

Therapeutic Exercise and Postural Education Program in Students of the Polytechnic University of Amozoc with Painful Musculoskeletal Syndromes through the use of digital platforms

Programa de Ejercicio Terapéutico y Educación Postural en Estudiantes de la Universidad Politécnica de Amozoc con Síndromes Dolorosos Musculoqueléticos mediante el uso de plataformas digitales

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Abstract

As a result of the health contingency caused by COVID-19; The following events occurred on March 30, a national health emergency was declared in Mexico. Leading to the establishment of measures for its prevention and control of the disease Suarez (2020). Likewise, the different levels of the educational system presented a change of dynamics with respect to the face-to-face classes replaced by the distance modality. Therefore, the students of the Polytechnic University of Amozoc of the Degree in Physical Therapy see the need to adopt the distance education model and thereby increase the hours sitting in inappropriate seats in front of a device; laptop, mobile phone and tablet. This results in the emergence of painful syndromes, especially when inappropriate postures are adopted, according to the data obtained through a questionnaire applied to the UPAM community. In response to this problem, a program of therapeutic exercise and postural education was implemented through the use of a videoconference application that influences the promotion and prevention of health within the school context (virtual modality) in improving their school performance and activities. of daily life.

Contingency, Painful syndromes, Therapy, Postural education, Videoconference

Resumen

Como resultado de la contingencia sanitaria a causa del COVID-19; se presentaron los siguientes sucesos el 30 de marzo se declara emergencia de salud nacional en México. Conduciendo al establecimiento de medidas para su prevención y control de la enfermedad Suarez (2020). Así mismo los diferentes niveles del sistema educativo presentaron un cambio de dinámica respecto a las clases presenciales sustituido por la modalidad a distancia. Por consiguiente, los estudiantes de la Universidad Politécnica de Amozoc de la Licenciatura en Terapia Física se ven en la necesidad de adoptar el modelo de educación a distancia y con ello incrementar las horas sentados en asientos inadecuados frente a un dispositivo; laptop, teléfono móvil y tableta. Lo cual tiene como consecuencia el surgimiento de síndromes dolorosos, sobre todo cuando se adoptan posturas inadecuadas, de acuerdo a los datos obtenidos por medio de un cuestionario aplicado a la comunidad UPAM. En respuesta a esta problemática se implementó un programa de ejercicio terapéutico y educación postural a través del uso de aplicación de videoconferencia que influye en la promoción y prevención de la salud dentro del contexto escolar (modalidad virtual) en la mejora de su desempeño escolar y actividades de la vida diaria.

Contingencia, Síndromes dolorosos, Terapéutica, Educación postural, Videoconferencia

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Introduction

As a consequence of the COVID-19 contingency, the students of the Polytechnic University of Amozoc of the degree in Physical Therapy adopted the distance learning model in order to prevent and control contagion. This has resulted in various alterations in the movement system, such as the emergence of painful syndromes in students, especially when they adopt inadequate and prolonged postures, the most predominant being sitting, in addition to the use of devices to carry out high-demand academic activities.

This has a significant impact on the tissues due to a lack of balance in the distribution of loads, so a programme of therapeutic exercise and postural education is designed and implemented through the application of Google Meet videoconferencing that influences the promotion and prevention of health within the school context (virtual modality).

Will the implementation of a therapeutic exercise and postural education programme through videoconferencing application allow to maintain the optimal condition of tissues and the decrease of painful musculoskeletal syndromes caused by inadequate prolonged postures in students of the Polytechnic University of Amozoc?

Theoretical framework**Impact of COVID-19 in the school context virtual modality**

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. It was recognised by WHO on 31 December 2019, declared in Wuhan (China), as a respiratory disease transmitted from person to person and spreading to several countries, causing deaths; due to increased transmission, it became a pandemic on 11 March 2020. WHO (2020)

In Mexico, the first case was recorded on 27 February and by 11 March 2020, 11 cases had been recorded, and on 14 March 2020, the Ministry of Public Education (SEP) brought forward the Easter holiday period. In addition, on 30 March, a national health emergency was declared in Mexico. This led to confinement and social distancing. Suarez (2020)

Likewise, the different levels of education adopt the distance (virtual) modality.

As a result of this virtuality, ENSANUT COVID-19 (2020) indicates the following figures: 18,872, 660 households with school-aged people used virtual media by 71.2% of students, in addition to the increase in academic tasks related to the study for sending and receiving information, added to the permanence in a seated or reclining position. In terms of physical activity, only 31.8% of the population over 10 years of age reported being physically active or practising a sport.

Of that fraction, in the group of adolescents aged 10-14 years, 68.8 per cent decreased their physical activity and increased the time spent sitting or reclining by 41.2 per cent. These figures were 60 and 35.3% in adolescents aged 15-19 years; while 61.7% of adults aged 20 years and older decreased their physical activity, and 29.1% increased the time spent sitting or reclining, which impacts on the adoption of an inadequate human body posture and the appearance of painful syndromes.

Body posture

It is the state that a body adopts and indicates the position of the body segments, being the interface with the external environment to detect and use information from the environment in order to position and orient the body to perform an activity and is the basis for the organisation of movement. The positioning and maintenance of the segments allows the transition from one stable posture to another, good posture depends on the integrity of the musculoskeletal system and anti-gravitational function. Duclos (2017)

Kinesiological model

The model considers movement as a system composed of anatomical and physiological elements involved in the production and regulation of movement. The importance of this model indicates that optimal function is preserved when there is regular and varied movement in the direction of joint motion, but maintaining the same posture for 20 minutes causes progressive deformation of the soft tissues, requiring more than 40 minutes for recovery, leading to tissue deformation and adaptation. Shirley Sahrmann (2005)

There are postures and movements that naturally produce an increase in tension loads due to the interaction of internal and external forces. Repeated movements and maintained postures affect the musculoskeletal system by modifying the contractile activity of the muscle fibre, fibre length, the participation of agonist and antagonist muscles and neurological tissue, causing tissue damage and affecting strength, resulting in altered movement, which is why one of the segments most affected is the spine.

Biomechanics of the spine and the Core

The spine has 33 vertebrae and its function is to protect the nerve structures, as well as having a functional unit made up of ligaments and intervertebral discs, which provide biomechanical properties such as flexibility at low loads and resistance at high loads. It also has neuromuscular structures that provide support for the trunk, head and control of movements in response to compression, traction, shear and rotational forces. Viladot (2001)

However, despite all these elements, there are active and passive positions that increase disc pressure, affecting viscoelasticity, the distribution of loads on the bone segments and increased muscle expenditure and low or scarce activation of the muscles that form the central core of the Core, causing neuromuscular failure. Calvo and Gómez (2017)

Impact of sitting on the spine

Viladot (2001) mentions that the load on the spine increases mainly in the seated position, the increase corresponds to 200% due to the increase in intradiscal pressure. Similarly, in the sitting position and without a backrest, the curve flattens and the intradiscal pressure increases significantly, so these postures are a risk factor for disc degeneration that affects the nutrition of the disc and generates alterations in the tissues and the appearance of pain.

It is therefore important to remember that posture is a state of muscular and skeletal balance that protects the structures. Unfortunately, online classes have forced students to spend prolonged periods of time in a seated position with inclination, which is a risk that leads to failure as a result of an erroneous relationship between the different parts of the body.

Pain syndromes in university students due to inappropriate loads and postures

Pain is the unpleasant sensory and emotional experience associated with an actual or potential tissue injury manifested by certain physiological, autonomic and behavioural reactions. Covarrubias (2013)

Some types of pain related to the present work are musculoskeletal pain whose origin is perceived in muscles, bones and adjacent tissues, Villaseñor *et al.*, (2013).

This relates to back pain that extends down the back of the trunk from the occiput to the sacrum with the possibility of radiating to the extremities, triggered by mechanical factors. Casals (2017)

It is worth mentioning that the duration and temporality of pain impacts on tissue injury in a progressive manner and are classified according to the following table.

Duration	Time
Acute	Less than 6 weeks.
Subacute	Duration between 6 weeks and 3 months.
Chronic	Longer than 3 months.
Recurrent	Acute episodes separated by periods free of 3 months.

Table 1 Duration of pain
Source Casals, (2017)

Camargo *et al.* (2009) allude that the occurrence of pain in the university population is determined by the following factors; academic activity, psychosocial, and physical hypoactivity having negative and positive effects. Under the same angle Agudelo, (2013) refers that students spend 80% of the school day in a single "sedentary" position to which must be added the time spent studying, eating and watching television added to the above during the pandemic INEGI, (2020) survey for the measurement of the impact of COVID-19 shows that of the 7.1 million students enrolled in higher education recorded the use of devices: smartphones 33.4%, laptop 52.4%, desktop computer 12.9%, tablet 1.2% in addition to the increase in terms of hours as 30.9% used the devices more than 8 hours, 26.6% 6-7 hours, 35.7% 3-5 hours, 6.6% less than 3 hours.

In addition other disadvantages are the excess of academic load and school activities in 18.8% that leads to the appearance of painful syndromes whose duration can start being acute and progressively can become chronic and recurrent pain causing a health problem. For example, in Mexico, the IMSS provided more than 300,000 consultations for low back pain that led to functional limitations, disability, medication, bandages, hygienic measures, rest and in some cases, in the face of structural changes, surgical treatment. IMSS (2018).

Digital physiotherapy in the school context

Physiotherapy practice is a service provided by physiotherapists to develop, maintain and restore maximum movement and functional ability throughout life. The service is provided in circumstances where movement and function are affected by ageing, injury, pain, disease, illness, disorders, conditions and/or environmental factors. WCPT (2019) furthermore digital physiotherapy is the service of health care, remotely through devices and digital communication its purpose is to facilitate the effective delivery of services through the use of information and communication technologies (ICT's); by means of video calls, video conferencing, virtual reality and internet programmes, given that they generate a new interaction of care to improve health and prevent COVID-19 contagions. Amaya and Beretta (2020)

Therapeutic exercise practice and postural education through digital physiotherapy

Digital physiotherapy can be used for preventive and corrective intervention through therapeutic exercise aimed at improving posture, mobility and muscle performance, together with the biomechanical properties of the different tissues. Under the supervision of the physiotherapist or physical therapist who determines through an evaluation the intervention protocol for its application, dosage, intensity and duration.

Likewise, it is necessary for physiotherapists to know postural hygiene, apply it and teach it Vélez (2018), its objective is to achieve a good mechanical-body posture and the importance in the prevention of back injuries, through the improvement of knowledge in the motor executions, to prevent painful symptoms Martínez *et al.* (2008).

Methodology to be developed

A descriptive, prospective and longitudinal study was carried out, in which a sample of 310 students was taken, 231 women (74.5%) and 79 men (25.5%) whose average age corresponds to 53.9% (18-20 years), 38.7% (20-22 years), 5.2% (23-26 years), 1.6% (27-29 years) and 0. The main objective of this study is to identify the factors related to the presence of painful syndromes of mechanical origin that affect the musculoskeletal system. Based on this, a proposal is developed for a programme of therapeutic exercise and postural education that influences the promotion and prevention of health within the virtual school context, in their school performance and daily life activities during the COVID-19 contingency.

Module I

The programme proposal was designed based on the results of a Google Forms questionnaire that included the identification of pain syndromes (adapted from the Nordic Questionnaire), postural habits (adapted from the author Alejandra Agudelo Martínez) and physical activity (taken from the Global Physical Activity Questionnaire (GPAQ)). This survey was applied to the aforementioned population of students from the Bachelor's Degree in Physical Therapy at the Polytechnic University of Amozoc.

Subsequently, the body region with the greatest affectation was identified and the exercise programme was proposed by means of a bibliographic review dedicated to the treatment of painful syndromes in the spine.

Structure of the programme

The programme was structured with the aim of maintaining optimal tissue condition, strength, movement and posture improvement to reduce painful musculoskeletal syndromes in students at the Polytechnic University of Amozoc. This programme was structured in 3 modules with a duration of 4 sessions, with a total of 12 sessions, the application corresponded to 2 sessions per week.

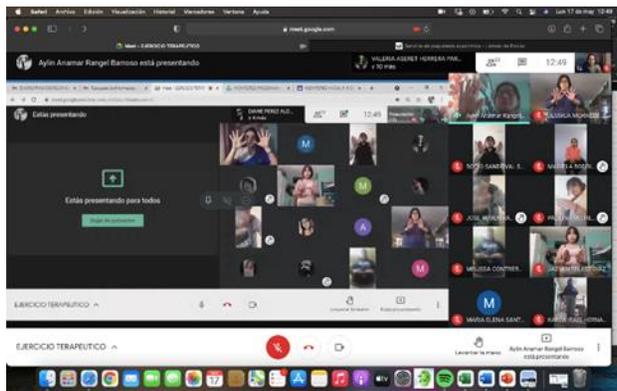


Figure 1 Implementation of the therapeutic exercise and postural education programme

Source: Own Elaboration

Module II

The application of the programme was through a videoconference (Google Meet) to a group of 28 volunteer students being 24 women and 4 men during the period September-November 2021 under the following scheme:

Briefing session

Initial evaluation (Pre-programme) a google form was applied, in which the following information was collected: School data, Height, Weight, BMI, Musculoskeletal pain, Pain scale (EVA), Muscle screening, Range of motion screening, and the evaluation of knowledge with respect to daily life postures.

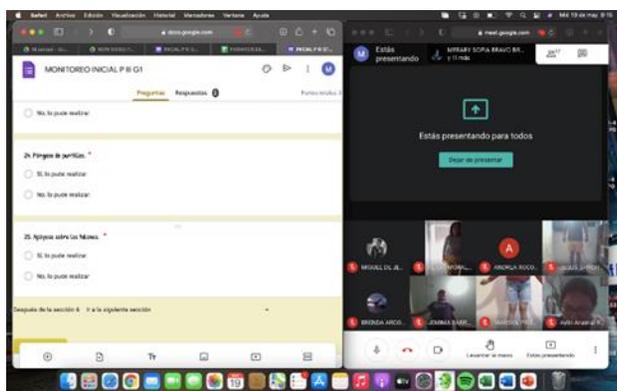


Figure 2 Evaluation of the therapeutic exercise and postural education programme

Source: Own Elaboration

Implementation of the programme

At the beginning and end of each session a monitoring form for injury prevention was implemented, after the form was filled in, the session with each of its phases was started:

1. Warm-up.
2. Strengthening.
3. Stretching.

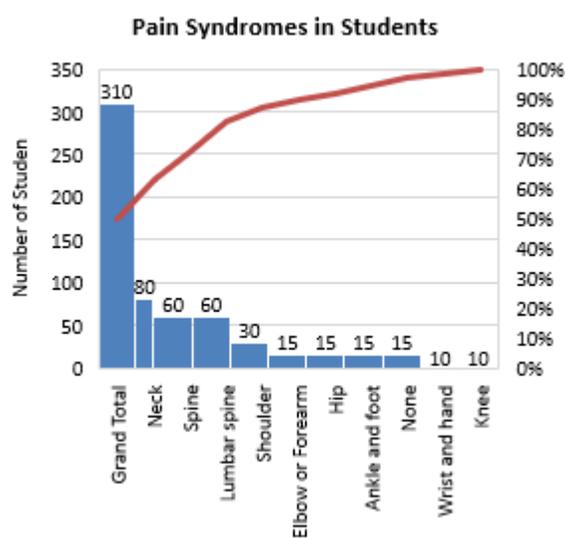
Final evaluation (Post-programme)

Carried out at the end of the programme by means of the evaluations corresponding to the initial evaluation.

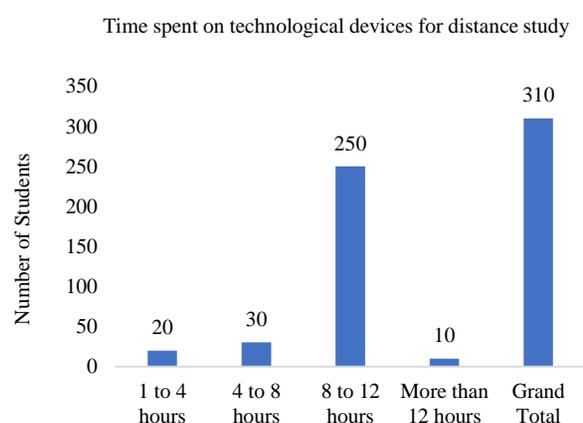
Module III

Once the information had been collected, the analysis of the results obtained in the forms specified above was carried out, in order to proceed with the elaboration of graphs through the Excel programme.

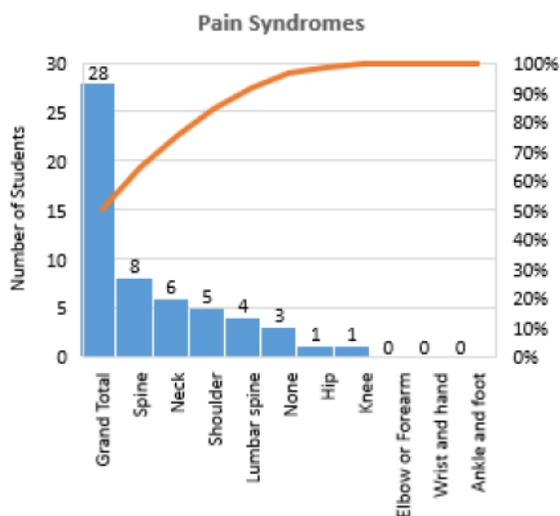
Results



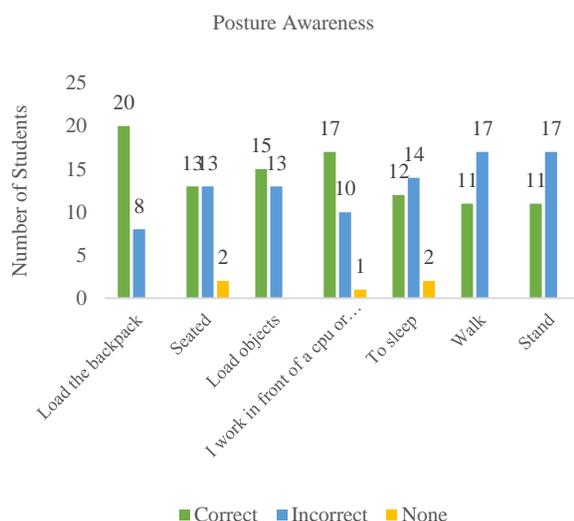
Graph 1 Students with pain syndromes in body regions
Source: Own Elaboration



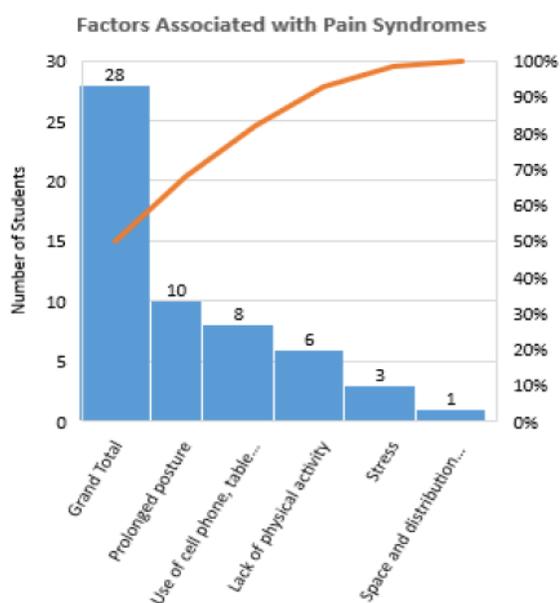
Graph 2 Time of use of technological devices for distance learning by UPAM students
Source: Own Elaboration



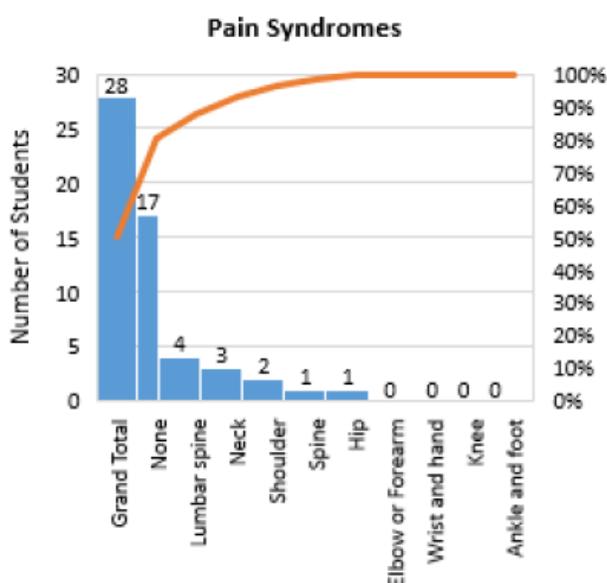
Graph 3 Pre-programme pain syndromes (initial programme assessment)
Source: Own Elaboration



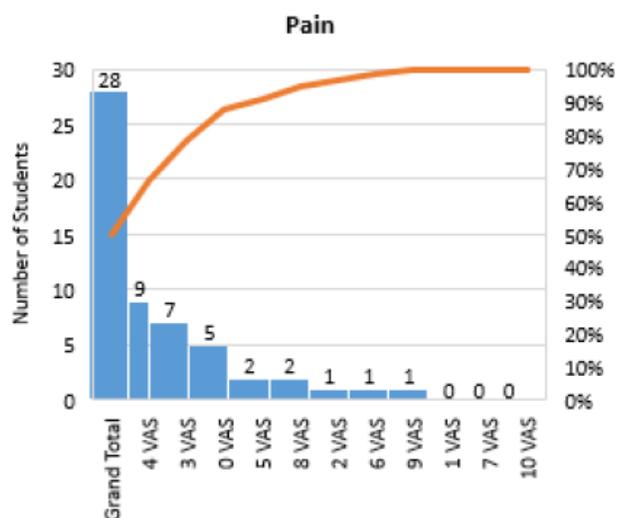
Graph 6 Knowledge of the pre-programme position (initial programme assessment)
Source: Own Elaboration



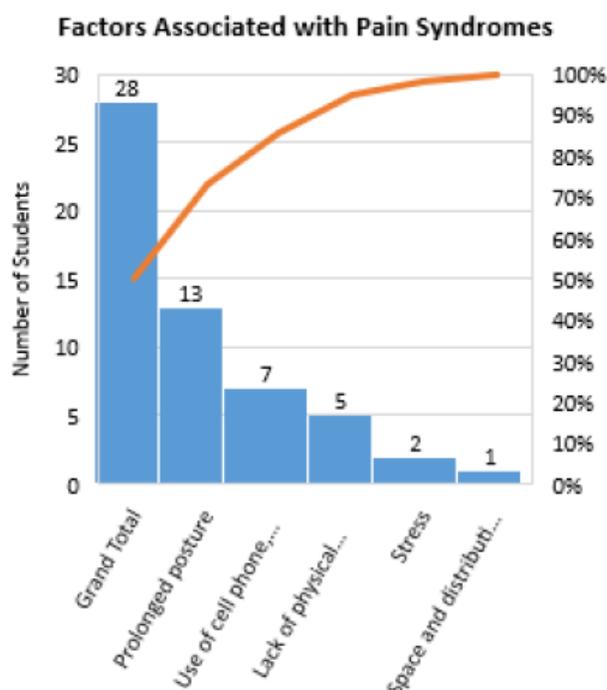
Graph 4 Factors leading to pre-programme pain syndromes (initial programme assessment)
Source: Own Elaboration



Graph 7 Post-programme pain syndromes (end-of-programme evaluation)
Source: Own Elaboration

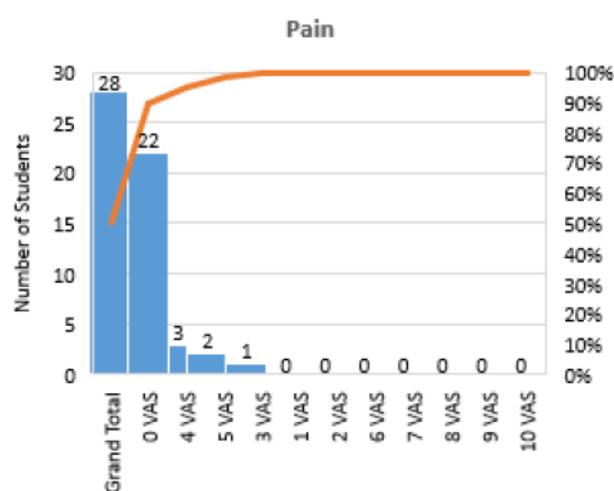


Graph 5 Pre-programme pain assessment using the VAS scale (initial programme assessment)
Source: Own Elaboration



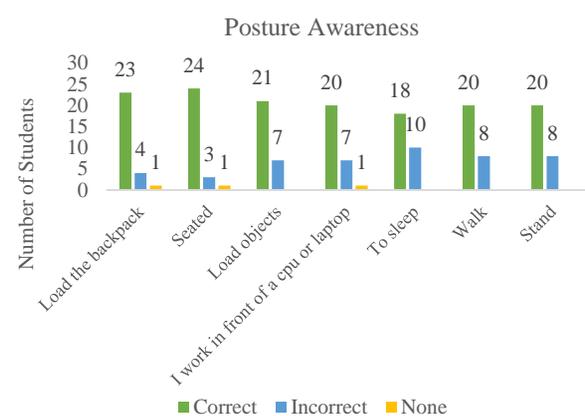
Graph 8 Factors associated with post-programme pain syndromes (end-of-programme evaluation)

Source: Own Elaboration



Graph 9 Post-programme pain assessment on VAS scale (end-of-programme evaluation)

Source: Own Elaboration



Graph 10 Knowledge of the post-programme position (final programme evaluation)

Source: Own Elaboration

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Conclusions

Physical Therapy students during the COVID-19 pandemic, secondary to the change from classroom to virtual mode, presented a higher incidence of pain syndromes at the spinal column level, specifically in the cervical, dorsal and lumbar regions, and to a lesser extent in the extremities, such as the hip and knee, which corresponds to 28 students.

The use of technological devices for 8-12 hours a day added to a decrease in physical activity and, secondarily, stress, which causes an increase in tension in the tissues, thus causing pain which, according to the VAS scale, reaches a maximum threshold of 9 and a minimum of 4, affecting the 28 students, which has an impact on their school performance.

In terms of knowledge of posture, the students identify some correct postures, mainly when carrying objects and even when standing in front of the computer.

After the implementation of the hygiene programme and workshop, they manage to recognise that the first factor that triggers tissue damage is prolonged posture, which has a direct impact on the spinal column. However, the practice of postural hygiene rules and therapeutic exercise improves the recognition of postural hygiene measures and, therefore, there is a reduction in the incidence of painful syndromes as well as the intensity, with the maximum degree of pain on the scale being 4 and a minimum of 1, reducing the number of students affected to 6, which has a positive influence on the movement system. Therefore, physiotherapeutic intervention was achieved through the use of technologies allowing to evaluate and supervise the exercise programme promoting health in a preventive way to avoid structural and functional damages that, in the long term, limit the performance of the human being and require prolonged or even surgical treatments.

References

- Agudelo-Martínez, A. (2013). Factores asociados a la postura corporal en estudiantes universitarios. *CES Movimiento y Salud*, 11–18. Recuperado de: <https://studylib.es/doc/5090168/factores-asociados-a-la-postura-corporal-en-estudiantes-u>
- Amaya, P., y Beretta., A. (2020). Guía en el manejo de telerrehabilitación para kinesiólogos y fisioterapeutas. Universidad Maza. 1-36. Recuperado de: <http://repositorio.umaza.edu.ar/bitstream/handle/00261/1804/GU%c3%8dA%20TELERREHABILITACION%20PARA%20KINESIOLOGOS%20Y%20FISIOTERAPEUTAS%20-%20Amaya%20y%20Beretta%20-%202020.pdf?sequence=1&isAllowed=y>
- Calvo-Soto A., Gomez, R., E. (2017). Los ejercicios del core como opción terapéutica para el manejo de dolor de espalda baja. *Salud Uninorte*. Barranquilla, 33(2) 259–267. Recuperado de: https://www.researchgate.net/publication/324441015_Los_ejercicios_del_core_como_opcion_terapeutica_para_el_manejo_de_dolor_de_espalda_baja
- Camargo-Lemos, D., Orozco L., Hernández, J. y Niño Cruz, G. (2009). Dolor de espalda crónico y actividad física en estudiantes universitarios de áreas de la salud. *Revista de la Sociedad Española del Dolor*, 429-436. Recuperado de: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-80462009000800003&lng=es&tlng=es
- Casals-Sánchez, j., Gasparyan, A., Martínez, F., Morcuende, A., Mud, F. y Mud, S. (2017) Documento de consenso de dolor de espalda, EDITTEC. Recuperado de: https://semergen.es/resources/files/documentos/Consenso_documento-consenso-dolor-espalda.pdf
- Covarrubias-Gómez, A., Guevara-López, U., Gutiérrez, C., Betancourt, J., y Córdova, J., (2013). Epidemiología del dolor crónico en México. 33(4), 207-213. Recuperado de: <https://www.medigraphic.com/pdfs/rma/cma-2010/cma104e.pdf>
- Duclos, N., Duclos, C., y Mesure, S. (2017). Control postural: fisiología, conceptos principales e implicaciones para la readaptación. ISSN 2523-6849
ECORFAN® All rights reserved
- EMC Kinesiterapia - Medicina Física. Recuperado de: <https://www.sciencedirect.com/science/article/abs/pii/S1293296517836628?via%3Dihub>
- ENSANUT COVID-19 (2020). Encuesta Nacional de Salud y Nutrición 2020 sobre Covid-19 Resultados nacionales. Recuperado de: <https://ensanut.insp.mx/encuestas/ensanutcontinua2020/doctos/informes/ensanutCovid19ResultadosNacionales.pdf>
- Ibacache Arraya, J., (2022) Cuestionario nórdico estandarizado de percepción de síntomas músculo esqueléticos. Instituto de salud pública Ministerio de Salud. Recuperado de: <https://www.ispch.cl/sites/default/files/NTPercepcion Sintomas ME01-03062020A.pdf>
- IMSS (2018) *En el IMSS, más de 300 mil consultas por lumbalgia en 2017*. Recuperado de: <http://www.imss.gob.mx/prensa/archivo/201810/246>
- Instituto Nacional de Estadística y Geografía (INEGI). (2020, 13 de septiembre). Encuesta para la Medición del Impacto COVID-19 en la Educación (ECOVID-ED) 2020. Recuperado de: <https://www.inegi.org.mx/investigacion/ecovided/2020/>
- Martínez-González, M., Gómez, A., y Hidalgo, M. (2008) Programas de higiene postural desarrollados con escolares. *Elsevier*. 30(5) 223-230. Recuperado de: <https://www.sciencedirect.com/science/article/pii/S0211563808000114>
- Organización Mundial de la Salud (2020). Recuperado de: <https://www.who.int/es/news/item/27-04-2020-who-timeline---covid-19>
- Shirley A. Sharman (2005) Diagnóstico y tratamiento de las alteraciones de movimiento Paidotribo. pp (11-53).
- Suárez, V., Suarez, M., Ronquillo, J y Oros, S. (2020). Epidemiología de COVID-19 en México. *Revista Clínica Española*, 220 (8), 463–471. Recuperado de: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7250750/>

Vélez-Muñoz, K., Castaño, M., Escobar, A., y Cubides, M., (2018). Grado Apropiación de la higiene postural en estudiantes de Fisioterapia, Fundación Universitaria del Área Andina, Pereira, Colombia. *Cuaderno De Investigaciones: Semilleros Andina*, 6(6). 42-46. Recuperado de: <https://revia.areandina.edu.co/index.php/vbn/article/view/783>

Viladot- Voegeli (2001) Lecciones básicas de biomecánica del aparato locomotor. Barcelona: Springer.

Villaseñor-Moreno, J., y Guizar, B., Lanza, L., y Escobar., V. (2013). Síndrome de dolor miofascial. Epidemiología, fisiopatología, diagnóstico y tratamiento. *Revista de Especialidades Médico-Quirúrgicas*, 18(2),148-157. Recuperado de: <https://www.redalyc.org/articulo.oa?id=47327854012>

WCPT (2019) Descripción de la fisioterapia declaración política. Recuperado de: https://world.physio/sites/default/files/2021-05/PS-2019-Description-of-PT-Spanish_0.pdf