Health Leadership and Quality of Life. 2025; 4:166
doi: 10.56294/hl2025166

ORIGINAL

Physiotherapeutic strategy for cervicalgia resulting from excessive use of Smartphones in students of an Angolan university

Estrategia fisioterapéutica de la cervicalgia resultante del uso excesivo de Smartphone en estudiantes de una universidad angolana

Karina Manuel Ferreira da Cruz[1], Ana Márcia António[1], Roberto Lardoeyt Ferrer[1]

[1]Instituto Superior Politécnico "Alvorecer da Juventude" (ISPAJ). Luanda, República de Angola.

Cite as: Ferreira da Cruz KM, António AM, Lardoeyt Ferrer R. Physiotherapeutic strategy for cervicalgia resulting from excessive use of Smartphones in students of an Angolan university. Health Leadership and Quality of Life. 2025; 4:166. https://doi.org/10.56294/hl2025166

Submitted: 08-08-2024 **Revised:** 25-10-2024 **Accepted:** 16-12-2024 **Published:** 01-01-2025

Editor: Prof. Javier Gonzalez-Argote

ABSTRACT

Introduction: neck pain is considered one of the most uncomfortable musculoskeletal problems and has a major impact on the quality of life of individuals, being the fourth leading cause of disability in adults. With technology constantly advancing, giving rise to devices with numerous functions such as smartphones, it contributes greatly to daily activities, especially for students. However, a large part of students overuse their smartphones and spend hours connected in flexed postures, overloading the cervical region. And physiotherapy offers a variety of effective techniques for this dysfunction.
Objective: to analyze the effectiveness of the physiotherapeutic strategy in students with neck pain resulting from excessive smartphone use.
Method: a quasi-experimental study with a longitudinal strategy was carried out with a sample of 14 students of both genders who presented neck pain. The intensity of pain, the range of motion of the cervical region were evaluated, and the spurling test was performed. After the evaluation, a pain relief and range of motion increase program was performed in 6 sections.
Results: There was a slight improvement in pain intensity with the visual analogue scale (p=0,11), there was an improvement in the range of motion, both in cervical flexion (p=0,002), cervical extension (p=0,002), right and left lateral cervical tilt (p=0,04) and cervical rotation (p=0,03) and there was an improvement in the spurling test (p=0,002).
Conclusion: the physiotherapeutic strategy was effective and provided greater functional independence in students with neck pain due to excessive smartphone use.

Keywords: Neck Pain; Smartphone; Students; Physiotherapeutic Strategy.

RESUMEN

Introducción: la cervicalgia es considerada uno de los mayores trastornos musculo-esqueléticos y tiene un gran impacto en la calidad de vida de las personas, siendo la cuarta causa de discapacidad en adultos. La tecnología en constante avance, como por ejemplo, dispositivos con numerosas funcionalidades como los teléfonos celulares, contribuye en gran medida con las actividades del día a día, especialmente, la población estudiantil. Algunos estudiantes abusan de sus teléfonos inteligentes y pasan horas conectados en posturas en flexión sobrecargando la región cervical. La fisioterapia ofrece una variedad de técnicas eficaces en esta disfunción.
Objetivo: analizar la efectividad de una estrategia fisioterapéutica en estudiantes universitarios con cervicalgia como resultado del uso excesivo de teléfonos inteligentes.
Método: se realizó un estudio cuasi-experimental de estrategia longitudinal con mediciones repetidas antes-después, a una muestra de 14 estudiantes de ambos sexos que presentaron cervicalgia. Se evaluó intensidad, amplitud del dolor, y se realizó la Prueba de Spurling.

Resultados: hubo una ligera mejoría en la intensidad del dolor con la escala visual analógica (p = 0,11), hubo una mejora en el aumento del rango de movimiento, tanto en flexión cervical (P=0,002), extensión cervical (p=0,002), inclinación lateral derecha e izquierda de la cervical (P=0,04) y rotación cervical (P=0,03) y hubo una mejora en la prueba de espurling (P=0,002).
Conclusión: la estrategia fisioterapéutica fue efectiva, proporcionando mayor independencia funcional en estudiantes con dolor de cuello resultante del uso excesivo del teléfono inteligente.

Palabras clave: Cervicalgia; Teléfono Inteligente; Estudiantes; Estrategia de Fisioterapia.

INTRODUCTION

Cervical pain is considered one of the musculoskeletal problems that affect human health. It has a great impact on the quality of life of people, being the fourth most important cause of disability in adults. It affects 12 % to 34 % of the adult population at some stage of life, with a higher incidence in the female sex.[1,2]

However, recent data show that new information and communication technologies (ICTs) are causing neck pain among adults and children, becoming a common and significant public health problem.

Cervicalgia is a localized pain in the cervical spine, related to musculoskeletal disorders, in the posterior region of the neck and upper region of the scapula or upper dorsal area, free of radiculopathies. The cervical region is considered a region of great mobility. It is essential for the movement of the head, so biomechanical stress is commonly caused by routine day-to-day activities, which can cause symptoms of acute and temporary pain, chronic injuries, or acceleration of degenerative processes in the region. These pains in the cervical spine related to biomechanical disorders and muscular pains are called cervicalgia.[2]

It is known that technology is constantly advancing, and the emergence of devices with innumerable functions that contribute to society's routine has resulted in excessive use by most people, especially portable devices, which facilitate remote communication.[3]

The World Health Organization (WHO) stated that health conditions are related to the excessive use of technological devices, including smartphones. Mobile technology is gaining more and more space in people's daily lives, which means it is increasingly used by young people and adults in higher education. Therefore, the excessive use of technological screens has become a global public health problem.[4]

A study by Esper[5] assessed that an individual is dependent on these devices when using them for more than 38 hours per week. ICTs facilitate daily activities; however, excessive use of these devices can have harmful effects on users and can be considered a pathological condition, as it causes feelings of discomfort, anxiety, and stress.

To date, there are no cut-off points in the literature for smartphone usage time; however, studies show that most people use, on average, two hours a day or more, and a large proportion of these individuals have usage time greater than or equal to four hours[6] and others greater than or equal to nine hours.[7]

Although the incidence of cell phone use is higher among young people, smartphones have reached practically all age groups of the population since, in addition to being an excellent means of communication, they have countless resources, such as social networks, calculators, cameras and various applications that contribute greatly to the daily activities of different audiences.[8]

However, the WHO recommends restricting the use of screens, and the guideline is for up to three hours a day. Experts recommend limiting cell phone use time to about two to three hours daily to avoid physical and mental health problems, such as eye fatigue, headaches, sedentary lifestyles, sleep problems, and technological dependence.

Clearly, the use of cell phones has transformed the lives of the world's population, especially students, and has become a daily habit. However, most students exaggerate the use of these devices and spend hours connected, usually in positions that can cause musculoskeletal disorders.

University students make up a group of 77 % of homophobes between 18-24 years old, revealing in research the adoption of the term Nomophobia, which means fear of being without their cell phone. Just over half expressed a strong dependence on their Smartphone, showing that such an object became an extension of the human being and their helplessness in front of it.[9]

Currently, due to technological advances, postural habits have been observed among students that overload the spine, especially the cervical spine, due to the intense use of mobile devices such as smartphones and tablets in their daily lives, generating stress. Biomechanics causes them to maintain inadequate postures for a long period since this technological exposure generates a more flexed neck posture with an anteriorization of the cervical spine, which is widely observed in students. This cause comes from interfering even in the quality of life of these young people.[10]

https://doi.org/10.56294/hl2025166

Therefore, the posture normally presented by the user when using these devices is one in which there is an undue projection of the neck, which can cause gradual stress in the cervical region of the spine. Therefore, this improper curvature may be related to the onset of pain in the posterior neck region.[11]

An effective physiotherapeutic treatment allows clinical improvement and prevention of cervical pain in individuals who suffer from it. In this sense, the following scientific problem arises:

How effective is implementing a physiotherapeutic strategy when applying the treatment protocol to university students with cervicalgia due to the excessive use of smartphones at the Instituto Superior Politécnico "Alvorecer da Juventude" (ISPAJ)?

To answer this question, the objective was defined to analyze the effectiveness of the physiotherapeutic strategy in students with cervicalgia due to excessive smartphone use at ISPAJ during the academic year 2023-2024.

METHOD

Type of study and study population

A quasi-experimental study was conducted with a longitudinal strategy with before and after measurements, using a quantitative or positivist approach in students of ISPAJ, located in the capital, Luanda, Republic of Angola.

ISPAJ is a private educational institution based on the trilogy teaching - research - extension, thus contributing to the development of Angola in specialized training and differentiated human capital with recognized quality. The structural organization of ISPAJ complies with the provisions of Presidential Decree No. 128/12 of July 24.

The university has a universe of 4,314 students studying health sciences, of which there was a study population of 62 students who had some myalgia at the ages of 18-47 years of the day session of classes and who offered informed consent to participate in the research. Other inclusion criteria were: clinical diagnosis of cervicalgia secondary exclusively to excessive use of cell phones. Students who had other osteoarticular clinical entities or whose cervical pain was due to other factors, even if concomitant with excessive cell phone use, were excluded. A non-probabilistic opinionated or criterion sampling technique was used.

Data collection techniques

Data were collected in December 2023 using a form created in Google Forms and shared via WhatsApp. After accepting the treatment protocol, they were placed in a WhatsApp group to begin the physical assessment and treatment. The data collection instrument comprised nine closed-ended questions involving age, gender, academic year, curricular year, time of daily use, posture during smartphone use, pain intensity using the Visual Analog Scale (VAS), and pain related to excessive smartphone use.

Variables and their operationalization

Variables were taken into account:

- Discrete quantitative: biological age, time of daily phone use.
- Nominal qualitative variables: gender, type of university career.
- Qualitative ordinal: Pain scale, student perception of the position adopted during the use of smartphones.
- Continuous quantitative: VAS, Cervical flexion, Cervical extension, Lateral tilt, Cervical rotation, and Spurling's test.

Research steps and intervention protocol

a) Evaluation: An anamnesis was performed, and each participant was interviewed to collect information on personal data, life habits, and the main complaint.

b) Physical examination: The intensity of neck pain was evaluated using the Visual Analogical Scale (VAS) test, which helps to measure the intensity of pain in the patient and points to the numerical image of the VAS scale presented by the professional and confirms the intensity of the pain. To evaluate the Range of Motion (ROM), a goniometry test was performed, which is done with a specific device to measure the angles of movement of the joints called a goniometer. For the measurement, the patient must be sitting or standing, with the upper limb placed close to the trunk and with the cervical angle in a neutral position to comply with the anatomical position, then attach the goniometer to the patient's body and with the movable arm of the goniometer follow the movement of the cervical joint performed by the patient. Finally, the Spurling test was performed, which is a test used to evaluate certain aspects of the cervical spine, including range of motion and nerve function. In this Spurling test, the patient remains seated while the practitioner stands and compresses or tilts the patient's head. Light pressure is applied for an average of 15 seconds, and questions about symptoms are asked. The test is positive

when the patient's symptoms greatly intensify due to compression.

c) Physiotherapeutic treatment: During six sessions, physiotherapeutic resources were applied to relieve neck pain and improve range of motion. In the first phase, patients were submitted to physiotherapeutic analgesia with electrotherapy, using conventional Transcutaneous Electrical Nerve Stimulation (TENS) at a frequency of 100 Hz, with an application time of 20 min, the patient on a stretcher in the prone position. Rubber electrodes with Gel to adhere to the skin were placed in the cervical region using the bipolar technique, with a distance of 3 cm between one electrode and the other. Massage therapy was used until the end of the sessions with the use of relaxing massage in the cervical region extended to the shoulders; it was performed with the patient lying on the stretcher with a sheet, in the prone position, and with the shoulders uncovered without any accessory on the neck, Gel and neutral oil were applied in the hands of the physiotherapist to help in the massage movements (sliding, kneading, friction) and pain relief with the analgesic Gel, the massages were performed with a light deep touch that lasted 15 min. Kinesiotherapy is one of the physiotherapeutic resources used; flexion, extension, and rotation stretching exercises were applied in the cervical region to help relieve pain and improve the range of motion. Flexion and extension exercises were performed with the patients seated on the pilates mat. The physiotherapist asked them to place their hands behind the head, bringing them downwards, while the chin approached the chest and remained in the position for 15 seconds; the same procedure was requested with cervical extension, placing the hands on the forehead and bringing the head backward to the maximum limit of each patient and remaining there for 15 seconds. There were pauses of 15 seconds. In the rotation exercises, patients were asked to rotate the neck. Also, they performed two sets of 10 neck retraction exercises, which helped reduce pain with fingers on the front of the chin to help push the head back while keeping the face directed anteriorly. Patients were held in this stretching position for 1-2 seconds, allowing the head to return to its neutral position. This movement was repeated for three series of 10.

d) Reevaluation: Once the physiotherapeutic treatment protocol was completed, patients were reevaluated concerning the VAS scale, the goniometry test, and the Spurling test.

Statistical methods

Descriptive statistics of central tendency and dispersion were used for continuous quantitative variables (specifically, arithmetic mean standard deviation of the mean and percentage for qualitative variables, with the preparation of frequency distribution tables for the latter.

Inferential statistical techniques were used, such as the Student's t-test for paired samples if the variable is normally distributed, and the Wilcoxon nonparametric test, with a statistical significance level 0,05.

Ethical considerations

The ISPAJ Ethics Committee approved the present study, which authorized the research.

After the inclusion and exclusion criteria were verified, all individuals considered eligible received information on the objectives and procedures inherent to the study and were available for clarification of any additional doubts.

The informed consent statement contained all relevant information and guaranteed confidentiality and anonymity.

RESULTS

Taking into account the characterization of the sample according to variables such as biological age, gender, and university career, the most frequent biological age was the range between 18 and 23 years with 31 students (50,0 %); the predominant gender was female with 55 students (88,7 %) and the physiotherapy career predominated with 27 university students (44,0 %). Forty-four percent of the students were in their fourth year of studies (Table 1).

One of the variables considered in the study was the percentage distribution of the participants according to the time of daily use of cell phones, showing that 50,0 % (n= 31) of the sample consumes from 4 to 8 hours of daily use of cell phones (figure 1).

All students surveyed indicated that they use their smartphone daily; 9,7 % (n=6) said they use their smartphone less than 1 hour per day, while 19,3 % (n=12) reported using it between 1 and 3 hours. The majority of students, 25,8 % (n=16), use their smartphone daily between 4-6h, then 24,2 % (n=15) spend it between 6-8h, and 21 % (n=13) use their smartphone per day more than 8 hours.

About 37,1 % (n=23) of the students did not report pain when using smartphones excessively. However, 22,6 % (n=14) of the students reported pain when excessively using the smartphone, and a higher number of students, 40,3 % (n=25), reported that they sometimes felt pain.

Table 1. Characterization of the sample according to epidemiological variables

Variables	Absolute frequency	Percentage
Biological Age		
18-23	31	50,0
24-29	20	32,2
30-35	8	12,9
36-40	3	4,8
41-47	0	0,0
Genre		
Female	55	88,7
Male	7	11,3
University career		
Physiotherapy	27	44,0
Nursing	10	16,0
Cardiopneumology	6	13,0
Dentistry	17	27,0
Academic year		
First	10	16,0
Second	7	11,0
Third	7	11,0
Fourth	27	44,0
Finalist	11	18,0

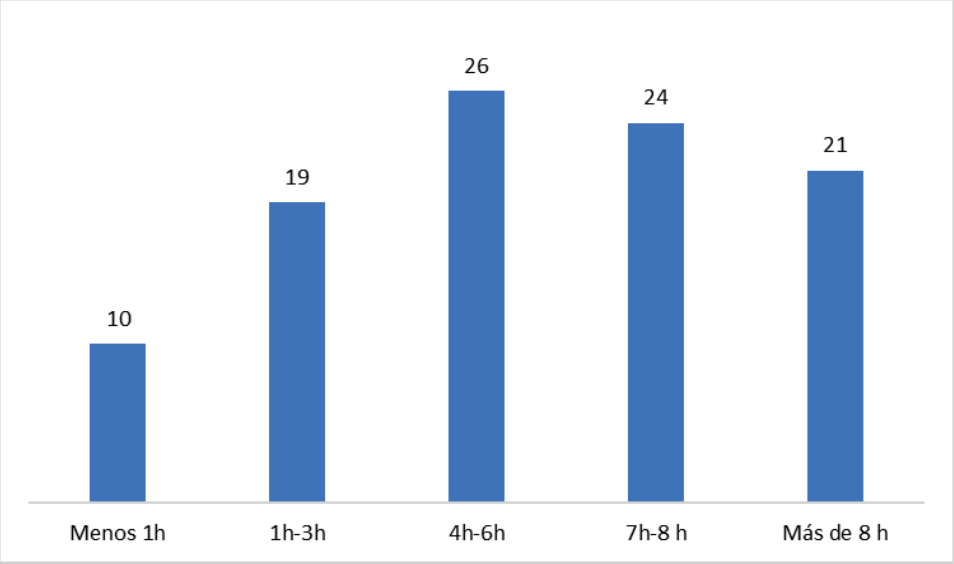

Figure 1. Percentage distribution of the sample according to the time of daily use of the cell phone

Maintaining a forward posture of the head causes tissue deformities and intensifies compressive loads on the cervical spine (Lima; Silva, 2019). Figure 2 demonstrates the students' perception of the posture adopted during the use of smartphones.

30,6 % (n=19) adopt the 15° craniocervical angulation position weighing 12 kg. However, 12,9 % (n=8) adopt the 0° position with a normal weight of 4,5 kg. 24,2 % (n=15) of the students have 30° craniocervical angulation weighing 18 kg while using the smartphone; 22,6 % (n=14) of the students have 45° craniocervical angulation weighing 22 kg and 9,7 %(n=6) of the students have 60° angulation weighing 27 kg.

Of the 62 students who completed the questionnaire, 18,3 % (n=11) reported that, according to the scale numbering, the number of pain ranged from 0-1, but the majority of students, 45 % (n=27), reported pain ranged from 1 - 3 according to the scale, 26,7 %(n=16) of students reported pain on a scale ranging from 5 to 7, and 1,7 %(n=1) reported pain on a scale of 7 to 9none reported pain on the 9-10 scale.

Of the 62 participants, 43 agreed to participate in the treatment protocol referred to in the methods section. Table 2 compares the results of the variables before (initial assessment) and after (reassessment).

Table 2 shows the results of the comparisons made before and after the intervention. For all variables, significant differences were obtained in the measurements in favor of an ostensible improvement with the physiotherapist strategy implemented.

https://doi.org/10.56294/hl2025166

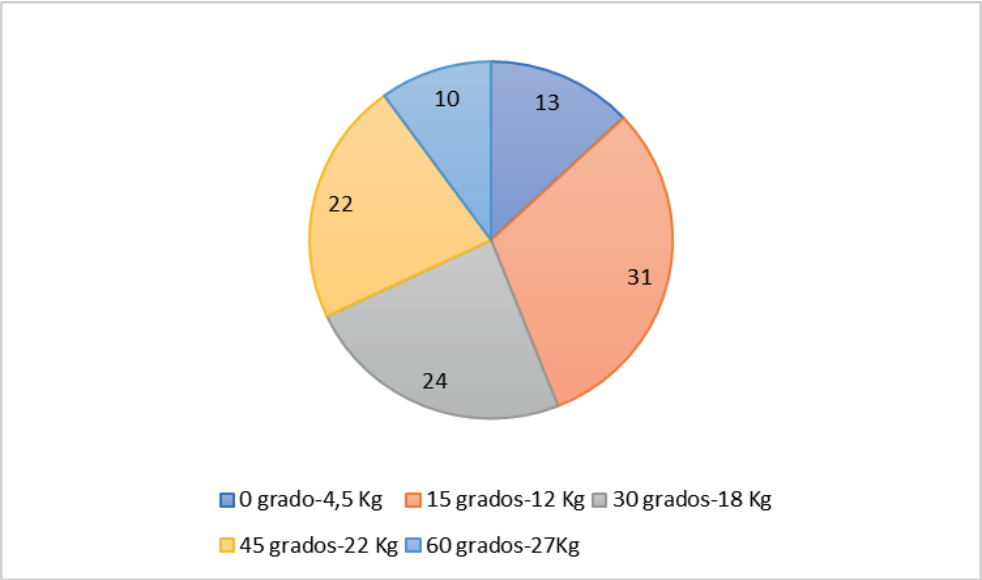

Figure 2. Percentage distribution of the sample according to posture during smartphone use

Table 2. Results of the evaluation and re-evaluation of the physiotherapeutic treatment (VAS, Spurling and Range of Motion)

Variables	Evaluation Mean+/- DS	Re-evaluation Mean+/- DS	p value
EVA	3,54 +/-1,34	0,85 +/- 1,02	0,002
Cervical flexion	63,6 +/- 1,33	64,7 +/- 0,57	0,002
Cervical extension	48,8 +/- 1,29	49,9 +/- 0,36	0,002
Lateral tilt	38,3 +/- 1,49	39,2 +/- 0,26	0,04
Cervical rotation	53,5 +/- 1,40	54,8 +/- 0,36	0,03
Spurling test	0,78 +/- 0,42	0,14 +/- 0,36	0,002

Symbology: VAS (Visual Analog Scale). SD: Standard Deviation

DISCUSSION

Between 2016 and 2020, cell phone users increased from 3,6 to 6,5 billion. About 97 % of people aged 18 to 24 in the United States use cell phones. In Hong Kong and Thailand, 68,2 % and 90 % of cell phone users had cervicalgia.[12]

The majority of the participants in the present investigation ranged from 18 to 23 years of age, as this is the average age of college attendance. The most frequent career and year was the degree in physiotherapy and fourth year, respectively, since the sampling applied was non-probabilistic accidental because it was a research project of a student's thesis in her final year.

The predominance of these injuries in the female sex corresponds to international statistics that report 48 % in women and 38 % in men.[12]

The finding in the present investigation about the time in hours per day using smartphones is evidence consistent with the research of Choudhary M et al.[13], who stated that students who spent about 5-7 hours per day with their devices reported neck pain of moderate to severe intensity.

It would be interesting for future research to determine whether the pain intensity would be related to the time spent using smartphones and the degree of dependence students may have on these devices.[14]

However, it has been shown that pain is not a constant symptom in cervicalgia induced by prolonged use of smartphones. Ribeiro da Silva[15] found that 50 % of the digital influencers he studied presented cervical pain.

On the other hand, the cervical support the weight of the head; this increases in direct relation to the degrees of flexion of the head, from 5 kg in the anatomical position with 0° inclination to 18 kg when it is inclined at 30° degrees and 27 kg at 60°.[16] In the present investigation, the cervical position of 15 degrees with angulation of 12 kg proved to be the most frequent. It would be interesting for future research to relate this variable to pain intensity according to the VAS scale. With 15° of cervical flexion, the head weighs 12 kg, i.e., more than twice as much as in neutral position. Therefore, continuous exposure to this weight can cause changes in the cervical spine, curvature, supporting ligaments, tendons, musculature, bony segments, etc.

The most common interventions by general medicine in this pathology are analgesics and acupuncture.

However, there is a great deficit of scientific evidence in the protocols to be followed in the therapeutic approach from the physiotherapy point of view,[16,17] hence the importance of the results obtained with the applied strategy, in which there was a significant improvement of the neck flexion and extension movements, pain, lateral tilt, cervical rotation, and Spurling's test.

One of the strategic alternatives used with great effectiveness in the present investigation was transcutaneous electrical nerve stimulation (TENS), which consists of the transcutaneous and non-invasive use of electrical stimulation to produce analgesia; it has been the object of clinical research since its development in 1967; it is a portable and economical device that generates soft pulsed electrical currents applied through the surface of the skin to stimulate the peripheral nerves through electrodes.[18]

Another effective alternative was therapeutic exercise, which aims to increase muscle and joint strength and improve muscle function and range of motion. This should reduce pain and disability, accelerate recovery, and return to usual activities.[18]

Finally, massotherapy was used, which reduces the short-term symptoms of cervical pain, as Laura Gracía Fernández states in her research.[19]

CONCLUSIONS

It is concluded that the triad physiotherapy-electrotherapy-massotherapy-therapeutic exercise is effective in cervicalgia due to the prolonged use of smartphones. However, in his preventive work, the physiotherapist should offer advice on how the posture should be adopted when using these devices, as well as the hours established by the WHO.

It is important to consider that these technological supports will never be eliminated; on the contrary, their use will increase even more, especially because in the teaching-learning process, active methods will predominate with the use of virtual learning environments, so it is logical and encouraging, the advantages offered by ICTs for all spheres of life, especially in secondary and higher education, so that preventive measures should be taken so that the health of Internet users is not affected. The students of the physiotherapy career have the responsibility to disseminate these results to the rest of the students in the university context where the research was carried out, as well as to disseminate them to the rest of the young people in other areas.

It is recommended that the research be extended, considering other analytical variables and other strategic variants of physiotherapy.

REFERENCES

1. Santos HA, Joia LCA. Liberação miofascial nos tratamentos de cervicalgia. Revista das Ciências da Saúde do Oeste Baiano, Higia. 2018; 3(1): 151-167. Disponible en: https://www.academia.edu/40862001/A_LIBERA%C3%87%C3%83O_MIOFASCIAL_NOS_TRATAMENTOS_DE_CERVICALGIA

2. Delgado RV. Abordagem básica cervicobraquialgia. Rev Electron Biomed. 2009;2:76-78. Disponible en: https://www.researchgate.net/publication/41395049_ABORDAJE_BASICO_DEL_PACIENTE_CON_CERVICOBRAQUIALGIA

3. Bauer MFS, Silva, DM. Análise fotogramética da postura cervical durante o uso do smartphone em diferentes posições. Novo Hamburgo, Brasil. 2017. Disponible en: https://biblioteca.feevale.br/Vinculo2/000010/00001036.pdf

4. World Health Organization. Public health implications of excessive use of the internet, computers, smartphones and similar electronic devices: meeting report, Main Meeting Hall, Foundation for Promotion of Cancer Research, National Cancer Research Centre, Tokyo, Japan, 27-29 August 2014. World Health Organization. https://iris.who.int/handle/10665/184264

5. Esper MV. Nomofobia, adolescência e distanciamento social. Revista mazônica, Amazonas. 2021; 26(2). 394-413. Disponible en: https://periodicos.ufam.edu.br/index.php/amazonica/article/view/9058

6. Kim HJ, Kim JS. The relationship between smartphone use and subjective musculoskeletal symptoms and university students. Journal of Physical Therapy Science. 2015; 27(3): 575–579. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4395668/

7. Lima MA, Silva JCS. Avaliação da capacidade funcional e dor na região cervical em estudantes de fisioterapia de uma instituição de ensino privado. 2019;9(1): 1-15

8. Ribeiro PVB. Análise postural cervical em usuários de telas digitais. Rev Ciên Saúde. 2019; 29(19):19-29.

Disponible en: https://revistaeletronicafunvic.org/index.php/c14ffd10/article/view/155

9. Emanuel R. The truth about smartphone addiction. College student journal. 2015; 49(2):291. Disponible en: https://www.researchgate.net/publication/281243425_The_truth_about_smartphone_addiction

10. Sato MI, Aguiar LF, Freitas MNV de, Guerra I, Martinez JE. Cervicalgia entre estudantes de medicina: uma realidade multifatorial. Rev. Fac. Ciênc. Méd. Sorocaba [Internet]. 31º de julho de 2019 [citado 19º de setembro de 2024];21(2):55-8. Disponível em: https://revistas.pucsp.br/index.php/RFCMS/article/view/37186

11. Culpi M, Martinelli ABMC. Desativação de Pontos-Gatilho no Tratamento da Dor Miofascial. Rev Bras Med Fam Comunidade, Rio de Janeiro. 2018; 13(40):0109. Disponible en: Culpi M, Martinell ABMC. Desativação de pontos-gatilho no tratamento da dor miofascial. Rev Bras Med Fam Comunidade [Internet]. 9º de dezembro de 2018 [citado 19º de setembro de 2024];13(40):1-9. Disponível em: https://rbmfc.org.br/rbmfc/article/view/1777

12. Danna Belén Leones Zúñiga, Juan José Moscoso Fonseca, Víctor Hugo Sierra Nieto, Sheyla Elizabeth Villacrés Caicedo. Uso de dispositivos móviles y alteraciones cervicales en estudiantes universitarios. Revista de Investigación en Salud. 2023; 6(18): 748 – 757

13. Choudhary M, Choudary A, Jamal S, Kumar R, Jamal S. The impact of ergonomics on children studying online during COVID-19 lockdown. J Adv Sports Phys Educ. 2020; 3(8):117-20. DOI: 10.36348/jaspe. 2020. v03i08.001

14. González Restrepo E, Perez Silva, A. Aplanamiento cervical en jóvenes universitarios por posturas inadecuadas a la hora de usar teléfonos inteligentes. [Internet]. Pereira: Fundación Universitaria del Área Andina. 2023 [citado: 2024, septiembre]

15. Ribeiro da Silva Junior R, Dos Santos Costa MV, Tavares Silva R, de Oliveira Mendes L, Ferreira Amaral AL, da Silva Raulino LT, Luiz da Silva J, Almeida Souza Filho JO. Correlação do uso do celular e dor cervical em influencer digital do litoral leste do Ceará: Correlation of cell phone use and cervical pain in digital influencer of the east coast of Ceará. SHS [Internet]. 2022 Jul. 14 [cited 2024 Sep. 19];3(3):1352-63. Available from: https://ojs.studiespublicacoes.com.br/ojs/index.php/shs/article/view/585

16. Centeno Leguia Dercy. Síndrome de text-neck: una nueva pandemia en la era smartphone. Revista Médica. Obtenido de Síndrome de text-neck: una nueva pandemia en la era smartphone. Revista Médica. 2019. Disponible en: https://doi.org/10.20453/rmh.v30i3.3593

17. Gowrisankaran S, Sheedy JE. Computer vision syndrome: A review. Work. 2015;52(2):303-14

18. Iván Mauricio Figueroa Morocho, Abigail Elena Burbano Lajones. Efectividad de los ejercicios fisioterapéuticos y la electroterapia en personas adultas con cervicalgia: revisión sistemática. Revista Latinoamericana de Ciencias Sociales y Humanidades, Asunción, Paraguay. 2024; V(1):2897. https://doi.org/10.56712/latam.v5i1.1805

19. Laura García Fernández. Efectividad de la compresión isquémica más masoterapia en mujeres con cervicalgia mecánica y puntos gatillo miofasciales en trapecio superior. Grado en Fisioterapia. Escuela de Enfermería y Fisioterapia San Juan de Dios. 2019. Disponible en: https://repositorio.comillas.edu/xmlui/bitstream/handle/11531/43856/PFG001105.pdf?sequence=1&isAllowed=y

FINANCING

No funding sources were available.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHORS' CONTRIBUTION

Conceptualization: Karina Manuel Ferreira da Cruz, Ana Márcia António Ferrer.
Formal analysis: Roberto Lardoeyt Ferrer.
Research: Karina Manuel Ferreira da Cruz, Ana Márcia António Ferrer.
Writing - original draft: Karina Manuel Ferreira da Cruz, Ana Márcia António, Roberto Lardoeyt Ferrer.