

Screen Time and Musculoskeletal Pain in Dental Students

Manuella Vasconcelos Tavares Carvalho¹, Michell André Andrade da Silva¹, Guilherme de Melo Ribeiro Aragão Barbosa¹, Sérgio Soares da Silva¹, Mariana Araújo Coutinho da Silveira¹, Pedro Rhuan Braz de Andrade², Mônica Vilela Heimer¹

¹Faculty of Dentistry, University of Pernambuco, Recife, PE, Brazil.

²Faculty of Medical Science, University of Pernambuco, Recife, PE, Brazil.

Corresponding author: Michell André Andrade da Silva

E-mail: michell.aandrade@upe.br

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ABSTRACT

Objective: To investigate the association between screen time and musculoskeletal pain in dentistry students at a Brazilian public university. **Material and Methods:** A cross-sectional study was conducted among dental students enrolled in the undergraduate program. Data collection was carried out through the application of a sociodemographic questionnaire and the Pain and Electronic Media Questionnaire involving a population group of 229 students with specific characteristics, using a convenience sampling method. Due to the pandemic, data was collected from January to December 2022 using Google Forms. **Results:** Most researched participants were from the 7th to the 10th period. It was possible to verify that 95.6% stated that their cell phone is the most used equipment. Furthermore, 71.6% reported using their cell phone five or more hours daily. The students also mentioned that 61.6% experienced back pain, 56.3% experienced neck pain when using a computer, 31% reported back pain, and 20.1% reported neck pain when playing electronic games. Regarding cell phone use, the locations where pain was most frequently reported were the wrists and hands (49.8%). **Conclusion:** The study highlights the impact of prolonged screen time on musculoskeletal pain among dental students, emphasizing the need for ergonomic interventions and educational programs to address and prevent discomfort associated with extensive use of digital devices.

Keywords: Musculoskeletal Pain; Dentistry; Screen Time.

■ Introduction

Screen time is all time spent on various forms of digital media, such as cell phones, video games, television, tablets, and computers. It is recommended that children and adolescents limit themselves to a maximum of two hours a day; exceeding this limit is considered excessive and harmful to health [1,2]. In general, having a limit on screen time is necessary for an individual's development, as even after childhood, it is suggested by the WHO that adults should not exceed three hours per day [3].

One of the adverse effects caused by excessive exposure to screens is musculoskeletal pain, which is defined as continuous pain in the body's bones, joints, and tissues, persisting for more than 3 months. Repetitive movements associated with non-ergonomic postures are predisposing factors to the development of musculoskeletal disorders [4].

Musculoskeletal disorders caused by this excessive use of screens are characterized by neck pain, lower back pain, headaches, and pain in the shoulders, elbows, arms, wrists, hands, and even in the region of the fingers, such as the thumb, due to constant exercise [5].

Dentistry is known for being a healthcare area in which professionals spend a lot of time sitting and producing repeated movements for many hours at a time, and it is common to find musculoskeletal disorders in this area [6]. Furthermore, health students in general, including dentistry, also use notebooks and cell phones to assist in studies and research in academic activities and for leisure time, often accompanied by inadequate postures that can cause pain and musculoskeletal changes [7].

In a selective study conducted with dentistry students, Almhdawi et al. [8] found that 67.1% of Jordanian students reported musculoskeletal pain from this combination of factors. A survey by Garbin et al. [9] in Brazil found that 81.4% of dentists had musculoskeletal disorders, primarily in the neck, shoulders, and lower back. Meisha et al. [6] reported musculoskeletal pain in her research, with 85% in the lower back, 84.6% in the neck, and 81.2% in the shoulders. These areas are cited in the study as the most common locations of musculoskeletal pain among dentists. Just like dentists, dentistry students experience the impacts of the profession early on [9,10].

Global literature indicates a potential link between screen time and musculoskeletal pain among dental students. However, there is a notable lack of Brazilian studies investigating this relationship. Therefore, this study aimed to assess the association between screen time and musculoskeletal pain, specifically in dental students.

■ Material and Methods

Ethical Clearance

The local Research Ethics Committee approved the present study under Opinion no. 3.242.121. All participants signed an informed consent form before data collection.

Study Design and Sample

This observational, cross-sectional, non-probabilistic study was conducted with dental students from the University of Pernambuco, a public university located in Recife, Brazil. Initially, 411 forms were sent to students regularly enrolled from the first to the tenth semester, with a response rate of 55.7%, resulting in a sample of 229 participants.

Data Collection

Data was collected using the Pain and Electronic Media Questionnaire, a validated instrument in Brazil used as a pre-test in the study [11], and a sociodemographic questionnaire. Data collection began in January and concluded in December 2022. Due to the pandemic, it was carried out through the digital platform Google Forms and distributed via the WhatsApp application.

The Pain and Electronic Media Questionnaire is an individual, confidential, and self-administered questionnaire with questions about the use of digital screens separated into categorized blocks. The digital screens evaluated are computers, cell phones, video games, and TV, addressing aspects of availability and usage patterns. Among electronic games, portable mobile devices (phones with keyboard, smartphones with touch screen, tablet, computers, Playstation portable - PSP) (Sony Corporation of America, NY, USA), Nintendo DS (Nintendo Co. Ltd, Kyoto, Japan) and Game Boy (Nintendo Co. Ltd, Kyoto, Japan), Wii (Nintendo Co. Ltd, Kyoto, Japan), Playstation (Sony Corporation of America, NY, USA) and Xbox (Sony Corporation of America, NY, USA).

This questionnaire also addresses painful symptoms of the musculoskeletal system present in the last three months. The questionnaire, modified from other instruments previously published by Pediatric Rheumatology of the Department of Pediatrics of the Faculty of Medicine of the University of São Paulo, included images of different body areas placed next to the questions to help adolescents identify the body area of musculoskeletal pain symptoms [9-11].

The sociodemographic questionnaire included questions about age (in years), sex, semester of the course, marital and professional status of the respondent, and household income (in Brazilian minimum wages).

Data Analysis

Categorical variables were analyzed descriptively using absolute frequencies and percentages, and numerical variables using mean, standard deviation, median, and the 25th and 75th percentiles (median (P25; P75)). Pearson's Chi-square test was used to evaluate the association between two variables for categorical variables. The t-Student test with equal variances or the Mann-Whitney test was used when comparing two categories concerning numerical variables. The t-student test was chosen when distributions were verified normality in each category and the Mann-Whitney test in the case of rejection of normality. The normality test was performed using the Shapiro-Wilk test, and equality of variances was performed using Levene's F test. The margin of error used in deciding the statistical tests was 5%. The data were entered into the EXCEL spreadsheet, and the program used to obtain the statistical calculations was IMB SPSS version 25 (IBM Corp., Armonk, NY, USA).

■ Results

A total of 229 participants completed the questionnaire. The age of the surveyed participants ranged from 17 to 30 years; however, 56.8% were between 20 and 22 years old, 81.7% were female, 45.0% were in the 7th to 10th semesters, 54.6% of the parents were married, 84.3% of the parents were employed, and 44.5% had a household income between two and four minimum wages (with the minimum wage in Brazil being R\$1,212.00 in 2022).

It was found that 79.9% used portable computers (notebooks, laptops, tablets, iPads, or other devices), 14% used desktop computers, and 6.1% never or rarely used computers. Regarding the frequency of use per week, 41% used computers daily, 34.4% used them 4 to 6 days a week, and 27.5% used them 1 to 3 days a week. From Monday to Friday, 27.5% spent an average of 5 hours or more per day on the computer, 34.5% spent 3 to 4 hours,

30.1% spent 1 to 2 hours, and 7.9% did not use the computer. Concerning nighttime habits, 61.1% used the computer after 10:00 pm.

Table 1. Assessment of computer use during the week.

Questions	N (%)
What type of computer do you use the most?	
Never or almost never use a computer	14 (6.1)
Desktop computer	32 (14.0)
Portable computer (notebook or laptop, tablet, iPad, or other devices)	183 (79.9)
How many days per week do you use a computer?	
1 to 3 days	63 (27.5)
4 to 6 days	72 (31.4)
Every day	94 (41.0)
From Monday to Friday, how much time do you spend on the computer?	
I do not use the computer	18 (7.9)
I spend, on average, 1 to 2 hours per day	69 (30.1)
I spend, on average, 3 to 4 hours per day	79 (34.5)
I spend, on average, 5 hours or more per day	63 (27.5)
From Saturdays, Sundays and holidays, how much time, on average, do you spend on the computer?	
I do not use the computer	58 (25.3)
I spend, on average, 1 to 2 hours per day	76 (33.2)
I spend, on average, 3 to 4 hours per day	52 (22.7)
I spend, on average, 5 hours or more per day	43 (18.8)
Do you usually use the computer after 10 pm?	
Yes	140 (61.1)
No	89 (38.9)

Regarding social media, 98.7% reported participating in some form of social network. Of these, 10.5% started using social media before the age of 10; 48.5% began between the ages of 10 and 12; 27.5% started between 13 and 15 years old; 4.8% began between 16 and 19 years old; 0.9% started after the age of 20; 1.3% reported not using social media; and 6.6% could not recall the age at which they began participating.

Among the devices used to access social media, 95.6% used a mobile phone with internet access, 3.1% used a desktop or portable computer, and 1.3% reported not using social media. Additionally, 93.0% said they accessed a social network after 10:00 pm. When asked about other uses for their mobile phones besides making and receiving calls, 47.6% reported sending and receiving messages or using WhatsApp, 41.5% used them for gaming, 10% for accessing social media, and 0.9% for taking photos. From Monday to Friday, 71.2% used their mobile phones for 5 hours or more per day, 25.3% used them for 3 to 4 hours, and 3.5% used them for an average of 1 to 2 hours. On Saturdays and Sundays, 71.6% used their mobile phones for five or more hours, 20.5% used them for 3 to 4 hours, and 7.9% used them for 1 to 2 hours. Nearly all (97.4%) reported using mobile phones after 10:00 pm (Table 2).

Table 2. Assessment of social media use and mobile phone usage.

Questions	N (%)
Do you participate in any social media?	
Yes	226 (98.7)
No	3 (1.3)
At what age did you start participating in social media?	
I don't remember	15 (6.6)
Under 10 years old	24 (10.5)
10 to 12 years old	111 (48.5)
13 to 15 years old	63 (27.5)
16 to 19 years old	11 (4.8)

Over 20 years old	2 (0.9)
I do not use social media	3 (1.3)
What device do you use most to access social media?	
Desktop computer / Portable computer (notebook or laptop)	7 (3.1)
Mobile phone with internet access	219 (95.6)
I do not use social media	3 (1.3)
Do you usually connect to a social network after 10 pm?	
Yes	213 (93.0)
No	16 (7.0)
Besides making and/or receiving calls, what do you use your mobile phone for the most?	
To send or receive messages, or WhatsApp	109 (47.6)
To play games	95 (41.5)
To access social media	23 (10.0)
To take photos	2 (0.9)
From Monday to Friday, on average, how much time do you spend using your mobile phone?	
I use it, on average, for 1 to 2 hours per day	8 (3.5)
I use it, on average, 3 to 4 hours per day	58 (25.3)
I use it, on average, 5 hours or more per day	163 (71.2)
On average Saturdays, Sundays, and holidays, how much time do you spend using your mobile phone?	
I use it, on average, for 1 to 2 hours per day	18 (7.9)
I use it, on average, 3 to 4 hours per day	47 (20.5)
I use it, on average, 5 hours or more per day	164 (71.6)
Do you usually use your mobile phone after 10 pm?	
Yes	223 (97.4)
No	6 (2.6)

The questionnaire also revealed that 44.5% of the surveyed students played electronic games. Of these, 17.0% played every day of the week, 6.5% played 4 to 6 days a week, and 21% played 1 to 3 days a week. When assessed by average hours per day, from Monday to Friday, 2.6% played for five or more hours, 9.2% played for 3 to 4 hours, 28.4% played for 1 to 2 hours, and 4.4% did not play. On Saturdays, Sundays, and holidays, 4.8% spent an average of 5 or more hours, 9.2% spent 3 to 4 hours, 24.9% spent 1 to 2 hours, and 5.7% did not play. Regarding nighttime habits, 30.1% reported playing after 10:00 pm.

Simultaneously, an assessment of TV usage revealed that from Monday to Friday, 23.1% do not watch TV; 57.6% watch for an average of 1 to 2 hours; 17.9% watch for an average of 3 to 4 hours; and 1.3% watch for more than 5 hours. On Saturdays, Sundays, and holidays, 24.5% do not watch TV; 44.5% watch for an average of 1 to 2 hours per day; 24.5% watch for 3 to 4 hours; and 6.6% watch for more than 5 hours. Lastly, regarding the simultaneous use of electronic devices/social media, 80.8% used a desktop computer, laptop, or notebook; 4.8% used a tablet; 6.6% used electronic games; 98.7% used a mobile phone; and 40.2% used TV.

In the direct analysis of musculoskeletal pain and activity performed, computer use revealed that 56.3% experienced neck pain; 28.4% reported pain in the shoulders and arms; 17.9% in the wrists and hands; 61.6% in the back; and 10.9% in the hips, legs, and feet. These variables overlap. In this context, 53.7% of participants reported needing to interrupt computer use due to pain.

In the analysis of electronic games, 20.1% of participants reported experiencing neck pain during play; 10.9% reported pain in the shoulders and arms; 17.0% in the wrists and hands; 31% in the back; 1.7% in the hips, legs, and feet; and 57.6% stated they did not experience any pain. These variables overlap. In this group, 27.5% of participants reported having to interrupt their gaming due to pain.

In the analysis of mobile phone use, 39.3% of participants reported experiencing neck pain; 16.2% reported pain in the shoulders and arms; 49.8% in the wrists and hands; 17.9% in the back; 2.6% in the hips, legs, and feet; and 28.4% stated they did not experience any pain. These variables overlap. Additionally, 49.3% reported experiencing pain that led them to interrupt their use of the mobile phone.

Table 3. Assessment of the presence of pain in muscles, bones, or joints when using the equipment.

Questions	N (%)
While using the computer, you feel pain in: ⁽¹⁾	
Neck	129 (56.3)
Shoulders and arms	65 (28.4)
Wrists and hands	41 (17.9)
Back	141 (61.6)
Hip, legs, and feet	25 (10.9)
I don't feel pain while using the computer	33 (14.4)
This pain made me stop using the computer	
Yes	123 (53.7)
No	73 (31.9)
I don't feel pain while using the computer	33 (14.4)
When you play electronic games, you feel pain in: ⁽¹⁾	
Neck	46 (20.1)
Shoulders and arms	25 (10.9)
Wrists and hands	39 (17.0)
Back	71 (31.0)
Hip, legs, and feet	4 (1.7)
I don't feel pain while playing electronic games	132 (57.6)
Did any time these pains make you stop playing?	
Yes	63 (27.5)
No	34 (14.8)
Don't feel any pain while playing electronic games	132 (57.6)
While using smartphones, you feel pain in: ⁽¹⁾	
Neck	90 (39.3)
Shoulders and arms	37 (16.2)
Wrists and hands	114 (49.8)
Back	41 (17.9)
Hip, legs, and feet	6 (2.6)
Don't feel any pain while using a smartphone	65 (28.4)
Did any time this pain make you stop using a smartphone?	
Yes	113 (49.3)
No	51 (22.3)
Don't feel any pain while using a smartphone	65 (28.4)

⁽¹⁾Since respondents could select multiple options, the sum of frequencies may exceed the total number of respondents.

Table 4 examines the relationship between weekly screen time on electronic devices and pain in any part of the body over the past 7 days. The table shows that 61.5% of participants, the highest concordance rate, reported experiencing pain in some part of the body associated with daily screen time on their mobile phones. Additionally, TV screen time was the only variable significantly associated ($p < 0.05$) with pain in any body part, with a higher percentage of those reporting pain when watching up to 3 hours of TV.

Table 4. Assessment of pain in any part of the body over the past 7 days in relation to screen time on electronic devices.

Variables	Experienced Pain in any Part of the Body in the Last 7 Days		Total N (%)	p-value ⁽¹⁾
	Yes N (%)	No N (%)		
Total	128 (55.9)	101 (44.1)	229 (100.0)	
Screentime in computer/day				0.918
Up to 3 hours	87 (56.1)	68 (43.9)	155 (100.0)	
More than 3 hours	41 (55.4)	33 (44.6)	74 (100.0)	
Screen time in electronic games/day				0.543
Up to 3 hours	123 (56.4)	95 (43.6)	218 (100.0)	
More than 3 hours	5 (45.5)	6 (54.5)	11 (100.0)	
Screen time in smartphones/day				0.538

Up to 3 hours	16 (61.5)	10 (38.5)	26 (100.0)	
More than 3 hours	112 (55.2)	91 (44.8)	203 (100.0)	
Screen time television/day				0.040*
Up to 3 hours	111 (59.0)	77 (41.0)	188 (100.0)	
More than 3 hours	17 (41.5)	24 (58.5)	41 (100.0)	
Total screentime/day				0.751
Up to 6 hours	13 (59.1)	9 (40.9)	22 (100.0)	
More than 6 hours	115 (55.6)	92 (44.4)	207 (100.0)	

(¹)Pearson's chi-square test; *Significant association 5%.

■ Discussion

The findings of the present study demonstrated that almost all students, 95.6%, use smartphones as their primary digital media, corroborating the findings of other authors [12,13] who stated that this means of digital media is used by young people College students. In the current context, digital screens, previously restricted to television, have evolved into mobile, portable media devices, such as smartphones and tablets, present in the daily lives of people of different social levels and age groups [13-15].

The increasing and early use of smartphones impacts the individual in terms of biological, psychological, and behavioral aspects during growth and the risk of developing diseases during adulthood [16]. A study conducted with dentistry students at the Federal University of Ceará reported that 71.92% of university students depended on smartphones [17]. Meanwhile, Salam et al. [18] found that WhatsApp was the most used instant messaging application among healthcare students. These findings corroborate the data from this research, in which most interviewees highlighted the application.

Regarding the period of the day when digital media is most used, it was observed that the highest percentages of smartphone and computer use were found after 10 pm. These data are confirmed by the literature, highlighting the more significant predominance of these digital technologies at night, from 6 pm to 11:59 pm [18]. Regarding screen time on other devices, students reported using computers and television for around 3 to 4 hours and 1 to 2 hours daily, respectively.

It is essential to highlight that this study was carried out during the coronavirus pandemic (COVID-19), in which the routine of most people was modified, having mainly impacted the university environment, with classes taught virtually, which required time greater than usual, on the part of students, when using electronic devices such as computers and smartphones [17].

Social isolation has heightened the harmful effects of excessive use of social networks and other applications [19]. The restrictions imposed to contain the spread of the disease increased the time spent on sedentary behaviors, in addition to leading to an increase in some addictions, including those related to digital media and social networks [20,21].

Concerning musculoskeletal pain, the regions most cited for constant use of digital screens were the back and neck. These findings corroborate a study carried out with young populations in Turkey, which reported that smartphone addiction has a significant relationship with musculoskeletal pain in the neck, wrists, hands, upper back, and shoulders [22]. These pains occur because most people use their phones by lowering their heads while placing them close to their waist or lap, and this can strain the cervical spine as the craniovertebral angle (ACV) increases, causing pain in the upper back [23].

ACV leads to forward head posture and slouched posture, commonly seen in people who use computers or smartphones for an extended period [20]. Back and shoulder pain is likely caused by static load from prolonged smartphone use, which is often combined with awkward body postures and excessive tension in various body muscles [24].

Some parts of the body that, theoretically, are little required when using smartphones were also present in the current research, such as hips, legs, and feet (2.6%), as the student, when using digital media, can adopt wrong postures and thus also harm your lower limbs. All these results align with Legan and Zupan's study [7], which also identified that the most common posture adopted by smartphone users is sitting. This posture has been associated with complaints in other body parts, such as the lower extremities, with a range of (0.4%) to (9.6%). This highlights the importance of using these new technologies in moderation and maintaining proper posture to prevent physical health problems related to their use.

Considering the findings, it is vital to highlight the significance of the association between musculoskeletal pain and screen time. However, it is crucial to acknowledge the study's limitations. Firstly, the survey conducted during the COVID-19 pandemic may introduce a social-behavioral bias, as personal interactions were reduced due to students being confined to their homes and relying more heavily on electronic devices for communication and learning. Additionally, the study employs transient quantitative methods to measure pain, underscoring the need for further research to provide additional insights and validate the findings.

■ Conclusion

An association was observed between screen time (TV) and pain in some parts of the body in the last 7 days among students. The prevalence of musculoskeletal pain when using the computer, electronic games, and cell phones for more than 3 hours/day was higher in the neck and back, followed by the hands and wrist, and lastly, the back.

■ Authors' Contributions

MVTC		https://orcid.org/0000-0001-9688-1524	Formal Analysis, Investigation, Writing - Original Draft and Writing - Review and Editing.
MAAS		https://orcid.org/0009-0000-3845-8082	Formal Analysis, Investigation, Writing - Original Draft and Writing - Review and Editing.
GMRA		https://orcid.org/0000-0002-2172-5663	Formal Analysis, Writing - Original Draft and Writing - Review and Editing.
SSS		https://orcid.org/0000-0003-0303-6714	Writing - Original Draft and Writing - Review and Editing.
MACS		https://orcid.org/0000-0003-3365-5858	Writing - Original Draft and Writing - Review and Editing.
PRBA		https://orcid.org/0000-0002-1836-4510	Writing - Original Draft and Writing - Review and Editing.
MVH		https://orcid.org/0000-0003-3842-192X	Conceptualization, Methodology, Formal Analysis, Investigation, and Writing - Review and Editing.
All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.			

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None.

■ Conflict of Interest

The authors declare no conflicts of interest. This manuscript was reviewed and edited with the assistance of ChatGPT and Grammarly writing tools to improve the clarity and fluency of the text.

■ Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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