EFFECT OF SIMULATED PATIENTS VERSUS PEER ROLE-PLAY ON PHYSICAL THERAPIST STUDENT CLINICAL REASONING AND CONFIDENCE

Jacque Lynn Bradford

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EFFECT OF SIMULATED PATIENTS VERSUS PEER ROLE-PLAY ON PHYSICAL THERAPIST STUDENT CLINICAL REASONING AND CONFIDENCE

by

Jacque Lynn Bradford

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Education

Major: Instruction and Curriculum Leadership

The University of Memphis

May 2018
DEDICATION

This dissertation is dedicated to both of my children, Jameson and Josie Catherine, as evidence that you can achieve anything that you desire as long as you put forth the grit and effort. You both witnessed me working long hours in the evenings and weekends during your childhood while I completed this manuscript and sacrificed some time with me while I did so. You were also able to witness the fruits of my labor during my graduation and hopefully continue to witness them in the years following as you progress in your education and future careers. I love you both dearly.
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ABSTRACT

The use of simulated patients is a developing instructional strategy in physical therapy education (PTE) programs. However, it is unknown if using simulated patients during instruction yields better outcomes than the traditional use of peer role-play. This two-arm randomized, experimental design investigated the effect of type of simulation-based instruction, simulated patients compared to peer role-play, on clinical reasoning and confidence of students enrolled in an entry-level PTE program learning patient transfer skills. Upon the conclusion of two instructional sessions, clinical reasoning was measured by the Think Aloud Standardized Patient Examination (TASPE) during a simulation experience. Student confidence in performing future acute care skills was measured by the Acute Care Confidence Survey (ACCS) following the simulation experience. Two independent-samples t-test demonstrated that there was not a statistically significant difference in the students’ TASPE scores or the ACCS scores based on the type of simulation-based instruction. This study provides evidence that peer role-play can be just as effective in improving physical therapist student clinical reasoning and confidence outcomes compared to using simulated patients when instructing patient transfer skills. Although the use of simulated patients may appear to promote deeper learning by portraying a more real scenario for practicing patient care skills, it is no more advantageous than peer role-play in terms of physical therapist students’ clinical reasoning and confidence skills when learning patient transfer skills.

Keywords: clinical reasoning, physical therapist education, confidence, simulation-based instruction, stimulated patients, peer role-play
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List of Abbreviations

Acute Care Confidence Survey (ACCS)
Commission on Accreditation in Physical Therapy Education (CAPTE)
Doctor of Physical Therapy (DPT)
Objective Structured Clinical Examination (OSCE)
Physical therapist education (PTE)
Think Aloud Standardized Patient Examination (TASPE)
CHAPTER ONE: INTRODUCTION

Introduction and Background

Simulation has been widely used for training since the early 1900s. Although simulation training can be primarily traced back to military origins, its methods have emerged in a multitude of industries. All share a common interactive application—the presentation of a situation, condition, or problem based on reality “to provide [learners] a context in which . . . decision-making and procedural skills can be practiced without risk” (Shoemaker, Riemersma, & Perkins, 2009). Simulation is of particular relevance to healthcare workforce education and training. Simulation-based instruction is commonly used in medical and nursing education; however, other healthcare professions, such as physical and occupational therapy, have not used it as readily and may also benefit from this form of instruction in meeting program goals.

Two overarching goals of physical therapist education (PTE) programs are to produce 1) competent clinicians for introduction into the workforce upon graduation and 2) students’ successful completion of the state licensing board examination. Competent physical therapists possess sound clinical reasoning skills to achieve effective and efficient clinical outcomes (Christensen et al., 2017). However, clinical reasoning is an intrinsic cognitive skill that is difficult to teach during traditional, lecture-based instruction and clinical practice (Fu, 2015; Gilliland, 2014). In fact, little research evidence exists on the best method to instruct physical therapist students’ clinical reasoning skills to prepare for clinical performance (Fu, 2015; Silberman, Litwin, Panzarella, & Fernandez-Fernandez, 2016b; Silberman, Panzarella, & Melzer, 2013). Furthermore, informal surveying of supervising acute care physical therapists on physical therapist student performance found that clinical instructors feel students are underprepared for clinical reasoning in the acute care setting. This finding is concerning as the
availability of student clinical education opportunities where clinical reasoning is most often practiced are dwindling for numerous reasons.

Some physical therapy settings, such as acute care, pediatrics, and inpatient rehabilitation, are experiencing dwindling availability of student clinical education opportunities for several reasons, including growing number of students admitted to PTE programs, increasing numbers of PTE programs, and limiting regulations on student practice posed by reimbursement agencies (e.g., Medicare and third-party insurance payers). The reduction in clinical education opportunities creates an environment in which the attainment of supervised clinical practice for physical therapist students to develop clinical reasoning and confidence in performing acute care clinical skills is becoming more challenging (Sabus & Macauley, 2016). More recently, PTE programs are being faced with an additional barrier with a requirement to pay for student internships, which many programs are financially unable to shoulder. The accumulation of barriers placed on the supply of clinical practice opportunities negatively impacts student entry-level competence and contributes to the “know-do gap” phenomenon (Holdar, Wallin, & Heiwe, 2013, p. 220) presented by the World Health Organization. This “know-do gap” phenomenon occurs when there is a gap between the available knowledge and the application of that knowledge in healthcare.

Simulation is an instructional technique, as opposed to a technology, used in the healthcare setting that serves to mirror real experiences with guided experiences to “evoke or replicate clinical skills performed in the real world in a fully interactive manner” (Gaba, 2007). A simulated patient is an actor trained to portray a patient (Lane & Rollnick, 2007) and a standardized patient is an actor trained to portray a patient in a standardized manner (Howley, 2013). Simulation is a broad term and can be used to manipulate a learning experience in a
number of ways, including fidelity of the physical, psychological, and environmental elements of the learning experience (Lopreciato et al., 2016). Within this study, fidelity differs from simulation modality based on the element of realism that the simulated experience mirrors the actual environment compared to the modality or specific type of simulation mode being used which is closely related to fidelity (Lopreciato et al., 2016). Simulation fidelity is defined as the realism of a simulated experience in relation to a real-life experience the simulated experience is aiming to mirror (Brunette & Thibodeau-Jarry, 2017; Lopreciato et al., 2016; Mori, Carnahan, & Herold, 2015; Scalese & Hatala, 2013). The simulated experience, including the patient in the scenario, can be manipulated to create a more authentic experience for the learner, i.e. psychological fidelity (Lopreciato et al., 2016). Psychological fidelity refers to the degree that the simulation experience feels real to the student (Adams et al., 2015). In this study, the fidelity of the patient in the simulated learning experiences defines low-fidelity as peer role-play with peers receiving not training to improve the realistic portrayal of the patient and high-fidelity as simulated patient who received training in order more realistically portray the patient.

The use of simulated and standardized patients is a developing instructional strategy in PTE programs where simulation is used and may be a strategy to address the “know-do gap” phenomenon (Bednarek, Downey, Williamson, & Ennulat, 2014; Blackstock et al., 2013; Cahalin, Markowski, Hickey, & Hayward, 2011; Mori et al., 2015; Ohtake, Lazarus, Schillo, & Rosen, 2013; Sabus & Macauley, 2016; Silberman, Litwin, Panzarella, & Fernandez-Fernandez, 2016a, 2016b). Advantages of using simulated and standardized patients for training include safe environment for trial of newly learned skills, opportunity for learners to replay and fine-tune skills within a single session to increase competency and confidence, allowance for standardization and/or customization of scenarios, and the addition of feedback to learners.
during or following performance from simulated patients trained to provide feedback (Lane & Rollnick, 2005). A simulated experience can offer students a safe and controlled setting to practice and attain clinical skills without fear of harming a patient (Frengley et al., 2011; Ohtake et al., 2013; Steadman et al., 2006).

Thus, the study examined the effect of low- and high-fidelity simulation-based learning experiences using traditional peer role-play compared to simulated patients on physical therapist students’ clinical reasoning and confidence. Specifically, this experimental study compared the effect of simulation-based instruction fidelity, use of simulated patients versus peer role-play, on physical therapist students’ clinical reasoning and confidence during the performance of a specific clinical skill (i.e., patient transfers). Findings from this study can be used to inform future PTE curriculum decision-making regarding the benefit of using high-fidelity simulation-based instruction of patient transfer skills via simulated patients versus traditional instruction using peer role-play into entry-level PTE programs as a greater expense is often associated with incorporating simulated patients. Further, the findings of this study provide recommendations for instructional design considering simulation-based instruction of clinical skills prior to clinical experience in the hospital-based setting, specifically those related to patient transfers, within the DPT program at the University of Tennessee Health Science Center.

**Problem of Practice**

The problem investigated in this study was originally derived from a problem documented in an informal survey of clinical instructors within the DPT program at the University of Tennessee Health Science Center. As a measure to assess the transfer of curricular outcomes to physical therapist student clinical performance in the acute care clinical setting, clinical instructors ($n = 23$) in the field who supervised Doctor of Physical Therapy (DPT)
students in a hospital-based setting were informally surveyed. The intent of the survey was to collect data on acute care clinical instructors’ perception of physical therapist students’ preparation for acute care clinical practice core competencies based on the Core Competencies for Entry-level Practice in Acute Care Physical Therapy (Greenwood et al., 2015). This survey identified 39% of the clinical instructors believed students were unprepared to perform out of bed transfers with patients in the hospital setting. Thirty-one percent of clinical instructors believed the physical therapist students were not prepared to perform clinical practice in the dynamic acute care setting. Additionally, 30.4% believed the students were not prepared to apply clinical decision-making skills to patient care. This data is consistent with existing literature regarding the decreased preparedness of DPT students in the acute care setting (Ohtake et al., 2013; Silberman et al., 2016b; Silberman et al., 2013). Because hospital systems’ reimbursement plans are based on Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores, decreased preparedness can negatively affect the quality patient care score that could lead to reduced reimbursement. These reeducations can negatively impact not only the therapist, but also the hospital as a whole. Further, the decreased quality of care provided by the novice physical therapist student propagates the continued limitations reimbursement agencies place on the physical therapist students’ clinical practice experiences.

The responsibility to train students in clinical reasoning skills rests with the educational institutions prior to the student practicing in the clinical environment. Simulation is an instructional strategy employed in the educational setting for teaching and learning clinical skills and has been used successfully in many disciplines. The current literature supports simulation-based learning experiences to increase student confidence and clinical performance in PTE
(Bednarek et al., 2014; Blackstock et al., 2013; Cahalin et al., 2011; Ohtake et al., 2013; Shoemaker et al., 2009; Silberman et al., 2016b; Silberman et al., 2013).

The DPT program at the University of Tennessee Health Science Center has access to a simulation center. The simulation center offers numerous simulation modalities of varying fidelity to use for instruction of clinical skills including simulated and standardized patients, high-fidelity human mannequins, task-trainers, and simulated hospital rooms. The center is currently used only for summative clinical skills assessment within the program, i.e., competency assessment prior to clinical experiences in the field using standardized patients. It has yet to be used for formative instruction in courses that focus on learning the clinical skills evaluated during the competency-based training. Formative training within the DPT program at UTHSC commonly uses low-fidelity simulation, i.e., peer role-play, for practicing patient care skills. Typically, clinical skills instruction, in courses such as PT 505 Fundamentals of Physical Therapy, involves a brief instructor demonstration in the physical therapy laboratory area followed by two, two-hour, hands-on laboratory practice sessions with student partners role-playing a patient for peer practice. At the end of the practice sessions, learned skills are assessed by the instructor through a practical performance assessment. During the practical assessment, the student performs a learned skill on an instructor role-playing a patient; the clinical skill is scored. While this instructional strategy using peer role-play is useful in teaching clinical skills, simulation-based instruction using a higher fidelity (e.g., simulated or standardized patients) may provide students with a more real-life like experience that may translate into improved student clinical reasoning and confidence during clinical practice.

In sum, the University of Tennessee Health Science Center physical therapist students’ clinical reasoning in the acute care practice setting needs improvement based on clinical
instructor perception. This perception is consistent with what research has documented. Due to the complex, dynamic nature and the high acuity patient needs in the acute care setting, novice physical therapist students demonstrate low confidence and underperformance in clinical practice in this setting (Silberman et al., 2013). The use of simulated patients as an instructional strategy to teach clinical skills, specifically clinical reasoning and confidence, has not been implemented or tested within the University of Tennessee Health Science Center DPT program, and literature on the use of simulation in PTE literature is limited (Ohtake et al., 2013).

**Purpose Statement**

The purpose of this experimental, posttest-only design study is to compare the fidelity of simulation-based instruction, simulated patients versus traditional peer role-play, on physical therapist students’ clinical reasoning during patient transfers and their confidence in performing acute care skills. Patient transfers is one of the many clinical skills performed by physical therapists in the acute care setting which requires both clinical reasoning and confidence to perform the skill safely and effectively. The independent variable, fidelity of simulation-based instruction, is generally defined as simulation learning experiences using high-fidelity with simulated patients or low-fidelity with peer role-play, used in the PT 505 Fundamentals of Physical Therapy course topic section on patient transfer skills. The dependent variables are generally defined as student clinical reasoning measured by the Think Aloud Standardized Patient Examination (TASPE) (Fu, 2015) and student confidence measured by score on the Acute Care Confidence Survey (ACCS) (Greenwood, Nicoloro, & Iversen, 2014). Based on the experiential learning theory, prior experiences have a direct relationship to future learning and thus should be taken into consideration as a covariate in this proposed study (Kolb, 1984; Pasquale, 2013). Due to the influence of previous experience on future learning processes (Kolb,
1984), the sample population of physical therapist students could have had differences in previous experience performing patient transfers with a relative, through previous work experience, or other opportunities. Thus, the variable of previous experience performing patient transfers was considered as a potential covariate; however, analyses demonstrated that I did not need to control for it.

Questions

The research questions for this study are:

Research Question 1. Is there a difference in clinical reasoning measured by the TASPE score following simulation-based instruction using simulated patients compared with peer role-play in physical therapist students performing patient transfer skills?

Research Question 2. Is there a difference in student confidence measured by the ACCS score following simulation-based instruction using simulated patients compared with peer role-play in physical therapist students performing patient transfer skills?

Null Hypotheses

The null hypotheses for this study are:

Null Hypotheses 1. There is no statistically significant difference between physical therapist students’ TASPE scores when participating in simulation-based instruction using simulated patients compared to peer role-play.

Null Hypothesis 2. There is no statistically significant difference between physical therapist student’ ACCS scores when participating in simulation-based instruction using simulated patients compared with peer role-play.
Definitions

Clinical reasoning. Clinical reasoning is defined as the ability to think and make clinical decisions during the performance of a clinical task or skill (Fu, 2015). According to the Clinical Reasoning Consortium of the American Council of Academic Physical Therapy, “clinical reasoning is a nonlinear, recursive cognitive process in which the clinician synthesizes information collaboratively with the patient, caregivers, and the healthcare team in the context of the task and the setting. The clinician reflectively integrates information with previous knowledge and best available evidence in order to take deliberate action” (Christensen et al., 2017, p. 177).

Peer role-play. Low-fidelity simulation modality in which a peer mocks the role of a patient for a student learner to practice clinical skills while imparting a sense of real patient care experience for the learner. (Bosse et al., 2012; Teasdale, Mapes, Henley, Lindsey, & Dillard, 2016). Peers typically do not undergo any formal training prior to portraying the role of a patient.

Fidelity. Fidelity simulation refers to the realism and likeliness of a simulated experience in relation to a real-life experience the simulated experience is aiming to mirror (Lopreciato et al., 2016; Mori et al., 2015; Scalese & Hatala, 2013).

Simulation. Simulation is an instructional technique, as opposed to a technology, used in the healthcare setting that serves to mirror real experiences with guided experiences to “evoke or replicate clinical skills performed in the real world in a fully interactive manner” (Gaba, 2007).

Simulation-based instruction. Simulation-based instruction will be defined as a realistic, experiential instructional strategy, which includes practice of content in a non-threatening educational environment by using a simulation (Frengley et al., 2011; Steadman et al., 2006).
**Simulated patient.** High-fidelity simulation modality in which an actor is trained to portray the role of a patient (Lane & Rollnick, 2007).

**Standardized patient.** High-fidelity simulation modality in which an actor is trained to portray the role of a patient in a standardized manner in order to teach and/or evaluate the clinical performance of a healthcare provider (Howley, 2013). Standardized patients are trained actors who simulate a *patient* during a simulation-based learning experience in a standardized manner (Mori et al., 2015)
CHAPTER TWO: REVIEW OF LITERATURE

Introduction

Simulation is an instructional strategy used in healthcare education to bridge the gap between academic knowledge and application of clinical skills (Bednarek et al., 2014; Brunette & Thibodeau-Jarry, 2017; Bruno et al., 2016; Cahalin et al., 2011; Herge et al., 2013; Mori et al., 2015; Nithman, Spiegel, & Lorello, 2016; Ohtake et al., 2013; Sabus & Macauley, 2016; Shin, Sok, Hyun, & Kim, 2014; Silberman et al., 2016b; Silberman et al., 2013). Simulation-based instruction refers to a realistic, experiential instructional strategy that includes practice of content in a non-threatening educational environment by using simulation (Frengley et al., 2011; Steadman et al., 2006). Although originally implemented in aviation and military settings, simulation implementation began in the medical setting in the 1970s using the Resusci Anne cardiopulmonary mannequin for basic life support training (Blackstock & Jull, 2007; Sabus & Macauley, 2016). Simulation has evolved to become a common trend in medical, nursing, and, more recently, PTE for clinical practice and assessment (Blackstock & Jull, 2007; Boulet et al., 2003; Ladyshewsky, Baker, Jones, & Nelson, 2000; Mori et al., 2015; Nithman et al., 2016; Pritchard, Blackstock, Nestel, & Keating, 2016). Simulation is described in the literature as “a technique—not a technology—to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner” (Gaba, 2007, p. 126). Simulation is used in the training of healthcare professionals for a variety of reasons including creating a more authentic environment for learning and assessing competence prior to actual clinical practice on real patients. As discussed above in Chapter One, simulation fidelity can take many forms, including high-fidelity human simulation, simulated and standardized patients, objective structured clinical examinations (OSCE), and peer role-modeling.
(Sakurai et al., 2014). Although physical therapy literature has begun to investigate simulation use as an instructional strategy, the investigation of simulation-based instruction in PTE is in its infancy. This study is specifically interested comparing the fidelity of simulation-based instruction, i.e., simulated patients and peer role-play, in the development of student clinical reasoning and confidence in performing an acute care skill of patient transfers.

A literature search was performed using PubMed, CINAHL, and ProQuest databases. Keyword searches contained the terms simulation, physical therapy, standardized patient, role-play, and competency or assessment. The purpose of this chapter is to review the literature to address the problem of limited literature support on different levels of fidelity within simulation-based instruction and its effect on clinical reasoning and confidence physical therapist students’ in entry-level physical therapist education. Through discussing theoretical frameworks, benefits of simulation, and challenges of simulation use in physical therapy literature, research on simulation use in regards to clinical reasoning and confidence in physical therapist education is explored below.

**Theoretical Context**

Physical therapist education programs are governed by the Commission on Accreditation in Physical Therapy Education (CAPTE). Of the many standards and required elements for accreditation (CAPTE, 2015), two standards are directly applicable to the measurement of student physical therapist competency of entry-level performance or formative assessment. These include: 1C3 – “students demonstrate entry-level clinical performance prior to graduation” (CAPTE, 2015, p. 2); and 6J – “the curriculum plan includes a variety of effective tests and measures and evaluation processes used by faculty to determine whether students have achieved the learning objectives . . . in the cognitive, psychomotor, and affective domains” (p. 22).
Simulation holds the potential to teach and assess physical therapist student performance in the cognitive, psychomotor, and affective domains and assess entry-level clinical performance prior to graduation, including clinical reasoning and confidence in performing skills.

Simulation experiences as an instructional strategy is grounded in evidence-based research in instructional design and theory. As Gaba (2007) stated in the definition of simulation above, simulation is “a technique—not a technology” (p. 126), and so simulation must be used as such. The use of a technique in instruction is used to satisfy a learning objective or meet an assessment need. Thus, experiential learning theory, concept of self-efficacy, and Bloom’s taxonomy are considered for the use of simulation-based instruction to teach psychomotor, affective, and cognitive skills required by CAPTE.

**Experiential Learning Theory**

Several articles support the use of simulation as an educational technique based on Kolb’s experiential learning theory (Brunette & Thibodeau-Jarry, 2017; Mori et al., 2015; Sabus & Macauley, 2016). According to Kolb (1984), “learning is the process whereby knowledge is created through the transformation of experience” (p. 38). Within this theory, knowledge is constantly transforming through the experiences of the learner. The effective transformation of a learner is experienced in four specific stages, often occurring in a cycle. This four-stage cycle begins with the experience itself, the *concrete experience*. Following being submersed in the experience, the learner must be able to observe or reflect back on the experience, *reflective observation*, and do so from as many perspectives as possible. Upon reflection, the learner then must form concepts or conclusions about the experience that can evolve into logical theories of the occurrence that is termed *abstract conceptualization*. This newly developed logical theory
can then be translated into a solution for future problems or experiences by the learner, or active experimentation (Kolb, 1984).

Kolb views learning as a major process in human adaptive behavior, which goes beyond the walls of a classroom. Learning occurs everywhere, all the time, and across the continuum of a lifetime (Kolb, 1984). This holistic nature of experiential learning theory is ideal in a hospital acute care environment that includes many more perspectives and happenings than what is being experienced by a single learner. For example, during one inpatient, acute care physical therapy session, a physical therapist interacts with a patient, but likely also a patient’s family member, a nurse, a physician, a medical social worker, a case manager, another therapy staff member, and a multitude of other health care providers situated in a hospital environment. Simulation used as a technique guided by experiential learning theory has the potential to combine a learner’s experience in a near authentic environment with other individuals and allows for time to reflect and debrief on the overall experience including the reflection of others simultaneously, if desired, to foster effective learning.

An example of how simulation can be used to reflect the experiential learning theory includes a medical case scenario of a physical therapist student who needs to conduct an initial physical therapy evaluation on a patient who recently experienced a stroke. The concrete experience would entail the student undergoing the simulation experience to complete the physical therapy evaluation that may include other individuals, including a high-fidelity human mannequin or a simulated patient, another physical therapist student, a staged family member, or another health care provider. Following the simulation experience, the student would have an opportunity to reflect consciously on the experience to allow for reflective observation. Abstract conceptualization would occur during debriefing (e.g., a group discussion, an individual
discussion, a questionnaire with open-ended questions, etc.) following the simulated experience. Debriefing often includes a faculty member or debriefer who guides the learner or a group of learners through the experience and develops ideas and responses for events that occurred and decisions that were made during the experience. The final step of active experimentation occurs upon the student’s clinical exposure to a real clinical environment in which the student will actively use the concepts learned from the simulation experience and apply them to a real-world clinical experience. According to experiential learning theory, the completion of all the above stages optimizes learning.

Kolb (1984) also explained that learning is an accumulation of knowledge that is continuously and constantly in development through experiences. Experiential learning theory discourages learning in terms of outcomes, as outcomes can be viewed as a failure to learning. However, according to Kolb, learning exists regardless of positive or negative outcomes. Learning is grounded in the continuous process of experience in which previous experiences can influence future learning experiences. Simulation offers a learning environment in which failures in learning do not create harm to patients and further enhances learning through errors.

Furthermore, if a learner garners experience from an error made in a simulation experience, it is likely the learner, when faced with an actual patient in a clinical environment, will recall previous experiences and prevent past errors from occurring. Outcomes resulting from simulation experiences should reflect potential improved clinical performance and facilitate continual learning rather than a representation of “nonlearning” (Kolb, 1984, p. 28).

The fidelity of simulated environment also affects student learning (Brunette & Thibodeau-Jarry, 2017). Per Brunette & Thibodeau-Jarry (2017), environments staged to be more realistic to the actual clinical setting improve “real life” performance based on transfer
theories. However, medical education literature yields varying results regarding the efficacy of high- versus low-fidelity in novice students learning cardiac resuscitation skills (Adams et al., 2015). Due to varying results and limited evidence supporting the use of high-fidelity over low-fidelity to enhance learning outcomes, further research is recommended on the topic.

**Self-efficacy Theory**

Relating to clinical reasoning in the challenging, dynamic acute care practice environment, self-efficacy is linked to behavioral outcomes that could improve or jeopardize the therapist’s ability to clinically reason if not developed or understood (Bandura, 1977). Self-efficacy refers to the personal judgment an individual possesses to be able to successfully engage in a behavior required to cope with a forthcoming situation (Bandura, 1977; Stajkovic & Luthans, 1998; Jones & Sheppard, 2011). Self-efficacy describes the personal behaviors that are expected in instances of obstacles or adversity that includes the initiation of coping behavior, amount of effort to expend, and the persistence of effort over time (Bandura, 1977). A therapist with high self-efficacy is more likely to engage in a challenging situation if he/she feels capable of succeeding in the situation. However, a therapist with low self-efficacy may avoid the situation due to fear, anxiety, previous faulty performance, or other personal experiences. Based on self-efficacy theory, the promotion of self-efficacy using high-fidelity simulation-based instruction could improve physical therapist students’ confidence in performing clinical skills, including clinical reasoning, in the challenging acute care setting. In other words, the more realistic the simulation experience, the greater the transfer of the experience to the real world performance in regards to self-efficacy (Brunette & Thibodeau-Jarry, 2017).

According to Bandura (1977), personal efficacy is based on four major sources of information: performance accomplishments, vicarious experience, verbal persuasion, and
emotional arousal. Performance accomplishments tend to be the most dependable source of self-efficacy over the other sources. Vicarious experiences can be created through viewing others engaging in a challenging scenario successfully. Individuals view another’s successful performance and are likely to form an expectation that they can perform successfully or can improve at that specific performance with continued effort. Individuals can be led to believing that can handle a behavior or situation through verbal persuasion or suggestion of another individual that they can be successful. Thus, verbal persuasion also perpetuates self-efficacy. Evidence supports physical therapist students’ enjoyment and satisfaction in engaging in simulation-based training (Shoemaker et al., 2009; Silberman et al., 2013; Bednarek et al., 2014; Ohtake et al., 2013). Positive emotional arousal can positively contribute to learners’ perceived self-efficacy and promote performance (Bandura, 1977). If a high-fidelity simulation experience can offer a safe, risk-free, and satisfying environment for learners to practice skills and situations in a more realistic manner over low-fidelity simulation, it is likely that high-fidelity simulation-based instruction could improve student self-efficacy for clinical skill performance prior to entry-level practice over low-fidelity simulation experiences.

**Bloom’s Taxonomy**

When considering using simulation as an instructional strategy, the development and assessment of learning objectives must be taken into consideration. The level of the skill must be considered for effective facilitation of learning, as is the fidelity of the simulation (Brunette & Thibodeau-Jarry, 2017). Bloom’s taxonomy of educational objectives (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) provides a foundational framework for the creation and assessment of learning objectives with respect to the cognitive, affective, and psychomotor learning domains. The taxonomy categorizes learning objectives into six major classes: knowledge, comprehension,
application, analysis, synthesis, and evaluation. The levels are hierarchical with knowledge being the lowest ordered level and evaluation being the highest ordered level. For this study, the instructional design of the simulated learning experiences included all levels of the major classes in order for the physical therapist students to practice clinical reasoning and develop confidence in performing patient transfer skills. Practice also included all three learning domains as the actual clinical skill of patients requires psychomotor and cognitive skills to perform effectively and affective domains to develop confidence in performing the skill.

Miller (1990) modified Bloom’s taxonomy to better capture clinical skills in medical education through the development of his Framework for Clinical Assessment. Miller’s framework consists of a pyramid with four graduating levels. The levels of the pyramid from the bottom up are Knows (knowledge), Knows How (competence), Shows How (performance), and Does (action). Simulation experiences can be staged to meet the hierarchical levels of Bloom’s taxonomy or Miller’s framework. Simulations offer the opportunity for instruction meet a variety of levels during one experience in varying order and of varying fidelity. The simulation experience can include several tasks with each task assessing a different objective level to vary the degree of difficulty. For example, one simulated patient case can employ higher level clinical reasoning skills previously learned and include newly learned material at a lower recall level. Fidelity can also be manipulated to incorporate high-fidelity for a higher level skill such as clinical reasoning and low-fidelity for a lower level skill such as describing a patient transfer.

This same premise is often used in OSCEs, which is well established in medical and other healthcare professional education in simulated skill assessments. An OSCE consists of multiple stations situated to assess a variety of objectives for the purpose of measuring competency specific clinical skills (Gorman, Lazaro, Fairchild, & Kennedy, 2010). Although OSCEs are used
to measure performance of clinical skills, the sequencing of stations may negatively affect the fidelity of the overall simulated experience in comparison with multiple tasks performed during a high-fidelity simulation patient encounter, much like actual patient care. Further research on OSCE use in PTE literature is recommended (Mema, Park, & Kotsakis, 2016; Sakurai et al., 2014; Swift, Spake, & Gajewski, 2013).

The higher levels of Bloom’s taxonomy and Miller’s pyramid involve clinical reasoning, which is more difficult to measure than the lower levels due to the invisible internal cognitive processing of clinical reasoning. One method used in medical and nursing education to teach and assess clinical reasoning skills is the “Think Aloud” technique (Burbach, Barnason, & Thompson, 2015; Forsberg, Ziegert, Hult, & Fors, 2014; Funkesson, Anbacken, & Ek, 2006; Pennaforte, Moussa, Loye, Charlin, & Audetat, 2016). The think aloud method requires learners to verbalize thoughts during a simulated patient encounter (Burbach et al., 2015). Fu (2015) developed a tool called the TASPE for the purpose of assessing physical therapist student clinical reasoning competency during a simulation experience. Fu developed the TASPE based on Miller’s framework by modifying the definition of each stage to relate to the education of clinical skills with the bottom three levels, Knows, Knows How, and Shows How being represented as competency in the academic setting and the last level, Does, being represented as performance in the clinical setting. Fu mentioned in his article that paper-based examinations assess the Knows level, and the Physical Therapist Clinical Performance Instrument assesses the clinical practice Does level. However, no tool to date assesses the competency (Shows How) level, thus the purpose for creating the TASPE (Fu, 2015). Although the results of the TASPE reliability study were modest, development of the tool was a first attempt to measure student physical therapist clinical reasoning performance using simulation prior to entry to clinical
practice. Regardless, Fu’s tool was well balanced in theoretical framework and warrants future investigation for reliability and validity.

Confidence is an affective skill that should also relate to the more complex levels of Bloom’s taxonomy and Miller’s pyramid (Miller, 1990). According to Bandura (1977), self-efficacy can develop through achievement of performance. Therefore, it is reasonable to assume that a student’s successful performance of a higher level skill could build confidence for performing the higher level skill in a real clinical setting. It is also reasonable to assume that confidence to perform in the real clinical setting would be greater if successful in performing a clinical skill in a high-fidelity environment over a low-fidelity environment. However, literature to date remains inconclusive (Adams et al., 2015; Lane & Rollnick, 2007). More research on the effect of high-fidelity compared to low-fidelity simulation-based instruction on student confidence in performing a higher level skill is needed.

**Review of the Literature**

The history of simulation use in healthcare is disputable in the literature. Commonly, studies cite the practice of simulation-based training began with nursing and medical education with the cardiopulmonary resuscitation mannequin in the 1970s (Bednarek et al., 2014; Blackstock & Jull, 2007; Nithman et al., 2016; Silberman et al., 2016a) or with anesthesiology in the 1990s (Frengley et al., 2011; Shoemaker et al., 2009; Steadman et al., 2006). Owen (2012) claimed simulation use in healthcare practice began 2,500 years ago in the form of clay anatomy models dated around AD 300 to 600. Owen explained simulation evolved from the clay models through many stages including realistic life-size patient simulators made of wax in 1771 and surgical simulators in the 1870s. Over the years, the advancement of simulation use and fidelity improved with technological advancements. Fidelity is described as the extent to which the
simulation matches the real patient and environment (Mori et al., 2015; Ohtake et al., 2013). Regardless, simulation use is not new to medicine and nursing education; however, simulation is relatively new to PTE beginning in the early 2000s (Bednarek et al., 2014; Blackstock & Jull, 2007; Silberman et al., 2016b).

Literature on best practice of simulation in healthcare education is constantly evolving as research is published on topics such as simulation instructional design, assessment, and transferability to patient care outcomes. The Association for Medical Education (AMEE) in Europe published a guide on best evidence practice of simulation in healthcare in 2013 with a team of international researchers (Motola, Devine, Chung, Sullivan, & Issenberg, 2013). Highlights from the guide discussed that simulation is used in research for the instruction of cognitive, psychomotor, and affective skills with individual learners and teams of learners, instructional design of simulation is important for teaching effectiveness, and the inclusion of feedback during simulation is critical for effective learning. The best evidence practical guide recommends further research in simulation instructional design best practice, the measurement of outcomes, and the translation of skills learned during simulation to improvement of patient outcomes in real clinical care. However, based on the AMEE guide, evidence exists to support the use of high-fidelity over low-fidelity during simulation-based instruction in healthcare education to improve cognitive, psychomotor, and affective skill domains.

**Benefits of Simulation-based Instruction in PTE**

Simulation experiences are beneficial in healthcare education by enabling a means for learners to practice psychomotor, affective, and cognitive skills and for instructors to assess learners’ attainment of these skills. Many researchers have expressed that simulation is an educational strategy that serves to bridge the gap between academic knowledge and application
of clinical skills (Nithman et al., 2016; Silberman et al., 2016b; Silberman et al., 2013). Mori et al. (2015) performed a systematic review of the use of simulation in PTE and discussed that simulation offers (a) students the ability to practice clinical skills in a risk-free environment, (b) faculty the ability to stage rare clinical cases not routinely seen during all short-term clinical internships, and (c) clinical education programs the ability to potentially replace clinical internship experiences in settings that are difficult to place students due to declining availability (e.g., in the acute care setting). Sabus and Macauley (2016) discussed similar benefits of simulation with the addition of allowing students the opportunity to slow down the case scenario to permit for temporal manipulation. Temporal manipulation refers to the ability to stop, pause, think, adjust, and re-perform a task during a simulation experience to capture a learning opportunity or compose a risk management strategy. For the acute care setting of clinical practice, simulation offers an opportunity to practice in a more authentic clinical environment compared with the traditional classroom or laboratory (Shoemaker et al., 2009) and potentially increase enthusiasm for the acute care setting (Bednarek et al., 2014; O'Connell, 2014). Altogether, simulation-based instruction can benefit PTE in a variety of areas, principally in fostering improved student clinical performance in the areas of psychomotor, affective, and cognitive skills.

**Knowledge-based or psychomotor skills.** A primary goal of entry-level PTE is to train students to become competent physical therapists in the clinical environment. Based on Bloom’s taxonomy, students must successfully establish basic content knowledge and psychomotor skills prior to progressing to higher order cognitive tasks (Bloom et al., 1956). Examples of psychomotor skills typically performed in physical therapy practice are performing range of motion on a patient’s upper or lower extremity, performing a specific manual technique, and
performing a patient transfer from lying in bed to sitting up in a chair. Once basic content and skills are achieved, students can begin to develop higher order skills such as clinical reasoning and confidence to improve self-efficacy of performing clinical skills in the real practice setting.

A meta-analysis of PTE literature revealed other students or standardized patients, low-fidelity mannequins, and part-task trainers in a laboratory setting are primarily used for instruction and assessment of psychomotor skills (Pritchard et al., 2016). Traditional assessment of psychomotor skills common in PTE include practical examinations (Carter, 1999). The rudimentary purpose of the practical examination is to facilitate students’ demonstration of knowledge acquisition, psychomotor skills, communication skills, and basic clinical decision-making skills without causing harm to the patient. A practical examination using peer role-play differs from an assessment with a standardized patient due to low-fidelity and probable lack of training of the patient model (Lane & Rollnick, 2007). Standardized patients undergo training to consistently play the role of the patient in a standardized manner. For these reasons, the transferability of the assessed skill(s) in a practical examination using peers playing the role of the patient to real clinical practice in a meaningful and relevant manner is questionable. However, assessment of the learned skill can be accurately executed using this practical examination method.

The practical examination can be conducted using a higher fidelity, e.g., standardized patients, to create a more authentic experience and maximize skill mastery to improve transfer of skills to real-life clinical practice. Ohtake et al. (2013) conducted a quasi-experimental pretest-posttest study using a simulation experience to assess physical therapist students’ confidence in performing technical, behavioral, and cognitive skills. Students reported confidence gains from somewhat confident to confident in all areas, as well as responded favorably to the simulated
experience as an instructional strategy. Although the simulation experience was an assessment in nature rather than formative, based on experiential learning theory, learning is continuous even through single experience outcomes. Similarly, a case study used three high-fidelity human simulation experiences during a cardiovascular and pulmonary course to instruct physical therapist students on cardiopulmonary skills (Bednarek et al., 2014). All students reported confidence gains in cardiopulmonary skills following simulation experiences and 82% of the students believe the simulation experiences changed their ability to make clinical decisions in an acute care setting, this demonstrating improved self-efficacy.

An exploratory study comparing the use of high-fidelity human simulation with a control group receiving the standard curriculum without simulation also reported similar physical therapist student gains in the performance of safety and communication skills following simulation experiences in the acute care setting, but from the perspective of clinical instructors in the field compared with those in the academic setting (Silberman et al., 2016b). Although no statistical significance between groups was identified in this study, clinical instructor commentary on the Clinical Performance Instrument based on qualitative analysis provided evidence of greater carryover of learning from the high-fidelity human simulation group compared with the control group who received no simulation-based training. This study is innovative in presenting potential for transferability of skills learned during simulation experiences to real clinical practice.

The use of OSCE is also common in medicine and nursing programs to assess clinical knowledge and skills using simulated standardized patients and is becoming more common in PTE programs (Gorman et al., 2010). An OSCE is a highly-structured examination, generally consisting of a uniform grading scheme, that involves several stations typically using
standardized patients as patient models. They are devised to assess clinical skills such as patient history taking, performance of specific physical examinations, or patient counseling or care management (Swift et al., 2013). Mema et al. (2016) conducted a content validation study on a pediatric critical care OSCE in medical education using Messick’s framework and reported high inter-rater reliability ($ICC = 0.9$) and acceptable internal structure ($G$-coefficient $= 0.67$); however, other validity measures were not examined. The reliability of OCSE use for a musculoskeletal examination in a PTE program reported high inter-rater reliability coefficients ($ICC = 0.77$), however found low internal consistency (Swift et al., 2013). Although OSCE reliability appears to be addressed and supported in PTE literature, validity of OSCE use in measuring clinical skills remains quite subjective and under-researched in PTE. In the researcher’s opinion, OSCE relates to simulation experiences by the involvement of standardized patients during assessment; however, they differ from simulation experiences by lack of continuity between tasks performed due to the segmented stations throughout the assessment rather than fluid sequencing of multiple tasks within a skill. The breaks between stations may lower the fidelity of the experience comparable with practical examinations.

**Affective skills.** In the practice of physical therapy, affective skills are demonstrated in all aspects of patient care including responsive communication with patients, family members and the interprofessional healthcare team, understanding the patient’s needs and environment in the design of patient treatment and goals, and awareness of ethical and cultural dilemmas that may affect patient care at an individual or larger community-based level. Affective skills, such as confidence, satisfaction, and self-efficacy, are challenging to teach in a traditional classroom because the classroom is not an authentic environment, especially compared with an acute care environment where patients are acutely ill and critical decisions are being made. Physical
therapist student preparation for clinical performance in the acute care setting outside of actual
in-situ clinical experience contrasts with outpatient physical therapy settings since an outpatient
setting is more easily replicated with peer role-modeling or standardized patients in a classroom
or laboratory setting. This limitation in student preparation for the acute care setting in the
classroom setting can be addressed with simulation experiences. Correspondingly, most of the
research conducted on simulation use in PTE revolves around the acute care, critical care, and
cardiopulmonary settings (Bednarek et al., 2014; Nithman et al., 2016; O'Connell, 2014; Ohtake
et al., 2013; Shoemaker et al., 2009; Silberman et al., 2013) on the premise of addressing the
limitation of acute care skills instruction in PTE.

In the physical therapy research studies involving simulation experiences in the
knowledge-based and psychomotor section above, the most common outcome measures
documented are self-evaluative performance measures, such as student confidence, self-efficacy,
and satisfaction. However, these self-evaluative measures are also affective skills that are
important components of clinical performance competency. Of the literature surveyed, student
confidence in clinical preparedness for the acute care setting following simulation experience(s)
increased (Bednarek et al., 2014; Nithman et al., 2016; O'Connell, 2014; Ohtake et al., 2013;
Shoemaker et al., 2009; Silberman et al., 2013); however, student satisfaction toward acute care
clinical practice post simulation results were equivocal, with scores improving in most studies
(O'Connell, 2014; Ohtake et al., 2013; Shoemaker et al., 2009; Silberman et al., 2013) and not in
another (Nithman et al., 2016). Of note, the study conducted by Bednarek, Downey, Williamson,
and Ennulat (2014) was the only study to use simulation in a formative manner rather than
summative. These findings suggest that the use of simulation experiences to prepare students for
the acute care clinical setting is viable; however, the simulation experiences do not necessarily

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generate student enthusiasm toward working in this setting. Reasons for this occurrence would benefit from future exploration.

Silberman et al. (2016a) performed a randomized exploratory study on the efficacy of high-fidelity simulation as an instructional strategy on physical therapist students’ self-efficacy of clinical performance prior to acute care clinical experiences. Post-simulation interview transcripts were reviewed qualitatively in addition to quantitative analysis of the students’ scores on the ACCS. Themes drawn from the qualitative analysis included student-perceived increased confidence in preparation for the acute care setting, increased confidence in communication with patient and interprofessional healthcare team, and a perceived improvement in clinical reasoning skills. Quantitative analysis demonstrated no statistical difference for self-efficacy scores between the group receiving high-fidelity simulation-based instruction and the control group at baseline, but a significant difference between-groups ($p < 0.001$) demonstrating a significantly larger change in self-efficacy for the simulation group over the control group. Similar results were cited in a case study with occupational therapy students using simulation-based training, which improved students’ perceived clinical skill performance, self-efficacy, and overall confidence (Herge et al., 2013). Although the methodology of the studies examining the effect of simulation ranged from case studies to quasi-experimental studies, research offers support for the use of simulation experiences to improve affective skills.

**Cognitive skills.** Due to the dynamic and ever-changing healthcare landscape and increasing responsibility placed on physical therapists to produce clinically significant patient outcomes, physical therapists must possess strong clinical reasoning skills to produce effective clinical outcomes (Christensen et al., 2017). Due to the increased responsibility and autonomy placed on physical therapists in clinical practice, the instruction and measurement of cognitive
skills including clinical reasoning and decision-making skills is a prevalent topic in PTE (Christensen et al., 2017; Holdar et al., 2013; Silberman et al., 2016b). Fu (2015) explained that, “clinical reasoning is nearly an invisible process that is not easily accessible or assessable” (p. 14). For this reason, PTE faculty face the challenge of teaching and assessing clinical reasoning skills or transfer of knowledge to application in the clinical setting (Shoemaker et al., 2009). Simulation offers an ideal environment for teaching clinical reasoning skills, especially for acute care-related skills that can be practiced in a non-threatening, low-stakes simulated environment versus the high-risk environment of the hospital setting.

A few studies performed in PTE examined the use of simulation as an instructional strategy to teach clinical reasoning skills (Ohtake et al., 2013; Shoemaker et al., 2009; Silberman et al., 2016b; Smith, Prybylo, & Conner-Kerr, 2012) with equivocal results. Smith et al. (2012) used a crossover design to study the impact of human patient simulation using mannequins compared with standardized patient simulation on physical therapist students’ ability to interpret electrocardiographic readings. While there was no significant difference between groups, survey results demonstrated a preference for human patient simulation or combination of both for learning electrocardiographic interpretation and related patient responses. However, the use of a standardized patient in this study was employed in a low-fidelity manner was compared with high-fidelity human patient simulation. The standardized patient was an instructor playing the role of a patient verbalizing a script of patient symptoms related to the electrocardiogram reading rather than demonstrating the symptoms like the human patient simulation.

Ohtake et al. (2013) conducted a pretest-posttest quasi-experimental study to measure the outcome of high-fidelity human simulation on physical therapist students’ performance of cognitive skills using a critical care intensive care unit patient case. Specific skills addressed in
this study included assessing patient status, recognizing a patient status change and implementing an appropriate response. Results noted student perceived improvement in cognitive skills following the simulation experience and, similar to Smith et al.’s (2012) study, resounding student satisfaction with the use of simulation as a learning environment. Also comparable with the Smith et al. study, another exploratory study (Silberman et al., 2016b) compared the use of high-fidelity human simulation with a control group receiving no simulation experience on physical therapist students’ clinical decision-making performance using an acute care case scenario. No significant difference between groups was found. However, qualitative analysis did indicate potential for differences in clinical performance between the groups based on clinical instructors’ narrative comments not captured in the Clinical Performance Instrument rating scale quantitatively.

Shoemaker et al. (2009) and Bednarek et al. (2014) researched the use of simulation to teach cognitive acute care clinical skills to physical therapist students in the form of a case study. Shoemaker et al. explained they used an acute care setting for their study due to their observation that physical therapist students generally have the most difficulty assimilating to acute care internships, especially in the intensive care unit setting. The intensive care setting often involves heightened complexity of patient physiologic instability, need for close monitoring, and a number of monitoring and interventional devices. This study utilized high-fidelity human mannequins equipped with multiple monitoring and interventional medical devices for the simulation experiences. Objectives for the physical therapist students during the simulation case included assessing the patient’s clinical status and readiness for physical therapy intervention, assessing and responding appropriately to the patient’s physiologic changes during mobilization, responding appropriately to ventilator alarms, safely mobilizing the patient to sitting at the edge
of the bed while observing all precautions associated with the medical devices attached to the patient, and suggesting additional interventions that may be beneficial for the patient. These objectives all involve a degree of clinical reasoning. Student clinical performance was not measured using a validated instrument; however, student feedback regarding the simulation learning experience was universally positive. Bednarek et al. performed a similar study using high-fidelity simulation with similar clinical reasoning-based objectives for the simulation experience. Again, no validated instrument was used to measure performance, yet student feedback ranged from the experience being *somewhat beneficial* (3) to *beneficial* (5) on a 1 to 5 Likert scale. Both studies provide worthwhile evidence supporting the use of high-fidelity simulation to improve physical therapist students’ clinical reasoning performance; however, future research using validated instruments to measure clinical reasoning performance is recommended.

One technique previously mentioned to make the invisible cognitive process of clinical reasoning detectable is the “Think Aloud” technique. This technique is established in nursing and medical education literature and more recently is published in PTE literature (Burbach et al., 2015; Forsberg et al., 2014; Fu, 2015; Funkesson et al., 2006; Pennaforte et al., 2016; Thackray & Roberts, 2017). As mentioned above, the think aloud method is a technique that solicits learners to independently verbalize their thoughts and reasons for decisions made during a simulation experience (Burbach et al., 2015). The think aloud method is founded on the premise of the hypothetico-deductive method proposed by Elstein, Shulman, and Sprafka in 1978 (Thackray & Roberts, 2017). According to the hypothetico-deductive model, practitioners begin patient care with forming tentative hypotheses based on the medical chart review and data collected throughout the examination and treatment confirms or disconfirms the
hypothesis/hypotheses (Elstein, Shulman, & Sprafka, 1978; Payton, 1985). Although this model was created as a medical model, Payton (1985) explained the application of information and hypotheses is fundamental to competence and is applicable to the practice of physical therapy.

The use of the think aloud technique in PTE literature is described by Fu (2015) and Thackray and Roberts (2017). Fu created a new instrument called the TASPE for the purpose of assessing clinical reasoning performance during simulation experiences. Fu’s instrument was guided by Elstein et al.’s (1978) hypothetico-deductive model and included the steps of cue acquisition, hypothesis generation, cue interpretation, and hypothesis evaluation. The TASPE utilizes the think aloud technique at three specific stages during a simulation experience and requires the learner to offer three hypotheses as suggested by Elstein et al. Fu found the TASPE to be both reliable among raters (weighted kappa 0.41 to 1.00; Spearman rho per examiner pair: $P < 0.001, 0.003,$ and 0.42) and valid based on a panel of physical therapists with six to ten years of teaching experience. All members of the panel were orthopedic certified specialists qualified by the American Board of Physical Therapy Specialties. Thackray and Roberts conducted a mixed-methods qualitative design study using the think aloud technique to observe the actions, thoughts and behaviors during clinical decision-making processes in a simulation scenario experienced by cardiovascular physical therapists in the acute respiratory care setting. Based on the collected data using the think aloud technique, video recordings, and semi-structured interviews, a thematic sequence of events was identified and translated into a conceptual model of clinical decision-making in cardiopulmonary physical therapy. Both studies demonstrate the use of the think aloud technique to capture and record clinical reasoning performance.
Challenges in the Use of Simulation

Although simulation experiences have many benefits to offer PTE, the benefits do come at a premium. Cost is documented in the literature as one of the greatest barriers to the implementation of simulation (Blackstock & Jull, 2007; Mori et al., 2015; O'Connell, 2014; Ohtake et al., 2013; Shoemaker et al., 2009; Silberman et al., 2013). Studies document the average cost of a mannequin is $35,000 to $55,000, which does not include the cost of the facility, time to install and test software and equipment, and faculty time to set up and maintain the simulation scenarios (Ladyshewsky et al., 2000; Mori et al., 2015; Ohtake et al., 2013; Shoemaker et al., 2009). When not using a mannequin for the simulation experience, actors portraying simulated or standardized patients also come at a cost. Some physical therapy programs may be able to share the cost of a simulation center with other programs or colleges, such as nursing or medicine, within the same university. This technique may help to distribute the high cost of the simulation center and increase the feasibility of use in physical therapy programs.

Another challenge of simulation use in PTE is the quality of the evidence supporting simulation as a beneficial instructional strategy in physical therapy literature. Pritchard et al. (2016) conducted a systematic review and meta-analysis on use of simulated patients in PTE using the PEDro scale, ranging from zero to ten, for research quality assessment of quantitative studies and the Quality Assessment for Qualitative Research Reports (QAQRR) scale for qualitative studies. Of the 13 studies that met the inclusion criteria for this review, only four of the studies were randomized controlled trials and one used a control group with no randomization of subjects into each group. None of the 13 studies reported participant or rater blinding, which introduces potential bias into scoring of participant performance. The PEDro
scores documented for these quantitative studies ranged from 0/10 to 6/10. QAQRR scores for the 13 studies ranged from 3/24 to 15/24, with common findings of insufficient information regarding study design, or data collection and analysis methods that also introduce bias in the conclusions.

Similarly, Mori et al. (2015) used the Medical Education Research Study Quality Instrument (MERSQI) to measure study quality within their systematic review on simulation use in PTE. Eight articles that met the inclusion criteria for simulation activities for learning specific skills were rated with a MERSQI score of 11/15 to 12.5/15, with the exception of one study scoring 11.5/18. The authors noted that most of these studies used smaller sample sizes, less than 37 students, likely from sample of convenience. In essence, both reviews found relatively low to moderate strength evidence to support simulation use in PTE.

While there are several ways the simulation fidelity can be manipulated during simulation-based instruction, standardized patients and peer role-play modalities have both been supported as effective instructional strategies for use with clinical skills training (Schlegel, Woermann, Shaha, Rethans, & Van der Vleuten, 2011). However, Lane and Rollnick (2007) published a literature review on the use of standardized patients and peer role-play in skills training and determined there is a need for more rigorous studies that examine skill acquisition following both simulation fidelities. While the current evidence on simulation-based instruction is worthwhile and contributory to the field, more closely controlled environments and experimental methodology provides the most convincing evidence of the effect that one variable plays on the other (Portney & Watkins, 2000). Research studies involving simulation learning experiences used in PTE are summarized in Table 1.
Table 1

**Summary of Research Studies Involving Simulation Learning Experiences in PTE**

<table>
<thead>
<tr>
<th>Author, publication date</th>
<th>Study Design</th>
<th>Focus</th>
<th>Outcome Measure(s)</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoemaker et al., 2009</td>
<td>Case study</td>
<td>High-fidelity simulation as a teaching intervention</td>
<td>Student reflection and self-evaluation</td>
<td>Cardiopulmonary and ICU</td>
</tr>
<tr>
<td>Blackstock et al., 2013</td>
<td>Randomized controlled trial</td>
<td>Simulated learning environment to replace time in clinical practice</td>
<td>Clinical examination based on the APP tool; questionnaire for student, hospital clinical educators and patients evaluating student performance</td>
<td>Cardiorespiratory</td>
</tr>
<tr>
<td>Ohtake et al., 2013</td>
<td>One-group, pretest/posttest, quasi-experimental study</td>
<td>Simulation learning experiences effect on student confidence</td>
<td>Student self-assessment; Likert scale</td>
<td>Critical care</td>
</tr>
<tr>
<td>Silberman et al., 2013</td>
<td>Pilot study</td>
<td>Human simulation to prepare students for acute care clinical practice</td>
<td>Student self-assessment; Likert scale</td>
<td>Acute care</td>
</tr>
<tr>
<td>Bednarek et al., 2014</td>
<td>Case study</td>
<td>High-fidelity simulation effect on student confidence</td>
<td>Student self-assessment; Likert scale</td>
<td>Acute care</td>
</tr>
<tr>
<td>Mori et al., 2015</td>
<td>Systematic review</td>
<td>Simulation learning experiences in PTE</td>
<td>Mix</td>
<td>Mix</td>
</tr>
<tr>
<td>Nithman et al., 2016</td>
<td>Retrospective, cross-sectional cohort study</td>
<td>High-fidelity simulation on student perceived readiness for clinical education</td>
<td>Student self-assessment; Likert scale</td>
<td>ICU</td>
</tr>
<tr>
<td>Pritchard et al., 2016</td>
<td>Systematic review and meta-analysis</td>
<td>Simulated patients in PTE</td>
<td>Mix</td>
<td>Mix</td>
</tr>
<tr>
<td>Silberman et al., 2016a</td>
<td>Randomized exploratory study; mixed methods</td>
<td>High-fidelity simulation training effect on student self-efficacy</td>
<td>Student self-assessment (ACCS); focus group</td>
<td>Acute care</td>
</tr>
<tr>
<td>Silberman et al., 2016b</td>
<td>Randomized exploratory study; mixed methods</td>
<td>High-fidelity simulation training for clinical internship performance preparation</td>
<td>Ratings on the CPI; narrative comments on the CPI</td>
<td>Acute care</td>
</tr>
</tbody>
</table>

*Note. APP = Assessment of Physiotherapy Practice tool; CPI = Clinical Performance Instrument.*

Beyond the large impact of cost on a PTE program and quality of evidence in PTE literature, the assessment of clinical reasoning to measure the efficacy of simulation-based instruction on clinical reasoning is difficult to conduct due to the intrinsic cognitive nature of
clinical reasoning. A recent article (Thackray & Roberts, 2017) documented the under-representation of physical therapist clinical decision-making skills in high-acuity settings, such as cardiorespiratory physical therapy. Strong clinical decision-making skills are principal in the practice of physical therapy and impact a physical therapist’s level of competence in an autonomous practice setting. The measurement of clinical reasoning using a simulated experience is not novel in physical therapy literature.

Several studies have used high-fidelity simulation experiences to teach clinical decision-making skills to physical therapist students involving acute care or musculoskeletal-related scenarios (Fu, 2015; Ladyshewsky et al., 2000; Mori et al., 2015; Ohtake et al., 2013; Pritchard et al., 2016; Shoemaker et al., 2009; Silberman et al., 2016b; Silberman et al., 2013); however, only Fu (2015) utilized a specific instrument rather than survey or subjective commentary to measure clinical reasoning of the students. The most commonly used procedures to assess clinical reasoning in PTE literature are learner reflection, interview responses, instructor comments, or non-parametric Likert scale responses (Ohtake et al., 2013; Shoemaker et al., 2009; Silberman et al., 2016b; Silberman et al., 2013). Of these studies, clinical reasoning was typically measured from the perspective of the learner rather than the faculty member or licensed physical therapist, with the exception if Silberman et al. (2016b). For example, Ohtake et al. (2013) conducted a study using a critical care simulation experience to measure student confidence in psychomotor, affective, and cognitive skill performance. Cognitive clinical reasoning skills were measured by student perceived confidence in performing these skills. Chi square analysis of student-reported confidence scores in this study demonstrated a “high confidence [i.e., survey responses of confident or very confident]” (Ohtake et al., 2013, p. 223) improvement in skill performance (51% pre-simulation versus 86% post-simulation) based on
student survey responses, which translates to the effective use of simulation to instruct cognitive skills. Yet, the data is subjective and could be influenced by the novelty of the simulation strategy.

Other methods for assessing clinical reasoning skills in PTE literature generally include either the think aloud method for exposing clinical reasoning skills (Fu, 2015; Thackray & Roberts, 2017) or by using simulated OSCE stations (Mema et al., 2016; Sakurai et al., 2014; Swift et al., 2013). Based on the overall outcomes of simulation-based research in PTE literature, physical therapist students favor the use of simulation for the application of clinical reasoning skills (Ohtake et al., 2013; Shoemaker et al., 2009; Silberman et al., 2013). Simulation use is advantageous in the enablement of capturing the domains of clinical skills in effort to bridge the gap between knowledge and application of skills in a more authentic environment.

Solution

Based on the literature discussed above, evidence exists supporting the use of simulation as an instructional strategy in healthcare education (Bednarek et al., 2014; Brunette & Thibodeau-Jarry, 2017; Bruno et al., 2016; Cahalin et al., 2011; Herge et al., 2013; Mori et al., 2015; Nithman et al., 2016; Ohtake et al., 2013; Sabus & Macauley, 2016; Shin et al., 2014; Silberman et al., 2016b; Silberman et al., 2013). Furthermore, current evidence supports that physical therapist students favor the use of simulation for the instruction of clinical skills (Bednarek et al., 2014; Ohtake et al., 2013; Shoemaker et al., 2009). Simulation-based instruction is effective in promoting psychomotor, affective, and cognitive skills based on research in medicine and nursing education (Motola et al., 2013), although research support on the efficacy if using high-fidelity over low-fidelity simulation is limited in PTE.
The enactment of simulation in education does come with challenges. Simulation is costly, both financially and timely (Sabus & Macauley, 2016). The evidence supporting simulation-based instruction in PTE literature is beneficial, yet warrants continued investigation using more rigorous methodology (Cahalin et al., 2011; Mori et al., 2015; Pritchard et al., 2016; Silberman et al., 2016b). Pritchard et al. (2016) suggest simulation use in PTE lacks the rigor for confidence in findings beyond other educational strategies in the development of clinical performance competencies. Additionally, there is a gap in the PTE literature that identifies the extent to which simulation fidelity used in simulation-based instruction would result in a greater improvement clinical reasoning and confidence outcomes among physical therapist students. Based on the current literature in the field of physical therapy practice, the problem is the limited support on which simulation fidelity, specifically simulated patients or peer role-play, used with simulation-based instruction creates a greater improvement in clinical reasoning and confidence of physical therapist students. Moreover, limited support exists regarding the assessment of clinical reasoning during a clinical performance task in a high-acuity, acute setting (Fu, 2015; Silberman et al., 2016b; Silberman et al., 2013). A meaningful solution is to conduct an experimental research investigation on comparing the fidelity of simulation-based instruction using simulated patients compared with peer role-play on clinical reasoning and confidence of physical therapist students in an acute care setting using validated instruments.
CHAPTER THREE: METHODOLOGY

Introduction

This study investigated the effect of simulation-based instruction with simulated patients compared with traditional practice using peer role-play on physical therapist students’ clinical reasoning and confidence outcomes. The physical therapist students were enrolled in an entry-level physical therapist education (PTE) program at the University of Tennessee Health Science Center. The design of this study is an experimental, posttest-only design study with intention to control for previous experience with patient transfers, if needed. This study addressed two specific research questions. First, is there a difference in clinical reasoning measured by the Think Aloud Standardized Patient Examination (TASPE) score following simulation-based instruction using simulated patients compared with peer role-play in physical therapist measured by the Acute Care Confidence Survey (ACCS) score following simulation-based instruction using simulated patients compared with peer role-play in physical therapist students performing patient transfers skills? Data collected included the TASPE (Fu, 2015), the ACCS (Greenwood et al., 2014), and a demographic questionnaire. Independent-samples t-tests were conducted to examine the research questions. This chapter will discuss the method and design, instrumentation, data collection, and data analysis for the proposed study.

The Design

To explore the effect of different types of simulation-based instruction on physical therapist student clinical reasoning and confidence, a posttest-only, experimental design was selected. This design is appropriate because it uses both manipulation and comparison. I manipulated the type of simulation-based instruction that the participants received by designing one group to practice the clinical skill of patient transfers with simulated patients, the treatment
group, and the other group practiced with peers, the comparison group. In other words, the comparison group was the group that participated in the traditional practice of peer role-play customarily incorporated in the PTE program against which the manipulation of the simulation-based instruction using simulated patients is compared. Random assignment to the treatment group or comparison group was also employed, which is another characteristic of the chosen design. However, due to using a sample of convenience and available physical therapist students at the university, random selection was not used.

The experimental design controls for most threats to internal and external validity (Creswell, 2015). The posttest-only design was selected over the pretest, posttest design to examine both research questions to reduce threats of testing, instrumentation, and regression (Creswell, 2015). Data collected on participant previous experience with performing patient transfers was collected in the demographic questionnaire. The aim of collecting this data was to potentially control for student previous experience with patient transfers in a healthcare setting, if needed. The purpose of the covariate was to control the extraneous variable of previous experience in performing patient transfers, if indicated, based on experiential learning theory and the influence of previous experiences on future learning (Kolb, 1984).

Participants

The population of this study included first semester Doctor of Physical Therapy (DPT) students enrolled in an accredited, entry-level PTE program at the University of Tennessee Health Science Center. According to CAPTE (2017), typical demographic information for this population of students include:

- A ratio of 62/38 female to male;
- Average of 9% minority enrolled;
- Education level of undergraduate degree or higher; and
- Average prerequisite grade point average (GPA) of 3.5.

All the demographics collected from the participants of the study are listed below in Table 2. The participant demographics closely match those of the typical demographics for the population of physical therapist students in the United States listed above.

Table 2

<table>
<thead>
<tr>
<th>Participant Demographics (n = 59)</th>
<th>Variable</th>
<th>Total</th>
<th>Simulated Patients Group</th>
<th>Peer Role-play Group</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>22.34 ± 3.18</td>
<td>23.00 ± 4.32</td>
<td>21.70 ± 1.15</td>
<td>.59</td>
<td></td>
</tr>
<tr>
<td>Gender (female)</td>
<td>38 (64.4%)</td>
<td>18 (62.1%)</td>
<td>20 (66.7%)</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>Ethnicity (White)</td>
<td>53 (89.8%)</td>
<td>27 (93.1%)</td>
<td>26 (86.7%)</td>
<td>.32</td>
<td></td>
</tr>
<tr>
<td>Undergraduate GPA</td>
<td>3.57 ± .29</td>
<td>3.61 ± .23</td>
<td>3.53 ± .33</td>
<td>.39</td>
<td></td>
</tr>
<tr>
<td>GRE Score</td>
<td>305.46 ± 6.31</td>
<td>305.70 ± 5.71</td>
<td>305.23 ± 6.93</td>
<td>.54</td>
<td></td>
</tr>
<tr>
<td>Preadmission Observation Hours</td>
<td>286.40 ± 332.08</td>
<td>286.40 ± 332.08</td>
<td>294.93 ± 324.95</td>
<td>.94</td>
<td></td>
</tr>
</tbody>
</table>

Note. GPA = grade point average; GRE = graduate record examination.

- Data are presented as mean ± standard deviations unless otherwise indicated.
- Mann-Whitney test unless otherwise indicated.
- Chi-square.

Student participants were a non-probability, convenience sample (Portney & Watkins, 2000) as the students who participated were convenient and accessible. The sample population from which the participants volunteered included first-year DPT students enrolled in a cohort-based curriculum in the first semester of courses. Participants will be elicited upon attendance to a course titled PT 505 Fundamentals of Physical Therapy in the DPT program. Informed consent to participate in the study, participants will be obtained and participants will be randomly assigned to the experimental and control group.
According to Cohen (1988), a minimum of seven thirty-five participants is recommended as an adequate sample size for each group for the statistical analysis to achieve a desired level of power of .80 with a moderate effect size of .60 in behavioral science research. A moderate effect size was found in a similar simulation-based research study examining standardized patients versus peer role-play studies cited in the literature review (Bosse et al., 2012). A minimum of 30 participants is recommended by Creswell (2015) to ensure an adequate sample size for each group in an experimental, posttest-only study in educational research. Therefore, a sample size of 30 participants was included in this study based on the larger number suggested by Creswell for educational research.

**Setting**

The setting of the investigation was the University of Tennessee Health Science Center in the Department of Physical Therapy and the Center for Healthcare Improvement and Patient Simulation. The DPT program at the university is accredited by CAPTE. Simulation-based instruction for both groups occurred in the university simulation center. The simulation center was selected for both groups to offer a simulated learning environment matching a hospital environment while incorporating the use of simulated patients or peer role-play for students to practice the clinical skill of patient transfer. Patient transfer skill practice traditionally occurs in the physical therapy laboratory space. The physical therapy laboratory has large mats rather than hospital beds for practice the patient transfer skills. The availability of the hospital beds and other authentic equipment in the simulation center contributes to the authenticity of the practice experience compared to the physical therapy laboratory. The instruction on patient transfers is typically taught during the first semester course PT 505 Fundamentals of Physical Therapy within the DPT program of interest. The purpose of the PT 505 course is to introduce basic
patient care skills to physical therapist students early in the curriculum. The patient transfer instructional segment within this course occurred near the end of the course as increased clinical reasoning skills are expected after reviewing basic content involved in patient care, such as medical equipment, patient medical status based on vitals measurement, and weight bearing contraindications. Duration of the instruction was two hours for two sessions over two weeks timespan. The assessments for both groups also occurred in the simulation center. The setting for this study was selected due to convenience and availability.

**Instructional Setting**

The Center for Healthcare Improvement and Patient Simulation is located on the research campus and supports a large multi-bed hospital room and several separate individual patient care rooms. The patient care rooms are staged as private patient hospital rooms that can accommodate several simulation modalities, including simulated patients, high-fidelity human mannequins, and task trainers. The large multi-bed hospital room was used for the simulation-based instruction. This room included typical hospital room accommodations within a large room with ten hospital beds set up in a realistic manner to simulate a multi-bed hospital space as shown in Figure 1. The wall behind the head of each bed contains wall units for monitor, oxygen, suction, and other connections commonly found in
patient hospital rooms. For the simulation-based instruction, simulated patients and peers, dependent on group, was stationed in a separate bed with specified medical equipment in use, Foley catheter or intravenous catheter. The availability of authentic medical equipment, including power hospital beds, hospital furniture, and Foley catheters and IVs, and the staged hospital environment, including draw curtains, vitals monitors, and wall units for equipment, contributed to the high-fidelity simulation experience. Fidelity refers to the degree of realism or behavior of a simulated setting that matches the authentic environment (Mori et al., 2015).

**Assessment Setting**

The simulation assessments for both groups occurred in the simulation center in three individual patient hospital rooms. The three simulation rooms were active simultaneously during the assessment phase of the study. Each single patient simulation room was equipped with a hospital bed, medical equipment based on the patient case scenario, and video and audio equipment for recording the participant and standardized patient scenario. The simulation center hosts a larger room near the single simulation rooms to allow participants to complete
assessment paperwork including reviewing the case scenario and completing the confidence survey outside of the patient care rooms. The “time-outs” for the assessment included in the TASPE occurred inside the single patient rooms. Each participant assessment was no longer than 30 minutes in duration to simulate an average typical patient treatment time frame during a patient treatment session and corresponds to the time allotted during the TASPE validation study (Fu, 2015).

Simulation-based Instruction

The simulation-based instruction for both groups was designed to follow simulation scenario development and instruction used in the literature (Brunette & Thibodeau-Jarry, 2017; Ohtake et al., 2013; Sabus & Macauley, 2016). The selection of simulation-based instruction was grounded on the construct that “because simulation education is by nature experiential, it offers an opportunity to evaluate context-specific decision making under controlled conditions” (O'Donnell & Kuzminsky, 2010, p. 349). The simulation-based instruction developed in this study was based the components published by Ker & Bradley (2010) and Pasquale (2013).

According to Ker and Bradley, effective simulation-based training includes:

- understanding the needs and requirements of the learner(s),
- measurement of technical and non-technical performance,
- facilitation of feedback,
- scenario creation based on learning outcomes,
- guided practice, including mistakes,
- synergy between clinicians and educational experts, and
- evaluation of the program.
Ker and Bradley discuss that when simulation-based instruction occurs among a large group of learners, a foundation of the importance of the content should be established and explained how it should be applied in the clinical setting. This explanation was included in the instruction. Following the introduction and foundation explanation, the progression of the instruction included instructor demonstration in real time without commentary, repeat demonstration with commentary, learner practice under supervision with feedback from instructor, peers, and simulated patient, and subsequent practice encouraged through self-directed learning with feedback (Ker & Bradley, 2010). Dick, Carey, and Carey’s (2015) elements for instructional design were also used in the development of the simulation-based instructional strategy.

Regarding simulation and experiential learning theory, the participants also experienced the four stages within the experiential learning cycle: *concrete experience*, an actual hands-on event; *reflective observation*, an opportunity to reflect on the actual event; *abstract conceptualization*, brainstorming on other potential relatable events; and *active experimentation*, following feedback—how would performance adapt in the future (Kolb, 1984; Pasquale, 2013). The use of the experiential learning theory was implemented in the simulation-based instruction through actual hands-on patient transfer simulation experiences, *concrete experience*, using simulated patients or a peer. *Reflective observation* in real-time during practice included numerous means of feedback between the student and peers, the instructor, the simulated patient, and the content and environment. New case patient scenarios were presented with increased embedded challenges set the stage for potential *abstract conceptualization* to occur for students to practice. The practice patient case scenarios increased in number of embedded challenges from the initial session to the final session to foster clinical decision-making based on the content previously introduced. The actual patient transfer technique was provided for the initial training
session case scenarios and excluded from the final session case scenarios to encourage the learners to develop clinical reasoning skills. The *active experimentation* phase of the experiential learning cycle occurred as the students tested their selection of transfer technique based on new case scenarios and adjusted their decisions as necessary. The simulation-based instruction consisted of the interweaving of both effective simulation-based training guidelines and experiential learning theory. Objectives for the simulation-based instruction were 1) perform patient transfer skills in a safe and professional manner, 2) demonstrate proper body mechanics and guarding techniques during patient transfer skills, 3) demonstrate transferring a patient onto a tilt table and positioning/standing a patient on a tilt table safely, 4) select and justify the best patient transfer technique based on a provided case scenario, and 5) demonstrate the use of teaching tips for transfer activities.

The treatment group received high-fidelity simulation-based instruction using simulated patients for practice compared with the comparison group receiving low-fidelity traditional peer role-play for practice when performing patient transfers. The simulation learning experience for the treatment groups consisted of simulated patients who will be manipulated by the participants during practice of patient transfer skills. Simulated patients are defined as trained actors who simulate a patient during a simulation-based experience (Lane & Rollnick, 2007). Simulated patients communicated with the participants to offer a more authentic experience relatable to an acute care hospital setting. Simulated patients were trained to mock a variety of patient cases to allow the participants to practice several different scenarios and received feedback on their performance from the instructor, peers, and the simulated patients. The participants in the comparison groups practiced patient transfer skills using peers role-playing patients. The only
difference between the treatment and comparison groups were the use of simulated patients or peers for practice of newly learned patient transfers skills are discussed below.

**Treatment group.** In the simulation-based instruction learning environment using simulated patients, learning can occur between learner(s), the instructor(s), the simulated patients, the content, and the environment (Pasquale, 2013). The intervention plan included instructional strategies to effectively instruct out-of-bed patient transfers including the standing pivot transfer, two-person lift transfer, sliding board transfer, hydraulic lift transfer, and dependent sliding transfer as described by Minor and Minor (2014). An outline for the simulation-based instructional strategy using simulated patients is shown in Table 3.

Participants randomly assigned to the treatment group practiced newly learned patient transfer skills using simulated patients. Participants were randomly split into two separate sub-groups to accommodate for a smaller instructor to student ratio. CAPTE notes an average of a 1:13 instructor to student ratio in PTE laboratory experience (2017). Therefore, instructional groups were split into two sub-groups to accommodate for the national average of instructor to student supervision in a laboratory experience. The instruction occurred in the simulation center for each sub-group for duration of two hours each week. Each participant in the treatment group attended a frequency of two sessions consisting of one session per week for two weeks with the inclusion of three instructors simultaneously during each session. One session occurred in the afternoon between 1 p.m. and 3 p.m. and the other session occurred between 3 p.m. and 5 p.m. on the same day.
Table 3

Simulation-based Instructional Strategy for Treatment Group

<table>
<thead>
<tr>
<th>Learning Components</th>
<th>Considerations per component</th>
<th>Instructional Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-instructional activities</td>
<td>Motivation for learning</td>
<td>Discuss practice in error-permitting environment prior to real-life clinical practice</td>
</tr>
<tr>
<td></td>
<td>Introduce objectives</td>
<td>Display objectives and recite orally</td>
</tr>
<tr>
<td></td>
<td>Recall of prerequisites</td>
<td>Recite orally</td>
</tr>
<tr>
<td></td>
<td>Benefits of learning material</td>
<td>Discuss orally</td>
</tr>
<tr>
<td>Content presentation</td>
<td>Pre-lab content</td>
<td>Chapter reading (Minor &amp; Minor, 2014, Ch. 9)</td>
</tr>
<tr>
<td></td>
<td>Demonstrate skills</td>
<td>Student will view instructor demonstration of each transfer using SP without commentary via video recording posted on learning management system</td>
</tr>
<tr>
<td></td>
<td>Repeat skills with commentary</td>
<td>Student will view instructor demonstration of each transfer using SP with commentary via video recording posted on learning management system</td>
</tr>
<tr>
<td>Learner participation</td>
<td>Hands-on practice with immediate feedback</td>
<td>Hands-on practice in small groups using basic patient cases with immediate FB from instructor, peers, SP, and environment</td>
</tr>
<tr>
<td></td>
<td>(concrete experience and reflective observation)</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>Informal check-off using assessment rubric</td>
<td>Peers to compare learner performance of transfer with respective transfer performance rubric and provide FB</td>
</tr>
<tr>
<td>Follow through activities</td>
<td>Additional rehearsal following feedback to improve performance</td>
<td>Learners practice by viewing same transfers performed by peers and offer FB as needed based on previous practice; cases increase in complexity upon second instructional session</td>
</tr>
<tr>
<td></td>
<td>(abstract conceptualization and active experimentation)</td>
<td></td>
</tr>
</tbody>
</table>

Note. SP = simulated patient; FB = feedback. Adapted from The Systematic Design of Instruction by W. Dick, L. Carey and J. O. Carey, 2015, Boston, MA: Pearson Education.

Comparison group. The instruction for the comparison group included the same simulation-based instructional strategies as the treatment group except for employing low-fidelity peer role-play for student practice of patient transfer skills rather than use of simulated patients. The instruction was carried out in the simulation center like the treatment group.
Participants randomly assigned to the comparison group were involved in the instruction using peer role-play. Participants were randomly split into two separate sub-groups to accommodate for a smaller instructor to student ratio as described above in the intervention group using the CAPTE national average of 1:13 instructor to student ratio (CAPTE, 2017). The two instructional sessions occurred in the same manner as described in the treatment group. The simulation-based instructional strategy is identical to the treatment group as shown above with the exception of replacing simulated patients with a peer.

**Instrumentation**

After completing the instruction, participants participated in a simulation experience to formatively assess the learned patient transfer skills. The instruments employed for this research study included the TASPE (Fu, 2015), the ACCS created by Greenwood et al. (2014), and a demographic questionnaire to collect demographic data. The TASPE was used to measure clinical reasoning performance for the first research question based on the total score achieved by each participant following instruction. The ACCS mobility scale was used to measure student confidence for the second research question based on the total confidence score reported by the participants following instruction. Each participant completed the demographic questionnaire that contained an item asking them to estimate weeks of previous experience performing patient transfers.

**Think Aloud Standardized Patient Examination**

The TASPE was developed and validity was assessed by Fu in 2015 using physical therapist students as participants. Fu designed the tool to make “the mostly invisible clinical reasoning ‘visible’ and accurately represented in the simulated testing environment” (p. 15) when combined with a standardized patient examination. According to Fu, the tool utilizes a
process of deduction relatable to the hypothetico-deductive reasoning model (Elstein et al., 1978) to determine clinical reasoning. Fu describes the hypothetico-deductive reasoning model as a model in which the practitioners base upon limited data from the initial cue acquisition to generate a limited set of hypotheses early in a patient encounter and use these early hypotheses to guide and narrow the subsequent search of the patient’s problem. Cues from the subsequent search are evaluated to confirm, refute, or modify the hypotheses. (p. 25)

Relating to the hypothetico-deductive reasoning model, the TASPE contains four processes: cue acquisition, hypothesis generation, cue interpretation, and hypothesis evaluation. The processes can occur serially or spontaneously. The physical therapist students’ verbal clinical reasoning responses during each process are recorded by examiners blinded to the intervention and group assignments and assessed by the TASPE in the form of a rubric. Examiners were also blinded to intervention and group assignments in the current research study. The organizational flow of the TASPE is pictured in Figure 2. Example rubrics for each time-out, three think aloud components, i.e., hypothesis generation, hypothesis evaluation, and treatment are shown in Figure 3, Figure 4, and Figure 5, respectively.
<table>
<thead>
<tr>
<th>Each Student Is Required to Do the Following During the TASPE in Sequence From Top to Bottom</th>
<th>Processes in the Hypothetico-Deductive Reasoning Model</th>
<th>Time-in/Time-out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read and analyze the written description of the patient (including basic information and subjective examination findings)</td>
<td>Cue acquisition</td>
<td>Time-out</td>
</tr>
<tr>
<td>First think aloud component: Provide and justify 3 most likely diagnostic hypotheses based on both positive and negative findings found in the written description of the patient</td>
<td>Hypothesis generation</td>
<td>Time-out</td>
</tr>
<tr>
<td>Perform physical examination on the patient</td>
<td>Cue acquisition and interpretation</td>
<td>Time-in</td>
</tr>
<tr>
<td>Second think aloud component: Provide and justify 3 most likely hypotheses based on both positive and negative findings found in the written description of the patient and the physical examination</td>
<td>Hypothesis evaluation</td>
<td>Time-out</td>
</tr>
<tr>
<td>Third think aloud component: Provide and justify 3 most appropriate interventions for the clinical presentations with the immediately preceding first diagnostic hypothesis considered</td>
<td>Treatment</td>
<td>Time-out</td>
</tr>
</tbody>
</table>

*Figure 2. Organizational flow of the TASPE. The processes of the hypothetico-deductive reasoning model in column two relates to the student tasks in the left column and the time-in and time-out periods in the right column. Adapted from “The Organizational Flow of the TASPE” by W. Fu, 2015, Journal of Physical Therapy Education, 29(4), p. 16.*
Figure 3. The rubric for the first retrospective think aloud process of hypothesis generation. During this time-out session, the participant verbalized his or her clinical reasoning to an examiner without interaction with the standardized patient. Adapted from “The Rubric Page Created for the First Think Aloud Component (Justifying Hypotheses)” by W. Fu, 2015, Journal of Physical Therapy Education, 29(4), p. 16.
**Figure 4.** The rubric for the second retrospective think aloud process of hypothesis generation. During this time-out session, the participant verbalized his or her clinical reasoning to an examiner without interaction with the standardized patient. Adapted from “The Rubric Page Created for the Second Think Aloud Component (Justifying Hypotheses)” by W. Fu, 2015, *Journal of Physical Therapy Education, 29*(4), p. 17.
Each rubric contains three think aloud items. Each item is rated by the examiner using the four performance criteria: excellent, competent, borderline, and poor. Examiners assigned scores on each rubric ranging from excellent (3) to poor (0), with competent (2) and borderline (1) falling between excellent and poor scores. A high score relates to excellent performance (3) and a low score would correspond with poor performance (0). Competent score (2) or above would be considered acceptable scores for clinical reasoning performance.

Figure 5. The rubric for the third retrospective think aloud process of hypothesis generation. During this time-out session, the participant verbalized his or her clinical reasoning for treatment intervention to an examiner without interaction with the standardized patient. Adapted from “The Rubric Page Created for the Third Think Aloud Component (Justifying Interventions)” by W. Fu, 2015, *Journal of Physical Therapy Education*, 29(4), p. 17.
Each performance criterion is defined on the rubric based on justification of relevant findings. The score on the TASPE is comprised of a total think aloud score for the summation of the rubrics, which could range from 0 to 27 points. The TASPE was used to collect data on both the knowledge-based and cognitive domains of Bloom’s taxonomy through the think aloud responses participants provide during the simulated patient interaction. Participants were allotted 30 minutes to complete the examination during the TASPE validation study (Fu, 2015) and was the time frame used for this study. Within 30 to 45 minutes, the participants were able to complete each process of the TASPE and the confidence survey to complete the assessment leg of the study.

The TASPE was designed using an examination deployment panel consisting of three physical therapy faculty members with teaching experience in physical therapy ranging from six to ten years. All members were certified by the American Board of Physical Therapy Specialties as orthopedic certified specialists. Validation assessment of the TASPE comprised of assessing 28 physical therapist students and four onsite examiners (Fu, 2015). The participants included in the TASPE validation study included a similar sample in the current study. Interrater reliability of the TASPE as measured by percent of judgments in exact agreement was 50% or greater in exact agreement in 64% of the item score comparisons. The weighted kappa values ranged from 0.41 to 1.00 after excluding one examiner due to being an outlier. Usefulness of the TASPE as rated by numerical rankings scored by the participants on a non-neutral response survey resulted in scores of either extremely well or well. Based on the literature review performed in Chapter Two, no studies using the TASPE are cited in the literature to date. The principle investigator received permission from the author to use the instrument in the study as shown in Appendix A.
Inter-rater reliability in the current study was performed following the simulation assessments to define the consistency of the examiners on the use of the TASPE for scoring the participants clinical reasoning performance. In this study, the TASPE was administered by three trained examiners blinded to the treatment and comparison groups using paper and pencil. Interrater reliability data was collected during this study by the principle investigator by means of video recordings of the participants’ verbalized responses to the TASPE prompts provided by each examiner. Inter-rater reliability per Spearman Rho correlations was high (\(r = 0.86, p < .0001\))

I performed field-testing of the TASPE prior to data collection in a different cohort of physical therapist students using a simulation experience with standardized patients. The TASPE was used to score the clinical reasoning performance of second-year physical therapist students using a patient case scenario in an acute care hospital setting. Field-testing included 54 physical therapist students and, at minimum, one examiner who participated in the current study. Results from the field-testing triggered modifications in the procedures section of this study to improve treatment integrity, for example, improved design of the pre-brief for the simulation experience, improved design of the instruction on the TASPE for the participants prior to the simulation experience, and increased training for the standardized patients. Consensus scoring was utilized during the field trial; however, since the case scenario and the simulation experience objectives were different than the current study, the consensus scoring was not as relatable to the current study as anticipated. Therefore, the first day of the simulation assessments were scored using the TASPE and consensus group scoring for 33 of the 59 participants. The second day of simulation assessments was scored individually by an examiner using the TASPE without feedback from other examiners for the remaining 26 participants.
Confidence Survey

To measure the dependent variable of student confidence for the second research question, the ACCS was selected to collect data on physical therapist student confidence in performing patient transfers following instructional intervention. Greenwood et al. (2014) created the ACCS to assess physical therapist students’ self-efficacy for clinical practice in the acute care physical therapy practice setting. The ACCS is a 15-item self-reported survey the authors based on Bandura’s concept of self-efficacy. The ACCS was used to collect data on the affective skill of student confidence during the instructional sessions. Construct validity of the tool was based on focus group responses from 11 expert physical therapists with a mean of 11.5 years in clinical practice. Survey items were developed using current literature, acute care practice references, and acute care entry-level minimum skills. The survey items are rated by participants on a certainty Likert scale with a response set scale ranging from 10 to 100 with 10 representing very uncertain and 100 representing very certain. The authors expressed that the certainty Likert scale from 10 to 100 is supported in the literature to be valid and reliable in measuring of self-efficacy. The score on the ACCS is based on the total of the responses for all 15 items. Total scores can range from 150 to 1500.

Items in the ACCS are based on four sub scales: judgment (making clinical decisions), manual skills (completing tasks such as taking blood pressure), mobility skills (ambulation, transfers), and instruction (providing communication and education with patients and the interprofessional team). The four sub scales were derived from the current literature based on acute care physical therapy practice (Greenwood et al., 2014). The sub scales reflect four essential psychomotor and cognitive skills necessary for competence in the acute care setting, yet students use the tool to rate their confidence (affective skill) on their clinical performance. Items
in the survey are randomly ordered among the sub scales, however only the total score will be analyzed. The ACCS is shown in Appendix B.

Validation testing of the ACCS involved 102 physical therapist students enrolled in a large urban university with a mean age of 22.8 years and gender distribution of 76% female and 12.7% male. Structural validity was tested using the exploratory factor analysis. Reliability using a test-retest design resulted in an ICC of 0.909. The ACCS demonstrated high internal consistency with Cronbach $\alpha$ of 0.91. The ACCS has been used in a recent randomized, exploratory study that examined the effect of high-fidelity human simulation on student physical therapist self-efficacy in the acute care practice setting (Silberman et al., 2016a). The confidence survey was administered electronically in the current study using Qualtrics Version May 2017 survey software immediately following the simulation assessment. Permission to use the ACCS was obtained from the author and can be viewed in Appendix C.

The ACCS was employed to measure physical therapist students’ self-reported confidence in performing acute care skills upon completing simulation-based instruction on a skill practiced in a simulated acute care environment. The ACCS measured several different underlying constructs; judgment (making clinical decisions), manual skills (completing tasks such as taking blood pressure), mobility skills (ambulation, transfers), and instruction (providing communication and education with patients and the interprofessional team). Each construct consisted of two–five questions. The scale had a high level of internal consistency (DeVellis, 2003; Kline, 2005) with the sample population, as determined by a Chronbach’s alpha of .90.

**Demographic Questionnaire**

A demographic questionnaire was used to collect data on each participant. The results from the demographic questionnaire were used to explain and generalize the sample data to the
general population and to examine the sample distribution (Portney & Watkins, 2000). The demographic questionnaire included the question “Do you have any previous experience performing patient transfers through employment or with a family member?” to measure the covariate potentially confounding variable of previous experience performing patient transfers is shown in Appendix D. If the participant responds “yes” to this question, the survey will prompt the participant to briefly describe the previous experience and estimate how much experience in performing patient transfers estimated in weeks. Data collected using the demographic questionnaire included sex, age, highest education level, and ethnicity. The demographic questionnaire was completed electronically by participants via a link provided in an email upon completion of informed consent to participate in the study.

**Data Collection**

Steps considered in the procedures of the study include the process for participant recruitment into the study, intervention procedures such as the anticipated use of each instrument and treatment integrity, and data collection procedures. A field trial for the use of the TASPE discussed in instrumentation section was completed in June 2017 to aid in the development of data collection procedures.

**Recruitment of Participants**

Prior to conducting the study and recruiting participants, IRB approval through the University of Memphis and the University of Tennessee Health Science Center was obtained. The IRB approval letters are available in Appendix E. Recruitment of participants occurred within the first semester during the DPT course of PT 505 Fundamentals of Physical Therapy for Fall 2017 using nonprobability sampling based on participant availability (Creswell, 2015; Portney & Watkins, 2000). There were no specific prerequisites for the PT 505 Fundamentals of
Physical Therapy course other than meeting the requirements for acceptance into the University of Tennessee Health Science Center DPT program, such as a score of approximately 300 on the GRE, prerequisite undergraduate GPA at or above 3.5, and a minimum of 100 observation hours in a physical therapy setting. Inclusion criteria included current enrollment in an accredited entry-level physical therapy program as a physical therapist student, active enrollment in the PT 505 Fundamentals of Physical Therapy course at the University of Tennessee Health Science Center, and physically able to perform out-of-bed patient transfers. Exclusion criteria included previous enrollment or completion of the PT 505 Fundamentals of Physical Therapy course, individuals who have previously worked as a physical therapist or physical therapist assistant in an inpatient clinical setting, and individuals who would not be able to physically perform out-of-bed patient transfers. One student who completed the informed consent process was excluded from the study following a physical injury after the consent process that limited the student from performing patient transfers.

Participants were voluntarily recruited by an in-person announcement prior to class for the course PT 505 Fundamentals of Physical Therapy. The participants were informed of the purpose of the study and assured that participation in the study would not impact the student’s academic standing in the program. An informed consent with a random number posted on it was provided in paper form to each potential participant for review including a means to contact the researcher for any questions or need for clarification. Voluntary informed consent for each participant was obtained using paper and pen prior to data collection. The informed consent form can be found in Appendix F.

Participants were randomized into the treatment groups using six-block randomization to ensure balance between the two groups based on random numbers collected from the completed
informed consent forms. Groups were split into equal number of participants to ensure pairs of participants for each instructional group using randomization design. Each participant also received an email containing a link to complete the demographic questionnaire online using Qualtrics software. The demographic questionnaire required each participant to enter the coded research participant number on the informed consent form to maintain participant confidentiality. Once assigned to the treatment or comparison group, each participant received a schedule for his or her respective instructional sessions for the two weeks instructional intervention in the Fall 2017 academic semester.

**Intervention**

The intervention not only consisted of the type of practice during instruction provided to the study participants but also included training for the simulated and standardized patients employed during the instruction and the assessment portion of the study. Additionally, three examiners were trained to produce consistent outcome measure scores using the TASPE. The participants also required orientation prior to the simulation assessment in the individual simulation rooms.

**Instructional sessions.** The instructional session for each group is outlined in the instructional strategy section shown in Table 3. Instructional sessions for both groups included out-of-bed patient transfers necessitating the use of a standing pivot transfer, two-person lift transfer, sliding board transfer, hydraulic lift transfer, and dependent sliding transfer as described by Minor and Minor (2014). Each participant practiced each transfer during the two instructional sessions. Practice included medical equipment attached to the role-playing student partner role or stimulated patient as an embedded challenge to employ knowledge-based, psychomotor and clinical reasoning performance skills. Instructors were used in a variety of ways to teach and
guide students to complete each transfer as outlined in the instructional strategy for each treatment group. The two instructional sessions were held for each group for duration of two hours each week. Sessions occurred during the afternoon either between 1 p.m. and 3 p.m. or 3 p.m. and 5 p.m. on the same day for each group. Session frequency was one session a week for two weeks.

Each instructional session included three instructors with a range of teaching experience from three to 15 years. All instructors were provided an instructional guide prior to instructional sessions. All instructors met for a one-hour session prior to the instruction to ensure instructional strategy understanding and to assume congruency in the delivery of instruction. The researcher led all instructional sessions, and the other two instructors delivered supporting feedback and instructional feedback during each session. As previously noted, all simulation-based instructional sessions for both groups were conducted in the simulation center using a simulated hospital environment.

**Assessment.** All simulation assessments were conducted in the simulation center in single simulated patient rooms. Participants were randomly assigned to an assessment day and time using six-block randomization to ensure a balance among the assessment times between the groups. Assessments were scheduled on 45-minute intervals from 8 a.m. to 5 p.m. over two days with three students being assessed per time frame excluding the 12 p.m. lunch hour. Unlike the instructional sessions, assessments were completed during the morning and afternoon due to scheduling limitations. Three examiners blinded to the group assignments scored the assessments using the TASPE; each participant scored by one of the three examiners. All three examiners completed training to ensure scoring consistency. Examiner training consisted of viewing a training manual, viewing example student cases online from the field study and practicing using
the TASPE with comparison with a guide with example responses and consensus scoring. All assessments were video recorded to allow me to rate the students and then perform interrater reliability testing.

When the assessment began, the participant was provided with a brief patient case scenario in a room located near the simulation assessment rooms for the first time-out. Upon reviewing the patient case scenario, the participant entered the patient room to signal for the examiner to enter the room. Once the examiner entered the room, the participant completed the first TASPE think aloud component by briefly verbalizing three diagnostic hypotheses on potential transfer selection and justifications based on both positive and negative findings found in the written patient case scenario. The examiner was trained to not provide any feedback during the think aloud sessions. The discussion between the participant and examiner was video recorded and saved based on the participant’s assigned identification code. The examiner recorded the participant’s response either using paper and pencil on the TASPE form. The examiner exited the patient room upon completion of the first TASPE think aloud component and presented to assessment viewing station in a room adjacent to the simulation assessment room.

Next, the participant interacted with the standardized patient to perform the first hypothesized patient transfer verbalized during the first think aloud component to complete the time-in session of the assessment. All activity in the simulation assessment room was video recorded. During the “time-in”, the participant interacted with the standardized patient and the simulated environment to prepare for and execute the previously selected out-of-bed patient transfer technique. Standardized patient and equipment manipulation was expected to complete
the transfer skill to formulate diagnostic hypotheses for the second and third time-out component.

Once the participant finished the out-of-bed patient transfer, the participant walked to the door to signal the examiner and hold up hands to form the “time-out” signal. Upon signal, the examiner re-entered the patient room to begin the second TASPE think aloud component. The participant briefly verbalized three diagnostic hypotheses for patient transfer selection with justification based on positive and negative findings found during the patient assessment and from the written patient case scenario. Again, the examiner did not provide any feedback during the time-out session. While actively in time-out, the standardized patient was trained to act as though he or she was no longer present and suspended the simulation (Howley, 2013).

The third and final phase of the assessment began immediately following the second think aloud component. The examiner prompted the student to verbalize three appropriate intervention hypotheses using the first diagnostic hypothesis considered, the same process as the selected patient transfer technique used during the time-in session. Once completed, the examiner and participant exited the debriefing room and directed the participant to an adjacent room to complete the electronic ACCS. The completion of the confidence survey following the assessment concluded participation in the study.

**Treatment fidelity.** Treatment fidelity describes the measures the researchers take to ensure that the independent variable is accurately manipulated or implemented. In this section, the standardized patient training, instructor training, examiner training, and student orientation to the simulation assessment are discussed.

**Simulated and standardized patient training.** To achieve consistency in the performance of the simulated and standardized patients among the instructional sessions and the assessment
sessions, both needed to undergo training specific to the study. All standardized patients have completed rigorous training through the simulation center on the role of the standardized patient; however, the simulated and standardized patients needed to become familiarized with the objectives of the patient transfer instructional sessions and the assessment session. Topics discussed with the simulated patients prior to inclusion in the instruction included encounter specifics and general nature of the patient role, review of the instructional session and assessment schedule, determine appropriateness of the simulated patients for the specific patient cases, and a list of “Do’s and Don’ts of Simulation” shown in Appendix G (Howley, 2013). Simulated and standardized patient training occurred one week prior to all instructional sessions and assessment sessions.

**Instructor training.** As discussed above, instructor training was created to outline the treatment fidelity compared with the comparison group. The training handout contained the information listed in each instructional strategy. Topics covered in the document included, but not limited to touring the simulation rooms and meeting the simulated patients as available, becoming acquainted with the equipment available in the simulation rooms, and detailed steps for each transfer to be covered during the instruction for both groups. All instructors who participated in the instruction of both groups were required to review the instructor training handout and instructor understanding was reinforced in a face-to-face meeting prior to the intervention phase.

**Examiner training.** As discussed above, three examiners were required for this study. Examiners met baseline requirements to be considered for the role, which included three or more years of clinical experience in a hospital-based practice setting as a licensed physical therapist, willingness to complete the examiner training course, and availability to participate on both days.
of assessments. Examiners were recruited by word of mouth from local hospitals that affiliate with the university DPT program. Examiner training focused on consensus scoring of the assessment using the TASPE (Anson, 2015). Based on recommendations from Anson (2015), examiner training consisted of instruction using the TASPE, practice dry runs using the TASPE and videos recorded from the field testing, and review of assessor bias errors. Inter-rater reliability measures were collected following the assessment phase using video recordings of the individual assessments.

**Student orientation to the simulation assessment.** To reduce the confounding interaction effect of participant unfamiliarity to the simulation environment, all students participated in a walking tour of the simulation facility and simulation assessment rooms. During the tour, students were introduced to the operation of the patient hospital beds, the medical equipment, and telephones. Immediately prior to the simulation assessment, participants were introduced to the TASPE and the “time-in” and “time-out” phases to become acquainted with the assessment process. The student assessment orientation included a brief discussion on the advantages of the simulation environment including a non-threatening place to learn to reduce potential student anxiety. It was explicitly explained that errors might occur as part of the learning process. The participants were advised that the simulation assessment experience was not being graded with intention to control potential anxiety with testing and that the simulation assessment was purely being used as a learning experience for the participants.

For the participants assigned to the treatment group receiving simulation-based instruction, the instructor briefly prepared the students to work with the simulated patients. Students were informed to always treat the simulated patients as a real patient with needs, concerns, and feelings (Owens & Gliva-McConvey, 2015). Again, students were reminded that
mistakes are a part of the learning process, but to consider the safety of the patient throughout the practice sessions. Students were made aware that the simulated patients only offered feedback during practice sessions and were trained not to offer feedback during the assessment session.

**Data Analysis**

**Demographic Information**

Complete data analysis alignment among the null hypotheses, data sources, and analyses is shown in Table 4. It is important to note that the participants experience with performing patient transfers prior to intervention was considered to be a potentially confounding variable. Data on the confounding variable was collected and analyzed. It was found via a correlation analysis that there was no interaction between the variable and the dependent variables in this study (Hinkle, Wiersma, & Jurs, 2003). An independent-samples t-test demonstrated that there was no significant difference between the two groups in the participants’ experience with performing patient transfers prior to intervention. As such, the potentially confounding variable was not considered as a covariate in the final analyses.

Table 4

<table>
<thead>
<tr>
<th>Null Hypotheses</th>
<th>Data Source Measuring the Dependent Variable</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There is no statistically significant difference between simulation-based instruction and traditional, demonstration-based instruction on physical therapist students’ TASPE scores.</td>
<td>Think Aloud Standardized Patient Examination</td>
<td>Independent-samples t-test</td>
</tr>
<tr>
<td>2. There is no statistically significant difference between simulation-based instruction and traditional, demonstration-based instruction on physical therapist students’ ACCS confidence scores.</td>
<td>Acute Care Confidence Survey</td>
<td>Independent-samples t-test</td>
</tr>
</tbody>
</table>

*Note: TASPE = Think Aloud Standardized Patient Examination (Fu, 2015); ACCS = Acute Care Confidence Survey (Greenwood et al., 2014)*
**Research Question 1**

Inferential statistics, specifically independent-samples t-test, was used to test the first null hypothesis examining the effect of type of instruction on physical therapist students’ clinical reasoning performance score as measured by the TASPE. An independent-samples t-test was selected as it is the most appropriate analysis to compare group mean TASPE scores between the two groups (Portney & Watkins, 2000). The TASPE assessment mean score served as the dependent variable. The fidelity of simulation-based instruction, simulated patient practice or traditional peer role-play practice, will serve as the independent variable.

Assumption tests were employed prior to conducting the independent-samples t-test to determine if use of the parametric analysis was appropriate. Assumption tests included testing for extreme outliers using boxplots, normality using Shapiro-Wilk test, and homogeneity of variance test using Levene’s test for equality of variances (Hinkle et al., 2003).

For the independent-samples t-test, the level of significance of alpha was set at .05 to reject or fail to reject the null hypothesis as is conventional in educational and clinical research (Creswell, 2015; Portney & Watkins, 2000). The effect size was reported as Cohen’s $d$ and was interpreted based on the thresholds of .2 for a small effect, .5 for a moderate effect, and .8 for a large effect (Cohen, 1988). Items reported in Chapter 4 include assumption testing, descriptive statistics ($M, SD$), number ($n$), significance level ($p$), and effect size ($d$).

**Research Question 2**

Inferential statistics, specifically independent-samples t-test, was be used to test the second null hypothesis examining the effect of type of instruction on physical therapist students’ confidence as measured by the ACCS. An independent-samples t-test was selected to analyze the
difference in the mean scores between the two groups in the same manner as research question 1. The total score on the confidence survey served as the dependent variable. The type of simulation-based instruction, simulated patient practice or traditional peer role-play practice, served as the independent variable.

Assumption tests, the same as described above for question one, were employed prior to conducting the independent-samples t-test to determine if use of the parametric analysis was appropriate. The level of significance of alpha of .05 was set and Cohen’s d was used to report the effect size part and interpreted using Cohen’s convention (1988). Items to be reported include assumption testing, descriptive statistics (M, SD), number (n), significance level (p), and effect size (d).
CHAPTER FOUR: RESULTS

Introduction

The data analyses were conducted to address the purpose of this study: to compare the effect of type of simulation-based instruction, simulated patients versus traditional peer role-play, on physical therapist students’ clinical reasoning during patient transfers and their confidence in performing patient transfer skills. This chapter discusses the results of the data analyses for the two independent-samples t-tests conducted.

Clinical Reasoning

An independent-samples t-test was used to test the first null hypothesis comparing the type of simulation-based instruction on the physical therapist students’ clinical reasoning performance as measured by the Think Aloud Standardized Patient Examination (TASPE). Originally, an ANCOVA was planned in order to control for participant previous experience with performing patient transfers. However, Pearson correlation analysis demonstrated that the covariate and dependent variable, TASPE scores, were not associated, $p = .74$. Furthermore, independent samples t-test demonstrated that the groups did not significantly differ based on the covariate, $t(57) = -1.40$, $p = .96$. As such, the decision was made to not consider the covariate and conduct an independent-samples $t$-test.

There were 30 participants in the simulated patients group and 29 participants in the peer role-play group. The simulated patients group’s TASPE scores ($M = 8.52$, $SD = 3.02$) were slightly higher than the peer role-play group ($M = 7.37$, $SD = 3.29$).

Prior to conducting the independent-sample $t$-test, assumption testing was completed. The assumption of no extreme outlier was examined using a visual inspection of box plots (see
Figure 6. While there was one outlier (case 41) in the peer role-play group, it was not extreme. Therefore, the assumption of no extreme outliers was not violated.

![Box Plots of TASPE Scores for Each Group](image)

**Figure 6. Box Plots of TASPE Scores for Each Group**

TASPE scores for each simulation-based instruction group were normally distributed, as assessed by Shapiro-Wilk’s test, $p > .05$. The assumption of homogeneity of variances, as assessed by Levene’s test for equality of variances ($p = .96$), was met. Results of the independent-samples $t$-test indicated no statistically significant difference, $t(57) = -1.40$, $p = .17$. Effect size, based on Cohen (1988), was small, $d = .36$. I failed to reject the null hypothesis. The students in the group receiving simulation-based instruction using simulated patients did not score significantly different on the TASPE than the peer role-play group.
Confidence

Another independent-samples $t$-test was used to test the second null hypothesis comparing the type of simulation-based instruction on the physical therapist students’ confidence as measured by the Acute Care Confidence Survey (ACCS). Originally, an ANCOVA was also planned in order to control for participant previous experience with performing patient transfers. However, the covariate was not related to the dependent variable, ACCS scores, $p = .56$. Furthermore, as noted above, independent samples $t$-test demonstrated that the groups did not significantly differ based on the covariate, $t(57) = -1.40, p = .96$. As such, as with the previous dependent variable, the decision was made to not consider the covariate and conduct an independent $t$-test.

There were 30 participants in the simulated patients group and 29 participants in the peer role-play group. Similar to the TASPE scores, the simulated patients group ACCS scores ($M = 977.59$, $SD = 152.40$) were higher than the peer role-play group ($M = 927.33$, $SD = 233.18$). Prior to conducting the independent-sample $t$-test, assumption testing was completed. Via visual inspection of box plots (see Figure 7), it was noted there was one outlier (case 38) in the peer role-play group. The outlier was not extreme. Therefore, the assumption of no extreme outliers was not violated.
ACCS scores for each simulation-based instruction group were normally distributed, as assessed by Shapiro-Wilk’s test ($p > .05$). The assumption of homogeneity of variances, as assessed by Levene’s test for equality of variances ($p = .13$), was met. Independent-samples $t$-test results indicated that there was not a statistically significant difference in the physical therapist students’ ACCS scores based on the type of simulation-based instruction, $t(57) = -.98$, $p = .33$. Effect size, based on Cohen (1988), was small, $d = .26$. Thus, I failed to reject the null hypothesis and concluded that the students in the group receiving high-fidelity simulation-based instruction using simulated patients scored higher on the ACCS but not significantly higher.
Summary

Although it was anticipated that previous experience would serve as a covariate in the planning of this study, the covariate was eliminated due to the lack of association with the dependent variable and limited variance in the variable between the groups. Therefore, two independent-samples t-tests were performed to examine each research question. The results of both analyses indicated that there was no statistical significant difference was found between the fidelity of simulation-based instruction, simulated patients or peer role-play, on students’ clinical reasoning and confidence. Potential explanations for this finding are addressed in the following Discussion section of this paper.
CHAPTER FIVE: DISCUSSION

Introduction

This randomized, experimental study was designed to compare the fidelity of simulation-based instruction using simulated patients compared to peer role-play on physical therapist students’ clinical reasoning and confidence in performing an acute care skill, patient transfers. Results of the independent-samples t-tests demonstrated no statistically significant differences in physical therapist students’ clinical reasoning and confidence when receiving simulation-based instruction using simulated patients versus peer role-play. A number of potential factors may have influenced the relationship between the high- and low-fidelity simulation-based instruction, clinical reasoning, and confidence. Previous literature illuminated some of these factors; however, further factors are discussed in this chapter.

Discussion

The first arm of this study was to investigate the effect of high- and low-fidelity simulation-based instruction, simulated patients or peer role-play, on clinical reasoning measured by the TASPE score in physical therapist students’ performing patient transfer skills. Both groups received simulation-based instruction; however, one group of physical therapist students practiced using a high-fidelity patient via simulated patients and the other group practiced using peers. Following the results of the independent-samples t-test, there was no statistical significant finding between the fidelity of simulation-based instruction, simulated patients or peer role-play, on physical therapist students’ clinical reasoning. Although the simulated patients group did demonstrate higher TASPE scores based on comparison of group means, the difference was not statistically significant. Although these results were not surprising based on previous literature (Adams et al., 2015; Lane & Rollnick, 2007; Schlegel et al., 2011), these results were not
congruent with what was hypothesized based on experiential learning theory and self-efficacy theory as discussed in Chapter Two. Several factors could explain this contradiction to theory, including instruction failing to include direct reflection on the physical therapist students’ performance, high motivation to succeed as typical of students in professional higher educational programs, both groups receiving simulation-based instruction rather than a control receiving no simulation-based instruction, and cognitive load theory.

According to the experiential learning theory, learning occurs through experience in four specific stages of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). Although all four of these stages were considered during the creation of the simulation-based instruction, the reflective observation stage was assumed to take place following the physical therapist students’ reception of feedback from a variety of sources. However, this may not have been the case in this study. Students were encouraged to reflect on the feedback they received from the patients (simulated patients or peers), but they were not required to discuss their reflections. Perhaps the lack of prompted reflection following the students’ performance of patient transfer skills resulted in a failure of the students to reflect on their performance as anticipated. This lack of emphasis could have affected the students’ learning outcomes and possibly the relationship between the instruction and the dependent variables. Lazonder and Harmsen (2016) suggest that immediate differences following inquiry-based learning have the potential to dissipate rather quickly after the instruction. The lack of statistically significant differences may be consistent with this idea when reflection on the experience does not occur.

Furthermore, experiential learning theory places emphasis on the reflection of an experience in the cycle of learning. Debriefing is a verbal form of reflection. It was anticipated
that the group practicing with simulated patients would have superior effects than the group practicing with peers on student clinical reasoning and confidence due to the higher fidelity of the learning experience and its effect on reflection. An emphasis on debriefing was not included in the simulation-based instruction in this study. Debriefing serves to illuminate the reflection of the students’ simulation experience; thus, further stimulating clinical reasoning and confidence beyond what was captured in this study. The process of debriefing has the potential to expose deeper learning experiences from one form of simulation fidelity to the other, e.g., simulated patients versus peer role-play. Course instructors reported during simulation-based instruction that the simulated patients group appeared to be more focused, sincere, and tended to ask more questions when practicing patient transfers than the peer role-play group. Course instructors also commented that at times laughing and humor with practice occurred in the peer role-play group that was not observed in the simulated patients group. Due to the perceived differences between the groups during practicing patient transfers, a difference was expected. However, the perceived difference did not impact the results as anticipated. Future instruction may benefit from the students directly presenting their reflections either verbally or written to clearly experience reflection on their performance. Reflection and debriefing is an essential component in learning within simulation experience based on simulation literature (Sabus & Macauley, 2016). Perhaps a more prominent demonstration of self-reflection on performance following practice of patient transfer skills by each participant would have better aligned with experiential learning theory than the instructional design in this study.

The prior academic success of the participants in a higher education setting may have also impacted the result of this study. According to a retrospective study performed by Lambe and Bristow (2011), prior academic success and scores on standardized assessment are positively
related to test performance in medical school. This same phenomenon may be occurring within the participants in the peer role-play group as each participant demonstrated high achievement and academic success on pre-admission GPA and GRE scores prior to admission to the PTE program. The students enrolled in this program are considered to be high performers per acceptance into a highly competitive PTE program. Furthermore, the average preadmission observation hours obtained by the participants in this study was 286 hours, exceeding the 100 hours admission requirement. Prior academic achievement and success of participants in the peer role-play group may have affected TASPE scores which could assist the participants in likely overcoming instructional shortcomings, e.g. lack of emphasis on reflection or debriefing, difference in fidelity of the patients. Self-efficacy theory supports this notion that performance accomplishment, e.g., prior academic success, contributes to one’s self-efficacy and motivation for future performance (Bandura, 1977), thus the peer role-play group may have worked a bit harder to overcome potential instructional barriers. Despite the type of fidelity of simulation-based instruction the participants received, previous academic performance may have resulted in all participants demonstrating good performance on the TASPE affecting the relationship between the fidelity of instruction and TASPE scores.

Furthermore, this study was designed to compare high- and low-fidelity simulation-based instruction; instruction using simulated patients for practice and instruction using peer role-play for practice among physical therapist students. Since simulation-based instruction has been shown to improve learning in health professions education and both groups each received a type of simulation-based instruction, simulated patients or peer role-play, both groups likely benefited from the instruction. The simulation-based instruction groups were selected for this study to examine the use of high-fidelity simulation, that of simulated patients, during skill acquisition
over the traditional use of peer role-play in PTE. However, future investigations may benefit from utilizing a control group not receiving simulation-based instruction for comparison.

Another consideration to explain the lack of difference between the high- and low-fidelity groups is that the relationship between fidelity and learning is dependent on the individual student’s experience (Adams et al., 2015). Based on the cognitive load theory, working memory is limited regarding the amount of information it can hold at one time and the number of concurrent operations it can perform with that information (Adams et al., 2015; Sweller, 1988; Van Gerven, Paas, Van Merriënboer, Hendricks, & Schmidt, 2003). According to this theory, a novice learner’s working memory is occupied with processing information relevant to the task at hand. Extraneous sensory and affective skills offered in the high-fidelity simulation-based instruction may be discarded in the learning process as they do not directly contribute to learning the new skill or are not captured in the limited capacity of the working memory (Sweller, 1988). For this reason, Haji et al. (2016) suggest that low-fidelity simulation-based instruction may be more effective for novice learners over high-fidelity simulation. For this reason, the increased realism of high-fidelity simulation using simulated patients for practicing patient transfer skills for the first time may have not benefited the students any more than what was gained from practicing with peers.

The second arm of this study was to investigate the effect on type of simulation-based instruction, simulated patients or peer role-play, on confidence measured by the TASPE score in physical therapist students’ performing patient transfer skills. Following analysis, there was also no statistical significant finding between high- and low-fidelity simulation-based instruction on physical therapist students’ confidence. As discussed above, failure to include debriefing segments into the simulation-based instruction, self-efficacy from successful academic
performances, and both groups receiving simulation-based instruction may have impacted the relationship between simulation-based instruction and clinical reasoning as investigated in this study. I also conclude that the students in both groups may have felt equally prepared by the simulation-based instruction and the students in the peer role-play group may have overcome instructional shortcomings yielding improved confidence performing these skills again.

**Limitations and Recommendations for Future Research**

The majority of threats to internal validity of this study were controlled by the randomized, experimental design (Creswell, 2015); however, some threats were not fully controlled. The threat of diffusion of treatment was a limitation as the participants were in the same cohort and could easily communicate with each other during other classes or outside of classes. The comparison group could have potentially communicated with the experimental group and interfered with the outcomes (Creswell, 2015). It was requested of each participant to refrain from discussing the instruction with the other group participants for the duration of the study. However, this could not be controlled within the study. Thus, in future studies it is recommended to include participants from several PTE programs or cohorts than one as used in this study. Other limitations and recommendations for future research are addressed below.

As presented in the discussion section, the course instructors commented on how the behavior of the physical therapist students during the instructional phase of the study was different between the two groups. It was noted that the peer role-play group exhibited more laughing and less sincerity during practicing patient transfers in comparison to the simulated patients group of students. Provided this observation, it is recommended that future studies include a qualitative component during the instructional phase to capture potential differences between the groups, including empathy, professionalism, motivation, etc.
The sample population should also be of interest when considering future research. While CAPTE publishes an annual report on aggregate PTE program data and the percentage of gender and ethnicity reported for the 2016 – 2017 Fact Sheet is similar to the sample population of participants at the University where this study took place (CAPTE, 2017), the participants were a convenience sample from the entry-level physical therapy program at one University. The use of participants from the first semester of the physical therapy program possibly helped to control for previous experience that could have potentially affected the treatment outcomes. However, the sample may not have been representative of entry-level physical therapy programs nationwide. Some programs may begin the first semester with core classes such as gross anatomy and kinesiology rather than the fundamentals in patient care instruction. Therefore, physical therapist students in other entry-level physical therapy programs may present with more clinical reasoning experience prior to a course on fundamental patient care skills is initiated within another PTE curriculum. Generalizations of the findings may only be applicable to a population with the specific characteristics as the study sample (Portney & Watkins, 2000). Although the sample population in this study was similar to the general population in PTE programs nationwide, it is limited by its application to diverse individuals. It is recommended that the effect of type of simulation-based instruction also be researched in populations outside of PTE in other healthcare professional education programs.

It must be made clear that “simulation is not, and can never be, a replacement for authentic experiential learning in the real world of clinical practice” (Ker & Bradley, 2010, p. 173). Simulation experiences utilized in this study were designed to prepare physical therapist students for performing patient transfers in a clinical environment and is not intended to replace actual clinical performance experiences. While it is known that simulation experiences cannot
replace actual clinical experiences (Ker & Bradley, 2010), the overarching goal of this study was to provide support for effective instructional strategies, specifically simulation-based instruction using simulated patients and peer role-play, in the preparation of physical therapist students for clinical performance in a dynamic and complex acute care clinical practice environment. Further research is recommended to identify if differences are seen outside the academic setting and in the clinical setting. It is also recommended that this study be repeated following the redesign of the simulation-based instruction to include a stronger emphasis on debriefing for reflection on experiences to promote deeper learning and more closely follow the experiential learning theory than originally designed. Other recommendations include improving the external generalizability of the results by including a sample beyond the University of Tennessee Health Science Center and a variety of levels of physical therapy students and investigating the use of simulation-based instruction with comparison to instruction without simulation to measure if the effect of simulation on clinical reasoning and confidence is any different than the results of this study.

Based on the results of this study, the use of simulated patients is no more advantageous than peer-role-play in terms of physical therapist students’ clinical reasoning and confidence skills when learning patient transfer skills. This may not be the case for other content areas or skill level of students and warrants further investigation. Although a new simulation center is appealing to integrate into instruction upon opening, implementation into PTE instruction should be based on evidence support verses novelty or appeal. Furthermore, future research should examine the fidelity of simulation-based instruction with an included debriefing component and with a variety of populations outside of PTE.
Implications

Although the use of simulated patients may appear to promote deeper learning by portraying a more real scenario for practicing patient care skills, it is no more advantageous than peer-role-play in terms of physical therapist students’ clinical reasoning and confidence when learning patient transfer skills based on the results of this study. Based on the results of this study, low-fidelity, e.g., peer role-play, methods as compared to high-fidelity simulation, e.g., simulated patients, appeared to be similar in its effect, and the former should continue to be considered by programs as it is often less costly. Despite limitations, the findings of this study contribute to the body of knowledge surrounding the use of simulation-based instruction to support physical therapist students’ clinical reasoning and confidence in performing acute care skills. Results of this study support the use of simulation-based instruction as a viable instructional strategy as both groups demonstrated the ability to clinically reason during a standardized patient simulated experience and confidence in performing acute care skills in the future.

Results of this study inform evidence-based practice for the design of instruction when using simulation with emphasis on clinical reasoning and confidence skills in PTE. “Simulation needs more supportive evidence, both in relation to its effectiveness and its efficiency in medical education” (Ker & Bradley, 2010, p. 174). Findings from this study can be used to help guide potential design of simulation-based instruction in entry-level PTE programs for preparation of clinical practice by ensuring the element of reflection or debriefing is included within the instruction or follows a simulated learning experience. Also, it is important to consider the expense of using simulation when designing instruction. When instructing foundational clinical skills such as patient transfer skills, it may be more beneficial financially to consider low-fidelity
simulation such as peer role-play to bridge the gap between knowledge and practice than compared to higher-level cognitive and clinical tasks such as deciding when to perform CPR on a patient with decreased responsiveness not addressed within this study.

I believe the instruction created in this study was fundamentally sound in placing emphasis on required components to be included in the simulation-based instruction. This study was guided by the simulation-based instruction components supported by Ker and Bradley (2010). In reflection of the instructional design used in this study, it was noted that Ker and Bradley’s components did not include a strong emphasis on debriefing. Other more recent literature supports a need for a strong emphasis, if not the strongest emphasis, to be placed on debriefing (Dreifuerst, 2015; Sabus & Macauley, 2016; Zigmont, Kappus, & Sudikoff, 2011). In sum, future design of instruction using simulation would likely benefit from emphasis placed on debriefing following the simulation experience to illuminate the reflection of the experience for the students.

Conclusion

Following the investigation of two simulation-based instructional sessions on physical therapist students’ clinical reasoning and confidence, results demonstrated no statistically significant difference between using simulated patients or peer role-play within the instruction of patient transfer skills. In other words, peer role-play can yield similar effects on learning patient transfers skills as simulated patients in the sense of student clinical reasoning and confidence in a PTE environment with limited access or funding for simulated patients or other high-fidelity simulation modalities.
REFERENCES


Appendix A

Permission to Use the Think Aloud Standardized Patient Examination Instrument
Subject: Re: JOPTE question from Jacque at UTHSC in Memphis
Date: Thursday, June 29, 2017 at 8:42:53 PM Central Daylight Time
From: LAURITA M. Hack
To: Bradford, Jacque L
CC: wf2214@cumc.columbia.edu
Attachments: PastedGraphic-3.tiff

Jacque, I am copying Dr. Fu here so that we can all be on the same page. The copyright to the material in her article, Development of an Innovative Tool to Assess Student Physical Therapists’ Clinical Reasoning Competency, is owned by the Journal of Physical Therapy Education. JOPTE hereby grants you the right to use the material included in the article.

In reviewing that article, I believe all elements of the TASPE are include within it. If you need additional material for your work, then you will need to obtain that from Dr. Fu.

I hope this clarifies copyright ownership and I wish you success in your work. Laurie

Laurita M. Hack, DPT, PhD, MBA, FAPTA
lhack001@temple.edu
610-519-0107
415 Gaetcombe Lane
Bryn Mawr, PA 19010

Professor Emeritus, Department of Physical Therapy
Temple University
Co-Editor
Journal of Physical Therapy Education

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On Jun 26, 2017, at 10:17 PM, Bradford, Jacque L <jbrad15@uthsc.edu> wrote:

Dr. Hack,

Hello! I hope this email finds you doing well.

It's been about a year now since I have emailed you below and I have made much progress in the past year. I have progressed in my coursework and am currently working on my dissertation proposal. I have another question for you if you don't mind. For my dissertation instrumentation I am considering the use of the Think Aloud Standardized Patient Examination (TASPE) developed by Dr. Wing Fu and published in JOPTE in 2015. I have communicated with Dr. Fu via email this past April and am awaiting
her permission to use her instrument. She has responded to me and informed me that she wanted to follow up with JOPTE prior to providing me consent. My question for you is, does JOPTE own the rights to her TASPE instrument published in JOPTE and should I truly be waiting on JOPTE permission as she informed me, or does she have right to grant me permission to use the TASPE for my dissertation project? The intent of my questioning is to seek final permission to use the TASPE for my dissertation instrumentation and assist Dr. Fu in collecting this information if possible. I understand how busy we all get during the spring semester and I would assume trivial tasks such as my request may not fall as high on her priority list (or yours for that matter) as it does on mine.

Thank you again for guiding me along as I begin my scholarly work as a PT educator. I appreciate your help tremendously.

Kindly,

Jacque

Jacque Bradford, PT, DPT, MS
Director of Clinical Education, Assistant Professor
Department of Physical Therapy
College of Health Professions
University of Tennessee Health Science Center
930 Madison Ave, Suite 640
Memphis, TN 38163
Telephone: (901) 448-2533
Fax: (901) 448-1411

From: UTHSC - Dept of PT <jbrad15@uthsc.edu>
Date: Wednesday, July 6, 2016 at 4:32 PM
To: Laurita Hack <lhack6001@temple.edu>
Subject: Re: Publication Suggestion

Dr. Hack,

Good morning. Since we last communicated about my EdD dissertation ideas in the emails below, I have learned more and more about what has already been done, and I have to decided to move on from that topic. I am reviewing the recent JOPTE and your guest editorial caught my attention about continuing the conversation on educational research in physical therapy. I am contacting you is to see if the 2016 CSM discussion on educational research is published somewhere, and if not, would you be willing to share some insight on areas that are desirable on the topic of educational research. I am curious if one of the areas would be interesting for my dissertation.

Sincerely,

Jacque Bradford, PT, DPT, MS
Director of Clinical Education
Department of Physical Therapy
College of Health Professions
The University of Tennessee Health Science Center
930 Madison Avenue, Suite 640
Memphis, TN 38163
☎ 901.448.2533 ✉ 901.448.5688 ⌜ jbrad15@uthsc.edu
Appendix B

Acute Care Confidence Survey
1. How certain are you that you can put a blood pressure cuff on a patient correctly in the acute care setting?

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2. How certain are you that you can determine if a patient is safe to go home from the acute care setting?

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3. How certain are you that you can decide if a person needs subacute rehab?

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4. How certain are you that you can safely perform a max assist transfer from a hospital bed to a wheel chair in the acute care setting?

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5. How certain are you that you can hear the first sound when taking a blood pressure in the acute care setting?

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6. How certain are you that you can accurately measure a person's knee flexion in the acute care setting?

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7. How certain are you that you can ambulate with a patient who has an IV in the acute care setting?

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8. How certain are you that you can instruct a person to get out of bed after a total hip replacement in the acute care setting?

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9. How certain are you that you can educate a physician that a patient does not need physical therapy in the acute care setting?

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10. How certain are you that you can determine an appropriate frequency of physical therapy for a patient in the acute care setting?

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11. How certain are you that you can interpret your patient’s hematocrit results to determine appropriateness of PT intervention in the acute care setting?

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12. How certain are you that you can safely assist a patient with supine to sitting who has a chest tube in the acute care setting?

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13. How certain are you that you can educate a nurse on how to properly transfer a patient who is touch-down weight-bearing in the acute care setting?

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14. How certain are you that you can identify when you need a second assistant with transferring a patient in the acute care setting?

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15. How certain are you that you can properly position a patient in bed with hemiplegia in the acute care setting?

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Appendix C

Permission to Use the Acute Care Confidence Survey
Re: Teleconference Follow up RE: ACCS Permission

Date: Wednesday, July 26, 2017 at 12:54:23 PM Central Daylight Time

From: Greenwood, Kristin

To: Bradford, Jacque L

Attachments: image001.png, image002.png

Hi Jacque,

Thanks for the reminder. Yes you have permission to use the survey as you discussed.

If you are willing will you share the two outcome tools you reference with me?

Thank you I look forward to hearing of your progress.

Kristin

Kristin Greenwood PT, DPT, EdD, MS
Board-certified Geriatric Clinical Specialist
Associate Department Chair &
Associate Clinical Professor
Department of Physical Therapy, Movement and Rehabilitation Sciences
Northeastern University

On Jul 26, 2017, at 10:46 AM, Bradford, Jacque L <jbrad15@uthsc.edu> wrote:

Dr. Greenwood,

Hello. Thank you again for taking the time during your summer to chat with me about your ACCS. As I continue to write, I appreciate your advice on incorporating the full survey rather than just the mobility subscale. I am curious to see the outcome. I followed up with Eric Stewart, and he said he used the TOSCE. Very close to TASPE. I looked into the TOCSE and it looks like it is a tool to measure IPE simulation experiences. This is great! I am going to look into the TOSCE for future potential research. Thanks for the lead.

I am curious if you had time to reply granting me permission to use the full ACCS survey for my dissertation research. The previous permission I received from you was just for the mobility scale. I have stipulated your conditions placed on my previous permission below:

- The survey is not altered including the permission statement
- The survey is referenced in my work
- I will keep you posted on my results

I hope you are enjoying your summer and I look forward to potentially meeting you at CSM.

Sincerely,

<image001.png>

From: "Bradford, Jacque L" <jbrad15@uthsc.edu>
Appendix D

Demographic Survey Using Qualtrics Software
Thank you for volunteering to participate in the study. Please answer the follow

Thank you for volunteering to participate in the study titled EFFECT OF EXPERIMENTAL-BASED INSTRUCTION ON PHYSICAL THERAPIST STUDENT CLINICAL PERFORMANCE. Please answer the following questions to the best of your ability and as you are comfortable answering. Should you have any questions or concerns, please contact Dr. Jacque Bradford at (901) 448-2533 or jbrad15@uthsc.edu.

Participant # (can be found on your informed consent form):

Participant age:

Participant gender:
- Male
- Female

Participant race:
- African American
- American Indian / Alaskan Native
- Asian/Pacific Islander
- Caucasian
- Hispanic/Latino
- Native Hawaiian / Other Pacific Islander
- Other
- Two or more races
- Unknown
Highest Education level:
- Undergraduate degree
- Masters degree
- Doctoral degree

Do you have any physical impairments that could limit you from performing patient transfers out of bed?
- Yes
- No

If you answered yes to Question #8, please describe any physical impairments you have that could limit you from performing patient transfers.

Do you have previous experience performing patient transfers through employment or with a family member?
- Yes
- No

If yes to Question #9, please briefly describe your experience with performing patient transfers.

If yes to Question #9, how much experience do you have in performing patient transfers in terms of weeks?
- < 1 week
- 1-2 weeks
- 3-6 weeks
- 7-12 weeks
- 12-24 weeks
- > 24 weeks
Appendix E

IRB Approval Letters
September 20, 2017

Jacque L. Bradford, PT, DPT, MS
UTHSC - COHP - Physical Therapy
640 930 Madison Building
930 Madison Avenue
Memphis, TN 38163-2243

Re: 17-05445-XP
Study Title: EFFECT OF SIMULATION-BASED INSTRUCTION ON PHYSICAL THERAPIST STUDENT CLINICAL PERFORMANCE

Dear Dr. Bradford:

The Administrative Section of the UTHSC Institutional Review Board (IRB) has received your written acceptance of and/or responses dated 08/22/2017, 08/28/2017 and 09/05/2017 to the provisos outlined in our correspondences of 08/17/2017, 08/25/2017 and 08/30/2017 concerning the above referenced project. The IRB determined that your application is eligible for expedited review under 45 CFR 46.110(b) categories (5), (6) and (7). The IRB has reviewed these materials and determined that they do comply with proper consideration for the rights and welfare of human subjects and the regulatory requirements for the protection of human subjects. Therefore, this letter constitutes full approval by the IRB of your application version 1.3 as submitted including:

- Demographic Survey Version 1.1 dated 09/02/2017.
- ACCS survey dated 08/10/2017.
- TASPE dated 08/10/2017.

All of the above were stamped IRB-approved 09/20/2017. You must use the date-stamped versions of study documents. Date-stamped materials are available in the Informed Consent and Other Project Documents folders of iMedRIS.

Approval of this study will be valid from 09/20/2017 to 08/11/2018.
In accord with 45 CFR 46.116(d), informed consent may be altered, with the cover statement used in lieu of an informed consent interview.

In the event that subjects are to be recruited using solicitation materials, such as brochures, posters, web-based advertisements, etc., these materials must receive prior approval of the IRB. Any revisions in the approved application must also be submitted to and approved by the IRB prior to implementation. In addition, you are responsible for reporting any unanticipated serious adverse events or other problems involving risks to subjects or others in the manner required by the local IRB policy. Lastly, you must request to close your project when you have completed data analysis. All of the above should be submitted to the IRB via the appropriate form in iMedRIS.

Re-approval of your project is required by the IRB in accord with the conditions specified above. You may not continue the research study beyond the time or other limits specified unless you obtain prior written approval of the IRB.

Sincerely,

[Signature]

Signature applied by James C Ekwensi on 09/20/2017 02:43:03 PM CDT

James C. Ekwensi, MBBS, MPH, MBA, DTM&H
Regulatory Specialist
UTHSC IRB

[Signature]

Terrence F. Ackerman, Ph.D.
Chairman
UTHSC IRB
Subject: PRO-FY2018-34 - Initial: Approval - Expedited
Date: Wednesday, September 27, 2017 at 4:48:52 PM Central Daylight Time
From: irb@memphis.edu
To: jlbarnes@memphis.edu, rcknsnsz@memphis.edu

Institutional Review Board
Office of Sponsored Programs
University of Memphis
315 Admin Bldg
Memphis, TN 38152-3370

Sep 27, 2017

Pi Name: Jacque Bradford
Co-Investigators:
Advisor and/or Co-Pi: Amanda Rockinson-Szapkiw
Submission Type: Initial
Title: EFFECT OF SIMULATION-BASED INSTRUCTION ON PHYSICAL THERAPIST STUDENT CLINICAL PERFORMANCE
IRB ID: #PRO-FY2018-34

Expedited Approval: Sep 20, 2017 (UTHSC Facilitated Review)
Expiration: Sep 20, 2018

Approval of this project is given with the following obligations:

1. This IRB approval has an expiration date, an approved renewal must be in effect to continue the project prior to that date. If approval is not obtained, the human consent form(s) and recruiting material(s) are no longer valid and any research activities involving human subjects must stop.

2. When the project is finished or terminated, a completion form must be submitted.

3. No change may be made in the approved protocol without prior board approval.

Thank you,
James P. Whelan, Ph.D.
Institutional Review Board Chair
The University of Memphis.
Appendix F

Informed Consent Form
EFFECT OF EXPERIMENTAL-BASED INSTRUCTION ON PHYSICAL THERAPIST STUDENT CLINICAL PERFORMANCE

The nature of this research study is designed to examine the effect of an experimental instructional strategy on physical therapist student clinical performance. The Principal Investigator of this study is Dr. Jacque Bradford. Should you have any questions about this research study, please contact Dr. Jacque Bradford at 901-448-2533 or jbrad15@uthsc.edu.

The purpose of this study is to examine if an experimental instructional strategy yields differing results than traditional instruction with physical therapy education instruction on a clinical performance task of patient transfers. All students in the Doctor of Physical Therapy course PT 505 Fundamentals in Physical Therapy will complete two, 2-hour instructional sessions and complete one clinical performance assessment in the simulation center. Both instructional sessions and the assessment will be performed by all students enrolled in PT 505 Fundamentals in Physical Therapy regardless of participation in this research study.

However, upon consent to participate in this study, you will be randomly assigned to either the experimental or comparison instructional group based on your assigned participant number written on this informed consent form using a six-block randomization algorithm. In basic terms, all participants will have an equal opportunity to be placed in the experimental group. Both groups will receive instruction on out of bed patient transfers. Groups will differ only in how the instruction on patient transfers will be provided. Further information on the specific differences between the delivery of instruction for each group will be provided upon the conclusion of the study. The difference between the standard education provided in the PT 505 course and participating in this research study is the task of completing a demographic questionnaire prior to participating in the instructional sessions, a brief 15-item confidence survey upon completion of the assessment segment, video recording, and half of those study participants randomized will receive experimental instruction. The Think Aloud Standardized Patient Examination (TASPE) will be completed during the assessment segment of the study, and will be completed by all students in the PT 505 course, regardless of participation in the study or not as a standard education requirement. However, data collected from the TASPE will be used in this study.

Each participant will participate in two, two-hour instructional sessions to learn and practice patient transfer skills used in physical therapy practice. Concluding the instructional sessions, each participant will complete an assessment to practice learned patient transfer skills in a simulation environment in the Kaplan Clinical Skills Center.

The assessment will last approximately 30-45 minutes and will be video recorded for the purpose of collecting instrument reliability data. No grades will be recorded during the assessment segment and is instructional in nature. The questionnaire and survey should take no longer than 5-10 minutes to complete.
Consent Form

There is one foreseeable risk for participation in this study which includes the loss of confidentiality as a risk in participating in the study. The anticipated benefit of participation in this study does not directly benefit you as the participant, but your participation has the potential to further evidence based practice on the use of the experimental instructional strategy in physical therapy education to promote more effective and efficient physical therapist student clinical performance.

Your participation is voluntary and if you choose to not participate or to stop participating at any time, your decision will not result in a penalty or affect your rights or your grade in any course.

Research participant confidentiality of data will be maintained solely by the Principal Investigator in a locked file cabinet or on a password-protected computer only accessed by the Principal Investigator.

You may contact Terrence F. Ackerman, Ph.D., UTHSC IRB Chairman, at 901-448-4824, or visit the IRB website at http://www.uthsc.edu/research/compliance/irb/ if you have any questions about your rights as a research subject, or if you have questions, concerns, or complaints about the research.

CONSENT OF SUBJECT:

You have read or have had read to you a description of the research study as outlined above. The investigator has explained the study to you and has answered all the questions you have at this time. You knowingly and freely choose to participate in the study. A copy of this consent form will be given to you for your records.

Signature of Research Subject (18 years +) Date Time

Printed Name of Adult Research Subject

Signature of Person Obtaining Consent Date Time

Printed Name of Person Obtaining Consent

09/1/2017 Page - 2 - of 3 Subject Initials

IRB NUMBER: 17-05445-XP
IRB APPROVAL DATE: 09/20/2017
IRB EXPIRATION DATE: 08/11/2018
Consent Form

In my judgment, the subject has voluntarily and knowingly given informed consent and possesses the legal capacity to give informed consent to participate in this research study.

Signature of Investigator __________________________ Date ______ Time ______
Appendix G

“Do’s and Don’ts of Simulation”

**Do** be both accurate and consistent each time you portray the case. Your goal is to present the essence of the patient case, not just the case history, but the body language, physical findings, and emotional and personality characteristics.

**Don’t** embellish the case. Don’t be creative in the details of the case and stray from the standardized information.

**Do** maintain role throughout the encounter no matter what the trainee may say or do in attempt to distract you from your role.

**Don’t** break from your role. Even if the trainee breaks from his/her role, the best thing to do is keep being you, the patient.

**Do** incorporate aspects of your own life when those details do not detract from the reality of the simulation. Try to feel, think, and react like the patient would. Begin to think about how “you” feel rather than the more distant stance of how the “patient” feels.

**Don’t** view the case as a script to be memorized since you will lose some of the reality of portraying a real patient.

**Do** provide feedback in your evaluation checklist as seen from the patient’s point of view.

**Don’t** simply restate in your feedback what the trainee did or did not do during the encounter.

**Do** self-monitor your comfort level with the role. You must believe in the plausibility of the role in order to assume it. Also, be sure that a simulation striking “too close to home” does not impact your ability to portray the role. If this is the case, then this role may not be a good match for you.

**Do** take the role seriously and carefully review the details of the case. Ask questions as you see possible discrepancies in the role and seek clarification when needed.