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INTEGRATED CLINICAL EXPERIENCES (ICES) IN PHYSICAL THERAPY: IMPACT ON COMMUNICATION SKILLS AND PROFESSIONALISM PRIOR TO FIRST FULL-TIME CLINICAL INTERNSHIP

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ABSTRACT

The purpose of this study was to investigate student and programmatic factors that may influence doctor of physical therapy (DPT) students' communication skills and professionalism before and after participating in a first time integrated clinical experience (ICE). Clinical education is an important component in healthcare education, including physical therapy (PT) education. It can take many forms including internships, co-ops, clerkships, and integrated clinical experiences (ICEs). The ICEs have been given specific attention in physical therapy because the Commission on Accreditation in Physical Therapy Education (CAPTE) has mandated their inclusion in DPT curricula. Best practices for ICEs, however, have not been published. This research study looked at Communication skills and professionalism as measured by the psychometrically-developed *Interpersonal Communication Questionnaire (ICQ)* and the modified *American Board of Internal Medicine (ABIM) Assessment Survey*. One hundred and sixty participants consented to participate in the study and completed the surveys. Correlations, mixed analysis of variance (ANOVA), hierarchical linear regressions (HLR), and hierarchical linear models (HLM) were conducted where Level one analysis examined how student-level predictors (gender, prior experience, age) relate to the overall student outcomes (Scores on the *ICQ* and modified *ABIM*: communication anxiety, communication confidence, interpersonal relations, and conveying medical information). Level two analysis examined how each regression coefficient of level one may be predicted by program level factors (ICE settings, ICE structure). Comparison between the control and intervention groups were conducted. Results of the analysis suggest that communication anxiety is a

significant predictor of self-report communication and professionalism. Participating in first ICE was not a predictor of communication skills and professionalism.

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TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

LIST OF FIGURES

FIGURE PAGE

CHAPTER 1

INTRODUCTION

Statement of the Problem

Clinical education is an important component in healthcare education, including physical therapy (PT) education (Mai, Stern, Hollman, Melzer, Thiele, & Rosenthal, 2014; Wruble Hakim, Moffat, Becker, Bell, Manal, Schmitt, & Ciolek, 2014; Weddle & Sellheim, 2011). It can take many forms (Hauer, Hirsh, Ma, Hansen, Ogur, Poncelet, Alexander, & O'Brien, 2012; Hirsh, Gaufberg, Ogur, Cohen, Krupat, Cox, Pelletier, & Bor, 2012), including internships, co-ops, clerkships, and integrated clinical experiences (ICEs). Integrated clinical experiences have been given specific attention in physical therapy because the Commission on Accreditation in Physical Therapy Education (CAPTE) has mandated their inclusion in Doctor of Physical Therapy (DPT) curricula. Best practices for ICE experiences, however, have not been published. The Commission on Accreditation in Physical Therapy Education (CAPTE) defines ICE as "Clinical education experiences that occur before the completion of the didactic component of the curriculum" (CAPTE, 2016). According to CAPTE, ICEs can "include but are not limited to: one day per week per term; a short full-time experience at the end of a term; a longer full-time experience between two regular terms" (CAPTE, 2016). It has been shown that active participation in guided learning during ICE participation leads to increased student satisfaction and improved academic outcomes (Weddle & Sellheim 2011). Although not all ICE

placements offer opportunities for students to practice psychomotor skills due to site specific restrictions, all ICE placements do have the potential to help students develop the attitudes, beliefs, and values necessary to become a competent entry-level practitioner. The two areas of particular interest for this study are communication and professionalism.

Expressive and receptive communication skills are critical to the successful development of entry-level physical therapists (Mai et al., 2014). These affective behaviors, however, are less likely to be explicitly taught and assessed in the classroom setting, and clinical instructors tend to be less comfortable grading a student down for deficiencies in this domain as compared to clinical skills (Hayes, Huber, Rogers, & Sanders, 1999; Hayward, Noonan, & Shain, 1999; Hayward, Blackmer, & Markowski, 2006; Black, Jensen, Mostrom, Perkins, Ritzline, Hayward, & Blackmer. 2010; Mai et al., 2014; Masin, 2002; Shepard, 2002). Given the critical role that affective communication skills play in the development of physical therapists, strategies intended to address and improve these skills should be explored.

The interest in getting students into clinical settings early is not unique to physical therapy. It can be seen in medicine (Cook, Irby, & O'Brien 2010; Littlewood, Ypinazar, Margolis, Scherpbier, Spencer, & Dornan, 2005), nursing (Nielsen, Noone, Voss, & Mathews, 2013) and other allied health professions (Mai et al, 2014; Wruble Hakim et al., 2014). Previous research has shown that medical and allied health students who have early clinical experience during their didactic training demonstrated increased confidence and perceived readiness for first full-time clinical internship after

participating in an ICE (Delany & Bragge, 2009; Walish, Olson, & Schuit, 1986; Weddle & Sellheim, 2011).

Previous research in physical therapy has shown that students who have had ICE exposure also report increased confidence in their communication abilities and feel more prepared to enter full-time clinical rotations than they did prior to their ICE (Babyar, Rosen, Sliwinski, Krasilovsky, Holland, & Lipovac, 2003; Hewson & Friel, 2004; Mai, Thiele, O'Dell, Kruse, Vaassen, & Priest, 2013; Mai, et al., 2014; Walish, Olson, & Schuit, 1986; Weddle & Sellheim, 2009; Weddle & Sellheim, 2011; Wilson, 2014). Most of these studies could not directly conclude that an ICE rotation improved confidence since no pre-ICE data were collected. Further research using a longitudinal design is indicated in order to improve internal validity in this body of literature.

Therefore, the purpose of this study is to investigate the relationship between student and programmatic factors that may influence a student's communication and professionalism in this group before and after participating in a first ICE. The student factors to be considered include age, gender, clinical experience prior to starting PT school, communication skills and professionalism. The student factors data were collected via self-report with communication confidence and anxiety data measured by the psychometrically-developed *Interpersonal Communication Questionnaire (ICQ).* The ICQ was developed for use with physical therapy students (Lewis, Bell & Ashgar, 2008). Additional communication skills and professionalism data were measured by the modified A*merican Board of Internal Medicine (ABIM) Assessment Survey.* The modified ABIM was developed to measure these variables with internal medicine

students (Symons, Swanson, McGuian, Orrange, & Akl, 2009). The programmatic factors considered in this study are school attended, ICE structure (academic clinical faculty vs. community clinical instructors), and the ICE setting (outpatient vs. inpatient). Programmatic factors data were collected through Key DPT Faculty Contacts at cooperating institutions as well as student self-report, including the student's perception of their clinical instructor's (CI) ability to guide the development of their communication skills and professionalism.

Definitions of Important Terms and Concepts

Integrated Clinical Experience (ICE): an active-learning method allowing early interactions between physical therapist students and patients/clients (Mai, 2013).

Experiential Learning Theory: learning that supports students in applying their knowledge and conceptual understanding to real world problems or authentic situations where the instructor directs and facilitates leaning (Wurdinger & Carlson, 2010).

Sociocultural Learning Theory: accounts for the fundamental role that social interaction plays in cognitive development (Vygotsky, 1978).

Community of Practice (CoP): a group of people that share a craft or profession (Lave & Wegner, 1991).

Clinical Instructor: physical therapists that supervise, teach, and assess student performance in a clinical setting.

Response shift bias: occurs when the experimental intervention changes the subject's evaluation standard during pre- post-test self-report measures (Howard, 1980).

Commission on Accreditation in Physical Therapy Education (CAPTE): accrediting agency that grants specialized accreditation status to qualified entry-level education programs for physical therapists and physical therapist assistants (capteonline.org).

CHAPTER 2

REVIEW OF LITERATURE

This literature review begins with consideration of learning theories, guided by major educational theorists that are relevant to clinical education in PT. Specifically, experiential, sociocultural, adult, and situated learning theories will be described, as each has been related to physical therapy education. The seminal works of theorists such as John Dewey and Lev Vygotsky, and subsequent theories related to their principles, help to incrementally frame this study of early Integrated Clinical Experiences (ICEs). As these theories and principles are addressed they will be related back to physical therapy education. Next, the importance of communication skills and their impact on clinician and patient outcomes will be examined. The review concludes with a transition from broader educational theory to pragmatic physical therapy-specific educational concerns, with the tension between opportunities and threats to clinical education serving to support the purpose of this study.

The literature review of clinical education across physical therapy and other allied disciplines supports the use of high quality, early ICEs (Hakim, et al., 2014; Mai et al., 2014). Integrated Clinical Experiences are a form of experiential learning (Hakim Wruble, et al., 2014). The clinical setting is where students are able to develop their psychomotor and clinical reasoning skills, along with affective behaviors and attitudes required of practicing physical therapists (Mai, et al., 2014). The availability of clinical sites for ICE placements across allied health disciplines, however, is limited

due to administrative barriers (Rodger, Webb, Devitt, Gibert, Wrightson, McMeeken 2008; Wetherbee, Palaima, McSorley, 2015), requiring effective use of clinical resources for all stakeholders: clinics, students and academic programs.

Experiential Learning Theory

John Dewey is the foremost theorist associated with experiential learning (Hakim Wruble, et al., 2014; Black et al., 2010). It was his contention that education and learning should not merely consist of the passing of information from a knowledgeable source to a novice without regard for factors such as applicability, prior knowledge and experience, or setting, as is typical of "traditional" education theories. Ideally, learning should occur in the setting in which the learner will be tasked to function (Dewey, 1938). This structure takes into account the learner's previous experience applied to the current situation, which Dewey termed "interaction", and an appreciation for the impact that experience has on the learner's future, both positive and negative, which he termed "continuity" (Dewey, 1938; Hakim Wruble et al., 2014). Experience can be considered the act of doing and undergoing the consequences of the action.

With experience described thusly, a child can "learn" that touching a flame is painful, and a dog can "learn" the boundaries of an electric fence through consequences. Dewey made the distinction that humans, unlike animals, can work though connections between actions and outcomes by thinking. The human generates an increased understanding of, and subsequent control over, circumstances as a result of thought and reflection. Therefore, learning requires the triad of taking action, undergoing the consequences of that action, and thinking about why the action and

consequences interact in the way they do. Ideal learning situations occur when impulse, observation, knowledge, judgement, and purpose interact to form perpetuated goal-oriented action, as well as the evaluation of the outcomes of those actions (Kolb, 1984).

This ability to think and learn in the manner described by Dewey, which is based on elements of the scientific method, is critical in the field of physical therapy. Physical therapy students and clinicians must 1) take a thorough patient history, 2) examine and evaluate subjective and physical findings, and 3) develop and execute a plan of care that is appropriate, evidence-based, amenable to the patient's desires, and culturally sensitive. The physical therapy student is utilizing both the interaction of previous experience and knowledge applied to the current clinical problem, as well as the continuity of the knowledge gained in the current clinical setting for future reference. When viewed through a Dewian lens, ICEs serve as opportunities where the clinical setting is central and critical to the development of clinical reasoning skills, psychomotor skills, and communication skills with actual patients (Hakim Wruble et al., 2014). The learning environment of the clinic is social, where knowledge is potentially constructed and reconstructed (Guba & Lincoln, 1994) through social interaction and linguistics. Given the social characteristic of the ICE learning environment, consideration of sociocultural learning theory is indicated.

Sociocultural Learning Theory

L. Vygotsky espoused a sociocultural theory of learning that emphasizes the role that social interaction and linguistics play in learning (Vygotsky, 1978; Black, et al., 2010). Vygotsky was critical of many of his peers, including but not limited to

Piaget, Binet, Koffka, and Thorndike, since he indicated that these dominant learning theorists underestimated the significance that factors such as shared language, culture, and society plays in learning (Vygotsky, 1978). Where Piaget believed that development precedes learning, Vygotsky posited that learning precedes development (Fosnot, 2013). This is an important distinction, as these impact both the design and assessment of learning opportunities. When a learner is presented with a difficult problem that he/she cannot solve independently, Vygotsky noted that guidance from a teacher or more knowledgeable peer may help the learner progress. The difference between what one is capable of doing independently and what is capable of with the guidance from a teacher or more knowledgeable peer is what Vygotsky referred to as the Zone of Proximal Development (ZPD) (Vygotsky, 1978). The assessment of ZPD is seen as prospective (what is the potential) as opposed to retrospective (what is the current level of development). Integrated Clinical Experiences offer the opportunity for physical therapy students to engage in the ZPD with the mentorship of clinicians and/or peers (Weddle & Selheim, 2011; Mai et al., 2014). As Aljaafreh and Lantolf state so elegantly with regard to professional education theory: "The ZPD is the framework, par excellence, which brings all of the pieces of the learning setting together- the teacher, the learner, their social and cultural history, their goals and motives, as well as the resources available to them including those that are dialogically constructed together" (Aljaafreh & Lantolf, 1994, p. 468).

There is a shared culture in any profession, including physical therapy, with a dialogically constructed lens through which the profession frames and addresses problems. The linguistic tradition helps ensure shared social meanings (Wilson,

1993), both within the profession and external to it. In order for the student to grow in the psychomotor skills and linguistic tradition of the profession, the student must participate in activities with a mentor in realistic settings, face challenges that are beyond their current proficiency with guidance from their mentor but not beyond their ZPD, share in the dialogue specific to their discipline, and in turn embody the culture of the profession set before them. In this way, learning is seen as a directional path that moves from a social plane that is external to the learner, to the internalized psychological plane, and then outward again as the student grows into the intellectual and cultural practices of their professional community (Black et al., 2010).

Research related to core Vygotsky ideas expands on these principles. Professional episteme, or knowledge, is grounded in dialogism (Renedo, 2017), whereby the learner actively reworks others' knowledge while infusing their own prior experience, values and intentions (Bakhtin, 1981) to form new knowledge. This process is fluid, where new dialogue, experience and conflict prompt the learner to reconsider and reframe their current knowledge frame (Renedo, 2017). Physical therapist education, particularly ICEs, have been shown to provide concrete learning experiences where communication, experience, setting, mentoring, and reflection interact to maximize students' learning efforts (Weddle & Selheim, 2011). The works of Arthur Wilson and Malcolm Knowles further frame how ICEs serve to support the learning and development of physical therapy students. Their work is identified as Adult Learning theory and this work will be considered next.

Adult Learning Theory

Adult learning theorist Arthur Wilson, like Vygotsky, criticized learning theories that frame learning as an individual and internal mental process where knowledge is acquired and stored for future use across circumstances (Wilson, 1993). Wilson, and other scholars such as Rogoff and Lave, consider knowledge and learning not as merely internal mental processes, but highly sensitive to context, or "fundamentally situated" in context (Wilson, 1993, p. 73). The interactions among and between people, settings, and tools are what ultimately constitute a learning experience (Wilson, 1993). Wilson, as well as Knowles (1980), through his concept of andragogy, maintain that adult learning is centered on experiences associated with everyday problems in their social world. One of Knowles' objectives was to differentiate adult learning from the way children learn by means of andragogy (construction of new knowledge on the foundations of what one already knows), in contrast to pedagogy, where the role of the learner is a dependent one in relation to the teacher. Key to Knowles' andragogy are the adult learner's need to know, their self-concept of learning with regards to their responsibility to learn, the role of learner's experiences, readiness, orientation to learning (needed to deal with the situation at hand), and the motivation to learn based on desire to learn (Knowles, et al., 2005). Physical therapy students, when immersed in the clinical setting, are required to interact with clinical instructors and patients. The ICEs are one format, early in the educational process, for student physical therapists where the need and motivation to learn are potentially actuated. When compared to the classroom setting, it is more challenging for students to be volitionally invisible in the clinical setting, thereby

providing motivation to be "ready". From a theoretical perspective, learning should be seen as occurring along a continuum throughout a lifetime requiring varied strategies, emphases, and problems at different times (Taylor & Hamdy, 2013) which is required to progress from a developing clinician towards expertise (Jensen et al., 1992). This requires the development of lifelong learning skills (Saarinen-Rahiika & Binkley 1998), a concept identified in the American Physical Therapy Association (APTA) Vision Statement for Physical Therapy 2020, the Standards of Practice for Physical Therapy, and the Code of Ethics (APTA.org).

Situated Learning Theory

Experiential, sociocultural and adult learning theories aim to expand the understanding of learning beyond purely internal and individual processes, and against the backdrop of previous theories that ignored or discounted the contextual facets of learning. This understanding of learning led to Wilson's "Situated Cognition". Once situated in a clinical exchange with a patient, physical therapy students' didactic knowledge will be insufficient to address all of a patient's concerns. The didactic knowledge must now be applied in a genuine clinical encounter, such as an ICE. It is at this juncture where the "magic" happens. The student's implicit knowledge becomes a legitimate lifeline of sorts in otherwise unfamiliar circumstances, and they are now a legitimate participant as a member of the culture of physical therapy (Brown, Collins & Duguid, 1989). The psychomotor skills required to use the "tools" of the profession (measurement devices, documentation requirements etc.), the affective and receptive communication skills required to examine, instruct, and gain rapport with patients, and opportunity to function as a health care provider with the

inherent roles and responsibilities that have been socially constructed, serve as the framework for the student, CI, and patient interaction (Brown, Collins & Duguid, 1989). This exchange between student, CI and patient also consists of expectations of all stakeholders that have been socially mediated at some point in history. For example, from the patient's perspective, what would be usual and customary for the patient to expect from a visit to a physical therapy clinic? From the CI's perspective, what should the physical therapy student be capable of at this point in their professional education? From the standpoint of the student, what type of student/mentor relationship is most effective? Furthermore, expectations of other stakeholders (referring physician, insurer/payer, employer, family members etc.) must be taken into consideration during a clinical encounter. Ideally, the student is not only making internal connections in real time (situated cognition), but also establishing a knowledge-base from which to draw on subsequent clinical encounters in a manner similar to that described by Vygotsky. The clinical setting is central to the learning that is occurring, where content "become something more to learn about rather than simply something useful in learning" (Brown, Collins & Duguid, 1989, p 41). Learning is no longer separated from the experience or the context of the situation.

Wilson's work provides a foundation for Lave and Wegner's work specifically their conceptualization of a community of practice, which has had important influence in PT education (Black et al., 2010; Hayward, Blackmer & Markowski, 2006; Rose, 1999). These latter theorists emphasize the social aspect of learning which they see becoming more crystalline as the learner becomes more involved in the community or culture of learning. The learner has the opportunity to participate in and understand

the history, assumptions, cultural values and rules of their chosen profession in what Lave and Wenger refer to as a Community of Practice (CoP) (Lave & Wegner, 1991). As with the other social theories of learning, the crucial elements of context and community are emphasized. Lave and Wegner's CoP concept is defined as "groups of people who share a concern, set of problems or passion about a topic, and who deepen their knowledge and expertise in the area by interaction on an ongoing basis" (Wegner, McDermott & Snyder, 2002, p. 4). The CoP serves to both guide and encourage the learner (Lave & Wegner, 1991; Taylor & Hamdy, 2013), and is perhaps the most salient way to frame clinical education. The work of Lave and Wegner has been applied to physical therapy education as it recognizes that students function within the specific CoP initially as novices working with more knowledgeable and experienced therapists in realistic clinical settings that lead to the development of the student's professional identity (Black et al., 2010; Hayward, Blackmer & Markowski, 2006; Rose, 1999). Black and colleagues have lead the development of these ideas in physical therapy education. They note that, initially, novices may feel "like peripheral, albeit legitimate, participants" when first participating in the CoP, but over time come to function as an integral team member (Black et al., 2010 p. 1768). There is also evidence that over time participants adopt certain behaviors, attitudes, skills and behaviors based on their participation in the CoP (Black, et al., 2010). There is a reciprocity during the formation of identity, or professional identity, where "who you are becoming shapes what you know or come to know, and what you know shapes who and what you are becoming" (Black et al., 2010, p. 1769). When examining a CoP holistically, the community itself becomes a vehicle by which long-term

organizational memory is developed and maintained and leads to what is referred to as social capital that is passed along to its members. Social capital has been defined as "the sum of the actual and potential resources embedded within, available through, and derived from the network of social relationships possessed by an individual or social unit" (Nahapiet & Ghohal, 1998, p. 243). As an emerging member of a particular profession, one must develop a professional identity that is consistent with the formal organization. A facet of developing professional identity is learning how to communicate effectively as a representative of the profession (Brown, Collins & Duguid, 1989).

Although not a situated learning theorist, the work of Kolb also provides important insights that are applicable to PT clinical education. He maintains that difficulties arising from learning communication and problem-solving skills are epistemologically based, where he defines epistemology as the origins, nature, methods and limits of knowledge (Kolb, 1984, p. 37). He contends that teaching approaches should be fluid depending on the content; for example, teaching statistics is different than teaching empathic listening. Kolb found the behavioral and cognitive learning theories insufficient due to their lack of accounting for objective experience, consciousness, and subjective experience. Kolb offers that 1) learning is best conceived as a process, not an outcome, 2) learning is a continuous process grounded in experience, and 3) the process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world (Kolb, 1994). The first tenet stands in contrast to the works of philosophers such as Locke, who offered that there exist elements of consciousness that stand immutable and therefore should

be objective and quantifiable. Kolb (1994) argues "no two thoughts are ever the same, since experience always intervenes" (p. 26). These two theorists clash on their views and therefore they would structure educational experiences and assessments differently. The second tenet speaks to the continuity of experience; as circumstances change it is not necessary to rebuild the new experience, rather, we draw upon our past experiences (William James grappled with this idea as he pondered how someone awakes the next day with the same consciousness from the previous night). Dewey also referenced this notion of continuity of identity being applicable to both individuals and communities (Dewey, 1938; Kolb, 1994).

Kolb's third tenet draws from Lewin's four modes (or abilities) of experiential learning. Kolb's four modes of experiential learning are 1) concrete experience abilities (involve self in new experiences openly and without bias- feeling), 2) reflective observation abilities (to reflect on and observe their observations from many perspectives- watching), 3) abstract conceptualization abilities (to form sound theories from one's observations- thinking), and 4) active experimentation abilities (use theories to make decisions and solve problems- doing). The effective learner needs to have skill in each of these abilities, despite their opposing nature. Indeed, Kolb conceptualized them as cyclical (The Kolb Cycle- Kolb, 1984). This leads to his naming of four basic learning styles: 1) the converging style (abstract, active), 2) the diverging style (concrete, reflective), 3) assimilating style (abstract, reflective) and 4) the accommodating style (concrete, active). These modes when viewed in pairs stand opposed to each other (see Figure 1): concrete experience on one end and abstract conceptualization on the other (feeling-thinking); to actively experiment and be a

reflective observer (doing-watching). Kolb proposes that as one is learning, one is moving along each continuum: from direct involvement to analytic detachment and from action taker to observer.

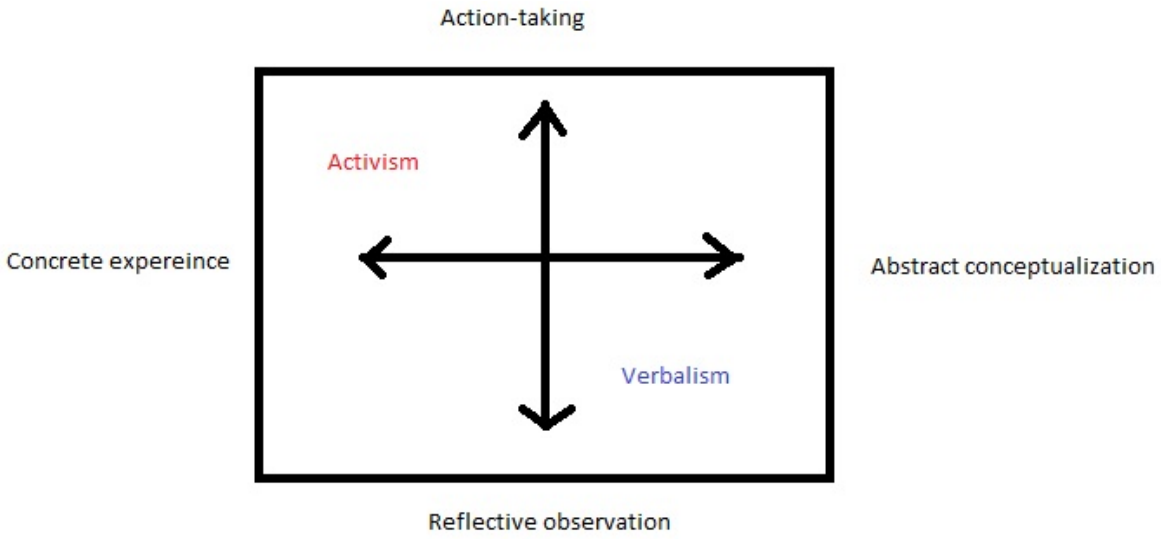

Figure 1. Representation of Lewin's 4 modes of experiential learning.

Kolb also posits that how these modes are resolved, or to what degree one mode may dominate the other, will effectively determine the resulting level of learning. He cites Freire, where dominance of action modes results in "activism" and dominance of reflective modes results in "verbalism" (p. 31) (see Figure 1). For Kolb, learning style is not a fixed trait, but a differential preference for learning that is apt to change from situation to situation (Coffield, et al., 2004). If an individual becomes adept at moving across these modes, it allows for "complexity and the integration of dialectic conflicts among the adaptive modes [that] are the hallmarks of true creativity and growth" (p. 31). The ability to be adept at both taking action and being reflective is requisite in clinical education.

Applications to Physical Therapy

Some theoretical ideas just discussed have been further developed in physical therapy and deserve further attention. Experiential, sociocultural, adult learning, and situated learning theories have been used to frame research in physical therapy education (Hakim Wruble et al., 2014; Weddle & Sellheim, 2011; Mai et al., 2014; Jensen et al., 1992). As previously mentioned the CoP is a powerful and salient model that is applicable to physical therapy education (Black et al., 2010; Hayward, Blackmer & Markowski, 2006; Rose, 1999). Opportunities that allow students to compare what they already know to new situations and reflect upon the differences, known as reflection in action, is critical to andragogy/ adult learning theory (Wilson, 1993; Knowles, et al., 2005) and this is essential in clinical learning situations. Ideally, in clinical education students reflect on their didactic and clinical knowledge to address a new patient situation. This idea has been developed in physical therapy education with emphasis on "the reflective practitioner" (Shepard & Jensen, 1990).

Taylor and Hamdy (2013), noted medical education researchers, argue that reflection in action, though critical, does not constitute a comprehensive model for clinical learning. Reflection *on* action must be considered as well. Reflection on action occurs when the learner thinks about the processes they used and considers the level of rigor and appropriateness of fit of the materials and processes they will employ (Taylor & Hamdy, 2013). This step is critical to the clinical sciences such as physical therapy, and the effective CI can, ideally, help facilitate this learning process.

Sociocultural aspects of learning are important, particularly when considering methods to teach clinical "soft skills" such as communication and professionalism. The critical elements of sociocultural theories are the roles of context and community,

and the clinical setting in physical therapy education is where these soft skills are utilized in practice. The works of Dewey, Vygotsky, Lave and Wegner, Wilson, Knowles and Kolb emphasize the importance of experience, sociocultural influences, community of practice, situated cognition, andragogy, and situated experience, respectively. It is critical though, to understand how these theories are related as well as the limitations in their development.

Learning theories that are heavily based on internalized cognitive processes fail to adequately capture the development of communication skills and professionalism. Skills in communication are particularly important in physical therapy education, as they are linked not only to academic success, but patient outcomes as well. Given the importance of communication skills, this literature will be considered.

Communication Skills

Communication skills have been linked to various practitioner and patient outcomes. Understanding and appreciating professional roles and responsibilities, and communicating effectively, have been shown to impact patient and provider outcomes positively in multi-disciplinary care settings (Suter, et al., 2009). Quality of communication during history-taking and discussions regarding plans of care have been shown to have an influence on patient emotional health, symptom resolution, function, physiologic measures such as blood pressure and blood sugar levels, and pain control (Stewart, 1995). Clinician-patient communication influences health outcomes such as adherence and self-care skills and has been shown to have more

global effects such as increased access to care, improved shared governance between clinicians and patients, and better management of emotions (Street et al., 2008).

The APTA is the professional organization of physical therapy. This organization lists communication skills as one of sixteen Minimal Required Skills of Physical Therapist Graduates at Entry-Level (APTA, n.d.). As previously mentioned, behaviors associated with communication skills are less likely to be taught and assessed in the classroom setting (Hayward, 2006; Hayward, 1999; Hayes, 1999; Mai, 2014; Shepard, 2002; Masin 2002). One method of developing and assessing interpersonal skills like communication in physical therapy students is through clinical experiences such as ICEs (Mai et al, 2014).

Clinical Education and Learning

Now that we have addressed educational theory and looked at physical therapy specific application of theory it is time to pragmatically consider the environment in which clinical education occurs. The aim of physical therapy education is to prepare students to be "effective contemporary practitioners of physical therapy" (apta.org). The APTA has published Minimum Required Skills of Physical Therapist Graduates at Entry Level (apta.org), which indicates that the successful graduate is capable of providing services across the lifespan of patients and clients with cardiovascular, pulmonary, musculoskeletal, neuromuscular, and other system diseases. In order for the academic programs to be in compliance with accreditation standards, the programs must demonstrate that they successfully meet the goals and objectives outlined by the Commission on Accreditation in Physical Therapy Education (CAPTE). How goals and objectives are met by each PT program is not

prescribed; although necessary to reduce variation in education, best practices have yet to be established (Jette et al., 2014). Physical therapy programs utilize various educational methods, including but not limited to readings, lectures, group projects, on-line self-instruction, hands-on lab sessions, and clinical internships. There is evidence that the expectation that a new graduate is prepared to practice in any setting, providing care to all age groups, is unrealistic under current clinical education models (APTA, 2017; IOM, 2011). This tension point that exists between theory and practice necessitates further investigation of clinical education practice. Early clinical exposure such as ICEs during didactic training, prior to full-time clinical internships, have shown promise as a method of enhancing clinical education (Mai et al., 2014; Hakim Wruble, et al., 2014).

Integrated Clinical Experience programs have been long used by medical schools (Dyrbye, Harris, & Rohern 2007) and more recently in physical therapy education. Studies have shown that medical school students have benefitted from their ICE experiences, such as practicing basic tests and measurements in authentic environments, increasing motivation from early and direct patient contact, and providing exposure to professional role models (Hakim Wruble, et al., 2014). Depending on the setting, the student may be required to interact with other healthcare providers, a patient's family members, or teachers. Interacting with other professionals and various stakeholders serves to develop the student's professional identity in a way that is not possible in the classroom setting.

As students progress from novice to entry-level practitioners and beyond, the growth process is potentially influenced by various mentors and role models. In

physical therapy, the role model demonstrates the core values of professionalism as defined by the APTA (http://www.apta.org/Professionalism/). There are opportunities in the classroom to serve as a role model, but they are limited at best. In the clinical setting one can serve as a role model explicitly, or while performing daily activities without any awareness of serving this additional purpose. With regards to professional education such as physical therapy, a hidden curriculum in which organizational structure and culture exerts influence (Dutton & Sellheim, 2014). This is made evident in the form of clinical instructors and peers telling parables and role modeling, transmitted informally in the clinical setting (Stern & Papadakis, 2006). For example, student learning of compassion/caring has been shown to be associated with attributes within the hidden curriculum through professional communication (Dutton & Sellheim, 2014).

Although the clinical setting is an ideal setting for development of psychomotor and communication skills, not all experiences are necessarily educative (Dewey, 1938). It has been shown that active participation in guided learning as described by Dewey and the assumption of legitimate clinical roles during ICE participation is associated with increased student satisfaction and improved academic outcomes (Weddle & Sellheim 2011). This assumes that the clinical instructors are aware of best teaching practices as described, which may not always be true. According to the Annual Report to the 2017 APTA House of Delegates, the Best Practice for Physical Therapist Clinical Education Task Force (BPCETF) reported that the quality of clinical education is "dependent on the clinical instructor, who may or may not be an effective teacher and may lack a strong connection to the academic

program" (p. 47). There is evidence that there is no change in professionalism associated with increasing participation in clinical education (Jette & Portney, 2003). Given the academic and clinic administrative barriers inherent in clinical education, methods to improve clinical education must continue to be pursued (Jette, 2014).

Administrative Barriers to Clinical Education in Allied Health

The availability of clinical sites across healthcare disciplines is currently threatened by influences such as fiscal constraints, changes in practice models, and staffing issues (Rodger, Webb, Devitt, Gibert, Wrightson, & McMeeken 2008; Wetherbee, Palaima, & McSorley, 2015). According to the American Association of Colleges of Nursing (2012), in 2011, over 75,000 qualified applicants were denied admission to a baccalaureate nursing program due to a lack of clinical teaching sites for nursing students. Although the shortage of physical therapy clinical sites is not as dramatic as in nursing, it has been negatively impacted by economic stressors. For example, Medicare Part B guidelines require that only services provided by a licensed physical therapist (and not a physical therapy student) can be reimbursed (HSS), which can negatively impact productivity in those settings where there is a substantial Medicare patient population (Wetherbee, Palaima, & McSorley, 2015). As a result, clinics have been less able to offer clinical rotation placements to students, particularly in outpatient and skilled nursing facility sites.

There is conflicting evidence regarding the impact of clinical education provision on clinical instructor productivity in rehabilitation sites. An early study reported an increase in productivity due to an increase in the number of patients seen, evaluations performed, and charges generated by the student and clinical instructor

pair versus the clinical instructor working alone (Dillon, Tomaka, Chriss, Gutierrez, & Hairston, 2003). It is not clear how restrictions on student involvement in billable services was handled. Similar results were demonstrated in a more recent study that examined productivity in an Occupational Therapy (OT) setting (Ozelie, Janow, Kreutz, Mulry, & Penkala, 2015). Another factor that has been studied in addition to concerns related to productivity, is clinical instructor burn-out which has been shown to contribute to the shortage of PT clinical sites (Wetherbee, Palaima, & McSorley, 2015).

In its 2017 Annual Report to the APTA House of Delegates, the BPCETF reported "the static payment for provision of services that does not keep pace with increased costs has resulted in an increased financial burden on clinical sites" (APTA, 2017). Novel approaches to clinical education, which are beneficial to both school and clinic, need to be developed and assessed. Recently, the New England Consortium of Clinical Education (NECCE) has been meeting with clinic owners and managers in order to understand the administrative and fiscal challenges clinics face when taking physical therapy students. Proposals have included increasing length of internships (up to one year) in an effort to recoup lost productivity at the beginning of the internship, tiered licensure, and paying clinical sites to take students.

There is also an issue related to capacity for clinical placements in the community. There are currently 233 accredited academic physical therapy programs in the U.S., with an additional 20 programs under development (CAPTE, 2016). The proliferation of programs, along with the expansion of some existing programs, longer clinical experience/ internship terms, residencies and fellowships in physical

therapists, observation and volunteer hours for prospective students, physical therapy assistant clinical education programs, and other non-physical therapy internships have negatively impacted clinical site availability (APTA, 2017).

Further compounding diminishing clinical site availability is the current staffing shortage of both academic and clinical instructors. In the U.S., there are currently 348 vacant faculty positions in physical therapy programs across the nation (CAPTE, 2016). The Association of Academic Health Centers (AAHC) identified physical therapy as an allied health field whose academic faculty shortage is problematic (AAHC, 2007). An APTA report from 2014 projects a shortage of practicing physical therapists ranging from 13,638 to 27,820, depending on the attrition rate of currently practicing physical therapists (APTA.org). According to a report by the Conference Board, cited by the APTA, an increase in demand for health care coupled with an aging population will push the number of needed licensed physical therapists as high as 232,000 by 2020 from an estimated 176,000 in 2014 (APTA.org).

The literature supports the use of ICEs in entry-level physical therapy curricula prior to first full-time clinical internships. Prior studies have indicated that ICEs are grounded in experiential, sociocultural and adult learning educational theories (Wruble et al., 2014; Mai, et al., 2014; Weddle & Sellheim, 2014). They are also now mandated by CAPTE as a required component of all physical therapy curricula. Many physical therapy programs had already instituted ICEs prior to this accreditation mandate, however, there is variability in the structure of these experiences. Other programs have not yet established ICE programs. Studies that examine the outcomes

of various models while considering student-level predictors are necessary as physical therapy programs develop ICEs. This study is an effort to further understand affective skill development of students with heterogeneous prior experiences across a variety of settings. Given the limited amount of clinical education time available during didactic training, factors that make the best utilization of this time should be explored.

CHAPTER 3

METHODOLOGY

A repeated measures, pre-post design was utilized in this study with first year DPT students from five schools as participants. The treatment in this study was student participation in their first ICE as part of their DPT curriculum. Participation in the study involved completing three surveys pre- and post- first ICE. The three surveys were a demographic and prior experience survey and two psychometrically-developed tools designed to measure communication skills and professionalism of healthcare practitioners, *Interpersonal Communication Questionnaire* (*ICQ*) and the modified *American Board of Internal Medicine survey* (Mod*ABIM*), respectively.

Data were collected at the beginning of the Fall semester, 2017, and again at the conclusion of the Fall semester. A Key DPT Faculty Contact was identified at each of the cooperating institutions who administered, collected, and returned the surveys to the investigator. The Key DPT Faculty Contacts were instructed to administer the surveys either immediately before or immediately after a class session. The risks associated with this study were minimal to non-existent. The benefits of this study are that it will help inform best practices for early physical therapy education as well as examine growth of communication skills and professionalism over time. The study was fully approved by the Institutional Review Board at the University of Rhode Island, and were also approved at each cooperating institution via Institutional Agreement Authorization.

Sample

Convenience sampling identified potential subjects from five Commission on Accreditation in Physical Therapy Education (CAPTE) accredited DPT programs. Table 1 provides data on each of these institutions and their DPT Programs. Data collections sites were the University of Rhode Island (URI), University of Hartford (UH), Simmons College (SIM), Stony Brook University (SBU), and Franklin Pierce University (FPU). A sixth DPT Program agreed to participate in this study but only 13 pre-test surveys were returned out of 74 suggesting that data collection procedures were not followed. This institution and the related data were dropped from the study. Data from URI, UH and SIM served as the experimental sample as their students participated in an ICE during the time of the study. Students from the remaining DPT programs served as the control group because they did not participate in an ICE during the time of the study. The DPT programs had similar characteristics in terms of program size (32 - 55 students in each cohort) and geographic location (northeastern United States). The key inclusion criteria were DPT programs that required ICEs for their first-year students prior to their full-time clinical rotations (experimental group) and DPT programs that did not require ICEs for the Fall semester (control group). Additional criteria included voluntary participation and the ability to read and understand written English.

Data Collection Tools

Three data collection tools were utilized in this study: demographic and prior experience survey, *ICQ,* and Mod*ABIM*. Each will be described.

The development of the demographic and prior experience survey was informed by the literature. As the current study is intended to move the physical

therapy (PT) profession's understanding of the ICE experience forward, another study to address the issues of interest was foundational in its development. The study found in the literature that is closest to the current study is Mai et al. (2014). This research team collected demographic information including age, sex, number of volunteer hours completed prior to admission to DPT Program, and prior paid experience as a PT Aide (see Appendix A). The same information was collected in this study since these variables have been shown to be related to Communication and Professionalism variables, the primary variables of interest in this study. Additionally, Symons, Swanson, McGuain, Orrange & Akl (2009) found gender differences in the Mod*ABIM*, where compared to females, males rated themselves more positively on three of the questionnaire items (*telling your patient everything*, $p = 0.032$; *explaining to your patient what they need to know*; $p = 0.040$; and *using words they can understand*, $p = 0.017$)

The *ICQ* measures communication anxiety (ComAnx) and communication confidence (ComConf) related to clinical experiences (see Appendix B). The tool was originally designed for use with PT students interacting with simulated patients (Lewis, Bell, & Ashgar, 2008). Test-re-test reliability was reported as $r = 0.72$ for the confidence subscale, and 0.70 for the anxiety subscale. The *ICQ* is an eight-item survey with a 5-point Likert-scale ranging from "Strongly Disagree" to "Strongly Agree". Four items make up the ComAnx subscale. The remaining four items measure ComConf (see Appendix B). The eight statements include positive statements (e.g. "I feel confident that I can interact with patients) and negative statements (e.g. "I am not quite sure of myself when interacting with patients"). With the given Likert scale,

double negative statements were scored as positive (e.g. “Strongly disagree- I am not quite sure of myself when interacting with patients”). The *ICQ* has also been used with PT students participating in ICE (Mai et al., 2014). There is no other tool that this investigator is aware of that has been designed to measure these constructs in physical therapy.

The Mod*ABIM* survey is a self-assessment of communication skills and professionalism originally used with medical school residents (See Appendix C). Participants were asked to indicate their level of performance on 11 interpersonal activities on a 5-point Likert scale (e.g. “ Using words they can understand when explaining their problems and treatment; explaining any technical medical terms in plain language”), ranging from “Poor” to “Excellent”. The survey includes two subscales, interpersonal relations (InterRelations) and conveying medical information (ConveyMedInfo). This investigator was granted permission to modify the modified *ABIM*, with an added descriptor for the purpose of making it consistent with the *ICQ and* further clarifying that the subject of interest in the questionnaire refers to patients. The internal consistency reliability (Cronbach’s alpha) has been reported to be an acceptable 0.86. The internal consistency of these subscales were 0.82 and 0.80 respectively (Symons, et al., 2009).

Data Collection Procedure

Potential subjects were introduced to the study through a Key DPT Faculty Contact at each school. These Key DPT Faculty Contacts were identified with the assistance of the Director of Clinical Education (DCE) at the University of Rhode Island. Surveys were distributed to the subjects, which included intent of the study

and instructions for completion (see Appendix A). Completion of the surveys implied consent. Participants were able to refuse to participate in the study at any point in time, with no negative consequences. The surveys were collected by the Key DPT Faculty Contacts and returned to the principal investigator (PI) via a provided pre-paid postage envelope and stored in a locked cabinet (Room 126, Independence Square).

Each participant used the last four digits of their student identification number as their unique identifier, and the surveys were color-coded by institution in order to match pre-and post- measures and allow for grouping during data analysis. Data collection occurred early in the 2017 Fall Semester (pre-test) and late in the 2017 Fall Semester (post-test). The second data collection occurred after participants had participated in their first ICE (approximately 4 hours per week for 12 weeks). The Key DPT Faculty Contact at each school (who was otherwise uninvolved in the study) administered the data collection tools to the participants in paper-form.

The "treatment" in this study was participation in an ICE. The researchers did not have any role in setting up ICEs, assigning ICE sites to students, or evaluating ICE performance. These experiences are a regular part of each school's DPT curricula and would occur with or without this study. The control group participants are from DPT schools that do not provide ICEs to their students during the Fall semester.

Table 1

School Description

School	Total Enrollment	Public/ Private	DPT Program Size	Cohort Size	Pre-Test Surveys Returned (n%)	Post-Test Surveys Returned (n%)

FPU	1,720 undergraduate 320 graduate	Private	124	54	100	100
SIM	1,700 undergraduate >4,000 graduate	Private	81	43	100	81
URI	14,801 undergraduate 3,033 graduate	Public	95	30	90	100
UH	5,171 undergraduate 1,566 graduate	Private	105	43	98	86
SBU	17,364 undergraduate 8,625 graduate	Public	255	84	88	73

Sources
http://www.franklinpierce.edu/about/facts.htm
http://physical-therapy-schools.startclass.com/l/154/Franklin-Pierce-University
http://www.simmons.edu/about-simmons/why-simmons/quick-facts
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http://physical-therapy-schools.startclass.com/l/458/University-of-Rhode-Island
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http://physical-therapy-schools.startclass.com/l/429/University-of-Hartford
http://www.stonybrook.edu/about/facts-and-rankings/
https://healthtechnology.stonybrookmedicine.edu/programs/pt/eldpt/faq#q3

CHAPTER 4

FINDINGS

To answer the research question, data analysis began with a data screening process to check for missing values for all questionnaire responses and for compatibility with the assumptions of the planned statistical tests. Next the main analysis was implemented to answer the research questions. First, a correlation matrix was examined for each variable for all participants, as well as a separate correlation matrix for the experimental group. The next analyses addressed difference questions which were conducted on each dependent variable separately. Addressing the first difference questions, mixed analysis of variance (ANOVA) was conducted to explore the relationship between time (pre-and post-test) and participation in an ICE (ICE/No ICE). Next, Hierarchical Multivariate Regressions (HMRs) were conducted, controlling both individual traits (Age, Gender, Number of volunteer hours, Prior work as a PT Aide, Number of paid work hours, and Pre-test scores for Communication Anxiety (ComAnx), Communication Confidence (ComConf), Interpersonal Relations (InterRelations) and Conveying Medical Information (ConveyMedInfo), and Program traits (School, Participation in ICE) to determine the relationship between the independent and dependent variables. Additional HMRs were conducted for only those participants that participated in an ICE, controlling for individual traits as listed above as well as Program traits (School, ICE setting, Clinical instructor faculty status, and Effort of clinical instructor to engage ICE student).

Finally, Hierarchical Linear Modeling (HLM) was conducted since participants were nested within schools. Hierarchical Linear Modeling was required because this is a longitudinal study examining change over time using repeated measures (Level 1), nested within individual participants (Level 2) who may be associated with particular groups, in this case schools, (Level 3) that are also undergoing change over time, therefore it is necessary to account for the influence of this hierarchical structure (Heck, Thomas & Tabata, 2014).

Data Screening

Descriptive statistics including skewness and kurtosis measures for all variables are presented in Table 2.

Table 2

Descriptive statistics for all variables, for all participants.

	N	M	SD	Skewness Statistic/ Standard Error	Kurtosis
Age	160	23.48	3.698	4.365/0.192	25.784
Sex (M=0; F=1)	160	0.66 (66% F)	0.476	-0.664/0.192	-1.579
Hours of volunteer	141	249.36	35.573	4.321/.204	24.567
Work as a PT aide (N=0;Y=1)	160	.41 (41% Y)	0.494	-0.36/0.192	-1.895
Hours of paid experience	159	393.89	1127.786	4.903/0.192	28.677
Participated in an Integrated Clinical Experience (N=0;Y=1)	158	0.46 (46%Y)	0.500	0.180/0.193	-1.993
ICE Clinical Instructor on DPT Program Faculty (N=0;Y=1)	77	0.13 (Y=13)	0.338	2.246/0.274	3.125
ICE Setting	53	0.83	0.463	0.888/.327	-1.260

(0=OP;1=IP)					
ICE instructor effort to engage	75	1.84	1.079	1.390/0.277	-0.117
School Code	160	2.11	1.565	-0.99/0.192	-1.481
ICQ-ComAnx					
Pre-test	158	16.36	2.645	-0.646/0.193	6.751
Post-test	160	16.24	2.651	-0.07 /0.192	0.406
ICQ-ComConf					
Pre-test	160	13.70	2.180	-0.080/.0192	8.649
Post-test	160	13.61	2.140	-1.171/0.192	4.961
Modified ABIM-InterRelations					
Pre-test	158	10.46	3.019	0.823/0.193	0.819
Post-test	160	10.34	3.378	0.945/0.192	2.264
Modified ABIM-ConveyMedInfo					
Pre-test	158	10.56	3.788	0.636/0.193	0.817
Post-test	160	10.44	3.938	0.687/0.192	1.1019

Number (N), Mean (M), Standard deviation (SD), Male (M), Female (F), Physical therapy (PT), No (N), Yes (Y), Integrated Clinical Experience (ICE), Doctorate of physical therapy (DPT), Interpersonal Communication Questionnaire (ICQ), Communication anxiety (ComAnx), Communication confidence (ComConf), Modified American Board of Internal Medicine survey (ModABIM), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Corrective transformations were applied to the pre-test and post-test scores as recommended in the literature (Mertler & Vannatta, 2005) in an effort to bring the variables closer to a normal distribution (see Table 3). The kurtosis of the ComConf pre-and post-test subscales were greater than 3 (3.803 and 4.916, respectively), indicating that these two subscales were not normally distributed even after transformation (Mertler & Vannatta, 2005). Given that analyses included mixed model ANOVA, Levene's and Box's test were also conducted (see Tables 4 and 5).

Table 3

Original shape, transformation with resultant skewness and standard error of ComAnx, ComConf, InterRelations, and ConveyMedInfo.

Variable	Original Shape	Transformation	Resulting Skewness Statistic /	Kurtosis

			Standard Error	
Pre-test ComAnx	Moderate negative skew	Reflect & square root	0.026 /0.193	-0.645
Post-test ComAnx	Moderate negative skew	Reflect & square root	0.103 /0.192	-0.773
Pre-test ComConf	Moderate negative skew	Reflect & square root	-0.359 /0.192	2.915
Post-test ComConf	Substantial negative skew	Reflect & logarithm	-0.131 /0.192	0.449
Pre-test InterRelations	Substantial positive skew	Logarithm	0 .121 /0.193	-0.732
Post-test InterRelations	Substantial positive skew	Logarithm	-0.055 /0.192	0.839
Pre-test ConveyMedInfo	Moderate positive skew	Logarithm	0.280 /0.193	-1.036
Post-test ConveyMedInfo	Moderate positive skew	Logarithm	0 .109/0.192	-0.457

Communication anxiety (ComAnx), Communication confidence (ComConf), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

The assumption of normality for ComAnx, InterRelations, and ConveyMedInfo was satisfied as assessed by visual inspection of normal Q-Q plots (see Appendix F).

There were no outliers in the data, as assessed by examination of studentized residuals for values greater than ± 3 for ComAnx, InterRelations, and ConveyMedInfo scores. Studentized residuals for ComConf scores had four outliers in the pre-test (-3.99, 3.53, -3.29, 3.46) and two in the post-test (-4.49, 3.09). Comparison of mixed ANOVA, with and without the outliers, revealed significant differences when the post-test outliers were removed from the data set and were therefore removed from further analysis.

Scores for ComAnx were assumed to be normally distributed, as assessed by Normal Q-Q Plots (see Appendix F). ComAnx, InterRelations, and ConveyMedInfo scores showed some deviation at the extremes, but a linear relationship for the majority of the data points (see Appendix F). Analyses of variance are considered to

be robust to deviations as such, since ANOVAs are based on normality of the distribution of means, not the distribution of the data (Norman, 2010).

Homogeneity of variances was assessed by Levene's test of homogeneity of variance ($p > .05$) within ANOVAs for each pre- post-test pair (see Table 4). The null hypothesis that the error of variance of the dependent variable is equal across groups was not rejected for ComConf post-test scores (sig. = .024). As a result, ComConf was not considered for further parametric analysis based on lack of homogeneity and persistent non-normality despite attempts to transform the data.

Table 4

Levene's test on pre and post-test data

Levene's Test of Equality of Error Variances[a]				
	F	df1	df2	Sig.
PRE-ComAnx (REFLsqrt)	0.864	1	152	0.354
POST- ComAnx (REFLsqrt)	3.122	1	152	0.079
PRE-ComConf (REFLsqrt)	0.194	1	153	0.660
POST- ComConf (Log10)	5.175	1	153	0.024
PRE - InterRelations (LOG)	0.048	1	153	0.827
POST - InterRelations (LOG)	0.935	1	153	0.335
PRE -ConveyMedInfo (LOG10)	0.031	1	153	0.861
POS-ConveyMedInfo (LOG10)	0.230	1	153	0.632

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + School + ParticipatedinanICE_A

Within Subjects Design: time
Communication anxiety (ComAnx), Communication confidence (ComConf), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Homogeneity of covariances with School and Participation in ICE variables loaded in to the model, as assessed by Box's test of equality of covariance matrices ($p > .05$), for each of the remaining dependent variables produced non-significant results. There was no violation of homogeneity of covariances. (see Table 5).

Table 5

Box's test of equality of covariance matrices for ComAnx, InterRelations, and ConveyMedInfo

Box's Test of Equality of Covariance Matrices[a]	
ComAnx	
Box's M	4.276
F	1.405
df1	3
df2	9168491.136
Sig.	0.239
InterRelations	
Box's M	3.604
F	1.184
df1	3
df2	12159247.872
Sig.	0.314
ConveyMedInfo	
Box's M	3.224
F	1.05
df1	3
df2	12159247.872
Sig.	0.365

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + SCHOOL_CODE + ParticipatedinanICE_A

Within Subjects Design: time

Communication anxiety (ComAnx), Communication confidence (ComConf), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Correlation matrices were examined on all dependent and predictor variables for all participants (see Appendix E) and for the ICE participants only (see Table 6). Considering there are 256 correlations in this matrix, several are of particular interest that were statistically significant are only reported here. When examining all participants there was a moderate negative correlation (-0.326) between females and

their clinical instructor's efforts to engage in conversations related to communication and professionalism, moderate correlation between pre-test ComAnx scores and post-test ComAnx scores (0.515), moderate negative correlation of pre-test ComAnx scores and post- test InterRelations and ConveyMedInfo scores (-0.345 and -0.328, respectively), moderate negative correlation between pre-test InterRelations and post-test ComAnx scores (-0.396), and moderate negative correlation between pre-test ConveyMedInfo scores and post-test ComAnx scores (-0.419). There was also moderate negative correlation between post-test ComAnx scores and post-test InterRelations and ConveyMedInfo scores (-0.476 and -0.495, respectively), as well as moderate positive correlation of post-test ComAnx and clinical instructor's efforts to engage in conversations related to communication and professionalism (0.308).

Correlations for those who participated in an ICE are listed in Table 6. There was a moderate positive correlation of pre-test ComAnx scores with post-test ComAnx scores (0.495) as well as moderate negative correlation with post-test InterRelations scores (-0.329). Post-test InterRelations scores showed moderate negative correlation to post-test ComAnx scores (-0.486). Post-test ConveyMedInfo scores showed strong positive correlation with post-test InterRelations (0.786), and moderate negative correlation with post-test anxiety (-0.551).

Table 6

Correlation among pre-test/ post-test measures for ICE participants on ComAnx, ComConf, InterRelations, and ConveyMedInfo.

	Pre-test ComAnx	Pre-test Com Conf	Pre-test Inter Relations	Pre-test Convey Med Info	Post-test Com Anx	Post-test ComConf	Post-test Inter Relations
Pre-test ComConf	0.272*	___					
Pre-test InterRelations	-0.248*	-0.077	___				
Pre-test ConveyMedInfo	-0.142	0.024	0.746**	___			
Post-test ComAnx	0.495**	.0175	-.0282*	-0.264*	___		
Post-test ComConf	0.153	0.004	-0.236	-0.276*	0.272*	___	
Post-test InterRelations	-0.329**	-0.034	0.509**	0.505**	-0.486**	-0.345**	___
Post-test ConveyMedInfo	-0.288*	-0.084	0.384**	0.517**	-0.551**	-0.303*	0.786**

Communication anxiety (ComAnx), Communication confidence (ComConf), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Main Analysis

The data analysis is intended to address the purpose of the study, namely to investigate the relationship of ICEs and communication skills and professionalism as measured by the Interpersonal Communication Questionnaire (*ICQ*) and modified ABIM Self-Assessment Survey (Mod*ABIM*). First, mixed ANOVAs were performed

to investigate pre- post-test scores within and between subjects grouped by ICE / no ICE, with School serving as a covariate. Mixed ANOVAs were run for each dependent variable separately. Descriptive statistics for the mixed ANOVAs are listed in Table 7.

Table 7

Descriptive statistics for mixed ANOVAs

Descriptive Statistics

Variable (transformation)	Integrated Clinical Experience	Mean	Std. Deviation	N
1. ComAnx				
Pre (REFLsqrt)	No ICE = 0	2.0284	0.66730	83
	Yes ICE = 1	2.0834	0.57503	72
	Total	2.0539	0.62475	155
Post (REFLsqrt)	No ICE = 0	1.9905	0.65480	83
	Yes ICE = 1	2.1748	0.52334	72
	Total	2.0761	0.60257	155
2. InterRelations				
Pre_(LOG)	No ICE = 0	1.0028	0.12322	83
	Yes ICE = 1	1.0055	0.11898	72
	Total	1.0040	0.12089	155
Post (LOG)	No ICE = 0	.9858	0.13853	83
	Yes ICE = 1	1.0080	0.11267	72
	Total	.9961	0.12726	155

3. ConveyMedInfo

Pre (LOG)	No ICE = 0	1.0066	0.15885	83
	Yes ICE = 1	.9872	0.15055	72
	Total	.9976	0.15485	155
Post (LOG)	No ICE = 0	.9875	0.17013	83
	Yes ICE = 1	.9958	0.13835	72
	Total	.9914	0.15573	155

Communication anxiety (ComAnx), Communication confidence (ComConf), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

The results of the mixed ANOVAs are presented in Table 8. There was a statistically significant interaction within-subjects between School and Time on post-test ComAnx scores, $F(1,152) = 4.571$, $p < .034$. (see Table 8).

Table 8

Mixed ANOVA: within-subjects results

Tests of Within-Subjects Contrasts

Measure: ComAnx

Source	time	Type III Sum of Squares	df	Mean Square	F	Sig.
Time	Linear	0.278	1	0.278	1.846	0.176
Time * School	Linear	0.687	1	0.687	4.571	0.034
Error(time)	Linear	22.844	152	0.150		

Communication anxiety (ComAnx)

Follow-up univariate ANOVA revealed a statistically significant between-subjects effects interaction between the school code and time on post-test anxiety scores, $F(4, 154) = 2.727$, $p < .031$ (see Table 9).

Table 9

Univariate ANOVA: between-subjects results ComAnx

Tests of Between-Subjects Effects

Dependent Variable: POST – ComAnx (REFLsqrt)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3.766[a]	4	0.941	2.727	0.031	0.066
Intercept	620.215	1	620.215	1796.745	0.000	0.921
School	3.766	4	0.941	2.727	0.031	0.066
Error	53.159	154	0.345			
Total	746.000	159				
Corrected Total	56.925	158				

a. R Squared = .066 (Adjusted R Squared = .042)
Communication anxiety (ComAnx)

Hierarchical Multiple Regression: All Participants

Next, HMRs were conducted to examine the strength of the relationship between Level 1 predictor variables (age, sex, Hours of volunteer physical therapy observation, Work as a physical therapy aide, Hours of paid experience, pre-test scores: ComAnx, InterRelations and ConveyMedInfo) and Level 2 predictor variable: (Participation in an ICE), predicting dependent variables of post-test scores: ComAnx, InterRelations, and ConveyMedInfo. School was entered as a covariate (Level 3).

Regression results indicate that the overall model significantly predicts post-test ComAnx, $R^2 = .360$, F (8, 56) = 10.357, $p = .001$ (see Table 10). Level 2 and Level 3 predictors were not significant (R2 change = .026 and .005, respectively). This model accounts for 36% of variance in post-test ComAnx (p=.005). This is an overall measure of the strength of association and does not reflect the extent to which any particular independent variable is associated with the dependent variable. A

summary of regression coefficients is presented in Table 11 and indicates that only one of the twelve variables significantly contributed to the model (pre-test ComAnx). Examination of the regression scatterplot (Appendix G) reveals that the residuals are not random. There appears to be distinct groupings of the residuals, indicating that the model, although statistically significant, does not fully describe relationship among the variables.

Table 10

Summary of Hierarchical Linear Model for ComAnx

Model Summary[d]

						Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	0.600[a]	0.360	0.268	0.44330	0.360	3.931	8	56	0.001
2	0.621[b]	0.386	0.258	0.44634	0.026	0.747	3	53	0.529
3	0.625[c]	0.390	0.250	0.44880	0.005	0.419	1	52	0.520

a. Predictors: (Constant), PRE-ConveyMedInfo(LOG), Work as a paid physical therapy aide, Age, PRE- PRE-ComAnx (REFLsqrt), Sex, Hours of volunteer physical therapy observation, Hours of paid experience prior to starting program, PRE-InterRelations (LOG)

b. Predictors: (Constant), PRE – ConveyMedInfo (LOG), Work as a paid physical therapy aide, Age, PRE - PRE-ComAnx (REFLsqrt) Sex, Hours of volunteer physical therapy observation, Hours of paid experience prior to starting program, PREinterpersonal_LOG, Clinical instructor's efforts to engage you in conversations related to communication and professionalism, RECODED_ICE_SETTING_ICE_ONLY, ICE Clinical Instructor on DPT Program Faculty

c. Predictors: (Constant), PRE – ConveyMedInfo (LOG10), Work as a paid physical therapy aide, Age, PRE-ComAnx (REFLsqrt), Sex, Hours of volunteer physical therapy observation, Hours of paid experience prior to starting program, PRE - InterRelations(LOG), Clinical instructor's efforts to engage you in conversations related to communication and professionalism, RECODED_ICE_SETTING_ICE_ONLY, ICE Clinical Instructor on DPT Program Faculty, School

d. Dependent Variable: POSTanxREFLsqrt

Communication anxiety (ComAnx), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Table 11

Regression coefficients for predicting ComAnx

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	0.195	0.615		0.317	0.753
	Age	0.014	0.015	0.099	0.908	0.368
	Sex	-0.091	0.127	-0.084	-0.72	0.474
	Hours of volunteer physical therapy observation	0.000	0.000	0.158	1.219	.228
	Work as a paid physical therapy aide	-0.218	0.146	-0.182	-1.49	0.141
	Hours of paid experience prior to starting program	-4.708E-5	0.000	-0.0057	-0.41	0.0687
	PRE- ComAnx (REFLsqrt)	0.400	0.106	0.439	3.759	0.000
	PRE – InterRelations (LOG)	0.473	0.782	0.111	0.605	0.548
	PRE - ConveyMedInfo (LOG)	0.442	0.626	0.129	0.706	0.483
2	(Constant)	-0.149	0.677		-0.220	0.827
	Age	0.017	0.016	0.120	1.060	0.294
	Sex	-0.070	0.134	-0.064	-0.521	0.605
	Hours of volunteer physical therapy observation	0.000	0.000	0.205	1.487	0.143
	Work as a paid physical therapy aide	-0.173	0.152	-0.145	-1.14	0.258
	Hours of paid experience prior to starting program	-8.717E-5	0.000	-0.105	-0.720	0.475
	PRE - ComAnx (REFLsqrt)	0.403	0.109	0.443	3.698	0.001
	PRE - InterRelations (LOG)	0.480	0.791	0.112	0.606	0.547
	PRE - ConveyMedInfo (LOG)	0.608	0.660	0.177	0.922	0.361
	ICE Clinical Instructor on DPT Program Faculty	0.027	0.191	0.017	0.139	0.890
	Clinical instructor's efforts to engage you in conversations related to communication and professionalism	0.010	0.057	0.021	.177	.860
	RECODED_ICE_SETTING_ICE_ONLY	0.223	0.151	0.179	1.484	0.144
3	(Constant)	-0.232	0.693		-0.334	0.739
	Age	0.016	0.016	0.113	0.996	0.324
	Sex	-0.052	0.137	-0.048	-0.381	0.705
	Hours of volunteer physical therapy observation	0.000	0.000	0.219	1.559	0.125

Work as a paid physical therapy aide	-0.160	0.154	-0.134	-1.04	0.302
Hours of paid experience prior to starting program	-9.633E-5	0.000	-0.116	-0.786	0.435
PRE - ComAnx (REFLsqrt)	0.408	0.110	0.448	3.712	0.001
PRE - InterRelations (LOG)	0.534	0.800	0.125	0.667	0.508
PRE - ConveyMedInfo (LOG)	0.545	0.671	0.159	0.813	0.420
ICE Clinical Instructor on DPT Program Faculty	0.014	0.193	0.009	0.075	0.941
Clinical instructor's efforts to engage you in conversations related to communication and professionalism	0.003	0.058	0.005	0.045	0.965
RECODED_ICE_SETTING_ICE_ONLY	0.215	0.152	0.172	1.416	0.163
School	0.051	0.079	0.075	0.647	0.520

a. Dependent Variable: POSTanxREFLsqrt

Communication anxiety (ComAnx), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Regression results for dependent variables InterRelations and ConveyMedInfo also showed that inclusion of the Level 2 variable, Participation in an ICE, did not contribute significantly (p = .141 and p = .231, respectively), however School was significant for both (p = .046 and .006, respectively). For InterRelations, only pre-test InterRelations score (p< .001) and School (.047) significantly contributed to the model. For ConveyMedInfo, pre-test InterRelations score (p = .009), pre-test ConveyMedInfo (.039), and School (.006) contributed significantly to the model. For simplicity, only the p values for the InterRelations and ConveyMedInfo variables are reported (see Table 12).

Table 12

Results of HMR Analyses for All Participants: InterRelations & ConveyMedInfo

Model	InterRelations	ConveyMedInfo
1 (Constant)	0.001	0.169
Age	0.974	0.466

	Sex	0.385	0.453
	Hours of volunteer physical therapy observation	0.755	0.624
	Work as a paid physical therapy aide	0.629	0.466
	Hours of paid experience prior to starting program	0.828	0.920
	PRE - ComAnx (REFLsqrt)	0.160	0.310
	PRE - InterRelations (LOG)	0.000	0.003
	PRE - ConveyMedInfo (LOG10)	0.803	0.041
	R^2	0.367	0.392
	F	8.199	9.084
2	(Constant)	0.001	0.223
	Age	0.958	0.425
	Sex	0.359	0.431
	Hours of volunteer physical therapy observation	0.788	0.649
	Work as a paid physical therapy aide	0.853	0.631
	Hours of paid experience prior to starting program	0.930	0.837
	PRE - ComAnx (REFLsqrt)	0.179	0.335
	PRE - InterRelations (LOG)	0.000	0.004
	PRE - ConveyMedInfo (LOG10)	0.893	0.033
	Participated in an Integrated Clinical Experience	0.136	0.224
	R^2	0.378	0.399
	R^2*Change*	0.011	0.007
	F Change	2.214	1.451
3	(Constant)	0.001	0.188
	Age	0.862	0.326
	Sex	0.360	0.429
	Hours of volunteer physical therapy observation	0.880	0.764
	Work as a paid physical therapy aide	0.884	0.663
	Hours of paid experience prior to starting program	0.713	0.859
	PRE - ComAnx (REFLsqrt)	0.130	0.229
	PRE - InterRelations (LOG)	0.000	0.009
	PRE - ConveyMedInfo (LOG10)	0.823	0.039
	Participated in an ICE	0.141	0.231
	School	0.047	0.006

R^2	0.398	0.434
R^2*Change*	0.019	0.035
F Change	4.042	7.722

Communication anxiety (ComAnx), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Multiple regression was then conducted for InterRelations with only the significant Level 1variable of pre-test InterRelations and Level 2 School. Regression results indicate that the overall model significantly predicts post-test InterRelations, R^2 = .349, *F* (1, 155)=82.925, *p* < .001, R^2 change = .022 (*p* = .021). This model accounts for 36% of variance in post-test ComAnx (*p*=.001). This is an overall measure of the strength of association and does not reflect the extent to which any particular independent variable is associated with the dependent variable (see Table 13).

Table 13

Hierarchical Linear Model Summary: InterRelations

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics F Change	df1	df2	Sig. F Change
1	0.590[a]	0.349	0.344	0.10299	0.349	82.925	1	155	0.000
2	0.609[b]	0.371	0.363	0.10155	0.022	5.446	1	154	0.021

a. Predictors: (Constant), PRE - InterRelations (LOG)

b. Predictors: (Constant), PRE - InterRelations (LOG) and School

c. Dependent Variable: POST - InterRelations (LOG)

Multiple regression was then conducted for ConveyMedInfo with only the significant Level 1variables of pre-test InterRelations and ConveyMedInfo and Level 2 School. Regression results indicate that the overall model significantly predicts post-test ConveyMedInfo, R^2 = .377, *F* (2, 154) = 46.517, *p* < .001, R^2 change = .044

(p = .001). This model accounts for 41% of variance in post-test ComAnx (p=.001). This is an overall measure of the strength of association and does not reflect the extent to which any particular independent variable is associated with the dependent variable (see Table 14).

Table 14

Hierarchical Linear Model Summary: ConveyMedInfo

Model Summary[c]

						Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	0.614[a]	0.377	0.369	0.12395	0.377	46.517	2	154	0.000
2	0.648[b]	0.420	0.409	0.11991	0.044	11.549	1	153	0.001

a. Predictors: (Constant), PRE – ConveyMedInfo (LOG) , PRE - InterRelations (LOG)

b. Predictors: (Constant), PRE - ConveyMedInfo (LOG) , PRE - InterRelations (LOG), School

c. Dependent Variable: POST – ConveyMedInfo (LOG)
Interpersonal Relations (InterRelations)

Hierarchical Multiple Regression: ICE participants

In order to investigate the relationship between individual and programmatic factors for those participants who participated in an ICE, HMRs were conducted to examine the accuracy of Level 1 individual trait predictor variables including post-test ComAnx, Level 2 predictor variables: ICE traits predictor variables, and Level 3 predictor value: School, of predicting dependent variables of post-test ComAnx, InterRelations and ConveyMedInfo.

Regression results indicate that Level 1 variables significantly predict post-test ComAnx, R^2 = .360; Level 2 and 3 predictors did not contribute significantly to the model (R^2 change = .031, F (9, 135) = 10.357, p = .036) (see Table 15). This model

accounts for 36% of variance in post-test ComAnx. Regression coefficients indicate that only pre-test ComAnx significantly contributed to the model (p = .001).

Table 15

Model Summary of Hierarchical Multiple Regression: ICE Only ComAnx

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.600[a]	0.360	0.268	0.44330	0.360	3.931	8	56	0.001
2	0.621[b]	0.386	0.258	0.44634	0.026	.747	3	53	0.529
3	0.625[c]	0.390	0.250	0.44880	0.005	.419	1	52	0.520

a. Predictors: (Constant), PRE - PRE - ConveyMedInfo , Work as a paid physical therapy aide, Age, PRE - ComAnx (REFLsqrt) , Sex, Hours of volunteer physical therapy observation, Hours of paid experience prior to starting program, PRE - InterRelations (LOG)

b. Predictors: (Constant), PRE - ConveyMedInfo (LOG10), Work as a paid physical therapy aide, Age, PRE - ComAnx (REFLsqrt) , Sex, Hours of volunteer physical therapy observation, Hours of paid experience prior to starting program, PRE - InterRelations (LOG) , Clinical instructor's efforts to engage you in conversations related to communication and professionalism, RECODED_ICE_SETTING_ICE_ONLY, ICE Clinical Instructor on DPT Program Faculty

c. Predictors: (Constant), PRE - PRE – ConveyMedInfo (LOG) , Work as a paid physical therapy aide, Age, PRE - ComAnx (REFLsqrt), Sex, Hours of volunteer physical therapy observation, Hours of paid experience prior to starting program, PRE - InterRelations (LOG) , Clinical instructor's efforts to engage you in conversations related to communication and professionalism, RECODED_ICE_SETTING_ICE_ONLY, ICE Clinical Instructor on DPT Program Faculty, School

d. Dependent Variable: POST - ComAnx (REFLsqrt)

Communication anxiety (ComAnx), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

For outcome variable InterRelations, regression results indicate that the overall model significantly predicts post-test InterRelations scores, R^2 = .420, $F(9,55)$ = 5.396, p < .001. This model accounts for 48% of the variance in post-test InterRelations scores. A summary of regression coefficients is presented in Table 16

and indicates that only post-test ComAnx scores significantly contributed to the model.

For outcome variable ConveyMedInfo, regression results indicate that the overall model significantly predicts post-test ConveyMedInfo scores, $R^2 = .505$, $F(12, 53) = 5.396$, $p < .001$. This model accounts for 51% of the variance in post-test ConveyMedInfo scores. A summary of regression coefficients is presented in Table 16 and indicates that only pre-test ConveyMedInfo and post-test ComAnx scores significantly contributed to the model. For simplicity, only *p* values are reported in Table 16.

Table 16
Results of HMR Analyses for ICE Participants: InterRelations & ConveyMedInfo

Model		InterRelations	ConveyMedInfo
1	(Constant)	0.000	0.006
	Age	0.669	0.929
	Sex	0.210	0.092
	Hours of volunteer physical therapy observation	0.589	0.869
	Work as a paid physical therapy aide	0.753	0.239
	Hours of paid experience prior to starting program	0.944	0.785
	PRE - ComAnx (REFLsqrt),	0.511	0.965
	PRE - InterRelations (LOG)	0.181	0.848
	PRE – ConveyMedInfo(LOG)	0.280	0.010
	POSTanxREFLsqrt	0.022	0.002
	R^2	0.326	0.497
	F	4.433	6.049
2	(Constant)	0.001	0.023

	Age	0.586	0.874
	Sex	0.165	0.120
	Hours of volunteer physical therapy observation	0.996	0.732
	Work as a paid physical therapy aide	0.649	0.353
	Hours of paid experience prior to starting program	0.672	0.582
	PRE - ComAnx (REFLsqrt),	0.271	0.898
	PRE - InterRelations (LOG)	0.128	0.907
	PRE – ConveyMedInfo(LOG)	0.247	0.014
	POST-- ComAnx (REFLsqrt),	0.043	0.005
	ICE Clinical Instructor on DPT Program Faculty	0.356	0.649
	Clinical instructor's efforts to engage you in conversations related to communication and professionalism	0.180	0.930
	ICE_SETTING_ICE_ONLY	0.150	0.298
	R^2	0.472	0.510
	R^2 Change	0.051	0.012
	F Change	1.687	0.427
3	(Constant)	0.001	0.010
	Age	0.636	0.774
	Sex	0.239	0.220
	Hours of volunteer physical therapy observation	0.867	0.959
	Work as a paid physical therapy aide	0.736	0.252
	Hours of paid experience prior to starting program	0.766	0.735

PRE - ComAnx (REFLsqrt),	0.318	0.964
PRE - InterRelations (LOG)	0.160	0.751
PRE – ConveyMedInfo(LOG10)	0.201	0.007
POST-- ComAnx (REFLsqrt),	0.035	0.003
ICE Clinical Instructor on DPT Program Faculty	0.410	0.770
Clinical instructor's efforts to engage you in conversations related to communication and professionalism	0.260	0.662
RECODED_ICE_SETTING_ICE_ONLY	0.134	0.241
School	0.324	0.079
R^2	0.482	0.539
R^2 *Change*	0.051	0.029
F Change	0.991	3.208

Communication anxiety (ComAnx), Interpersonal relations (InterRelations), Conveying medical information (ConveyMedInfo)

Hierarchical Linear Modeling/Linear Mixed Modeling

Lastly, in order to fully understand the relationships between the predictor and outcome variables, further analysis that addressed the nested nature of the data (students nested in School), Hierarchical Linear Modeling (HLM) was conducted. Each dependent variable was examined separately, with School as the independent variable. Significance of the intercept would indicate that further modeling is necessary (Heck, Thomas, & Tabata, 2014). None of the intercepts from the models were significant, indicating that further modeling would not be necessary (see Tables 16 -19).

Table 17

Hierarchical Linear Model: ComAnx

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error	Wald Z	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Residual		0.344943	0.039281	8.781	0.000	0.275941	0.431201
Intercept [subject = SCHOOL_CODE]	Variance	.0019133	0.021349	0.896	0.370	0.002148	0.170447

a. Dependent Variable: POST-- ComAnx (REFLsqrt), Communication anxiety (ComAnx)

Table 18

Hierarchical Linear Model: InterRelations

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error	Wald Z	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Residual		0.015277	0.001740	8.782	0.000	0.012221	0.019097
Intercept [subject = SCHOOL_CODE]	Variance	0.002015	0.001748	1.153	0.249	0.000368	0.011031

a. Dependent Variable: POST - InterRelations (LOG) . Interpersonal Relations (InterRelations)

Table 19

Hierarchical Linear Model: ConveyMedInfo

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error	Wald Z	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Residual		0.021159	0.002410	8.781	0.000	0.016926	0.026451
Intercept [subject = SCHOOL_CODE]	Variance	0.004480	0.003597	1.245	0.213	0.000928	0.021615

a. Dependent Variable: POST - ConveyMedInfo(LOG10) . Conveying medical information (ConveyMedInfo)

CHAPTER 5

CONCLUSION

The purpose of this study was to investigate the relationship between DPT student and programmatic variables, and a student's communication skills and professionalism before and after participating in a first ICE. First year DPT students were surveyed prior to and after participating in their first ICE during the first semester of their DPT curriculum. A comparison group of first year DPT students who did not participate in ICE were utilized as a control group. Survey response data did not support a relationship between participation in first ICE and communication skills and professionalism as measured by the *ICQ* or Mod*ABIM* survey.

DISCUSSION

Data in this study were collected from DPT students at five physical therapy programs and were analyzed with multiple statistical tools. Since there is a paucity of literature on these topics, many of the findings are of interest. Several results, however, are particularly noteworthy: 1) Communication Anxiety (Com Anx) was a predominant variable across the analyses, 2) the inability of the other variables to predict the outcome variables of Communication and Professionalism, and 3) psychometric considerations with the skewed data, a potential ceiling effect, response shift bias and the limitations of the self-rating measures. Policy implications of the results of this study and directions for future research are considered.

Communication Anxiety and its Implications

The results of this study suggest that DPT students' anxiety related to communicating with patients, (and perhaps extending to families, and colleagues) may be an important, but overlooked element of early clinical experiences of DPT students. While there may be an informal understanding in physical therapy education that anxiety can inhibit students' potential, the results of this study suggest that anxiety may be a particular deterrent in developing communication and professionalism goals. This anxiety may be a particularly salient characteristic related to early clinical experiences that has not been fully explored. The results presented a pattern that was persistent and that related to multiple dimensions of professional communication. This is important because it provides a CI with a powerful tool to assist an ICE student when they are struggling. Consideration of a student's underlying anxiety may allow the CI to enact strategies that leverage the student's strengths in ways that lessen their overall anxiety. It is important to understand that this discussion does not relate to students with diagnosed anxiety disorders, rather it is intended to bring attention to a dimension of communication that is generic.

The current findings show that communication, both casual and mechanistic, is associated with underlying anxiety, both before and after the first semester of DPT school, regardless of whether or not students participated in an ICE. People have long recognized the relationship between student anxiety and academic success (Seipp, 1991). Specific to nursing, high levels of anxiety have detrimental effects on academic and clinical performance (Moscaritolo, 2009). Academic success is tantamount to DPT students; in order to obtain licensure to practice physical therapy one must pass all phases of a DPT curriculum. Doctor of physical therapy curricula are

rigorous, typically consisting of over 100 semester credit hours (or the equivalent) with individual semester credit loads of 20 units being common.

As mentioned previously, affective behaviors such as communication skills and professionalism are less likely to be explicitly taught and assessed in the classroom setting, and clinical instructors tend to be less comfortable providing critical feedback to students in this domain as compared to psychomotor clinical skills (Hayes, Huber, Rogers, & Sanders, 1999; Hayward, Noonan, & Shain, 1999; Hayward, Blackmer, & Markowski, 2006; Black, Jensen, Mostrom, Perkins, Ritzline, Hayward, & Blackmer. 2010; Mai et al., 2014; Masin, 2002; Shepard, 2002). It has been shown that when professional behavior issues are taken into consideration, a small but significant number of DPT students fail a clinical course due to difficulty integrating affective skills such as professionalism, interpersonal skills and communication (Wilgens & Sharf, 2015). The current results indicate that anxiety is a contributing factor to the self-reported affective skills considered in this study. Efforts to assess and address underlying student anxiety, both in the academic and clinical settings, may prove beneficial. One suggestion from the literature to address underlying academic anxiety is the incorporation of learning-style strategies during professional education. Knowledge of learning-styles has been shown to successfully decrease nurse anesthesiology student anxiety, as well as improve clinical performance in the cognitive and affective domains (Garcia-Otero & Teddlie, 1992).

To make this self-assessment as meaningful as possible, students must be able to realistically consider their learning in these areas. While we may assume that graduate students can do this, the evidence suggests this assumption may not be

accurate. There is evidence to suggest that differences exist between undergraduate and graduate medical students' learning styles and learning approaches (Samarakoon, et al., 2013). In order to be successful in clinical graduate programs, a shift from superficial to deep learning is essential. While the participants in the current study were first semester DPT students transitioning from undergraduate to graduate status, there are no data which consider this change in learning styles and/or approaches for DPT students. It has been suggested that superficial learning strategies such as syllabus-bound learning with emphasis on routine memorization are more prevalent in undergraduates, particularly those undergraduates seeking admission to graduate school (Samarakoon et al, 2013). In order to be successful in graduate professional programs such as medicine and DPT, a shift toward deep learning characterized by understanding of concepts and relating ideas is required. Exposure to clinical education is thought to facilitate this shift (Samarakoon et al., 2013); reflection and self-assessment are critical to this transition. Anxiety may be a barrier to transitioning from one learning environment to another.

Anxiety in clinical education deserves further consideration. Any efforts directed at ICEs should consider the impact of student anxiety on communication and professionalism. Academic and clinical instructors concerned with these outcomes in DPT students need to recognize the role that anxiety plays in student's self-ratings of communication and professionalism. Furthermore, it is important to consider the role that anxiety can potentially play in a student's overall clinical performance. Communication and professionalism skills will inevitably serve as the foundation for clinical interactions with patients and supervisors alike, and these skills may either

enhance or debilitate clinical performance. Anxiety related to academic achievement has been described as both facilitating and debilitating to performance (Alpert & Haber, 1960), and this relationship is evident in clinical education as well. It stands to reason that a student with underlying communication anxiety may struggle in a genuinely situated clinical setting with content or skills previously taught and assessed in a classroom setting. Helping students understand their capabilities, i.e. both strengths and weaknesses, prior to clinical experiences may prove beneficial.

For students, underestimation of one's coping ability can lead to anxiety (Barlow, 2002), therefore, self-assessment of learning and communication styles may prove beneficial in helping students mitigate this threat. Based on this understanding, self-assessment of learning and communication should be a routine part of the academic program, and this assessment should be addressed between academic institution, CI, and DPT student in order to maximize benefit during ICE.

It has been suggested that when students perceive faculty conveying inviting communication behaviors, such as showing respect for students, expressing pleasure with a student group, acting friendly and trustful of students, their anxiety levels are reportedly lower (Cook, 2005). The inverse of this is true as well: negative learning environments lead to increased anxiety and decreased performance capabilities (Cook, 2005). From the CI's perspective, however, it is a potentially daunting task to provide feedback in such a manner and quantity that the student finds constructive. Ironically, student satisfaction with feedback has been linked more to the emotional impact of the feedback rather than frequency and quality. To be effective, feedback from CIs does not need to be voluminous, but framed in a positive light. This is an important concept

because there exists a risk of performance deterioration particularly if the feedback is perceived as primarily negative (Telio, Ajjawi, & Regehr, 2015).

Considering the perspective of the CI, a majority of physical therapist CIs rate themselves as effectively prepared and competent instructors, with a positive relationship of age, years of experience as a physical therapist and CI, and number of students supervised related to self-reported effectiveness as a CI (Buccieri, et al., 2006). Clinical instructors, however, may not be aware of the strength that the emotional context of feedback has on students. The results of this study can inform CI practice with issues related to student communication and professionalism in that anxiety plays a significant role in self-assessment and potentially performance.

Predicting Communication and Professionalism

Mixed ANOVA analyses that looked at differences in the outcome variables revealed School as a significant variable, whereas participation in an ICE was not statistically significant. This important finding indicates a clustering effect in play, and the effect of School must be accounted for in order to fully understand these data.

While every DPT educational program is designed to meet the CAPTE standards, important variability among programs exist. There are several reasons why these data demonstrated a difference among schools. The structure of the curricula are different when comparing schools, where there is variability of the courses offered during the first semester. Also, different applicants are attracted to different schools based on factors such as private vs. public institutions, cost, and location (urban, suburban and rural). Variation among pre-requisite requirements may potentially

effect the cohorts as well. There are also influences unique to each cohort within an institution as well as across institutions that may account for some clustering effects.

An interesting finding of this study was the lack of predictive power seen for the numerous participant and school variables. The most remarkable was the lack of data supporting the relationship between ICE participation and development of communication and professionalism. These, of course, are preliminary finding that should be interpreted with care. But they suggest that CAPTE may want to proceed cautiously as ICEs are now embedded in CAPTE standards. Many factors may come into play here. This study focused on changes associated with participation in a first ICE in only one semester. The relatively short period of time that participants participated in an ICE was most likely a factor in the non-significant finding. The ICE is also concurrent with a heavy academic course load, the latter of which may play a larger role in underlying anxiety levels than other factors. Additionally, there is evidence that student improvements in communication confidence are very specific to practice area (e.g. orthopedics, neurology, cardiopulmonary) and not readily carried over to other practice settings in early PT education (Wright, Moss, Dennis, Harold, Levy, Furness, & Reubenson, 2018). This means that communication skills and professionalism are highly contextualized; efforts to focus on more generic skills early in clinical exposure may serve to diminish the effect of practice domain on these emerging abilities.

None of the other predictor variables considered in this study were significant. This is somewhat surprising, given that ICEs are grounded in educational theory, have a developing body of evidence supporting them, and are now a mandated component

of DPT education. This literature, however, relies heavily on post-test measures only, with questionable internal validity. Further research is certainly warranted, and policy implications related to use of clinical time need to be informed by evidence. This relates to not only ICEs, but also to other required components that involve clinic cooperation such as pre-acceptance observation hours. Pre-acceptance observation hours are typically a part of DPT application processes, but there is notable variation in the number of observation hours required by school. Data from the current study suggest that, as previously mentioned, where there may be some perceived benefit in students' decision making with regard to career fit in PT, additional benefits as a function of increases in required observation hours may be overestimated. Prior experience as a paid PT Aide was not a significant predictor in the current study, which is contrary to prior works (Mai et al., 2014). Perhaps the difference lies with the research design; Mai et al. utilized post-test only while the current study utilized a pre-post design.

Given the inability to predict the outcome variables as previously discussed, and the importance of School through earlier analyses, it is critical that the nested nature of these data (participants nested within School) are accounted for in future research. This dynamic is not entirely unexpected given the nature of the data; the differences between the pre- and post-test means are marginal. It is quite possible that the pre-post-test design did not capture the essence of growth over time due to a ceiling effect seen in the data, which will be discussed in the next section.

Psychometric Considerations

Four psychometric considerations deserve further attention: skewness of the data, ceiling effect, response shift bias, and the limitations of self-assessment. Recall, the skewed data required transformation (see Tables 2 and 3) to meet statistical test assumptions. The skewness and the ceiling effect both came about because participants tended to rate themselves higher on the positive Likert scale statements and lower on the negative Likert scale statements. Participants agreed that they were likely to perform well on the positive behaviors and avoid negative behaviors, thus scores were very similar for both pre- and post-tests.

While many parametric procedures are robust to violations of normality, these data are not ideally suited for such analyses. It seems apparent that these self-assessments are not normally distributed. The data also present the worrisome ceiling effect previously described. As a result, little difference in pre- post-test means was seen for each outcome variable (see Table 7).

The next psychometric concern relates to a response shift bias (Howard, 1980). There is a risk inherent in pre-test post-test design where the participants' self-rating of behaviors prior to experience may be inaccurate. An objective of educational interventions such as ICE is to develop the student's understanding and awareness of, among other objectives, communication skills and professionalism. It is possible that the extent to which the ICE meets its goals will alter participants' perspectives in evaluating themselves on those dimensions, threatening the reliability of pre-test to post-test scores. This phenomenon is referred to as response shift bias (Howard, 1980).

Response shift bias also highlighted the underlying issue of self-assessment as a method of estimating actual performance in this population. Perceptions of ability are "imperfectly correlated with actual ability" across multiple domains (Kruger & Dunning 1999, p 1124). This raises questions about individuals' ability to accurately assess their performance, particularly individuals whose performance is rated in the lower quartile by external assessment (Kruger & Dunning, 1999; Symons et al., 2009). Lower performing individuals tend to rate themselves higher than their performance warrants. A similar phenomenon has been shown in higher performers, where inaccuracies in self-assessment trend negatively, known as the "burden of expertise" (Kruger & Dunning, 1999). Whereas higher performers have shown the ability to recalibrate their self-assessments once exposed to additional feedback, such as peer review and observations of others, lower performers fail to do so (Hodges, Regehr, & Martin, 2001). This means high performers come to understand, through external feedback, that they know more than they originally thought, but low performers' overestimation of their ability does not change even with feedback that they need to improve. It is possible that as the participants engaged in learning activities throughout the semester, they developed a more expansive sense of knowing what they don't know, threatening the accuracy of their pre-test assessment. As we have seen, self-assessment of communication skills are influenced by the practice domain where the student is functioning, and there is little carryover in confidence across practice areas (Wright, et al., 2018). Student's clinical confidence is linked to area-specific knowledge and skills, and depending on the timing and structure of the curriculum students may be less confident and more anxious in a given setting. In contrast, a

subset of the participants may be more or less immune to intervening experience regardless. This study did not include any CI ratings of ICE student performance to compare to student self-assessments, but further research should address this interesting relationship.

Policy Implications

Given the role that anxiety plays in the development of communication skills and professionalism, and the evidence that anxiety can be mediated by self-assessment and instructor feedback, it would appear prudent to consider incorporation of these elements on self-assessment of learning styles and communication skills on a programmatic level. This information may be helpful to students, academic faculty and CIs. Furthermore, CIs may benefit from consideration of the noteworthy role of underlying student anxiety when developing learning opportunities in the clinic. Of particular interest is the type and frequency of student feedback and its relationship to student anxiety.

Future Studies

Although the pre- post-test design, with comparison group, was intended to be a rigorous method to address the research question, the four psychometric issues discussed could have potentially impacted the results. Further research should attempt to minimize these issues.

In order to control for the effects of learning activities on the pre-test assessment, utilization of a "post-then-pre" design may be appropriate (Rockford & Kohn, 1989). This involves administration of a typical post-test survey, with immediate re-administering the survey asking the participant to rate themselves

relative to prior to the learning activities in order to capture any changes. This would potentially allow for more robust data analysis and insight into this idea. Further studies should also incorporate additional ratings, such as feedback from clinical instructors and patients in addition to student self-ratings in an effort to capture factors that significantly predict these important outcome variables. Additional research should also examine the relationship between amount of clinic time and clinical variables.

APPENDICES

APPENDIX A

Dear DPT Students:

In order to better understand how DPT students develop professionalism and communication skills, particularly early on in their doctoral training, we are collecting data from DPT students at a number of programs in the Northeast. Although there is some evidence that support the use of activities such as simulated patients and early clinical experiences (Integrated Clinical Experience or ICE), best practices have yet to be developed. The purpose of this study is to add to what is known about the relationship between professionalism, communication, and early clinical exposure.

To participate, we would like you to complete three brief surveys. The surveys ask you to 1) provide background information, 2) respond to questions about professional behavior, and 3) provide a self-rating of your perceived communication skills. You should be able to complete the surveys in about 5-10 minutes. Please do not put your name on the survey; rather, use the school-specific code provided to you along with the last four digits of your student ID. The surveys will be re-administered at the end of the Fall semester of 2017 and lastly at the end of the Spring semester in 2018. Your participation with this study is final upon the completion of the surveys in the Spring of 2018. Dr. Susan Roush and Professor John McLinden are working on the project this academic year (2017-18) in order to satisfy the latter's dissertation requirements for the University of Rhode Island and Rhode Island College's joint PhD in Education program, and hope to be able to present our results at a national APTA meeting, or publish it in a professional journal.

Your participation in this study is completely voluntary and will not affect your grades in any way. You can withdraw at any point without penalty. [Key DPT Faculty Contact] is assisting with our data collection, but she will not know how you responded to any item on the survey. If you have any questions about the research, please contact the Principal Research Advisor, Dr. Susan Roush. She is available via email (Roush@uri.edu) or telephone (401-874-5626) at the time of your data collection to answer any questions you may have. You may also contact any of us (emails below) or contact the University of Rhode Island's Vice President for Research and Economic Development, at 70 Lower College Road, Suite 2, Kingston RI 02881, telephone: (401) 874-4328.

Thank you for your time and contribution to our research. We wish you the best of luck in the remainder of your academic endeavors.

Sincerely,

Susan E. Roush, PhD, PT
Roush@uri.edu

John P. McLinden, PT, MS
jmclinden@uri.edu

Appendix B

The Interpersonal Communication Questionnaire

We are interested in knowing how you feel about interacting with patients. Please answer the following questions and indicate whether you agree or disagree with each statement by circling the appropriate number on the scale.

1= STRONGLY DISAGREE to 5 = STRONGLY AGREE

	Strongly Disagree				Strongly Agree
The thought of assessing patients makes me nervous	**1**	**2**	**3**	**4**	**5**
I am not sure that I will find talking to patients ok	1	2	3	4	5
I worry about having to speak to patients	1	2	3	4	5
I am not sure of myself when interacting with patients	1	2	3	4	5
I feel confident that I can interact with patients	1	2	3	4	5
Having to talk to patients is a frightening prospect	1	2	3	4	5
I am positive that assessing patients will not be a problem	1	2	3	4	5
I think that talking to patients will be a positive experience	1	2	3	4	5

Subscales:
Communication Anxiety: 1,2,3,4
Communication Confidence: 5,6,7,8

ID: _____

Appendix C

Modified American Board of Internal Medicine Self-Assessment Survey

We are interested in knowing how you feel about interacting with patients. How would you rate yourself at the following skills, where 1 = EXCELLENT to 5 = POOR:

	Poor				Excellent
Telling them everything; being truthful, upfront and frank; not keeping things from them that they should know	**1**	**2**	**3**	**4**	**5**
Greeting them warmly; calling them by the name they prefer; being friendly, never crabby or rude	1	2	3	4	5
Treating them like they are on the same level; never "talking down" to them or treating them like a child	1	2	3	4	5
Letting them tell their story; listening carefully; asking thoughtful questions; not interrupting them while they're talking	1	2	3	4	5
Showing interest in them as a person; not acting bored or ignoring what they have to say	1	2	3	4	5
Warning them during the physical exam about what you are going to do and why; telling them what you find	1	2	3	4	5
Discussing options with them; asking their opinion; offering choices and letting them help decide what to do; asking what they think before telling them what to do	1	2	3	4	5
Encouraging them to ask questions; answering them clearly; never avoiding their questions or lecturing them	1	2	3	4	5
Explaining what they need to know about their problems, how and why they occurred, and what to expect next	1	2	3	4	5
Using words they can understand when explaining their problems and treatment; explaining any technical medical terms in plain language	1	2	3	4	5
How would you rate your professionalism?	1	2	3	4	5

ID: _____

Appendix D

Demographic and Prior Experience Survey

Identifier: _____ (last 4 digits of student ID)
Age: _____ Sex: M F

Approximately how many hours of volunteer physical therapy observation did you complete prior to starting your physical therapy doctorate program? _____

Do you have prior paid work experience in healthcare? Y N

If yes, did you work as a paid physical therapy Aide? Y N

Approximately how many hours of paid experience did you complete prior to starting your physical therapy doctorate program? _____

Have you participated in an Integrated Clinical Experience (ICE) this semester?
Y N

If yes, please answer the following:

Was your ICE Clinical Instructor also on your DPT Program Faculty? Y N

What type of setting did you perform your ICE this semester? Please select the site below that most closely matches where you were.

a. Outpatient orthopedic- hospital based
b. Outpatient neurologic- hospital based
c. Outpatient orthopedic- private practice
d. School system
e. Home Care
f. Inpatient- Acute Care
g. Inpatient- Rehabilitation
h. Skilled Nursing Facility
i. Pediatric outpatient
j. Other: please describe

_____

	Excellent				Poor
How would you rate your clinical instructor's efforts to engage you in conversations related to communication and professionalism?	1	2	3	4	5

Appendix E

Correlation Table: All Variables

Correlations

		Age	Sex	Hours of volunteer physical therapy observation	Prior paid work experience in healthcare	Work as a paid physical therapy aide	Hours of paid experience prior to starting program	Clinical instructor's efforts to engage you in conversations related to communication and professionalism	SCHOOL_CODE	PREamREFLsqrt	POSTamREFLsqrt	PREconf_REFLsqrt	POSTconf_Log10	PREinterpersonal_LOG	POSTinterpersonal_LOG	PRE_CONVEYING_LOG10	POST_CONVEYING_LOG10	Participated in an Integrated Clinical Experience
Age	Pearson Correlation	1	-.105	-.084	.131	-.006	.085	.195	-.070	-.111	-.089	-.119	-.032	-.121	-.095	-.043	-.026	-.058
	Sig. (2-tailed)		.185	.320	.099	.939	.289	.179	.381	.165	.264	.140	.690	.129	.235	.592	.746	.468
	N	160	160	141	160	160	159	49	160	158	159	156	159	158	159	158	159	158
Sex	Pearson Correlation	-.105	1	-.165	-.109	-.195*	-.192*	-.326*	-.010	-.061	-.094	-.023	.013	-.122	.009	-.050	.010	.055
	Sig. (2-tailed)	.185		.050	.171	.013	.015	.022	.903	.444	.239	.775	.871	.128	.907	.535	.902	.492
	N	160	160	141	160	160	159	49	160	158	159	156	159	158	159	158	159	158
Hours of volunteer physical therapy observation	Pearson Correlation	-.084	-.165	1	.196*	.251**	.131	-.269	-.039	-.059	.074	-.112	-.036	.015	-.032	-.004	-.053	-.082
	Sig. (2-tailed)	.320	.050		.020	.003	.121	.090	.654	.500	.384	.192	.670	.857	.710	.959	.533	.335
	N	141	141	141	141	141	140	41	141	139	140	137	140	139	141	139	141	140
Prior paid work experience in healthcare	Pearson Correlation	.131	-.109	.196*	1	.797**	.331**	.052	.041	-.126	-.116	-.051	.085	-.021	-.065	-.019	-.069	-.238**
	Sig. (2-tailed)	.099	.171	.020		.000	.000	.723	.609	.114	.147	.526	.287	.789	.418	.810	.389	.003
	N	160	160	141	160	160	159	49	160	158	159	156	159	158	159	158	159	158
Work as a paid physical therapy aide	Pearson Correlation	-.006	-.195*	.251**	.797**	1	.362**	.035	.057	-.019	-.023	.022	.045	.065	-.004	.125	.008	-.237**
	Sig. (2-tailed)	.939	.013	.003	.000		.000	.813	.475	.810	.773	.788	.574	.417	.965	.118	.917	.003
	N	160	160	141	160	160	159	49	160	158	159	156	159	158	159	158	159	158
Hours of paid experience prior to starting program	Pearson Correlation	.085	-.192*	.131	.331**	.362**	1	.094	.084	-.103	-.042	.010	.161*	.015	-.040	.080	-.007	-.186*
	Sig. (2-tailed)	.289	.015	.121	.000	.000		.524	.292	.201	.597	.901	.044	.853	.619	.318	.934	.020
	N	159	159	140	159	159	159	48	159	157	158	155	158	157	158	157	158	157
Clinical instructor's efforts to engage you in conversations related to communication and professionalism	Pearson Correlation	.195	-.326*	-.269	.052	.035	.094	1	-.177	-.238	-.316*	.032	.005	-.198	-.247	-.169	-.183	c
	Sig. (2-tailed)	.179	.022	.090	.723	.813	.524		.224	.103	.027	.828	.972	.176	.087	.252	.208	.000
	N	49	49	41	49	49	48	49	49	48	49	48	49	48	49	48	49	47
SCHOOL_CODE	Pearson Correlation	-.070	-.010	-.039	.041	.057	.084	-.177	1	.027	.192*	.145	.103	.211**	.278**	.216**	.348**	-.055
	Sig. (2-tailed)	.381	.903	.654	.609	.475	.292	.224		.738	.015	.071	.196	.008	.000	.006	.000	.491
	N	160	160	141	160	160	159	49	160	158	159	156	159	158	159	158	159	158
PREamREFLsqrt	Pearson Correlation	-.111	-.061	-.058	-.126	-.019	-.103	-.238	.027	1	.589**	.426**	.203*	.393**	.306**	.323**	.282**	.031
	Sig. (2-tailed)	.165	.444	.500	.114	.810	.201	.103	.738		.000	.000	.011	.000	.000	.000	.000	.696
	N	158	158	139	158	158	157	48	158	158	157	156	157	158	157	158	157	156
POSTamREFLsqrt	Pearson Correlation	-.089	-.094	.074	-.116	-.023	-.042	-.316*	.192*	.589**	1	.313**	.280**	.348**	.481**	.386**	.500**	.149
	Sig. (2-tailed)	.264	.239	.384	.147	.773	.597	.027	.015	.000		.000	.000	.000	.000	.000	.000	.062
	N	159	159	140	159	159	158	49	159	157	159	155	158	157	158	157	158	157
PREconf_REFLsqrt	Pearson Correlation	-.119	-.023	-.112	-.051	.022	.010	.032	.145	.426**	.313**	1	.173*	.267**	.223**	.265**	.253**	.136
	Sig. (2-tailed)	.140	.775	.192	.526	.788	.901	.828	.071	.000	.000		.031	.001	.005	.001	.001	.093
	N	156	156	137	156	156	155	48	156	156	155	156	155	156	155	156	155	154
POSTconf_Log10	Pearson Correlation	-.032	.013	-.036	.085	.045	.161*	.005	.103	.203*	.280**	.173*	1	.250**	.268**	.243**	.283**	-.027
	Sig. (2-tailed)	.690	.871	.670	.287	.574	.044	.972	.196	.011	.000	.031		.002	.001	.002	.000	.739
	N	159	159	140	159	159	158	49	159	157	158	155	159	157	158	157	158	157
PREinterpersonal_LOG	Pearson Correlation	-.121	-.122	.015	-.021	.065	.015	-.198	.211**	.393**	.348**	.267**	.250**	1	.590**	.814**	.582**	.011
	Sig. (2-tailed)	.129	.128	.857	.789	.417	.853	.176	.008	.000	.000	.001	.002		.000	.000	.000	.887
	N	158	158	139	158	158	157	48	158	158	157	156	157	158	157	158	157	156
POSTinterpersonal_LOG	Pearson Correlation	-.095	.009	-.032	-.065	-.004	-.040	-.247	.278**	.306**	.481**	.223**	.268**	.590**	1	.504**	.859**	.070
	Sig. (2-tailed)	.235	.907	.710	.418	.965	.619	.087	.000	.000	.000	.005	.001	.000		.000	.000	.382
	N	159	159	141	159	159	158	49	159	157	158	155	158	157	159	157	159	157
PRE_CONVEYING_LOG10	Pearson Correlation	-.043	-.050	-.004	-.019	.125	.080	-.169	.216**	.323**	.386**	.265**	.243**	.814**	.504**	1	.587**	-.061
	Sig. (2-tailed)	.592	.535	.959	.810	.118	.318	.252	.006	.000	.000	.001	.002	.000	.000		.000	.449
	N	158	158	139	158	158	157	48	158	158	157	156	157	158	157	158	157	156
POST_CONVEYING_LOG10	Pearson Correlation	-.026	.010	-.053	-.069	.008	-.007	-.183	.348**	.282**	.500**	.253**	.283**	.582**	.859**	.587**	1	.013
	Sig. (2-tailed)	.746	.902	.533	.389	.917	.934	.208	.000	.000	.000	.001	.000	.000	.000	.000		.874
	N	159	159	141	159	159	158	49	159	157	158	155	158	157	159	157	159	157
Participated in an Integrated Clinical Experience	Pearson Correlation	-.058	.055	-.082	-.238**	-.237**	-.186*	c	-.055	.031	.149	.136	-.027	.011	.070	-.061	.013	1
	Sig. (2-tailed)	.468	.492	.335	.003	.003	.020	.000	.491	.696	.062	.093	.739	.887	.382	.449	.874	
	N	158	158	140	158	158	157	47	158	156	157	154	157	156	157	156	157	158

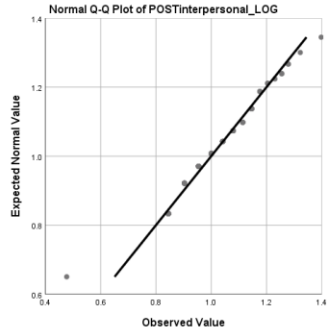
*. Correlation is significant at the 0.05 level (2-tailed).

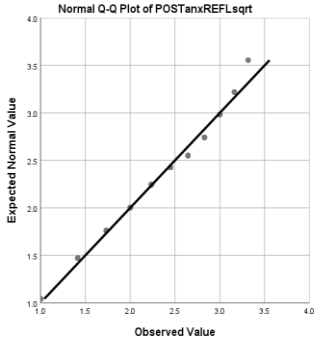
**. Correlation is significant at the 0.01 level (2-tailed).

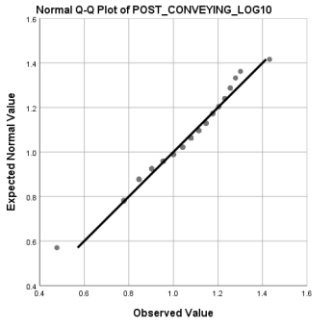
c. Cannot be computed because at least one of the variables is constant.

Appendix F

Q-Q Plots for Dependent Variables after Transformation



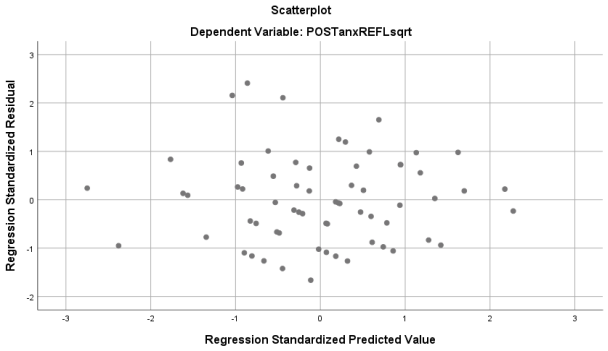




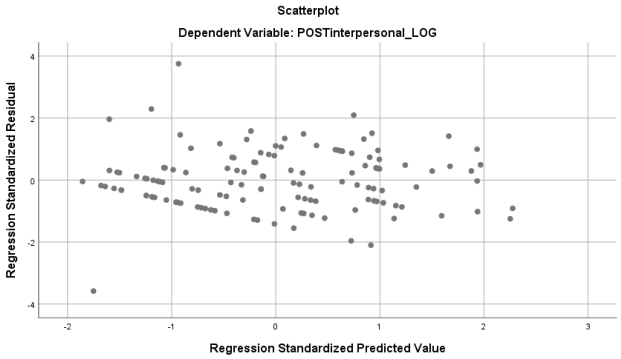
Appendix G

Scatterplots: HMR for all participants

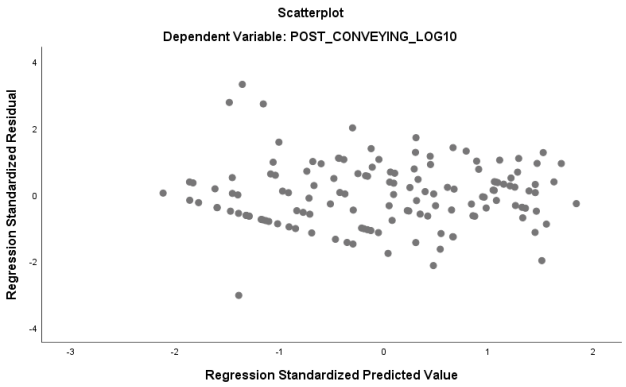
ComAnx



InterRelations



ConveyMedInfo



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