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Skeletal Muscle Symptoms in Students of Health Majors with Dependence on Mobile Devices: An Observational Descriptive Study

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Featured Application: Prevalence of skeletal muscle symptoms in students and their relations with dependence on mobile devices.

Abstract: In the world, there are more mobile phone lines than people. These numbers have been increasing, especially in university students, due to the academic and social demands of a globalized and interconnected world in social networks, raising concerns about the health effects of mobile device overuse. The goal of this study was to establish the relationship between musculoskeletal symptoms in students at the health department of an institution of higher education and their dependence on mobile devices. An observational, descriptive study in which 334 interviews were presented, of which 244 were selected, corresponding to students with dependence on mobile devices. We find most symptoms in the neck (56.3%), followed by the dorsal region with (49.4%), wrist (42.6%), shoulder (33.9%), and elbow (9.6%). Study correlations were low for the back (Rho: 0.274) and wrist (Rho: 0.200) and very low for the neck (Rho: 0.171) and shoulder (Rho: 0.142). The presence of musculoskeletal symptoms, mainly in the neck, back, and wrist in university students with dependence on mobile devices belonging to the health department associated with academic programs in phonoaudiology, physiotherapy, and medicine, is common; however, the correlation was found to be low between dependency level and pain in the back and wrist and very low between dependency level and pain in the neck. Our results suggest that university wellness programs should focus on the neck, dorsal region of the back, wrist, and shoulder and that contrary to what was previously thought, there is a low correlation between dependence on cell phone use and musculoskeletal symptoms.

Keywords: musculoskeletal symptoms; dependency; mobile device

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1. Introduction

Currently, mobile devices (MDs) are an integral part of normal activities owing to their great communication capacity. According to the quarterly bulletin of the Technology Information Communication System in Colombia, the number of mobile phone service users reached a total of 65 million [1] at the end of the first quarter of 2019, indicating that there are more mobile phone lines than inhabitants in the country. These numbers have been increasing, raising concerns about the health effects of MD overuse.

Griffiths [2] proposed the new concept of technological addictions to refer to a type of dependency that is not toxic but behavioral. Muñoz-Rivas and Agustín [3] referred to it as dependency and abuse processes involving not only toxic substances but also behavioral activities. One of the scenarios where dependence on MDs is most relevant is at university [4–6] because its use can increase as it is used not only as a form of communication,

access, and exchange of information, documents, and data but also as a form of interaction among peers and the maintenance of status, and fashion, among others. There is a growing concern given that adolescents and young people are still in the process of training and structuring their behavior and habits [2]. Although this phenomenon has been described with many names (dependence, excessive use, nomophobia etc.), it has not been officially recognized as a pathology. Nevertheless, MDs can generate true addictive processes and it can lead to serious social, personal, and health problems.

Virtuality in education increased due to the search for students with digital learning profiles, typical of a liquid spatial and temporal society, a globalized world, and highly interconnected social networks. Therefore, we think that university students are the ones who make greater use of cell phones, thus increasing the possible presence of musculoskeletal symptomatology in contrast to the non-schooled young population.

The use of electronic devices has been related to physical discomfort in 50% of primary education students [7]. A significant correlation has been also reported between exposure to mobile devices, mainly hand-held, and the incidence of corporal discomfort in 30% of schoolchildren [8]. Another study performed on 15–19-year-old students found that neck and shoulder pain are more likely to be related to the use of mobile phones, whereas lower back pain is more likely related to the use of tablets [9]. Furthermore, the results of a study conducted at the University of Nevada with 412 students [10] indicated sex differences in musculoskeletal symptoms (MSS) during the use of mobile devices, with women reporting significantly more symptoms in the upper back and shoulder regions than men.

To date, there are few publications performed on university students to determine the musculoskeletal effects associated with dependence on mobile devices. Here we show a cross-sectional and analytical study to determine the relationship between dependence on mobile devices and MSS in university students at a health faculty of an institution of higher education in Colombia.

2. Materials and Methods

2.1. Type of Study, Design, Population, and Sample

This is an observational, cross-sectional, analytical study conducted on university students from the Department of Health at Santiago de Cali University (Universidad de Santiago de Cali), in the city of Cali, Colombia, with a population (N) of 4194 students. The sample size calculation indicated a total of 352 students (95% CI, 5% error) to be included in the study, selected according to stratified random sampling, wherein the strata corresponded to each of the eight undergraduate programs in this Department. For the sampling, the distribution by semester and gender was considered to consider the proportionality for each of these variables. The hypothesis of the study is that musculoskeletal symptomatology correlates with mobile dependence. In this sense, Table 3 shows the correlation between students with some degree of dependence and the presence of musculoskeletal symptomatology in students of health programs. For that reason, we performed this study on a total of 248 students previously detected as with some level (high, medium, or low) of dependence on mobile devices (248/334; 74.2%) [11].

2.2. Inclusion and Exclusion Criteria

Only daytime programs were included in this study to control the selection biases. Evening programs have different sociodemographics toward nomophobia that could have affected the results of the study.

Participants who had some degree of dependence on the use of MDs, who were financially and academically enrolled, aged >18 years, and who voluntarily signed the informed consent were included. Exclusion criteria were incomplete forms fulfilling and performing sports or artistic activities in which the use of fingers or hands could significantly interfere with the results (selection bias), such as artists who play guitar or perform manual arts and athletes who compete in basketball and volleyball.

2.3. Enrollment of Participants

Members of the research team made periodic visits to classrooms with lists of preselected participants, as described previously [11]. In each case, a comprehensive explanation of the study goal was provided and interest in participation was confirmed. We proceeded to the informed consent signature by the participant and two witnesses, before the application of the instruments.

2.4. Pilot

A pilot test was conducted with 36 students to verify comprehension of the questions, adjust the wording, organize the order of the questions, and determine the real-time for completing the instruments. The rest of the sampling continued once the adjustments were made.

2.5. Test of Dependence on Mobile Devices and Sociodemographic Data

Previous to the application of the instruments, a pilot test was conducted with 36 students to verify comprehension of the questions, make adjustment to wording when necessary, organize the order of the questions, and determine the real-time for completing the instruments. The rest of the sampling continued once the adjustments were made. The Mobile Dependence Test (MDT) described by Mariano Chóliz Montañés [12] was used to determine the level of dependence on mobile devices, and its application lasted 10 min. This instrument comprises 22 items on a Likert-type scale subdivided into the following three factors, with scores ranging from 0 (zero) as the minimum value up to 88 as the maximum value:

(1) tolerance and abstinence, represented by items 11–22;
(2) abuse and difficulty in controlling the impulse, corresponding to items 2, 4, 5, 6, 8, 12, and 20;
(3) problems caused by excessive use, represented by items 1, 3, 7, 9, and 10.

This questionnaire was validated and linguistically adapted in 2016 for university students from public and private universities, with reliability for abstinence and tolerance ($\alpha = 0.901$), for abuse and difficulty controlling impulse ($\alpha = 0.8553$), and for problems caused by excessive use ($\alpha = 0.762$). The MDT detects low, medium, and high levels of dependency as well as its absence. This questionnaire was validated and linguistically adapted to Spanish in 2016 for university students from public and private universities [13]. Sociodemographic data such as sex, age, study program, and years completed were recorded in different forms.

2.6. Musculoskeletal Symptoms

MSS was characterized through the validated Spanish version of the Nordic Questionnaire [14], whose application lasted 7 min. The test consists of two levels: a general one that sought to determine the occurrence of musculoskeletal discomfort by anatomical region and a specific one that focuses on deepening the chronology, frequency, duration, intensity, and impact it has had on normal activities [15].

2.7. Data Analysis

Data were recorded by double-entry typing in Epi-Info (v 7.0) [16]. The information from the two databases was compared and mismatching data was removed after verification in the primary source. Descriptive and bivariate analyses were performed using Epi-Info. The only quantitative variable considered was age and it was analyzed by ranges defined using standard statistical tools. The qualitative variables were analyzed with frequencies and percentages. Subsequently, a bivariate analysis was performed between the sociodemographic variables and the prevalence of MSS in different parts of the body. Statistical significance analysis was performed with the Chi-square test (X^2), considering an alpha of 0.05. Multivariate analysis was performed using the Spearman correlation test, and its reference values were between 0 and 1.0.

2.8. Ethical Aspects

The protocol for this study was reviewed and endorsed by the Institutional Review Committee for Research Ethics with Humans (CIREH) of the Universidad del Valle (approval minutes #020-018 of 2018) and the Ethics and Bioethics Scientific Committee of the Universidad Santiago de Cali (minutes #03 of 2019). A letter of agreement of wills was also signed between the Center for Studies and Research of the Department of Health (CEIS) of the Universidad Santiago de Cali and the research project coordinator as authorization and support to conduct the study. The protocol was classified as having minimal risk and fulfilled all the requirements described in resolution 8430 of 1993 of the Ministry of National Health [17]. The study adhered to the principles of the Helsinki declaration [18] and confidentiality was guaranteed through coding and signing of an informed consent before participation.

3. Results

3.1. Pilot Test

During the pilot test, it was identified that the duration of the application of the instrument per student was 17 to 20 min. As previously described, in our original study we detected 248 participants who presented some level of dependency (low, medium, or high) [11]. Participants with dependence to mobile devices distributed across the educational programs as follows: Medicine (46/248; 18.5%), Physiotherapy (43/248; 17.3%), Dentistry (38/248; 15.3%), Nursing (34/248; 13.7%), Speech Therapy (28/248; 11.3%), Surgical Instrumentation (20/248; 8.1%), Respiratory Therapy (20/248; 8.1%), and Psychology (19/248; 7.7%) (Figure 1).

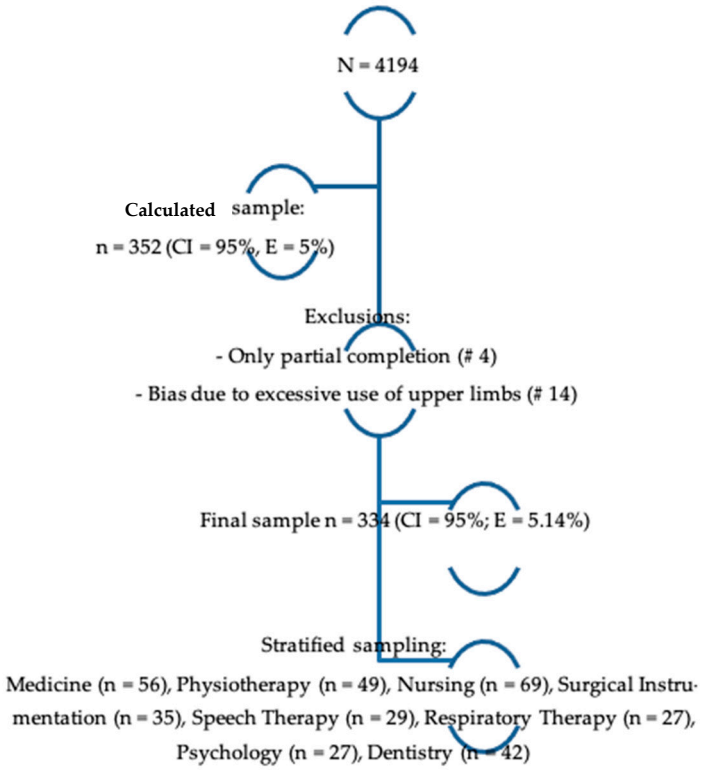

Figure 1. Flowchart of study participants.

3.2. Prevalence of MSS and Its Association with Sociodemographic and Academic Features

We detected discomfort in at least one body region in 76% (188/248) of the participants which were previously detected as with some level of dependence to mobile devices (Table 1). It is remarkable that a great majority of those who presented discomfort in any body region, particularly in the neck and back, were between 18 and 23 years of

age; However, we observed a significant association with age only for MSS in the neck. Although MSS were consistently more prevalent in women in all assessed body regions, no statistically significant differences were observed. Regarding the academic program, a significant association was found between MSS in neck, back, and wrist with Physiotherapy and medicine (Table 1). According to the year of study, MSS were more prevalent in the first two years of study and were significantly associated with MSS in the neck (Table 1). These latter data are consistent with those obtained for age.

Table 1. Sociodemographic characteristics, dependency and MSSs.

Variables		Neck n (%)	Back (n) n (%)	Shoulder (n) n (%)	Wrist (n) n (%)
Age	18–19	60 (31.9)	50 (30.3)	34 (29.6)	34 (24.3)
	20–21	54 (28.7)	46 (27.9)	32 (27.8)	39 (27.9)
	22–23	39 (20.7)	40 (24.2)	26 (22.6)	37 (26.4)
	24–25	15 (8.0)	13 (7.9)	12 (10.4)	14 (10.0)
	26–27	9 (4.8)	7 (4.2)	3 (2.6)	7 (5.0)
	28–29	7 (3.7)	6 (3.6)	6 (5.2)	7 (5.0)
	≥30	4 (2.1)	3 (1.8)	2 (1.7)	2 (1.4)
	Total	188 (100)	165 (100)	115 (100)	140 (100)
	CI95	19.8–20.7	19.9–2.4	19.3–20.1	19.0–19.9
	X^2	35.1986	23.8927	76.7155	71.6564
	P	0.0191	0.2471	0.5833	0.7359
Sex	Male	32 (22.2)	30 (23.4)	26 (30.2)	27 (23.9)
	Female	112 (77.8)	98 (76.6)	60 (69.8)	86 (76.1)
	Total	144 (100)	128 (100)	86 (100)	113 (100)
	X^2	1.0439	0.1917	2.9574	2.6688
	P	0.306	0.661	0.398	0.614
Program	Nursing	24 (12.8)	21 (12.7)	14 (12.4)	14 (9.9)
	Physiotherapy	37 (19.7)	36 (21.8)	17 (15.0)	32 (22.5)
	Phonoaudiology	21 (11.2)	21 (12.7)	12 (10.6)	17 (12.0)
	Instrumentation	20 (10.6)	17 (10.3)	12 (10.6)	17 (12.0)
	Medicine	31 (16.5)	27 (16.4)	23 (20.4)	22 (15.5)
	Dentistry	19 (10.1)	17 (10.3)	9 (8.0)	14 (9.9)
	Psychology	18 (9.6)	13 (7.9)	14 (12.4)	12 (8.5)
	Resp. Therapy	18 (9.6)	13 (7.9)	12 (10.6)	14 (9.9)
	Total	188 (100)	165 (100)	113 (100)	142 (100)
	X^2	27.871	28.843	22.079	49.629
	P	0.0002	0.0002	0.395	0.007
Year of study	1	41 (28.5)	29 (22.7)	21 (24.4)	29 (25.7)
	2	41 (28.5)	40 (31.3)	23 (26.7)	32 (28.3)
	3	21 (14.6)	24 (18.8)	15 (17.4)	17 (15.0)
	4	26 (18.1)	23 (18.0)	21 (24.4)	25 (22.1)
	5	15 (10.4)	12 (9.4)	6 (7.0)	10 (8.8)
	Total	144 (100)	128 (100)	86 (100)	113 (100)
	X^2	12.51	4.789	11.21	20.849
	P	0.013	0.309	0.511	0.184

Nordic Questionnaire Results

We found highly significant differences in all variables of the Nordic questionnaire (Table 2). In order to assess for some errors in the treatment of data we performed the same analysis including a group of non-dependent controls and the values of significance changed considerably; therefore, we assume that there is no error in the statistical treatment of the data.

Table 2. MSSs' Characteristics According to the Nordic Questionnaire.

Variable	Neck n (%)	Shoulder n (%)	Back n (%)	Elbow n (%)	Wrist n (%)
How long have you had the discomfort?					
No time recorded	1 (1)	0 (0)	2 (2)	0 (0)	2 (2)
<1 month	73 (51)	39 (45)	62 (48)	32 (47)	56 (50)
2–3 months	32 (22)	17 (20)	27 (21)	14 (21)	22 (19)
4–6 months	19 (13)	13 (15)	19 (15)	11 (16)	16 (14)
7–9 months	4 (3)	4 (5)	3 (2)	2 (3)	2 (2)
10–12 months	15 (10)	13 (15)	15 (12)	9 (13)	15 (13)
X^2	117.12	71.376	87.421	50.989	89.296
P	<0.001	<0.001	<0.001	<0.001	<0.001
Have you had to change places because of the inconvenience?					
Yes	107 *(74)*	46 (53)	94 *(73)*	36 (53)	76 (67)
No	37 (26)	40 (47)	34 (27)	32 (47)	37 (33)
X^2	132.14	115.191	141.916	126.353	131.844
P	<0.001	<0.001	<0.001	<0.001	<0.001
Has the discomfort prevented you from performing normal activities during the last 12 months?					
Yes	32 *(22)*	16 (19)	28 *(22)*	7 (10)	21 (19)
No	112 (78)	70 (81)	100 (78)	61 (90)	92 (81)
X^2	26.535	52.761	29.591	26.636	32.955
P	<0.001	<0.001	<0.001	<0.001	<0.001
Have you received treatment for the discomfort in the last 12 months?					
Yes	20 (14)	11 (13)	33 *(26)*	4 (6)	14 (12)
No	124 (86)	75 (87)	95 (74)	64 (94)	99 (88)
X^2	15.712	25.541	35.686	13.894	22.662
P	<0.001	<0.001	<0.001	<0.001	<0.001
Have you had discomfort in the last 7 days?					
Yes	85 (59)	42 (49)	62 (48)	16 (24)	46 (41)
No	59 (41)	44 (51)	66 (52)	52 (76)	67 (59)
X^2	93.40	95.539	74.066	53.225	74.566
P	<0.001	<0.001	<0.001	<0.001	<0.001
What is the intensity of the discomfort?					
No discomfort	2 (1)	2 (2)	4 (3)	1 (1)	4 (4)
Mild	76 *(53)*	51 *(59)*	54 *(42)*	55 *(81)*	66 *(58)*
Moderate	52 (36)	20 (23)	50 (39)	10 (15)	32 (28)
Strong	12 (8)	12 (14)	17 (13)	2 (3)	9 (8)
Very strong	2 (1)	1 (1)	3 (2)	0 (0)	2 (2)
X^2	228.093	248.520	228.573	256.817	248.821
P	<0.001	<0.001	<0.001	<0.001	<0.001
What do you attribute the discomfort to?					
Does not know/Did not answer	37 (26)	40 (47)	59 (46)	39 (57)	48 (42)
Pulled muscle	1 (1)	3 (3)	0 (0)	3 (4)	2 (2)
Poor posture	73 *(51)*	24 *(28)*	47 *(37)*	13 (19)	18 (16)
Stress	23 (16)	9 (10)	13 (10)	1 (1)	3 (3)
Repetitive movement	1 (1)	4 (5)	1 (1)	4 (4)	8 (7)
Cell phone	9 (6)	3 (3)	3 (2)	6 (9)	30 *(27)*
Illness/Injury	0 (0)	3 (3)	5 (4)	2 (3)	4 (4)
X^2	132.27	145.622	86.140	142.428	127.413
P	<0.001	<0.001	<0.001	<0.001	<0.001
Total	144 (100)	86 (100)	128 (100)	68 (100)	113 (100)

Prevalence of MSS weas higher as the time of discomfort was shorter with values close to 50% for manifestations of ≤1 month, i.e., of an acute nature. Although MSS in the neck and back cause significant changes of the place for work, they did not prevent normal activities in the last 12 months and have not required significant treatment during the same

period. The MSS with highest prevalence in the last 7 days was in neck and the lowest prevalence was in elbow (Table 1). The highest proportion of MSS intensity was mild for all body regions, with the elbow having the lowest prevalence. As the intensity increased, more significant levels of prevalence were observed for the back and neck regions (Table 2). Regarding the attribution of the discomfort, participants refer to poor body posture and stress as the main causes of MSS, especially for the neck, back, and shoulder. However, MSS in the wrist is mainly attributed to the use of MD, specifically cellphones. A concerning observation is that approximately 10% or more of participants report MSS during the last 10–12 months in most body regions.

3.3. Correlations between Musculoskeletal Symptoms, Nordic Questionnaire and Dependence on Mobile Divices

Finally, according to Spearman's correlation coefficient, the relationships between MSS in each of the regions considered in the Nordic questionnaire and dependence on MD were low for the back and wrist and very low for the neck and shoulder (Table 3).

Table 3. Correlation between Mobile Device Dependency and MSSs.

Region	Spearman's Rho	
Neck	Correlation coefficient	0.171
	Sig. (bilateral)	0.007
	n	248
Shoulder	Correlation coefficient	0.142
	Sig. (bilateral)	0.025
	n	248
Back	Correlation coefficient	0.274
	Sig. (bilateral)	0.000
	n	248
Elbow	Correlation coefficient	0.072
	Sig. (bilateral)	0.259
	n	248
Wrist	Correlation coefficient	0.200
	Sig. (bilateral)	0.002
	n	248

4. Discussion

We found MSS mainly in neck, back, and wrist in university students form a Health Faculty, previously detected as with dependence to MD. The MSS in neck was significantly associated to age, academic programs, and year of study. Additionally, the academic program was also significantly associated to MSS in back and wrist but not shoulder. Highest MSS prevalence were found in Speech Therapy, Physiotherapy, and Medicine. The MSS detected in our study are more of an acute nature than chronic; however, an important proportion indicated MSS of a chronic nature. Despite all the previous results, the correlation between dependency to MD and MSS in back and wrist was low; and very low between dependency to MD and MSS in neck.

While the curriculum correlated with musculoskeletal symptoms, we expected the content of the curriculum to modulate the effects of mobile device overuse. However, physiotherapy, medicine, and phonoaudiology, programs related to body care, were found to have greater musculoskeletal symptomatology, which suggests that there is little use of the knowledge learned in each of the programs for the prevention or control of the symptomatology found, especially in the first years of training.

In turn, the university wellness programs can focus actions on the musculoskeletal system, especially in the neck, back, shoulder, and wrist focused in the first years of training in the academic program.

With regards MSS in university students as dependent to MD and its association to sociodemographic features, some studies have shown similar results to ours while others differ considerably. A study conducted at the UNLV (University of Nevada-Las Vegas) detected that most of the MSS were in neck, back, and shoulder [10]. Another study from the University of Canada found that most participants reported pain of some severity in at least one region including neck, upper back, and shoulder [19]. The study by Kalirathinam D. et al. found lower percentages of prevalence but still predominantly in neck and shoulder [20]. Additionally, we found a significant association of MSS in the neck with age, showing that younger students are more prone to develop MSS in neck; however, this result is hardly observed in other studies. In fact, our findings differ from the results by Barrantes and López, which state that regardless of age, students are likely to develop some sort of MSS [21]. Regard sex, we observed a higher prevalence of MSS in women for each of the body regions assessed, but not statistical significance was found. Other studies like the one by Blair B et al., have been able to show significant statistical differences in higher frequencies of MSS in women, specifically in the upper back and shoulder regions [10]. Another study by Lee SP, et al. found that sex was a significant predictor of symptoms while using MD and women have twice higher the probability of experiencing MSS while using the devices than men [22]

Our study shows other relevant results when comparing academic variables with MSS. However, it is not possible to contrast them due to the lack of similar published studies. This fact is a strong argument to support further research on this topic to make a better characterization and to establish effective control and/or mitigation strategies in university students. MSS in neck, back, and wrist were significantly associated to the academic program, especially those in Physiotherapy and Medicine; however, the previous anatomical knowledge in these two programs might be causing some bias regard MSS as it would be easier to recognize by them. Similarly, we detected a significant association between MSS and year of study in which symptoms are more frequent during the first years of studies. This finding is very interesting topic for future research in order to determine use of ICTs in those face-to-face vs. virtual academic courses of the first semesters of each academic program.

Very few studies have characterized the MSS in terms of its length. While we detected that most of the MSS were of an acute nature, a study by Almhdawia et al. [23] performed in 838 health sciences university students showed that MSS were either of an acute or chronic nature. However, these results were on general population while ours are focused on users previously classified as dependent to MDs. The study by Regiani et al. [24] reports similar results from general university students. The correlation between dependency to MD and MSS were very low in the neck and shoulder, and low in the back and wrist. However, the available evidence on this regard is limited because the application of a plethora of available tests which do not allow for the comparison of results. However, a few case-control studies have shown that MMS related to compression of the median nerve can be associated with addiction to mobile devices [25–28]. It is extremely important to highlight that the correlations were not strong, but it is striking that the levels of exposure are being exponentially presented and that it is necessary to analyze this problem in the future and standardize its recreational use in the classroom.

The strengths of this study included that this is one of the few, if any, studies on prevalence of MSS in university students of a Faculty of Health, already identified as dependent to MD and the instruments use, the TDM test and the Nordic questionnaire, are highly adapted and accepted for the specific circumstances of our study. Nevertheless, it is noteworthy that there are many potential biases which might influence the findings of our study. Within those is the fact that undergraduate health sciences students, when investigated in the academic environment, remain in the classrooms for long periods, using furniture that does not have ergonomic adaptations for extended periods of time. One important factor to be considered in future research is the length of the MD use. Guterres et al. showed that the prevalence of MSS is higher in students using MD for $\geq$6 h [29].

Other features like weight, BMI, postural alterations, as well as psychological aspects that might affect the body position are just other examples of other variables that might result in inappropriate ergonomic positions, triggering musculoskeletal changes and MSS [30]. The adoption of inappropriate postures and muscle overload and its association with MSS in neck and back has been studied by Guterres et al. [29]. Students also perform activities of their future profession in health services where they sometimes manipulate weights, often move in search of supplies, and adopt static postures and repetitive movements that can favor the onset of MSS [31]. Despite all the discussed facts, this study brings to our attention many concerns that should be addressed in future research, such as mental and behavioral disorders, especially prolonged stress, which may be associated with the appearance of painful conditions, because they can suppress the immune system and cause tissue damage [32,33].

Another effect of the results of the study is the prevention of deformities, such as text neck syndrome, which causes lordosis or a backward curvature, which generates a change in the position each time the head will be more forward, which increases the pressure at the intervertebral level and generates degenerative problems, chronic pain, and musculoskeletal symptomatology. This happens because dependence on mobile devices produces long-term musculoskeletal consequences, due to the repetitive and continuous movement and inappropriate postures that produce a muscular compromise.

For example, we thought that the use of devices through the hands would focus all the symptomatology on the wrists and thumb, but it was low. We found more symptomatology in the back and head. So, the study helped to make visible musculoskeletal symptomatology in regions distant from the hand, which may go unnoticed by other researchers and physiotherapists.

On the other hand, we found zero articles in PubMed that in their title or abstract address the relationship between cell phone dependence and musculoskeletal symptoms, which we think is a strength of our study, because we present this relationship for the first time. Other studies have shown a relationship between changes in behavior, academic performance and cell phone dependence [34]; most studies report this behavioral change as a public health problem [35] that involves mental health aspects, linked to the increased use of mobile devices due to the Covid-19 pandemic in the development of academic and work activities [36].

Finally, our study results highlight the importance of MSS related to dependence on MDs in University students, especially those from health sciences. We found very interesting relationships with academic features like program and year of study which should be further analyzed. The nature of MSS, more acute than chronic, provides hopes of successful early intervention strategies. This study is of great importance since MDs have gained hierarchy and interest in the daily work of humankind and, therefore, have a greater impact on the health of those exposed. The recent COVID-19 pandemic has just exacerbated the exposition to MDs and urgent actions are needed to mitigate the impact of its excessive use.

5. Conclusions

Our results suggest that there is not a high correlation between musculoskeletal symptoms and levels of mobile device dependence among students in health programs. Our team hopes to test whether the academic program is a modulating factor regarding the presence of musculoskeletal symptoms in students with mobile device dependence.

The presence of musculoskeletal symptoms, mainly in the neck, back, and wrist in university students with dependence on mobile devices belonging to the health department associated with academic programs in phonoaudiology, physiotherapy, and medicine, is common. A correlation was found to be low between dependency level and pain in the back and wrist and very low between dependency level and pain in the neck.

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