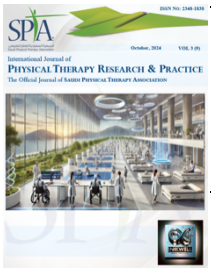

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Original Article

Pain Neuroscience Education Training Enhances Pain Knowledge Among A Sample of Saudi Physiotherapists but does not Alter Attitudes or Beliefs

Mai Aldera[1]

[1.] Health Rehabilitation Sciences, College of Applied Medical Sciences, King Saud University, Saudi Arabia.
*Corresponding Authors: maldera@ksu.edu.sa

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Abstract

Background: Pain management for patients with chronic pain requires a comprehensive biopsychosocial approach that includes pain neuroscience education. Physiotherapists play a crucial role in delivering pain education and require a strong understanding of pain neuroscience education to enable them to tailor individual patient education, refine clinical decision-making, and potentially address central sensitization. However, limited research explores the Saudi physiotherapists' knowledge and attitudes towards pain neuroscience education. **Objectives:** This study investigated the impact of pain neuroscience education training on physiotherapists' knowledge, attitudes and beliefs towards working with people with chronic pain. **Methods:** Twenty-six physiotherapists participated in a 3-day, 21-hour intensive pain neuroscience education training program aligned with International Association for the Study of Pain (IASP) standards. The program included lectures, case studies, and group discussions led by a pain rehabilitation expert. Participants completed the Health Care Pain Attitudes and Impairment Relationship Scale (HC-PAIRS) and the Revised-Neuroscience Pain Questionnaire (R-NPQ) before and after the training. **Results:** Knowledge scores (R-NPQ) significantly increased post-intervention ($p < .001$), with a greater number of correct responses and fewer incorrect responses. No significant changes were observed in attitudes towards chronic pain patients (HC-PAIRS, $p = .99$). **Conclusion:** This study demonstrates that a structured pain neuroscience education (PNE) training program can significantly enhance the knowledge of Saudi physiotherapists. However, it highlights a potential gap in influencing attitudes towards chronic pain patients. Future research should explore the effectiveness of multi-component interventions, including clinical supervision, to foster long-term behavioural changes aligned with biopsychosocial principles of pain management.

Keywords: Pain neuroscience education, pain education, physiotherapists, chronic pain, physiotherapists' knowledge and attitudes.

Introduction

Chronic pain is a global health concern, ranking as a leading cause of disability (Mills et al., 2019). Effective management of chronic pain conditions requires a comprehensive approach, and evidence-based practice emphasizes the biopsychosocial model (Bevers et al., 2016). This model

acknowledges the complex interplay of biological, psychological, and social factors in the perception and experience of pain (Bevers et al., 2016). A comprehensive approach to chronic pain management must consider these multifaceted influences of the biopsychosocial factors to provide effective patient care and education (Bevers et al., 2016). Thus, pain education for affected patients emerges as a promising first-line intervention method (Moseley et al., 2024; Clarke et al., 2011).

While pain education empowers patients with knowledge, Pain Neuroscience Education (PNE) empowers them with a deeper understanding of pain's intricate biological, psychological, and social factors. It dissipates the misconception that pain solely reflects tissue damage and highlights its potential persistence even after healing (Moseley et al., 2024). Furthermore, PNE emphasizes the influence of social, psychological, and biological factors on pain perception (Moseley & Butler, 2015). Equipped with this understanding, PNE can assist patients to become active participants in their treatment, fostering potentially improved outcomes (Moseley et al., 2024; Clarke et al., 2011).

Physiotherapists play a vital role in pain management teams (Jacobs et al., 2016). Their grasp of the core concepts of PNE can enhance patient care. For example, physiotherapists can leverage PNE to demystify the process of central sensitization (a heightened pain response) and its impact on pain perception for their patients. Physiotherapists who understand PNE are better equipped to tailor patient education, refine clinical decision-making, and potentially address central sensitization (Moseley et al., 2024; Jacobs et al., 2016). This, in turn, has the potential to lead to substantial improvements in patient outcomes (Clarke et al., 2011).

However, a crucial question arises: are physiotherapists adequately equipped with the latest knowledge on pain neuroscience education (PNE)? Research in Saudi Arabia suggests a concerning knowledge gap regarding PNE among physiotherapists, highlighting the need for targeted training (Alodaibi et al., 2018; Alhowimel et al., 2021). Notably, in Saudi Arabia, there is a lack of research comparing knowledge and attitudes among therapists before and after pain education training. This present study aims to address this gap by investigating physiotherapists' knowledge and attitudes towards pain management before and after PNE training and the association between the knowledge and attitudes of physiotherapists with their gender, age, education level, work experience, and location in Saudi Arabia (Central region, Eastern region, Northern region, Southern region, and Western region).

Methods

A prospective pre-post study was conducted in Saudi Arabia. A convenience sample of physiotherapists working full-time in musculoskeletal outpatient services within the Saudi Ministry of Health (MOH) was recruited. Eligible participants were invited to a free, 26-participant capacity training workshop as part of the MOH's continuous education program. Prior to enrollment, all potential participants received a detailed information sheet outlining the study's objectives, procedures, potential risks and benefits, and their right to withdraw at any time. Written informed consent was obtained from each participant, ensuring they fully understood the study and voluntarily agreed to participate. Participants were assured that their identities would remain anonymous throughout the study

Table 1: Mapping the learning objectives to the 2017 IASP Interprofessional Pain Curriculum.

Learning objective	Description
1. Understand the multidimensional nature of pain.	Recognize the biological, psychological, and social factors that contribute to the pain experience. Nociceptive, neuropathic and nociplastic pain mechanisms; central sensitisation and pain chronicity; the role of descending pain modulatory systems; psychological/social factors influencing pain perception
2. Discuss clinical assessment and measurement approaches.	Utilize appropriate tools and techniques to assess and measure pain, including self-report measures, observational scales, and physiological indicators
3. Describe multi-professional and interprofessional strategies for pain management.	Collaborate with other healthcare professionals to develop and implement effective pain management plans
4. Recognize the importance of patient-centered care.	Prioritize the patient's perspective and needs in pain management decision-making
5. Address common misconceptions about pain	Correct misunderstandings about pain, such as the belief that pain is always a sign of injury.
6. Identify risk factors for the development of chronic pain	Recognize factors that may contribute to the transition from acute to chronic pain.
7. Discuss the role of non-pharmacological interventions in pain management.	Understand the benefits and limitations of non-pharmacological approaches, such as physical therapy, occupational therapy, and cognitive-behavioural therapy.
8. Apply principles of evidence-based practice to pain management	Use research-based evidence to guide clinical decision-making.
9. Address ethical considerations in pain management.	Recognize and address ethical dilemmas related to pain treatment, such as the use of opioids.

The training package included 21 hours of education provided over 3 days. The education included interactive elements like case studies and group discussions. The learning materials were provided by an expert and academic consultant in pain rehabilitation. The training package adhered to The International Association for the Study of Pain (IASP) standards, featuring clear, measurable objectives that directly corresponded with the 2017 IASP Interprofessional Pain Curriculum (International Association for the Study of Pain, 2024). This curriculum offers a comprehensive overview of pain management principles and practices, as outlined in Table (1).

Outcome Measures

Participants' demographic data were collected before the education session, including gender, age, education level, work experience, and location in Saudi Arabia (Central region, Eastern region, Northern region, Southern region, and Western region).

Participants completed two outcome measures before and after the pain neuroscience education training sessions: the English version of the Health Care- Pain Attitudes and Impairment Relationship Scale (HC-PAIRS; Rainville et al., 1995) and the English version of the Revised-Neurophysiology Pain Questionnaire (R-NPQ; Moseley, 2007; Catley et al., 2013). Given that physiotherapists working in Saudi Arabian hospitals are required to study and speak English, the use of English versions of these measures was appropriate.

The Health Care-Pain Attitudes and Impairment Relationship Scale (HC-PAIRS)

The HC-PAIRS was used to assess participants' attitudes towards patients with chronic pain and comprises 13 items. Each item has a 7-point Likert scale response ranging from strongly disagree (= 1) to strongly agree (= 7). Scores can range from 13–91, with lower scores indicating more positive

practitioner attitudes towards chronic pain patients. The HC-PAIRS is a valid and reliable measure of attitudes towards patients with chronic pain (Rainville et al., 1995; Mutsaers et al., 2012).

The Revised-Neurophysiology Pain Questionnaire (R-NPQ)

The R-NPQ was used to assess participants' knowledge of pain neuroscience, as it shows better psychometric properties than the Neurophysiology Pain Questionnaire (NPQ; Catley et al., 2013). It consists of 13 statements, and the participant can respond with true, false, or unsure. Each correct answer receives 1 point, while incorrect and unsure responses receive 0 points (Moseley, 2003). The total score can range from 0 (lowest understanding) to 13 (highest understanding). A total score of 0–4 is interpreted as indicating low knowledge of pain neurophysiology, a score between 5–8 indicates moderate knowledge of pain neurophysiology, and a score of 9–12 indicates high knowledge of pain neurophysiology (Catley et al., 2013). The R-NPQ is a valid and reliable measurement tool (Catley et al., 2013).

Data Analyses

Descriptive statistics were used to describe the sample's characteristics. Paired sample t-tests were used to compare pre- to post-study scores measured using the HC-PAIRS and R-NPQ measurement outcomes. P values less than 0.05 were considered significant. Effect size calculations were made to test the statistical significance using Cohen's d (Cohen, 1988).

Reliability Analysis

A reliability analysis was performed on the items comprising the HC-PAIRS. The initial analysis indicated a low internal consistency both at pre- (α = .44) and post-intervention (α = .54) time points, with several negative intercorrelations. Six items were therefore removed, based on the total number of negative intercorrelations and the increase in the internal consistency of the scale their removal would result in. The removal of these 6 items led to an internal consistency of α = .60 for the pre-intervention time point and α = .67 for the post-intervention time point. Total mean scores on the remaining 7 items were calculated for each time point, with higher values indicating more positive attitudes towards patients with chronic pain.

Assumption Testing

Prior to proceeding with the inferential analyses, the assumptions required for each parametric test were assessed. The evaluation of skewness and kurtosis values suggested normally distributed data in HC-PAIRS at both intervention time points, as well as in HC-PAIRS pre-post intervention change scores. Also, normally distributed data were observed in R-NPQ correct and wrong responses at both intervention time points and in R-NPQ pre-post intervention change scores. In addition, although normally distributed data were identified in R-NPQ-neutral responses at pre-intervention time points, data were not normally distributed at post-intervention time points. Therefore, the equivalent non-parametric test was performed in the case of R-NPQ post-intervention neutral responses. In addition, non-parametric tests were conducted for age and years of work experience, due to the ordinal level of measurement (Field, A., 2018).

Relationship Between Attitudes Towards Patients with Chronic Pain and Pain Neuroscience Knowledge

A Pearson's correlation analysis was conducted to assess if there was a statistically significant

relationship between pre-post intervention change in attitudes towards patients with chronic pain, measured with the HC-PAIRS, and pre-post intervention change in R-NPQ scores.

Relationship between gender and HC-PAIRS scores: A series of independent samples t-tests were conducted to assess if there was a statistically significant difference in pre-intervention attitudes towards patients with chronic pain and pain neuroscience knowledge between men (n = 9) and women (n = 17).

Relationship between years of experience and HC-PAIRS scores

To explore potential correlations between years of clinical experience and pre-post intervention attitudes towards chronic pain patients and pain neuroscience knowledge, a Spearman's rho correlation analysis was conducted

Relationship between age and HC-PAIRS scores

To explore potential correlations between participants' age groups and pre-intervention attitudes towards chronic pain patients and pain neuroscience knowledge, a Spearman's rho correlation analysis was conducted

Results

Sociodemographic Characteristics

Fifty-five physiotherapists applied to participate in the training program from whom 26 were selected based on the MOH criteria of having a minimum and maximum number of educational courses per year for each participant. As shown in Table 2, of the 26 participants, most were women (65.4%), aged between 30 to 39 years (46.2%). Most often (42.3%), participants had between 6 to 10 years of work experience and lived in the central region of Saudi Arabia.

Table 2: *Sociodemographic Characteristics of the Sample (N = 26)*

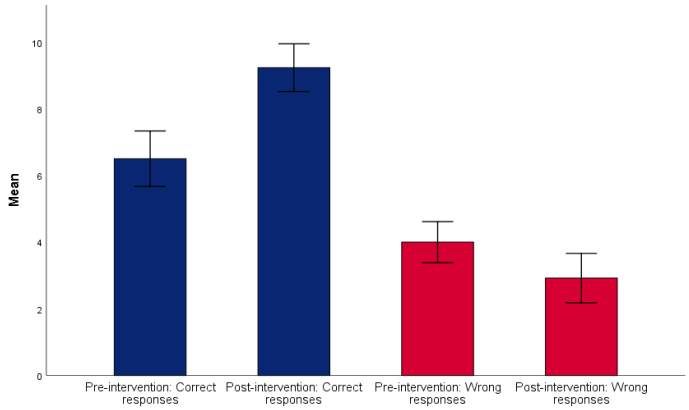
	n	%
Gender		
Men	9	34.6
Women	17	65.4
Age		
20-29 years	10	38.5
30-39 years	12	46.2
40-49 years	4	15.4
Education		
Bachelor's degree	24	92.3
Master's degree and above	2	7.7
Work experience		
0-5 years	8	30.8
6-10 years	11	42.3
11-15 years	3	11.5
16-20 years	3	11.5
Above 20 years	1	3.8
Location in Saudi Arabia		
Central	11	42.3
Eastern	5	19.2
Northern	3	11.5
Southern	3	11.5
Western	4	15.4

Main Outcomes

As shown in Figure 1, HC-PAIRS scores did not show a statistically significant difference from pre- to post-study (p = 0.99) and effect size Cohen's d = 0.003. For the R-NPQ, there was a statistically significant change in the number of correct responses [t (25) = -7.73, p < .001, Cohen's d = -1.52], wrong responses [t (25) = 2.30, p = .006, Cohen's d = 0.59], and unsure responses [T = 7.00, p = .001, r = -0.65] between pre- and post-study. Post-intervention there was a greater number of

correct responses, a lower number of wrong responses, and a lower number of neutral responses.

Figure 1: Number of correct and wrong for the Pain Neuroscience Knowledge Before and After the Intervention (N = 26)



Note. Error bars represent 95% CIs.

Relationship Between Attitudes Towards Patients with Chronic Pain and Pain Neuroscience Knowledge

Correlation analyses indicated a non-statistically significant relationship in pre-post intervention change incorrect (p = .98), wrong (p = .22), and neutral responses (p = .12) (see Table 3 for correlation coefficients).

Table 3: *Relationship Between Change in Attitudes Towards Patients with Chronic Pain and Change in Pain Neuroscience Knowledge (N = 26)*

	Attitudes	Correct responses	Wrong responses	Neutral responses
Attitudes	1			
Correct responses	0.005	1		
Wrong responses	-0.25	-0.33	1	
Neutral responses	0.31	-0.47*	-0.63**	1

* $p < .05$; ** $p < .01$

Relationship between Sociodemographic Characteristics and HC-PAIRS scores

A Spearman's rho correlation analysis was performed to evaluate if there was a statistically significant relationship between age and years of work experience with pre-intervention attitudes towards patients with chronic pain and pain neuroscience knowledge (N = 26), as shown in Table 4, no significant relationships were found between age and HC-PAIRS scores (p = 0.71) or correct responses on the R-NPQ (p = 0.77).

Table 4: Relationship between Age and Years of Work Experience with Pre-Intervention Attitudes Towards Patients with Chronic Pain (HC-PAIRS) and Reserved-Pain Neuroscience Knowledge (R-R-NPQ) (N = 26).

	Age	Years of exp.	Attitudes	Correct responses	Wrong responses	Neutral responses
Age	1					
Years of experience	0.73**	1				
Attitudes	-0.076	-0.019	1			
Correct responses	0.061	0.18	-0.12	1		
Wrong responses	0.60**	0.40*	-0.16	-0.36	1	
Neutral responses	-0.44*	-0.46*	0.24	-0.76**	-0.3	1

* $p < .05$; ** $p < .01$

However, a statistically significant positive strong relationship was demonstrated between age and wrong responses on the R-NPQ (p = 0.001), and a statistically significant negative strong relationship

between age and neutral responses on the R-NPQ (p = 0.023). No significant relationship was found between years of work experience and HC-PAIRS scores (p = 0.93) or correct responses on the R-NPQ (p = 0.38). A statistically significant positive strong relationship was found between years of work experience and wrong responses on the R-NPQ (p = 0.046), as well as a statistically significant negative strong relationship between years of work experience and neutral responses (p = 0.019).

Furthermore, no significant differences were found between genders for pre-intervention HC-PAIRS scores and R-NPQ scores between genders (see Table 5).

Table 5: Results of Independent Samples T-tests Between Men (n = 9) and Women (n = 17) in Differences in Pre-intervention Attitudes Towards Patients with Chronic Pain and Pain Neuroscience Knowledge

	Men Mdn±SD	Women Mdn±SD	t	p	Cohen's d
Attitudes	4.38±1	4.4±0.7	-0.05	1	-0.02
Correct answers	6.4±2.3	6.5±2	-0.1	0.9	-0.04
Wrong answers	4±1.8	4±1.4	0	1	0
Neutral answers	2.6±1.9	2.3±2	0.32	0.8	0.13

DISCUSSION

This study aimed to investigate the effect of PNE training on physiotherapists' knowledge and attitudes towards pain management and, secondarily, explore the association of various demographic factors on pre-intervention outcomes. We found that 21 hours of training of physiotherapists in PNE resulted in a significant increase in the knowledge of participants but did not significantly change their attitude towards patients with chronic pain.

The Revised-Neurophysiology of Pain Questionnaire (R-NPQ)

The Revised Neurophysiology of Pain Questionnaire (R-NPQ) was used to assess participants' knowledge of pain mechanisms. Our findings align with previous research demonstrating that short-term pain education programs significantly improve pain neuroscience understanding among physiotherapists (Cox et al., 2016; Mankelow et al., 2022; Bareiss et al., 2019). This is further supported by the statistically significant changes observed in our study, with participants exhibiting a marked increase in correct responses and a decrease in both incorrect and unsure responses pre- and post-training.

Furthermore, a noteworthy finding of this study is the significant decrease in unsure responses (p = 0.001) between pre- and post-training. This indicates that the 21-hour educational program effectively addressed areas of uncertainty among physiotherapists regarding pain neuroscience. By reducing these knowledge gaps and fostering a more comprehensive understanding, the program likely contributed to an improved level of confidence in their ability to handle pain-related problems.

Notably, many prior studies investigating knowledge gains employed physiotherapy students at various stages of their education and with diverse academic backgrounds (Cox et al., 2016; Bareiss et al., 2019; Wassinger, 2021; Saracoglu et al., 2021). This observation suggests that a strong foundation in basic sciences, such as anatomy and physiology, might have facilitated the acquisition of new knowledge regarding pain neuroscience, regardless of the participants' years of practice experience.

The Health Care-Pain Attitudes and Impairment Relationship Scale (HC-PAIRS)

The result of the HC-PAIRS scores revealed no significant change in participants' attitudes and beliefs towards chronic pain patients following 21 hours of education sessions. This finding aligns with some previous studies, particularly among physiotherapy students at the entry-level, where studies have shown no immediate or short-term (6-month) shifts in attitudes following educational sessions (Latimer et al., 2004). However, this contrasts with other studies that observed reductions in negative attitudes after educational interventions. For instance, a cross-sectional study involving students across various healthcare disciplines demonstrated significant improvement in physiotherapy students' attitudes towards chronic pain (Mankelow et al., 2022). Additionally, Colleary et al.'s (2017) work suggests that even brief educational sessions (70 minutes) can positively impact physiotherapists' recommendations for chronic pain patients in the UK. However, reconciling these seemingly contradictory findings is challenging due to the lack of standardized educational content and varying intervention durations across studies.

Factors Influencing Results

Several factors might explain the observed lack of significant change in physiotherapists' attitudes and beliefs. Firstly, Mezirow's transformative learning theory (Baumgartner, 2012; Owen, 2016) suggests ingrained knowledge (constructivism), like the biomedical model prevalent in Saudi physiotherapy education (Owen, 2016), can be challenging to shift. This presents an obstacle in modifying attitudes towards chronic pain, which necessitates a biopsychosocial approach (Simpson et al., 2021). Future interventions promoting critical reflection could foster a more transformative learning experience.

Secondly, the HC-PAIRS instrument was specifically designed to assess attitudes and beliefs towards chronic low back pain (Rainville et al., 1995). The educational training sessions in the current study, however, provided general education on pain mechanisms and contributors applicable to various complex pain conditions. This lack of specific focus on chronic low back pain in the educational intervention might have limited the HC-PAIRS' ability to capture broader shifts in participants' general pain beliefs and attitudes, as suggested by Houben et al. (2004).

Furthermore, the educational module content in many previous studies (Cox et al., 2016; Mankelow et al., 2022; Bareiss et al., 2019; Wassinger, 2021) appears to be spread out over a longer period compared to the present research. The current study conducted an intensive (21-hour) delivery within three days. This concentrated approach may have negatively enhanced accessibility to instructors and information, potentially leading to a different learning experience compared to time-spread-out modules.

Demographic Variables: R-NPQ and HC-PAIRS

The findings of the current study suggest that while physiotherapists increased their level of knowledge regarding pain education after an intense training program, this was not sufficient to change their attitude. The finding shows there is no statistical significance between age and year of work experience and the HC-PAIRS. However, a statistically significant negative strong relationship between age and the R-NPQ neutral responses was identified, suggesting that older individuals provided more wrong responses and fewer neutral responses.

The result revealed a statistically significant negative correlation between years of experience

and the number of neutral responses on the R-NPQ. This suggests that participants with more experience provided fewer neutral responses and potentially more incorrect answers. While experience can be a valuable teacher (Daley & Cervero, 2016), the professional environment can hinder knowledge acquisition. It is noteworthy that most participants (70%) had extensive experience (over six years) and nearly all (90%) held bachelor's degrees, potentially indicating a need for educational interventions that address knowledge gaps not necessarily filled by clinical practice (Rojo et al., 2023).

Limitations:

This study acknowledges several limitations. Firstly, the sample size was relatively small, potentially limiting the generalizability of the findings. While participants were recruited from various locations within Saudi Arabia, a larger sample could provide more robust results. Additionally, the study lacked a follow-up period to assess knowledge retention and potential changes in attitudes and behaviours. Finally, the research did not directly investigate modifications in clinical behaviour. It's important to recognize that altering therapists' beliefs may not always translate into immediate changes in their clinical practice.

Conclusions

The present study investigated the impact of a short-term, intensive educational program on physiotherapists' knowledge and attitudes regarding chronic pain management. Our findings demonstrate that the program effectively enhanced participants' knowledge of pain mechanisms, as evidenced by the significant improvement in R-NPQ scores. However, the intervention did not yield a statistically significant change in attitudes towards chronic pain patients as measured by the HC-PAIRS questionnaire.

These findings suggest a potential dissociation between knowledge acquisition and attitudinal change. Future research could explore the effectiveness of educational programs designed specifically to target and modify attitudes and beliefs related to chronic pain, potentially incorporating strategies that promote critical reflection and foster a more transformative learning experience. Additionally, future studies may benefit from employing a larger sample size and incorporating a follow-up period to assess the long-term retention of knowledge and potential changes in clinical behaviour.

Declaration of Interest:

The author reports there are no competing interests to declare.

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