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Review Article

Investigation of the relationship of the use of the cellular and/or smartphone appliance with osteomioarticular lesions of the cervical spine and hand

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Abstract

Introduction: Considering that the cell phone and/or smartphones had become part of the human being and thus brought problems to people's health.

Objective: To investigate the existing relationship between the use of mobile telephone devices and the health problems of the user, focusing on musculoskeletal injuries of the cervical spine and hand and as hypotheses had the existence or not of this relationship.

Methodology: A field study, cross-sectional, with a quantitative approach, of the descriptive type, was carried out in March and April 2019 with academics from the Physiotherapy course at Centro Universitário de João Pessoa- Unipê. Data collection was carried out through a questionnaire that explored questions related to socio-demographic data, the reasons why the devices are used, the quantification of hours of use per day and the postures adopted, among others.

Discussions: The data were analyzed and described through tabulation in Microsoft Excel version 2016 through simple descriptive statistics and in that same program, graphs and tables were constructed for a better display of the results that were confronted with the scientific literature. The sample was mostly female, single, brown, with income between one and five minimum wages and right-handed.

Conclusion: There are reasons for this relationship to exist and that the problems arising from this interaction continue to grow since users, despite feeling pain, heaviness, numbness and tingling, among others, do not abandon their devices and because it is a theme that involves the world, it needs to be special attention from the scientific community.

Introduction

In the mid-1990s, the first "smartphone" arrived in Brazil, starting a significant advance for mobile telephony and thus being a novelty for most of the population, but it was quite limited in relation to the functions of current devices, without talk about purchasing power that most people did not have [1]. Nowadays, this situation has reversed and cell phones and/or smartphones have developed, offering access to the internet and various other functions, not to mention the ease of purchase that has grown, becoming more accessible and necessary, being seen as an extension of the individual [1].

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The cell phone and/or smartphone is seen today as the "world in your hands", as that is how it is designated by a large part of the world's population and through it, people seek to solve many of their problems, such as bank transactions, purchases, registration of colleges and universities, even the regulation of the menstrual cycle is controlled by the device, these same problems are solved in the palm of the hand wherever the person is, whether in the bathroom, on the street, in traffic, in the club, that is, she is always available, next to its owner to be handled [2].

Along with this development that offers numerous functions such as the internet, social networks and games, among others, comes the exaggerated and abusive use of the cell phone and/or smartphone, causing people to spend an average of 12 hours a day handling the device, which can result in well-known injuries such as Repetitive Strain Injuries - RSI and Work-Related Osteomyoarticular Disorders - DORT, problems resulting from repetitive activities [3].

It is also worth mentioning the question regarding nomophobia, which is the anguish and concern of disconnecting from the virtual world, where the cell phone and/or smartphone is a means of always staying connected, bringing a feeling of pleasure, being thus one more reason to be near the device for longer periods of time [1].

According to King [4] nomophobia is a compulsion characterized by the irrational fear of remaining isolated and disconnected from the virtual world. These same authors refer that in abstinence from the cell phone or tablet (internet), the symptoms are similar to those of the abstinence syndrome from the use of drugs such as alcohol and cigarettes.

Another reason that makes the topic relevant and more in need of discussion is the introduction of ICT (Information and Communication Technologies) in schools where electronic devices are introduced, including cell phones and/or smartphones, to assist in the teaching-learning process, being thus one more reason for children and young people to always have the devices in their hands [5].

For handling cell phones and/or smartphones, the musculoskeletal system is widely used, thus being the biggest concern, since most of those who handle these devices are young adults who are in bone, joint and muscle development that is associated with wrong or vicious postures when handling these devices, they can cause certain complications in these structures, requiring early treatment [5].

The cervical spine and the hand are segments that are directly impacted by cell phone use and/or smartphone because they perform many repetitive movements for a long time and in inappropriate postures, making the biomechanics of these structures subject to ergonomic risks and, consequently, the appearance of physiological changes, more precisely, injuries [2].

The effectiveness of this research is justified by the increase in the occurrence of musculoskeletal disorders, especially in the young adult public, due to the excessive use of these devices, which in turn cannot let go of them even with the presence of an already predisposed pain condition [3].

In view of the above, this research sought to answer the question: What is the relationship between the use of the cell phone and/or smartphone with the appearance of musculoskeletal injuries of the cervical spine and hand?

The primary objective of this study was to investigate the relationship between the use of cell phones and/or smartphones and musculoskeletal injuries of the cervical spine and hand. As secondary objectives, it presented: knowing the socio-demographic profile of the sample; evaluating/quantifying the hours of use of the cell phone and/or smartphone; evaluating the posture practiced in the use of these devices; measuring pain before and after handling the devices and to analyze the relationship between the use of the devices and the resulting injuries.

Methodology

This is a cross-sectional field study with a quantitative approach of the descriptive type. Data collection was carried out at the Centro Universitário de João Pessoa - Unipê located at Br 230, Km 22, Água Fria, João Pessoa, PB, during the months of March and April 2019 on weekdays in the morning.

The research was carried out with undergraduate students in Physiotherapy (Bachelor's Degree) with all classes and periods of the morning shift, which totaled a universe of 324 students, which was chosen because it is composed mostly of young adults, where a large part has the tool in the question of the study – the cell phone and/or smartphone and also because it is an easily accessible population because it belongs to the same environment as the researcher.

Participants should be aged between 18 and 29 years old, bearing in mind that at this age bones, joints and muscles have already developed, which in a younger or older person could interfere with the research, since younger people are in bone development and there may be confusion of pain or symptoms and those older than the age range could confuse the symptoms of stress injuries, considering the possibility of not existing, with an already predisposed pathological condition such as arthritis, for example. These people had to own a cell phone and/or smartphone and had owned or used a device for at least one year. Regarding gender, both could participate without restriction, as long as they met the study criteria.

As the present study followed all the requirements in accordance with the resolution of the National Health Council (CNS/MS) 466/12, all participants needed to sign the Free and Informed Consent Term - TCLE, to be able to participate in the research, due to requirements of the ethics committee to prove that the person participated in the research of their own free will.

Academics who performed or performed some professional activity six months before the time of data collection that involved repetitive activities such as a telemarketing operator, for example, were not part of the sample, as there was a

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probability that they already had injuries or showed signs and symptoms, but due to to the work he or she does or has done and not for the real reason for the research, which is also likely not to exist [3].

And also, those who at some point withdrew from the research for any reason, be it personal, professional, or emotional, in short, of nature, the individual would be excluded from the research without any prejudice, but this did not happen.

The data collection instrument was a questionnaire prepared by the author of the research, based on the authors Pereira [2], Oliveira [3] and Trazzi [1]. This instrument sought to explore data on the socio-demographic profile of the sample, the reason why the devices are used, the postures used in this use, the number of hours of handling these devices per day, the measurement of pain during and after use, and the presence/quantification of symptoms indicative of RSI and WMSD.

Before applying the questionnaire, the academics were informed about the objectives of the study and its importance, highlighting that they were contributing to a current social problem which is the musculoskeletal consequences due to the use of the cell phone and/or smartphones. The instrument was explained to the academics, how to answer and careful reading was also suggested so that the answers were provided with information that was consistent with reality.

The socio-demographic profile was collected through closed questions, such as age, gender, marital status, race, and income, where the participant marked the option that fit or identified.

A question referring to nomophobia, which is a very significant reason for having the device for a longer time, was also present in the instrument, where it showed signs and symptoms and the participant could select up to five options if any.

The time interval of use of the devices per day was explored by a question mark X, and in the options, there were time intervals such as, for example, 5 to 8 hours a day, where the participant could only mark one option.

With regard to postures, they were discovered through multiple-choice questioning, in which more than one option was allowed. Several numbered and described postures were presented, such as, for example, sitting with the neck flexed with both forearms resting on the legs, so the candidate could mark the four most used positions in handling and then could write the number of the most used posture among them. the options already marked by him on the blank board, which was next to this question.

The participant was asked whether or not there was pain during and after using the device and this measurement was analyzed and accounted for using the VAS (visual analog pain scale), which was numbered from 1 to 10, where 1 represented the absence of pain. and 10, maximum pain. Thus, two separate scales, one to quantify pain during use and another for post-use, were designed in a square format numbered from 1 to 10 and only one box corresponding to your pain could be marked on each scale [3].

The questionnaire ended with another multiple-choice question related to the symptoms, which were followed by numerical scales to quantify the degree of that particular symptom. These scales were numbered from 1 to 4, where each number has a name: 1 – mild; 2 – moderate; 3 - strong; and 4 – unbearable. So, if the participant presented, for example, localized pain, he would mark this option and highlight the degree of this pain on the scale. Data analysis was carried out in three stages: Data Tabulation, Simple Descriptive Statistics, and Analysis of the relationship between Osteomyoarticular Injury and x Use of cell phone and/or smartphone, which was done through contrast with the scientific literature on the subject involved [3].

Data tabulation was performed in Microsoft Excel version 2016, where they were transcribed into the program in different tables. The socio-demographic data were analyzed using simple descriptive statistics in the Microsoft Excel program, and from there, graphs were constructed that characterized the sample.

The analysis, in the light of the scientific literature, was carried out with several articles published in magazines and conference proceedings, monographs and academic dissertations, and also some websites with themes related to the present study, where all these sources are between the years 2008 to 2018.

Discussion

In total, 199 academics answered the data collection instrument, however, only 99 of them became part of the sample, as the rest did not meet the study criteria.

The sample had an average age of 21.15 years with a standard deviation of 2.46, which coincides precisely with the period when most young people are at university, studying for their first degree, whether in public or private universities. Of the 99 participants in the sample, 78% are female and 22% male. It was already expected that in terms of sex, females would be dominant due to the fact that the study population is part of a health course that is not usually desired by men and more precisely in the Physiotherapy course, which is a graduation that attracts more the women [5-7].

In the study by Negri [6], it is mentioned that women are more likely to acquire RSI or WMSDs precisely because of their body composition, because they have less muscle mass, hormones, and estrogens, which retain fluid in tissues and contribute to the inflammatory process and they generally tend to handle devices more than men who are at lower risk. This result regarding gender was very close to that of the study by Castellanos [7], where the socio-demographic profile and motivations of undergraduate students in public health were surveyed, where 78.6% were female and 21.4% for men, and in relation to age, 50.4% of the sample was in the age group of

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20 to 29 years old and 27.6% in the age group of fewer than 20 years old, data that are close to those found here.

Also corroborating with the research by Alves [8], where the perception of Physiotherapy students regarding their performance in the SUS was researched, gender also behaved in the same proximity of this study, 79.7% were female and 20, 3% were male and the age group from 19 to 29 years old represented 92.2%. male and in relation to age, 50.4% of the sample was aged between 20 and 29 years old and 27.6% in the age range of fewer than 20 years old, data that are close to those found here [8].

Also corroborating with the research by Alves [8], where the perception of Physiotherapy students regarding their performance in the SUS was researched, gender also behaved in the same proximity of this study, 79.7% were female and 20, 3% were male and the age group from 19 to 29 years old represented 92.2%. In view of these comparisons, the constant that has been maintained in relation to these data is clear, that is, even over time, the female gender is predominant in courses in the health area, with this age group of 18 and 29 years.

Regarding marital status, the sample was mostly composed of single individuals with 93%, followed by only 5% of married individuals. It is common for university students to have a single marital status at this stage of life and with the age group found since they are starting to program financial stability through the conclusion of the university. Another fact would also be that today's young people, especially college students, are giving less preference to relationships and marriages and focusing more on professional achievement, and financial independence and only after that do they seek some loving relationship [7,8].

In the study by Coelho [9], their sample consisted of university students in the last semesters of health courses and, among the demographic characteristics, marital status behaved as follows: 77.6% of the sample was single and 20.4% married, that is, the present study presents itself in this same dynamic, with the single marital status dominating a large part of the sample, however, the married rate is 15% higher than that found here.

Corroborating the study by Santos [10], which was also carried out with Physiotherapy students, the marital status was quite similar, 86.2% of the sample was single and only 12.1% belonged to the married marital status. With regard to race, the sample was mostly brown and white. It is important to highlight the behavior, as it can be seen that 54% of the sample is made up of pardos and 38% of whites, but the rate of black people adds up to only 6%, even today there are quota systems for this portion of the population [10].

Santos [11], in their study, analyzed the lifestyle of university students at a private institution of higher education in Brazil, and also the differences between freshman and graduating students, also collected the demographic characteristics of these students, and among them, the white race dominated both freshmen and seniors [11]. The black race once again with a very low percentage, with 1.81% of freshmen and 1.67% of graduates. Regarding the participants' income, family income was taken into account, where most of the sample had an income in the range of one to five minimum wages.

Referring to the study by Nardelli [12], which sought to describe the profile of students entering health courses at a federal higher education institution, the income percentages were as follows: 8.1%, with income of up to two minimum wages; 12.1%, up to three salaries; 19.4%, up to four salaries; 8.1%, up to five salaries, percentages that, together, approach or are within the same range of most of the sample, that is, 65%, of the present study [12].

Of the 99 sample components, 90 are right-handed, left-handers were in second place with only eight participants and ambidextrous were represented by only one participant, with their respective percentages. Left-handers generally suffer from having this laterality, because most of the time they need to adapt to a situation that their physiology does not have the ability to perform, be it objects, school desks, the work environment, in short, conditions that force a segment that is not prepared for certain demands. At times, they are victims of prejudice, as they are seen as incapable of not being able to perform certain activities [12].

In the table below named Table 1, the percentages of each sign or symptom indicated by the participants that are directly related to the possibility of the person having a certain degree of nomophobia and consequently constantly handling mobile devices will be presented (Table 1).

In the study by Bragazzi [13], the DSM-V (Diagnostic and Statistical Manual of Mental Treatments) is cited, which states that, for a person to be a victim of a phobia, some event must result in significant interference in at least one of the areas of the individual's life, whether professional, family, leisure, among others.

For this reason, it is important to highlight that all participants in the sample claimed to have at least one of

Table 1: Distribution of signs and symptoms.

Signals and symptoms	N°	%
blurred view	36	36%
Panic if you run out of your cell phone/smartphone	21	21%
Searing pains in the head and eyes	38	38%
Desperate if you run out of GPS	3	3%
impaired sleep	45	45%
phantom vibes	18	18%
Talk to people who are close to you on the device	31	31%
Take the equipment to the bathroom	78	79%
Don't feel the need to talk eye to eye	3	3%
Feel limited to 140 characters	1	1%
No longer memorize phone numbers	37	37%
I want to take pictures of everything and everyone.	13	13%
Sleep with the device on the pillow side	67	68%

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these signs or symptoms, which makes it a worrying result considering that, if they happen frequently, they can be strong factors that can interfere in the lives of women. people, making them more susceptible to being carriers of the nomophobia syndrome, but to different degrees [13].

In front of Table 1, large percentages can be observed in different signs or symptoms, starting with the sign of taking the device to the bathroom, where 79% of the sample said they practice it, that is, even the person busy with physiological or personal hygiene needs, he cannot distance himself from the device [13,14].

Next, 68% claimed to sleep with the device next to the pillow, an attitude that makes it clear that the user handles the device before going to sleep and will probably use it when waking up. According to the findings of Oliveira [14], who sought to identify the level of nomophobia in university students, 59% of the participants always use the device before going to sleep and 45% stated that they use it when they wake up.

Headaches, inability to memorize more numbers and blurred vision were stated to exist at an average of 37% each, which increases the possibility of the presence of nomophobia among these users. Of course, these phenomena can be due to other causes, but cell phones and smartphones certainly have their faults included in this environment. The other manifestations were more distributed, but also significant, such as, for example, communication through the device with a person who is on the user's side, where 31% claimed to have this practice [14].

The next reasons, by the way, contribute to nomophobia, such as social networks, which are exactly where users with this syndrome do not want to be disconnected (Table 2).

In the study by Picon [15], it is pointed out that there are no diagnostic requirements to consider a person dependent on this subtype of technology that is social networks, but health professionals who work mainly with children and adolescents need to pay attention since at these ages the use of these technologies is very frequent and continuous. Furthermore, all communications made by this audience are made via social networks, according to Picon [15], which in turn are present on smartphones, thus being another great reason to always be handling these devices.

According to Cronemberger [16] and Picon [15], the big problem with social networks is that they have mechanisms that always encourage people to return to them, such as, for example, the likes of a photo in the Instagram application, the Whatsapp conversation notifications among others and all of this is included in the devices, which significantly contributes to continuous and abusive use.

Regarding academic research, which was an activity affirmed by 76%, the user will prefer to do it on their device since it is in their hands ready for this purpose, discarding the practice of turning on a computer or notebook. This has its disadvantages, that is, the individual can handle it anywhere, like the bed, for example, leading him to adopt incorrect postures [15,16].

Next came calls with 73%, which tend to decline as people are preferring to send messages through chat apps than actually make calls. The other activities presented were not very confirmed as can be seen in Table 2.

It is notable that more than half of the participants, that is, 58%, handle their devices for more than eight hours a day. Considering that users sleep eight hours a day, it can be concluded that they spend 35% of the day using their devices, a situation that causes many repetitive movements and wrong postures resulting in alterations and/or wears and possibly injuries [16].

The results found corroborate the study by Silva [17], which aimed to correlate the time of daily use of electronic devices with vision and thus 52% of their sample claimed to use the devices for more than eight hours daily another important fact was that 87% of its participants claimed to handle the devices in dark environments where they confirmed they had visual problems such as myopia, astigmatism, myopia + astigmatism, blurred vision, among others.

In his study on the excessive use of smartphones, the contents that smartphones offer to provide pleasure and reward and thus, logically, these feelings are caused, by the user will continue to handle his device, losing track of time [17].

The devices, because they are very compact, allow them to be handled in different ways and thus contribute a lot to the practice of bad ergonomic behavior [1,18]. The way in which the hands of the participants behave when handling the device is shown in Table 3.

The table shows that the majority of the participants, 59%, stated that they handle their device using both hands with the help of the thumbs, which makes it possible for the two limbs to be symmetrically affected by injuries, resulting in occupational diseases. Then 37% said they use only one hand to interact with the screen, where the tendency is to be a faster injury process due to using only one limb in greater quantity [17].

Such results corroborate the study by Oliveira [3], which aimed to evaluate a possible development or emergence of compressive neuropathies, more precisely Carpal Tunnel Syndrome (CTS) related to the continuous use of smartphones,

Table 2: Distribution of the activities carried out on the devices.

Performed activities	N°	%
Connections	72	73%
Social networks	96	97%
Games	26	26%
Torpedoes	2	2%
GPS	9	9%
academic research	75	76%
Others	18	18%

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Table 3: Distribution regarding the behavior of the hands in handling the devices.

Hand behavior	N°	%
With just one hand with the help of the thumb to	37	37%
interact with the screen.	58	59%
With both hands, with the help of both thumbs to	4	4%

in their results, 68% of its participants also use both hands, aided by the thumbs to interact with the screen and they also reported that the ramifications and sensory distribution of the median nerve are located in the thumbs, the nerve affected by CTS [3].

In order to know the postures that users adopt when handling their devices, several postures were described where the participant should mark the four most used during this act. After the selected options, the individual highlighted the one he uses the most among the four chosen [17]. Knowledge of these postures is extremely important because if they are ergonomically wrong, it is precise because of this poor postural behavior that people acquire physical alterations in certain body segments and may become victims of possible injuries and continue with a compromised prognosis [17].

After carrying out statistics, still in the Microsoft Excel program, the postures most used by users were discovered and, therefore, Table 4 shows how they were marked by the participants, indicating their respective percentages (Table 4).

The results are worrying given that the postures considered the most incorrect were the most marked and the least exhausting SBOT [18], were the least marked by the sample. It is important to highlight that a significant portion of the sample confirmed using postures that involve continuous flexion of the cervical spine. As shown in Table 4, 93% reported using the sitting posture with flexed neck and elbows, 70% use the standing posture with flexed neck and elbows, and 28% reported using the seated posture with flexed neck and forearms resting on the legs, these postures that propel the head forward and downward [18].

In this way, it is possible to detect the change in the center of gravity of the cervical spine, thus causing an imbalance of forces that will be imposed mainly on the intervertebral discs, which may cause disc protrusion, for example, and as individuals do not leave the apparatus, can progress to disc hernias [18]. The musculature is also subject to continuous tension, which can cause pain in the back of the neck, overloading the shoulder complex and thus radiating pain or other occupational symptoms to the upper limbs. Another result worth mentioning is that the postures in which the individual lies down to handle the devices were significantly marked. One more fact confirms the use of devices at rest time [18].

The lying posture in dorsal decubitus with flexed elbows was pointed out by 82% of the participants, 41% indicated adopting the lying posture in a prone position with flexed elbows and 62% affirmed using the lying posture in profile with flexed elbows. These positions in decubitus can even improve the ergonomic conditions of the cervical spine, but the elbows are flexed for a long time and often compete with gravity, that is, continuously exerting a force which can generate weakness, loss of flexibility or even inflammation and this everything can be irradiated to the forearms and hands and also to the shoulders [16].

Unfortunately, the postures considered more ergonomic, that is, those that cause less physiological impact were the least marked by the participants. The sitting posture with the neck straight with the device in front of the eyes was affirmed to be practiced by only 13% of the sample and the standing posture with the device in front of the eyes, that is, with the cervical spine straight, only 5% affirmed to adopt -there. Consequently, if users adopt postures that alter their body mechanics by promoting tension, static muscle work, and repetitive movements, at some point discomfort and pain will arise, indicating that there is an overloaded segment [16,17].

Therefore, the participants were asked if there was a pain in any part of the body during and after using their cell phone and/or smartphone. Two visual analog scales were included in the data collection instrument, numbered from 1 to 10, considering 1 for absence and 10 for maximum pain, which behaved as shown in Table 5.

Table 5 indicates that 70% of the sample claimed to feel some degree of pain in somebody's segment while handling their devices, of course, one must consider the possibility that there are other reasons for this pain to occur, but the devices are certainly included in this fault [18].

Table 4: Distribution regarding postures adopted in handling the device.

Posture	N°	%
Lying supine with elbows	81	82%
inflected.	41	41%
Lying in a prone position with	61	62%
flexed elbows.	4	4%
Lying in profile with elbows	92	93%
inflected.	28	28%
Lying in profile with arms outstretched.	13	13%
Sitting with flexed neck and	69	70%
elbows also flexed.	5	5%

Table 5: Degree of pain on the VAS during use.

rate	N°	%
1	30	30%
2	16	16%
3	15	15%
4	9	9%
5	10	10%
6	9	9%
7	6	6%
8	3	3%
9	0	0%
10	1	1%

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According to Silva [18], pain is the first indicator of any tissue injury and is a subjective and personal sensation, that is, two people can have the same injury, and even so one feels more pain than the other. It also points out the importance of pain measurement, which, as it is subjective, there is no single standard and thus it becomes very difficult to treat since it does not have a measure for the correct basis of treatment [18].

In the study by Bottega [19], it is stated that pain, whether acute or chronic, results in symptoms such as changes in sleep patterns, appetite, and libido, irritability, and decreased ability to concentrate, in addition to difficulties in family activities, professional and social, events that devices cause in users [19].

In order to discover the existence of other symptoms that the user presents besides pain in general, he was asked if he presents other manifestations that are related to the act of handling the devices. As well as pain, these different symptoms also signal that some segment or structure of the body is being overloaded, an event that constantly occurs when handling devices, especially the cervical spine and hands that are constantly being used either in any position [19].

It is also important to remember that these symptoms present in device users are mostly related to RSI and WMSDs, which is the combination of overload on body structures and lack of time to recover from them, since these users do not drop their smartphones for long intervals, and this combination is most responsible for the appearance of occupational diseases. Table 6 shows the behavior of these symptoms within the sample [19].

As can be seen in Table 6, almost all symptoms had a very significant percentage, and what is worrying is that many participants claimed to have more than one of these manifestations. As previously mentioned, many times these symptoms do not appear independently and thus happen in tandem, generating greater and longer discomfort to the user [19].

Localized pain was the most reported symptom by the participants, and there could be no other result, since, when asked about the degree of pain in any part of the body resulting from the use of the devices, the majority of the sample confirmed having some degree, even if they are small [20]. And also because it is an almost inevitable manifestation of existence when it comes to overloads of certain body segments such as the cervical spine and hands.

Table 6: Distribution of symptoms of musculoskeletal injuries.

Symptoms	Nº	%
numbness	45	45%
tingling	40	40%
heavy feeling	46	46%
localized pain	68	69%
strength decrease	26	26%
Shock	19	19%
muscle stiffness	38	38%

According to Pessoa [20], the pain that exists in patients with RSI is the result of morpho-functional changes in the tissues, when they are exposed to risk factors, in this case, the very act of handling the devices. Individuals who use smartphones constantly may be victims of both nociceptive pain and neuropathic pain. In the study by Schestatsky [21], nociceptive pain is linked to bone, muscle, or joint injuries and neuropathic pain is related to central nervous system injuries, such as peripheral nerve compression.

As shown in Table 6, the symptoms of numbness, tingling, the sensation of heaviness and shock were well affirmed by the sample, and thus, these considerable percentages bring a hypothesis to the present study, where it can be suspected that many of these individuals suffer from neuropathic pain, due, for example, to nerve compression, a situation that can happen when handling devices due to repetitive movements when interacting with the screens [20].

According to Negri [6], these symptoms can reach chronic stages and start to hinder the individual's functionality, preventing him from carrying out his day-to-day activities such as writing, the use of smartphones and other activities that require hand movements to be performed.

The persistence of these symptoms can even alter the user's behavior, his mood, and if he is a victim of nomophobia, he can enter a withdrawal crisis and become anxious for not being able to handle his device due to the discomforts that are chronically installed. Hence, the problem will generalize, reaching all spheres, and generating a dispute between addiction and the functional inability to use their devices [6-21].

Conclusion

Technology is undoubtedly here to stay and along with it, people's lives have changed considerably, many activities have been facilitated, what was far away has become close, and in short, many problems have been solved. The cell phone and more precisely the smartphone is one of the fruits of this technology that today is part of the individual.

This artifact, just as it has numerous benefits, also has its very significant disadvantages, especially with regard to the health of its owners.

Today, many problems are solved with these mobile devices and therein lies the problem, if a device is portable and is always within reach ready to provide solutions, it is clear that its owner will turn to his smartphone and handle it for such resolution. starting to use it more often.

Children and young people lead the use of these devices, which is worrying, considering that this public is in body development and repetitive activities are not welcome in these stages, as they can lead to changes in this transformation.

In view of this, the technology industry takes advantage of this situation and continues to constantly create artifices that attract people's attention, keeping them closer and closer to the devices and urging them to always want more resources,

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keeping their consumption always high. And so today, this use has become and is abusive, and people increasingly report complaints about their health resulting from this relationship with this type of technology.

In view of the results of this study, it became clear how this practice interferes not only with people's physical health but also with other areas of their lives, such as social and emotional ones.

According to the scientific community, the problem is broader than one can imagine, because when it goes beyond physical problems, it can modify the personality of these users, thus covering the entire biopsychosocial sphere.

The present study sought to investigate the relationship between the use of these devices and musculoskeletal injuries of the cervical spine and hand, arising from this abusive use, where it was possible to verify that there are several significant reasons for this relationship to occur directly. Therefore, it becomes a relevant subject since most people have these devices, handle them frequently and may file complaints regarding them.

The majority of the participants stated that they use the devices for a good part of the day and adopt inappropriate postures when handling them, which alters the body's biomechanics, bringing various physical harm. They also showed considerable signs of dependence on this technology, showing different degrees of nomophobia, a syndrome known by few, but which in reality many have.

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