

## ORIGINAL ARTICLE

**COMPARISON OF PAIN NEUROPHYSIOLOGY KNOWLEDGE AMONG HEALTH SCIENCES STUDENTS**Khurram Shahzad<sup>1</sup>, Ikram Ali<sup>2</sup>, Abdul Baseer Khan<sup>3</sup>, Zia Ullah<sup>4</sup>, Seema Gul<sup>5</sup>**ABSTRACT**

**Introduction:** Pain has been known to be the Fifth vital sign since the 1990's. The chronic pain is of special consideration in the modern era, as its prevalence is increasing day by day. To treat these patients, a multi disciplinary approach is followed, which involves Pain Re-education and reconceptualization. The notion of healthcare practitioners is of prime importance. However, most educational programs, especially for health graduation students, include minimum or no content about pain and/or its management. The notion of pain retained by health care professionals is therefore essential for efficient therapy of patients.

**Material & Methods:** This cross-sectional study was carried out in April 2019 in Khyber Medical College and Institute of Physical Medicine & Rehabilitation, KMU Peshawar. The sample size was 190. The data was collected by stratified sampling technique. Data collection was done using the latest version of Neurophysiology of Pain Questionnaire (NPQ). The collected data was entered into IBM SPSS v.25. The normality of the data was checked via One Kolmogorov Smirnov's test. Our data distribution was not normal thus, we used non-parametric test. Frequencies of the demographics were calculated. The percentage of correct responses was calculated then, the total score for each participant was calculated. Finally, the mean score for each institute was found and compared with each other to see any statistically significant differences.

**Results:** The response rate of our study was 98% with 186 participants out of 190. 150 students (79%) participated from Khyber medical college while 36 students (19%) from Institute of physical medicine & rehabilitation. Mean Score on the NPQ-14 items was  $7.01 \pm 1.9$ . There was no significant difference found between the level of knowledge held by students of KMC and IPM&R ( $p=0.10$ ).

**Conclusion:** This study indicates that the students at Khyber Medical College and Institute of Physical Medicine and Rehabilitation of KMU, as shown a satisfactory level of knowledge about Pain Neurophysiology. The inclination physiotherapy students to answer some questions more than medicine students were observed on the subject of 'Perception of pain'.

**Key Words:** health sciences education, neurophysiology, pain education, pain knowledge

**Authors' Declaration:** The authors declared no conflict of interest and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed substantially to the planning of research, question designing, data collection, data analysis and write-up of the article.

**Authors' Affiliation**

<sup>1</sup>Senior team leader Clinical coding, Codingwize SMC, Pvt Ltd

<sup>2</sup>Assistant Professor, IPM&R, Khyber Medical University, Peshawar

<sup>3</sup>Physiotherapist, Abu Dhabi, Stem Cell Center

<sup>4</sup>Incharge Dynamic Physiotherapy clinic, Timergara Dir Lower

<sup>5</sup>Lecturer Khyber Medical University Institute of Health Sciences, Islamabad

**Corresponding Author**

Ikram Ali

Assistant Professor, IPM&R, Khyber Medical University, Peshawar

Email: drikramali@gmail.com

**This article may be cited as:** Shahzad K, Ali I, Khan AB, Ullah Z, Gul S. Comparison of pain neurophysiology knowledge among health sciences students. Rehman J Health Sci. 2024;6(1). 29-36

Submitted: August 24, 2023 Revisions Submitted: April 25, 2024 Accepted: May 23, 2024

## INTRODUCTION

The healthcare providers' concept of pain is developed during their undergraduate level. The chronic pain is of special consideration in the modern era, as its prevalence is increasing day by day. A patient with chronic pain is in such a state where non-painful stimuli can also cause an increase in pain as the patient's threshold has lowered. The patient is in a state of hypervigilance. To treat these patients, a multi-disciplinary approach is followed, which involves Pain re-education and reconceptualization. Thus, the concept held by the healthcare professionals is of prime value. However, most educational programs, especially for health graduation students, include minimum or no content about pain and/or its management.<sup>1</sup> This lack of knowledge about pain mechanisms, as well as its inadequate management, may generate major human resources costs for patients, families and society.<sup>2</sup>

The curriculum of healthcare professionals was questioned many years ago. There have been improvements for pain content by various ways. Either the content of pain credit hours has been increased or following research, Pain Neuroscience Education sessions have been introduced in annual cycle in the curriculum. Those sessions were aimed to improve the healthcare professional's base knowledge on the neurophysiology of pain further improving the lives of patients.<sup>3,4,5</sup> The applications of Pain Neurophysiology Education (PNE) are widespread. PNE has been utilized in the care of patients experiencing chronic pain. Evidence shows promising results in increasing therapeutic outputs in aquatic therapy, fibromyalgia patients, various Musculoskeletal Disorders (MSD's) and Athletic population as well.<sup>6,7,8</sup> A randomized surveillance study revealed that a 70-minute meeting for undergrad physical therapy learners enhanced understanding of pain neurophysiology, enhanced behaviors and enhanced the likelihood that patients with chronic pain would receive suitable treatments suggestions. This randomized controlled trial used The Modified Health Care Pain Attitudes and Impairment Relationship Scale (HC-PAIRS). The study revealed an enhancement of 25% in understanding of injury biology after PNE action relative to a shift of -1.5% in the controlled group of the study.<sup>8</sup>

A systematic review and meta-analysis

discovered mild proof of pain biology education having a tiny to mild impact on pain reduction and low-quality proof of a tiny to mild impact on clients with chronic low back pain.<sup>9</sup>

The knowledge of pain neurophysiology is very important to a Healthcare provider such as Physician, Physical Therapist, Nurses and other ancillary healthcare professionals<sup>9,10,11</sup> as they are the one who will manage the pain of the patient. However, most educational programs, especially for graduation students, include minimum or no content about pain and/or its management.<sup>12</sup> Therefore, healthcare consultants' understanding of pain is essential for efficient patient leadership because healthcare practitioners transfer data to patients.<sup>13</sup>

In our knowledge there are some amount of studies carried out on topic of knowledge of Pain Neurophysiology among health sciences students specially in the developed countries like UK, Spain, Australia, Portugal and Italy and its impact in the treatment of patients with pain.<sup>7,14,3,15</sup> Moreover, according to our knowledge no study was found in our setting regarding knowledge of Pain Neurophysiology among health sciences students in published data of Pakistan. Therefore, we proposed this study in order to find out Knowledge of Khyber Medical College (KMC) & Institute of Physical Medicine & Rehabilitation (IPM&R) final year Students on pain behavior in these potential clinicians.

## MATERIAL AND METHODS

This cross-sectional study was conducted after getting approval from the Graduate committee of IPM&R, Khyber Medical University and office of the director medical education Khyber Medical College Peshawar. The data was collected from the final year students of KMC and IPM&R by using Neurophysiology of Pain Questionnaires (NPQ). The NPQ consisted of 14 questions, of which 7 were based on the biological mechanisms of pain while the other 7 were composed on the perception of pain. The Rasch analysis showed reliable internal validity and reliability of the questionnaire.<sup>65</sup> It had an equal proportion of correct and incorrect answers.

The Sample size was calculated by online Raosoft calculator as 190. Since there was difference in the number of final-year students between KMC and IPM&R so stratified

sampling technique was adopted to ensure equal proportions from both Institutes. Repeater students are excluded because repeaters might have more knowledge as compared to a fresh student on a given topic. Finally, the data was collected conveniently from the participants. The response rate was 98%, fulfilling 186 out of 190 of our sample size. The proposed duration for this cross-sectional study was 04 months from April-July 2019. The collected data 186/190 was entered into IBM SPSS 25. 'One-Kolmogorov-Smirnov Test' was used to see the normality of our data set. Our dataset was not normally distributed. So, we used tests that followed non-parametric assumptions. Variables were defined in our data set as categorical or scale. The variables were expressed in terms of frequencies and percentages, while Means along the Standard deviations were also calculated. Results are presented as mean (SD). The complete score was calculated for each participant after comparing with the correct answers out of 14. The number of responses, which were correctly answered in the questionnaire were calculated as the percentage proportion (% score) with the equation  $(\text{[No. of correct responses/14]} \times 100)$ .

Furthermore, the classification as 'Low Knowledge level' & 'High Knowledge level' was also done based on scale from 0-6 and 7-14 as described by Vaughan et.al.<sup>64</sup>

Cross-tabulation was done to see the percentage of correct responses from students at both institutes set apart by Gender. Means were compared to see the mean scores of students from both institutes. Lastly, the Mann Whitney-U Test was used to evaluate any important distinction between IPM&R and KMC learners of the final year. For all tests conducted, p-values were two-sided, and the results were considered statistically significant if the p-value was below 0.05.

## RESULTS

The response rate of our study was 98% with 186 participants out of 190. 150 students (79%) participated from Khyber medical college while 36 students (19%) from Institute of physical medicine & rehabilitation. Male students (100) accounted for 54% of our data while females (86) made up for 46% of our data. Out of 150 participants from Khyber Medical College, 86 (57%) were males while 64 (43%) were females. From IPM&R, male

students were 14(39%) and females were 22(61%) in number. NPQ consisted of 14 questions on biological mechanisms and perception of pain. 0-6 score was rated as 'low score' on knowledge on pain neurophysiology while 7-14 was considered as 'high score' respectively. The mean score for our sample on NPQ was  $7.01 \pm 1.9$ .

Table 1 Comparison of NPQ-Scores among students of KMC & IPM&R, KMU.

The results from the final years' medicine students of KMC (n = 150) and Physiotherapy students of IPMR (n = 36) were differentiated whether there were variations among the knowledge level of the learners throughout the final year. The average proportion of right answers by the final year student's NPQ was  $50 \pm 13.7$ , with no statistically significant distinctions identified between the 2 institutes. ( $p=0.10$ ) after the application of the Mann Whitney-U Independent samples test. Likewise, the results of the Gender were also compared ( $p=0.59$ ) which showed same level of knowledge between the genders.

## DISCUSSION

Our mean score on the NPQ was 7.01 (1.9) which shows that the sample had a satisfactory 'High level Knowledge' on the Neurophysiology of Pain. It can be also stated in percentages as 50.07 (13.7) which can be compared with the previous studies. The scores for Male were 6.7 (1.9) while the mean NPQ scores for Females were 7.3 (1.8), which shows that there was a slight inclination of NPQ scores for Females but there were no Significant differences between the Gender on NPQ scores. Fifty-six (37%) students in Khyber Medical College obtained a Low-level knowledge score while 94 (62%) students got High level knowledge score. In Institute of Physical Medicine & Rehabilitation, there is a slight good percentage curve seen, with 11 (30%) in Low-Grade knowledge while 25 (69%) were seen to obtain High-level of Knowledge category on Pain Neurophysiology. We inferred that there was a low ratio of Low-level knowledge in IPM&R (7% difference) while a slightly higher ratio of High-level knowledge (7% difference) in IPM&R students However, there was no significant difference found between the 2 independent groups. It is inferred that there was a slightly higher ratio of High-level knowledge about Pain neurophysiology in the students of IPM&R and KMC Peshawar. But

the mean score was only (7.01) which shows that the score is on the borderline only. There was no significant difference found between the Genders as well. Analyzing each question correct response percentage, it is seen that Only Question 01 and Question 13 are answered with highest correct responses, while Question 05,07,08,10,12 and 14 are answered with moderate correct responses while Question 03, 04, 06 and 09 are answered with the lowest correct responses as seen in Table 5.

This study only included Final year of the institutes. Previous studies show comparison between healthcare students of 1<sup>st</sup> year and Final year or either 3<sup>rd</sup> year of 4 years degree program.<sup>9,10</sup> Also, in literature review it is seen that studies compared more than one department. So, a comparison is being made between the Final year score of medical students and physiotherapy students of Final year as our study comprised of the mentioned institutes providing these degrees. Comparing our results with Adillón et al. we observe that the mean percentage for Final year students was 58.13, while our mean percentages were 50.08. This shows that our students have 8% less knowledge as in comparison with the students in Spain. Although, the outcome measure is quite different.<sup>13</sup> There was significant difference between the Genders in final year of physiotherapy in her which our study does not implicate in Pakistan.

Marques et al. used a 12 questions NP which was suggested by Catley et al.<sup>65</sup> It was an experimental study.

Comparing their baseline results of Mean score of 62.5% with our mean score of 50.08% shows that our mean score was quite low. There was an introduction of NPE Session which in our case was not present.<sup>18</sup>

Alodaibi et al. also used 12-items NPQ. Comparing their final year results with ours shows that their students got 52% scores on NPQ while our students got 50% which is much in line with each other. A comparison between the results shows 53% correct mean scores for males and 57% for females in Final year of their study for students in their study while our results show a slightly low score of 48% for males and 52% for females. There was no significant distinction between the mean rating scores of the learners at King Saud University and Students from other

schools, which is our case is also the same. There were no significant differences between the Genders between both the studies.<sup>59</sup>

Hush et al. considered IASP pain curriculum into a 3-year pre-licensure physical therapy program. Our results cannot be considered in their domain, but we can see the significant improvement in score after introduction of pain curriculum in their case. The mean score for R- NPQ was 78% in the 3<sup>rd</sup> year while our scores are around 50% which shows how the pain neurophysiology knowledge is lacking without the introduction of proper content in the curriculum of the under-graduation students. Also, Hush et al. considered the measuring tool in the form of Assessment of physiotherapy practice, which showed remarkable improvement with 78% results.<sup>60</sup>

Comparing our results with Clenzos et al. observed that the Pain neurophysiology knowledge was with mean score of only 15% in Sports and Orthopedic manual therapists in South Africa as compared to our 50.08% while their sample consisted of certified Manual therapists, although their outcome tool was RPKAQ. They considered 75% as the minimal scale for adequate knowledge level while our scale considered 50% as the minimal scale.<sup>10</sup>

Comparing our results with Fitzgerald et al. observed that their sample mean scores on NPQ-19 items was 53% while our sample was 50.08% which shows that students of KMC and IPM&R has equal level of pain neurophysiology knowledge with those of Osteopathy students in 3<sup>rd</sup> year while keeping the NPQ percentages in view. Furthermore, their Gender non-significance with NPQ scores is also similar with our findings.<sup>62</sup>

The response rate among female participants from the medical college was 2% lower, reflecting the influence of cultural constraints. Our research group faced challenges in data collection from females due to the absence of a female member, underscoring the importance of diverse representation for comprehensive research endeavors.

## CONCLUSION

Our study indicates that the students of final year MBBS and physiotherapy students at Institute of Physical Medicine and Rehabilitation, KMU have shown a satisfactory level of knowledge on the subject of pain neurophysiology. The findings suggest that there is an equivalent level of knowledge



between final year medical students and physiotherapy students of KMU. The level of knowledge was also seen to be the same across the gender of the institutes. For physiotherapy students, the correct percentages of responses calculated about 'Perception of Pain' were greater than for Medicine students. This disparity in correct responses between physiotherapy and medicine students may be attributed to the specialized focus and in-depth training that physiotherapy students receive in the area of 'Perception of Pain.' The curriculum and practical experiences within physiotherapy programs might contribute to a heightened understanding and proficiency in this specific domain compared to the broader medical education received by medicine students.

## REFERENCES

1. Springer S, Gleicher H, Hababou H. Attitudes and beliefs about musculoskeletal pain and its association with pain neuroscience knowledge among physiotherapy students in Israel. *Isr J Health Policy Res.* 2018;7(1):67.
2. S. M. Fishman et al., "Core Competencies for Pain Management: Results of an Interprofessional Consensus Summit," *Pain Med.*, vol. 14, no. 7, pp. 971–981, Jul. 2013. *Pain Med.* 2013;14(07):971–81.
3. Colleary G, O'Sullivan K, Griffin D, Ryan CG, Martin DJ. Effect of pain neurophysiology education on physiotherapy students' understanding of chronic pain, clinical recommendations and attitudes towards people with chronic pain: a randomised controlled trial. *Physiotherapy.* 2017;103(4):423–9.
4. Hunter J, Watt-Watson J, McGillion M, Raman-Wilms L, Cockburn L, Lax L, et al. An Interfaculty Pain Curriculum: Lessons learned from six years' experience. *Pain.* 2008;140(1):74–86.
5. Heavner J. Teaching pain management to medical students. *Pain Pract.* 2008; 9:85.
6. Louw A, Diener I, Butler DS, Puentedura EJ. The Effect of Neuroscience Education on Pain, Disability, Anxiety, and Stress in Chronic Musculoskeletal Pain. *Arch Phys Med Rehabil.* 2011 Dec;92(12):2041–56.
7. Lee H, McAuley JH, Hübscher M, Kamper SJ, Traeger AC, Moseley GL. Does changing pain-related knowledge reduce pain and improve function through changes in catastrophizing? *Pain.* 2016 Apr;157(4):922–30.
8. Pires D, Cruz EB, Caeiro C. Aquatic exercise and pain neurophysiology education versus aquatic exercise alone for patients with chronic low back pain: A randomized controlled trial. *Clin Rehabil.* 2015;29(6):538–47.
9. Mattos LB, Dahmer A, Magalhães CR. Knowledge of PT students: Sys Review. *Abcs Heal Sci Cs.* 2015;40(3):184–9.
10. Clenzos N, Naidoo N, Parker R. Physiotherapists' knowledge of pain: A cross-sectional correlational study of members of the South African Sports and Orthopaedic Manipulative Special Interest Groups. *South African J Sport Med.* 2013;25(4):95.
11. Hashemi M, Akbari ME, Razavi SS, Saadat-Niaki A, Khameneh SMH. Evaluating resident physicians' knowledge, attitude, and practice regarding pain control in cancer patients. *Iran J Cancer Prev.* 2015;8(1):1–10.
12. J. Watt-Watson et al., "An integrated undergraduate pain curriculum, based on IASP curricula, for six Health Science Faculties," *Pain*, vol. 110, no. 1, pp. 140–148, Jul. 2004.
13. Adillón C, Lozano È, Salvat I. Comparison of pain neurophysiology knowledge among health sciences students: a cross-sectional study. *BMC Res Notes.* 2015 Dec 22;8(1):592.
14. Pires D, Cruz EB, Caeiro C. Aquatic exercise and pain neurophysiology education versus aquatic exercise alone for patients with chronic low back pain: a randomized controlled trial. *Clin Rehabil.* 2015 Jun 8;29(6):538–47.
15. Moseley L. Unraveling the barriers to reconceptualization of the problem in chronic pain: the actual and perceived ability of patients and health professionals to understand neurophysiology. *J Pain.* 2003 May;4(4):184–9.
16. Treede R-D. The International Association for the Study of Pain definition of pain: as valid in 2018 as in 1979, but in need of regularly updated footnotes. *Pain reports.* 2018 Mar;3(2): 643.
17. Neurophysiology [Internet]. Wikipedia. 2012. p. 01. Available from: <https://en.wikipedia.org/wiki/Neurophysiology>
18. Marques ES, Xarles T, Antunes TM, Silva KKD da, Reis FJJ, Oliveira LAS de, et al. Evaluation of physiologic pain knowledge by physiotherapy students. *Rev Dor.* 2016;17(1).
19. Rathore FA, New PW, Iftikhar A. A

- Report on Disability and Rehabilitation Medicine in Pakistan: Past, Present, and Future Directions. *Arch Phys Med Rehabil.* 2011 Jan 1;92(1):161–6.
20. Fishman SM, Young HM, Lucas Arwood E, Chou R, Herr K. Core competencies for pain management: results of an inter-professional consensus summit. *Pain Med.* 2013; 14:971–81. 3.
  21. Lakha SF, Pennefather P, Agboatwala M, Siddique SZ, Badr HE, Mailis-Gagnon A. Chronic Non-Cancer Pain Management Capacity in Karachi. *Pain Ther.* 2017 Dec;6(2):179–91.
  22. Morone NE, Weiner DK. Pain as the fifth vital sign: exposing the vital need for pain education. *Clin Ther.* 2013 Nov 1;35(11):1728–32.
  23. Mitka M. “Virtual textbook” on pain developed: effort seeks to remedy gap in medical education. *JAMA.* 2003; 290:2395.
  24. Heavner J. Teaching pain management to medical students. *Pain Pract.* 2008; 9:85.
  25. Burge F, McIntyre P, Kaufman D, et al. Family medicine residents’ knowledge and attitudes toward management of cancer pain. *J Pain Symptom Manage.* 1998; 15:359–364.
  26. Briggs EV, Carr EC, Whittaker MS. Survey of undergraduate pain curricula for healthcare professionals in the United Kingdom. *Eur J Pain* 2011; 15:789–95.
  27. Goldberg DS, McGee SJ. Pain as a global public health priority. *BMC Public Health.* 2011;11(1):770.
  28. Gordon DB, Watt-Watson J, Hogans BB. Interprofessional pain education—with, from, and about competent, collaborative practice teams to transform pain care. *Pain Reports.* 2018;3(3).
  29. McMahan SB, Koltzenburg M, Wall PD, Melzack R. Inflammatory mediators and modulators of pain. In: Wall and Melzack’s *Textbook of Pain.* 5th edition. Philadelphia: Elsevier; 2006. p. 49–72.
  30. Moseley GL. A pain neuromatrix approach to patients with chronic pain. *Man Ther.* 2003;8(3):130–40.
  31. Nijs J, Van Wilgen CP, Van Oosterwijck J, Van Ittersum M, Meeus M. How to explain central sensitization to patients with ‘unexplained’ chronic musculoskeletal pain: practice guidelines. *Man Ther.* 2011;16(5):413–8.
  32. Louw A, Diener I, Butler D, Puentedura E. The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. *Arch Phys Med Rehabil.* 2011;92(12):2041–56.
  33. Tauben D, Loeserz J. Pain Education at the University of Washington School of Medicine. *J Pain.* 2013;14(5):431–7.
  34. Murinson BB, Nenortas E, Mayer RS, Mezei L, Kozachik S, Nesbit S, et al. A new program in pain medicine for medical students: integrating core curriculum knowledge with emotional and reflective development. *Pain Med.* 2011;12(2):186–95.
  35. Bair M. Learning from our learners: implications for pain management education in medical schools. *PAIN MED.* 2011; 12:1139–41. Bair M. Learning from our learners: implications for pain management education in medical schools. *PAIN MED.* 2011; 12:1139–41.
  36. Tousignant-Laflamme Y, Tousignant M, Lussier D, Lebel P, Savoie M, Lalonde L, et al. educational needs of health care providers working in long-term care facilities regarding pain management. *Pain Res Manag.* 2012;17(5):341–6.
  37. Merlin LR, Horak HA, Milligan TA, Kraakevik JA, Ali II. A competency-based longitudinal core curriculum in medical neuroscience. *Neurology.* 2014; 83:456–62.
  38. Mezei L, Murinson BB. Pain education in North American Medical Schools. *J PAIN.* 2011;12(12):1199–208.
  39. Vadivelu N, Mitra S, Hines R, Elia M, Rosenquist RW. Acute pain in undergraduate medical education: an unfinished chapter! *Pain Practice.* 2012;12(8):663–71.
  40. Chen I, Goodman B, Galicia-Castillo M, Quidgley-Nevares A, Krebs M, Gliva-McConvey G. The EVMS pain education initiative: a multifaceted approach to resident education. *J Pain.* 2007;8(2):152–60.
  41. Rice AS, Smith BH, Blyth FM. Pain and the global burden of disease. *Pain.* 2016; 157:791-796.
  42. Woolf, C. J. (2011). Central sensitization: implications for the diagnosis and treatment of pain. *Pain*, 366 152(3 Suppl), S2-15.
  43. Moseley, L. (2007). Reconceptualizing pain according to modern pain science. *Physical Therapy* 329 Reviews, 12(30), 169-178.
  44. Nijs J, Paul van Wilgen C, Van Oosterwijck J, van Ittersum M and Meeus M. How to explain central sensitization to patients with ‘unexplained’ chronic musculoskeletal

- pain: practice guidelines. *Man Ther* 2011; 16: 413–418.
45. Ryan CG, Gray HG, Newton M and Granat MH. Pain biology education and exercise classes compared to pain biology education alone for individuals with chronic low back pain: a pilot randomised controlled trial. *Man Ther* 2010; 15: 382–387.
46. 20. Moseley L. Combined physiotherapy and education is efficacious for chronic low back pain. *Aust J Physiother* 2002; 48: 297–302.
47. Manchikanti L, Singh V, Datta S, Cohen SP, Hirsch JA. Comprehensive review of epidemiology, scope, and impact of spinal pain. *Pain Physician*. 2008; 12:35–70.
48. Moseley GL. Reconceptualising pain according to modern pain science. *Phys Ther Rev*. 2007;12(3):169–78.
49. Tegner H, Frederiksen P, Esbensen BA, Juhl C. Neurophysiological pain education for patients with chronic low back pain. *The Clinical journal of pain*. 2018 Aug 1;34(8):778–86.
50. Pate JW, Veage S, Lee S, Hancock MJ, Hush JM, Pacey V. Which Patients with Chronic Pain Are More Likely to Improve Pain Biology Knowledge Following Education? *Pain Pract*. 2019;19(4):363–9.
51. Fletcher C, Bradnam L, Barr C. The relationship between knowledge of pain neurophysiology and fear avoidance in people with chronic pain: A point in time, observational study. *Physiother Theory Pract*. 2016;32(4):271–6.
52. Fitzcharles MA, Ste-Marie PA, Panopalis P, Ménard H, Shir Y, Wolfe F. The 2010 American college of rheumatology fibromyalgia survey diagnostic criteria and symptom severity scale is a valid and reliable tool in a French speaking fibromyalgia cohort. *BMC Musculoskelet Disord*. 2012;13.
53. Meeus M, Nijs J. Central sensitization: a biopsychosocial explanation for chronic widespread pain in patients with fibromyalgia and chronic fatigue syndrome. *Clin Rheumatol*. 2007; 26:465–473.
54. Woolf CJ, Salter MW. Neuronal plasticity: increasing the gain in pain. *Science*. 2000; 288:1765–1769. Woolf CJ, Salter MW. Neuronal plasticity: increasing the gain in pain. *Science*. 2000; 288:1765–1769.
55. Staud R, Price DD, Robinson ME, et al. Maintenance of windup of second pain requires less frequent stimulation in fibromyalgia patients compared to normal controls. *Pain*. 2004; 110:689–696.
56. Staud R, Vierck CJ, Cannon RL, et al. Abnormal sensitization and temporal summation of second pain (wind-up) in patients with fibromyalgia syndrome. *Pain*. 2001; 91:165–175.
57. Cox T, Louw A, Puentedura EJ. An abbreviated therapeutic neuroscience education session improves pain knowledge in first-year physical therapy students but does not change attitudes or beliefs. *J Man Manip Ther*. 2017;25(1):11–21.
58. Methods PE, Yanci J, Granados C, Goosey- V, Science S, Sciences H, et al. The Effect of Pain Neuroscience Education on Sports Therapy and Rehabilitation Students' Knowledge, Attitudes and Clinical Recommendations Towards Athletes with Chronic Pain. *Joural Sport Rehabil*. 2019;28(5):438–43.
59. Alodaibi F, Alhowimel A, Alsobayel H. Pain neurophysiology knowledge among physical therapy students in Saudi Arabia: A cross-sectional study. *BMC Med Educ*. 2018;18(1):1– 5.
60. Hush JM, Nicholas M, Dean CM. Embedding the IASP pain curriculum into a 3-year pre- licensure physical therapy program: Redesigning pain education for future clinicians. *Pain Reports*. 2018;3(2):1–7.
61. Louw A, Podalak J, Zimney K, Schmidt S, Puentedura EJ. Can pain beliefs change in middle school students? A study of the effectiveness of pain neuroscience education. *Physiother Theory Pract*. 2018;34(7):542–50.
62. Fitzgerald K, Fleischmann M, Vaughan B, de Waal K, Slater S, Harbis J. Changes in pain knowledge, attitudes and beliefs of osteopathy students after completing a clinically focused pain education module. *Chiropr Man Ther*. 2018;26(1):1–9.
63. Tarimo N, Diener I. Knowledge, attitudes and beliefs on contributing factors among low back pain patients attending outpatient physiotherapy treatment in Malawi. *South African J Physiother*. 2017;73(1):395.
64. Vaughan B, Mulcahy J, ... KF-TC journal of 2019 U. Evaluating Patient's Understanding of Pain Neurophysiology: Rasch Analysis of the Neurophysiology of Pain Questionnaire. *journals.lww.com*. 2019;35(2):133–9.
65. Catley M, O'Connell N, Pain GM-T journal of, 2013 U. How good is the

neurophysiology of pain questionnaire? A Elsevier. 2013;14(8):818–2  
 Rasch analysis of psychometric properties.

*Table 1: Students Demographic data and Scores on NPQ 14 Items*

	Khyber Medical College	IPM&R
n	150	36
Degree	MBBS	DPT
Age (Years)*	23.4±1.3	23.5±0.8
Male	86 ± 14.2974	14±10.3753
Female	64 ± 13.824	22±11.396
NPQ Score*	6.8±1.9	7.5±1.5
NPQ Percentage	49.1±14.2	53.9±10.8
Mean NPQ score	7.01±1.9	

\*Mean scores are mentioned along with Standard deviation  
 NPQ= Neurophysiology of Pain Questionnaire.

*Table 2: comparisons with P value*

StatisticalTest	Gender	N	Z	p-value (2-tailed)
<b>Mann WhitneyU-test</b>	MALE	100	-1.62	0.10
	FEMALE	86	-1.8	0.59

KMC= Khyber Medical College, IPM&R= Institute of Physical Medicine & Rehabilitation