

Developing Self-Efficacy in Doctoral Students for Treating Patients with Hand Therapy

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Abstract
In the Doctor of Physical Therapy (DPT) program, the process of fabricating orthotics, including prescribing, and modifying orthotics is documented in the Physical Therapy Guide to PT Practice as an intervention that physical therapists perform with patients. However, not all DPT students are educated on the process of fabricating orthoses or know which orthosis should be recommended for a specific diagnosis. Many patients who are diagnosed with a wrist or hand condition require an orthosis as part of the appropriate treatment. The problem addressed in this study is if DPT students do not typically learn about orthotics related to patient conditions and learn the fabrication process, they have decreased self-efficacy of treating patients with wrist and hand conditions. DPT students may have a higher self-efficacy of treating patients with hand and wrist conditions if they are educated on fabricating orthoses and know which orthosis to recommend for a diagnosis. Self-efficacy involves how an individual perceives themselves succeeding in a task. Working successfully in a challenging clinical environment is dependent on a physical therapist's self-efficacy. The purpose of this quasi-experimental pretest posttest study was to explore the benefits of educating DPT students on upper extremity orthotics and fabricating upper extremity orthotics on the affect their self-efficacy of treating patients with wrist and hand dysfunction. The research helped to answer questions related to physical therapy students' experience of an orthotics fabrication lab and the relationship, if any, of their self-efficacy of treating patients. Data was collected using a web-based survey including the adapted Physiotherapy Self Efficacy questionnaire and a question regarding future interest in hand therapy to evaluate if a relationship exists between self-efficacy and receiving training on upper extremity orthotic fabrication. Approximately 130 participants were recruited for the study. Recommendations for implementing orthotics training for DPT students were suggested based on results. Results from this study identify strong rationale to support orthodics training; including upper extremity orthotic fabrication and training, in DPT curricula. Future DPTs can be more prepared to treat a wrist and hand caseload and have successful treatment outcomes.

Keywords: *Physical therapy education, hand therapy, student engagement, orthosis patients, Bandura's self-efficacy*.
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1. Introduction

One of the learning components of a Doctor of Physical Therapy (DPT) program is management of upper extremity dysfunction through orthotic devices. Students pursuing DPT are educated on hand content and upper extremity orthotics as a part of their PT curriculum. DPT students should have a strong sense of self-efficacy in treating patients by the time they complete school. A physical therapist's self-efficacy affects their ability to work successfully in a challenging clinical environment (Silberman, 2016). Entry-level DPT education should equip students with the knowledge and skills for different practice settings and expose them to different specialty areas (Erikson et al., 2017). One of these specialty areas includes hand therapy. Hand therapy involves rehabilitation of the upper extremity, including the hand to the shoulder. (Hand Therapy Certification Commission, HTCC, 2023). A merging of Occupational Therapy (OT) and PT practice using comprehensive knowledge of the upper extremity to improve function is involved in hand therapy (HTCC, 2023).

The American Physical Therapy Association (APTA; 2023a) hand and upper extremity section promotes research and education in hand and upper extremity education while its vision is "Optimizing human capacity by advancing the practice of hand and upper extremity physical therapy" (para. 2). Physical therapists treat the impairments of the body including the shoulder, elbow, wrist, and hand. Individuals with upper extremity injuries may be required to wear an upper extremity orthosis as part of their treatment plan. Upper extremity orthotics are custom made or prefabricated, which includes orthotics that can be purchased at a store. Hand interventions in a DPT program that are recommended at the guided practice level include prescription of orthotic or supportive devices, application of orthotic devices (custom or prefabricated), and fabrication of orthotic devices (Erikson et al., 2017).

Including specialty area content in an entry level program can be challenging for educators due to time constraints, concern over the scope of professional practice, and difficulty determining the depth of the specifics of specialty material to be added to a program that is already heavy with information (Erikson et al., 2017). If DPT students are not receiving training on prescribing and recommending upper extremity orthotics, then students may not have the skills and education to be confident in referring orthotics to patients in need. Additionally, students may have decreased self-efficacy in this area. This can lead to referrals to other healthcare specialties. Educators can tailor teaching strategies of DPT students to increase their self-efficacy (Bandura, 1997). Good instruction by educators can increase interest and technical skill in an area (Bandura, 1997). One study found that professional self-efficacy can have a direct impact on health care professionals' job performance (Bernales-Turpo et al., 2022). Sparse evidence is in the literature on the effectiveness of DPT students educated on upper extremity orthotics and orthotic fabrication on their self-efficacy in a DPT curriculum.

1.1 Background of the Study

The hand accounts for approximately 90% of upper extremity function (Herndon, 2018). Individuals with hand and wrist injuries may need to receive customized treatment which can prevent complications and dysfunction (Arroyo-Berezowsky & Quinzaños-Fresnedo, 2021). A patient with a hand injury or disease can be impacted greatly by their ability to function (Jorge, et al., 2020). One intervention that is within a PT's scope of practice is the use of an orthosis (Jorge, et al., 2020). Depending on the diagnosis, a patient with a hand or wrist injury may be prescribed a custom or prefabricated orthosis. There are various patient health conditions in which an orthosis is recommended as part of the treatment plan (Farzad et al., 2024). Since physical therapists treat the upper extremity in their scope of practice, including the wrist and hand, it is important for DPT students to have the knowledge and expertise on referring orthotics to the appropriate patients with wrist and hand related diagnoses. Optimizing the use of the hand is dependent on the therapist's ability to provide appropriate and effective interventions, which can significantly affect a patient's overall function (Jorge, et al., 2020).

Clinicians and Patients

Clinicians should base treatment decisions on knowledge and clinical experience along with the diagnosis of the patient (Jorge, et al., 2020). In addition, acquiring the skills to fabricate custom orthotics could further extend into a physical therapists' scope of practice. DPT students' self-efficacy in treating patients with hand and wrist dysfunction can be directly affected from learning the skill. By training and exposing DPT students to upper extremity orthotics and fabrication skills, the gaps in healthcare treatment in this area can be lessened.

Many patients that have wrist or hand injuries require an upper extremity orthosis as part of their plan of care. Orthoses in hand therapy are used as an intervention with the evaluation and treatment of patients with hand conditions (HTCC, 2023). Orthotics can be custom molded or prefabricated. Since prescribing, recommending, fitting, and fabricating orthotics is within the scope of practice of a physical therapist, DPT students should be educated on this skill set It is unknown whether educating DPT students on upper extremity

orthotics and fabricating upper extremity orthotics will affect their self-efficacy of treating patients with hand dysfunction. Not all DPT programs educate students on the skills to fabricate a custom orthosis, nor teach the appropriate orthosis that should be referred upon a particular diagnosis. For example, a University program in Miami offers PT students orthotic fabrication as an elective course (University of Miami, 2023). Other universities include fabrication of orthotics as part of the regular DPT curriculum. If teaching DPT students more about orthotics will increase their self-efficacy in treating patients with hand and wrist conditions, then it could become an integral part of the curriculum and improve patient care.

Education for Hand Therapy Among Students

Education for hand therapy is initially introduced to students in entry level PT and OT graduate programs (Short et al., 2018). Barriers of integrating hand content in an entry level PT program include: time and prioritization, lack of expertise in hand therapy to teach students, and perception of professional scope of practice (Schofield & Schwartz, 2020). Due to the shortage of PT practitioners in hand therapy, there is a gap in both practice and literature regarding the education of hand therapy for DPT students (Erickson et al., 2017; Short et al., 2018). Examining factors that contribute to DPT students' knowledge and application of upper extremity orthotics through an orthotics fabrication workshop is worthy of research. The findings addressed gaps in the literature on DPT orthotic fabrication. Results from the study provided DPT educators with a better understanding of how DPT students education is potentially enhanced from having a learning experience of fabricating upper extremity orthotics.

According to the Alliance for Physical Therapy Quality and Innovation (APTQI; 2023), there is a shortage of physical therapists in healthcare in the United States (U.S.). Approximately 22,000 physical therapists left the healthcare workforce in 2021 (Dickson, et al., 2021). This number, plus the other healthcare workers that exited the profession, has resulted in higher healthcare costs and straining the already overstretched healthcare system (AAPTQI, 2023). Educating future physical therapists on upper extremity orthotics, identifying a proper orthosis for a certain diagnosis, and having the skill set to fabricate a custom orthosis, may increase students' interests in wrist and hand conditions (Spaulding et al., 2020). The interest and foundational background could increase the DPT students' ability to treat patients with upper extremity conditions.

In addition, faculty members who lack the specialized skills to educate students on orthotics can impact student learning outcomes and contributes to the shortage of physical therapist performing hand therapy (Schofield & Schwartz, 2020). Specialty areas, such as hand content and upper extremity orthotics should be included in a DPT curriculum because it is within the PT scope of practice. Design and fabrication of orthotics is a "technical psychomotor skill that requires faculty with the knowledge and specialized skills" to instruct students with hands on practice to develop necessary competence (Schofield & Schwartz, 2020, para 3). Faculty with the specialty skills could train other faculty as part of professional development to prevent problems educating the technique.

Hand therapy is a specific area of rehabilitation where certified occupational therapists and physical therapists who have extended knowledge, evaluate, and treat people with upper extremity conditions (Valdes, 2022). Recommended hand therapy content in a DPT curriculum have been identified (Erickson et al., 2017). The psychomotor domain content items were categorized into three levels: knowledge, guided practice, and independence (Erickson et al., 2017). These levels were further filtered into examination, tests and measures, and interventions. The recommendations in the guided practice section in the interventions category are that entry level PT students are educated on the prescription, fabrication, and application of orthotic devices (custom or prefabricated; Erickson et al., 2017). Eleven different specific orthotic devices were also recommended at the guided practice level for Entry-Level Physical Therapy Education.

Self-efficacy is the belief that an individual has on their ability to complete a task successfully (Bandura, 1997). Albert Bandura's Theory on Self-Efficacy explains that when people work through their own challenges or problems, they acquire positive experiences that can increase their self-efficacy (Bandura, 2018). If students learn hand content related to orthotics by an experience, this may increase their knowledge in the area and in turn, improve their self-efficacy.

Guidelines for Physical Therapy Practice

The APTA adapted the Guide to Physical Therapy Practice as a resource describing physical therapy practice and the foundations upon which PT practice is built (APTA, 2023b.). Interventions categories that are listed in the guide are based on the results of a patient examination and evaluation and on the goal for the individual's needs (APTA, 2023b). Adaptive and assistive technology are procedural interventions that physical therapists use, which includes the "prescription, application, and, as appropriate, fabrication or modification of

splinting, bracing, …orthotic devices…and other adaptive technologies to improve functioning" (APTA, 2023b, para. 1). Physical therapists select, prescribe, apply, fabricate, and modify adaptive technologies when examination findings indicate that the use will benefit an individual (APTA, 2023b). Since prescription and fabrication of orthotic devices is within the scope of practice, DPT curriculums should support educating PT students in this area.

However, there is no research that addresses DPT students' knowledge of upper extremity orthotics influencing their self-efficacy toward evaluating and treating patients with wrist or hand conditions. This study provided research that addresses student knowledge of upper extremity orthotics and self-efficacy. DPT students should be educated on upper extremity orthotics related to hand dysfunction and know which type of orthosis is appropriate to refer, according to the patient's diagnosis. In addition, DPTs who have the skill set to fabricate an orthosis for a patient that requires one, can save the patient and additional stakeholders costs and time in advance patient care.

While occupational therapists are trained to work with patients with wrist and hand injuries, physical therapists are also trained and educated in this area. Since physical therapists evaluate and treat patients with upper extremity injuries and it is within their scope of practice, then it is essential that PT students receive education on fabricating and recommending upper extremity orthotics. By acquiring this knowledge and skill set, students may have more self-efficacy of treating patients with wrist and hand injuries. In the US., there is a shortage of physical therapists working in the specialty area of hands (Stegink-Jansen, 2017). As of 2019, the ratio of OT to PT providers treating hands in the U. S. is 7 or 8:1 and Canada is 3:1 (Stegink-Jansen, 2017). A concern for the PT profession is the potential to lose the ability to practice hand therapy if there are fewer practitioners qualified to provide hand therapy (Stegink-Jansen, 2017).

Self-Efficacy

Bandura (1997) discussed four main sources of self-efficacy which are: mastery experiences, vicarious experiences, verbal persuasion, and emotional and physiological states. The two concepts that aligned with this study are mastery experiences and vicarious experiences. In this study, the students practiced a new skill by learning about and fabricating orthotics, which is challenging. By learning and practicing the skill, the students can increase their self-efficacy. The vicarious experience was delivered by having the instructor, or role model, teach the skill of fabrication and then the students had the opportunity to observe, imitate, and practice the skills.

DPT students should be educated on upper extremity orthotics and have the knowledge to make clinical decisions on referring upper extremity orthotics to the appropriate patients. They should also be exposed to orthotic fabrication and be familiar with the process to provide the best care for their future patients. The students' self-efficacy after the intervention may influence future DPT program curriculum design. If DPT students feel that they have enough knowledge in the curriculum to optimally treat patients with hand and wrist conditions, then they may have increased self-efficacy in treating patients with these conditions.

The Problem

The problem is that DPT students may not typically learn the fabrication process in orthotics related to patient conditions prior to clinical practice, resulting in a decrease in self-efficacy of treating patients with wrist and hand conditions in a University DPT graduate program. According to the Physical Therapy Guide to PT practice, physical therapists can fabricate, prescribe, and modify orthotics (APTA, 2023b). Many individuals with upper extremity injuries may need an orthosis as part of their intervention plan. Professionals involved in orthotics through well-planned collaboration, offering training, and mentoring is discussed (Harte, 2022). Trying to find the ideal solution for fitting an orthotic device that is comfortable, long-lasting, and effective should be at the forefront of health care professionals that work with orthotics (Harte, 2022). Orthotics education must continue to improve to anticipate and reflect shifts in healthcare, pedagogical thinking, technology, and student expectations (Spaulding et al, 2020). Since physical therapists are healthcare professionals that incorporate orthotics into patient care, it is critical that PT students have orthotics training and knowledge. Quality assurance criteria will be used in the future of prosthetic and orthotic programs to demonstrate student learning of evidence-based practice skills and discipline-specific cognitive psychomotor skills that support quality patient care (Spaulding et al, 2020). An emphasis on learning orthotics in physical therapy programs may be warranted.

1.1.1 *Purpose of the Study and Research Questions*

The purpose of this quantitative quasi experimental pretest posttest study was to explore the benefits of educating DPT students on upper extremity orthotics and fabricating upper extremity orthotics on the affect their self-efficacy of treating patients with wrist and hand dysfunction. This directly reflected the research questions that will follow. Data and results obtained from this study contributes to future research studies regarding the

research problem and connects the relationship between the variables. This quantitative experimental study improved the understanding of students' self-efficacy of treating patients with wrist and hand injuries after receiving education on upper extremity orthotics and fabrication. Data was collected using an online survey from 125 DPT students who were enrolled in an orthotics course from an accredited PT program in the Southeastern U.S. Participant inclusion criteria included DPT students taking an orthotics course as part of the DPT curriculum and who received the intervention of fabricating orthotics. Exclusion criteria for participants are DPT students who were not taking an orthotics course. Results of the study may advance DPT curricula to incorporate valuable experiences and learning components for successful student outcomes.

DPT student participants received an online survey of an adapted version of the Physiotherapist Self-Efficacy (PSE) Questionnaire. The purpose of the survey was to collect data that would inform physical therapy educators, curriculum developers, and program directors of physical therapy programs on the possible benefits of incorporating an upper extremity orthosis fabrication experience into a PT curriculum. Data was analyzed using descriptive statistics, bivariate tests, Pearson's r zero correlation, independent-samples t-test, and a One-Way Anova, and a multivariate analysis. As part of the same survey, the students received a validated quiz where they were asked to answer questions regarding choosing upper extremity orthotics for a specific diagnosis. The experimental quantitative correlational study aims to answer the following research questions:

RQ1. Will an enhanced learning and lab experience delivered to the experimental group be associated will significantly higher pretest to posttest changes in mean Self-Efficacy scores relative to the control group?

RQ2: Will the experimental group evidence a higher pre-test to post test change relative to the control group on the ability to recommend appropriate orthoses for a wrist/hand condition?

RQ3 Will an enhanced learning and lab experience delivered to the experimental group be associated will significantly higher pretest to posttest changes in mean level of interest relative to the control group**?**

Hypotheses

H1. The experimental group will evidence significantly higher pretest to posttest changes in mean Self-Efficacy scores relative to the control group.

H2: The experimental group will evidence a significantly higher change in number of correct responses from pre-test to post-test relative to the control group.

H3: The experimental group will have a significantly higher pre test to post test changes in mean level of interest scores relative to the control group.

2. Methodology and Sample

This study used a quantitative research method approach to answer the research questions and to gain an understanding of how upper extremity orthotics and fabrication education impact physical therapy students' self-efficacy. Bandura's Theory of Self-Efficacy guided the approach and aligns with the research questions. The Physiotherapist Self Efficacy (PSE) questionnaire was adapted and used in this study (van Lankveld et al., 2017) to collect data. A self-administered questionnaire was used as part of a survey. A pretest posttest design was used to investigate the variables and to determine if there is a change. The experimental group received the learning activity and the control group did not. The knowledge pertaining to selecting the orthosis to the diagnosis was tested by a six item knowledge quiz as part of the survey. For the third research question, an additional Likert scale item was added to the end of the quiz addressing the level of interest in hand therapy.

Nonrandom convenience sampling was used for this study. The participants were not randomly assigned, and the sample was convenient because a naturally formed group is used, which in this study are the students enrolled in the course (Creswell, 2023). The 69 participants were enrolled in a physical therapy program and were currently taking a prosthetics and orthotics course. A non-probability method was utilized with convenience sampling (Jacobson, 2021). Every student within the population had an equal opportunity for participation.

3. Data Analysis and Results

Table 1 presents a descriptive analysis of categorical study participant characteristics. Data indicated about half of the sample was from four campuses across the United States (n=31, 44.9%), was in the experimental group (n=36, 52.2%), was female (n=40; 58.0%), was of a White racial/ethnic identity (n=36, 52.2%), and was between the ages of 20-25 (n=37, 53.6%). The study groups were paired by campus in which the experimental group consisted of campuses and the control groups in Texas and Florida.

Table 1

Table 1 Descriptive Analysis of Categorical Demographic Characteristics (n=29)

Variable	N	%
Campus Attended		
Texas	8	11.6
Florida	56	81.1
California	5	7.2
Study Group		
Experimental (Florida and California)	36	52.2
Control (Texas and Florida)	33	47.8
Gender		
Male	28	40.6
Female	40	58.0
Prefer not to say	1	1.4
Age		
20-25	37	53.6
26-30	28	40.6
31-35	4	5.8
Race/Ethnicity		
White or Caucasian	36	52.2
Black or African-American	7	10.1
Latino or Hispanic	10	14.5
Asian or Asian-American	8	11.6
Native American	1	1.4
Two or more	6	8.7
Prefer not to say	1	1.4

Table 2 presents a descriptive analysis of pretest and posttest responses reflecting study participant current level of interest to further knowledge in Hand Therapy as a specialty area of physical therapy. Data indicated that at pretest the most frequent response to this item was either *A Little interested* (*n*=25, 36.2%) or *Somewhat interested* (*n*=25, 36.2%). At posttest, the most frequent response to this item was *Somewhat interested* (*n*=33, 47.8%).

Table 2

Table 2 Pretest and Posttest Responses Reflecting Study Participant Current Level of Interest to Further Knowledge in Hand Therapy as a Specialty Area of Physical Therapy (n=69)

Variable	N	%
Pretest: What is your current level of interest to further your knowledge in hand therapy as a specialty area of physical therapy?		
Not interested	9	13.0
A Little interested	25	36.2
Somewhat interested	25	36.2
Very interested	10	14.5
Posttest: What is your current level of interest to further your knowledge in hand therapy as a specialty area of physical therapy?		
Not interested	7	10.1
A Little interested	20	29.0
Somewhat interested	33	47.8
Very interested	9	13.0

Table 3 presents a descriptive analysis of outcome variables pretest, posttest, and pre/post change scores. Data indicated that the average score reflecting Self-efficacy at pretest was 2.85 (*SD*=.89, MIN/MAX=1.00-5.00), at posttest was 3.38 (*SD*=.92, MIN/MAX=1.00-5.00), which resulted in a pre/post change score of .54 (*SD*=.85, MIN/MAX=-1.15-3.08). Data also indicated that the average score reflecting correct knowledge items at pretest was 3.99 (*SD*=.98, MIN/MAX=2.00-6.00), at posttest was 4.20 (*SD*=1.07, MIN/MAX=2.00-6.00),

which resulted in a pre/post change score of .22 (*SD*=1.29, MIN/MAX=-3.00-3.00).The distribution of all the scores were approximately normal as the skewness and kurtosis were not approximately two times the standard error of each respective value.

Table 3
Table 3 Descriptive Analysis of Outcome Variables Pretest, Posttest, and Pre/Post Change Scores (n=69)

Variable	M (SD)	Minimum/ Maximum	Skew (SE)	Kurtosis (SE)
Pretest Self-Efficacy	2.85 (.89)	1.00-5.00	.36 (.29)	.16 (.57)
Posttest Self-Efficacy	3.38 (.92)	1.00-5.00	-.42 (.29)	-.02 (.57)
Self-Efficacy Pre/Post Change Scores	.54 (.85)	-1.15-3.08	.26 (.29)	.26 (.57)
Pretest Knowledge Items	3.99 (.98)	2.00-6.00	.32 (.29)	-.50 (.57)
Posttest Knowledge Items	4.20 (1.07)	2.00-6.00	.03 (.29)	-.91 (.57)
Knowledge Items Pre/Post Change Scores	.22 (1.29)	-3.00-3.00	-.04 (.29)	-.49 (.57)

RQ1: Association between pretest to posttest change in self-efficacy scores by study group.

Research question one examined if an enhanced lab experience delivered to the experimental group would be associated with significantly higher pretest to posttest changes in mean self-efficacy scores relative to the control group. Data analysis revealed that mean self-efficacy score changes from pretest to posttest did not vary significantly between the study groups. Therefore, the null hypothesis for research question number one is accepted. However, from a clinical standpoint, the self-efficacy scores did evidence a positive increase among both the control and the experimental groups from pretest to posttest. This might suggest that although the hypothesis was not supported, there may be a level of instructional value associated with this enhanced learning condition. Furthermore, there was not an opportunity to increase levels of self-efficacy for some students, because their pretest mean scores were towards the higher end of the scale. This may be related to the fact that they already have experience and perhaps resulting high self-efficacy in treating patients with hand and wrist conditions.

Self-efficacy is the belief that an individual has on their ability to succeed in a situation (Bandura, 1997). Data reflecting students' levels of self-efficacy in treating patients with hand and wrist conditions was gathered as a part of the current research. The concept of self-efficacy is supported from the data gathered from this research. Through experience and introspection on performance achievements, self-efficacy is fostered (Venskus & Craig, 2017). Self-efficacy beliefs are domain specific (Scott et al., 2021). Self-efficacy is relevant to the healthcare industry and can be assessed in domains or fields where skill performance and skill-specific self-efficacy are correlated (DaLomba et al., 2021). van Lankveld et al. (2017) discussed the importance of self-efficacy in preparing PT students for clinical practice. Self-efficacy should thoroughly be evaluated in connection to the setting being studied, according to Bandura (1977). van Lankveld et al. (2017) recognize that self-efficacy beliefs should be assessed in connection to important standards of functioning in one clinical area during PT education. Job performance and student learning can be predicted by self-efficacy levels (Lowe et al., 2022). Research by Alaryani et al. (2021) demonstrated that a positive relationship existed between high levels of knowledge and high levels of self-efficacy. Thus, while the findings of Research question one were not statistically significant, the enhanced learning lab of fabricating orthotics in this study may be instructionally significant. If students learn hand content related to orthotics by an experience, as in this enhanced learning condition presented by this study, it is likely that their knowledge in this area will result in improved self-efficacy.

RQ2: Association between pretest to posttest change in ability to recommend orthoses by study group.

Research question number two examined if the experimental group would evidence a higher pretest to posttest change relative to the control group regarding the ability to recommend appropriate orthoses for a wrist and hand condition. Data analysis indicated that there was not a statistically significant change in self-efficacy scores between the groups for ability to recommend an appropriate orthosis. Therefore, the null hypothesis for research question number two is accepted. Research by Erickson et al. (2017), Short et al. (2018), and Kaunnil et al. (2022) established a gap in both practice and literature involving hand therapy education for DPT students. Educating future physical therapists on upper extremity orthotics, identifying an appropriate orthosis for a specific diagnosis, and developing the skill set to fabricate a custom orthosis, may increase students' interests in

wrist and hand conditions (Spaulding et al., 2020). Furthermore, suggested hand therapy content in a DPT curriculum have been acknowledged (Erickson et al., 2017). Physical therapists are healthcare professionals that incorporate orthotics into patient care; Therefore, it is critical that PT students have orthotics training and knowledge in order to treat patients with the best quality care. Spaulding et al. (2020) found that lab experiences are active learning that can aid students with increased knowledge. Therefore, the fact that the current research study did not identify a statistically significant increase in levels of knowledge from pretest to posttest among the students in the enhance learning lab is an unexpected outcome. This finding could be related to the fact some of the participants already had high scores on select questions of the knowledge quiz, leaving little room for change. Similarly, while the results of Research question two were not statistically significant, they were instructionally significant. This supports why DPT curricula might be beneficial to educate DPTs on upper extremity orthotics including fabrication and selection.

RQ3: Association between pretest to posttest change in future interest in hand therapy by study group.

Research question number three examined if an enhanced learning and lab experience delivered to the experimental group would be associated with significantly higher pretest to posttest changes in mean level of future interest in hand therapy relative to the control group. Data analysis revealed that there was not a statistically significant change in future interest scores between the groups. Consequently, the null hypothesis for research question number three is accepted. In respect to research question three, some future interest revealed a positive change while some participants revealed a negative change, and some had no change at all. Taken together these findings suggest that some students may not want to learn an extra skill set of physical therapy, which would add another level of pressure and time. Consequently, some students may have taken interest in the learning lab and want to further their learning of hand therapy through learning more about orthotic intervention. Additionally, the posttest most frequent response was somewhat interested in hand therapy. Whether the students were in the control group or the experimental group, they still achieved a level of learning about orthoses that may have had an effect on their interest in hand therapy. These findings gleaned from these three research questions together regarding the effectiveness of the learning lab may be heavily influenced by the fact that many of the student participants entered the pretest with higher self-efficacy and knowledge scores initially. This study may have benefited by having several students with little or no experience with the subject matter in order to illustrate how effective the learning condition might be for that group. Additionally, only a small number of participants may be influenced to change their perception on hand therapy. Until this enhanced learning condition is delivered to this type of study participants, the effectiveness may not be clear. It is likely that replicating this study would produce a more varied set of results that would better illustrate the potential effectiveness of the learning lab. Self-efficacy, knowledge, and future interest may vary among different cohorts.

4. Conclusions

This study found an increase in self-efficacy and knowledge of orthotics after standard LMS content or an enhanced learning lab on fabricating orthotics. As healthcare is changing and there is an increased need for physical therapists, specialty areas in PT are also in demand. Entry-level DPT education should prepare students with the knowledge and skills for various practice settings and expose them to different specialty areas (Erikson et al., 2017). One of these specialty areas includes hand therapy.

It is recommended that this study be repeated with different cohorts and with an additional qualitative component to increase validity. A future study could use a mixed methods study design to include interviews of students on their perceptions of fabricating orthoses and how it affects their learning. By including a qualitative component, the researcher could get a deeper understanding of how learning about orthoses and the fabrication process impacts DPT students with treating patients with hand and wrist conditions. Additionally, a qualitative study could investigate the reasons that DPT students are interested or not interested in hand therapy as a future specialty.

The study used an adapted version of the PSE, a validated knowledge quiz, and a question regarding future interest in hand therapy to explore an association of an enhanced learning lab on orthotics and the impact on self-efficacy, knowledge, and interest in hand therapy. The results uncovered that there was no statistical significance from pretest to posttest between the experimental and control groups. However, both the experimental and the control groups evidenced an increase in self-efficacy and knowledge within the groups.

Despite the non-significance of the statistical findings in the results of the study, this research can be seen as a first step toward integrating a learning lab of fabricating orthoses and self-efficacy in treating patients with hand and wrist conditions, that have not been directly linked. If teaching DPT students more about orthotics can increase their self-efficacy in treating patients with hand and wrist conditions, then it is beneficial for this

learning to become an integral part of the curriculum, resulting in improved patient care. This research contributes to a growing body of evidence suggesting that orthotic intervention including fabrication and knowledge of recommending orthoses is warranted in DPT curriculums.

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