

ORIGINAL SCIENTIFIC PAPER

The Relationship between Pain Neurophysiology Knowledge and Attitudes toward Biopsychosocial Approach to Treatment of Back Pain in Physical Therapists in Slovenia

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Abstract

Integrating the biopsychosocial model in physical therapy is essential for effective pain management and requires properly educated physical therapist. This study examines if knowledge of pain neurophysiology influences physical therapists' preference for a biopsychosocial approach in treating back pain (BP) in Slovenia. Data were collected via an anonymous online survey, distributed to physical therapists in Slovenia. The final sample consisted of 66 participants, with a mean age of 30.4 years. The results indicated a significant negative correlation between NPQ (Neck Pain Questionnaire) scores and "Pain Attitudes and Beliefs Scale for Physiotherapists Ratio" (PABS-Ratio) ($\rho = -0.44$; $p < 0.001$), suggesting that physical therapists with higher pain neurophysiology knowledge are more inclined towards the biopsychosocial approach. The regression analysis revealed that NPQ score was the only significant predictor of PABS-Ratio ($R^2 = 0.31$). This study demonstrates a significant relationship between pain neurophysiology knowledge and a preference for the biopsychosocial approach to treating BP among physical therapists in Slovenia. Therapists with greater knowledge of pain neurophysiology are more likely to adopt a biopsychosocial approach. Future research should explore this relationship in different cultural contexts and investigate strategies to overcome barriers to the implementation of the biopsychosocial model in clinical settings.

Keywords: *pain science, physical therapy, pain education, evidence-based practice, treatment preferences*

Introduction

Inappropriate beliefs about pain can cause patients to experience increased fear, stress, and anxiety, which can lead to avoidance of physical activity and increased disability (Gardner et al., 2017; Louw, Zimney, O'Hotto, & Hilton, 2016; Louw, Zimney, Puentedura, & Diener, 2016; Nijs, Roussel, Paul van Wilgen, Köke, & Smeets, 2013). Patient's beliefs can be influenced by the beliefs of the healthcare provider (Darlow et al., 2012; Gardner et al., 2017). Therefore, it is important for healthcare professionals to be aware of their own beliefs and how these may impact their patients' perceptions of pain.

Over the past two decades, pain literature has experienced

rapid growth, with the number of articles increasing nearly threefold (Ozek, Lu, Pouromran, Radhakrishnan, & Kamarthi, 2023). Traditionally, the understanding of the pathophysiology of pain has been based on the biomedical model, i.e. the belief that pain and disability result from a particular structural impairment and that treatment should be directed at that impairment (Darlow et al., 2012; Gardner et al., 2017; Leysen et al., 2021). Modern pain neuroscience emphasizes that pain is often unrelated to tissue damage and can even occur without it. In addition, psychological (behaviours, beliefs, stress, catastrophizing) and social factors (family and work-related issues) play an important role in the experience of pain (Pincus, Burton, Vogel, & Field, 2002).



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In patients with low back pain (LBP), psychosocial factors are thought to have a greater impact on LBP disability than biomedical (i.e., injury severity and the condition of body structures) or biomechanical factors (i.e., kinetics, kinematics, muscle activity and gait parameters) (Abd Rahman, Li, Schmid, & Shaharudin, 2023; Eriks-Hoogland et al., 2011; Linton, 2000). Furthermore, psychosocial factors are associated with the transition from acute to chronic LBP, with fear avoidance, depression, and catastrophizing predicting this progression (Pincus et al., 2002). Research shows that catastrophizing, depression, kinesiophobia, and avoidance behaviors are associated with poorer treatment outcomes and increased disability in LBP patients (Pincus & McCracken, 2013; Ranger et al., 2020). Therefore, healthcare professionals should consider all aspects of LBP (biomedical/biomechanical and psychosocial) and apply a biopsychosocial treatment approach for both acute and chronic stages of LBP (Mescouto, Olson, Hodges, & Setchell, 2022; Nieminen, Pyysalo, & Kankaanpää, 2021). Considering psychosocial factors in treatment is also important for patients with neck pain – occupational psychosocial factors have been shown to have a greater impact on neck pain intensity than occupational biomechanical factors (Igwesi-Chidobe, Effiong, Umunnah, & Ozumba, 2024).

It seems that adequate knowledge among healthcare professionals is crucial for the effective implementation of the biopsychosocial model in the management of back pain (BP). Studies demonstrate that greater orientation towards biopsychosocial treatment in managing patients with LBP is supported by physiotherapists' knowledge of pain neurophysiology (Mikamo and Takasaki, 2021). Knowledge of pain neurophysiology also contributes to reducing beliefs that chronic LBP and musculoskeletal pain justifies disability (Mukoka, Olivier, & Ravat, 2019; Springer, Gleicher, & Hababou, 2018), reflecting the perspective of the biomedical model. Furthermore, studies demonstrate that pain knowledge gained through additional training based on the International Association for the Study of Pain guidelines can significantly enhance understanding of pain and notably increase the attitudes towards a biopsychosocial approach among physiotherapists (Bareiss, Nare, & McBee, 2019). Exploring a relationship between pain neurophysiology knowledge and attitudes towards biopsychosocial model can help in modifying educational programs to better contribute to evidence-based treatment of patients with BP, for instance, by placing greater emphasis on pain neurophysiology. To determine whether the findings are consistent across different practitioner groups and countries, it is crucial to conduct similar research with physical therapists internationally. Various healthcare systems, cultural attitudes towards pain, and educational approaches may influence the relationship between knowledge of pain neurophysiology and attitudes towards the biopsychosocial treatment model. The aim of our study was to determine the relationship between pain neurophysiology knowledge and attitudes toward biopsychosocial approach to treatment of BP among physical therapists in Slovenia. We hypothesize that physical therapists who are well-versed in pain neurophysiology are more likely to adopt a biopsychosocial approach than those who are unfamiliar with it. Additionally, we hypothesize that post-graduate students are more likely to favor the biopsychosocial model and have greater knowledge of pain, as they are currently in the process of education compared to participants, who completed their studies years ago.

Methods

Data collection

Data were collected via an online anonymous survey (1KA online portal, Centre for Social Informatics, University of Ljubljana) between November 2023 and February 2024. An online link to the survey was distributed through an email database we created by gathering contact information from both public and private physical therapy centers across Slovenia. The emails were primarily sent to healthcare centers or private practices rather than individual practitioners. The only eligibility criteria for participation in the survey was a minimum of a Bachelor's degree in physical therapy. One month after the initial invitation, reminder emails were sent again. The participants were requested to acknowledge their consent for the data to be used (anonymously) for the purposes of this study. Participants acknowledged their voluntary participation at the beginning of the survey by ticking a box next to the statement. The survey was returned by 86 participants, however, only 66 were complete and were included into the final analysis. The sample consisted of 47 women and 19 men (mean age: 30.4 ± 6.8 years; range = 22–62 years). Twenty-one participants (26.5%) were post-graduate students with Bachelor's degree in physical therapy. The research methods and interventions used were non-invasive and approved by the Commission of the University of Primorska for Ethics in Human Subjects Research.

Questionnaires

The survey incorporated sections for demographic information, including gender, age, educational status, and duration of clinical or work experience. Additionally, it featured the revised NPQ (Neck Pain Questionnaire) (Catley, O'Connell, & Moseley, 2013) and the PABS-PT (Pain Attitudes and Beliefs Scale for Physiotherapists) (Houben et al., 2005). The inclusion of educational status was specifically designed to identify those participants who, despite already possessing a Bachelor's degree, were engaged in further studies at the Master's or PhD level.

The PABS-PT was formulated to distinguish between biomedical and biopsychosocial approaches in the treatment of LBP (Ostelo, Stomp-van den Berg, Vlaeyen, Wolters, & de Vet, 2003). The original 31-item PABS-PT questionnaire was previously revised (Houben et al., 2005). The revised scale, which was used in this study, consists of a two-factor structure, encompassing a ten-item subscale for biomedical orientation and a nine-item subscale for biopsychosocial orientation, employing a six-point Likert scale (ranging from 1 for 'totally disagree' to 6 for 'totally agree'). Higher scores on each subscale suggest a more pronounced leaning towards either the respective treatment orientation. We followed the methodology of a prior research where the mean scores of each subscale were computed (PABS-Biomedical and PABS-Biopsychosocial, respectively), and the ratio between PABS-Biomedical and PABS-Biopsychosocial was determined (PABS-Ratio) (Mikamo & Takasaki, 2021). A ratio greater than 1 indicates a predominant biomedical treatment orientation, implying that the clinician views disability and pain primarily as outcomes of specific tissue pathology, and thus focuses on treatments targeting these pathologies. Conversely, a ratio less than 1 suggests a predilection for biopsychosocial treatment, reflecting the clinician's belief that disability and pain are not solely the result of tissue damage but may also be influenced by psychological and social factors.

The revised NPQ (Neurophysiology of Pain Questionnaire) was designed to assess the extent of knowledge regarding pain neurophysiology. Initially developed in 2003 (Moseley, 2003), it underwent a revision and revalidation in 2013 (Catley et al., 2013). The NPQ is a unidimensional instrument consisting of 12 items (Catley et al., 2013), each with a three-level categorical response option: true, false, or undecided. The scoring of the NPQ is based on the number of correct responses (either 'true' or 'false'), with a higher number of correct responses (maximal score =12) indicating a better understanding of pain neurophysiology. A score of 0 is attributed to incorrect responses and those marked as undecided.

Questionnaire translation

To ensure that the participants took the survey in their native language, a translation-backtranslation was carried out. The approach involved initially translating the original survey instruments from English into the Slovenian language. This was done by both authors independently. The authors are both fluent in the English language. Their translations were compared afterwards and a consensus was reached. In case of disagreement, a third researcher not involved in the study (physical therapist with PhD and university professor) was consulted. Subsequently, a separate bilingual expert, unaware of the original English version, translated the content back into English. This process ensured the accuracy of the translation and verified that the translated version accurately reflects the same item content and meaning as the original English version. The internal consistency of the translated questionnaires based on the data from this

study was acceptable for NPQ score (Chronbach's $\alpha=0.63$), and good for PABS-Biopsychosocial subscale ($\alpha=0.71$) as well as PABS-Biomedical subscale ($\alpha=0.78$).

Statistical analysis

Data were analyzed statistically using IBM SPSS software (version 27.0). Descriptive statistics were presented with frequencies and frequency proportions for categorical variables, and as means and standard deviations for numeric variables. Where necessary, the normality of the distributions was checked using the Shapiro-Wilk test. One-sample t-test was used to test if there was a statistically significant preference for either biomedical or biopsychosocial model (reference criterion =1). Gender comparisons, as well as comparisons between students and the rest of the sample, were conducted using the Mann-Whitney test due to the non-normal distribution of the questionnaire scores. The associations between NPQ and PABS were assessed using Spearman's rank-order correlation coefficient, interpreted as very low ($0 < \rho \leq 0.19$), low ($0.2 \leq \rho \leq 0.39$), medium ($0.4 \leq \rho \leq 0.59$), high ($0.6 \leq \rho \leq 0.79$), or very high ($0.8 \leq \rho \leq 1.0$). To report the confidence in correlation coefficients, 95% confidence intervals (CI) were added. Additionally, a multiple linear regression analysis was performed with gender, educational status, and NPQ as predictors, and PABS-Ratio as the dependent variable. Statistically significant results were accepted at $p < 0.05$.

Results

General outcomes

The students were significantly younger than the rest of the participants (26.1 ± 3.8 years vs. 34.8 ± 9.7 years; $p < 0.001$).

Table 1. Descriptive statistics for key outcome variables.

Outcome variable	Mean	SD	Minimum	Maximum
Age (years)	31.37	8.75	22	62
Working experience. if any (n = 47)	10.57	10.02	1	42
NPQ Score	8.19	1.74	3	12
Biomedical score	34.86	7.62	10	51
Biopsychosocial Score	34.09	6.13	9	43
PABS-Ratio	1.06	0.31	0.46	2.04

Legend: SD – standard deviation, NPQ - Neurophysiology of Pain Questionnaire (NPQ); PABS - Pain Attitudes and Beliefs Scale for Physiotherapists Ratio

Mean PABS-Ratio was 1.08 ± 0.27 , indicating a slight preference for the biomedical model (Table 1). One-sample t-test indicated that this deviation was not significantly different from the neural score of 1 ($t=1.72$; $p=0.090$). Mean PABS-Biomedical factor was 34.11 ± 7.5 points (range =23–47) and mean PABS-Biopsychosocial factors was 35.74 ± 6.5 points (range =18–43). The mean NPQ score was 8.18 ± 1.81 points (range =3–12). Independent-sample t-test indicated a significantly higher NPQ score for men ($p=0.033$), but no differences for PABS-Ratio ($p=0.364$). Similarly, students did not show different scores than the rest of the sample (NPQ: $p=0.736$; PABS-Ratio: $p=0.260$).

Correlations

Across the whole sample, there was a significant negative small-to-moderate correlation between PABS-Ratio and NPQ score ($\rho=-0.44$; 95%CI=-0.25 to -0.60; $p < 0.001$), indicating that participants with higher NPQ scores lean toward the bio-

psychosocial model. The correlation seemed to be potentially stronger in men ($\rho=-0.53$; 95% CI=-0.10 to -0.79; $p=0.019$) than in women ($\rho=-0.36$; 95% CI=-0.08 to -0.59; $p=0.015$). In addition, the correlation appeared to be stronger in students ($\rho=-0.56$; 95% CI=-0.17 to -0.80; $p=0.010$) compared to the rest of the sample ($\rho=-0.42$; 95% CI = -0.20 to -0.60 $p = 0.004$). Years of working experiences did not correlate with NPQ scores ($p=0.118$) and PABS-Ratio ($p=0.789$). Similarly, age did not correlate with neither NPQ score ($p=0.490$) nor the PABS-ratio ($p=0.611$).

Regression

A stepwise linear regression model included only NPQ score as a significant predictor of PABS-Ratio ($F=29.85$; $p < 0.001$; $R^2=0.31$). The regression coefficients indicated that each point increase in NPQ score, the PABS-Ratio is decreased by 0.09 (95% Confidence interval =0.06–0.13) (Figure 1).

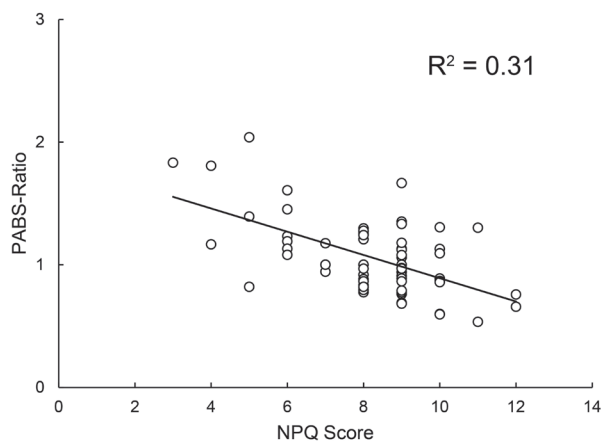


FIGURE 1. The relationship between NPQ scores and PABS-Ratio.

Discussion

Our study aimed to determine the relationship between pain neurophysiology knowledge and attitudes toward biopsychosocial approach to treatment of BP among physical therapists in Slovenia. As hypothesized, the correlation analysis showed that physical therapists with greater knowledge of pain neurophysiology (i.e., with higher NPQ scores) lean more toward the biopsychosocial approach (i.e., have lower PABS-Ratio) when treating patients with BP.

Since the biopsychosocial model and the science of pain have developed concurrently, our results are to be expected. Pain was previously equated with nociception, which is consistent with the biomedical model (Cohen, Quintner, & Buchanan, 2013). However, modern research shows that nociception is simply the stimulation of nerves that convey information about potential tissue damage to the brain, whereas pain is a subjective perception resulting from the processing of sensory information that is influenced by an individual's genetic composition, prior learning history, current psychological status, and sociocultural influences – factors that are taken into account within the biopsychosocial model (Gatchel, Peng, Peters, Fuchs, & Turk, 2007; Moseley & Vlaeyen, 2015). Our results demonstrating positive association between pain neurophysiology knowledge and biopsychosocial approach to treating patients in physical therapists, are similar to a previous study by Mikamo and Takasaki (2021), which concluded that pain neurophysiology knowledge may support biopsychosocial management of LBP among Japanese physical therapists. When comparing the strength of these associations, our step-wise linear regression model yielded an R^2 of 0.31, indicating stronger predictive power than the multiple regression analysis by Mikamo and Takasaki (2021), which yielded an R^2 of 0.16. While the association between pain neurophysiology knowledge and the tendency towards a biopsychosocial approach to treatment appears to be similar regardless of cultural differences, we found some other distinctions between participants from different countries. Our research has shown that physical therapists in Slovenia have a slight preference for the biomedical approach when treating patients with BP, which is in contrast to the results found in Japanese physical therapists who on average preferred the biopsychosocial approach (Mikamo & Takasaki, 2021). This discrepancy may be due to differences in clinical and working environments, as well as varying levels of knowledge about pain neurophysiology. In addition to the lack of knowledge, clinical/working environment may also

affect the tendency to adopt a biomedical approach to treatment. Time and work pressure have been found to be the most common barriers to the implementation of evidence-based practice in physiotherapy (Nascimento, Fernandes, Teixeira-Salmela, & Scianni, 2020; Scurlock-Evans, Upton, & Upton, 2014). The findings of other studies further confirm the importance of pain knowledge in driving changes in attitudes toward the treatment of patients. For example, studies have demonstrated that pain neuroscience education for healthcare providers enhances their understanding of pain neurophysiology and positively influences their attitudes toward managing pain, including in patients with LBP, supporting the adoption of a biopsychosocial approach or reducing the tendency toward a biomedical approach (Colleary, O'Sullivan, Griffin, Ryan, & Martin, 2017; Mankelov, Ryan, Taylor, & Martin, 2020; Saracoglu, Aksoy, Afsar, & Arik, 2021).

Furthermore, our results showed that the correlation between pain neurophysiology knowledge and the tendency to adopt a more biopsychosocial approach to the management of BP patients is higher in students compared to the rest of the sample. These results suggest that knowledge of pain neurophysiology in students/young population strongly determines the extent to which they tend to adopt a biopsychosocial approach. The working population/older people with more pain neurophysiology knowledge also tend to lean towards the biopsychosocial model when treating BP patients, but this link is not so strong for them. Therefore, in the working/older population, pain neurophysiology knowledge does not seem to have as much influence on the choice of treatment approach as it does in the younger population. One possible explanation for this discrepancy is that knowledge of pain neurophysiology may have a greater influence on students' choice of approach, as they generally lack extensive work experience. In contrast, physical therapists with greater work experience, even if less educated in pain neurophysiology, may still recognize the importance of psychosocial factors in patient care. Through practical experience, they may naturally adopt a biopsychosocial model, regardless of their theoretical knowledge specifically related to pain neurophysiology. Supporting this notion, Huang et al. (2023) emphasize that clinical experience itself can influence a practitioner's knowledge. It is also possible that, although practitioners have theoretical knowledge of pain neurophysiology, the transfer of this knowledge to the clinical setting is limited by barriers such as non-standard practices in clinical settings, doubts regarding clinical compe-

tence, lack of perceived professional support, insufficiencies in teaching and learning process and discrepancies between simulated scenarios and actual clinical situations (Hashemiparast, Negarandeh, & Theofanidis, 2019).

We found that pain neurophysiology knowledge and the tendency towards a biopsychosocial approach are neither influenced by the years of work experience nor by the age of the physical therapists. This probably highlights the importance of physical therapists' individual commitment to continuous professional development, critical evaluation of their practice and openness to adopting new, evidence-based techniques. Studies have identified several personal characteristics that promote the willingness to adopt evidence-based practices: taking responsibility for learning activities; deviating from traditional protocols (Delitto, 1998); open-mindedness (Hurley, 2000); willingness to engage in clinical practices inconsistent with local norms (Green, Gorenflo, Wyszewianski, & Michigan Consortium for Family Practice Research, 2002); and believing that evidence-based guidelines can be applied without compromising productivity or patient flow (Bridges, Bierema, & Valentine, 2007). In contrast to our findings, Bareiss et al., (2019) observed that knowledge of pain neurophysiology and attitudes toward treating patients with LBP are influenced by the year of study. They found that senior students demonstrated greater knowledge of pain neurophysiology and a stronger tendency toward a biopsychosocial approach compared to junior students. Such a discrepancy may be attributed to differences in educational programs across

countries—universities in some regions may incorporate more content on pain neurophysiology into their curricula compared to those in Slovenia.

The main limitation of our study is the potential for sampling bias. The participants who chose to respond to our survey might have had a pre-existing interest in pain neurophysiology and the biopsychosocial model, potentially skewing the results. This suggests that our sample may not be fully representative of the broader population of physical therapists in Slovenia. Future research should aim to mitigate this by employing strategies to encourage a more diverse range of participants, potentially through different recruitment methods. In addition, the cause-and-effect relationship cannot be established from our study design; it could be that an initial interest in biopsychosocial model led some participants to learn about pain neurophysiology.

Conclusions

In conclusion, our study demonstrates a significant relationship between pain neurophysiology knowledge and a preference for the biopsychosocial approach to treating BP among physical therapists in Slovenia – physical therapists with greater pain neurophysiology knowledge lean more toward the biopsychosocial approach when treating patients with BP. Future research should aim to explore this relationship in different cultural contexts and investigate strategies to overcome barriers to the implementation of biopsychosocial model when treating patients with BP in clinical settings.

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Conflict of interest

The authors report there are no competing interests to declare.

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