crude	OR adjusted	95% CI	
			lower	upper
Addiction				
WITHOUT-SA	1.000			
WITH-SA	2.376		1.547	3.650
WITH-SA		2.489	1.554	3.986
Age				
Age		1.090	1.026	1.157
Time				
≥3 h		1.000		
≤1 h		0.839	0.350	2.008
Between 1 and 3 h		0.554	0.345	0.889
Academic level				
PhD		1.000		
Other		0.976	0.221	4.320
BS		1.591	0.58	4.369
MS		1.785	0.661	4.816
Gender				
Female		1.000		
Male		0.563	0.335	0.945
BMI				
Obesity		1.000		
Underweight		0.287	0.065	1.263
Normal weight		0.409	0.115	1.458
Pre-obesity		0.372	0.096	1.437
Posture				
Sitting		1.000	1.000	1.000
Standing		0.760	0.358	1.613
Lying		1.814	0.999	3.295

Dependent variable: CSP (no CSP: reference). OR, odds ratio; WITH-SA, with smartphone addiction; Nagelkerke (pseudo-R²) = 14.6.

the primary aim of examining the association between (self-reported) smartphone use addiction and CSP in university students. To the teams' knowledge, this is the first study that analyzed the association between self-reported addiction to smartphone use and CSP among the university population in Portugal. The main findings obtained were that SA and CSP were prevalent in more than ¼ of university students and that self-reported SA was associated with CSP in the studied students, with a higher proportion of students having neck, thoracic, or lower back pain reporting SA as well. Nevertheless, neither pain intensity nor disability index differed between students WITH-SA and WITHOUT-SA, though a poor positive correlation was found between SA and neck pain disability.

Based on SAS-SV, the mean results obtained (27.14 ± 8.53) were similar to those obtained by Ta-

teno and colleagues [24] (26.1 ± 10.0). The present study showed a 31.0% self-report rate for SA compared to other reports, ranging from 17 to 62% [2, 8, 25–28]. The average use time of university students varies in the literature between 2 and 8 h per day [3, 5, 28]. Most of the students WITH-SA reported a daily use of more than 3 h per day, significantly different from most of the students WITHOUT-SA, who reported an everyday use of 1 to 3 h. A recent study observed that each additional hour of use was associated with a 6% increase in the likelihood of neck pain [29]. An experimental study on 20 university students found that 35% of them were smartphone addicted, but there was no association between smartphone use and head and neck pain. However, muscle activity in certain muscles increased after 30 min of smartphone use [6].

The findings of Mustafaoglu and colleagues [25] provide important insights into the adverse effects of SA on the musculoskeletal health of university students. The study highlights that prolonged use of smartphones can lead to musculoskeletal pain, particularly in the upper back, neck, and wrists/hands. The SAS score was found to be significantly associated with musculoskeletal pain in these areas, which emphasizes the need for effective interventions to prevent and manage SA among university students (ORs: 1.08, 1.07, 1.10, respectively; 95% CIs: 0.98–1.11). Similarly, a study conducted on 259 nursing students in a Turkish university found that SA was linked to increased levels of pain in various parts of the body. The students had an average SAS-SV score of 25.71 ± 7.49 , and all reported experiencing pain in their ears, pinkie, elbow, shoulder, wrist, eye, hand, and neck due to phone use. Those with the highest levels of headache, ear pain, shoulder pain, and low back pain had SAS-SV scores that were 7.4, 6.8, 8.4, and 8.2 times higher, respectively. The results of the study suggest that higher SAS-SV scores are associated with more severe and widespread pain, including headache, ear pain, shoulder pain, and low back pain [30]. More recently, Giraldo-Jimenez and colleagues [14] developed a data-driven model to predict smartphone dependence using machine learning techniques using a retrospective study using university students ($n = 1,228$), including the Risk Factors Questionnaire, smartphone dependency, and musculoskeletal symptoms. It was shown that self-reported information could provide insights into predicting SA.

Despite the evidence in biomechanics contributions, the findings did not find an association between postures and CSP [7, 12]. However, a review found that when using smartphones, there is an increase in muscle activity in the upper trapezius, erector spinae, and neck extensor muscles. Additionally, the angle of head flexion, head tilt, and forward head shifting also increases. Using a smartphone while sitting causes an even greater shift in the head-neck angle compared to standing [31]. It is essential to highlight that the neck musculature is richly innervated by proprioceptors. Thus, wrong proprioceptive afferents may negatively modulate the corresponding neuromuscular activity [32]. Modifications in multiple locations along the motor pathway can be complementary, additive, or competitive. The movement system's response depends on the relative impact of events across its elements and can vary between individuals and tasks. However, these kinetic and kinematic adaptations may eventually contribute to the chronicity of spinal pain [33].

Results cannot be generalized to other populations as all participants were university students, and po-

tential confounders were not assessed. In light of the fact that SA can lead to psychological and emotional changes [34, 35], future research may also consider analyzing variables such as academic performance, sleep quality, mood, cognitive functioning, and pain behavior. The multimodal information could, therefore, contribute to CSP research in future studies. Also, other body regions involved in smartphone manipulation should be explored, including the elbow, wrist, forearm, and hand. Finally, the pattern of smartphone use among individuals (postural strategies) and environmental conditions could also be examined.

Conclusions

SA and CSP seem prevalent among university students, with more than $\frac{1}{4}$ of university students reporting both conditions, not necessarily in coexistence. Students with self-reported addiction to smartphones reported a higher current daily use of this device than students without addiction, confirming the pattern of use addiction. These students also evidenced a greater prevalence of neck, thoracic, and low back pain when compared to university students without addiction. Results also suggested a weak positive correlation between SA and neck disability. Therefore, researchers, health professionals, policymakers, and other stakeholders should be aware of the potential implications of this association to deepen its causality relationship further and minimize its impact.

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Statement of Ethics

This study was approved by the Ethics and Deontology Council of the University of Aveiro (CED-UA) (No. 01-CED/2020) and by the Ethics Committee of the School of Health of the IPP (Proc. CE0029A). To access the survey, participants had to consent to their participation after reading the goals, major methods, and implications of the study, having the opportunity to clarify any doubt about it. Compliance with the General Data Protection Regulation was also guaranteed, using a secure platform (LimeSurvey) and data anonymization, ensuring no identification of participants through individual data or online data analysis.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Maria Eduarda Oliosi and Ana Rita Pinheiro: conceptualization, methodology, formal analysis, writing original draft, and visualization. Cláudia Silva: conceptualization, methodology, writing, review, and editing. Daniela Simões: conceptualization, methodology, formal analysis, writing, review, and editing.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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