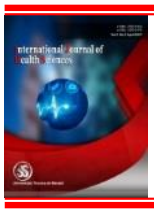

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Curricular Assessment of Pain Science Education in an Entry-Level Doctor of Physical Therapy Program

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Abstract

Aim: Institutions should evaluate the current curricula and level of DPT students' pain-related knowledge to allow for strategic implementation and modifications. The purpose of this study was to evaluate entry-level DPT) students' knowledge of pain neurophysiology spanning the curriculum to assist in guiding strategic modifications. Methods: This cross-sectional study was conducted using a convenience sample of students from eight different campuses within the same institution. Students completed the Revised Neurophysiology Pain Questionnaire (rNPQ) in the first week of the following courses, spanning three terms within the curriculum. The analysis included descriptive statistics and a comparison of means. Results: A total of 838 students completed the rNPQ. The overall mean score was 71.9% (8.6+1.6). An incremental increase in the rNPQ was noted later in the curriculum. A difference was noted between campuses (p=0.005) when not separated by course. A statistical difference in delivery format (p=0.002) was found, more specifically between T4 and T6 (p<0.001). Conclusion: This data will guide the optimal integration of modern pain science curricular recommendations. Further research in the quantity, quality, and delivery of pain science education can guide future curricular development to include modern pain science concepts.

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1 Introduction

Pain is one of the most common reasons individuals seek healthcare intervention. Physical therapists play a critical role as frontline healthcare providers in providing nonpharmacological management (Frieden & Houry, 2016). Current evidence-based guidelines for managing chronic MSK pain are multidisciplinary and include a biopsychosocial component. Yet, entry-level DPT students report greater confidence in working within the biomedical model (Mankelow et al., 2020).

There is evidence suggesting that pain education for entry-level DPT students is insufficient in curricula with most programs teaching pain management from a biomedical perspective (Bement & Sluka, 2015). One study found a mean of 31 hours dedicated to pain science in DPT curricula in the United States. However, 61% of faculty felt the time allocated was inadequate (Bement & Sluka, 2015). The wide range of time spent on pain science (5 to 115 hours) demonstrates significant inconsistency within DPT curricula. More concerning is that less than 50% of the faculty surveyed were aware of the IASP pain curriculum (Bement & Sluka, 2015). There is a "dire need" for more education on modern pain science (Hoegh, 2022).

In 2018, the IASP pain curriculum was adopted by the American Physical Therapy Association (APTA) House of Delegates to provide a framework to incorporate modern pain science concepts and deficiencies in healthcare discipline curricula (Slater et al., 2018). Institutions that have implemented the IASP pain curriculum have noted increases in knowledge of pain neurophysiology as students advance through the curriculum, and also 10% higher clinical performance scores (Jones & Hush, 2011). Hush et al. (2018), embedded the IASP curriculum in a three-year DPT program in Australia. After implementation, there was an increase in rNPQ scores as students progressed through the curriculum. Further, students also demonstrated a higher level of clinical competencies in pain management (Hush et al., 2018).

The IASP revised its definition of pain in 2020 and the APTA proceeded to recognize the role of the physical therapist in the treatment of pain by publishing a white paper in 2021 discussing the role of PTs in the treatment of pain and the opioid crisis (APTA, 2021; Slater et al., 2018). Additionally, the APTA supported the release of the PEM by the Academy of Orthopedic Physical Therapy (AOPT) to guide faculty and institutions in the integration of pain sciences into DPT curricula (Shepherd et al., 2021). The PEM provides an evidence-based examination and interventions for the management of pain throughout the lifespan, while also including various pedagogical approaches (Shepherd et al., 2021). Yet, appropriate and strategic implementation of the suggested modern pain science manual across a curriculum requires a baseline assessment. Therefore, this study aimed to assess the current pain-related knowledge of entry-level DPT students to guide strategic curricular revisions to align with current recommendations in pain science education (Boyle & Myford, 2013; Nurkertamanda et al., 2017).

2 Materials and Methods

This cross-sectional study was conducted using a convenience sample of students from eight different DPT campuses within the same institution. There are two delivery methods for the DPT programs within the institution: hybrid and residential. Students completed the rNPQ in the first week of the following courses, which span the curriculum: Term 1 (T1), Term 4 (T4), and Term 6 (T6). The study received approval from the Institutional Review Board (IRB) prior to data collection (IRB-PT-0625-427). Informed consent was not required as data was anonymous and archival in nature and collected routinely in curricular quality assessment. The rNPQ was placed electronically in the first unit of each course as an optional, no-credit

assignment. During week 3, the survey results for each student in each course were downloaded into an Excel file for analysis within the curricular assessment process.

The original NPQ consists of 19 closed-ended questions which are answered true, false, or undecided. Correct responses are awarded one point, and incorrect (or undecided) responses are awarded zero points. Scores can range from 0-19, with higher scores indicating greater pain neurophysiology knowledge. The original NPQ is a valid and reliable measurement for health care professionals, patients, and physical therapy students with a Pearson Separation Index of .84 and an acceptable test-retest reliability of 0.97 (Moseley, 2003). The 12-item rNPQ that was used in this study was developed after Rasch Analysis and has been deemed reliable and valid with good test-retest reliability of .989 in patients with chronic pain and is a reliable and valid tool for assessing pain knowledge (Catley et al., 2013).

Statistical analysis utilized IBM SPSS version 27.0 (IBM Corp., Armonk, NY, USA). The data analysis plan was conducted in four phases. First, all study variables were presented using descriptive statistics, such as means, standard deviation, and minimum/maximum values for continuous variables, while frequencies and percentages were presented for categorical variables. The second phase of data analysis was an analysis of variance testing. Specifically, a series of one-way ANOVA and a post-hoc test was performed to identify differences between the explanatory variables (i.e., term and campus) and the dependent variable rNPQ score at a statistically significant level (p<0.05). rNPQ results were expressed as mean in absolute value and percentage of correct responses (Bliss & Jacobson, 2020; Gifford & Butler, 1997).

In the third phase of the data analysis, a two-way ANOVA was performed to analyze the effect of term and campus on the rNPQ score. This analysis will inform us whether our independent variables (the "course" and "campus") and their interaction (the "course*campus") have a statistically significant effect on the dependent variable, "rNPQ score." Finally, the last stage of the data analysis, an independent t-test was performed to compare the rNPQ score between the delivery formats (hybrid versus residential).

3 Results and Discussions

Out of 2,883 DPT students, 838 completed the rNPQ, which is 29% of enrolled students. Of these, 37.5% (n=315) were enrolled in T1, 31.1% (n=261) students were enrolled in T4, and 31.3% (n=263) students were in T6. The overall mean (SD, % correct) rNPQ score was 8.6 (1.6, 71.9%), T1 7.7 (1.7, 64.8%), T4 9.0 (1.6, 75.2%) and T6 9.2 (1.6, 77.2%). (Figure 1). The rNPQ total score was significantly different between courses (p<0.001). A post-hoc analysis revealed that students' rNPQ score in T1 (M=64.8%) was lower than scores in T4 (M=75.2%) (p<0.001) and T6 (M=77.2%) (p<0.001) (Table 1). Between campuses, the rNPQ total score was different (p=0.005) when not separated by course. When analyzing the rNPQ total score by campuses in each separate course, the rNPQ total score was not different between the campuses in T1 (p=0.39) and T4 (p=1.00), but a significant difference was observed in T6 (p<0.001). A post-hoc analysis comparison between pairs showed that the rNPQ total score in Hybrid 3 (M=88.6%) was significantly higher when compared to Residential 1 (M=74.0%) (p<0.001) and Residential 4 (M=71.2%) (p<0.001) (Table 2).

A difference in rNPQ scores between the delivery methods (p=0.002) was noted. When comparing the rNPQ total score between the delivery format separately, the rNPQ score was not different between T1 (p=0.44), but a difference was observed between the delivery format in T4 (p=0.025) and T6 (p<0.001) (Table 3).

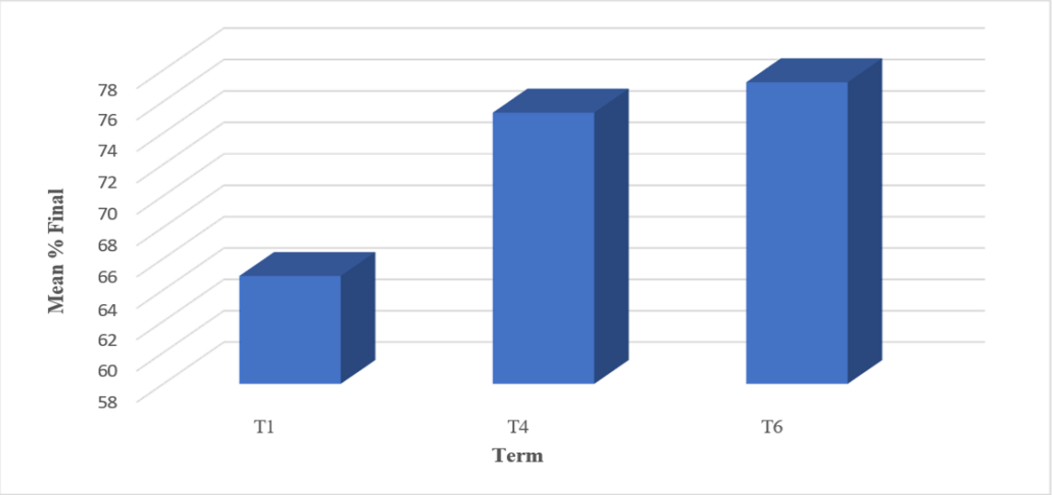

Figure 1. Average percentage scores on rNPQ by term (n=838)

Table 1
One-way ANOVA analysis of rNPQ total score by independent variable (n=839)

Variable	n	*M* (SD)	*M* in %	CI	F(df)	p-value
Term						
rNPQ Total Score						
T1	315	7.7(1.7)	64.8	7.5-7.9		
T4	261	9.0(1.6)	75.2	9.0-9.2	66.3(2)	<0.001*
T6	263	9.2(1.6)	77.2	9.0-9.4		

*p<0.05

Table 2
One-way ANOVA post hoc analysis of rNPQ total score by independent variable- campus and term (n=839)

Variable	n	*M* (SD)	*M* in %	CI	F(df)	p-value
Campuses						
rNPQ Total Score						
Hybrid 1	64	8.6(1.6)	71.8(13.8)	8.2-9.0		
Hybrid 2	64	8.9(1.7)	74.2(14.8)	8.4-9.3		
Hybrid 3	79	9.3(2.0)	77.5(17.4)	8.8-9.7		
Residential 1	123	8.4(1.5)	70.4(12.5)	8.1-8.7	2.93(7)	0.005*
Residential 2	192	8.5(1.9)	71.4(16.3)	8.2-8.8		
Residential 3	148	8.7(1.6)	72.5(13.9)	8.4-8.9		
Residential 4	102	8.5(1.6)	71.4(13.4)	8.2-8.8		
Residential 5	67	8.0(1.9)	67.4(16.6)	7.6-8.5		
T1 rNPQ Total Score						
Hybrid 1	30	7.8(1.3)	65.5(11.3)	7.3-8.3		
Hybrid 2	28	7.9(1.9)	66.3(15.9)	7.2-8.7		
Hybrid 3	31	7.9(2.0)	65.8(17.1)	7.1-8.6		
Residential 1	42	7.7(1.4)	64.8(12.1)	7.3-8.2		
Residential 2	58	7.3(1.9)	61.4(16.2)	6.8-7.8		
Residential 3	54	7.9(1.7)	65.8(14.6)	7.4-8.3		
Residential 4	33	8.3(1.6)	69.1(14.0)	6.8-8.1		
Residential 5	39	7.7(1.6)	62.6(16.0)	7.5-7.9		

T4 rNPQ Total Score						
Hybrid 1	13	8.1(1.6)	72.2(13.3)	7.7-9.6		
Hybrid 2	19	9.8(1.3)	82.4(11.4)	9.2-10.5		
Hybrid 3	20	9.6(1.6)	80.0(14.1)	8.8-10.3		
Residential 1	31	8.6(1.6)	72.3(13.8)	8.0-9.2		
Residential 2	68	8.8(1.6)	73.5(13.5)	8.4-9.2		
Residential 3	58	9.1(1.5)	76.4(12.5)	8.7-9.5		
Residential 4	24	8.9(1.7)	74.6(12.1)	8.3-9.5		
Residential 5	28	8.8(1.6)	74.1(14.2)	8.2-9.5		
T6 rNPQ Total Score						
Hybrid 1	21	9.6(1.5)	80.5(12.9)	8.5-10.3		
Hybrid 2	17	9.3(1.1)	77.9(9.2)	8.7-9.9		
Hybrid 3	28	10.6(1.3)	88.6(11.1)	10.1-11.1		
Residential 1	50	8.8(1.2)	74.0(10.5)	8.5-9.2		
Residential 2	66	9.3(1.8)	78.1(15.0)	8.9-9.8	6.3(6)	<0.001*
Residential 3	36	9.1(1.3)	76.1(11.1)	8.6-9.5		
Residential 4	45	8.5(1.6)	71.2(13.3)	8.0-9.0		
Residential 5 (no cohort)						

*p<0.05

Table 3
Independent T-test of rNPQ total score comparison between delivery formats (*n*=839)

Variable	n	*M* (SD)	*M* in %	CI95%	t(df)	p-value
Delivery/Term						
rNPQ Total Score						
Hybrid	207	8.9(1.8)	74.7(15.7)	.15-.72	3.07(837)	0.002*
Residential	632	8.5(1.7)	71.0(14.6)			
T1 rNPQ Total Score						
Hybrid	89	7.9(1.7)	65.9(14.8)	-.26-.61	0.76(313)	
Residential	226	7.7(1.7)	64.4(14.9)			
T4 rNPQ Total Score						
Hybrid	52	9.4(1.6)	79(13.3)	.24-.71	2.26(259)	0.025*
Residential	209	8.9(1.5)	74.3(13.2)			
T6 rNPQ Total Score						
Hybrid	66	10.0(1.4)	83.3(12.1)	.54-1.4	4.43(261)	<0.001*
Residential	197	9.0(1.5)	75.1(13.2)			

*p<0.05

Discussion

This study provides baseline data on entry-level DPT students' knowledge of pain neuroscience. The data will be used to guide curricular revisions to improve student knowledge in modern pain science. Comparing the delivery format of the curriculum and location will allow institutions to examine various pedagogical approaches to deliver modern pain science concepts and to optimize implementation.

Student scores improved throughout the curriculum, which is consistent with current literature (Logan & Wicinski Reynolds, 2021; Wassinger, 2021). The mean rNPQ scores for the DPT students in this study were 71.9%, whereas scores for final-year medical students in Spain and Saudi Arabia were 54.4% and 52% respectively (Adillón et al., 2015; Alodaibi et al., 2018). First-term PT students enrolled in STM1 scored only slightly lower (64.8%) on the rNPQ compared to final-year physiotherapy students in Spain (68.92%) (Adillón et al., 2015). However, T4 (75.2%) and T6 (77.2%), which occur later in the curriculum, scored higher, which may suggest that knowledge increases as the curriculum progresses.

These findings are consistent with Wassinger (2021) in which rNPQ scores across a curriculum progressively increased over time with a significant increase in rNPQ scores from year 1 to 2 with an effect size of 1.10. In Saudi Arabia, as physical therapy students progressed through a curriculum, there was an 8% increase in mean rNPQ, whereas students in the current study had a 12.4% increase (Alodaibi et al., 2018).

More recently in 2022, an international, multidisciplinary cross-sectional study quantified and compared pain knowledge amongst allied healthcare students from first to final year in the curriculum (Mankelow et al., 2022). The study included 12 institutions and six disciplines spanning Australia, England, Northern Ireland, the Republic of Ireland, and Scotland. In the first year, a total of 370 physiotherapy students scored 5.7 (47.5%), whereas in the final term scores on the rNPQ increased to 9.1 (75.83%). The final year scores noted in this study (75.83%) are similar to the scores in T6 students of the current study which were slightly higher (77.2%). All healthcare disciplines included (occupational therapy, physiotherapy paramedics, midwifery, nursing and diagnostic radiography). Yet, only physiotherapists showed a significant improvement (p=0.01) on pain knowledge as the curriculum progressed (Mankelow et al., 2022). Consistent with other literature, the authors noted that pain education teaching varied (0-40 hours) between courses, disciplines and Institutions (Mankelow et al., 2022). However, the aforementioned scores are not as high as those reported in other studies that included targeted educational interventions (Mankelow et al., 2020; Marques et al., 2016).

Marques et al. (2016), evaluated the knowledge of pain neurophysiology after active teaching-learning strategies in 14 physiotherapy students. The baseline rNPQ score was 62.5%; after a 12-week incremental intervention, mean scores increased to 90%. The low sample size is a limitation in comparing these results to the current study, which has a sample size of 838 students. Mankelow et al. (2020) performed a focused 70-minute lecture to allied healthcare students in their first and second terms. Prior to the lecture, students' mean rNPQ scores were 48%, whereas post-lecture scores improved to 78.3%. Long-term follow-up at 6 months demonstrated that knowledge was maintained at 65%, but not at the level immediately after the intervention. Further research on pedological approaches to pain science and long-term retention in entry-level DPT students can assist faculty and institutions in guiding a strategic implementation of pain sciences in curricula once a baseline is established (Bonatesta et al., 2022; Moseley et al., 2023; Fechner et al., 2024).

This study is not without limitations. A strength of the study is the large sample size from various geographical regions within the United States. However, the generalizability of these findings is limited as it is associated with only one DPT curriculum. This study did not examine pain science knowledge changes longitudinally which limits data analysis. Finally, this study did not examine knowledge of pain neurophysiology after implementing modern pain science curricular recommendations. Although the latter is optimal to further evaluate curricular changes, a baseline assessment is needed to help guide informed decisions regarding curricular changes that include modern pain science concepts.

4 Conclusion

Students demonstrated adequate knowledge of pain neuroscience in the DPT curriculum, where pain science content is scaffolded through various courses. A push for greater knowledge in pain sciences has been charged to PT educators and clinicians to produce DPT graduates who are competent in assessing and treating pain. The first step to improving clinical competence is curricular assessment for strategic modification and updates to align with recommendations from professional associations. While this descriptive pilot study provides baseline data on student knowledge of pain neuroscience, the current results do not address if pain neuroscience knowledge would increase after a targeted educational intervention. Further research in the quantity, quality, and delivery of pain science education in conjunction with the current data can guide future curricular development.

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