



OPEN A cross-sectional study on pain neurophysiology knowledge among Spanish primary healthcare professionals

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Healthcare professionals' (HCPs) knowledge and beliefs about pain are known to influence the treatment outcomes. The objective of this descriptive cross-sectional study was to evaluate the knowledge of the neurophysiology of pain among HCPs working with pain patients in primary care. Physiotherapists, nurses, physicians, nursing assistants, social workers and dentists of primary care were surveyed using the Neurophysiology of Pain Questionnaire (NPQ)(range 0–19) between September–December of 2022. Data on demographics, job-related information, own chronic musculoskeletal pain experience and specific training in the management/treatment of chronic musculoskeletal pain were collected and analyzed. Out of 1265 HCPs contacted, 510 (40.3%) participated and completed the survey. They were mostly women (78%), with a mean age of 49.5 ± 11.9 years. The NPQ score was 12.8 ± 2 . Physiotherapists scored highest (14.4 ± 2). HCPs with chronic musculoskeletal pain scored less than those without, 12.5 ± 2 vs. 13 ± 1.8 ($p < 0.01$). The most reported areas of pain were the lumbar spine (25.3%) and neck (24.5%). No differences were found between sexes, age or healthcare profession. Primary HCPs demonstrated low to moderate levels of knowledge in pain neurophysiology, with room for improvement, particularly among those experiencing chronic musculoskeletal pain themselves. These findings suggest a need for enhanced pain management training, both within university curricula and through ongoing professional development programs for HCPs.

Keywords Chronic musculoskeletal pain, Pain knowledge, Pain management, Pain perceptions, Primary care, Survey

The global burden of chronic musculoskeletal pain continues to rise, affecting about 1.7 billion people, and constitutes the leading cause of disability and work absenteeism^{1,2}. In Spain, up to 25.9% of the population presents chronic musculoskeletal pain², which accounts for approximately 22% of primary care consultations³. The prevalence⁴ of chronic musculoskeletal pain is expected to continue to grow, and consequently, affect healthcare systems sustainability, especially the public ones⁵.

Pain is influenced not only by biological factors but also by cognitive, emotional, and social ones⁶. The significant advances recently observed in basic pain science, pain neuroscience, and pain management⁷ make it challenging for healthcare professionals (HCPs) to remain fully up to date, potentially creating a gap between current research and clinical practice. This evolving landscape not only complicates the application of new evidence into routine care but may also compromise patient outcomes.

HCPs knowledge and beliefs about pain may influence patient's beliefs and coping strategies⁸. Communication between HCPs and patients can influence treatment responses, therapeutic decisions, and occurrence of side effects⁹. In Spain, where the vast majority of chronic musculoskeletal pain patients are managed in the primary

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care, the public health system operates in a decentralized manner, with each autonomous community tailoring its primary care services to local needs. Primary care is delivered mainly through health centers—which serve as the gateway to the health system—and these centers are staffed by family doctors, nurses, pediatricians, midwives, physiotherapists, and other health professionals. These professionals provide direct patient care, health education, health promotion, and disease prevention¹⁰.

The curricula of some undergraduate health-related programmes (such as Medicine, Nursing, Physiotherapy) have improved over the years by incorporating biopsychosocial approaches to pain management^{11,12}. However, these curricula still have few hours of specific formation in pain neurophysiology^{11,13}. Several studies have assessed pain knowledge among healthcare undergraduate students, and highlighted the need for further curriculum enhancement to improve pain management competencies^{14–16}. One widely useful tool for assessing pain knowledge is the Neurophysiology of Pain Questionnaire (NPQ)¹⁷, which evaluates an individual's understanding of the biological mechanisms underlying pain.

Current clinical guidelines advocate for the use of educational interventions and therapeutic exercise as first-line treatments for persistent pain conditions^{18,19}. For example, pain science education (PSE) is used to improve chronic musculoskeletal pain patient's coping skills challenging and restructuring their maladaptive beliefs²⁰. Interestingly, chronic musculoskeletal pain patients have lower pain neurophysiology knowledge compared to non-chronic musculoskeletal pain patients²¹. A recent meta-analysis has shown that PSE has a small to moderate effect on pain intensity, disability and psychological distress while being a safe intervention²². It is relevant that the HCPs possess a comprehensive and up-to-date understanding of pain neurophysiology to properly deliver PSE to chronic musculoskeletal pain patients.

Given the crucial role of primary HCPs as the first point of contact for most chronic musculoskeletal pain patients, our primary objective was to assess their knowledge about pain neurophysiology within primary care settings. The secondary objective was to explore the associations between the knowledge about pain neurophysiology and various factors, including the number of training hours in pain management, healthcare profession, and urban and rural settings. Additionally, we assessed whether the presence of chronic musculoskeletal pain among HCPs influenced their understanding of pain neurophysiology.

Methods

Design and participants

This cross-sectional study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines²³. Ethical approval for the study was granted by the Valladolid East and West Ethics Committee (PI 22-2753 and PI 22-076). Data acquisition complied with Spanish Data protection regulations (*Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales*). Data was processed anonymously. Signed informed consent was obtained from all the participants.

Procedure

An institutional e-mail was sent to 1,265 HCPs from 41 different primary health care centres from Valladolid. Prior authorization was obtained from the two primary care management areas to invite all HCPs to participate in the study. All participants had to be active HCPs in the Primary Care Management of Valladolid. Participants were physiotherapists, nurses, physicians, nursing assistants, social workers and dentists.

The survey was administered between September and December 2022. Participants were provided with detailed information about the study and its implications. They were only allowed to continue with the survey if the informed consent to participate in the study was accepted. Participation was voluntary with no incentives given to participants.

Sociodemographic data was collected. All participants were asked whether they had received specific training in pain treatment, whether they work in urban, semi-urban or rural areas, healthcare profession and years in the same position. Participants were asked if they had chronic musculoskeletal pain or not, considering pain to be chronic if persists for more than 3 months²⁴. Regardless of whether the pain was chronic or not, the location of their pain was asked, using a body chart divided into nine regions: craniofacial, cervical, dorsal, low back, hips, arms, hands, legs and feet.

Pain neurophysiology knowledge was evaluated using the Spanish version¹⁶ of the NPQ¹⁷. The questionnaire is divided in two sections: “pain mechanisms” and “pain perception”. It consists of 19 closed-ended questions referred to the biological mechanisms that support pain or how and why pain is perceived, with the response options of true, false, or undecided (Table 1). Each correct response scored one point, whereas incorrect or undecided responses scored zero points. Items 1, 2, 8, 10, 12, 14, 15 and 18 were related to pain mechanisms. Items 3, 4, 5, 6, 7, 9, 11, 13, 16, 17 and 19 addressed pain perception. “Pain mechanisms” section has a score range from 0 to 8, while “pain perception” section ranges from 0 to 11, with higher scores indicating greater knowledge. A previous study considered a cut-off score of 10 points to define a sufficient level of knowledge for patients²⁵. Given that a score below 10 is deemed insufficient for patients, we assumed that HCPs should ideally achieve a score higher than 10 to be considered as having sufficient knowledge about pain.

Statistical analysis

NPQ score and NPQ sections are summarized with means and standard deviations. Categorical variables are expressed with absolute frequencies and percentages. Student t-test was applied for comparing percentages of correct answer in the NPQ sections pain mechanisms and pain perception, while 95% confidence intervals (95%CI) were calculated for percentages of participants who responded incorrectly to NPQ items. A multiple-way ANOVA was conducted to examine the effects of age (categorized as 18–40, 41–55, and 56–70), sex, specific training, work setting, specific training in chronic musculoskeletal pain, and presence of chronic musculoskeletal

| Question | T | F | U |
|-----------------------------------------------------------------------------------------------------------------------|---|---|---|
| 1 Receptors on nerves work by opening ion channels in the wall of the nerve | * | | |
| 2 When part of your body is injured, special pain receptors convey the pain message to your brain | | * | |
| 3 Pain only occurs when you are injured | | * | |
| 4 The timing and intensity of pain matches the timing and number of signals in nociceptors | | * | |
| 5 Nerves have to connect a body part to your brain in order for that body part to be in pain | | * | |
| 6 In chronic pain, the central nervous system becomes more sensitive to nociception | * | | |
| 7 The body tells the brain when it is in pain | | * | |
| 8 The brain sends messages down your spinal cord that can increase the nociception going up your spinal cord | * | | |
| 9 The brain decides when you will experience pain | * | | |
| 10 Nerves adapt by increasing their resting level of excitement | * | | |
| 11 Chronic pain means that an injury hasn't healed properly | | * | |
| 12 Nerves can adapt by making more ion channels | * | | |
| 13 Worse injuries always result in worse pain | | * | |
| 14 Nerves adapt by making ion channels (gates) stay open longer | * | | |
| 15 s-order nociceptor (messenger nerve) post-synaptic membrane potential is dependent on descending modulation | * | | |
| 16 When you are injured, the environment that you are in will not have an effect on the amount of pain you experience | | * | |
| 17 It is possible to have pain and not know about it | | * | |
| 18 When you are injured, chemicals in your tissue can make nerves more sensitive | * | | |
| 19 In chronic pain, chemicals associated with stress can directly activate nociception pathways | * | | |

Table 1. Neurophysiology of pain questionnaire (NPQ)¹⁷. *Correct answer; T: True; F: False; U: Undecided.

pain on NPQ scores. Assumptions of normality and homogeneity of variances were assessed before conducting the analysis. Post hoc comparisons were performed using Tukey's test to account for comparing NPQ scores across HCPs. To quantify the magnitude of the differences, effect sizes were calculated using Cohen's d, with thresholds defined as (d < 0.2), medium (0.2 ≤ d ≤ 0.5), and large (d > 0.8)²⁶. Associations between NPQ scores and categorical variables were visualized using multiple boxplots. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using R version 4.1.3.

Results

Missing data

We had two missing values, one for age and another for healthcare profession. These patients were not included in the analysis of that variable.

Socio-demographic data

A total of 510 out of the 1,265 (40.32%) HCPs participated in the study, of whom 78% were women. The mean age of the participants was 49.5 ± 11.9 years. In terms of healthcare profession, nurses represented the largest proportion of participants (42.9%). Physiotherapists were the profession with most years in the same job position (12.7 ± 10.3), followed by the "other" group with 12.5 ± 12.7 years, physicians with 11.6 ± 11.8 years and finally nurses with 9.5 ± 10.9 years.

A total of 55.7% of the respondents reported that they had not received any specific training on the management of chronic musculoskeletal pain. Those who claimed to have received through training courses of less than 50 h or through clinical sessions. A total of 43.7% (223) of participants reported the presence of chronic musculoskeletal pain. Table 2 shows a complete description of socio-demographic data.

NPQ score

The overall NPQ score was 12.8 ± 2.0 with 67.3% of correct answers. Participants scored highest in pain mechanisms than in pain perception (5.6 ± 1.1 with 70.3% correct answers vs. 7.2 ± 1.5 with 65.1% correct answers; $p < 0.001$). Some of the most commonly incorrectly answered questions were:

- Q2: 469 participants answered incorrectly (92%, 95% CI: 89.3, 94).
- Q4: 442 participants answered incorrectly (86.7%, 95% CI: 83.4, 89.3).
- Q5: 380 participants answered incorrectly (74.5%, 95% CI: 70.5, 78.1).

On the other hand, the most frequently correct questions were:

- Q19: 496 participants answered correctly (97.5%, 95% CI: 95.5, 98.4).
- Q13: 486 participants answered correctly (95.29%, 95% CI: 93.09, 96.82).

A more detailed description is presented in Fig. 1.

| Socio-demographic data | N (%) |
|----------------------------------------|-------------|
| Age 18–40 | 119 (23.4%) |
| Age 41–55 | 206 (40.5%) |
| Age 56–99 | 184 (36.1%) |
| Men | 112 (22%) |
| Nurse | 219 (42.9%) |
| Years in same job position (Mean ± SD) | 9.5 ± 10.9 |
| Physician | 215 (42.2%) |
| Years in same job position (Mean ± SD) | 11.6 ± 11.8 |
| Physiotherapist | 41 (8%) |
| years in same job position (Mean ± SD) | 12.7 ± 10.3 |
| Other | 35 (6.9%) |
| Years in same job position (Mean ± SD) | 12.5 ± 12.7 |
| Specific training in chronic pain: yes | 226 (44.3%) |
| Suffer from Chronic pain: yes | 223 (43.7%) |
| Work setting: urban area | 327 (64.1%) |
| Work setting: rural area | 183 (35.9%) |

Table 2. Socio-demographic characteristics of the sample. *SD* standard deviation.

NPQ scores across subgroups

Physiotherapists achieved higher NPQ score (14.4 ± 2) than physicians (13.2 ± 1.7 , $p < 0.001$, $ES = 0.69$) and nurses (12.4 ± 1.8 , $p < 0.001$, $ES = 1.15$). Participants with specific training in the management of chronic musculoskeletal pain scored higher in the NPQ (13.3 ± 1.8) than those with no specific training (12.4 ± 2 , $p = 0.06$, $ES = 0.46$) as shown in Fig. 2. No differences were found between sexes, age, or work setting (rural or urban) in NPQ scores. (Table 3)

HCPs pain and pain location

Two-hundred twenty-three participants (43.7%) answered that they were suffering from chronic musculoskeletal pain. Out of them, 45.7% were women. In relation to healthcare profession, they were: 45.7% in nurses, 41.4% in physicians, 29.3% in physiotherapists and 61.8% in other healthcare professions.

HCPs suffering from chronic musculoskeletal pain scored lower (12.5 ± 2.1) in the NPQ than those who did not suffer (13 ± 1.8 , $p = 0.02$ $ES = 0.29$) (Fig. 2).

Regardless of whether the pain was chronic or not, the location of their pain was asked. Up to 25% ($n = 129$) of the sample had pain in the lower back, which was the most commonly reported side of pain, followed by neck pain ($n = 125$, 24%). The third most frequently reported pain location was the dorsal back ($n = 56$, 11%). Figure 3 provides a full description of reported pain areas.

Discussion

The results of this study showed that pain neurophysiology knowledge was low to moderate among HCPs in Valladolid, as assessed by the NPQ. Physiotherapists were the ones with higher pain neurophysiology knowledge, followed by physicians and nurses. Also, HCPs who had received specific pain management training had higher pain neurophysiology knowledge than their counterparts. No differences were found between sexes, age or work setting. The 43.7% of the sample have chronic musculoskeletal pain. HCPs with chronic musculoskeletal pain scored lower on the NPQ than those without.

Studies assessing pain knowledge often use questionnaires and scales that predominantly take a biomedical approach. These instruments, such as the Knowledge and Attitude Survey Regarding Pain²⁷ or modified versions^{28–30}, focus on pharmacological and interventional pain management rather than first-line of treatment strategies. Current clinical practice guidelines in chronic conditions like low back pain¹⁸, neck pain³¹, and fibromyalgia³², recommend a more comprehensive and active coping treatments based on exercise¹⁹, patient education and cognitive-behavioral therapy. Consequently, it is essential to use questionnaires that assess professionals’ knowledge and focus on the updated understanding of chronic pain.

Related to healthcare profession and pain neurophysiology knowledge, physiotherapists scored the highest. The field of physiotherapy is characterized by its breadth of specialization, encompassing areas such as neurology, traumatology, and sports, each demanding continuous and specialized education. This inherent diversity compels physiotherapists to engage in persistent postgraduate training, seeking master’s degrees and specialized courses to maintain expertise within their chosen domains. This demand is reflected in the wide range of postgraduate training available, including master’s degrees and postgraduate programs with significant workloads (e.g., postgraduate programs in Neurofunctional and Cardiorespiratory Physiotherapy exceeding 1900 h) and specialized courses with durations of 20–25 h. Although a recent study reported that physiotherapists who completed their education more than 10 years ago showed a minor improvement in evidence-based knowledge compared to those who recently finished their university degree³³, physiotherapy remains a highly updated profession due to its strong emphasis on continuous professional development and the rapid integration of new research and clinical practices into its curriculum and practice. Different studies have been published recently

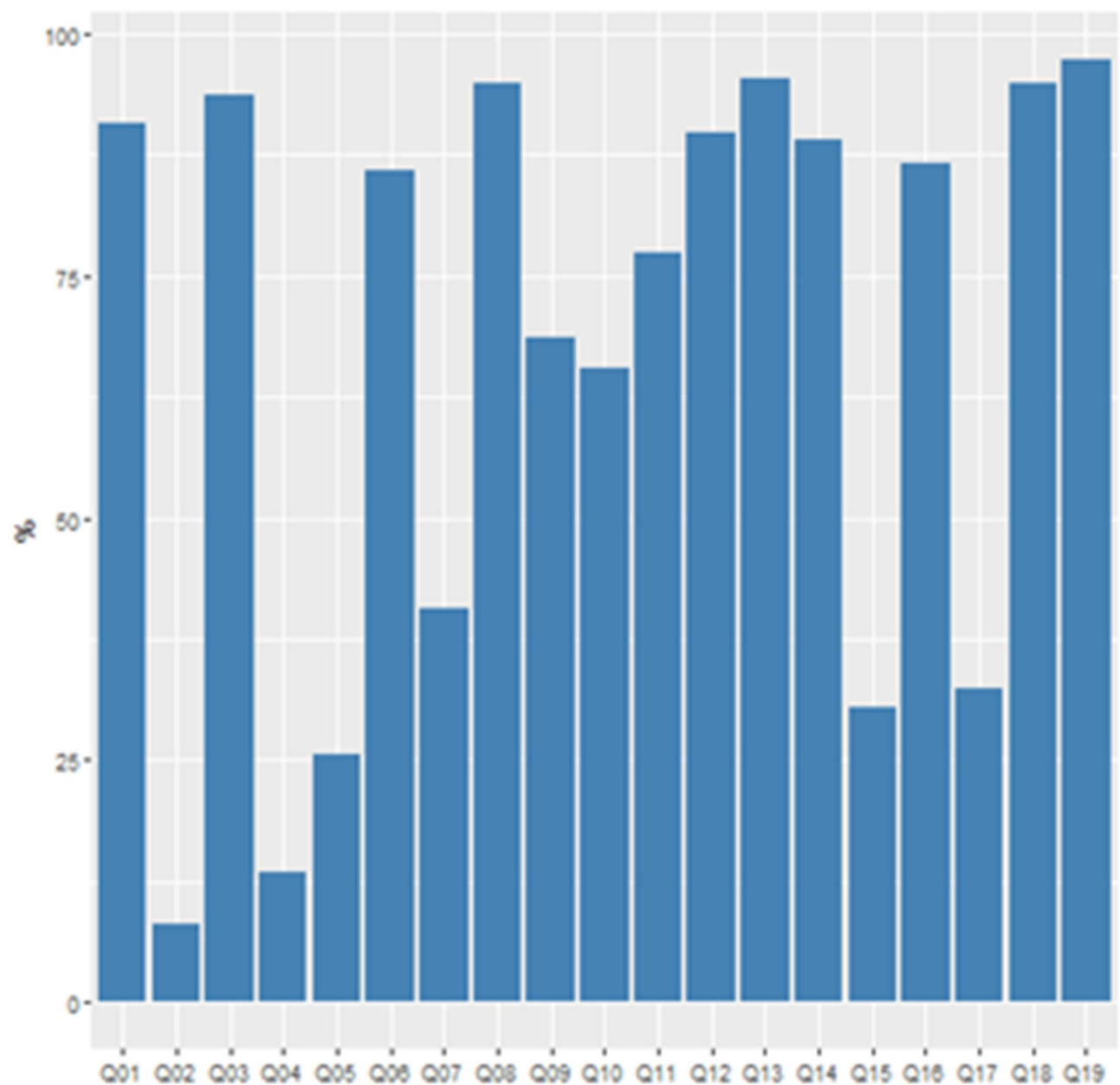


Fig. 1. Percentage of correct answers to each question of the Neurophysiology of Pain Questionnaire (NPQ).

assessing pain neurophysiology knowledge among physiotherapists. Fourré et al.³⁴ showed that physiotherapists had a mean score of 12.6 in the NPQ (66% of correct answers), which is similar than our overall results, but lower than the results observed in Stern et al.³⁵ and Lane et al.³⁶, with a 75% and 80% of correct answers, respectively. However, the latter two studies used the short form of the NPQ, which contains only 12 questions^{35,36}.

We have found only one study¹⁴ evaluating pain neurophysiology knowledge using the NPQ in other HCPs non-physiotherapists, where they scored 8.4/12 (short form of NPQ). Due to the use of the short form and the small sample size ($n = 14$), it is difficult to draw reliable conclusions from this study. The insufficient knowledge is also reflected in undergraduate students, as seen in another study carried out in Spain, last year physical therapy students (68.9% of correct answers) seem to know more about pain neurophysiology than last year medical students (54%)¹⁶.

With the exception of physiotherapists, our sample of other HCPs exhibited higher scores in pain mechanisms knowledge. This discrepancy might stem from a reliance on traditional neurophysiological knowledge, which could explain the elevated scores in this particular subset of questions compared to those assessing pain perception. It is possible that physicians and nurses in Spain are less acquainted with recent advancements in pain neurophysiology, which may have been disseminated primarily through physical therapy congresses. This could account for the observed differences in overall NPQ scores and subset scores, both among students and professionals. Furthermore, pain perception and the role of the brain and the central nervous system in

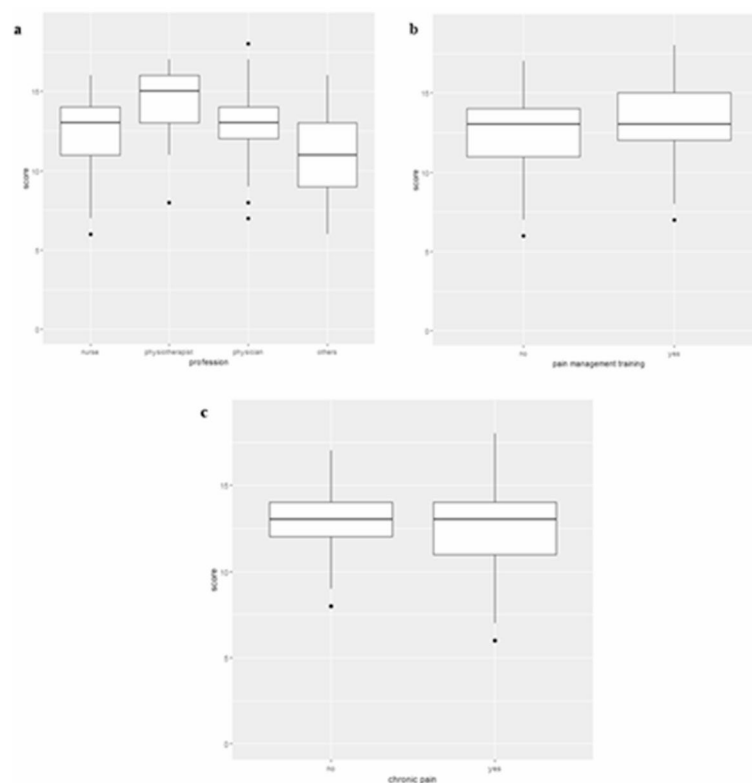


Fig. 2. Neurophysiology of Pain Questionnaire (NPQ) scores among different groups. It ranges from 0 to 19. The higher the score the more knowledge in pain neurophysiology. **(A)** Healthcare profession, **(B)** Having received specific pain management training and **(C)** Suffer from chronic pain. The “others” group is composed by nursing assistants, social workers, odontologists and wardens.

| | | NPQ score | Effect size | F value | p-value |
|-----------------------------------|-----------------|------------|-------------|---------|---------|
| Age | 18–40 | 12.7 ± 1.9 | | 0.15 | 0.70 |
| | 41–55 | 12.9 ± 2.0 | 0.12 | | |
| | 56–70 | 12.8 ± 1.9 | 0.05 | | |
| Sex | Female | 12.8 ± 1.9 | | 0.89 | 0.34 |
| | Male | 12.7 ± 2.0 | 0.08 | | |
| Profession | Physiotherapist | 14.4 ± 2.0 | | 29.19 | <0.001 |
| | Nurse | 12.4 ± 1.7 | 1.15 | | |
| | Physician | 13.2 ± 1.7 | 0.69 | | |
| | Other | 11.1 ± 2.7 | 1.86 | | |
| Work setting | Rural | 12.7 ± 1.9 | | 0.16 | 0.68 |
| | Urban | 12.9 ± 2.0 | 0.11 | | |
| Specific training in chronic pain | Yes | 13.3 ± 1.8 | | 3.54 | 0.06 |
| | No | 12.4 ± 2.0 | 0.46 | | |
| Suffering from chronic pain | Yes | 12.5 ± 2.1 | | 5.13 | 0.02 |
| | No | 13.0 ± 1.8 | 0.29 | | |

Table 3. NPQ score subgroups comparison. NPQ scores are expressed in Mean ± SD.

pain processing. Consequently, not all HCPs may be fully familiar with these concepts, despite their crucial importance for the effective management of patients with chronic musculoskeletal pain³⁷.

HCPs knowledge and beliefs about chronic pain have been recognised to have an impact on patients³⁸. A systematic review showed that the education provided to patient was related with HCPs’ attitudes and beliefs³⁹. Another study demonstrated that pain catastrophizing followed by high levels of pain was related to pain chronification⁴⁰. This suggests that insufficient knowledge of pain neurophysiology among HCPs could contribute to poor management of both acute and chronic musculoskeletal pain, potentially leading to an increase in chronic musculoskeletal pain patients in the future. This could even affect HCPs own’s pain, as it

Location of pain

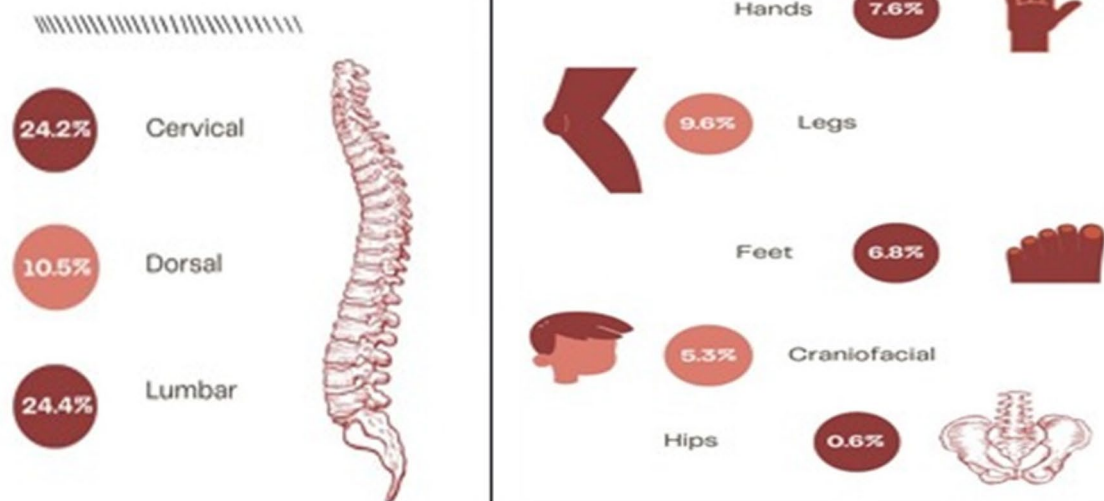


Fig. 3. Participants' pain location. Low back and cervical pain were the most frequent areas of pain.

could be taking them away from active coping it, as recommended by clinical practice guidelines^{18,19}. Such a correlation may shed light on the association observed between lower pain neurophysiology knowledge and the presence of chronic musculoskeletal pain in HCPs. Training HCPs in a biopsychosocial model can improve knowledge and attitudes towards people with pain⁴¹, as well as reducing pain catastrophizing levels⁴². PSE and therapeutic exercise have been shown to improve pain catastrophizing among chronic back pain patients^{43–45}, maintaining the improvements up until 6 months after the intervention in some cases⁴⁵.

There is a need of updating the pain curricula imparted at universities^{13,46–49}. As deficit in pain neurophysiology knowledge has also reported by undergraduate students from various health professions^{16,50}. In addition, an international study of undergraduate students, including nurses, midwives, and allied health professionals, showed that there was little improvement in knowledge and attitudes between first and final years students. This suggests that the curriculum has little impact on students' understanding of pain¹⁴. However, in our sample we do not find any differences in pain neurophysiology knowledge between age groups, which could mean that the formation received in this topic might have been similar in the last decades. A study of the Canadian Universities on number of hours studied among the different healthcare programmes unveiled that Veterinary had, by far, more hours dedicated to studying pain neurophysiology, followed by Physical Therapy¹³. In a similar report published by Miró et al. across Catalonia healthcare undergraduate degrees, similar results were found, being Dentistry and Veterinary the degrees with the most hours dedicated to the study of pain, with 115 and 103 respectively, followed by physical therapists with 97, Nursing with 87 and Medicine with 70¹¹. It is noteworthy that, despite the prevailing biomedical model among Spanish physicians, which often prioritizes pharmacological pain management they receive the least amount of dedicated pain education in their curricula. We therefore believe that public healthcare systems should prioritize lifelong initiatives for HCPs, since it is crucial they remain current with evidence-based practices, particularly in common pain conditions³³.

Interestingly, we found that approximately 44% of our sample suffers from chronic musculoskeletal pain. This is significantly higher than national average (25.9%) reported by the Spanish National Pain Observatory. In a sample of 14,720 HCPs studied, the 14.3% of them had pain in the lower back and 17.1% in other body location for longer than 3 months⁵¹, which is almost three times less than in our sample. However, this data should be considered carefully, as the mean age is 33.8 ± 8.6 years, factor that could explain the big difference in chronic musculoskeletal pain prevalence with our sample. Among a different 2572 HCPs sample, the 69.1% of them suffered from chronic low back pain, where 71% were females, with 49.5% of people with chronic low back pain had between 40 and 64 years old⁵². In addition, Daraiseh et al.⁵³ found that in a 263-nurse sample from a hospital setting, 28% reported having low back pain that was functionally limiting in the last year. There seems to be a higher chronic musculoskeletal pain prevalence among HCPs than in general population.

By 2050, the world population of people aged 60 and 80 and over will have doubled and tripled, respectively⁵⁴. Spain will be the most aged country in the world in 2050, when 31.4% of the population will be over 65 years of age. With increasing life expectancy and an aging population, chronic musculoskeletal pain is also expected to increase in the coming years². We firmly believe that a change in the current health treatment model is essential. Using a biopsychosocial approach and involving the patient in their treatment and educating them to actively deal with their pain^{55–57} may be a critical step forward.

To assess the external validity of our study, we compared the demographic characteristics of our sample with those reported for the Spanish primary national healthcare system. By examining the distribution of sex, age, and job position, we observed a notable similarity between our sample and the Spanish Primary National Healthcare System⁵⁸. This comparative analysis suggests that our findings are likely representative of the broader population of primary HCPs in Spain, thereby strengthening the generalizability of our conclusions.

This study presents several limitations that warrant consideration. Firstly, the cross-sectional design precludes the establishment of causal relationships between pain neurophysiology knowledge and the presence of chronic musculoskeletal pain in HCPs. Consequently, we cannot determine whether lower knowledge contributes to pain, or vice versa. Secondly, the 40.3% response rate may introduce selection bias, as HCPs who chose to participate might possess different characteristics or knowledge levels compared to those who did not. While the NPQ was utilized, its inherent limitations, including reported poor fit for some items, could affect the validity of the results. Furthermore, the study's reliance on self-reported chronic musculoskeletal pain, without standardized pain measurement tools, limits the precision of pain assessment. Finally, the inclusion of an “other professionals” group with only 34 participants from diverse disciplines hinders the ability to draw meaningful conclusions about this subgroup.

Given the observed knowledge gaps in pain neurophysiology among HCPs, future research should prioritize international replication of this study to assess the prevalence of this issue across diverse public healthcare systems. Finally, research should explore the impact of specific training programs on knowledge translation and clinical practice of HCPs, ultimately aiming to improve patient outcomes in chronic pain management.

Conclusion

Primary HCPs of Valladolid have low to moderate pain neurophysiology knowledge, with room for improvement, particularly among those experiencing chronic musculoskeletal pain themselves. The finding that physiotherapists demonstrate the highest level of knowledge underscores the potential value of their specialized training in this area. Moreover, the correlation between personal experience with chronic musculoskeletal pain and lower knowledge scores suggests that subjective pain experience may negatively influence understanding and application of pain neurophysiology principles. While factors such as sex, age, and profession did not significantly impact knowledge levels, the positive association between formal pain management training and higher scores reinforces the importance of continuous professional development. Consequently, these results call for a reevaluation of current training programs and university curricula, with a focus on integrating comprehensive pain neurophysiology education to enhance the clinical competency of all primary HCPs and ultimately improve patient outcomes in chronic pain management.

Data availability

Sequence data that support the findings of this study have been deposited in the private database of the Unit for Active Coping Strategies for Pain in Primary Care, which is not accessible since it is a public institution. If required, data will be sent via email. Please contact FMC, on fmonteroc@saludcastillayleon.es to access the data.

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Author contributions

LPP and FMC designed the study and collected the data. JN and LPP wrote the original draft. AMI and JN performed the statistical analysis. LBS, FMC and RMCG reviewed and edited the final draft. All authors have reviewed the final form of the manuscript. ChatGPT4 which has been used to improve the language and quality of the text. The authors have reviewed the final version to ensure accuracy and clarity.

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Declarations

Competing interests

The authors declare no competing interests.

Additional information

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