Assessment of Teaching and Learning Activities in Pediatric Physical Therapy: Factors Influencing Knowledge Development and Confidence

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Background and Purpose. Little is known about teaching and learning activities that influence the development of knowledge and knowledge confidence of entry-level physical therapist (PT) students regarding pediatric physical therapy content. This study was designed to investigate teaching and learning activities that promoted or inhibited the development of the students’ self-rated knowledge and knowledge confidence during a pediatric physical therapy course.

Subjects. Twenty second-year entry-level PT students participated in this study.

Methods. Quantitative data were collected through online surveys to capture student ratings of knowledge and knowledge confidence regarding selected course objectives before and after 5 instructional units. Qualitative data were gathered using audiotaped focus group interviews and weekly journal entries addressing questions about teaching and learning activities that enhanced or diminished the subjects’ knowledge and knowledge confidence.

Results. For each instructional unit, students self-rated their postinstruction knowledge and knowledge confidence significantly higher than their self-rated preinstruction knowledge and knowledge confidence. Factors found to promote self-rated knowledge and knowledge confidence included self-directed learning activities, a positive, supportive learning climate, well organized class sessions, and repeated experiences with children. Alternatively, poorly organized class sessions, feeling intimidated in class, a lack of experience working with children, and a lack of explicit clinical reasoning by faculty were factors identified as inhibiting the students’ ability to increase their knowledge and knowledge confidence.

Discussion and Conclusion. The results of the current study reflect the developmental process that PT students go through as they work to acquire knowledge and develop knowledge confidence. Both traits appear to be influenced by the type and quality of the teaching and learning activities provided during a pediatric physical therapy course, as well as the strength of the relationship that exists between PT students and core faculty members.

Key Words: Pediatrics, Entry-level education, Student learning, Teaching methods.

INTRODUCTION

For nearly 100 years, physical therapist (PT) education programs have focused on preparing professionals for practice. The goal of these professional programs has been to provide high quality instructional activities that enable PT students to move from being unconsciously incompetent to becoming consciously competent professionals who are able to intentionally apply their knowledge and skills to effectively treat their patients. Bruno and Hunt and Furustig, in their confidence-based learning work, described this situation when they reported that learners who are highly competent, but possess low levels of knowledge, will often take actions that lead to negative outcomes. Alternatively, students who have high levels of knowledge, but lack confidence in their knowledge, may be reluctant to act in practice. Thus, the development of knowledge and knowledge confidence are essential aspects of competence, ones that PT students need to acquire as they prepare to enter the profession.

Competence generally refers to the ability of someone to successfully complete a given task or demonstrate a specific skill. Recently, Rapport et al identified 5 essential core competencies around pediatrics that all PT students should attain in professional PT education. These competencies reflect a student’s ability to successfully demonstrate knowledge, psychomotor skills, and other abilities such as self-confidence, interpersonal skills, clinical reasoning, and knowledge confidence, as related to human development, age-appropriate patient/client management, family-centered care for all patient/client and family interactions, health promotion and safety, and understanding of legislation, policy, and systems. The focus of the current paper is on the teaching and learning activities that promote or inhibit the development of self-rated knowledge and knowledge confidence by PT students during a pediatric physical therapy course. Due to the limited amount of evidence that exists regarding the development of knowledge and knowledge confidence in pediatric PT education, the research questions for this study were: (1) Do the teaching and learning activities utilized in...
a pediatric physical therapy course result in an increase of students' self-rated knowledge and knowledge confidence regarding pediatric physical therapy? And, (2) which teaching and learning activities did students perceive as promoting or inhibiting the development of their self-rated knowledge and knowledge confidence in pediatric physical therapy content during this pediatric physical therapy course?

Knowledge consists of the information, facts, and skills gained through education and experience. Knowledge confidence has been described and was operationally defined here as how certain someone is of their knowledge. Self-confidence has been defined as a general feeling of self-worth coupled with a belief in one's ability to handle certain situations or complete certain tasks, while a person's belief or confidence in being able to successfully execute a particular skill or behavior is known as self-efficacy. For example, to effectively assess a child's gait pattern, a therapist must understand concepts like step and stride length, initial contact, femoral anteverision, etc., then assess the child's range of motion and strength, interact effectively with the child and his/her family member(s), and confidently and accurately evaluate the presence or absence of critical events typical in gait. It is important to recognize that competence, confidence, and self-efficacy are closely related, but not synonymous. As noted above, students and practitioners with more confidence than knowledge may be dangerous in the clinic, while those with too little confidence in their knowledge and skills may not be willing to implement a given plan of care.

The development of competence in PT students occurs over time as a result of students who actively engage in their didactic education and clinical experiences. As PT students complete the early phases of their didactic and clinical education, they become aware of what they need to learn. With additional experience and training, they develop the ability to use their newly acquired knowledge and skills, but do so with focused concentration, and often times have to think through how to perform a specific skill, such as how to assess the muscle function of a 9-year-old with spina bifida. During the later phases of their training, including their final clinical education experiences, students ideally become consciously competent entry-level practitioners who are able to apply their professional knowledge and clinical skills more naturally and proficiently.

**REVIEW OF LITERATURE**

Quantitative and qualitative studies utilizing survey and focus group methods have found that classroom teaching and work training strategies influence learners' self-efficacy and self-confidence. Teaching strategies found to be helpful in increasing student self-efficacy include experiential learning opportunities and active strategies, such as question and answer sessions, collaborative learning, electronic applications, and conceptual problem assignments. In a study analyzing nurses' self-assessments of competence, repetitive performance of clinical skills resulted in higher levels of self-assessed competence. Similarly, a systematic review of the nursing education literature found the use of high-fidelity patient simulation resulted in students reporting increased levels of confidence or self-efficacy in caring for patients. A study of medical students, utilizing survey and simulated performance measures, also found there was a significant correlation between the number of times a skill or procedure was performed and the students' perceived level of confidence. Interestingly, in that study, no correlation was found between perceived level of confidence and performance assessment. A course climate where students were engaged comfortably in the learning process and felt supported by the faculty has also been found to contribute to enhanced levels of self-efficacy (i.e., students' confidence in their abilities). In worker training, Schwoerer et al. found initial levels of a learner's self-efficacy, motivation, and performance expectancy positively influenced work-specific self-efficacy and appeared to create a psychological readiness for training. General cognitive ability and prior job knowledge have also been shown to be predictors of self-efficacy and performance in training.

Several studies have demonstrated that a variety of educational methods can positively influence the development of self-efficacy or self-confidence in PT students. Boissonnault et al. found that PT students reported higher levels of self-confidence in medical screening and patient referral skills following a role play instructional strategy compared to a traditional lecture strategy. Corrigan and Hardham, using a mixed-methods design of questionnaires and focus groups, reported that a formative simulated practical exam task resulted in increased student confidence and efficacy in self-evaluation of clinical skills. A similar 2-phase mixed-methods study found the use of standardized patients early in the professional curriculum promoted the development of self-confidence in PT students as they prepared for clinical fieldwork. Comparable results were obtained when faculty in Australia used senior (fourth-year) physiotherapy students to serve as standardized patients for junior (second and third-year) students in neurology, cardiorespiratory, and musculoskeletal coursework. The junior level students reported increased levels of self-confidence in their physical examination and patient management skills, while the senior students reported significant increases in their confidence to provide feedback. Further, Greenfield et al. in a retrospective analysis of students' reflective narratives, reported that early clinical experiences with adult patients increased the self-confidence of first and second-year PT students.

Emerging technologies have also been shown to have a positive impact on the development of self-confidence in PT students. For example, high-fidelity human simulations improve PT students' self-confidence in cardiopulmonary, acute, and intensive care unit (ICU) care. Students who self-analyzed a video-taped recording of their clinical skills reported greater improvements in self-confidence for future clinical experiences compared to students who experienced a more traditional tutoring process. In addition, the use of online discussions and web-based learning activities, as well as the use of a deconstructed case analysis process in teaching physical therapy ethics, promoted an increase in self-confidence and autonomy in the students' ability to analyze professional issues, such as ethics and social determinants of health.

How students study and the methods faculty use to present information in class, as well as the assessment strategies employed to evaluate student learning, also influence student levels of self-confidence. Utilizing the Revised Approaches to Study Inventory, which measures deep, surface, and strategic approaches to study, Hayes et al. found students' approaches to how they study entry-level physical therapy content influenced their academic self-confidence. Greater use of lectures, multiple choice examinations, and material perceived by students as not being clinically relevant were linked to decreased use of the strategic approach to study and decreased student confidence. Meanwhile, greater use of interactive methods and patient cases was associated with a deep approach to learning and increased confidence.

There is a paucity of literature examining the development of student or therapist confidence in pediatric physical therapy content. Shields and Taylor reported that student physiotherapists who had weekly contact (for 8 weeks) with a young adult with Down syndrome reported feeling more confident in their ability to work with indi-
METHODS

Research Design

This mixed methods study utilized qualitative and quantitative data collection techniques.

Quantitative Design. The quantitative component of this study used online surveys to capture the students’ self-rated knowledge and knowledge confidence regarding selected course objectives for 5 instructional units: prenatal development, infant development, toddlerhood/early childhood, middle childhood, and adolescence. Likert scale ratings for the course objectives included in each survey provided the subjects with a method to quantitatively estimate their self-rated knowledge and knowledge confidence before and after they completed each instructional unit.

Qualitative Design. Qualitative research methods were implemented because they are well-suited to study the complexity of educational environments, learner perspectives and perceptions of educational experience, and subtle teaching and learning relationships. A phenomenological qualitative approach, using focus group interviews and narrative responses through open-ended survey questions and journaling, examined the students’ perceptions of which teaching and learning factors promoted or inhibited their knowledge confidence in the pediatric physical therapy course. The intent of the phenomenological portion of the study was to understand the meaning of the students’ “lived experience,” and to depict the essence of their experience. This was largely an exploratory process to elucidate the ways in which the students came to understand, account for, take action, and otherwise manage their day-to-day situations in this particular pediatric physical therapy course.

The focus groups provided a listening research process that offered insight into the subjects’ lived experiences, as well as the opportunity to explore similarities and differences in perspectives among subjects. Journaling or narrative research methods allowed the students to recount events that were significant to them, provided reflection upon those events, and focused on how students interpreted and ascribed meaning to their experiences. In particular, Moen noted that narratives capture not only significant happenings, but also provide insight into the individual’s context due to the connection to the individual’s social, cultural, and institutional setting. These qualitative data were used to inform the understanding of the quantitative results, and added depth and breadth to this study.

Subjects

This study used purposive sampling of PT students enrolled in a second-year pediatrics course in a Doctor of Physical Therapy (DPT) program. The subjects were recruited from the 30 students enrolled in the course. An overview and explanation of the study, including review of the consent form, was provided to all enrolled students on the first day of the class by the researchers. Following this explanation, a DPT program administrative assistant remained in the room as students chose to either provide written informed consent or not to participate in the study. Completed consent forms were collected and held in a locked cabinet until course completion by the administrative assistant to ensure both investigators were blinded to who had chosen to participate in the study.

Twenty of the 30 second-year DPT students agreed to participate in the study (66.6%). The students who chose to participate reflected the overall make-up of this particular cohort of PT students (Table 1). All subjects had completed 77 credits of the 118-credit curriculum, including two 8-week full-time clinical rotations, and 60 hours of integrated clinical experience (ICE) prior to the pediatrics course.

Eight of the initial 20 subjects (40%) completed weekly written journals, and 10 of the initial 20 subjects volunteered to participate in the postcourse focus group component of this study. Of those 10, 9 of the focus group subjects were female (90%) and 1 was male (10%). One student was ill the day of her focus group, so only 9 subjects completed the focus group interviews. Since the researchers were blind to which students completed the journal entries, it is not known if the same or different students participated in the focus groups. Two focus groups of 4 or 5 students were held.

The number of students who completed the weekly pre and postinstructional unit online surveys averaged 14 students (70%), but ranged from 8 to 18 depending on the unit. For example, 18 subjects completed the pre and postnatal unit surveys, which took place during the first week of the course, while 8 students completed the pre and postsurveys on adolescence, which occurred at the end of the course.

Data Collection Procedures

Quantitative Data. Each subject was prompted via an email from the administrative assistant mentioned above to complete an online instructional unit survey within 48 hours of beginning and ending the 5 instructional units included in the pediatrics course. Three demographic questions were also included in the first survey. Each survey prompted the students to rate their knowledge and knowledge confidence regarding the course objectives for each unit on a 10-point Likert scale. The subjects’ online survey responses were automatically tabulated. Table 2 provides sample course objectives that were used in the online surveys.

Qualitative Data. As part of the first online survey, subjects completed 2 open-ended questions: (1) Describe how confident you

| Table 1. DPT Class and Research Study Participant Demographic Information |
|-----------------------------|------------------|-----------------|-----------------|
| **Group**                   | **Gender**       | **Age Range**   | **Ethnic Background** |
| DPT class                   | Female/Male      | (in years)      | 87% Caucasian 13% ethnic minorities |
|                            | 27/3             | 20–37 Mean = 22.8 |                             |
| Research study subjects     | 17/3             | 22–29 Mean = 24.4 | 100% Caucasian             |
are in your knowledge of pediatrics beginning this course, and (2) describe your previous experience(s) with children or pediatrics prior to beginning this course. All subjects who chose to participate in the online survey portion of this study were also asked to complete a weekly journal responding to 2 questions: (1) What situations or interactions from the week promoted confidence in your knowledge in this course? And, (2) what situations and/or interactions from the week inhibited confidence in your knowledge in this course? The journals were turned into the program administrative assistant, who then forwarded them to the investigators when the course ended. Students’ journals were labeled with a user name assigned by the administrative assistant for the online surveys, thereby allowing the investigators to be blind to the author of the journal.

During the pediatrics course, an email was sent by the DPT program administrative assistant to ask the subjects to consider participating in the focus group component of the study following completion of the course. Two focus groups (n = 4, n = 5) were held in a conference room on campus approximately 3 weeks after completion of the pediatrics course. Students were asked to respond to questions designed to further examine their knowledge confidence through course learning activities and interactions. The focus group questions are located in Appendix A. A separate written informed consent, including permission to audiotape, was obtained from each student prior to the focus group. Ground rules for the focus group included: (1) there are no wrong answers, (2) positive or negative responses are appropriate, and (3) share ideas even if they differ from others; these were reviewed at the beginning of each focus group. During the focus group, 1 of the investigators served as moderator and 1 took notes.

Data Analysis
Quantitative Data. The quantitative data was subjected to 2 statistical analyses. The first analysis was designed to verify if the students self-rated their preinstruction knowledge and knowledge confidence levels per instructional unit significantly higher or lower than their self-rated postinstruction knowledge and knowledge confidence scores. Because the number of questions in each online survey ranged from 16 for prenatal development and infancy to 19 for middle childhood, each subject’s unit raw scores were converted to a percentage of the total possible points for that survey. For example, based on the 10-point Likert scale used in this study, a total of 160 questions: (1) What situations or interactions from the week promoted confidence in your knowledge in this course? And, (2) what situations and/or interactions from the week inhibited confidence in your knowledge in this course? The journals were turned into the program administrative assistant, who then forwarded them to the investigators when the course ended. Students’ journals were labeled with a user name assigned by the administrative assistant for the online surveys, thereby allowing the investigators to be blind to the author of the journal.

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research methods coded the raw data utilizing a framework of factors promoting or inhibiting confidence in knowledge. A constant comparative method was used to describe, code, and group dominant patterns, categories, and themes based on this conceptual framework.46 The other researcher then independently reviewed the raw data to confirm or dispute the themes. When the researchers met to discuss the coding there were only minor variations in theme labels, which were then collaboratively decided. Table 3 contains a complete summary of identified themes.

Triangulation, a process of using multiple methods of data collection or multiple sources of data, served as the mechanism for increasing credibility and dependability and reducing researcher bias.44,46 Conducting focus groups with multiple students from the course provided a source of triangulation. Further, the written journal data provided a source of triangulation for the focus group interview data. Review of the data and confirmation of themes by the second researcher provided a method to improve trustworthiness. Saturation of data, where no new insights were occurring from the journals or focus group interviews, was reached relative to factors promoting or inhibiting confidence in knowledge in this pediatric course.

**RESULTS**

**Quantitative Results**

The quantitative results are presented first because these data provide the basis for answering the first research question: Do the teaching and learning activities utilized in a pediatric physical therapy course result in an increase of the students’ self-rated knowledge and knowledge confidence regarding pediatric physical therapy? Figures 1 and 2 illustrate the preand postinstruction self-rated knowledge and knowledge confidence self-ratings, respectively.

A significant unit difference in the preinstruction self-rated knowledge \( F(4, 63) = 6.22, P = .000 \) and knowledge confidence \( F(4, 63) = 6.077, P = .000 \) scores was observed for this group of PT students. As shown in Figure 1, the students self-rated their preinstruction knowledge levels for infant development higher than for the other instructional units. Tukey post hoc analysis confirmed the presence of significant preinstruction self-rated knowledge differences between infant development and toddlerhood/early childhood \( (P = .000) \), middle childhood \( (P = .003) \), and adolescence \( (P = .038) \). Figure 2 illustrates the significantly higher level of preinstruction self-rated knowledge confidence for infant development compared to the other instructional units. A significant difference in the students’ self-rated preinstruction knowledge
confidence between infant development and toddlerhood/early childhood \((P = .000)\) and middle childhood \((P = .005)\) was confirmed using Tukey post hoc tests.

Based on the ANOVA and Bonferroni correction mentioned earlier, no significant between-unit differences were observed in the postinstruction self-rated levels of knowledge and knowledge confidence submitted by this group of students \((P > .025)\). As can be seen in figures 1 and 2, the students self-rated their postinstruction knowledge and knowledge confidence highest for middle childhood and adolescent development, and lowest for toddlerhood/early childhood development.

The pre and postinstruction change scores from the Likert surveys are presented in Table 4. As expected, these data show that for each instructional unit, the students’ self-rated postinstruction knowledge and knowledge confidence ratings were significantly higher than before completion of the teaching and learning activities associated with each instructional unit \((P < .05)\). Compared to the other units of instruction, students showed the greatest increase in self-rated knowledge and knowledge confidence before and after the middle childhood unit. Alternatively, students showed the smallest gains in self-rated knowledge and knowledge confidence about infants. These data also show that the subjects consistently self-rated their knowledge slightly higher than their knowledge confidence before and after instruction for each period of development presented in this pediatrics course.

### Qualitative Results

The qualitative data are presented next to address the second research question: Which teaching and learning activities did students perceive as promoting or inhibiting the development of their self-rated knowledge and knowledge confidence in pediatric physical therapy content during this pediatric physical therapy course?

**Narrative Survey Questions.** At the end of the week 1, online survey students were asked to describe how confident they were in their knowledge of pediatrics upon beginning the course. The majority of students \((n = 19)\) expressed limited or no confidence in some or all aspects of pediatric knowledge, as illustrated by a student, who said, “Confidence is pretty low. I have limited background in pediatrics, and not much knowledge, so I am not confident in what I know.” Nine of the students reported having confidence or moderate confidence in an aspect of pediatrics, but not in pediatric physical therapy in general. One student commented, “I am not very confident in my knowledge of the developmental portion. I

### Table 4. Descriptive Statistics and Paired Samples t Test Results for Students’ Self-Rated Knowledge and Knowledge Confidence Pre and Postinstructional Unit

<table>
<thead>
<tr>
<th>Instructional Unit</th>
<th>Student Attribute</th>
<th>Preinstruction Mean ± 1 SD</th>
<th>Postinstruction Mean ± 1 SD</th>
<th>Paired Samples t Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prenatal development</strong></td>
<td>knowledge</td>
<td>58.8 ± 24.4</td>
<td>98.4 ± 22.3</td>
<td>(t(16) = -5.066, P \leq .000)</td>
</tr>
<tr>
<td></td>
<td>knowledge confidence</td>
<td>53.2 ± 22.0</td>
<td>86.4 ± 22.7</td>
<td>(t(16) = -4.364, P \leq .000)</td>
</tr>
<tr>
<td><strong>Infant development</strong></td>
<td>knowledge</td>
<td>67.5 ± 19.0</td>
<td>87.7 ± 28.9</td>
<td>(t(13) = -4.188, P \leq .001)</td>
</tr>
<tr>
<td></td>
<td>knowledge confidence</td>
<td>60.1 ± 17.2</td>
<td>81.2 ± 29.2</td>
<td>(t(13) = -3.856, P \leq .002)</td>
</tr>
<tr>
<td><strong>Toddlerhood and early childhood</strong></td>
<td>knowledge</td>
<td>37.9 ± 20.0</td>
<td>86.1 ± 29.6</td>
<td>(t(14) = -5.766, P \leq .000)</td>
</tr>
<tr>
<td></td>
<td>knowledge confidence</td>
<td>32.1 ± 16.8</td>
<td>77.7 ± 40.0</td>
<td>(t(14) = -5.391, P \leq .000)</td>
</tr>
<tr>
<td><strong>Middle childhood</strong></td>
<td>knowledge</td>
<td>51.7 ± 25.1</td>
<td>122.7 ± 31.2</td>
<td>(t(13) = -6.697, P \leq .000)</td>
</tr>
<tr>
<td></td>
<td>knowledge confidence</td>
<td>46.0 ± 25.0</td>
<td>114.4 ± 28.7</td>
<td>(t(13) = -7.114, P \leq .000)</td>
</tr>
<tr>
<td><strong>Adolescence</strong></td>
<td>knowledge</td>
<td>45.8 ± 13.4</td>
<td>100.1 ± 25.8</td>
<td>(t(7) = -7.125, P \leq .000)</td>
</tr>
<tr>
<td></td>
<td>knowledge confidence</td>
<td>42.8 ± 19.4</td>
<td>92.8 ± 28.4</td>
<td>(t(7) = -5.858, P \leq .001)</td>
</tr>
</tbody>
</table>

*These results are based on the raw data obtained from the subjects for each instructional unit. Note, the total number of points per instructional unit varied between instructional units due to the number of objectives associated with each unit.*
Students were also asked to describe their previous experience(s) with children or pediatrics prior to beginning the course. A variety of experience levels were described, including 11 students who had experience with typically developing children through babysitting, coaching, working in a day care center, etc. Three students had exposure to pediatric physical therapy in a previous clinical experience, 4 had observed pediatric physical therapy as a pre-PT student, and 5 had experience working with children with disabilities as a camp counselor, nanny, dance class teacher, or teacher's assistant in special education classes. Five students had very limited or no exposure or experience with children prior to this course.

**Journal and Focus Group Results.** Eight students completed weekly journal entries reflecting on what factors facilitated and inhibited their knowledge confidence. These factors were explored in more depth with 9 students during the focus group interviews. Three primary themes that influenced students' knowledge confidence emerged from the journal narratives and interviews: (1) Previous experience with children, (2) student self-efficacy, and (3) teaching methods/characteristics.

Students who had previous experience with children (theme 1) noted that certain aspects of that experience translated into more confidence in the pediatric course. This was reflected by 1 student from the second focus group (FG), who said, "...having interacted with kids before and kind of knowing how to handle them and how they move, I felt a little more comfortable with coming up with intervention ideas... just because I know kind of how infants move" (FG2). Another student commented, "...because I worked at the MDA [camp], and when we discussed that topic...I did have a better picture in my head of what a child with muscular dystrophy looks like...I could formulate a mental picture in my head of what kind of patient I'd be seeing" (FG1).

Students who lacked experience with children, especially children with disabilities, reported lacking confidence, feeling unsure, and being scared and intimidated by the pediatric course and pediatric PT. This was echoed by 1 student, who noted, "I think I lacked confidence just in general, like thinking about children with disabilities...that just seemed really scary and fragile. They're just little kids and I felt like I would hurt them no matter what I did" (FG 1). Another stated, "My confidence in knowledge is low as I feel unsure of myself in this field, with little experience and little recollection of previous embryology and genetics from under-grad" (Journal 3). One more commented, "I'd only interacted with typically developing children, so it was kind of daunting to see how do you address all of these things and especially different age spans, because I never thought of ever working with an infant in PT" (FG1).

Several students noted that they believed in their abilities as learners, which promoted their confidence even with unfamiliar content (theme 2: student self-efficacy). The fact that they had been successful as students in previous PT coursework further facilitated this confidence. One student reflected on that notion, stating, "I was confident in general...I think that between the tutorials and the program, where everything else was helping us learn how to learn. I mean...we built up so much confidence along the way that we can do this" (FG2). Another student said, "After 2 years – even though I might not know exactly what the textbook says, I feel like I can come up with an answer that's sufficient and that would be safe and effective for this population. So I feel like the experience I had in my [previous] 2 years of knowledge, even though it wasn't in pediatrics, helped me with boosting my confidence..." (FG1).

In contrast, for several students, their perception of the pediatric course being different from other courses appeared to decrease their self-efficacy and confidence, as noted by 1 student who commented, "I think part of the apprehension is that peds, especially younger peds, are so fragile, and it's a huge developmental time in their life, that if it doesn't go well, there's huge consequences for the rest of their life, whereas in courses like outpatient, if it's somebody with back pain, which, yes, it can be very debilitating, but it's kind of a different scenario" (FG2). Another student stated, "Most of us maybe had a brief couple of peds patients in our clinicals beforehand, but I would say that I had less of a foundation to start from. I think a lot of it too, is we think peds is just so different..." (FG2).

Additionally, several students expressed perfectionistic expectations of themselves that tended to inhibit their confidence in their knowledge. As 1 student noted, "I feel like there's a lot of different personality types, but they're all high achievers, and even if we know it [content], we feel like we don't know it as well as we should, so it could just be part of our makeup, always just not going to be as confident as we are knowledgeable" (FG1).

The majority of journal entries focused on various teaching and learning experiences (theme 3: teaching methods/characteristics) that promoted or inhibited student knowledge confidence from week to week. These factors were explored in more depth in the focus group interviews. Within this theme, 4 sub-categories were identified, including (1) active, contextual learning experiences, (2) self-directed learning, (3) the learning environment, and (4) lack of faculty explicit reasoning.

A majority of students reported that active learning experiences contextualized by concrete experiences, such as contact with children or actual case studies, increased their knowledge confidence, as 1 student said, "...I think that by setting up the hands-on experiences...a chance to work with kids, especially with kids with disabilities...any amount of real exposure really helps to build confidence" (FG2). Another added, "The typical children visit also increased my confidence as I was able to see what a typically developing child looks like and contrast to the videos and clinic observations of children with impairments" (Journal 1).

Students stated that when they were able to actively apply what they were learning, they tended to better understand and retain what they were learning and felt more confident and ready for clinical experiences. "And actively doing it helps you remember it better, versus just listening to it. You know, the [interventions using the] doll stands out in my mind, so that's something I'll remember versus a lecture" (FG1). A journal entry showed 1 student noting, "This week time spent in class on clinical application of interventions and assessment were very helpful in cementing current knowledge and applying goals to cases. This gave us guided opportunity to practice clinical reasoning and gain confidence in our new knowledge" (Journal 9).

Students reported that various self-directed learning opportunities, such as weekly ungraded online quizzes and creating a 1-page reference document for exams, helped them understand course content and facilitated their confidence in their learning, as indicated by a student who stated, "...I really feel the online quizzes as self-learning have promoted my learning and confidence for this course. Through the self-readings and online quizzes I am able to get a good understanding of the diagnosis and feel confident about what I have learned" (Journal 8). Another student noted, "Having the reference sheet for the test made me feel much more confident about how I would do. It's funny though, because I probably only used the sheet about 3 times throughout the entire test. It ended up being a great study tool!" (Journal 2).

Positive learning environment factors, described by multiple students as promoting their knowledge confidence, included classroom sessions with a safe environment,
instructor encouragement and openness to ideas and alternative answers, and organized teaching strategies. The students described how these factors tended to contribute to their participation in learning and helped generate engagement in the course. “Tutorial always increases my confidence of my knowledge. Not only is knowledge applied to a patient case, I get to problem solve with my peers in a safe environment with a tutor willing to help when necessary” (Journal 1). Another student added, “An interaction that promoted my confidence was the professors’ encouragement to form our own opinions and treatment styles…” (Journal 3).

In contrast, several learning environment factors inhibited the development of student confidence in their knowledge, including classroom situations in which students felt intimidated. In 1 particular class session, individual students were called to the front of the class to work with a guest child with disabilities in front of their peers. One student reflected on that scenario, commenting, “I think the whole class, nobody wanted to do anything with him. I was so fearful…It was so intimidating, because we haven’t really worked with children with disabilities. Physically I haven’t done that, so then you’re standing amongst all your peers…I almost felt ambushed” (FG1). Another student stated, “The day that [name of guest patient] was brought in I felt very intimidated to work hands on with him in front of all my peers because I really didn’t feel confident in my ability to assess what was going on nor how to hold/work with him appropriately” (Journal 2).

The different relationship and rapport that exists with guest or adjunct faculty versus core faculty was also perceived as inhibiting confidence by the students. “There are a lot more [guest] PTs coming in than actual faculty members teaching, and…we develop a rapport with you guys, and I think that increases our comfort level, which increases our confidence, whereas when you have new faces, that rapport is not there” (FG2).

Rushed, content laden, and long class sessions were all also mentioned as negatively affecting learning and knowledge confidence, as 1 student emphasized, “Things were going so fast, and the questions were being asked so fast that I had no idea what the answers to the questions even were, I was still backpedaling to keep up…and it was really disconcerting and low confidence to sit there…I know I didn’t retain a lot from that lecture” (FG2). Another student commented, “Something that inhibited my confidence in my learning was the [name of lecture]. It was packed with a lot of information that was not all gone over. It felt very rushed and overwhelming. I left feeling confused about the material…” (Journal 4).

Students reported that the lack of explanation of an instructor’s reasoning process (explicit reasoning) tended to decrease how confident they felt in their knowledge, as 1 student stated, “I didn’t quite see where they were going. It’s kind of nice when it’s explicit as far as where you’re going and you can follow along and you feel more confident if you understand where this is going and what we’re doing…” (FG1). Another commented, “When we did see an evaluation, [instructor] told us things that we didn’t necessarily agree with, and it was like, ‘Well, I don’t really see that,’ but there was no discussion on why what I’m seeing is different than what [instructor] is seeing, which decreases my confidence, because I feel like, well, you’re obviously the expert, and if I don’t see that, then I’m wrong…” (FG1).

**DISCUSSION**

The purpose of this mixed-methods study was to investigate the teaching and learning activities that promoted or inhibited the development of self-rated knowledge and knowledge confidence by PT students during a pediatric physical therapy course. The quantitative results of the students’ self-rated levels of knowledge and knowledge confidence confirm that the students self-rated their postinstruction levels of knowledge and knowledge confidence significantly higher than their preinstruction ratings for each of the 5 instructional units offered in this pediatric physical therapy course. Concurrently, the qualitative results revealed specific teaching and learning activities that enhanced or diminished the students’ ability to develop higher levels of self-rated knowledge and knowledge confidence.

The students described several teaching and learning activities that enhanced their ability to increase their knowledge and improve their knowledge confidence during this course. They reported in the focus group session, as well as their weekly journals and during class discussions, that having previous experience being around or working with children in a given age range had a positive effect on their self-rated knowledge and knowledge confidence. This was especially true for the infant and middle childhood development units, during which they described multiple experiences being around and handling infants, as well as coaching youth sports and working at summer camps prior to entering the PT educational program. Students also reported in their journal entries that observing in a pediatric physical therapy clinic prior to the infant development unit enhanced their confidence about infant development. Experience with a given population was reported by Shields and Taylor to be an important factor for increasing the self-confidence of student physiotherapists in Canada, as well as for practicing pediatric rehabilitation therapists. Thus, it is possible that this group of PT students had enhanced levels of self-confidence during these 2 units because of their previous experiences with infants and children, and due in part to the clinic observation session that was a small portion of this course. The subjects also noted in their journals that self-directed online learning modules that included pre and postmodule quizzes for infant reflexes and infant motor development contributed to their relatively high postinstruction self-ratings regarding infant development.

Typically developing children visiting class during the middle childhood development and adolescence units were also noted by the students as having a positive impact on the development of their knowledge and knowledge confidence. During these in-class sessions the students interacted with the children and practiced using select assessment tools (eg, Test of Gross Motor Development, 2nd Ed., and the Bruininks-Oseretsky Test of Motor Proficiency, 2nd Ed.) Their observations are similar to the perceptions shared by Morgan and Cleave-Hogg, who reported that students who had more practice performing a given skill or task had higher levels of perceived self-confidence. In addition, several instructional sessions of the middle childhood and adolescence units were provided by a “core” faculty member who implemented well-organized classroom presentations in a relatively safe learning environment where students could develop effective assessment and intervention strategies. Several students reported that these teaching strategies promoted their knowledge confidence. Further, their journal entries revealed that being encouraged to prepare a 1-page reference sheet throughout the units that could be used during the written examination increased their level of self-rated knowledge and knowledge confidence. Collectively, their middle childhood and adolescence postinstruction self-ratings are consistent with the literature, and reflect the importance of previous experiences, active, real life learning activities, and the value of a positive and supportive course climate that utilized typically developing children as patients/clients.

In addition to these positive strategies, the subjects also described several teaching and learning activities that inhibited or diminished their ability to increase their
self-rated knowledge and/or improve their knowledge confidence. A lack of previous experience working with or being around children in certain developmental periods (eg, toddlerhood/early childhood) prior to an in-class visit by toddlers negatively impacted their ability to feel confident in their knowledge. These perceptions are consistent with the literature, which suggests that a lack of experience with a given population seems to lower the self-confidence of PT students, as well as less experienced practicing clinicians.\textsuperscript{10,11} Their relatively low postinstruction self-ratings for the toddlerhood/early childhood unit seemed to reflect the impact of a specific teaching and learning session in which the students felt intimidated and put on the spot by a guest presenter who asked them to work with a toddler who presented with multiple impairments in front of their peers, core faculty, and the child’s parents. As noted in their weekly journals and the focus group sessions, this particular teaching and learning activity undermined their self-confidence, as they did not feel well supported by the faculty and clearly did not feel comfortable with the learning processes associated with this classroom experience. These perceptions are consistent with the findings reported by Fencl and Scheel\textsuperscript{21} and Eley\textsuperscript{26} who suggested that students who believe that the course climate is not positive or perceive that they are not well supported by the faculty may experience reduced levels of self-confidence. Journal entries also noted that students lacked experience being around or working with children who have disabilities, which may have reduced confidence in their ability. The development of self-rated knowledge and knowledge confidence during the toddlerhood/early childhood unit was also undermined by instructional sessions that students perceived to be too long (4 hours with 1 speaker) or were poorly organized, as when an instructor inconsistently alternates between PowerPoint slides, a Word document, and video recordings of children.

Although significant increases in self-rated knowledge and knowledge confidence were observed for each instructional unit, none of the postinstruction self-ratings for knowledge or knowledge confidence exceeded 65%. The students’ postinstruction ratings may, however, reflect a healthy level of humility, as students may have become aware of how much they still needed to learn as they progressed through the course. It is also possible that their perceptions reflect the developmental process that PT students go through as they work to acquire knowledge, develop confidence in their knowledge, and strive to become consciously competent. This group of PT students still had 41 credit hours of their entry-level curriculum, including 3 full-time clinical rotations, to complete. As such, they were in the midst of developing their knowledge and skills and not yet able to apply them proficiently.\textsuperscript{2-4,20}

The current results may also reflect the limited opportunities the students had in this course to apply their newly acquired knowledge and skills with children of all ability levels. As noted in the literature and by several students enrolled in this study, those without prior experience with children felt unsure of themselves and became scared and somewhat intimidated when they began this course.\textsuperscript{40,43} Collectively, these factors may also explain the slightly lower self-rated knowledge confidence ratings reported by these students pre and postinstruction, as compared to their self-rated knowledge ratings. It is also possible that more effective teaching and learning activities, such as having typically developing children visit class during each developmental period so students could practice clinical observation and examination skills using appropriate assessment tools, would lead to higher levels of self-rated knowledge and knowledge confidence. Studies by Stewart et al\textsuperscript{17} and Hughes et al\textsuperscript{18} provide support for this approach, as they recommend students who have repeated opportunities to apply their knowledge and skills increase levels of self-confidence and self-efficacy. In addition, using guest presenters in a more effective manner (eg, for shorter instructional sessions and/or providing more guidance to guest speakers on how to organize instructional sessions) may also result in higher postinstruction knowledge and knowledge confidence ratings. Further, the subjects in the present study confirmed the results of previous reports that highlighted the relationship between a positive and supportive classroom/course environment and the development of students’ self-confidence.\textsuperscript{21,26}

LIMITATIONS

It is important to recognize that the results of this study represent the perceptions of a single cohort of PT students who were completing their education at a small private liberal arts university. They were matriculating through a relatively unique DPT curriculum,\textsuperscript{26} in which students take 1 course at a time, with the content of each course purposefully organized so that there is a close juxtaposition of medical sciences, behavioral science, and clinical application. Further, in previous courses, they had been consistently exposed to an eclectic approach to teaching and learning that included lectures, labs, small group work, multiple guest speakers, tutorials, and self-directed learning. It is possible that groups of PT students who complete their professional education at other types of institutions or in more traditional curricula may have perceptions that differ from the current subjects. The current sample size and our reliance on student self-ratings are also limitations of the current investigation. In addition, 1 of the authors had significant teaching responsibilities in this particular pediatric course, which may have contributed to unknown bias. Further, although the pre and postinstructional unit surveys were grounded in the student learning objectives for this course and based on Bandura’s\textsuperscript{52} work regarding well-designed Likert scales, no type of reliability and validity testing prior to this study was performed. Finally, the inferential statistical analyses should be viewed cautiously, as these were applied to data that were not confirmed to be interval or ratio variables.

CONCLUSION

The current study revealed that PT students possess varying levels of preinstruction experience, self-rated knowledge, and knowledge confidence regarding pediatric physical therapy content. These students noted that self-directed learning activities, real-life experiences with children, organized class sessions, and a positive, supportive learning climate all enhanced their ability to develop knowledge and knowledge confidence in pediatric physical therapy content. Alternatively, teaching and learning activities that were poorly organized, created a nonsupportive learning environment, or lacked explicit clinical reasoning on the part of the faculty diminished student ability to increase self-rated knowledge and knowledge confidence. Students also noted that their relationship with core faculty versus guest speakers played an important role in the development of knowledge and knowledge confidence. Future research is needed to explore the value of a formal pre-course assessment regarding pediatric physical therapy content, how technology and self-directed learning activities may be used to enhance student learning, and how in-course student feedback may be used to refine teaching and learning activities that promote the ability of students to increase knowledge and knowledge confidence. Also warranting confirmation is whether increased levels of self-rated knowledge and knowledge confidence translate to an improved ability to apply that knowledge in clinical practice.

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REFERENCES


Appendix A. Focus Group Questions

1. Describe your confidence in your knowledge abilities starting the pediatrics class.

   (Possible probes):
   - Describe any difference in your confidence in your knowledge/abilities in pediatrics as compared to the other DPT courses you have taken to date.
   - How has your prior DPT curricular preparation influenced your confidence in knowledge related to pediatric physical therapy?

2. What role have faculty played relative to your confidence?

3. Describe a time when you held back in class because you were not confident.
   a. Why were you feeling a lack of confidence at that time?

4. Describe your previous experience with children/pediatrics.
   a. How has your experience influenced your knowledge confidence in this course?

5. How has your level of knowledge confidence affected the effort you have put into your learning in this course?

6. Do you have more confidence in 1 area of pediatrics versus another? Why?

7. What is needed to further your confidence level in pediatric physical therapy?

8. Of all the things we discussed, what to you is the most important?

9. Have we missed anything?