

Assessment of knowledge about the neurophysiology of pain and self-perception of skills to assist individuals with pain among undergraduate physiotherapy students in Brazil: cross-sectional study

Avaliação do conhecimento sobre neurofisiologia da dor e autopercepção de habilidades para atender indivíduos com dor em graduandos e graduados em fisioterapia no Brasil: estudo transversal

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ABSTRACT

BACKGROUND AND OBJECTIVES: Approaches to coping with pain, such as patient education, are directly related to the professionals' skill level. The identification of possible learning gaps in the different stages of training can contribute to the development of new teaching strategies and methods. This study aimed to evaluate and compare the level of knowledge about the neurophysiology of pain and the self-perception of abilities to care for individuals with pain in undergraduate and graduate students in physiotherapy in Brazil.

METHODS: This is a cross-sectional analytical observational study, in which the Neurophysiological Pain Questionnaire (QND) was applied to assess the level of knowledge about the neurophysiology of pain. A self-administered questionnaire was also used to collect sociodemographic data from the sample and to assess self-perception of abilities to care for individuals with pain. The characteristics of the study population were defined by descriptive statistics. For the analysis of QND score distribution and self-perception of abilities to care for individuals with pain, the Shapiro-Wilk test was used. In the bivariate analysis to

compare the distribution of the QND score and self-perception of abilities to care for individuals with pain between the stages of undergraduates and schooling after graduation, the Kruskal-Wallis test was used, with a significance level of 5% and 95% confidence interval. The statement Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) was used as a guide for reporting the results of the study.

RESULTS: A total of 306 volunteers participated in the study, 208 undergraduate students (22.3 ± 3.2 years) and 98 physiotherapists (31.7 ± 8.7 years). The average QND score for undergraduate students was 6.17 and 8.56 for physiotherapists, considering a total of 12 points. There was a significantly higher difference in the scores obtained on the QND by undergraduates in the intermediate phase and in the last year ($p < 0.05$), as well as in the self-perception of abilities to care for individuals with pain and perform a biopsychosocial approach to the patient, between the different phases of the course. However, among physiotherapists, no significant difference was observed in the total QND score, and in the self-perception of abilities to care for individuals with pain.

CONCLUSION: The findings of this study suggest that the level of knowledge about the neurophysiology of pain and self-perception of skills to care for individuals with pain differs between academics and physiotherapy professionals. However, the low QND score of physiotherapy undergraduates, as well as the absence of significant differences in the QND between the different levels of physiotherapist training, suggest that curricular implementation and specific training on pain may be indispensable to increase the level of knowledge and skills of physiotherapists in the treatment of individuals with pain.

Keywords: Health knowledge, Pain, Neurophysiology, Physiotherapy.

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HIGHLIGHTS

- When compared to undergraduates, Physiotherapists present greater knowledge about pain neurophysiology and self-perception of skills to assist individuals with pain.
- The low score of the Neurophysiological Pain Questionnaire suggests that curricular implementation of pain-oriented subjects is needed in undergraduate physiotherapy education.
- Specific training on pain should be carried out to increase the level of knowledge and skills of physiotherapists in the treatment of individuals with pain.

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RESUMO

JUSTIFICATIVA E OBJETIVOS: Abordagens para o enfrentamento da dor, como educação do paciente, estão diretamente relacionadas ao nível de habilidades dos profissionais. A identificação de possíveis lacunas do aprendizado nas diferentes fases de formação pode contribuir para o desenvolvimento de novas estratégias e métodos de ensino. O objetivo deste estudo foi avaliar e comparar

o nível de conhecimento sobre neurofisiologia da dor e a autopercepção de habilidades para atender indivíduos com dor em alunos de graduação e graduados em fisioterapia no Brasil.

MÉTODOS: Trata-se de um estudo observacional analítico do tipo transversal, em que foi aplicado o Questionário Neurofisiológico de Dor (QND) para avaliar o nível de conhecimento sobre neurofisiologia da dor. Também foi utilizado um questionário autoaplicado para coletar os dados sociodemográficos da amostra e avaliar a autopercepção de habilidades para atender indivíduos com dor. As características da população do estudo foram definidas pela estatística descritiva. Para a análise da distribuição do escore QND e da autopercepção de habilidades para atender indivíduos com dor foi utilizado o teste Shapiro-Wilk. Na análise bivariada para a comparação de distribuição do escore QND e da autopercepção de habilidades para atender indivíduos com dor entre as fases dos graduandos e a escolaridade após a formação foi utilizado o teste de Kruskal-Wallis, nível de significância de 5% e intervalo de confiança de 95%. A declaração *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) foi utilizada como guia para relatar os resultados do estudo.

RESULTADOS: Um total de 306 voluntários participaram do estudo, sendo 208 alunos de graduação ($22,3 \pm 3,2$ anos) e 98 fisioterapeutas ($31,7 \pm 8,7$ anos). A pontuação média do QND para os alunos de graduação foi 6,17 e de 8,56 para os fisioterapeutas, considerando um total de 12 pontos. Observou-se uma diferença significativamente superior na pontuação obtida no QND pelos graduandos da fase intermediária e do último ano ($p < 0,05$), bem como na autopercepção de habilidades para atender indivíduos com dor e realizar uma abordagem biopsicossocial do paciente entre as diferentes fases do curso. Contudo, entre os fisioterapeutas, não foi observada diferença significativa na pontuação total do QND e na autopercepção de habilidades para atender indivíduos com dor.

CONCLUSÃO: Por meio dos achados deste estudo, foi possível observar que o nível de conhecimento sobre neurofisiologia da dor e autopercepção de habilidades para atender indivíduos com dor difere entre acadêmicos e profissionais de fisioterapia. Entretanto, a pontuação baixa do QND dos graduandos de fisioterapia, bem como a ausência de diferenças significativas do QND entre os diferentes níveis de formação dos fisioterapeutas, sugere que a implementação curricular e capacitações específicas sobre dor são indispensáveis para ampliar o nível de conhecimento e habilidades dos fisioterapeutas no tratamento de indivíduos com dor.

Descritores: Dor, Educação em saúde, Especialidade de Fisioterapia, Neurofisiologia.

INTRODUCTION

Chronic pain (CP) is considered an important global public health problem due to its high prevalence and because it significantly interferes with the physical and emotional capacity and quality of life of individuals, leading to misuse and dependence on opioid drugs¹⁻⁴. Among the approaches to coping with pain, patient education stands out. It is believed that the resignification of pain through education can reduce limiting beliefs, promote behavioral changes, and increase adherence to

treatment, reflecting on the clinical evolution and quality of life of the individual^{5,6}.

Patient education depends directly on the level of knowledge and skills of health professionals, such as physiotherapists. However, studies indicate that undergraduate students and health professionals have a deficit of knowledge about the neurophysiological mechanisms of pain, considering themselves unprepared to care for patients with CP, attributing this fact to the period of professional qualification⁷⁻¹⁰. Previous research comparing the biomedical and psychosocial beliefs of students in the first and last year of undergraduate physiotherapy showed that the educational system does not seem to act as a modifier of the beliefs that students present at the beginning of their undergraduate studies¹¹. Thus, this scenario of unpreparedness can be justified because of a flawed teaching on pain in undergraduate health courses.

Pain education for health professionals at all levels of training is considered an important means to change ineffective practices in pain management¹². In view of this need, the commission of physiotherapists of the Brazilian Society for the Study of Pain (SBED) developed a specific pain curriculum for undergraduate physiotherapy based on the recommendations proposed by the International Association for the Study of Pain (IASP) and adapted its content to the reality of the population and Brazilian professional praxis¹³.

Even in the face of this recommendation, there is still a lack of specific disciplines for the teaching of pain, and only 7% of higher education institutions have some specific discipline on pain in the physiotherapy course¹⁴. Therefore, pain is not seen as a central theme, but as a complementary concept in some disciplines. This results in precarious learning, fragmented content, in which the complexity of the subject and its psychosocial dimensions are often neglected^{15,16}.

Considering that every individual has the right to receive adequate treatment, planned and executed by a properly trained professional, and that the physiotherapist is a professional qualified to manage pain, it is of paramount importance to evaluate the level of knowledge of these professionals, both on the neurophysiological aspects of pain, as well as on the self-perception of skills to assist individuals with pain. Thus, it is believed that the identification of possible learning gaps in the different stages of training can contribute to the development of strategies, contents, and teaching methods on pain, providing effective teaching to academics and health professionals, as well as adequate and assertive treatment to the patient, reducing the burden caused by technical-scientific inability and ineffective clinical practices in pain management¹⁷⁻¹⁹.

Previous studies conducted in Europe, Africa, Asia, and Oceania investigated the knowledge about pain neurophysiology in students, physiotherapists, and other health professionals, in addition to its application in specific populations, such as low back pain, and no studies have been identified so far that addressed students or professionals from different regions of Brazil^{16,19, 20-22}. Within this context, the aim of this study was to evaluate and compare the level of knowledge about pain neurophysiology and self-perception of skills to assist individuals with pain among undergraduate and graduate physiotherapy students in Brazil.

METHODS

This is a cross-sectional analytical observational study, approved by the Research Ethics Committee of the Federal University of Santa Catarina (No. 4.460.023). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement was used as a guide to report the study results. The data collection procedure was carried out from March to July 2021, by filling out an electronic questionnaire, using the Google Forms® platform. The questionnaire link was disseminated through social media, regional physiotherapy and occupational therapy councils and the Brazilian Association of Traumatology-Orthopedic Physiotherapy (ABRAFITO).

The sample was by means of convenience, based on the spontaneous demand of the participants who agreed to participate in the research. Physiotherapy academics and professionals residing in Brazil, aged 18 years or older, were included. Participants who were attending or had other training in health courses, who did not complete the questionnaire correctly and who did not agree to participate in the research were excluded from the study. Those who met the inclusion criteria signed the Informed Consent Form (ICF), where they received information about the objectives and procedures of the study.

For data stratification, the sample was divided into subgroups, with undergraduate students in: first year, intermediate phases and students in the last year of undergraduate studies. Physiotherapists were divided into four subgroups, according to the last title of training, being: undergraduate, specialization, master's, and doctorate.

Study variables

The variables analyzed in the present study were: 1) knowledge about pain neurophysiology (QND); 2) self-perception of skills to assist individuals with pain.

Tools for data collection

For the collection of the data necessary for the research, a self-administered questionnaire was used as an instrument, consisting of three sessions:

1) sociodemographic data: data were collected to identify the sample by means of a structured questionnaire, prepared by the authors, including information regarding age, gender, state of residence, level of education, specific data for undergraduates (number of phases attended) and graduates (time of work, type of work institution, level of postgraduate studies and area of work).

2) Self-perception of skills to assist individuals with pain, through a structured questionnaire prepared by the authors: the level of interest in pain (none, low, medium and high), the skills to assist individuals with CP and to perform a biopsychosocial approach (none, low, medium and high) were evaluated.

3) Neurophysiological Pain Questionnaire (QND): the Brazilian version of the QND, translated and culturally adapted²³, is a self-administered instrument containing 12 items that assess the level of knowledge related to the neurophysiology of pain, in which each item contains three response options, namely: true, false and don't know. The results of the QND are interpreted with each correct answer corresponding to one point, while incorrect or undecided answers are not scored. Incorrect answers allow the identification

of inadequate beliefs, while the "don't know" option allows the identification of gaps in knowledge, avoiding assumptions and false hits. Therefore, the total score ranges from zero to 12, and the higher the score, the greater the level of understanding of the pathophysiological mechanisms of pain.

Statistical analysis

For analysis of the results, the database was organized in Microsoft Excel®-Windows 2010 spreadsheets and analyzed by Stata® 16.1 software. The description of the characteristics of the study population was given by measures of central tendency and dispersion for quantitative variables, and absolute and relative frequencies for qualitative variables. The Shapiro-Wilk test was used to analyze the distribution of the QND score and self-perception of skills to assist individuals with pain. In the bivariate analysis for the comparison of the distribution of the QND score and the self-perception of skills to assist individuals with pain between the phases of the undergraduates, and the education after training, the Kruskal-Wallis test was used, significance level of 5% and confidence interval of 95%.

RESULTS

The sample consisted of 306 participants. Initially, 319 individuals answered the questionnaire and, after applying the exclusion criteria, 13 were excluded (1 did not agree to participate, 1 answer was duplicated and 11 had training in other health courses). Table 1 presents the sociodemographic and academic characteristics of undergraduate students and physiotherapists.

Table 1. Sociodemographic data and academic characteristics of undergraduate students and physiotherapists.

Variables	Undergraduates (n=208)	Physiotherapists (n=98)
Age (years)	22,2 ± 3,2	31,7 ± 8,7
Gender, n (%)		
Female	175 (84,1)	65 (66,3)
Male	33 (15,9)	33 (33,7)
Region, n (%)		
North	1 (0,5)	5 (5,1)
Northeast	16 (7,7)	8 (8,2)
Central-West	5 (2,4)	3 (3,1)
Southeast	17 (8,2)	19 (19,4)
South	169 (81,2)	63 (64,3)
Level of Education		
Undergraduate, first year	24 (11,6)	
Undergraduate, intermediate	133 (63,9)	
Undergraduate, final year	51 (24,5)	
Graduate		44 (44,9)
Specialization		28 (28,6)
Master's/PhD		26 (26,5)
Work Institution, n (%)		
Private Institution		64 (65,3)
Public Institution		15 (15,3)
Both sectors		12 (12,3)
Not working		7 (7,1)
Graduation time, years (MD ±DP)		3,4 ± 2,6

MD±DP = Average ± Standard Deviation; n = number of participants.

Key results

Self-perception of skills to assist individuals with pain

Undergraduates

Figure 1A presents the description of the students' skills and interest in pain. The majority reported high interest in the topic of pain (62%), however, 44.7% pointed out medium skills to assist individuals with CP, as well as to perform a biopsychosocial approach (39.4%). There was a statistically significant difference ($p < 0.05$) between the self-reported skills of undergraduates to as-

sist individuals with CP and to perform a biopsychosocial approach to the patient, between the different phases of the course.

Physiotherapists

Figure 1B presents the frequency of responses of physiotherapists according to education levels. Regarding pain, most have high interest in pain (76.5%), however, a low percentage (21.43%) reports having high skills to assist individuals with CP. For the biopsychosocial approach, specialists and graduates

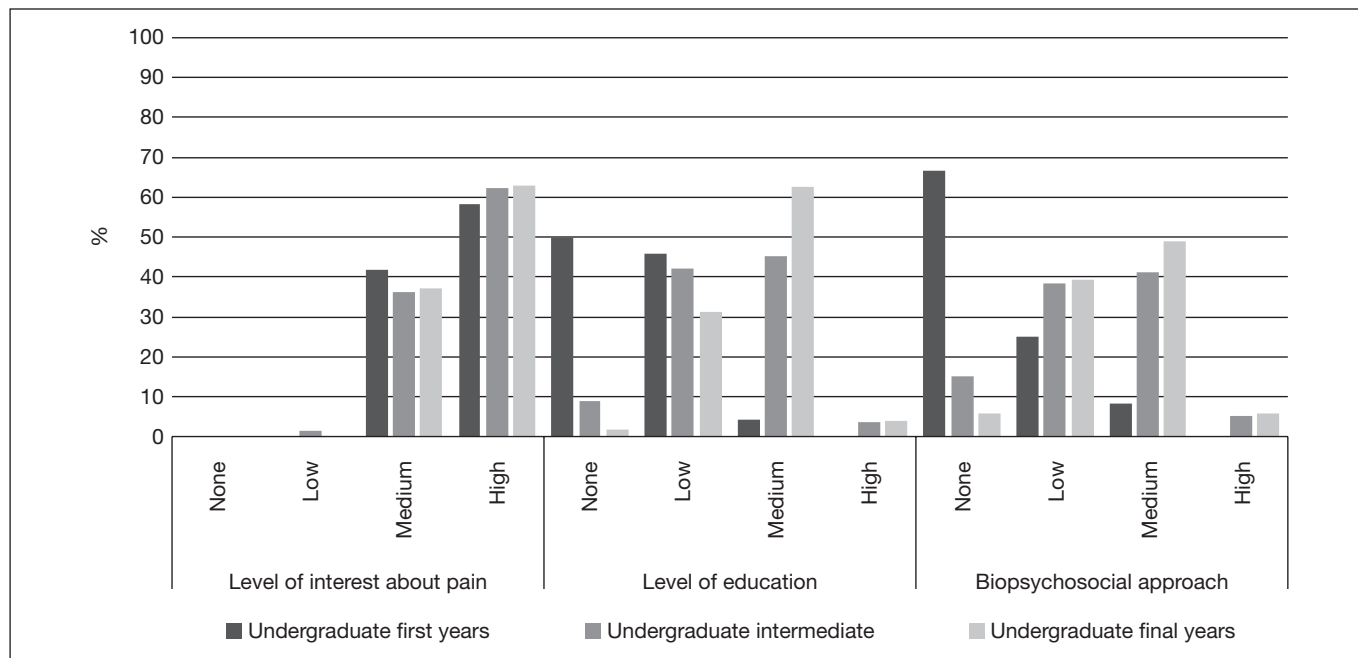


Figure 1A. Description of students' pain skills and interest

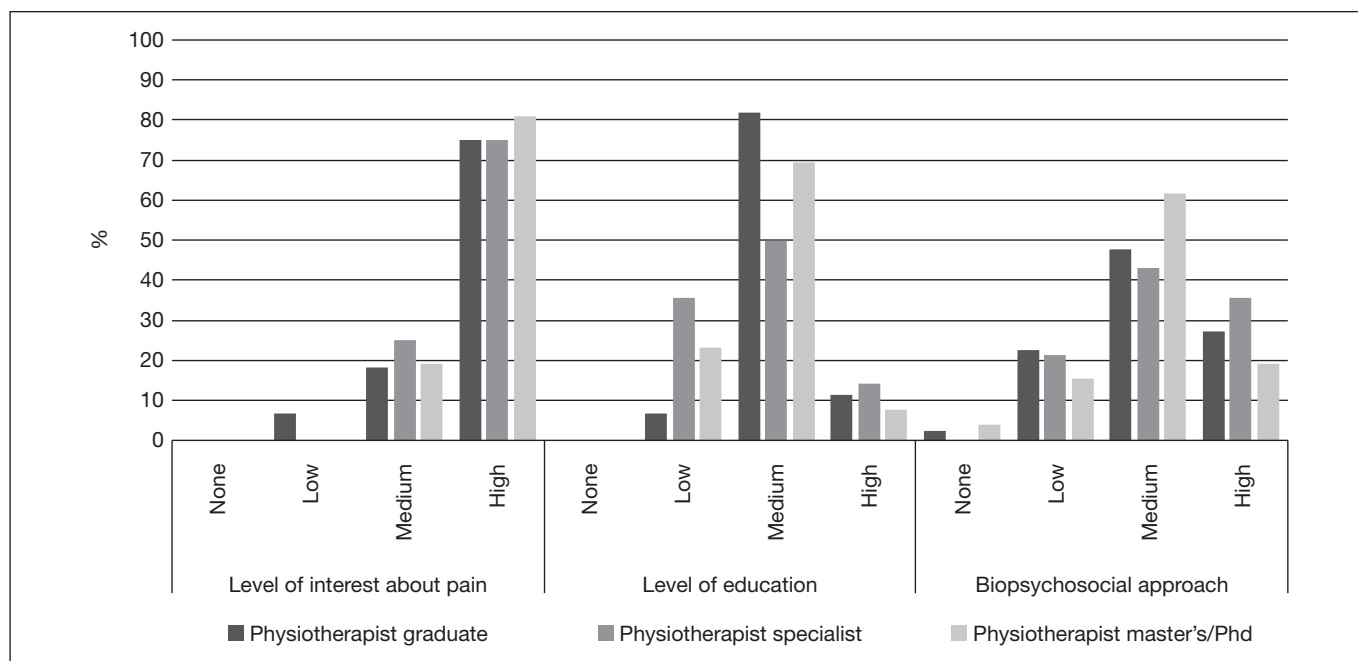


Figure 1B. frequency of physiotherapists' responses according to educational levels.

have a higher percentage of high skills. No statistical difference was observed between the percentages of responses according to education level.

Neurophysiological pain questionnaire (QND)

Undergraduate students

The total score for undergraduate students was 6.17 out of 12 points. The score per group was: first year: 4.79; intermediate phases: 6.57 and final year: 7.15. In the intra-group comparison, there was a significantly higher difference in the score obtained in the QND by the students of the intermediate phase and the last year ($p < 0.05$). The prevalence of correct answers for each question per group is shown in figure 2A.

Physiotherapists

The total score for physiotherapists was 8.56 out of 12 points. The score per group was: undergraduate: 7.63; specialization: 8.60; Master's/PhD 8.81. No difference was observed between the total score of the groups. The prevalence of correct answers for each question according to the groups is shown in figure 2B.

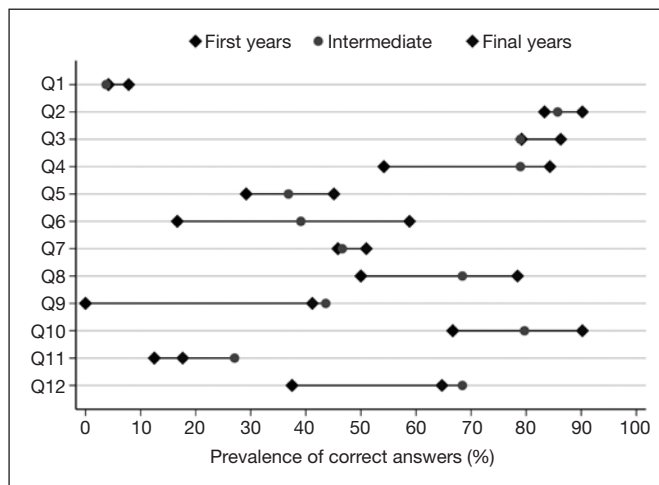


Figure 2A. Prevalence of correct answers

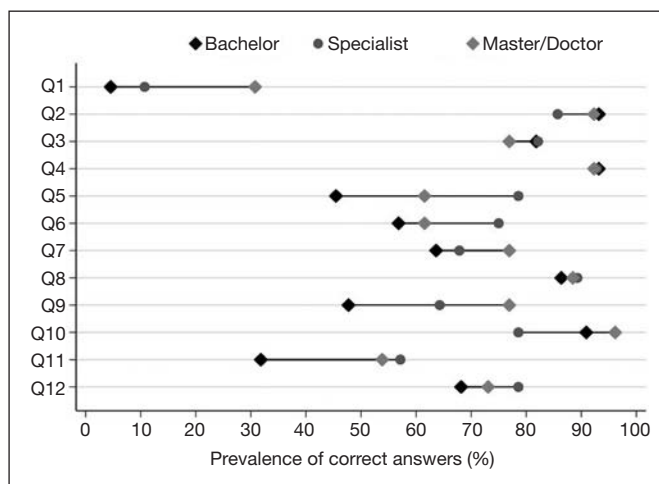


Figure 2B. Prevalence of correct answers

Question 1: “When part of your body is injured, special pain receptors carry the pain message to your brain.”; Question 2: “Pain only occurs when you are injured or are at risk of injury.”; Question 3: “Special nerves in your spinal cord carry danger messages to your brain.”; Question 4: “Pain occurs whenever you are injured.”; Question 5: “The brain decides when you will feel pain.”; Question 6: “Nerves adapt by increasing their level of excitability at rest.”; Question 7: “Chronic pain means an injury has not healed properly.”; Question 8: “Worse injuries always result in worse pain.”; Question 9: “Descending neurons are always inhibitory.”; Question 10: “When you are injured, the environment you are in will not affect the amount of pain you feel, as long as the injury is exactly the same.”; Question 11: “It is possible to feel pain and not know it.”; Question 12: “When you are injured, special receptors carry the message of danger to your spinal cord.”

DISCUSSION

The results show that most of the sample presented a high level of interest in pain and average skills to assist individuals with CP and approach treatment in a biopsychosocial manner.

Questions 1, 5, 9 and 11 of the QND were the ones that received the lowest rate of correct answers. These items involve the mechanism of nociception, modulation, and perception of pain. The QND does not have a cut-off score to define knowledge levels. Some studies determined the value of 65% as the minimum to consider a satisfactory knowledge in pain neurophysiology but did not demonstrate the method used for which they considered this value, therefore, for comparison of results, the percentage of correct answers and the score reported in studies were considered^{10,12}. Regarding students, those in the intermediate phases scored 37.14% higher compared to the first-year group and 8.91% lower compared to the final year group. In general, undergraduate students scored 6.17 points, representing 51.44% correct answers, which is like the findings of a previous study, where individuals scored 6.20 points, representing 52%.²⁰ Additionally, the authors reported that knowledge was limited regarding the neurophysiology of pain among the students. The percentage of correct answers of the first-year group (39.93%) was similar to the score of 42.7% of the first-year students. In the same study, the final year students scored 68.90%, representing 15.53% more correct answers than the sample of the final year group of the present study (59.64%). The authors concluded that the students’ understanding of pain may not be sufficient and does not guarantee a CP approach that helps the patient to reconceptualize their pain²¹.

Final year students at the University of the Witwatersrand, South Africa, scored 6.97 (58.08%), similar to the result found in the present study of 7.15 (59.64%) for the final year group. The authors concluded that the greater the students’ knowledge about pain, the better their attitudes towards patients with chronic low back pain and the more likely they were to use a biopsychosocial model rather than a biomedical model²².

The overall score of undergraduate students was slightly higher than a sample consisting of students from two universities in

Ireland and the UK, who averaged 45%. They demonstrated an increase to 79% in knowledge after a 70-minute pain neurophysiology education session for undergraduate physiotherapy students²⁴. Another study reported a score of 7.5 (65%) in fifth semester students of a physiotherapy course in the state of Rio de Janeiro. After undergoing active teaching-learning methodologies, the score increased to 10.8 (90%), suggesting that a discipline that addresses content in a specific way may be ideal to improve knowledge in pain neurophysiology¹².

These results indicate that after undergoing teaching strategies on the subject, undergraduate students can increase their knowledge of pain neurophysiology to a similar or even greater extent than physiotherapists trained in the subject, according to scores reported in studies that used the QND to evaluate physiotherapists after educational sessions on pain²⁵⁻²⁷.

Some studies have evaluated the knowledge on pain neurophysiology in other health courses, besides physiotherapy, where physiotherapy obtained a higher score. This may suggest that the same limitations in pain education are present in other health courses^{21,22}. The mean score of physiotherapists (8.56 points; 71.37%) was similar to that of 211 Australian osteopaths who scored 72.2% of the questionnaire in one study, and higher than that of other more recent studies that assessed the QND in physiotherapists not trained in pain neurophysiology²⁷. Another study found a score of 6.7 (55.8%) in a group of 111 Arab physiotherapists, considering the result as limited knowledge in pain neurophysiology¹⁹.

The QND was applied before and after a pain education program in some studies. One such study evaluated a group of physiotherapists in a doctoral program in Australia, in which elements of the IASP pain curriculum were incorporated. The sample scored 56% correct at the beginning and 78% at the end of the first semester. This improvement was maintained over the longer term, indicated by reassessment at year three, with a mean score of 77%²⁵. Another study applied the QND to American doctoral students in physical therapy before and after an elective course on pain based on IASP guidelines. Students scored 64% in the first semester and 76.9% in the last semester (third year). Students who participated in the course improved their percentage to 86%²⁷. Americans who were pursuing a doctoral degree in physical therapy scored 41.3% at the beginning and 84.2% at the end of a three-hour pain neurophysiology education session in another study²⁵. Thus, pain-specific education sessions and disciplines seem to be effective in improving the knowledge and attitudes and beliefs of students and professionals towards patients with pain²². Active teaching-learning strategies have been shown to be able to favor this construction of knowledge¹².

Question 1 “When part of your body is injured, special pain receptors carry the pain message to your brain” was the one with the lowest percentage of correct answers, 24 being 4.81% of undergraduate students and 13.27% of physiotherapists. In other studies, the same question was also reported as having the lowest percentage of correct answers (<10%)^{20,21}. It is possible that the question has been misinterpreted, where participants imply “special pain receptors” by “nociceptors”, which are not synonymous, since nociceptors are receptors of real or potential harmful sti-

mul, and pain is a product of the brain²⁹. The question with the highest percentage of correct answers by undergraduates was 2 “Pain only occurs when you are injured or are at risk of injury”, with 86.4% of correct answers. The physiotherapists presented a percentage of 90.82%, being the second question with the highest rate of correct answers.

It is expected that first-year and intermediate undergraduate students do not yet have a great knowledge about pain, however, it is worrying that final year students have presented an unsatisfactory knowledge, since they will be the next physiotherapists inserted in the labor market, acting as first contact professionals, and attending patients with pain with great frequency.

Physiotherapists in the undergraduate group had a 23.70% higher percentage than final year undergraduate students. Physiotherapists consider that professional experience generates a greater increase in knowledge about pain than graduation, which can be harmful, since practice based only on experiences can perpetuate inadequate concepts on the subject³⁰. It is of paramount importance that physiotherapists have adequate knowledge since every technique with the objective of analgesia acts by a certain neurophysiological mechanism involving the pain pathways⁸. The knowledge of biological, social, and psychological factors necessary for pain assessment and management should be acquired during graduation¹².

The findings of this study may reflect the current situation of the curricula of undergraduate physiotherapy courses, where most do not have a specific discipline on pain. To change this scenario, it is necessary to review these curricula and adopt strategies to improve students' knowledge. Teaching about pain and adequate skills of health professionals, based on evidence and practical action has been identified as an important measure to improve pain care^{7,12}. The implementation of the pain curriculum for physiotherapy proposed by SBED, based on IASP recommendations, in physiotherapy courses could be an effective strategy for this problem. The content of the curriculum addresses the multidimensional nature of pain, basic science involving neurophysiology and types of pain, assessment and treatment, pain management and clinical conditions¹³.

New studies may address the comparison of QND among undergraduate students from public and private universities, as well as among physiotherapists who have or have not undergone some type of specific training on pain. Despite having participants from various regions of Brazil, most of the study volunteers were from the south and southeast regions, and it is not appropriate to generalize the results to the whole country, characterizing a limitation of the study.

CONCLUSION

Through the findings of this study, it was possible to observe that the level of knowledge about pain neurophysiology and self-perception of skills to assist individuals with pain differ between physiotherapy students and professionals. The low score of the QND, identified in physiotherapy undergraduates, shows possible curricular failures on the subject during academic training. In addition, it was possible to identify that

there was no significant difference in the QND score, and in the self-perception of skills to assist individuals with pain, between the different levels of training of physiotherapists. Thus, it is believed that curricular implementation and specific training on pain may be indispensable to increase the level of knowledge and skills of physiotherapists in the treatment of individuals with pain.

AUTHORS' CONTRIBUTIONS

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Statistical Analysis, Writing - Preparation of the original

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Data Collection, Writing - Preparation of the original

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Statistical Analysis, Writing - Preparation of the original, Validation, Visualization

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Methodology, Writing - Review and Editing

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Resource Management, Project Management, Methodology, Writing - Review and Editing, Supervision, Validation, Visualization

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