Publication status: Not informed by the submitting author

PROPOSAL FOR VIDEO LESSONS ON EDUCATIONAL TECHNOLOGY COVERING PAIN NEUROPHYSIOLOGY

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https://doi.org/10.1590/SciELOPreprints.11617

Submitted on: 2025-03-30
Posted on: 2025-04-04 (version 1)
(YYYY-MM-DD)

PROPOSTA DE VIDEOAULAS SOBRE TECNOLOGIAS EDUCATIVAS RELATIVAS À NEUROFISIOLOGIA DA DOR

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RESUMO:
Introdução: Dada a etiologia biopsicossocial da dor crônica, são defendidas abordagens terapêuticas que englobam aspectos físicos e psicossociais, como a educação em neurofisiologia da dor (END). **Objetivo:** Sugerir conteúdo tecnológico para END por meio de videoaulas. **Métodos:** O conteúdo foi proposto em duas etapas: (i) avaliação por especialistas em END e adaptação do conteúdo segundo suas sugestões; (ii) verificação da eficácia das videoaulas. A END foi desenvolvida em duas videoaulas com conteúdo relacionado ao processamento da dor. Depois, os voluntários com dor crônica assistiram às videoaulas. O conhecimento da neurofisiologia da dor foi avaliado por meio de um questionário validado antes e depois da exposição às videoaulas. O efeito clínico da mudança no nível de conhecimento sobre a neurofisiologia da dor foi testado pelo tamanho do efeito. **Resultados:** Três pesquisadores profissionais com ampla experiência em END e um professor de neuroanatomia compuseram a equipe de especialistas. Os eixos temáticos que orientaram o conteúdo sugerido pelos especialistas foram: anatomia e neurofisiologia; neurobiologia e aspectos multifatoriais da experiência da dor; estratégias para lidar com a dor. Na fase de teste da eficácia das videoaulas, participaram seis voluntários com dor lombar crônica. Verificou-se que a END foi capaz de aumentar o conhecimento sobre a neurofisiologia da dor com um tamanho de efeito de 0,90, que é considerado grande. **Conclusão:** A sistematização das informações sobre a END em videoaulas, de acordo com as diretrizes sugeridas, mostrou-se adequada e eficaz, pelo menos em curto prazo, para aumentar o conhecimento sobre a neurofisiologia da dor.

Palavras-chave: dor crônica, tratamento da dor, educação do paciente como disciplina, educação em saúde.

PROPOSAL FOR VIDEO LESSONS ON EDUCATIONAL TECHNOLOGY COVERING PAIN NEUROPHYSIOLOGY

ABSTRACT:
Introduction: Given the biopsychosocial etiology of chronic pain, therapeutic approaches that encompass physical and psychosocial aspects, such as education in pain neurophysiology (NPE), are advocated. **Objective:** To suggest technology content for NPE using video lessons. **Methods:** The content was proposed in two stages: (i) evaluation by NPE specialists and adaptation of the content according to their suggestions; (ii) verification of the effectiveness of the video lessons. The NPE was developed in two video lessons with content related to pain processing. After, volunteers with chronic pain watched the video lessons. Knowledge of pain neurophysiology was assessed using a validated questionnaire before and after exposure to the video lessons. The clinical effect of the change in the level of knowledge about pain neurophysiology was tested by effect size. **Results:** Three professional researchers with extensive experience in NPE and a neuroanatomy lecturer comprised the team of

experts. The thematic axes guiding the content suggested by the experts were: anatomy and neurophysiology; neurobiology and multifactorial aspects of the pain experience; strategies for dealing with pain. In the phase of testing the effectiveness of the video lessons, six volunteers with chronic low back pain participated. The NPE was found to be capable of increasing knowledge about the neurophysiology of pain with an effect size of 0.90, which is considered large. **Conclusion:** The systematization of information on NPE in video lessons in accordance with the suggested guidelines proved to be adequate and effective, at least in the short term, in increasing knowledge of pain neurophysiology.

Keywords: chronic pain, pain management, patient education as a subject, health education.

PROPUESTA DE LECCIONES EN VÍDEO SOBRE TECNOLOGÍA EDUCATIVA QUE CUBRAN LA NEUROFISIOLOGÍA DEL DOLOR

RESUMEN:
Introducción: Dada la etiología biopsicosocial del dolor crónico, se aboga por enfoques terapéuticos que engloben aspectos físicos y psicosociales, como la educación en neurofisiología del dolor (END). **Objetivo:** Sugerir contenidos tecnológicos para la END mediante videoclases. **Métodos:** El contenido se propuso en dos etapas: (i) evaluación por especialistas en END y adaptación según sus sugerencias; (ii) verificación de la eficacia de las videoclases. La END se desarrolló en dos videoclases con contenidos relacionados con el procesamiento del dolor. Después, voluntarios con dolor crónico vieron las videoclases y se evaluó el conocimiento de la neurofisiología del dolor mediante un cuestionario validado antes y después de la exposición. El efecto clínico del cambio en el nivel de conocimientos se comprobó mediante el tamaño del efecto. **Resultados:** Tres investigadores profesionales con amplia experiencia en END y un profesor de neuroanatomía formaron el equipo de expertos. Los ejes temáticos que guiaron los contenidos sugeridos por los expertos fueron: anatomía y neurofisiología; neurobiología y aspectos multifactoriales de la experiencia dolorosa; estrategias de afrontamiento del dolor. En la fase de comprobación de la eficacia de las videoclases participaron seis voluntarios con lumbalgia crónica. Se comprobó que la END era capaz de aumentar los conocimientos sobre la neurofisiología del dolor con un tamaño del efecto de 0,90, que se considera grande. **Conclusiones:** La sistematización de la información sobre la END en videoclases de acuerdo con las directrices sugeridas demostró ser adecuada y eficaz, al menos a corto plazo, para aumentar los conocimientos sobre la neurofisiología del dolor.

Palabras clave: dolor crónico, tratamiento del dolor, educación del paciente como asignatura, educación sanitaria.

INTRODUCTION

The perception of pain varies widely in terms of intensity, quality, and duration among different people and disease conditions. The painful phenomenon can have different pathophysiological mechanisms and meanings (Raja et al., 2020). Historically, in prehistoric and ancient times, pain was associated with magic rituals or divine trials. In Ancient Rome, based on studies of sensory physiology, Galen established the relationship between pain and the central nervous system (CNS) and the peripheral nervous system (PNS), considering it a sign of internal bodily changes with or without environmental influence (David Le Breton, 2007). According to the gate theory proposed by Melzach and Wall in 1967, there are neural mechanisms capable of modulating nerve impulses originating in the PNS and directed to the CNS, which occur predominantly but not exclusively in the dorsal horn of the spinal cord, both in a facilitatory and inhibitory sense (Rachlin, 2010).

According to the International Association for the Study (IASP), the most contemporary definition of pain is "an unpleasant sensory and emotional experience associated with or similar to that associated with actual or potential tissue injury" (Raja et al., 2020). It is currently known that nociception is considered a physiological component of pain processing through which the transduction, transmission, and modulation of the nociceptive stimulus take place. It should be emphasized that the

nociceptive stimulus is only perceived as pain through the stage called perception, which occurs in the brain through a set of brain mechanisms capable of discriminating, decoding, and redefining the painful phenomenon through a synaptic network that encompasses different regions of the CNS (De Ridder et al., 2021; Molska & Filippini, 2021).

Considering that the perception of pain is influenced by different areas of the CNS, including the structures of the limbic system (De Ridder et al., 2021; Nijs et al., 2021), several factors influence the experience of pain and its intensity, such as previous experiences, expectations, learning processes, and beliefs (Dionísio et al., 2020). Additionally, everyday situations, stress, anxiety, depression (Zavarize & Wechsler, 2012), working conditions (Neves, 2006), diet (Brioschi et al., 2009), and sleep (Batista et al., 2022) influence the perception of pain.

Acute pain plays a crucial role in maintaining health, as it allows us to recognize the presence of noxious stimuli from the mildest to potentially lethal, thus acting as an organic alarm system. However, when pain persists for long periods, the protective effect of pain diminishes, and chronic pain (CD) sets in. Chronic pain leads to a wide range of negative and maladaptive sequelae that compromise the whole being (Nijs et al., 2023). The chronification of pain becomes a disease in itself, involving structural and functional alterations in the CNS and PNS that favor the generation, maintenance, and amplification of painful behavior and experience (Bułdyś et al., 2023; Nijs et al., 2011, 2023).

Chronic pain has a high prevalence and significant personal and social impact (Aguiar et al., 2021). It is estimated that 10% of the world's population suffers from chronic pain (Goldberg & McGee, 2011), regardless of age, gender, ethnicity, income, or geography (Mittinty et al., 2018). It generates disability, impairment of physical functioning and mental health, and a consequent reduction in quality of life (Galan-Martin et al., 2020; Nijs et al., 2013).

Based on the multidimensional profile of pain and the lack of clarity in the relationship between the characteristics of the painful experience reported by the patient and the physical damage that justifies them, therapeutic approaches based on the biopsychosocial model have been recognized as more appropriate than those based solely on biomedical aspects (Barros et al., 2023; Nijs et al., 2023).

Thus, the treatment of chronic pain requires a multifactorial intervention with sensory, emotional, cognitive, and social components (Vieira et al., 2019). This approach contrasts with the biomedical model, which focuses on tissue damage without considering psychological and social aspects. The biopsychosocial model, advocated by the World Health Organization, views the disease process as influenced by biological, psychological, and social factors, reinforcing the need for multifactorial and interdisciplinary treatment (Nijs et al., 2013).

Among the interventions advocated for the treatment of chronic pain, education in pain neurophysiology (NPE) has been used, especially in conjunction with physiotherapeutic treatment. NPE involves educational sessions on the neurobiology, neurophysiology, and processing of pain, providing details on peripheral receptors, peripheral and central sensitization, synaptic activity, pain modulation, and brain processing, considering the multifactorial aspects of the pain experience (Hotta et al., 2022). NPE aims to improve the patient's understanding of pain and reduce the perceived threat, teaching that chronic pain is often related to nervous system hypersensitivity rather than tissue damage (Bülow et al., 2021), encouraging behavioral change.

Although NPE is a valid therapeutic option, it is essential to establish a systematic and standardized approach to the presentation of information to patients. The use of video lessons as a medium for conveying NPE can help to mitigate potential biases associated with face-to-face oral presentations, which may be influenced by spoken language variability. This systematic approach can be particularly crucial when NPE is utilized in research or in settings where a broad audience is targeted, ensuring that the information is consistently coherent and accurate.

For this reason, it is necessary to adapt the content conveyed through video lessons before their application to ensure it aligns with NPE premises. This study aimed to propose NPE technology content in the form of video lessons. The hypothesis of this study posits that the systematization of knowledge related to pain neurophysiology (NEP), structured into video lessons under the guidance of experts in the field, has the potential to enhance patients' understanding of pain processing mechanisms.

METHODS

Ethics of the study and participants

To meet the research objective, two study designs were used: (i) a methodological design to adapt the content of the video lessons based on elements recommended for NPE using lay language; (ii) a quasi-experimental design to test the effectiveness of the strategy. Approval was obtained from an institutional Human Research Ethics Committee (protocol number 5.976.309).

All study participants were informed about the nature of this research and signed two copies of a free and informed consent form, drawn up in accordance with resolution 466/12 of the National Health Council, following the Declaration of Helsinki. One copy was retained by the participant, and the other by the researchers.

To standardize the physical cause that triggered the chronic condition, volunteers with a clinical diagnosis of chronic low back pain (CLBP) who had been referred to an institutional Physical Rehabilitation Centre were recruited. Volunteers were of both sexes and aged between 18 and 59. All volunteers underwent a physical, functional, and sociodemographic assessment conducted by a trained professional.

The following criteria were employed for inclusion: i) volunteers who were physically inactive and reported persistent or intercurrent low back pain for more than three months; ii) low back pain with physical characteristics compatible with mechanical etiology according to the evaluation and treatment guidelines proposed by the American College of Physicians and the American Pain Society (Chou et al., 2007).

The exclusion criteria were as follows: i) a history of back surgery; ii) pregnancy.

Preparation of video lessons

The video lessons were initially recorded based on the elements recommended for the preparation of the NPE.

The components covered were as follows (Catley et al., 2013; Louw et al., 2016; Nijs et al., 2013; Santos et al., 2011; Siqueira, 2018; Zimney et al., 2014): i) anatomy and neurophysiology (peripheral and central receptors, neurons, synapses, PNS, ANS, pain processing and modulation, cerebral coding of pain, peripheral and central sensitization); ii) neurobiology and multifactorial aspects of the pain experience (pain-related behavior, temporal classification of pain, representation of pain, meaning of pain, kinesiophobia, catastrophizing, and breaking paradigms in relation to pain); iii) strategies for dealing with pain (maintaining active physical status, positive thoughts, controlling anxiety and focusing on resolving conflicts, managing emotions, early resumption of activities of daily living and work activities).

In this iteration, in addition to the audio content, the exhibitor's image was displayed at the bottom right of the video. Several images were incorporated to enhance comprehension, as well as some animations.

Appropriateness of content

In order for the content to be appropriate, the video lessons were evaluated by a committee of experts. This committee was made up of researchers in the field of pain neurophysiology and professionals with clinical experience. The professionals with clinical experience were selected from a list created by searching the internet and the lattes curriculum of professionals who worked and researched in the field. In addition, the committee included professionals with recognition in the local community for treating CLBP. In addition, university professors from the disciplines of neuroanatomy, anatomy, and neurophysiology were invited to join the committee.

Upon acceptance of the invitation to participate in the research, each expert received the video lessons via email and was instructed to complete a structured questionnaire developed on Google Forms (presented in full below) pertaining to the suitability of the topics comprising the video lessons. The questionnaire included spaces for evaluators to provide suggestions.

Following the identification of the suggestions, the video lessons were restructured to incorporate the experts' requests.

Validation of the series of video lessons on pain neurophysiology education (Structural Basis Phase)

Dear Collaborator,
Thank you for your participation. Below are the topics that will compose the video lessons. We ask you to evaluate whether each topic is pertinent. The last question will provide space for your suggestions.
Please note that this phase aims to identify all the topics that must be included in a lesson on pain education to make it as comprehensive as possible. The topics listed here will form the structural basis for the development of the video lessons.
There will be a series of 2 video lessons, each with a specific theme. Each video lesson should last between 15 to 20 minutes.

- Indicates a required question

1. Full Name
2. What is your primary academic background, highest degree, and institutional affiliation?
3. How would you classify your experience with the topic "Neurophysiology, Pain Processing, and Modulation"?
    - Minimal
    - Limited
    - Moderate
    - Extensive
4. How would you classify your experience with the topic "Pain Neurophysiology Education"?
    - Minimal
    - Limited
    - Moderate
    - Extensive
5. How long have you been studying the topic of "pain"?
    - Less than 1 year
    - Between 1 and 5 years
    - Between 6 and 10 years
    - More than 10 years

FIRST VIDEO LESSON - Anatomy and Neurophysiology

6. **Content Assessment**
    - 1.1) Conceptualization of Pain ("Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage")
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 1.2) Concepts of Pain as an Alarm System
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 1.3) Pain Propagation (Concepts of Receptors, Neurons, and Synapses)
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 1.4) Concepts of PNS, CNS, and ANS
        - Appropriate
        - Inappropriate

        - Needs adjustments
    - 1.5) Concepts of Pain Processing and Modulation (Differentiating Nociception from Pain Experience; Concepts of Brain Interconnectivity)
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 1.6) Concepts of Brain Coding of Pain (Synapses between Different Brain Regions, Including the Limbic System), Peripheral and Central Sensitization
        - Appropriate
        - Inappropriate
        - Needs adjustments
7. Do you have any suggestions for the content of this video lesson (FIRST VIDEO LESSON)? If you suggested adjustments in any of the questions above, please identify the question(s) and what needs to be improved.

SECOND VIDEO LESSON - Neurobiology and Multifactorial Aspects of Pain Experience + Strategies for Managing Pain

8. **Content Assessment**
    - 2.1) Temporal Classification of Pain (Differentiating Acute and Chronic Pain)
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 2.2) Concepts of a Dysregulated Alarm System
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 2.3) Concepts of Pain Representation and Meaning (Chronic Pain Ceases to Be a Warning Signal; Describing Factors That Dysregulate the Alarm System, Such as Emotions and Beliefs About Pain)
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 2.4) Pain-Related Behavior, Kinesiophobia, Catastrophizing (Relating to the Idea of the Firefighter Who Can Either Pour Water or Gasoline on the Fire)
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 2.5) Paradigm Shifts in Pain (Raising Awareness of the Need to Consider Psychosocial Factors in Addition to Physical Aspects)
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 2.6) Valuing Positive Thoughts
        - Appropriate
        - Inappropriate
        - Needs adjustments
    - 2.7) Maintaining an Active Physical Status (Reinforcing That Physical Exercise Releases Analgesic Substances)
        - Appropriate
        - Inappropriate
        - Needs adjustments

- 2.8) Controlling Anxiety and Focusing on Conflict Resolution (Shifting Focus From the Problem to Actions That Effectively Resolve the Conflict)
  - Appropriate
  - Inappropriate
  - Needs adjustments
- 2.9) Managing Emotions (Introducing the Use of Breath Control and Meditation)
  - Appropriate
  - Inappropriate
  - Needs adjustments
- 2.10) Early Resumption of ADLs and Work Activities
  - Appropriate
  - Inappropriate
  - Needs adjustments

9. Do you have any suggestions for the content of this video lesson (SECOND VIDEO LESSON)? If you suggested adjustments in any of the questions above, please identify the question(s) and what needs to be improved.

Thank you for your participation and contributions.

Evaluation of the effectiveness of video lessons

In order to assess the efficacy of the video lessons in their final iteration, following the restructuring recommendations provided by the experts, the NPE was applied to a cohort of volunteers with CLBP.

Prior to the administration of the NPE, the volunteers' knowledge of the neurophysiology of pain was evaluated using an instrument that has been validated for this purpose. This is the Pain Neurophysiology Questionnaire (QND), an instrument that is used to assess how individuals reformulate concepts related to the biological mechanisms that underlie their pain, as well as to evaluate the effects of cognitive interventions in the context of clinical practice and research (Catley et al., 2013).

The QND was translated and culturally adapted for the Brazilian population (Nogueira et al., 2018) and consists of 12 questions, each with "true," "false," and "I don't know" answer options. When points are awarded, one point is added for each correct answer. In correct responses do not contribute to the total score, nor do responses marked as "I don't know." These responses indicate a lack of knowledge, which may lead to erroneous assumptions or guesses. The higher the score obtained on the questionnaire, the greater the likelihood of having a comprehensive understanding of pain neurophysiology.

Following the completion of the QND by the volunteers, they were presented with a series of video lessons, which were shown to them on a 40-inch Samsung LED TV in a closed, comfortable room equipped with chairs, within the premises of an institutional physiotherapy clinic. The sound was amplified using a portable speaker.

The session lasted approximately 70 minutes. The initial content of the video lesson addressed topics related to the anatomy and neurophysiology of pain. Following this presentation, a period was allotted for the volunteers to pose questions and share their experiences and opinions regarding the content. The second video lesson then covered topics related to the neurobiology and multifactorial aspects of the pain experience, as well as strategies for dealing with pain. Once again, there was an opportunity for the volunteers to share their experiences and ask questions.

Once the video lessons had been presented and discussions had taken place, the QND was applied once more to ascertain whether the content presented had increased the volunteers' knowledge of the neurophysiology of pain.

Authorship contribution

EVBF: Conceptualization, Investigation, Resources, Writing - Original Draft; **ITRS:** Conceptualization, Methodology, Investigation, Resources, Supervision, Writing - Review & Editing;

ARC: Conceptualization, Methodology, Supervision, Writing - Review & Editing; Project administration.

Statistical analysis

For the descriptive statistical analysis, expressed in mean and standard deviation values, the free software Jamovi version 2.4.11 was used. An alpha of 0.05 was adopted.

The effect size (ES) was also calculated by comparing the QND responses before and after exposure to the video lessons. This was done in order to assess whether the changes in knowledge about the neurophysiology of pain were clinically relevant. The effect size (ES) was calculated using the Hedges' g. The TEs were interpreted according to the following criteria (Lakens, 2013; Sawilowsky, 2009): null (less than 0.10); very small (0.10 to 0.19); moderate (0.20 to 0.79); large (0.80 to 1.19); very large (1.20 to 1.99); enormous (>2.0).

RESULTS

A total of 10 researchers were invited, with three clinicians and seven teachers. Two researchers declined participation, and five did not respond. No clinicians responded to the request. Only one professor agreed to participate. The team of experts' characteristics are detailed in Table 1.

TABLE 1: Characterization of the team of expert evaluators of the video lessons on pain neurophysiology education for content validation.

	Specialist 1	**Specialist 2**	**Specialist 3**	**Lecturer**
Professional training	Physiotherapist	Physiotherapist	Physiotherapist	Biologist
Academic qualification	PhD student in Rehabilitation Sciences	PhD in Physiology	PhD student in Rehabilitation Sciences	PhD in Structuraland Cellular Biology
Experience with the topic of pain neurophysiology	Large	Large	Large	Small
Experience with NPE	Large	Large	Large	Small
Time spent studying the topic of pain	Between 6 and 10 years old	re than years	re than years	ess an 1 year

Caption: pain neurophysiology education (NPE)

In the original version, which was sent to the team of experts for their comments, the video lesson corresponding to the first content was 25 minutes long, while the one corresponding to the second content was 23 minutes long. Following a series of preliminary trials, the researchers also identified a need to reduce the length of the content, as some volunteers found it challenging to maintain sustained attention throughout the video lessons.

The principal recommendations of the team of experts were as follows: i) adjustments to the content on pain propagation, the peripheral nervous system (PNS), the central nervous system (CNS), the autonomic nervous system, and pain modulation; ii) adjustment and improvement of the illustrations; iii) improvements to the language to make it more suitable for the lay public; iv) a recommendation to emphasize pain control based on reframing, positive thoughts, and alternative treatments; v) removal of the animations that worked more as a distraction than as a factor to facilitate understanding of the content.

In the final version, following the recommendations of the expert team, the initial content of the video lesson was presented in 25 minutes, with the subsequent content taking 17 minutes.

Six volunteers, averaging 50.2 ± 8.7 years old, 76.8 ± 19.9 kg in body mass, and 1.69 ± 0.12 m in

height, participated. Before the video lessons, the average QND score was 4.0 ± 1.6 points, rising to 6.0 ± 1.6 points after. The ES for this change was 0.90, considered large.

DISCUSSION

The objective of this study was to propose NPE content using video lesson technology and to verify the effectiveness of this content in promoting an increase in knowledge about the neurophysiology of pain. Expert feedback was sought to enhance the content, ensuring that it was more appropriate in terms of its aesthetic presentation, spoken language, and, most importantly, the topics covered. In light of the observed increase in patient knowledge regarding pain, the hypothesis of this study has been validated.

The findings of the present study indicate that the video lessons on NPE resulted in an increase in knowledge about the neurophysiology of pain. This change was found to have significant clinical relevance, as evidenced by TE. This result is consistent with other findings in the literature (Lepri et al., 2023), which observed the effectiveness of NPE through a systematic review. This involved a single video lesson session, lasting between 20 and 25 minutes, which demonstrated improvement in psychosocial factors in patients with CLBP in the short term.

Given the biopsychosocial etiology involved in chronic pain, NDE has emerged as a tool that can be used in clinical practice with the aim of increasing the patient's knowledge of pain and favoring changes in behavior. As evidenced by the literature, increased knowledge about pain as a result of NPE has been observed to generate positive changes in various outcomes, including a reduction in psychosocial aspects such as levels of catastrophizing, anxiety, disability, as well as improvements in physical-functional functions (Hotta et al., 2022).

A meta-analysis (Shin & Kim, 2023) evaluated the clinical effects of NPE on pain intensity, catastrophizing, and kinesiophobia levels in patients with CLBP. The results indicated that, in the short term, there was a reduction in pain intensity and catastrophizing after NPE. Furthermore, in the long term, a reduction in kinesiophobia levels was observed. Furthermore, the authors of another systematic review (Lepri et al., 2023) proposed that the optimal number of NPE sessions is three or fewer.

The classification of the predominant pain phenotype facilitates the selection of an appropriate treatment approach and strategies to reduce sensitization and also the amplification of pain. Such a classification encourages the use of the biopsychosocial model and multidisciplinary integration, and an assessment is necessary to formulate the intervention (Nijs et al., 2023). Clinical criteria for classifying pain phenotyping are being developed to be adapted to chronic conditions (Nijs et al., 2021).

Pain can be classified into three main categories according to the International Association for the Study of Pain (IASP): nocioceptive pain, neuropathic pain, and nociplastic pain. Nocioceptive pain is caused by actual or threatened damage to non-neural tissue due to the activation of nocioceptors. Neuropathic pain is related to a lesion or disease of the somatosensory nervous system. Nociplastic pain, on the other hand, arises from altered nociception despite there being no tissue damage (Nijs et al., 2021, 2023).

The treatment of pain and the content of the NPE can be adapted according to the phenotype of the predominant pain. To address patients with predominantly nociceptive pain, the origin of nociception can be explained; in patients with predominantly neuropathic pain, the lesion or disease of the nervous system (NS) and central sensitization (CS) can be clarified; and nociplastic pain can be clarified about central sensitization (Nijs et al., 2023). Nevertheless, further research is required to establish a standardised approach to the content of the NPE and the number of sessions (Shin & Kim, 2023). Consequently, it is recommended that future studies test content designed specifically for each pain phenotype.

Although the findings of this study indicate that the video lessons developed were adequate and effective in increasing knowledge about the neurophysiology of pain in the short term, it is not possible to draw conclusions about the volunteers' ability to retain this knowledge over time or to incorporate the content into their routine. Therefore, further studies are necessary to address this limitation. The primary limitation of this study was the lack of participation by clinicians, who could have contributed to the construction of the content from a practical perspective of managing patients with chronic pain.

As a suggestion for future studies, it is necessary to validate the guiding principles for video lesson technology. The principal contribution of this study was to present the overarching thematic axes that are necessary for the construction of digital material, while also acknowledging the potential for further expansion of the content.

The following messages are directed at clinical professionals who are at the forefront of pain management: i) video lessons can reduce the bias of spoken language in conveying information; ii) an educational approach to pain neurophysiology serves to enhance one's understanding of pain.

FINAL CONSIDERATIONS

The findings of this study indicate that, at least in the short term, the systematic presentation of information on near-death experiences (NDEs) in video lessons is an effective method for increasing knowledge about pain. The material developed for this study can be broadly divided into three main areas: anatomy and neurophysiology; neurobiology and multifactorial aspects of the pain experience; and strategies for dealing with pain.

FOUNDING

This study was supported by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES – undergrand code: 1852), and the second author was the beneficiary.

DECLARATION OF CONFLICT OF INTEREST

The authors declare that there is no conflict of interest with this article.

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