Examining the relationship between entry-level physiotherapy pain curricula and pain-management competency

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Abstract

Chronic pain affects one in every five Canadians, impacting physical and mental health, as well as functional capabilities. In addition to the burden on the person living with pain, the management of chronic pain is costly, and thus poses a societal burden. In response to these burdens, the Canadian Pain Task Force developed an Action Plan for Pain, which included recommendations for improved pain education in prelicensure health professional programs in Canada. The idea that better pain education will improve care for patients living with pain hinges on an underlying assumption that improved or increased amounts of pain education will lead to better clinician competency. However, this assumption has yet to be directly examined empirically. This thesis aimed to test this assumption through the administration of an online survey for pain educators to gather data about curriculum, and an online pain-management competency assessment consisting of a multiple-choice and simulation-based component for students, to measure pain management competency. This data was then analyzed to create a hierarchical linear model, wherein PT students (level 1) are nested within PT programs (level 2). This study revealed significant differences across schools in student performance on the Competency Assessment. However, the hierarchical linear model analysis showed that no program-level variables, including time dedicated to pain education, accounted for variability in pain management competency. cGPA was the only significant predictor of pain management competency. The finding that time dedicated to pain education does not predict pain management competency may imply that cultivating pain management competency is less about time dedicated to content, but the quality of that time. This theory aligns with some literature about competency-based clinical education, which suggests that time dedicated to education is less important in developing competency in students than the way

in which content is delivered. Future research could investigate other curricular factors that could explain variability in pain management competency across schools.

Résumé

La douleur chronique touche un Canadien sur cinq et a un impact sur la santé physique et mentale, ainsi que sur les capacités fonctionnelles. Outre le fardeau qui pèse sur la personne souffrant de douleur, la gestion de la douleur chronique est coûteuse et constitue donc un fardeau pour la société. En réponse au fardeau de la douleur chronique, le groupe de travail canadien sur la douleur a élaboré un plan d'action qui comprend des recommandations visant à améliorer la formation en gestion de la douleur dans les programmes de formation des professionnels de la santé avant l'obtention de l'autorisation d'exercer au Canada. L'idée qu'une meilleure formation sur la douleur améliorera les soins prodigués aux patients souffrant de douleur repose sur l'hypothèse sousjacente que l'amélioration ou l'augmentation de la formation sur la douleur conduira à une meilleure compétence des cliniciens. Cependant, cette hypothèse n'a pas encore été directement examinée de manière empirique. Cette thèse visait à tester cette hypothèse par l'administration d'un sondage en ligne destiné aux formateurs en gestion de la douleur afin de recueillir des données sur le programme d'études. De plus, une évaluation en ligne des compétences en gestion de la douleur, comprenant une composante à choix multiples et une composante basée sur la simulation, a été réalisée auprès des étudiants pour mesurer leurs compétences dans ce domaine. Les données ont été analysées pour créer un modèle linéaire hiérarchique, dans lequel les étudiants en physiothérapie (niveau 1) sont imbriqués dans les programmes de physiothérapie (niveau 2). Bien qu'il y ait eu des différences significatives entre les écoles dans la performance des étudiants à l'évaluation des compétences, l'analyse du modèle linéaire hiérarchique a montré qu'aucune variable au niveau de l'école, y compris le temps consacré à l'enseignement de la douleur,

n'expliquait la variabilité de la compétence en matière de gestion de la douleur. La moyenne cumulative était le seul facteur prédictif significatif des compétences en gestion de la douleur. La conclusion selon laquelle le temps consacré à l'enseignement de la douleur ne permet pas de prédire les résultats de l'évaluation des compétences est conforme à certaines publications sur l'enseignement clinique basé sur les compétences, qui théorisent que le temps consacré à l'enseignement est moins important pour le développement des compétences chez les étudiants que la manière dont le contenu est dispensé. Les recherches futures pourraient porter sur d'autres facteurs du programme d'études susceptibles d'expliquer la variabilité des compétences en matière de gestion de la douleur d'une école à l'autre.

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Contribution of Authors

Alaanah Bhanji was responsible for various aspects of the data collection, such as preparing the ethics approval, creating and distributing the surveys, and assisting with data collection. Alaanah Bhanji was responsible for directing the data analysis, performed preliminary analyses on her own, and was assisted with further analyzing the results and creating models by Chad McClintock (biostatistician) and Hongrun Mao (biostatistics master's student). Alaanah Bhanji was responsible for writing the manuscript. Other than the usual guidance from her supervisory committee, Alaanah received support from Fatima Amari when preparing the ethics approval.

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Abbreviations

Physiotherapist (PT)

Pain Education in Physiotherapy (PEP)

Multiple-Choice Question (MCQ)

Hierarchical linear modeling (HLM)

Introduction

Chronic pain is defined as continuous or recurrent pain that persists for at least 3-6 months and affects one in every five Canadians (Canadian Pain Task Force, 2019; Moulin et al., 2002). Chronic pain is complex, both in its etiology and treatment; biological, psychological, and social factors influence the experience of chronic pain. Pain manifests as a physically and emotionally unpleasant experience, and differs significantly between individuals (Canadian Pain Task Force, 2019). In addition to a prolonged, physically unpleasant experience, individuals with chronic pain suffer emotional distress. This can include anxiety, frustration, or depressed mood. Individuals living with chronic pain often experience functional disability, meaning that chronic pain interferes with daily living activities and participation in social roles (Nicholas et al., 2019). Moreover, those living with chronic pain are at an increased risk of suicide (Racine, 2018). In addition to the burden on the person living with pain, the management of chronic pain is costly and poses a societal burden. One reason for this is the high reliance on opioids for pain management; Canadians are the second highest per capita users of opioids worldwide (Helmerhorst et al., 2017). Chronic pain can thus be understood as a multifaceted condition that impacts a person's physical health, emotional health, and functional capabilities, in addition to a condition that impacts Canadian society at-large.

In response to the burden of chronic pain, the Canadian Pain Task Force developed an Action Plan for Pain in Canada in 2021. The Task Force was established in 2019 to provide advice to guide policymakers in improving the prevention and management of chronic pain in Canada (Health Canada, 2021). One goal in the Action Plan for Pain was that health professionals should have the knowledge, skills, and educational support to appropriately assess and manage pain based on population needs. As part of their recommendations to achieve this goal, the Task Force listed entry-level health professional education as a target for improvement (Health Canada, 2021).

Specifically, the Task Force proposed creating standardized pain-related curricula and competencies for health professional programs; creating specific competency frameworks for Canada and building pain competencies into health care practitioner licensure exams; integrating equity-oriented and trauma-informed pain care into prelicensure education for health professionals (Health Canada, 2021). These objectives are similar to other national pain strategies globally, which underline improved pain education to improve care for those living with pain (Briggsl et al., 2011; Hoeger Bement & Sluka, 2015).

The hypothesis that improved health professional pain education will improve care for patients living with pain hinges on an underlying assumption that improved health professional pain education will lead to better clinician pain management competency. However, this assumption has yet to be directly examined empirically. Testing this assumption is crucial to ensure the creation of evidence-based educational interventions. To test the assumption that better pain education leads to improved clinician competency, this thesis will examine the relationship between pain education and pain management competency in graduating Canadian physiotherapists (PTs). In the following review of the literature, important background research in understanding and evaluating this assumption will be examined. Specifically, the review will first explore historical trends in understanding pain and trends in clinical pain management. Then, it will examine the role of PTs in managing pain, first from the perspective of research, and then what PT pain management looks like in reality. The gap between research on PT pain management and clinical practice will be explored. Next, the literature on PT pain education in Canada will be explored, followed by a review of steps taken to-date to improve pain education in Canada. Lastly, the literature review will examine various research methods to measure PT pain management competency and PT pain education.

Review of the Literature

Trends in understanding pain and pain management

Within Western healthcare approaches, pain was historically understood to be an exclusively biomedical phenomenon, wherein pain was believed to be directly correlated with tissue damage (Mescouto et al., 2022; Waddell, 1987). As such, treatment has previously focused on finding the injury that was causing pain and facilitating healing as a means of eliminating pain. However, such approaches had limited success, where treatments following this model did not always lead to improved patient outcomes (Mescouto et al., 2022). Over time, the body of research on pain grew, and a paradigm shift occurred wherein pain began to be understood as a biopsychosocial phenomenon, as opposed to a purely biomedical phenomenon. This shift was initiated because of a new understanding of pain, the Gate Control Theory of Pain, which posited that pain signals are processed in the spinal cord when being sent to the brain, which leads to the possibility that pain is accentuated or attenuated by factors outside of tissue damage (Melzack & Wall, 1965). This means that two individuals with the same tissue damage could have drastically different pain experiences. This understanding led to increasing evidence that pain is more complex than initially understood and affected by various factors in a patient's life (Engel, 1977; Waddell, 1987). This has culminated in increased recognition that psychological and social factors affect patient experiences and outcomes.

The role of PTs in managing pain

Given the shift from the understanding that pain is a purely biomedical phenomenon, to the knowledge that pain is complex and multifaceted, it is now understood that best practices involve using a biopsychosocial approach when managing chronic pain. Moreover, given the opioid crisis and increasing understanding that pain can be managed using strategies outside of pharmaceuticals, the Action Plan for Pain in Canada highlighted the need for accessible, nonpharmacological,

individualized, multidimensional care in reducing the burden of chronic pain (Health Canada, 2021). Physiotherapists (PTs), being trained in administering manual therapy and specific exercise training, are well situated to provide non-pharmacological treatment of pain (Moseley, 2002). Furthermore, as primary care clinicians, PTs are an accessible source of care for those living with pain (Desjardins-Charbonneau et al., 2016).

Research related to the role of PTs in pain care

Research has shown that PTs can provide a tailored approach to support patient engagement in physical activity and exercise, approaches that align well with a biopsychosocial model of pain management. PTs can employ strategies such as graded physical activity, mindbody approaches, and facilitating connections with community-based resources (Thacker et al., 2021). PTs can bring a pragmatic approach to pain care, as their primary goal is to improve functional outcomes and promote engagement in meaningful activities in their patients. Patients report that they value and prioritize focusing on function, as opposed to solely pain reduction, with a particular focus on resuming meaningful activities and participation in daily activities when establishing goals for care (Thacker et al., 2021). Managing psychological factors related to pain and functional capacity is part of a PT's responsibility to their patients and they have the capacity to deliver psychologically informed care, where they adapt treatment based on psychological factors and use strategies such as motivational interviewing and cognitive-behavioural techniques

(Thacker et al., 2021).

Research has shown that PTs can be involved in the development and delivery of self-management techniques over time. Patients who employ self-management strategies to cope with chronic pain are less likely to have high levels of pain-related disability; PTs can support their patients to engage in active chronic pain self-management strategies (Thacker et al., 2021). This can take the form of pain neurophysiology education, cognitive behavioural techniques, or

individualized, goal-oriented exercises. Targeted pain neurophysiology education can produce functional and symptomatic improvement; this is a valuable skill, as explaining pain is an important component of chronic pain management (Moseley, 2002). Overall, PTs are well positioned to support the needs of patients living with chronic pain by using non-pharmacological interventions, promoting functional outcomes, and supporting patients' self-management. These approaches are in line with a biopsychosocial approach to pain management.

Research-to-practice gaps

There is a significant gap between what is recommended in research and actual PT clinical practice. This research-to-practice gap may be broadly understood as PTs operating from an outdated biomedical model of pain, as opposed to the currently supported biopsychosocial model of pain. Literature about these research-to-practice gaps in PTs managing chronic pain will be reviewed below and include challenges such as a lack of understanding psychosocial factors that influence a patient's pain, challenges with managing the therapeutic relationship, and unhelpful attitudes and beliefs, such as stigma.

Research examining the role of PTs in the biopsychosocial management of pain highlights the need for clinicians to help patients manage pain in conjunction with psychological strategies, and recognizing the role of nervous system sensitization in a patient's experience of pain (Nijs et al.,

2016). However, PTs often have limited recognition of the roles that cognitive, psychological, and social factors have in pain, which contributes to the research-to-practice gap. PTs often report lacking the skills and confidence to successfully discuss and address cognitive, psychological, and social factors with patients. Instead, PTs often report that they are more comfortable and confident treating patients with pain with more "straightforward" presentations of pain, who do not have complicating factors (Synnott et al., 2015). This may be because PTs often find it easier to focus

on “mechanical” factors such as mobility and movement patterns in their treatment of pain. This finding may reflect the heavily biomedical training that PTs receive, and an absence of explicit training in communication about pain (Synnott et al., 2015). Research has found that patients of PTs who lack competence in addressing depression, anxiety, and post-traumatic stress disorder often experience barriers to recovery (Daykin & Richardson, 2004). Evidently, PTs often struggle to implement a biopsychosocial approach in their practice. This may result from their clinical training being heavily rooted in a biomedical framework.

Another explanation for research-to-practice gaps is that PTs encounter difficulties with managing the therapeutic alliance while simultaneously employing a biopsychosocial approach to pain management. Specifically, PTs may avoid discussing psychosocial factors with patients unless a patient themselves raises these issues as factors in their pain (Synnott et al., 2015). This may be because patients report angst that the presence of these factors may delegitimize their pain experience in the eyes of their clinician (Ng et al., 2021). PTs may struggle to communicate with patients especially when they believe that their treatment advice conflicts with patients’ beliefs and attitudes. This is because a patients’ understanding and cooperation with the PT’s pain beliefs and attitudes is fundamental to a functional therapeutic alliance (Jeffrey & Foster, 2012). Hence, challenges with managing pain using a biopsychosocial approach may stem from PTs attempting to preserve their therapeutic alliance with patients.

Another set of important factors that shape a PT’s ability to manage pain well is their attitudes and beliefs; unhelpful attitudes or beliefs contribute to the research-to-practice gap. For instance, biomedically-oriented pain beliefs seep into clinical reasoning and explanations given to patients (Daykin & Richardson, 2004). How a PT attributes and explains pain to a patient influences that patient’s beliefs and behaviour. Furthermore, research has found that PTs may stigmatize certain behaviours that indicate that cognitive, psychological, and social factors are

impacting a patient's pain experience (Synnott et al., 2015). When a PT stigmatizes a patient, they often attribute negative characteristics to them, such as attention-seeking, lacking motivation or independence, or motivated by financial gain (Synnott et al., 2015). A clinician operating from stigma may lack awareness that a patient's behaviour may reflect underlying cognitive, psychological, and social factors. Alternatively, it may result from a lack of empathy towards patients who don't fit neatly into their understanding of pain (Synnott et al., 2015). Research has also pointed to the idea that PTs may categorize and label patients; "good" patients tend to experience better outcomes compared to "difficult" patients, who tend to experience poorer outcomes or are written off, or referred (Daykin & Richardson, 2004). Patients labeled as "good" tend to have fewer psychological or social factors at play. Stigma can thus undermine successful pain management by compromising communication and patient engagement with treatment (Synnott et al., 2015).

Understanding the current state of PT pain education

One potential reason for these research-to-practice gaps is inadequate pain education. As such, there is an abundance of research examining the current state of pain education. This research points to limitations found across health professions, including physiotherapy. One core issue is that early learning in PT programs tend to focus on musculoskeletal problems (Foster & Delitto, 2011). This teaching often ends up reinforcing students' understanding that pain and disability have clear anatomical and pathological links. This foundation reinforces a biomedical perspective of pain, which is difficult to challenge later. This is also partially a result of foundational definitions taught in entry-level training being heavily rooted in disease and injury models of anatomy, strength, and pain (Foster & Delitto, 2011). Thus, even when biopsychosocial principles are taught to students, most of the time and attention is spent on biomedical assessment and treatment of musculoskeletal problems (Foster & Delitto, 2011). This research points to a fundamental issue in

PT pain education—students are initially equipped with an understanding of pain that is entrenched in a biomedical paradigm, which is limited in its effectiveness when it comes to application to pain management, and which is hard to challenge later—even in the face of opposing evidence.

IASP Curriculum Guidelines. It is important to have an "ideal" state of PT pain education to work toward, and to compare current pain education. Knowledge about how PTs can support pain management in patients living with chronic pain has been synthesized into recommendations for entry-to-practice curricula. Specifically, the International Association for the Study of Pain (IASP) authored several profession-specific curriculum outlines to describe how health professionals can most effectively manage pain, encouraging professional education bodies to adopt the criteria. The IASP's curriculum guidelines for PT includes four domains, as decided by a consensus-building process. The domains include the multidimensional nature of pain, pain assessment and measurement, management of pain, and pain conditions (International Association for the Study of Pain, 2018). The guidelines include learning outcomes such as understanding the biopsychosocial model and its relevance to pain; modifying pain and encouraging helpful behaviours, promoting tissue healing, improving function, and reducing disability; implementing management that includes patient education, functionally oriented behavioral-movement reeducation approaches and exercise, and manual therapy (International Association for the Study of Pain, 2018). The IASP recommendations reinforce and further demonstrate the potential for PTs to manage pain using a biopsychosocial approach. These recommendations provide a framework to understand an ideal vision for both PT pain management and PT pain education.

The current state of PT pain education internationally (outside of Canada). Previous research has looked at PT pain education in the context of the IASP curriculum guidelines, using it as a standard to measure the current state of pain education. An American study that used the

IASP curriculum guidelines as a framework for assessing PT pain education found that within American PT pain education, the total content on pain in their curriculum was 31 hours on average; hours ranged from 5 to 115 hours across schools (Hoeger Bement & Sluka, 2015). This study found that most schools had designated blocks of time to address pain; these chunks of time were integrated throughout the curriculum. However, only 61% of respondents believed that their students received adequate education in pain management (Hoeger Bement & Sluka, 2015). This research indicates that often, educators perceive that students do not receive sufficient pain education relative to the IASP curriculum guidelines. Furthermore, it pointed to the lack of awareness that educators have around IASP curriculum guidelines, which indicates a need for improved awareness of pain education standards (Hoeger Bement & Sluka, 2015).

Further international research has looked at how graduating students perceive that they are performing in relation to the IASP curriculum recommendations for PT. Specifically, pain education was measured in Australian exercise physiology programs. Similarly to PTs, accredited Exercise Physiologists (AEPs) are 4-year, university-trained allied health professionals with services covered under public and private health schemes. The survey revealed that only three universities were aware of the IASP curricula recommendations (Jones et al., 2022). Within the curricula, educators spent the most time on content about exercise therapy and pain assessment; they spent the least amount of time on themes related to differences between acute and chronic pain; the biopsychosocial model of pain; psychological management of pain; multidisciplinary management of pain (Jones et al., 2022). This study also looked at students' perceived competency. Results showed that 74% of graduates perceived their degree to be inadequate in preparing them to treat people with chronic pain. Over half of graduates (51%) lacked awareness of guidelines for PT pain curricula (Jones et al., 2022). This research demonstrates shortcomings of pain education

related to the biopsychosocial management of pain; these limitations are perceived by both educators and students.

Internationally, there exists inadequacies in how recommended pain content is addressed across PT programs. There is an overall lack of emphasis on biopsychosocial approaches to pain management, which is crucial to effective pain management. Research suggests that there is room for improvement in PT pain education across many countries.

The current state of PT pain education in Canada. Similar to research conducted in other countries, PT pain education has been examined in Canada. Compared to other health professions in Canada, PT has more time devoted to pain curricula (e.g., more than dentistry, medicine, nursing, occupational therapy, and pharmacy) (Watt-Watson et al., 2009). This research has found that PT programs typically have the most time dedicated to teaching students about nonpharmacological pain management compared to other professions, both relative to other curriculum areas and in terms of total time spent (Watt-Watson et al., 2009). A national survey was administered to Canadian PT educators in 2016 to assess the current state of pain education in Canada in more granularity. This survey measured the time that educators reported spending on pain education curricula, as well as whether or not IASP curriculum areas were integrated into the curriculum "in sufficient depth" (Wideman et al., 2020). This study found that the time dedicated to pain education ranged from 8 to 65 hours across the country. This range represents an eight-fold difference across schools in the amount of time dedicated to pain education—which points to significant variability in pain education across Canadian PT programs. Furthermore, this study found that less than half of the recommended IASP content is incorporated across Canadian PT programs (Wideman et al., 2020). This research suggests that there are clear shortcomings in PT pain education in Canada, similar to the shortcomings seen in other countries.

Given the inadequacies in PT pain education, a stakeholder meeting was held in Montreal in 2016. This meeting included people living with pain, PT students and recent graduates, pain educators, PT program administrators, and representatives from the Canadian Alliance of Physiotherapy Regulators, Physiotherapy Education Accreditation Canada, Canadian Physiotherapy Association, and Physiotherapy Practice Profile project (Wideman et al., 2018). Part of this meeting involved discussing the IASP curriculum guidelines. Stakeholders agreed that the IASP guidelines may be too "unwieldy" for non-pain experts to integrate into PT curriculum; the guidelines include more than 100 items and may be considered too complex (Wideman et al., 2018). There was consensus that there is still a need for a reference standard specific to Canadian PT pain education, consistent with literature emphasizing the importance of contextualizing KT efforts to the local environment (Wideman et al., 2018). Thus, this workshop revealed a need to create a Canadian-specific guideline for PT pain education.

Following this work, a stakeholder-endorsed national strategic plan for improving PT pain education across Canadian programs was developed. Stakeholders such as PT students and recent PT graduates, people living with pain, and Canadian PT pain educators were involved in creating the strategic plan (Wideman et al., 2022). This plan was developed iteratively and led to the emphasis of five priorities. The strategic plan included priorities such as improving the uptake of best evidence within individual PT programs and advancing pain education research. This research further emphasized the need to incorporate best practices from research into PT pain education and to continue to research PT pain education (Wideman et al., 2022). The strategic plan provides stakeholder support for the furthering of research and strategies to improve PT pain education.

Given the stakeholder consensus to create a Canadian-specific guideline to inform PT pain education, a working group of Canadian pain educators was formed to help formulate this guideline. At each of the 15 entry-level PT programs in Canada, one or two representatives lead

the pain education at their local program. This network of university-based pain educators was named the Pain Education in Physiotherapy Curriculum Initiative (PEPCI). PEPCI members helped develop a 15-item competency profile that delineates the necessary abilities for PTs to possess to manage pain upon entry to practice (Augeard et al., 2022). A modified Delphi design, an iterative process that uses a progression of repeated rounds of voting to achieve agreement, was used to achieve consensus across relevant stakeholders on a competency profile for pain management education in Canadian PT programs. To reach consensus, this approach integrates existing literature, perspectives of stakeholders, and the judgment of experts within a field to reach consensus (Augeard et al., 2022).

The result was a 15-item Pain Education in Physiotherapy (PEP) Competency Profile. Unlike the IASP guidelines based on learning outcomes, these guidelines were created in the form of competencies. This is consistent with research that has found that competency-based education emphasizes a specified level of performance based on a student's knowledge, skills, and attitude (Hoeger Bement et al., 2014). The items are described fully in **Appendix 1**. The competencies are divided into two domains. The first domain describes competencies that address specific aspects of pain management, such as conducting a comprehensive assessment and facilitating transitions in care. The second domain contains competencies that permeate all aspects of pain management, such as communicating effectively with patients and integrating research evidence into care. Understanding the necessary competencies for PTs to possess provides an ideal state of PT pain care to work towards. The PEP Competency Profile also offers a guideline for pain education specific to the Canadian context, which is an important first step in examining PT pain education for potential areas of improvement.

Methods to assess the link between PT pain education and pain management competency To assess the relationship between PT pain education and pain management competency, it is necessary to evaluate both measures accurately using evidence-based approaches.

Methods for assessing PT pain education. Generally, pain education has been assessed using surveys wherein educators self-report various metrics about their curriculum. For instance, a study done to measure the integration of IASP pain curriculum guidelines into American PT programs used a 10-item survey designed to evaluate how pain was incorporated into the curriculum, the amount of time spent on pain, and the resources used to teach pain (Hoeger Bement & Sluka, 2015). An Australian study similarly administered a survey to educators to assess pain curricula, where the survey consisted of three sections. The sections included information about degree requirements and characteristics, questions on pain curriculum taught, and questions to assess competency domains outlined in the IASP criteria for PT (Jones et al., 2022). A previous Canadian study conducted by the Wideman lab similarly used a national survey to assess pain education across Canadian PT programs. The survey asked about the time dedicated to pain-related content, how this content was integrated within the curriculum, and the level of integration of IASP curriculum themes within the program (Wideman et al., 2020). Past research thus points to surveys as a common and effective way to measure pain education.

Methods for assessing pain management competency. Assessing competency requires more than self-reported data. Measuring competency, which is "the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served," requires an assessment of basic skills, clinical reasoning and judgment (Epstein, 2002). As such, an assessment tool is one of the most reliable ways to measure competency. Competency assessments have been developed to measure pain-related competencies. For instance, Canadian researchers created a Pain

Competence Assessment Tool (PCAT) based on the pain management core competencies aligning with IASP curriculum guidelines for interprofessional pain curriculum (Hassan et al., 2022). The PCAT is an online competency-based assessment tool for healthcare providers that consists of 5 case scenarios followed by 17 key-feature questions, which were designed to simulate the sequence and the follow-up visits seen in real-life practice (Hassan et al., 2022). This written assessment tool can assess clinical competence in managing chronic pain relative to interprofessional pain management.

In addition to written assessments, simulation-based assessments allow the evaluation of behavioural aspects of clinical competency. Simulation-based assessments specifically facilitate the assessment of important interpersonal competencies like communication skills and empathy (Weller et al., 2012). Prior to this research, there lacked an assessment tool, whether written or simulation-based, to measure pain-management competencies specifically for PTs.

Given the need for a tool to measure PT pain management competency, the Wideman lab developed a competency assessment to measure competency relative to the Canadian-specific PEP Competency Profile. To measure graduating student pain management competency, a multicomponent assessment including a multiple-choice question (MCQ) assessment, and a simulation-based assessment was developed (draft manuscript; see **Appendix 2**).

The MCQ assessment was developed such that it assesses the items of the PEP Competency Profile at the "Knows How" level of Miller's pyramid of clinical competence, which is the highest level of clinical competence that can be assessed with MCQ assessments (Miller, 1990). Each question was framed with vignettes as lead-ins to prompt students to demonstrate their ability to apply theoretical knowledge in various scenarios. PTs and graduating students from three PT programs in Canada piloted the assessment and shared feedback about the MCQ items. In total, 28

items were selected based on the discrimination demonstrated and pragmatic considerations for real-life implementation, such as time constraints.

To develop the simulation-based assessment, stations were created using scenarios seen in real clinical encounters. A corresponding marking rubric was developed for each station. Stakeholders reviewed simulation stations and rubrics for relevance, clarity, and completeness, and then piloted the stations with graduating PT students. The stations that demonstrated adequate inter-rater reliability and internal consistency of the overall assessment were selected for the final version of the assessment, which included three total stations.

The MCQ and simulation-based assessments provide a tool to measure pain management competency in graduating Canadian PT students, which is a necessary component of measuring the relationship between PT pain education and PT pain management competency.

Study Description

The Action Plan for Pain in Canada, as well as other calls for improved pain education, hinges on the assumption that improved or increased pain education will lead to improved pain management competency. It is crucial to test this assumption to ensure that educational interventions are evidence-based and productive. This thesis aims to test this assumption in the context of Canadian PT programs. This will be achieved by conducting an analysis wherein PT pain education and PT pain management competency are quantified; the relationship between these variables will be examined using hierarchical linear modeling to determine if there is a relationship and the nature of this relationship.

Methods

Purpose. The primary purpose of this study was to determine if the integration of 15 pain management competencies into Canadian entry-level PT program curricula predicts graduating student pain management competency.

Design. To answer the research questions, a cross-sectional study design was used. This study employed an online survey for pain educators to gather data about curriculum, and an online pain-management competency assessment consisting of a multiple-choice and simulation-based component for students, to measure pain management competency.

Framework. Making program-specific recommendations for curricular improvements is in line with a guiding framework of this project, which is to employ an integrated knowledge translation (IKT) approach. This approach focuses on the creation and maintenance of a collaborative exchange of knowledge between researchers, healthcare professionals, educators, students, and people living with pain. This approach ensures that research findings are scientifically rigorous while being relevant, applicable, impactful, and aligned with the needs of knowledge users (Wideman et al., 2018). To enable this process, stakeholders such as PT educators, clinicians, and individuals living with pain were engaged as partners. Input was solicited throughout the research process, including the identification of relevant content and the design of the assessment tool. This collaboration facilitated the inclusion of perspectives of those directly impacted by pain education, contributing to the relevance and applicability of the developed tools. **Power analysis**

There are 15 PT programs across Canada. Using a sample size calculator for multi-level analysis, a critical alpha of 0.05, a conservative intra-cluster correlation coefficient of 0.1, and estimating a moderate effect size (i.e., an F-squared value of 0.15), it was expected that 15 clusters would be needed to detect a significant relationship between the primary independent variable (i.e. hours dedicated to pain education) and pain management competency. This estimated effect size is

equivalent to a 5-mark difference (out of 100) among programs at the lowest quartile of the percent range compared to those at the highest quartile.

Participants

Educators. To measure the integration of PEP Competency Profile items into PT curriculum, educators at entry-to-practice PT programs in Canada who are responsible for teaching pain-related content were recruited. This network of university-based pain educators, PEPCI members, were invited to participate in a survey to determine the integration of PEP Competency Profile competencies into curriculum.

Students. To measure graduating students' pain management competency, students of PEPCI members were recruited. Students were a part of the 2022 or 2023 graduating cohort. The Competency Assessment was carried out over two school years to accommodate logistical and timing constraints. All students of PEPCI members in their respective cohorts participated in assessment-related activities, as they were integrated into regular class activities. Before beginning the activity, students completed a consent form. Students who consented to their data being used for research purposes were included in analyses. Integrating the assessment into regular class activities was intended to reduce bias in the students who participated, due to perceived confidence or time available to participate. Students were compensated $20 CAD for participating.

Inclusion and exclusion criteria. The students whose data was included in the analysis were students who consented to their data being shared, and who completed both sections of the Competency Assessment. Students who did not complete both parts of the assessment (MCQ and simulation-based) were excluded from the analysis. Students who reported that they were not on track to graduate with the rest of their cohort were also excluded from the analysis.

Procedure

Collecting Curriculum Data. PEPCI members were recruited via email to participate in an online survey in the spring of 2023. This online survey, The Pain Education Survey, was administered on LimeSurvey (LimeSurvey GmbH, 2006). The survey included several sections designed to quantify PT pain education at their respective programs.

Administering the Competency Assessment. To measure graduating student pain management competency, a Competency Assessment composed of a multiple-choice question (MCQ) assessment and simulation-based component was administered to students graduating from an entry-level PT program. This assessment was developed in earlier stages of this project.

The Competency Assessment was integrated into regular classroom assessments. Prior to completing the assessment, students completed a consent form and sociodemographic survey. The consent form allowed students to indicate whether they consented to the use of their data for research purposes. The sociodemographic items prompted students about individual factors, such as age, sex, gender, and additional pain management experiences.

The Competency Assessment used to measure pain management competency was a multicomponent assessment including a 28-item MCQ assessment and a simulation-based component consisting of three stations. Administration of the MCQ questions was conducted on LimeSurvey (LimeSurvey GmbH, 2006). Students were given one hour to respond to the 28 questions and could navigate backward to revisit questions they may have already completed or skipped. Upon completing the 28-item assessment, consenting students were automatically sent their results from the MCQ assessment.

The simulation-based component occurred over Zoom. Students were asked to participate in three different stations meant to be similar to pain management scenarios seen in a real clinical encounter. Each participating PT program was assigned a different day on which students would

complete the assessment. Students were provided links to a Zoom call, in groups of six at a time. In the main Zoom session, a facilitator explained the logistics of the simulation-based assessment to the students. After this briefing, the facilitator placed students into breakout rooms, such that there was only one student per breakout room. In one Zoom call, there were two of each of the three stations set up. Inside these breakout rooms were a simulated patient actor and a secondary facilitator. The secondary facilitator was responsible for recording the session and ensuring the session went smoothly. Students were given time to read the scenario before interacting with the simulated patient. After this time, students had either 6 or 8 minutes to interact with the patient, depending on the nature of the station. After 8 minutes, the facilitator in the main Zoom session brought students back to the main room and sent them to their next station. This was repeated until students completed all three stations. Recordings of the simulation-based assessment were uploaded to OneDrive by the secondary facilitators.

Measures & Variables

Quantifying pain-related curriculum. The Pain Education Survey asked educators to provide information about how pain management competencies from the PEP Competency Profile may or may not be incorporated into the mandatory curriculum that all entry-level PT students receive. This involved providing information about if and how each of the 15 competencies were integrated into learning activities. Educators were asked about specific types of learning activities within which competencies may be integrated, such as didactic instruction, problem-based learning, simulation-based activities, case-based learning, or other types of activities. This data was used to create a proportion, where the number of competencies that had at least one reported learning activity was divided by the total number of competencies (15).

Educators were asked if and how each of the 15 competencies was integrated within student assessments. They were asked about specific evaluation methods within which competencies may

be incorporated, such as practical assessments, written assessments, presentations, problem-based learning, simulation-based activities, or other types of assessments. This data was used to create a proportion, where the number of competencies that had at least one reported assessment was divided by the total number of competencies (15).

Educators were asked to report if they had learning objectives and learning outcomes for each of the 15 PEP competencies in their program syllabi. Educators were given the option of uploading their syllabi instead if they had time restrictions, where a member of the research team would map the learning objectives and outcomes included in syllabi onto competencies instead. Lastly, educators were asked to report an estimate of the total number of mandatory hours dedicated to pain education in their respective programs.

To measure the proportion of PEP Competency Profile competencies addressed in learning outcomes and objectives, educators were given the choice of mapping learning objectives or outcomes from their syllabi onto the 15 PEP Competency Profile competencies or providing their syllabi for members of the research team to map onto the competencies. For educators who opted to provide their syllabi, one member of the research team read through each syllabus and matched any relevant learning objectives or outcomes to the PEP Competency Profile competencies. Then, this research member coded learning objectives and outcomes from all schools based on three criteria: 1) is the learning objective/outcome explicit about pain or come from a pain-specific course (yes/no); 2) to what extent does the learning objective/outcome match the scope of the PEP Competency Profile competency (fully/partially/no); 3) which level of Miller's Pyramid of Clinical Competence is the objective/outcome written at (knows/knows how/shows how/does). The coding was repeated by another member of the research team. Any discrepancies were discussed and resolved between coders. Pain-related learning objectives or outcomes were given a score of 2 if they fully matched the scope of the PEP competency, 1 if it partially matched the scope

of the PEP competency, or 0 if it did not match the scope of the competency. These values were added up to create a score out of 30.

This survey allowed the creation of four variables: hours dedicated to each competency, the proportion of PEP Competency Profile competencies addressed through learning activities (proportion out of 15), the proportion of PEP Competency Profile competencies addressed through assessments (proportion out of 15), and the proportion of PEP Competency Profile competencies addressed through learning outcomes or objectives (proportion out of 30).

Student pain management competency. The MCQ component involved 28 questions framed with vignettes to prompt students to demonstrate their ability to apply theoretical knowledge in various clinical scenarios. Questions highlighted key dilemmas often seen in clinical pain management. Each question corresponded to a competency from the PEP competency profile. For the MCQ assessment, LimeSurvey provided an output about whether each question was answered correctly or not for each student. Each correct answer received one point.

For the simulation-based assessment, two graders graded every video for a single station (across three stations, six graders were involved). Graders provided a rating on a Likert scale ranging from 0-4 for several rubrics. These rubrics addressed various components of the clinical encounter (**Appendix 3**). Scores were averaged across the two graders and added to create a station-specific score for each student.

To create a score for overall student pain management competency, the scores from the MCQ assessment and simulation-based assessment were converted into percentages based on the highest possible score for each section. The scores from both components were then added together, weighted equally, to create an overall pain-management score.

Sociodemographic information. Along with the consent form, students filled out a sociodemographic survey. This survey collected information on gender, sex, age, mother tongue,

whether they were on track to finish their degree with the rest of their cohort, and whether they had participated in additional pain-related courses outside of their program. Additionally, students reported their ethnicity based on the Canadian census categories and were permitted to select more than one category to best describe themselves. To simplify this data, ethnicity variables were grouped into multiple categories: Caucasian (yes or no); Indigeneity (yes or no); and Visible Minority (yes or no).

GPA. The cumulative GPA (cGPA) of consenting students was collected from program administrators from each program (i.e., not self-reported). This data was requested on behalf of students who consented to share their GPAs for research purposes. cGPA was standardized using multiple online conversion charts and checked against standardized tables.

Analysis

Hierarchical linear modeling (HLM) was chosen to evaluate the relationship between *integration of pain-related content* and *pain management competency score.* HLM was selected as it can account for both student-level and program-level factors. For the HLM model, PT students (level 1) are nested within PT programs (level 2). The primary HLM analysis focuses on determining the unique contribution *time dedicated to pain content* (level 2) in explaining *pain management competency Score* (level 1), adjusting for student-level variables (level 1). The secondary analysis explores the unique explanatory value of the integration of pain management competencies into learning activities, assessments, learning objectives and learning outcomes, using the same analytic approach as the primary analysis.

Prior to conducting the multi-level model, it was first necessary to investigate whether there are truly group differences between schools with respect to how students performed on the competency assessment. To do this, an ANOVA F-test was conducted to determine if at least two programs had significantly different scores. After determining that there were group differences between schools,

the multi-level model could be built. This was done using the PROC MIXED procedure in SAS, also known as linear mixed modeling. Regression coefficients and parameters were estimated using the Restricted Maximum Likelihood (REML) method, the default method in SAS, which produces unbiased estimates. REML is preferred under many conditions, especially when sample sizes are smaller. For model evaluation and comparison, Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC) were used as assessments. Models with larger log-likelihoods or smaller AIC and BIC values indicate better-fitting models.

To build the multi-level model, first, an empty model (unconditional model) was created, which contains random effects of PT programs and random variation within each program, by having only a random intercept. This model is important in evaluating the proportion of total variability in MCQ scores that can be explained by program alone. Then, a second model was created, which included both a random intercept and hours data (level 2). Lastly, a third model was built using a random intercept, hours data (level 2), and student-level variables (level 1). The level 1 predictors were selected by performing the backward elimination approach. The backward selection procedure using PROC GLMSELECT. For this selection, 0.15 was chosen as the stay significance level. After adjusting for select level 1 variables, a final model was created.

Results

Baseline Results—Compulsory Pain Management Curricula

There are 15 total entry-level PT programs in Canada, however two programs (Program 8 and Program 11) had logistical constraints that prevented their involvement in this analysis. Hence, the results represent the curriculum of 13 of the 15 PT programs in Canada.

Below is a short-hand version of the PEP Competency Profile that corresponds to several of the following figures. The full Competency Profile is in **Appendix 1**.

competency	short description
competency 1	therapeutic alliance
competency 2	assessment
competency 3	diagnosis and prognosis
competency 4	treatment plan
competency 5	transitions in care
competency 6	monitoring and adapting treatment
competency 7	collaboration
competency 8	advocacy
competency 9	person-centered care
competency 10	support autonomy
competency 11	communication
competency 12	social justice
competency 13	self-reflection
competency 14	evidence-based practice
competency 15	safe and ethical care

The first metric examined across PT programs was hours dedicated to pain education.

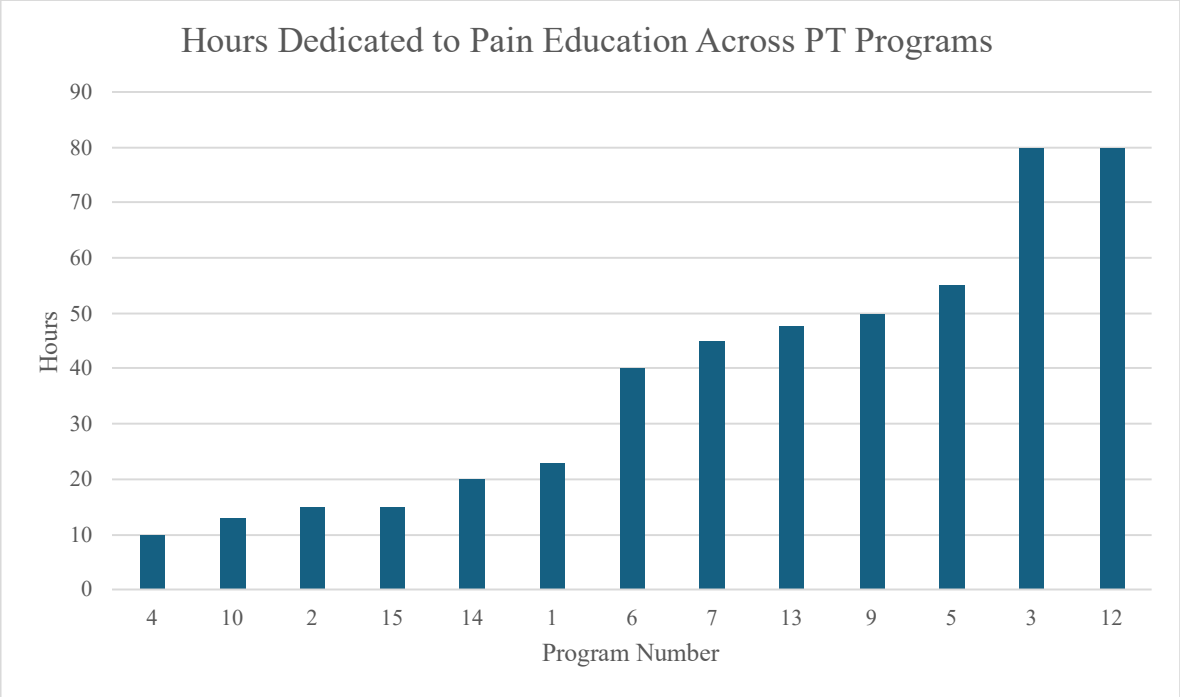

Figure 1. This figure illustrates the range in time dedicated to pain education in Canadian PT programs, where the number on the x-axis corresponds to a specific PT program, and the y-axis represents time dedicated to pain education in hours.

Figure 1 illustrates time dedicated to pain education across PT programs. Across the 13 schools included in the analysis, the average time dedicated to pain education in entry-level PT programs was 38.0 hours (SD = 24.4). The number of hours dedicated to pain education ranged from 10.0 hours to 80.0 hours, with the median being 40.0 hours.

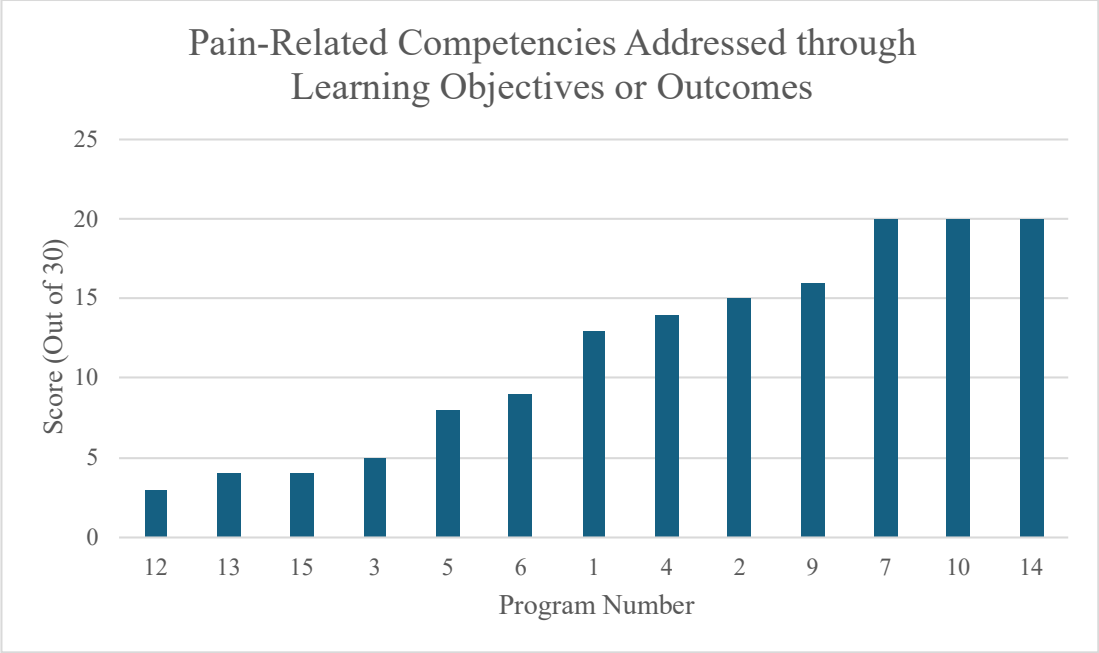

Figure 2. This figure illustrates the range in scores for learning objectives and outcomes. The score reflects how well each objective or outcome matched the scope of each of the 15 PEP competencies. The x-axis corresponds to a specific PT program.

Pain-related learning objectives or outcomes were given scored out of 30, depending on how well each objective or outcome matched the scope of the 15 PEP competency. The average score for learning objectives or outcomes was 11.6 (SD = 6.5). The scores for learning objectives or outcomes that each program had related to the PEP Competency Profile is illustrated in *Figure 2*.

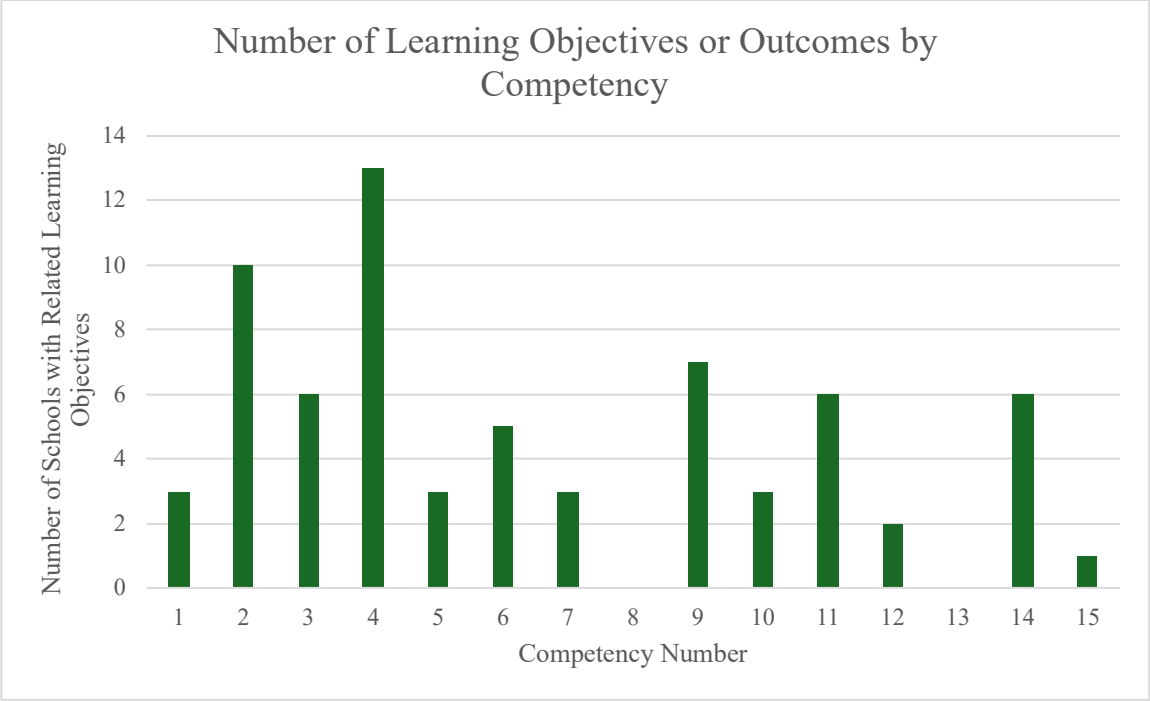

Figure 3. This figure illustrates how many programs had a learning obective or outcome relative to each of the 15 PEP competencies. The x-axis represents each of the 15 PEP competencies.

The breakdown of pain-related objectives and outcomes addressed by competency is shown in *Figure 3*. Competency 8 (advocacy) and competency 12 (social justice) were not addressed in learning objectives or outcomes in a pain-specific context at any program.

Competency 4 (treatment plan) was most often addressed in learning outcomes and objectives.

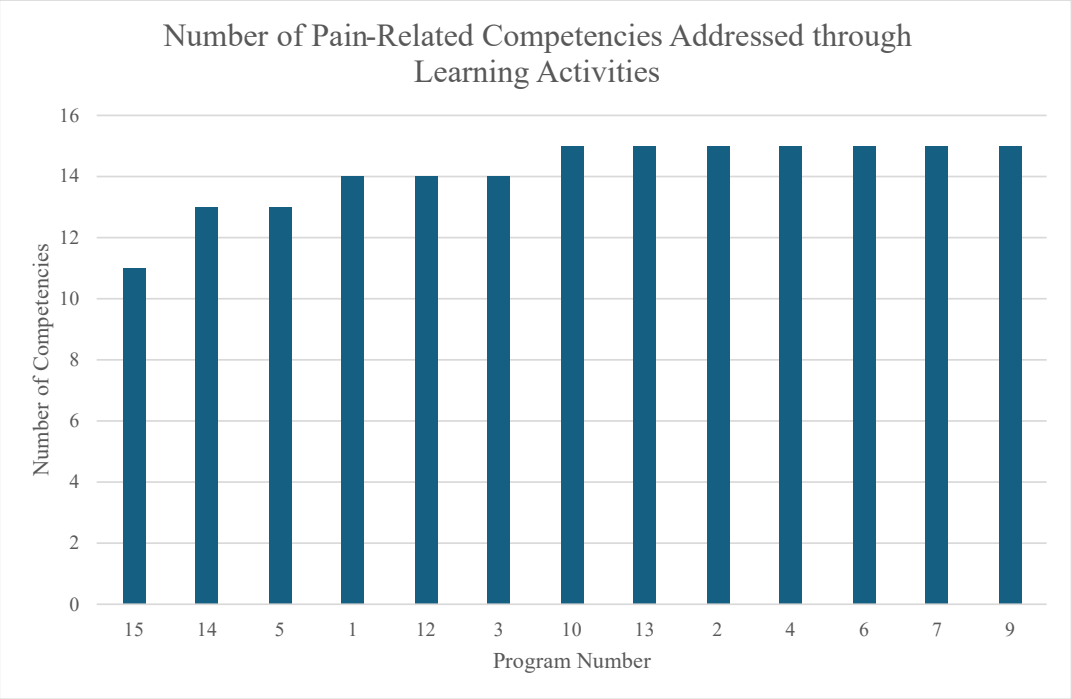

Figure 4. This figure displays the range in number of PEP competencies addressed through learning activities across PT programs. The x-axis corresponds to a specific PT program.

In terms of competencies addressed in learning activities, on average, most schools addressed 14.2 (SD = 1.2) of 15 PEP competencies through learning activities in their curricula. The number of competencies addressed through learning activities ranged from 11 to 15 competencies. The number of competencies addressed through learning activities by program is illustrated in *Figure 4*.

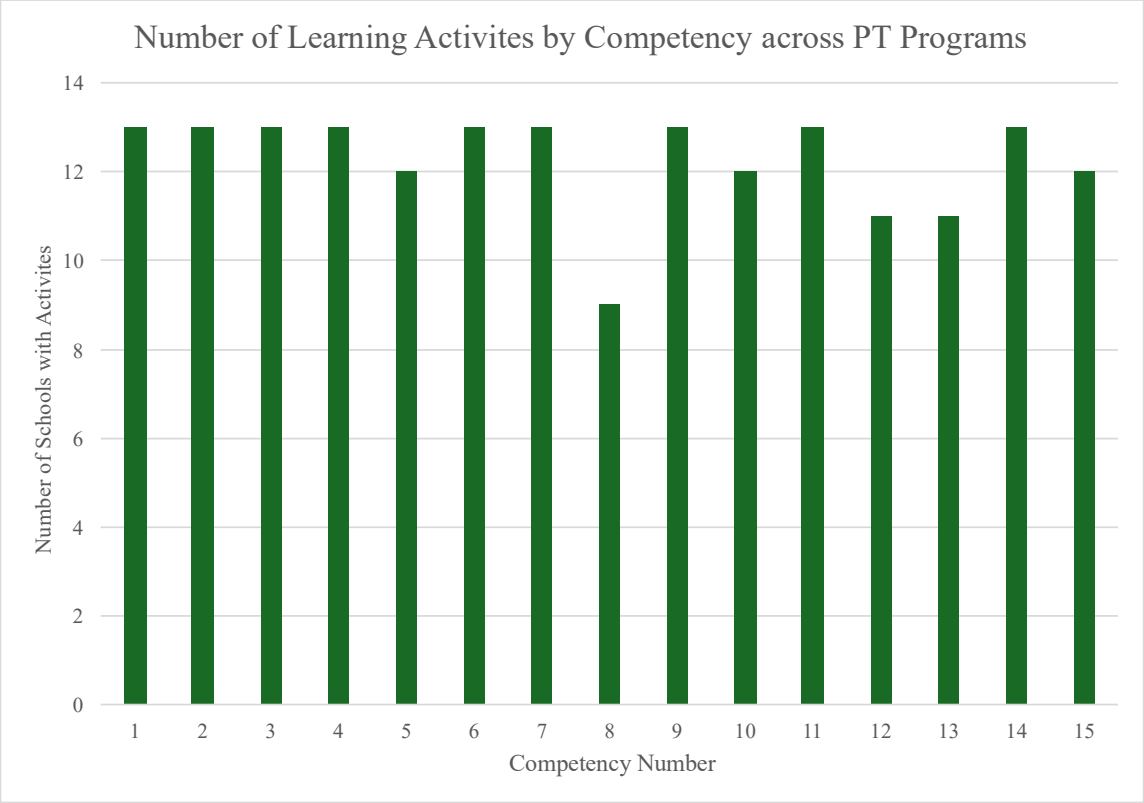

Figure 5. This figure illustrates how many programs had a learning activity relative to each of the 15 PEP competencies. The xaxis represents each of the 15 PEP competencies.

Most commonly, educators reported a lack of learning activities for competency 8 (advocacy), 12 (social justice), and 13 (self-reflection). The breakdown of pain-related learning activities addressed by competency is shown in *Figure 5*. Many competencies were addressed through learning activities by all 13 schools included in this study.

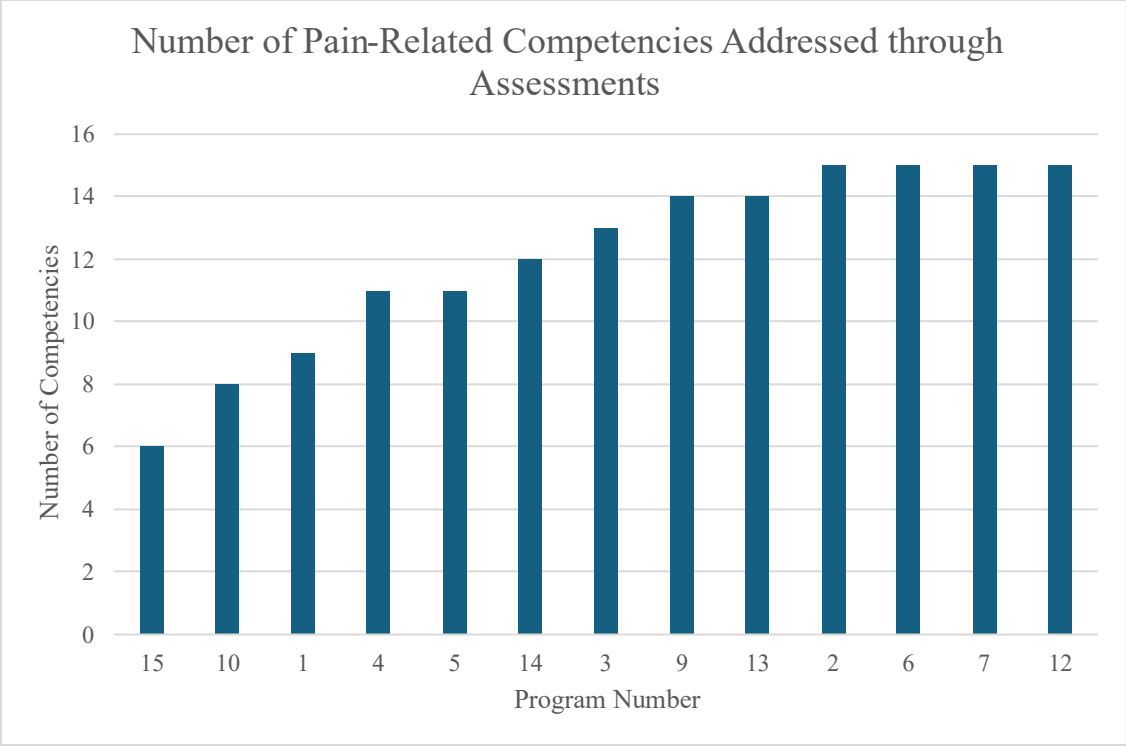

Figure 6. This figure displays the range in number of PEP competencies addressed through assessments across PT programs. The x-axis corresponds to a specific PT program.

The number of PEP competencies addressed through assessments was, on average, 12.2 (SD = 3.0) of 15 competencies. The number of competencies addressed through assessments ranged from 6 to 15 competencies. The number of competencies addressed through assessments by program is illustrated in *Figure 6*.

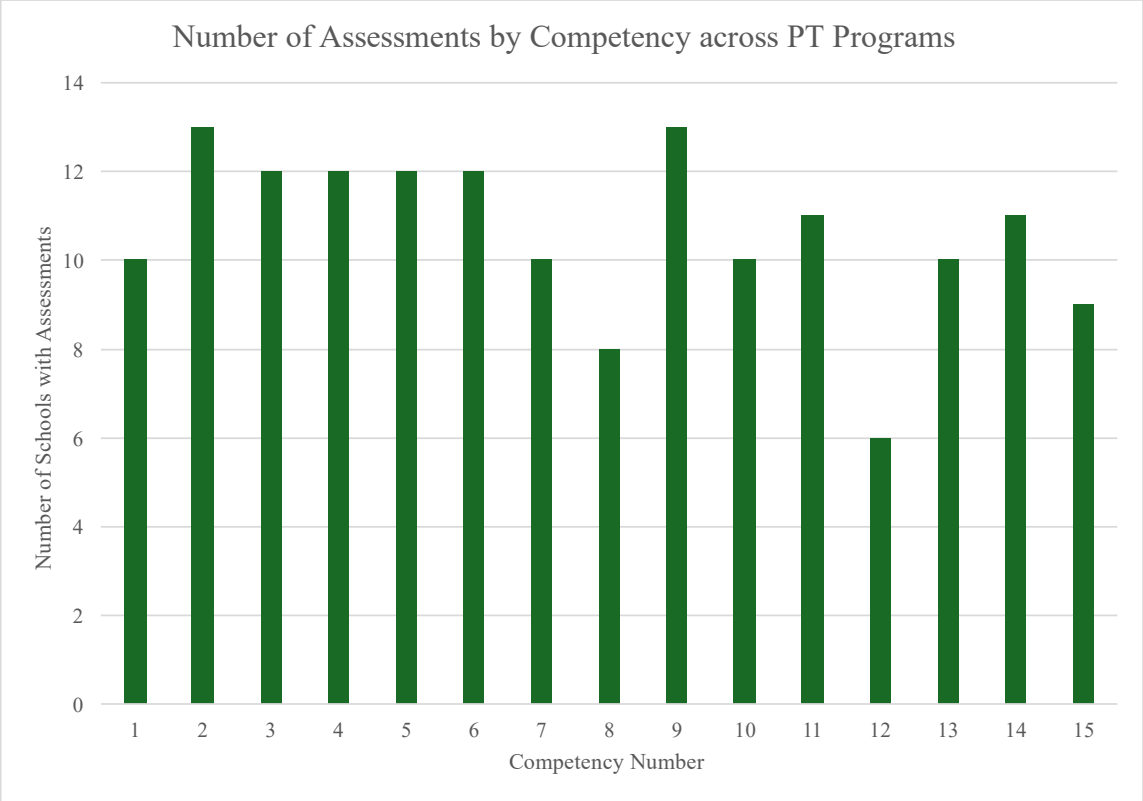

Figure 7. This figure illustrates how many programs had an assessment relative to each of the 15 PEP competencies. The x-axis represents each of the 15 PEP competencies.

The breakdown of pain-related assessments addressed by competency is shown in *Figure 7*. The most common competencies that were not addressed through assessments were competency 8 (advocacy), competency 12 (social justice), and competency 15 (safe and ethical care). All 13 programs addressed competency 2 (assessment) and competency 9 (person-centered care) through assessments.

Baseline Results—Graduate PT Students

After exclusions, the total analyzed sample was 539 students across 13 entry-level PT programs. The number of consenting students across the schools ranged from 18 to 94 students. The demographic information of the sample is shown in *Table 1*. Importantly, the size of each program cohort has been excluded from the table to preserve the anonymity of the PT programs.

Table 1. This table illustrates baseline characteristics of the 539 students who completed the Competency Assessment.

Characteristic	Level	Statistic	Participants (N=539)
Age		Mean(SD)	25.3 (2.7)
		Median(IQR)	25.0 (24.0, 26.0)
		Min-max	22.0 - 41.0
		Missing(%)	19 (3.5%)
CGPA		Mean(SD)	3.7 (0.2)
		Median(IQR)	3.8 (3.7, 3.9)
		Min-max	2.8 - 4.0
		Missing(%)	42 (7.8%)
Biological sex	Female	Frequency(%)	368 (68.3%)
	Male		153 (28.4%)
	Missing		18 (3.3%)
Gender	Man	Frequency(%)	152 (28.2%)
	Woman		365 (67.7%)
	Other		3 (0.6%)
	Missing		19 (3.5%)
Ethnicity	Indigenous	Frequency(%)	10 (1.9%)
	Visible minority		201 (37.3%)
	Other		256 (47.5%)
	Missing		72 (13.4%)
Advanced courses	No	Frequency(%)	479 (88.9%)

	Yes		42 (7.8%)
	Missing		18 (3.3%)
Mother tongue	English	Frequency(%)	353 (65.5%)
	French		115 (21.3%)
	Other		53 (9.8%)
	Missing		18 (3.3%)
On track	Yes	Frequency(%)	521 (96.7%)
	Missing		18 (3.3%)

The average age of the graduating PT students was 25.3 years old; age ranged from 22 to 41 years old. The sample of graduating PT students predominantly reported being female and identified as a woman. Most graduating students identified that their mother tongue was English. However, several schools sampled had French as their primary language of instruction, thus many graduates reported that their mother tongue was French.

There are relatively high levels of missing data for ethnicity. This is because two programs belonged to schools where ethics board regulations made it more difficult to ask students about their race. For these schools, students were not asked about their race—their data is considered missing. Students identifying neither as Indigenous, nor a visible minority comprised most of the sample. Students identifying as Indigenous comprised the smallest amount of the sample.

In terms of various academic metrics, most students reported that they had not taken some form of advanced course on pain. The average cGPA of the PT graduates was 3.7. This category of data also had a relatively high amount of missing data due to some students not consenting to their GPA being requested on their behalf. This data is summarized in *Table 1*.

Table 2. This table illustrates how students performed on the Competency Assessment, both overall and on the invdividual components.

Characteristic	Level	Statistic	Participants (N=539)
MCQ score (percent)		Mean(SD)	73.2 (11.0)
		Median(IQR)	75.0 (64.3, 82.1)
		Min-max	25.0 - 100.0
		Missing(%)	0 (0.0%)
SIM score (percent)		Mean(SD)	67.4 (9.7)
		Median(IQR)	67.5 (60.6, 74.4)
		Min-max	25.0 - 90.6
		Missing(%)	0 (0.0%)
Composite score		Mean(SD)	70.3 (8.2)
		Median(IQR)	70.8 (65.6, 76.1)
		Min-max	40.6 - 92.5
		Missing(%)	0 (0.0%)

Performance on the competency assessment is broken down in *Table* 2. Overall, students received a score of 70.3% on the assessment, ranging from 40.6% to 92.5%. On average, students answered about 73.2% of MCQ items correctly, which corresponds to approximately 20 of 28 questions correctly answered; the median score was 75.0% (21 questions answered correctly). MCQ assessment scores ranged from 25.0% to 100.0%. Performance on the simulation-based component was 67.4%, and ranged from 25.0% to 90.6%. The relationship between MCQ assessment and simulation scores are shown in *Figure 8*.

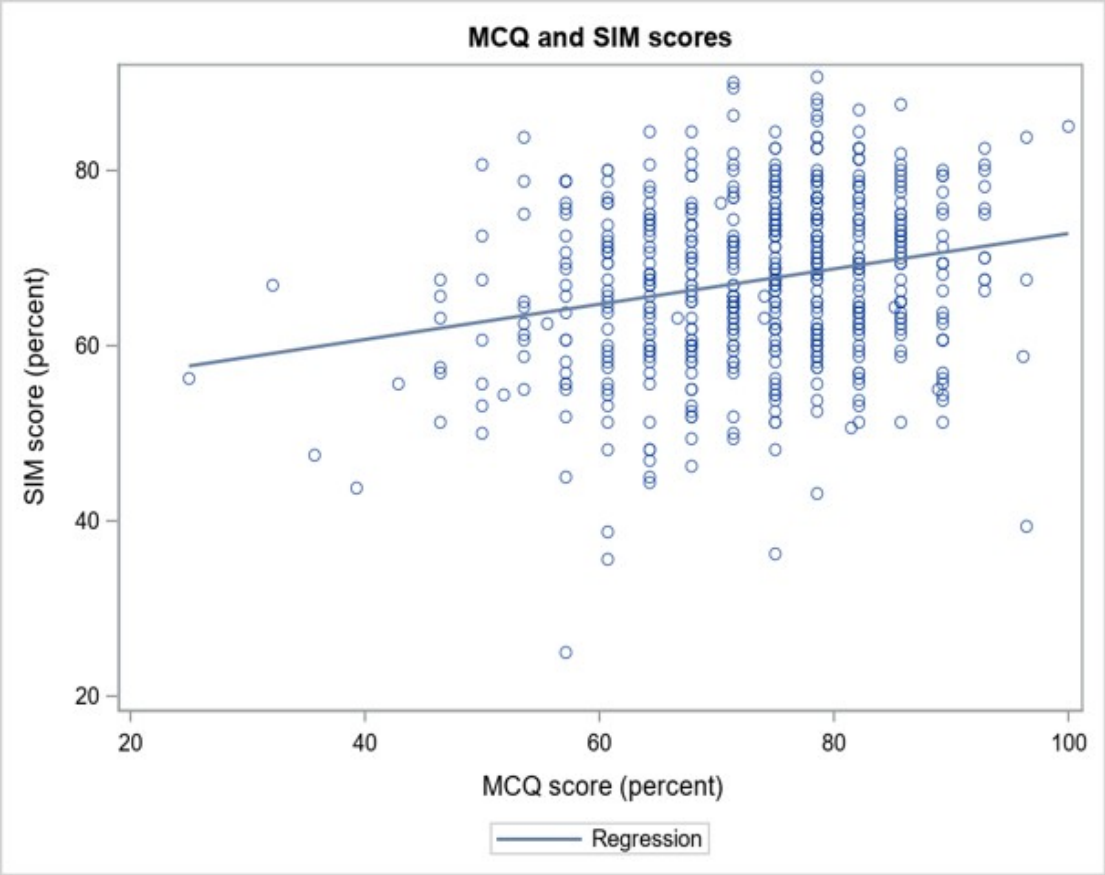

Figure 8. This figure illustrates the correlation between students' performance on the MCQ component and their performance on the simulation-based component.

The two components of the assessment had a Pearson correlation of 0.23 ($p < .0001$).

Performance on the competency assessment varied by school. Results from the competency assessment broken down by school are displayed in *Figure 9*.

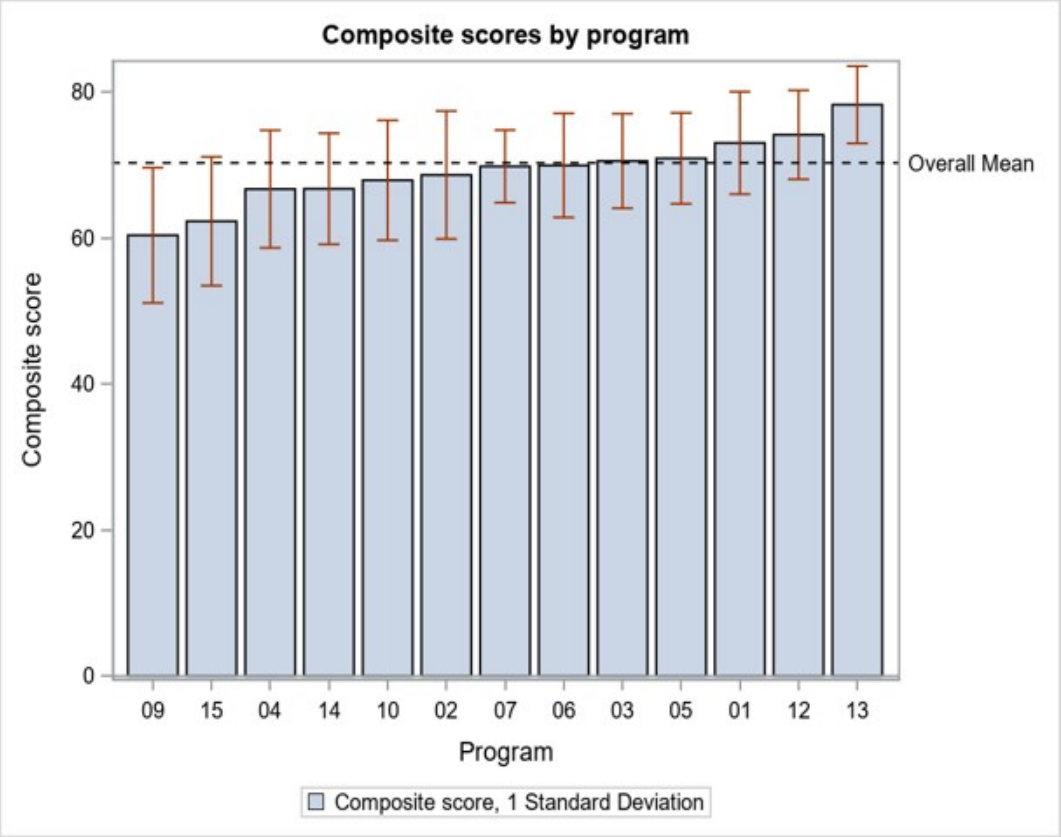

Figure 9. This figure illustrates the average performance of students at each of the participating PT programs on the Competency Assessment. Error bars represent +/- 1 standard deviation.

The school with the poorest performance, Program 9, had a mean score of 60.4%. The school with the best performance, Program 13, had a mean score of 78.3%. This difference in scores represents a range of 17.9% across programs. A post-hoc test (Tukey-Kramer grouping) was run to determine which schools were significantly different from each other and are illustrated in *Figure 10*.

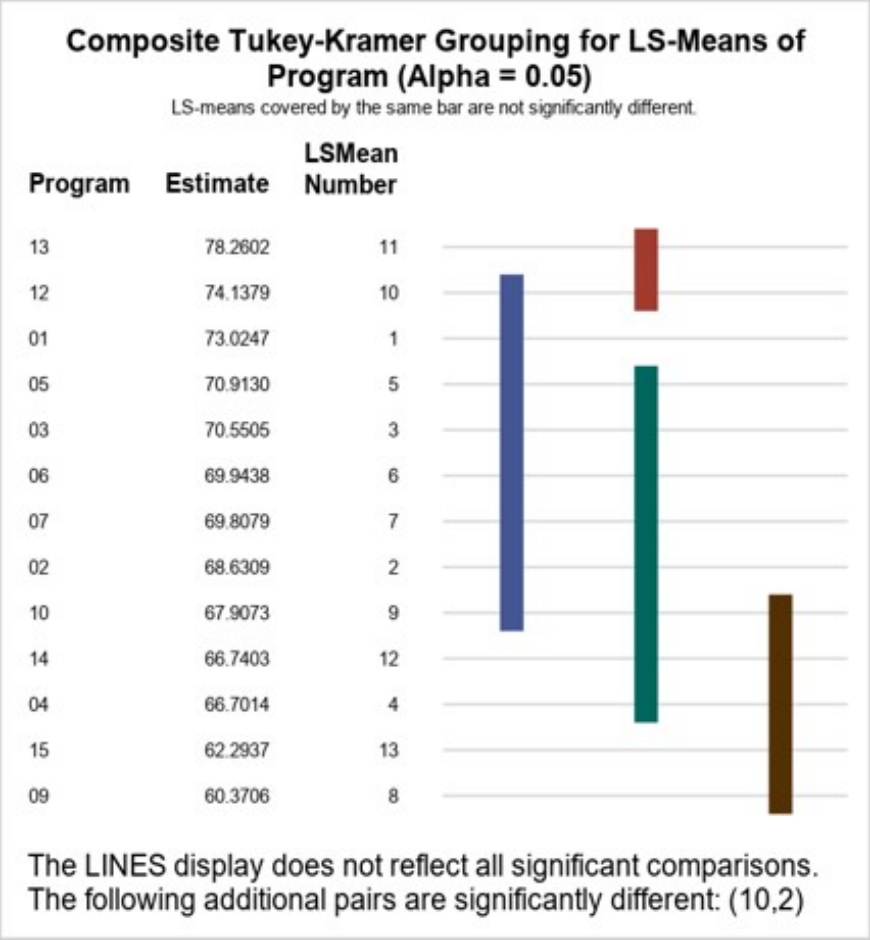

Figure 10. This figure represents the outcome of the Tukey-Kramer Grouping to illustrate which programs had significantly different performance on the Competency Assessment.

This test shows that programs fell into 5 statistically different ranges of performance. In other words, performance on the Competency Assessment was significantly different across schools in Canada.

Bivariate Analysis—School Level Variables (Level 2)

Prior to building a hierarchical model, bivariate analyses were conducted to gain an initial understanding of whether individual variables influenced the outcome variable (competency assessment score). For the four program-level variables, bivariate analyses were conducted using Pearson correlations. Results from this analysis are shown in *Table 3*.

Table 3. This table illustrates the Pearson correlations of each of the curricular metrics and the outcome variable, Competency Assessment performance.

Variable	Pearson correlation	P-value	N
Pain education hours	0.19935	<.0001	539
Activities	0.13446	0.0018	539
Objectives	-0.22113	<.0001	539
Assessments	0.12897	0.0027	539

Within the bivariate analysis, number of hours dedicated to pain education was a significant predictor of competency score. The relationship between hours and performance is displayed in *Figure 11*.

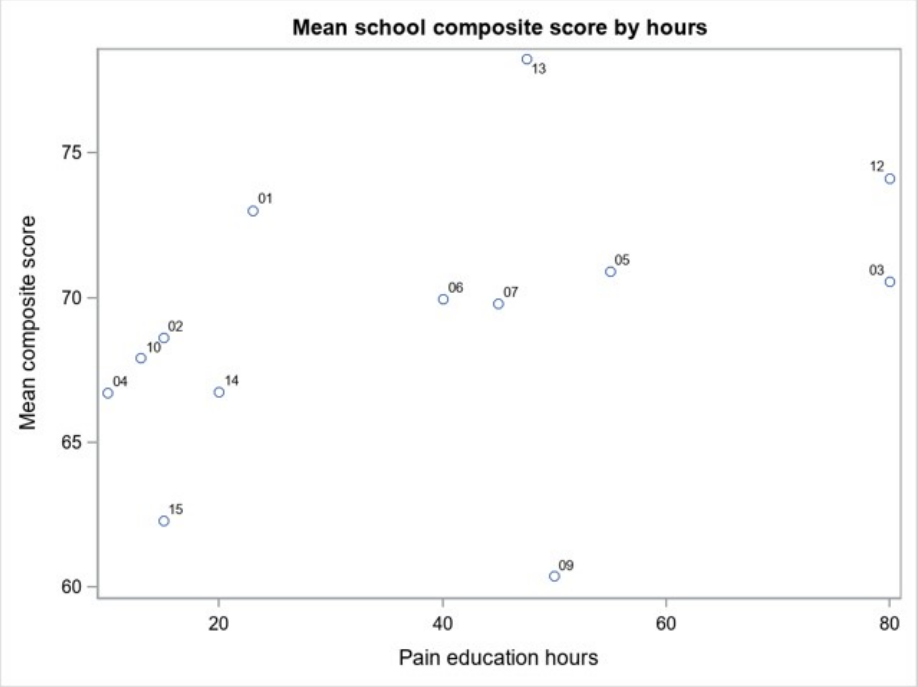

Figure 11. This scatterplot illustrates the time dedicated to pain education at each of the programs with the respective average performance on the Competency Assessment of that program

In terms of proportion of PEP competencies addressed in learning objectives and outcomes, this was a significant predictor of competency assessment performance, though there was a negative correlation. The relationship between learning objectives and performance outcomes is displayed in *Figure 12*.

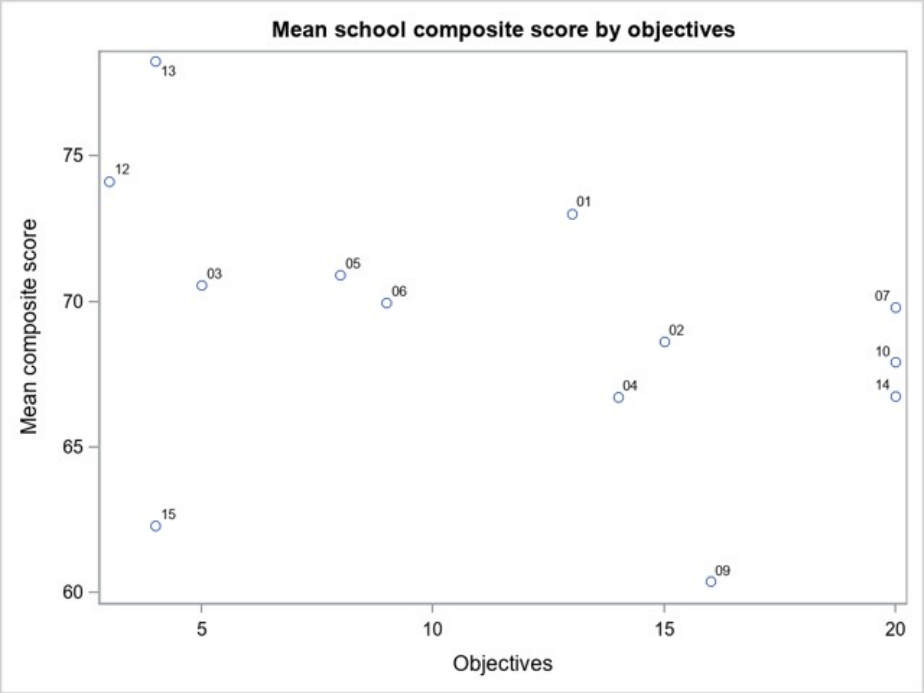

Figure 12. This scatterplot illustrates the score representing learning objectives and outcomes for each of the programs with the respective average performance on the Competency Assessment of that program.

The proportion of PEP competencies addressed in learning activities and assessments were also significant positive predictor of competency assessment score. The relationship between activities and performance is displayed in *Figure 13*; the relationship between assessments and performance is displayed in *Figure 14*.

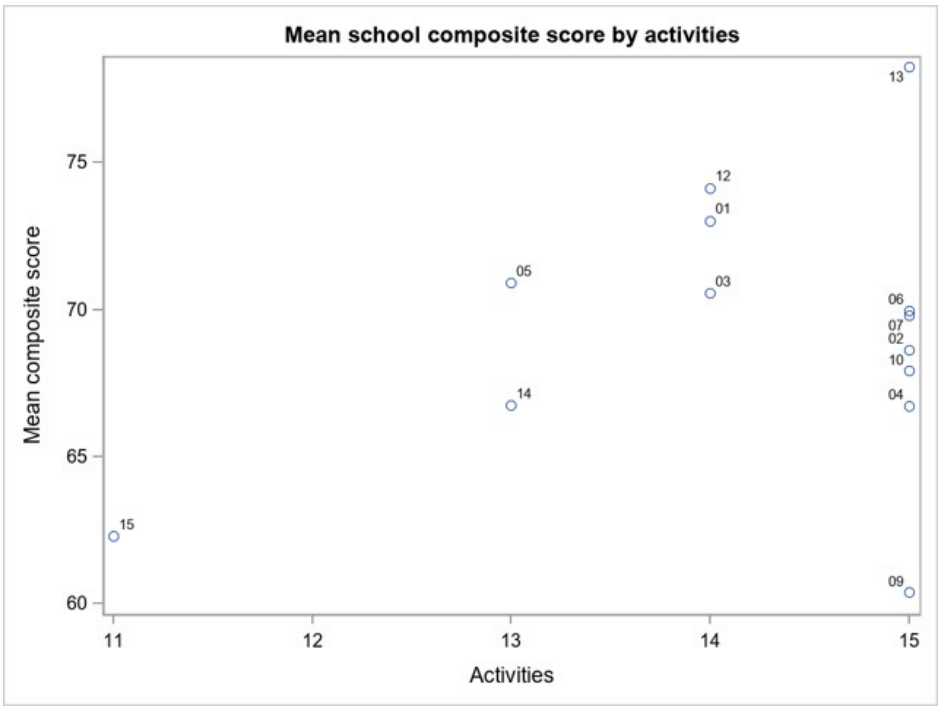

Figure 13. This scatterplot illustrates the number of learning activities for each of the programs with the respective average performance on the Competency Assessment of that program.

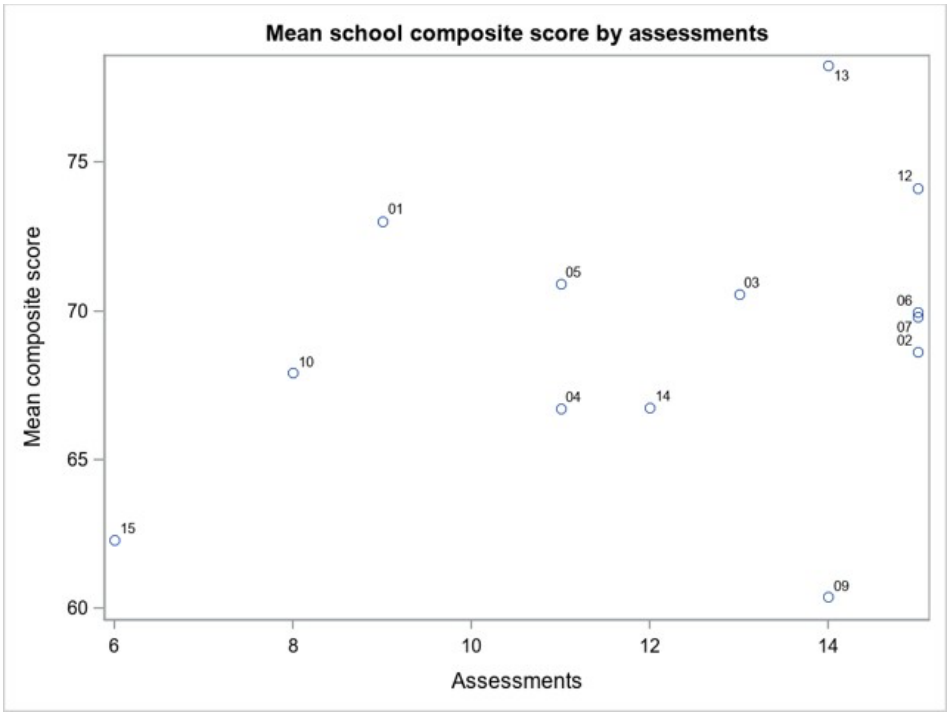

Figure 14. This scatterplot illustrates the number of assessments for each of the programs with the respective average performance on the Competency Assessment of that program.

Bivariate Analysis—Student Level Variables (Level 1)

P values were generated using one-way ANOVAS or the Wilcoxon rank sum test for each student-level variable to aid in model selection. Results from this analysis are shown in *Table 4*.

Table 4. This table illustrates the outcome of one-way ANOVAs for student level variables and their effect on Competency Assessment performance.

Variable	Level	Mean	Std Dev	P-value
Biological sex	Female	70.6	7.85	0.390
	Male	70.0	8.67	.
Gender	Man	70.2	8.36	0.725
	Woman	70.6	7.83	.
	Other	71.6	12.9	.
Ethnicity	Indigenous	67.3	8.40	0.253
	Visible minority	70.9	7.83	.
	Other	71.3	7.78	.
Advanced courses	No	70.2	7.99	0.052
	Yes	72.8	9.04	.
Mother tongue	English	70.8	8.16	0.166
	French	69.2	8.02	.
	Other	70.5	7.74	.

Differences in sex and gender did not lead to differences competency assessment score. Similarly, ethnicity and mother tongue did not have a significant effect on competency score. Lastly, having taken advanced courses in pain management did not lead to significant differences in competency assessment performance.

Pearson correlations were used to estimate the influence of age and cGPA on the Competency Assessment performance. Results from this analysis are shown in in *Table 5*.

Table 5. This table represents the outcome of Pearson correlations to estimate the effect of student level variables on Competency Assessment performance.

Variable	Pearson correlation	P-value	N
Age	0.04594	0.2958	520
CGPA	0.34851	<.0001	497

Age did not have a significant effect on competency assessment score. However, cGPA did have a significant effect on competency assessment score.

Models

An adjusted hierarchical linear model was created using a backwards selection process. Values from this model are displayed in *Table 6*, along with the values from the corresponding unadjusted models.

Table 6. This table represents the outcome of the HLM model to predict Competency Assessment performance, displaying both adjusted and unadjusted parameter estimates.

Variable	Unadjusted* parameter estimate	P-value	Adjusted parameter estimate	P-value
Pain education hours	0.08	0.15	0.04	0.58
Activities	1.07	0.34	1.28	0.39
Objectives	-0.29	0.15	-0.25	0.34
Assessments	0.51	0.25	-0.17	0.81
CGPA	15.13	<.01	14.98	<.01

The curriculum-level variables, including hours dedicated to pain education, number of competencies addressed by learning objectives or outcomes, number of competencies addressed by activities, and number of competencies addressed by assessments were not significant predictors of pain management competency. cGPA was the only significant predictor of pain management competency. The unadjusted and adjusted parameter estimates show similar findings.

Power

Findings deviated from several of the estimated parameters from the initial power analysis. For instance, only 13 of the 15 potential programs participated in this study, the intra-cluster correlation coefficient was higher than expected (0.29 instead of 0.1) and the observed effect size was lower than expected (F-squared = 0.05, representing a low-moderate effect). These observed parameters suggest that more than 15 PT programs (i.e., more programs than there are across Canada) would have been required to observe a statistically significant relationship in this analysis.

Discussion

Summary and main findings

Overview. This project involved administering a competency assessment to graduating PT students across 13 Canadian programs. This study looked at various metrics related to education in PT programs in Canada that may impact pain management competency in graduating PT students. Both PT pain education and pain management competency in graduating students were measured in terms of a 15-item competency profile specific to PT pain management in Canada that outlines the necessary abilities for PTs to possess to manage chronic pain effectively.

This is the first project of its kind where pain management competency was measured and compared across health professionals through a coordinated national study. The most significant finding of this study was that performance on the Competency Assessment among graduating PT students differed significantly across entry-level PT programs in Canada. This finding provides a novel understanding that PT pain management competency across Canada is inconsistent with respect to PT programs. The finding that pain management competency is inconsistent across Canada is useful in providing evidence that there is a need to improve pain education across the country and especially in lower-performing programs, such that graduating PT students have higher pain management competency scores consistently across the country.

The main analysis of this study involved creating a hierarchical linear model to determine whether pain education predicts pain management competency in graduating PT students. This analysis showed a lack of relationship between pain education and pain management competency across all metrics of pain education. These results imply that time devoted to pain education in PT programs does not affect pain management competency. Similarly, integration of PEP competencies into learning objectives or outcomes, learning activities, and assessments does not

shape pain management competency. Hence, this study was unable to identify any program-level factors that explain the observed program-level differences in pain management competency. However, cGPA was a significant predictor of pain management competency across students in this sample; students who performed well academically in their program tended to perform well on the competency assessment. This finding implies that improved academic performance correlates with improved pain management competency.

Competency assessment data. Students received an overall score of 70.3% on the competency assessment. The average performance on the MCQ portion was 73.2% and 67.4% on the simulation-based component. The Pearson correlation between the two components of the assessment was 0.22, which reflects a small, yet significant, correlation between the two components. The fact that there is a correlation makes sense, as both components measure pain management competency. It also makes sense that this was not a large correlation, as the assessments measure pain management competency in different ways and measure different aspects of pain management competency.

The only significant predictor of pain management competency score was cGPA, a student-level variable. This finding makes sense, as cGPA reflects a student's performance in their coursework, which tests their knowledge and clinical skills; the competency assessment was also a test of knowledge and clinical skills. This is consistent with other literature examining clinical abilities in general. A recent scoping review examining clinical experience performance in PTs and occupational therapists found that students' academic achievement may be crucial in predicting clinical experience performance (Horwitz et al., 2023). An American systematic review and meta-analysis found that first and third-year GPAs had a strong relationship with student's first attempt performance on the National Physical Therapy Examination (Wolden et al., 2020). This previous research provides evidence that GPA is an important predictor in other evaluations of clinical

abilities. Importantly, though, these are not pain-specific evaluations—these studies looked at generic assessments of PT competency. There is a current lack of research looking at the link between GPA and PT pain management competency to compare the findings of this study.

Student performance varied significantly across schools, where there was a 17.9% difference between the lowest-performing and highest-performing schools. Furthermore, post-hoc tests revealed that schools fell into five statistically significant different ranges. The fact that there were program-level differences makes sense, given that there are many differences from program to program, ranging from students admitted into the program, to the various qualities of educators teaching about pain, to the types of courses that students are obligated to take to graduate. However, given that no program-level variables measured in this study account for these differences, perhaps other variables not quantified in this project may account for performance differences across schools. This could be an educator's comfort or confidence level in teaching about pain, an educator's previous involvement in pain-related research, an educator's integration with the rest of the teaching faculty, teaching styles, or the way pain is explained to students. It may be worth investigating these factors to gain a further understanding of the educational factors that shape pain management competency. However, this study highlighted that it may be difficult to quantify educational metrics; qualitative methods may be better suited in developing an understanding of why pain management competency differs across programs.

The finding that pain management competency differs across programs provides individual PT programs the opportunity to compare their performance to the performance of other schools to help decide what interventions might be the most worthwhile. The utility of this data and these findings will be further explored in later sections of the discussion.

Curricular metrics. The time dedicated to pain education ranged from 10 to 80 hours. This variability demonstrates that pain education across Canadian PT programs is not homogenous, and

differences exist in the amount that entry-level PT programs teach about pain. This study found that the range in time dedicated to pain education is similar to the 8-fold difference in time dedicated to pain education across Canadian PT programs found in a previous version of this survey (Wideman et al., 2020). This study found that the relatively high variability in pain education seen across Canadian PT programs a few years ago still exists. The previous study attributed this variability to a lack of a minimum national reference standard on PT pain education across Canada. A lack of a minimum standard leaves pain education and the amount and ways in which it is delivered to the discretion of the faculty (Wideman et al., 2020). This explanation is still relevant—though there is now a Canadian-specific competency profile for pain management competencies, pain education is still not standardized across PT programs. This variability is also seen in the variability in learning objectives and outcomes relative to the PEP Competency Profile across PT programs. Moving towards a standard of pain education in PT programs may be an important step in ensuring that PTs across Canada have consistently highquality pain education; therefore, access to high-quality pain care is equally accessible across Canadians living with pain.

Visual inspection of the scatterplot comparing time dedicated to pain education (*Figure 11*) and pain management competency reveals that the relationship between time and competency may be more logarithmic than linear. This points to the idea that there may be "diminishing returns" when it comes to spending time teaching about pain; there may be a minimum amount of time dedicated to PT pain education that has a meaningful direct effect on cultivating pain management competency in students, but once a certain amount of time is reached, there is no longer significant effects in student pain management competency. This is supported by the fact that no programs that had under 22 hours dedicated to pain education scored above the mean on the competency assessment; only in programs providing above 23 hours did students, on average, perform higher than average on the competency assessment. This may indicate that there may be a minimum

number of hours needed to ensure pain management competency. Future research should explore this idea.

The finding that time dedicated to PT pain education does not predict pain management competencies in graduating PT students is counter to strategies proposed to improve pain management competency. For instance, studies examining pain education often suggest increased pain education to improve pain management competency (Jones et al., 2022; Watt-Watson et al., 2009). However, the lack of a correlation between time dedicated to pain education and pain management competency found in this study does not support this suggestion. This study does not provide evidence that increasing the amount of pain education would lead to decreased pain management competency. However, given the limited amount of time available in PT programs, spending more time on pain-related content would not necessarily be the most efficient use of time or resources.

Despite countering the idea that more time spent on teaching about pain would lead to improved competency, the finding that time and competency are not necessarily linked follows a shifting paradigm in clinical education. Specifically, there is emerging research that suggests that competency-based education, which is focused on ensuring that students have the capabilities necessary to provide high-quality care, reduces the need to rely on time as a standard for quality education (Gruppen et al., 2016; Van Rossum et al., 2018). Competency-based education, instead, hinges on intentional competency-based learning activities and assessments (Gruppen et al., 2016). In other words, it is not about the quantity of time dedicated to teaching; it is the quality of those teaching hours.

Though the number of learning objectives or outcomes did not influence pain management competency, interesting trends are seen in this data. Domain 2 competencies, such as competencies 8 (advocacy), 12 (social justice), and 13 (self-reflection), were less likely to be addressed through

learning objectives or outcomes. This may be because these skills may be taught and reinforced more clinically or informally. Alternatively, educators may find it difficult to find ways to equip students with these competencies in the curricula. A last reason is that perhaps these themes are addressed more subtly throughout the curricula; thus, educators may not feel the need to create an explicit learning objective or learning outcome related to these competencies. Competency 4 (treatment plan) was most likely to be addressed in learning outcomes or objectives. One interesting finding relative to learning objectives and outcomes is that the highest-performing schools had the fewest learning objectives and outcomes. For instance, Programs 12 and 13 had the highest performance on the competency assessment compared to all other programs yet had the two lowest scores for their objectives and outcomes. This finding may imply that the quantity of learning objectives and outcomes is irrelevant to the quality of pain education that students receive.

There was relatively low variability in the number of competencies addressed through learning activities across PT programs. Domain 2 competencies, such as competencies 8 (advocacy), 12 (social justice), 13 (self-reflection), and 15 (safe and ethical care) were less likely to be addressed through learning activities. This may be due to educators prioritizing to focus on more "hard skills" in the activities that they plan for students. Alternatively, it may be more difficult for educators to plan activities that target these more "abstract" aspects of pain management.

The number of competencies addressed through assessments ranged from 6 to 15. Like the other curricular metrics, domain 2 competencies, such as competencies 8 (advocacy), 12 (social justice), and 13 (self-reflection) were less likely to be addressed through assessments. This may be due to educators do not prioritize assessing these skills, or because they do not know how to assess these soft skills. Competency 2 (assessment) and Competency 9 (patient-centered care) were most likely to be addressed. The reason Competency 2 might be most commonly addressed through assessment is that it may be most accessible to assess in the classroom relative to other clinical

skills, such as treatment. One explanation for Competency 9 being commonly assessed is that patient-centered care is an aspect of pain management that is core to any patient interaction— thus it may be more accessible to assess.

None of these metrics (learning objectives, activities, or assessments) predicted pain management competency. However, the curricular survey provided interesting information about which pain management competencies were more or less likely to be addressed in the curricula of entry-level PT programs across Canada. This data can provide educators with benchmarked and program-specific data about where curriculum can be further developed if educators feel the need to build on their existing pain education. Qualitative methods may be useful in exploring why educators may choose to include certain activities and assessments about some pain-related competencies and not others.

The results of this study do not show that increased competency-based learning objectives or outcomes, activities, or assessments lead to increased pain management competency. This finding conflicts with literature on competency-based education, which posits that cultivating clinical competency is a matter of creating intentional competency-based learning objectives, learning activities, and assessments (Gruppen et al., 2016). One potential explanation for this finding that the learning objectives and outcomes, activities, and assessments were measured using a competency-based framework retrospectively. In other words, these metrics were measured according to this framework after their development and delivery; they were not designed with this framework at hand. Thus, different results may be found if learning objectives and outcomes, activities, and assessments were designed according to the PEP Competency Profile. An alternate explanation for the lack of correlation between these metrics and performance is measurement error. Though surveys are typically used to measure various curricular metrics, curriculum is quite difficult to quantify—no perfect measure to quantify curriculum currently exists. Surveying

educators about pain curriculum in their programs required precise definitions, and even though specificity was prioritized in collecting this data, survey questions could have been interpreted differently by educators. A last explanation for the finding that more competency-based learning objectives or outcomes, activities, or assessments do not lead to increased pain management competency is that competency-based metrics are potentially less relevant to some other programlevel factor—for instance, the clinical experiences that students are typically exposed to.

Contributions to the literature & applications of findings

One main finding of this study is that GPA is an important predictor of pain management competency. Given the current lack of research linking GPA and PT pain management competency, this study provides initial evidence that the GPA of PTs may be linked to their ability to manage pain. This finding implies that supporting PT students' success, in general, may support their ability to manage pain well.

Another key finding of this study is that time dedicated to pain education does not necessarily predict pain management competency. This counters some previous assumptions in hypothesizing how pain management can be improved through education improvements (i.e., assumptions that increasing the amount of pain education will lead to improved pain management competency). This is important information for PT pain educators, as time in PT programs are limited, so it is not necessarily an efficient use of resources or time to increase the amount of pain education. Instead, focusing on the quality of the time spent educating PTs about pain may be more valuable in ensuring PTs are well-prepared to manage pain in Canadians living with chronic pain.

This study is the first of its kind—where the link between pain education and pain management competency was examined by administering a competency assessment tool nationally and across a profession. This study found variability in pain education across PT programs in Canada. It also found significant variability in PT pain management competency across PT

programs in Canada. While this study did not determine that these two variables were linked using the metrics examined, it nevertheless demonstrated that variability exists across schools in how pain is taught and how well graduating PT students manage pain. This data can be used to allow individual PT programs to benchmark their performance relative to the average national pain management competency score, and relative to other schools. This effort has already begun, wherein individual PT programs have been provided with the average performance of their graduating PT students relative to other programs. Schools also received a breakdown of how their students are performing relative to the different competencies assessed in the MCQ and simulationbased assessments. This knowledge translation effort is an important initiative in helping educators orient themselves to specific challenges that their PT students may be struggling with, and potential areas and targets of improvement for their program.

In addition, this study also provides supporting evidence that moving towards creating a minimum standard for pain education in Canada may be beneficial. This is because pain-related pain education in PT programs is currently left to the discretion of pain educators at individual PT programs; creating a minimum standard of pain education may lead to more consistent pain management competency in PTs. If a minimum standard for PT pain education in Canada is developed, Canadians living with pain will hopefully have access to consistent care across the country.

This study also provides an example of how a pain management competency assessment can be delivered at a national level to provide insight into the extent to which graduating PT students possess clinical skills, knowledge, and abilities related to pain management. This study can serve as a template for examining various factors that may contribute to the development of pain management competencies in graduating PT students. The methods used in this study could also be used at a program level, where educators may administer this type of assessment to students

across cohorts to determine which educational interventions improve pain management competency in PTs.

Limitations and future directions of research

There are several limitations of this study worth discussing. In terms of the curricular variables, there was a lack of variability in the assessments and activities variables. This may reflect an actual lack of variability in the pain-related competencies addressed through learning activities and assessments. However, there may have been issues in the way that this data was collected. Given that learning objectives and outcomes, learning activities, and assessments were measured as a proportion relative to the 15 PEP competencies, there was a maximum value for these variables. This may not be an accurate reflection of curriculum, because the actual number of objectives or outcomes, learning activities, and assessments may be highly variable within one competency and this variability might explain differences in pain management performance; the way this data was asked about and collected would not reflect this. Thus, repeating a curriculum survey in which educators can provide a metric that more accurately represents the learning outcomes and objectives, activities, and assessments of the curriculum would be an important step in verifying, or countering, the findings from this study.

A further challenge with the way that all curriculum-level variables were collected was that they were self-reported in a survey. While this is generally how this type of data is collected, and what the literature shows as a valid way to collect data about curriculum, it could lead to inaccuracies. This is because the interpretation of what "counts" as pain-related curriculum could vary between educators. Thus, repeating this survey in a way that accounts for this variability in interpretation would be an important step in verifying these findings. One potential solution would be to host a webinar with educators and provide an example of how the survey would be filled out with hypothetical examples.

Another possible issue with the methods used to gather program-level data in this study is that the educators had differing involvement in their respective PT programs; there was variability among educators in how well-integrated they were in their respective faculties. This variability may have shaped how well each pain educator could represent, report, and detail the extent of pain education in their program. A way to address this limitation would be to design a survey to be completed by all instructors who teach pain-related content and to have researchers summarize this data.

This line of research may benefit from future investigation of other factors that might influence the variability in pain management competency among schools. This could take the form of additional survey work asking educators about other metrics related to pain education—for example, the amount of time dedicated to planning for pain-related content, or the nature of clinical experiences students are most likely to be exposed to during their training. Some research about nurses has found that clinical work experience is one of the most significant predictors of pain management competency across clinicians (Shrestha et al., 2023). Hence, investigating the nature of clinical experiences that students undergo may be especially important.

Another constraint of this study is that it only included 13 programs, compared to the initial estimate that 15 clusters would be needed. However, results indicate that more clusters than the 15 PT programs in Canada would have been required to achieve adequate power to detect a significant relationship between the independent and dependent variables. This implies that even if all 15 PT programs in the country had participated in this study, similar results would have been observed. This suggests that the targeted curricular metrics of pain education in this study do not adequately explain the observed variability in pain management competency across Canadian PT programs. Future research should utilize different methods, such as qualitative methods, to explore what might explain this variability.

Qualitative methods could provide insight into the specific activities and assessments that students participate in, as well as information about student engagement, and the extent to which pain-related activities and assessments are about pain (relative to other content areas that they may be integrated with). Gathering this information, coding it, and examining it relative to student pain management competency may provide important information about how the quality of pain education may shape pain management competency. Qualitative methods could also be used to explore various factors that educators and students perceive to affect pain management competency. For instance, interviewing recent PT graduates and inquiring about both their educational and clinical experiences as practicing PTs could help link potential shortcomings in pain education to limitations in clinical pain management competency, or determine which factors in PTs' education were most helpful in developing their clinical competence and competence surrounding pain management. In addition, qualitative work could explore perceptions of what educators perceive to be the most important curricular factors that shape PT pain management competency.

An example of future qualitative work that could expand upon the findings of this study and provide more insight into what program-level factors influence pain management competency in graduating PT students would be focus group discussions with graduating PT students. These focus groups could be conducted with students from schools across the range of performance (e.g., a focus group with students from a low-performing school, a focus group with students from an average-performing school, and a focus group with students from a high-performing school). These focus groups could aim to elucidate which factors of their pain education helped students develop competence in managing pain. Differences in factors discussed between groups of students could be examined to determine potential differences in pain education that might lead to better performance at certain programs. These focus groups could be paralleled by focus groups with

educators, focused on exploring differences in educational strategies across programs that might lead to better outcomes in some schools. This type of investigation could also serve as a learning opportunity for educators to hear how other programs cultivate pain management competency in PTs.

Future research could build on this study by benchmarking the Competency Assessment findings; understanding what an "adequate" score on the Competency Assessment would provide crucial insight to individual PT programs about whether their students are well prepared to manage chronic pain. One way of comparing Competency Assessment data to clinical performance is by surveying graduates about their experience managing pain as clinicians and whether their entry-level training adequately prepared them to manage pain in their current patients. Comparing Competency Assessment performance with this data could provide insight into an ideal minimum performance for which to strive.

Conclusion

This thesis examined the relationships between pain education across Canadian PT programs and pain management competency in graduating PT students by administering a curricular survey to Canadian PT educators and a pain management Competency Assessment to graduating PT students. The main finding of this study was a novel understanding that pain management competency differed significantly across Canadian PT programs among graduating PT students. This study found differences in curricular metrics across schools, though they did not account for the variability in Competency Assessment across programs. The only significant predictor of Competency Assessment performance was GPA. The finding that hours of pain education does not predict Competency Assessment performance is consistent with some literature about competency-

based clinical education, which posits that time dedicated to education is less important in developing competency in students than how content is delivered; in other words, the quality of education may be a more important factor in cultivating pain management competency than the actual time dedicated to pain education. Further research is warranted to develop a further understanding of the factors that contribute to pain management competency in graduating PT students.

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Appendix

Appendix 1: PEP Competency Profile

competency	full definition	short form
Domain 1: Competencies addressing specific aspects of pain management		
Competency 1	Facilitate the development of a therapeutic alliance with the person living with pain.	therapeutic alliance
Competency 2	Perform a comprehensive assessment with the person living with pain that uses appropriate tools and strategies to explore and evaluate the lived experience of pain, as well as the mechanisms underlying pain and the physical, psychological, and socioenvironmental factors that influence pain.	assessment
Competency 3	Synthesize and interpret assessment findings to develop a painrelated diagnosis and/or classification and to generate a prognosis.	diagnosis and prognosis
Competency 4	Develop and implement an individualized treatment plan that is based on the assessment findings and goals of the person living with pain.	treatment plan
Competency 5	Facilitate appropriate transitions in care for the person living with pain.	transitions in care
Competency 6	Use appropriate tools and strategies to monitor and evaluate the effectiveness of the treatment plan for the person living with pain and adapt care accordingly.	monitoring and adapting treatment
Competency 7	Collaborate with relevant professionals in a manner that fosters an integrated, patient-centered approach to pain management.	collaboration

Competency 8	Advocate with, and on behalf of, people living with pain, at the level of the individual, family, and/or care providers, institution, and community.	advocacy
Domain 2: Competencies that permeate all aspects of pain management		
Competency 9	Use a person-centered approach to pain management that addresses the complex, multidimensional, and subjective nature of pain.	person-centered care
Competency 10	Support and promote the autonomy of the person living with pain and foster partnership in their care.	support autonomy
Competency 11	Communicate with people living with pain in a way that is tailored to their individual needs and abilities, demonstrates active listening and empathy, and validates their lived experience.	communication
Competency 12	Make practice decisions that are informed by principles of social justice, inclusiveness, and equity and promote cultural safety.	social justice
Competency 13	Engage in critical self-reflection that fosters continuous professional growth and development.	self-reflection
Competency 14	Integrate best research evidence, clinical expertise, and patient values when making practice decisions.	evidence-based practice
Competency 15	Use a safe, ethical, and compassionate approach to care.	safe and ethical care

Appendix 2: Development of a comprehensive tool for evaluating physiotherapy competency in pain management: integrating simulation and written assessments

Table of Contents

Title

Development of a comprehensive tool for evaluating physiotherapy competency in pain management: integrating simulation and written assessments

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Abstract

Introduction: Chronic pain is a global challenge, affecting one in five people and resulting in substantial healthcare costs. Despite its prevalence, gaps in pain management education persist within healthcare programs. Developing a tool to evaluate entry-level student competency in pain management is essential to address these disparities. This study describes the development and initial psychometric evaluation of

the Pain Education in Physiotherapy (PEP) competency assessment tool, aimed at measuring student competency in pain management across entry-level physiotherapy (PT) programs.

Methods: The tool was developed using a well-established DeVellis process. A steering group of experts guided the creation of multiple-choice questions (MCQ) and simulation-based stations to assess competencies at different levels of Miller's Pyramid. Pilot testing was conducted with PT students (n=146 for MCQ; n=53 for simulations) to evaluate the tool's psychometric properties.

Results: Twenty-eight MCQ items and three simulation-based stations were selected based on item discrimination and alignment with competencies. The MCQ component showed moderate internal consistency ($\alpha = 0.648$), and the simulation-based assessments demonstrated moderate internal consistency ($\alpha = 0.626$) with good inter-rater reliability (ICC range: 0.73–0.86).

Discussion: The PEP tool was developed with integrated knowledge translation principles, engaging stakeholders throughout the process to ensure relevance and practical utility. By incorporating simulation-based evaluations, the tool addresses critical interpersonal skills such as communication and empathy, which are often overlooked in traditional assessments. This innovative approach not only fills existing gaps in pain management education but also provides a more holistic evaluation of student competencies, tailored specifically to the needs of the PT profession.

Conclusion: The PEP competency assessment tool represents a significant advancement in pain management education globally. Its rigorous development process, stakeholder engagement, and promising initial evaluation underscore its potential to enhance student competency and improve patient care outcomes.

Introduction

Chronic pain is a leading cause of disability across the world, resulting in a substantial societal burden.[1–8] Despite calls for improved pain management,[1,2] many patients report that healthcare providers lack the competencies needed for effective care,[9–11] leading to misunderstanding, stigma, and prolonged disability.[11–13]

Entry-level training has been identified as a central element to this issue, as it sets the foundation for the practice of future healthcare providers.[14] Variability in entry-level pain management training for physiotherapists (PTs) and other healthcare professions leads to clinicians being inadequately prepared, highlighting the need for more consistent training.[9–11,14–24]

Efforts to improve pain management training have included the development of interprofessional and profession-specific competencies.[25,26] For example, the Pain Education in Physiotherapy (PEP) competency profile was developed to define the essential competencies required by PTs to manage pain, including both technical (e.g., conducting a pain assessment) and interpersonal competencies (e.g., demonstrating empathy).[25] However, these competencies alone are insufficient without robust tools to assess them comprehensively.[27]

Current assessment tools often focus on interprofessional competencies and do not adequately address competencies specific to physiotherapy (PT).[26,28] Given that entry-level training is primarily delivered and regulated within professions, and that most training occurs within these professional boundaries rather than through interprofessional education, a profession-specific assessment tool becomes essential to measure the pain management competencies that are unique to the profession. This tool would not only assess the acquisition of competencies by graduating PT students, but also could help to identify trends at the program level and highlight gaps in the curriculum that require further development.

Moreover, this new tool should incorporate simulation-based evaluations as a core component.[29–36] Unlike traditional written exams, which tend to focus on knowledge, simulation-based evaluations can assess important interpersonal competencies like communication skills and empathy.[29–36] These competencies are essential for effective pain management but are challenging to measure through conventional assessments.[37] By simulating real-world scenarios, the tool would provide a more accurate and comprehensive assessment of a PT's pain management competencies.[29–36]

Developing this tool through a participatory approach is also crucial to remain aligned with best practice recommendations.[38–41] By involving invested parties, such as people living with pain, educators, and clinicians, the tool can be ensured to be relevant, valid, and adapted for real-life implementation.[38–41]

The objective of this study is to develop and pilot a new assessment tool that will standardize the evaluation of pain management competencies in PTs. Achieving this objective will allow for the evaluation of entry-level training outcomes, better understand the consequences of established discrepancies, facilitate benchmarking of training quality, and support the creation of targeted educational interventions. Through these improvements, the quality of care for individuals living with pain will be significantly enhanced, directly translating to better patient outcomes. This article will provide an overview of the development process of the PEP competency assessment tool and report on the results of the psychometric analysis.

Methodology

Framework

Miller's Pyramid of Clinical Competence, a model outlining five hierarchical levels of competence, guided this project.[42,43] In this model, learners progress from theoretical knowledge (*Knows*) to applying knowledge (*Knows How*), demonstrating practical skills (*Shows How*), and performing competently in real-

world settings (*Does*).[42,43] The level *Trusted* is a recent addition and reflects a crucial stage where decisions are made regarding the learner's readiness to perform clinical duties independently.[43]

The development of the PEP competency assessment tool was strategically guided by Miller's Pyramid of Clinical Competence, focusing on the *Knows How* and *Shows How* levels.[42,43] Targeting these levels allows the assessment of how well students apply their theoretical knowledge to practical situations and demonstrate practical skills in a controlled environment. The *Does* and *Trusted* levels fall outside the immediate scope of this assessment.

Integrated knowledge translation approach

This project followed integrated knowledge translation (IKT) principles, involving researchers, healthcare professionals, educators, students, and people living with pain.[38–41] Partner input at key stages ensured that the PEP tool is scientifically rigorous while remaining applicable, and responsive to the needs of the end-users.

Methods

Creation of a steering group

A steering group of 12 members, including people living with pain (LC, LS), a recent PT graduate (NM), pain educators (AH, DW, GB, JM, TW, YTL), a psychometric expert (CSO), and knowledge translation experts (AB, AT), oversaw all aspects of the development process. All members of the steering group had equal involvement in the planning and decision making related to all aspects of this project.

Design

Scale development and initial validation was done using a DeVellis protocol, a well-established 8-step process for assessment development.[44–46]

Step 1 – Defining the construct

The DeVellis process began by identifying the PEP competency profile as the reference standard.[25,44–46] The steering group then developed an assessment blueprint, mapping competencies against Miller's Pyramid levels. This blueprint helped to determine what competencies should be evaluated at what levels. For example, developing a pain-related diagnosis or facilitating transitions in care were appropriate for the *Knows How* level, while communication skills or demonstrating empathy were best suited for the *Shows How* level.[42]

The assessment was divided into two different components, intended to be completed by a student within two hours. A written exam featuring multiple-choice questions (MCQ) to evaluate the *Knows How* level, while simulation-based stations were selected to evaluate competencies requiring a practical demonstration (i.e., *Shows How*). Each MCQ, framed with vignettes as lead-ins, was designed to challenge students to showcase their ability to apply theoretical knowledge in nuanced scenarios. The simulation-based stations provided students with realistic clinical scenarios, requiring them to demonstrate their practical skills, effective communication, and appropriate clinical interventions. This assessment structure was selected to ensure a comprehensive evaluation of the students, capturing the diverse competencies required in pain management.

Steps 2 & 3 – Items generation & Assessment format selection

At this stage, the process was divided into the generation of the MCQ items and the simulation-based stations. Steering group members identified key content domains and clinical scenarios for the PEP

competencies. They developed 40 parameters (Table 1) to guide the creation of 120 MCQ items by pain educators, which were later refined based on item performance and relevance.

Primary competency component(s) to target.
Synthesize and interpret assessment findings to develop a pain-related classification.
Primary content domains to target.
Back pain. Nervous system hypersensitivity.
Key scenario and problem to address.
A new patient with back pain presents with a complex set of signs and symptoms that makes differential diagnosis (e.g., from nociceptive pain and neuropathic pain) of the underlying mechanisms a challenge yet indicate that pain is being primarily driven by nervous system hypersensitivity. The goal of the question is to identify that this patient's pain is driven by nervous system hypersensitivity.

Table 1 – Example of a parameter to guide the MCQ item writing process.

The steering group developed simulation-based stations using realistic scenarios, to elicit the demonstration of the targeted competencies. The final version of the simulation-based assessment was intended to have three stations, to fit within usual time and resources available in PT programs. Aiming to optimize the final selection of stations and explore a diverse range of scenarios, we decided to generate six stations. This comprehensive approach allowed for the assessment of feasibility, effectiveness, and quality, enabling the steering group to select the best performing stations for inclusion in the final assessment.

A corresponding marking rubric was developed for each station by steering group members.[47–49] Each of the rubrics included two broad sections: one with items specific to the station (e.g., doing a comprehensive pain assessment) and one with items shared across stations (e.g., clarity of message). Each item was scored using a Likert scale ranging from 0 to 4, with anchors specific to each item (Appendix 1).

Throughout this process, the people living with pain (LC, LS) consulted with other people with lived experience and guided the discussion to ensure that the selected competencies and assessment methods resonated with the experiences and expectations of individuals living with pain.

Steps 4 & 5 – Items review & Validation item

University-based pain educators (n=10), international experts (FB, JH and JWW), and Canadians living with pain reviewed the MCQs, simulation stations, and rubrics for relevance, clarity, and completeness. They were asked to score the items using a 3-level scale ranging from 1 (no reservations) to 3 (major reservations) and provide feedback. The steering group reduced the total number of items from 120 to 60 based on experts' scores and comments. Remaining MCQ items were updated according to the feedback provided. Experts were also asked to review the simulation-based stations and share their comments regarding the scope and focus of the scenarios. The steering group removed one station and amended the remaining stations for clarity based on the feedback provided.

Additional feedback was sought through cognitive interviews.[50–52] Practicing PTs and final year students from three different PT programs in Canada shared their thoughts about the MCQ items (n=6 students and n=4 clinicians) and simulation-based stations (n=4 students and n=2 clinicians).[50–52] These one-on-one interviews were conducted online by a steering group member (GB) and lasted 60 minutes. The data were then analyzed by the steering group. Understanding their thought processes and their understanding of the assessment helped further refine the MCQ items and the simulation-based stations.

At this stage, the steering group piloted the 60 MCQ items and five simulation-based stations without including a validation scale (e.g., desirability scale).[53,54] This decision was anticipated from the outset, considering that the topics covered are not of a "sensitive" nature and that there is no published gold standard available for result comparison.[53,54]

Step 6 – Items administration

The piloting process (*Step 6*) was conducted in collaboration with three Canadian PT programs and aimed to recruit at least 200 participants for the MCQ and 50 participants for the stations based on our power calculation.[55] To facilitate the recruitment process, the pilot assessment was incorporated within each program's curriculum and presented as a class learning activity for which students had the option to share their data for the purpose of our research project. All students registered in the program were eligible.

The MCQ items were administered using LimeSurvey (LimeSurvey GmbH, 2006), an online survey tool approved by the ethics review board. The same survey tool was used to obtain online written consent. The simulation-based assessment was delivered online using Zoom (Zoom Video Communications Inc., 2016), a videoconference platform. Each station was recorded for the evaluators to review at a later stage. Participants provided written consent prior to releasing their data for the purpose of this research project.

In preparation for the implementation of the simulation-based assessment, the steering group organized a training program for the actors and facilitators. Actors, portraying patients in the simulation-based stations, were invited to training sessions to gain a nuanced understanding of their roles, ensuring fairness and consistency in patient presentation. Evaluator's training sessions involved detailed explanations of the rubric's components, specific anchors for each Likert scale score, and practical examples. This training was not only intended to align evaluators with the assessment objectives but also foster inter-rater reliability, given that each station was scored independently by two evaluators.

Steps 7 & 8 – Items evaluation & Scale length optimization

These steps were conducted using Classical Test Theory (CTT) item analysis.[56,57] This approach assessed item discrimination, difficulty, and internal consistency using Cronbach's alpha, as well as inter-rater reliability for the simulation-based stations through the Intra-class Correlation Coefficient (ICC).[56,57] Given

our sample size, CTT was an appropriate method to test the reliability and validity of both the MCQs and simulation stations.[56,57]

All analyses were carried out by using the Statistical Package for Social Sciences (SPSS, v26.0). A corrected item-total correlation coefficient was used to determine the item discrimination values of individual MCQ items and guide the selection of the best performing item for each parameter. The following ranges were used: good (item-total correlation coefficient >0.3), fair (0.2-0.3), low (0-0.19), and negative item discrimination (<0). Blueprint alignment was the second key criteria for item selection, to ensure adequate representation of the targeted competencies. We explored the inter-item correlation for the items and flagged any that had negative coefficients or a value >0.8. This was done to reduce measurement error (indicated by a negative coefficient) and redundancy (indicated by a correlation coefficient >0.8). Following the selection of final items, we performed a reliability analysis using Cronbach's alpha to measure internal consistency. The stations that demonstrated adequate inter-rater reliability and improved internal consistency of the overall assessment were selected for the final version of the tool. Missing or incomplete data were handled using listwise deletion.

Results

Written assessment

The complete data of 146 students (out of 162 respondents) were included in this analysis (Table 2). Of the 60 items piloted, four questions had good item discrimination, 20 showed fair item discrimination, 33 demonstrated low item discrimination, and three questions had negative item discrimination. The item difficulty coefficient ranged from 0.27 to 0.97. In total, 28 items were selected based on discrimination, blueprint alignment and practical considerations.

Participants in the MCQ (n=146)

Sex: total (percentage)	
Female	105 (71.92%)
Male	41 (28.08%)
Age: years (SD)	
	25.12 (2.85)
Participants in the simulation-based stations (n=53)	
Sex: total (percentage)	
Female	33 (62.26%)
Male	20 (37.74%)
Age: years (SD)	
	25.94 (3.33)

Table 2: Demographic information of participants

A summary of the psychometric properties of the selected items is provided in Table 3. Cronbach's alpha for the 28 items was 0.648, indicating moderate internal consistency. Students had a mean total score of 19.2 (68.57%) out of 28 points (standard deviation = 3.66), with a minimum of 9 (32.14%) and a maximum of 26 (92.86%) points.

Item	Mean	Std. Deviation	Discrimination
Item 1	.49	.50	.14
Item 2	.83	.38	.24
Item 3	.45	.50	.18
Item 4	.74	.44	.18
Item 5	.92	.27	.30
Item 6	.55	.50	.19
Item 7	.53	.50	.15
Item 8	.44	.50	.27
Item 9	.70	.46	.20
Item 10	.75	.44	.15
Item 11	.76	.43	.18
Item 12	.72	.45	.20
Item 13	.76	.43	.16
Item 14	.90	.30	.18
Item 15	.85	.36	.21
Item 16	.66	.48	.11
Item 17	.89	.32	.26
Item 18	.65	.48	.25
Item 19	.62	.49	.20
Item 20	.71	.45	.13
Item 21	.87	.34	.18

Item 22	.76	.43	.15
Item 23	.69	.47	.13
Item 24	.59	.49	.14
Item 25	.65	.48	.24
Item 26	.21	.41	.25
Item 27	.74	.44	.31
Item 28	.97	.18	.37

Table 3: Psychometric properties of selected MCQ items.

Simulation-based assessment

The results from 53 students who also completed the MCQ were analyzed (Table 2). Pragmatic considerations led to selecting three final stations (Stations 3, 4, and 5) based on their alignment with the assessment blueprint, overall internal consistency, and inter-rater reliability. The initial ICCs for these stations ranged between 0.66 and 0.83 (Table 5). After refining the rubrics by removing some items, the ICCs improved to 0.73–0.86, indicating excellent inter-rater reliability (Table 6).[58] These stations, covering clinical pain assessment, pain education, and treatment adjustments, contributed to an overall Cronbach's alpha of 0.626, reflecting moderate internal consistency.

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Station 3							
Single Measures	.712[a]	.544	.825	5.942	50	50	.000
Average Measures	.832[c]	.705	.904	5.942	50	50	.000
Station 4							
Single Measures	.496[a]	.263	.675	2.973	52	52	.000
Average Measures	.663[c]	.417	.806	2.973	52	52	.000
Station 5							
Single Measures	.639[a]	.441	.778	4.547	49	49	.000
Average Measures	.780[c]	.612	.875	4.547	49	49	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.
a. The estimator is the same, whether the interaction effect is present or not.
b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.
c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 5: ICC scores for Stations 3, 4 and 5.

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Station 3 (without rubric item d)							
Single Measures	.751[a]	.605	.848	7.042	52	52	.000
Average Measures	.858[c]	.754	.918	7.042	52	52	.000
Station 4 (without rubric items d and f)							
Single Measures	.578[a]	.367	.733	3.743	52	52	.000
Average Measures	.733[c]	.537	.846	3.743	52	52	.000
Station 5							
Single Measures	.639[a]	.441	.778	4.547	49	49	.000
Average Measures	.780[c]	.612	.875	4.547	49	49	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.
a. The estimator is the same, whether the interaction effect is present or not.
b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.
c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 6: ICC scores for Stations 3, 4 and 5 with adjusted rubrics

Discussion

The development of the PEP competency assessment tool represents a significant advancement in the field of pain management education, particularly within the PT profession. The purpose of this study was to describe the development and the initial psychometric evaluation of a tool specifically designed to assess student performance on pain management competencies. By introducing several key innovations, this tool addresses existing gaps in competency evaluation and offers new, effective approaches to training future healthcare providers.[1,14,19]

Following a comprehensive DeVellis process, the tool was piloted with 146 students for the MCQ and 53 for the simulation-based assessment.[45] The MCQ component demonstrated moderate internal consistency ($\alpha = 0.648$), with 28 items selected based on item discrimination and alignment with the targeted competencies. Simulation-based stations demonstrated moderate internal consistency ($\alpha = 0.626$) and exhibited good inter-rater reliability (ICC range: 0.73–0.86), with three stations selected for the final tool.

One of the primary innovations of this study is the creation of a profession-specific assessment tool tailored to the unique needs of PTs. While existing tools like the Pain Competency Assessment Tool (PCAT) focus on interprofessional competencies,[28] the PEP tool is specifically designed to evaluate the competencies required for effective pain management within PT.[25] This targeted approach ensures that the assessment is directly relevant to the scope of practice of PTs, allowing for a more accurate evaluation of their preparedness to manage pain in clinical settings.

A key innovation of the PEP tool is its use of simulation-based evaluations alongside traditional written exams. While conventional assessments focus on knowledge, the PEP tool integrates the *Shows How* level, assessing practical skills and interpersonal competencies like communication and empathy.[12,22,34–36,59] This dual focus on technical and interpersonal competencies ensures PT students are holistically prepared to meet the complex needs of patients with chronic pain, ultimately improving patient outcomes.[12,22,34–36,59]

The development of the PEP tool was further strengthened by the use of an assessment blueprint – a matrix that mapped each competency to the *Knows How* and *Shows How* levels of Miller's Pyramid.[42,43] This systematic approach ensured that all essential competencies were comprehensively addressed across both the MCQ items and the simulation-based stations. By guiding the selection and refinement of assessment items, the blueprint reinforced the validity and reliability of the tool, ensuring alignment with the intended educational outcomes.

Moreover, the development of the PEP tool was deeply rooted in IKT principles, involving key stakeholders throughout the process.[38–41] By engaging individuals with lived experience of pain, educators, and students, the tool was crafted to be relevant, applicable to real-world clinical scenarios, and reflective of the needs and perspectives of those it aims to assess.[38–41] This stakeholder-engaged approach is critical to the tool's success, ensuring that it is not only theoretically sound but also practically useful and adaptable to various educational contexts.[38–41]

Finally, while the PEP tool is designed specifically for PTs, the principles and methods employed in its development hold potential for broader application. The structured approach used in creating the PEP tool, particularly the use of an assessment blueprint and simulation-based evaluations, can serve as a template for developing similar tools in other healthcare professions. This potential for broader application underscores the innovative nature of this work and its contribution to the ongoing evolution of competency assessment in healthcare education.

It should be acknowledged that we did not reach the planned sample size for the MCQ component. We recruited 146 participants, rather than the 200 recommended by the power calculation.[55] This shortfall could potentially impact the robustness of the psychometric evaluation, as a larger sample size would have increased the statistical power of our analysis, providing more precise estimates of item characteristics and overall reliability.[55] Additionally, while the initial psychometric properties of the tool are promising, the PEP competency assessment tool is still in the early stages of development. Further research is needed to continue refining the assessment items, ensuring their reliability and validity across different cohorts of students. The current findings should be viewed as preliminary, highlighting the necessity for additional validation studies to confirm the tool's effectiveness. Future research should aim to test the tool in larger and more diverse samples to enhance its generalizability and practical utility. These limitations underscore the preliminary nature of our findings and emphasize the need for ongoing refinement and validation to establish a robust, reliable, and valid assessment tool.

Despite these limitations, the PEP competency assessment tool holds significant promise as a valuable resource for evaluating and improving competency in pain management. By providing a structured and systematic framework for assessment, the tool not only ensures that essential competencies are evaluated but also allows educators to pinpoint specific areas where students may need further

development. This targeted feedback can be instrumental in tailoring educational interventions to address gaps in knowledge or skills, thereby enhancing the overall quality of pain management education.

Furthermore, the PEP tool could help quantify differences in competency levels before and after educational interventions, which would offer a robust mechanism for measuring the impact of these interventions. This feature is particularly valuable for academic programs aiming to continually refine their curricula to better prepare students for clinical practice. The ability to track improvements in competency over time provides a clear, evidence-based approach to curriculum development, allowing educators to make data-driven decisions that enhance student outcomes.

Its focus on technical and interpersonal competencies makes it a versatile tool that could be applied to other healthcare professions. Future studies should explore the tool's effectiveness in different settings, potentially broadening its impact and application. This adaptability and relevance across disciplines underscore the innovative nature of the PEP tool, positioning it as a valuable resource for enhancing healthcare education and improving patient care outcomes.

Overall, the PEP competency assessment tool introduces several key innovations that enhance pain management education for PTs. Its profession-specific focus, incorporation of simulation-based evaluations, holistic approach to competency assessment, and stakeholder-engaged development process collectively contribute to a more comprehensive and practical tool. As this tool continues to be refined and validated, it holds great promise for improving the quality of pain management education and, ultimately, patient care outcomes.

Conclusion

The PEP competency assessment tool was developed and initially evaluated using a comprehensive DeVellis process, resulting in a structured framework that effectively assesses both practical application

and interpersonal skills crucial for effective pain management.[25,59] The tool demonstrated moderate internal consistency, with an alpha of 0.648 for the MCQ component and 0.626 for the simulation-based stations, along with good inter-rater reliability for the latter (ICC range: 0.73–0.86). These results underscore the tool's potential to reliably measure pain management competencies among PT students.

This development marks a significant milestone in addressing the long-standing gaps in pain management education within Canadian PT programs. By engaging stakeholders such as individuals with lived experience of pain, educators, and students throughout the development process, the tool is not only relevant and grounded in real-world practice but also adaptable to various educational contexts.[38–41] The involvement of these stakeholders ensured that the tool addresses both technical and interpersonal competencies, which are essential for improving patient outcomes.

The participatory research methods employed in this study provide a robust example of how to develop and evaluate a competency assessment tool. The lessons learned and methodologies applied here may serve as a model for future initiatives aimed at enhancing pain education across different healthcare professions and regions. As the tool continues to be refined and validated, it holds great promise for elevating the quality of pain management education and, ultimately, improving patient care outcomes.

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Appendix 3: Example of a station and corresponding marking rubric

Time to prepare for the station: 2 minutes
Background information about the patient
Jamie is 44-years-old and has a long history with recurrent non-specific low back pain. Jamie is frustrated that despite all of the different treatments (medication, chiropractic, steroid injections, massage) the pain still persists. Jamie consulted you in a further attempt to eliminate the pain condition.
During your first session, your initial assessment indicated that nervous system hypersensitivity (nociplastic pain) is the primary driver of Jamie's pain. Your prognosis is that physiotherapy, or other forms of treatment, are highly unlikely to eliminate Jamie's back pain.
During the last session, you completed pain neuroscience education with Jamie and explained how Jamie's pain is not caused by tissue damage. You proposed to Jamie that your treatment should focus on functional goals and coping strategies to live with the pain.
Jamie, on the other hand, wants to focus treatment on eliminating the pain and doesn't want to resume meaningful activities, such as gardening and hiking, while experiencing pain. You are now initiating your second session with Jamie, which will be held virtually over Zoom.
Instructions
During this encounter, help Jamie consider the value of focusing treatment on functional goals, despite continued pain. Collaborate with Jamie in trying to find consensus on the overarching focus for your physiotherapy treatment. Time to complete this station: 10 minutes

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Rubric

2a Provides relevant evidence-based responses

0	1	2	3	4
Responses are not relevant and/or not based on evidence		Provides relevant evidencebased responses to some questions		Provides relevant evidencebased responses to all questions

Indicators of relevant best-evidence responses to SP prompts:

- "I was thinking about what you were saying last time and it doesn't make sense. You want me to move more, but you must not understand how bad the pain actually is. I just don't see why you wouldn't wait until I am better."
- Provides rationale for why activity-based interventions are more appropriate than pain-elimination strategies (e.g. Explaining why pain-elimination strategy is unlikely to be effective; Explanation that pain is not a direct reflection of what is happening in tissues)
- "Are you saying I have no hope of getting rid of this pain? What kind of life would that be, like living like this all of the time!"
- Accurate communication of prognosis (NB this rubric does not evaluate how the prognosis is discussed)
- Explains how quality of life can be improved without eliminating pain
- "So, what are you actually proposing here? What would your treatment actually look like? How will it help me?"

- Proposes an activity-based (graded) approach that is tailored to patient interests and aligned with evidence
- Other explanations that are relevant and aligned with evidence

2b Explores patient expectations and attempts to find common ground

0	1	2	3	4
Does not explore patient's expectations and does not attempt to find common ground		Partially explores patient's expectations and/or makes partially adequate attempts to find common ground		Fully explores patient's expectations and adequately attempts to find common ground

Indicators: (NB: need both exploration of expectations AND working to find common ground)
- Uses strategies to ensure that patient's expectations are understood (e.g. probing questions, restating/confirming patient's expectations)
- Uses the patient's activities of interest (hiking, gardening) to build engagement in activitybased treatments and quality of life goals (e.g. linking prognosis to opportunities for improving quality of life)

2c Clarity of message that is trying to be communicated

0	1	2	3	4
Message is mostly unclear and not understandable.		Message is somewhat clear and understandable.		Message is clear and understandable.

Indicators: (NB. clarity of communication should be considered by imagining the perspective of the SP)
- Message is coherent
- The complexity of the message is appropriate for the SP
- Language is appropriate for the SP and there is a minimal use of jargon

2d Clarity of verbal expression

0	1	2	3	4
Verbal expression is mostly unclear.		Verbal expression is somewhat clear.		Verbal expression is clear.

Indicators: (NB: Clarity of verbal expression should be evaluated in the language used for the session (i.e. French or English))
- Verbal expression is clear, in terms of fluency, diction, grammar, tone, volume, pace

2e Conveys empathy

0	1	2	3	4
Does not demonstrate empathy and/or responds inappropriately		Inconsistently demonstrates empathy		Consistently demonstrates empathy

Indicators of empathy:

- Acknowledges/validates suffering and/or patient concerns, while avoiding judgemental or stigmatizing language/tone/body language
- Expressions of concern appear to be authentic/genuine
- Demonstrates that patient perspective has been considered and is understood

2f Organization and cohesiveness

0	1	2	3	4
Minimal organization and cohesiveness		Somewhat organized and cohesive.		Organized and cohesive.

Indicators of organization and cohesiveness:

- Flexibility in adapting to patient concerns/responses
- Uses time effectively (e.g. avoids repetition)
- Logical/clear structure and flow to the encounter
- Able to integrate responses to patient questions/concerns within overarching purpose of the encounter
- Structures the session in a purposeful manner that aligns with the station objective (i.e. using a collaborative approach to trying to help the patient understand the value of functional goals and find common ground)

2g Uses a collaborative approach

0	1	2	3	4
Does not use a collaborative approach.		Inconsistently uses a collaborative approach		Consistently uses a collaborative approach.

Indicators of a collaborative approach:

- Uses strategies to assess patient's understanding (e.g. asks patient if they have understood; uses a brief teach-back strategy)
- Uses strategies to encourage patient engagement
- Listens to patient's response
- Tailors communication based on patient's response
- Rolls with resistance

2h Global rating

Considering the goal of this station was to *use a person-centred and evidence-based approach to finding common ground on the focus for PT treatment*, please rate the student's overall level of competency on this station:

Well below entrylevel	Slightly below entry-level	Meets minimal entry-level	Slightly above entry-level	Well above entrylevel