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**Exploring the Clinical Reasoning of Experienced Occupational Therapists:
A Metacognitive Approach**

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Exploring the Clinical Reasoning of Experienced Occupational Therapists: A Metacognitive Approach

Abstract

Purpose: This study explored the clinical reasoning of experienced occupational therapists' (OTs) perceptions of how practitioners apply anatomy concepts in practice. The research question was: how do OTs apply anatomy concepts during their clinical reasoning processes in everyday practice?

Methods: A qualitative methodology using a case study format framed with a metacognitive and phenomenological approach was used in this inquiry. Convenience and purposive sampling was utilized to recruit nine participants. Inclusion criteria were: (1) licensed OTs, and (2) a minimum of three years of occupational therapy experience. Semi-structured interviews were conducted to facilitate participants' metacognition of clinical reasoning. Interviews were transcribed, coded, and themed.

Results: Participants practiced in a wide range of settings including acute care, acute inpatient rehabilitation, hand therapy, intensive care (ICU), outpatient house calls, school-based practice, and skilled nursing. Level of experience ranged from four to 32 years. Findings showed there were two influential factors that guided decisions made by OTs: (1) various ways of knowing, and (2) the OT process. Across all interviews, three common themes were generated regarding clinical reasoning: (1) client-centered care, (2) clinical judgment, and (3) collaboration. Concepts of anatomy were embedded in clinical judgment and collaboration; however, participant responses and references to anatomy within clinical reasoning varied.

Conclusion: Clinical reasoning as articulated by the participants was consistent with the literature regarding clinical reasoning, client-centered care, and clinical judgments, with anatomy use integrated throughout those topic areas. Clinical reasoning as articulated by the participants was consistent with the literature regarding clinical reasoning, client-centered care, and clinical judgments, with anatomy use integrated throughout those topic areas. Based on the findings of the present study, the researchers suggested that OTs may at times contribute to medical problem solving by identifying diagnostic cues. OTs may benefit from a broad understanding of anatomy (nervous and musculoskeletal systems) and pathology to make certain clinical decisions in practice. Further research is needed to gain a more comprehensive understanding of how OTs use anatomy concepts within practice and the requirements for occupational therapy program curricula in preparing competent entry-level practitioners.

Exploring the Clinical Reasoning of Experienced Occupational Therapists: A Metacognitive Approach

Occupational therapists (OTs) must be adequately educated to make critical clinical decisions in practice that influence client care. Decisions are grounded in the overall goal of occupational therapy, which is to help clients achieve “health, wellbeing, and participation in life through engagement in occupation” (AOTA, 2014a, p. S4). OT practitioners achieve this by using knowledge, skills, and professional behaviors as they continuously engage in clinical reasoning, which Schell (2003) defined as “the process used to plan, direct, perform, and reflect on patient care” (as cited in Boyt-Schell & Schell, 2008, p. 5). Clinical reasoning, as facilitated within the classroom, allows students to master the knowledge base and establish beginning competence in integrating their knowledge into practice (Liu, Chan, & Hui-Chan, 2000). A particular type of knowledge required for OTs consists of the structure and function of the human body, which refers to anatomical concepts (Accreditation Council for Occupational Therapy Education, 2011).

Historically, anatomy has been included in occupational therapy curricula; however, there is limited research related to how anatomical concepts actually contribute to the clinical reasoning of OTs within specific practice settings. Schofield (2017) identified a lack in clarity of specific anatomical content required for competent practice and the need for empirical evidence to resolve this. In addition, there has been continued debate over what to include in anatomy curricula. Clinical opinions are needed to assist in determining what anatomy content to include in occupational therapy programs by asking what anatomy knowledge and constructs practitioners use in practice (Latman & Lanier, 2001). To address these concerns, we explored the literature regarding anatomy within general healthcare curricula, occupational therapy curricula, and occupational therapy practice, as well as, the connection between anatomy and clinical reasoning.

After a thorough review of the literature, we completed a qualitative case study format framed with a metacognitive and phenomenological approach to answer the inquiry: How do OTs apply anatomy concepts during their clinical reasoning processes in everyday practice?

Literature Review

In an effort to determine the clinical relevance and necessity of the extent of anatomy content, we set out to explore the knowledge base used by experienced OTs to make clinical decisions. We completed a thorough review of the existing literature from such databases as Academic Search Complete, Cochrane Database of Systematic Reviews, CINAHL, Education Source, ERIC, Google Scholar, Health Source, MEDLINE, PsychINFO, and PubMed for empirical and conceptual literature that focused on the education of human anatomy within college level curricula. Occupational therapy curricula, clinical reasoning, and the use of anatomy in practice were also topics included in the search. The availed research indicates that occupational therapy requires specific knowledge, skills, and professional behaviors.

In order to engage in competent practice, OTs are expected to understand how the systems of his or her work environment operate (Strong, Baptiste, & Salvatori, 2003). Understanding individual work environments allows practitioners to make sound clinical decisions for clients related to specific environmental supports and hindrances. Additionally, OT practitioners should be able to articulate the value of their unique role within a professional team in that setting (Strong et al., 2003). Practitioners need to know how to communicate with others, to perform assessments and interventions, to engage in client-centered practice, to reason clinically, and to self-reflect (Adam, Peters, & Chipchase, 2013). An understanding of personal values, beliefs, and cultural commitments as well as ethical considerations is also important for competent occupational therapy practice (Strong et al., 2003).

Practitioners need to possess content knowledge that is relevant and up-to-date. One component important for practitioners, which OT students must learn in their programs of higher education, is a thorough understanding of anatomy and the functioning of anatomical systems. Anatomical expertise applies to involvement across all practice settings and across the lifespan, ranging from pediatrics to

geriatrics. For the purpose of this research project, knowledge related to the application of anatomy for competent practice will be specifically addressed. We will discuss the involvement of anatomy within healthcare education at large and within occupational therapy programs, as well as the necessity of anatomy in practice. Finally, we will explore the available literature regarding clinical reasoning and the connection to anatomical knowledge.

Anatomy Education in Healthcare

Anatomy education has changed over the past several decades. Throughout this time, anatomy education has evolved to meet healthcare education demands which include changes in student needs, advances in technology, and limitations in learning resources and faculty qualifications (Schofield, 2017).

As a result of our examination of the existing literature regarding anatomy education at large, there is a lack in clarity in how “anatomy” is defined as it was not specified if physiological concepts were or were not included. According to an instrumental resource for anatomists, *Gray’s Anatomy*, anatomy is defined as, “the study of the structure of the body” (Standring, 2008, p. xxii). Due to the difficulty in discussing anatomical concepts in isolation, it appears as though anatomy education within research literature may also be referring to physiology, which is defined as, “the study of the normal functioning of a living organism and its component parts, including all its chemical and physical processes” (Silverthorn, 2013, p. 2). For the purpose of this study, we will use the term “anatomy” to refer to both anatomical and physiological concepts.

General education literature in multiple healthcare fields at large discussed the many ways of structuring the curriculum and the various educational techniques that are perceived to be beneficial by students and recommended by educators (Gopal et al., 2010; Latman & Lanier, 2001; Sugand, Abrahams, & Khurana, 2010; Wilson et al., 2017). A review was completed regarding different teaching approaches and strategies to anatomy education, and highlighted the need for reform (Sugand et al., 2010). Anatomy educators believe that utilizing cadavers provides an opportunity for students to develop patient-centered approaches, humanistic values, professionalism, maturity, effective interpersonal skills, coping skills, communication skills, and empathy (Sugand et al., 2010). Similarly, 85% of 154 allied health clinicians (physical therapists, physician assistants, OTs) who participated in a qualitative study also recommended the use of cadavers to study and learn anatomy (Latman & Lanier, 2001). In addition to cadavers being a useful teaching medium, methods that involve students teaching each other help to increase understanding of anatomy concepts, become more independent self-directed learners, develop communication skills, and improve attitudes toward anatomy (Sugand et al., 2010). One hundred and sixty-five healthcare-related students (excluding biology majors), who participated in a quantitative study, demonstrated significant improvement in the cardiac portion of their laboratory examinations following a web-based cardiology learning module (Gopal et al., 2010).

While there are a variety of teaching methods, no single method has been found to be superior in terms of learning outcomes based on a meta-analysis of 27 empirical studies (Wilson et al., 2017). Additionally, among the varied healthcare professions, such as speech and physical therapies, a range of anatomy knowledge is required to fulfill competency standards of the respective professions and to meet the interdisciplinary collaboration demands of the ever-changing medical field (Giuriato, Pather, Ashwell, & Strkalj, 2016; Sugand et al., 2010). Interdisciplinary collaboration refers to the joint effort of a healthcare team involving multiple professions (i.e. medicine, nursing, social work, and therapies) to effectively achieve a client’s health or rehabilitation goals (Moe & Brataas, 2016). Although an understanding of certain anatomy concepts is necessary to effectively work within healthcare, the amount of anatomical detail and knowledge required for competent healthcare professionals, including OTs, still remains unknown.

Anatomy Education within Occupational Therapy

According to the current Accreditation Council for Occupational Therapy Education (ACOTE) *Standards and Interpretive Guide* (2011), a foundational content requirement for occupational therapy education outcomes is that students should be able to, “demonstrate knowledge and understanding of the structure and function of the human body to include the biological and physical sciences. Course content must include, but is not limited to, biology, anatomy, physiology, neuroscience, and kinesiology or

biomechanics” (p. 18). The explicit inclusion of anatomy or physiology is not stated in the most recent, third iterative draft of the proposed 2018 ACOTE standards; however, it is unclear if it is implied (ACOTE, 2017). Despite recognition that anatomy and physiology constructs are required in the curriculum, there has been continued debate over the depth and breadth of anatomy curricula appropriate for OT students. Discussion has centered on the complexity of content needed for entry-level practice, the most effective teaching methodologies required for content assimilation, the perceived value of anatomy education by practitioners, and the ongoing review of anatomy for practitioners to stay current.

Anatomy within OT curricula. An overview of the historical background of the development of a master’s occupational therapy program recognized there were debates regarding content to be included in curricula between accreditation committees, education communities, students, and practitioners (Saarinen & Salvatori, 1994). Additionally, in a retrospective exploration of anatomy’s inclusion in occupational therapy curricula, Carroll and Lawson (2014) revealed that the founders of the *American Occupational Therapy Association (AOTA)* had extensively debated the educational needs of OTs until the *American Medical Association* offered their input in deciding the standards, which supported inclusion. Debates among professionals and governing bodies of the profession about what to include in anatomy courses continues.

Interestingly, current anatomy curricula is still viewed as problematic because physicians often help to develop guidelines of anatomy content requirements (Schofield, 2017). As a result, course guidelines may be more detailed than what is realistically required or needed for other healthcare students in anatomy courses. Empirical work regarding anatomy within occupational therapy curricula is limited. Due to the paucity of literature regarding relevant anatomy content necessary in occupational therapy curricula, there is a resulting lack of consistency across occupational therapy programs.

Lack of uniformity in anatomy teaching methods across OT schools. According to Schofield (2014), “core knowledge that OT students possess upon graduation may potentially vary due to content differences between education programs” (p. 98). Limited existing conceptual and empirical literature was found regarding the most effective methods to teach anatomy to OT students (Carroll & Lawson, 2014; Latman & Lanier, 2001; Saarinen & Salvatori, 1994; Schofield, 2014; Thomas, Denham, & Dinolfo, 2011).

Evidence supports that a combination of non-traditional teaching methods, instead of purely lecture-based methods alone, is perceived by students and practitioners to be beneficial if they include at least one of the following: problem-based learning, case-based learning, cadaver utility and/or dissection, and small-group learning (Table 1). However, exact effective teaching pedagogies have not been identified. Just as it is important to acquire OTs’ perspectives regarding occupational therapy education, it is imperative to consider practitioners’ perceptions of relevant anatomy knowledge needed to be competent in entry-level practice.

Table 1. *Summarized Literature of Teaching Methods Across OT Schools*

Author	Teaching Method	Article Summary
Conceptual Literature		
Saarinen & Salvatori (1994)	Problem based learning (PBL)	Students who completed the OT and PT programs perceive PBL curricula of a master’s program to be strong in self-directed learning, small group learning, integration of content with clinical skills labs, and overall relevance of learning.
Carroll & Lawson (2014)	Cadavers	The inclusion of cadaveric dissection supports the underlying philosophy of occupational therapy, learning through participation.
Empirical Literature		

Latman & Lanier (2001)	Cadavers	The most preferred method of teaching anatomy for surveyed OTs, PTs, and PAs in Texas was student dissection of human cadavers.
Schofield (2014)	Cadavers	OT practitioners in the study recommended the inclusion of cadaver dissection and/or prosection.
Parmar & Rathinam (2011)	Case-based learning (CBL)	Students gained and retained knowledge presented in an integrated and CBL approach with statistically significant post-test scores.
Thomas et al. (2011)	Small-group and supplemental digital web-based methods	Students perceived an improved ability to name major anatomical structures from memory, to draw major anatomical structures from memory, and to explain major anatomical relationships from memory.

OTs' perceptions of anatomy knowledge needed for competent practice. OTs recommend the inclusion of an anatomy course in occupational therapy programs. Ninety-six percent of 47 licensed OT practitioners from Texas who participated in a quantitative study reported that they believe all students in the profession should have a gross anatomy course (Latman & Lanier, 2001). In a similar pilot study, Schofield (2014), an OT and one of the only current researchers addressing the extent of anatomy knowledge needed by OT practitioners, found that all 50 practitioners in Arizona that participated in the quantitative survey recommend an anatomy course in entry-level master's occupational therapy programs. A larger follow-up study including 832 practitioners from across the United States found that 99% of the surveyed participants recommended an anatomy course in entry-level master's occupational therapy programs (Schofield, 2017). Therefore, based on current, albeit limited literature, it is perceived that anatomy course content is important to the occupational therapy profession; however, the extent of the content required has not yet been found.

In the same study, experienced OTs expressed having high expectations for entry-level practitioners' anatomy knowledge. Seventy percent of the 832 surveyed expressed that entry-level OT practitioners had adequate anatomical knowledge (Schofield, 2017). However, there was a significant difference between practitioners with three or more years of experience and those with less than three years; the more experienced the clinician, the more likely they perceived entry-level practitioners as having inadequate anatomical knowledge (Schofield, 2017). Despite the difference in perceived inadequacy of anatomy knowledge, it is unknown if the variation in anatomy knowledge affects clinical reasoning skills in entry-level occupational therapy practice. It is also uncertain if the skills were actually taught; however, assimilation did not occur or atrophied over time for certain entry-level practitioners.

Schofield (2017) indicated the need for empirical evidence to resolve the ambiguity surrounding specific anatomical content needed for competent practice. Practitioners recommend the study of nervous, muscular, and skeletal systems as well as the upper extremities be included in anatomy courses for OT students (Latman & Lanier, 2001; Schofield, 2014). Additionally, practitioners stated using anatomy knowledge for: (1) the application of upper limb biomechanics, (2) the evaluation of proper body positioning and posture, (3) prevention of pain, (4) the assimilation of how systems in the body interact, and (5) the promotion of client safety (Schofield, 2017). While the research did reveal basic concepts about anatomical knowledge required for practice (Latman & Lanier, 2001; Schofield 2014; Schofield, 2017), there is a need for clinical opinions in determining anatomy course content, as the extent of this knowledge needed in practice is still unclear.

The importance of anatomy in OT practice. Anatomy knowledge helps OTs evaluate a client's functional performance, implement treatment techniques and interventions, address client needs to enhance restoration of anatomical function, communicate effectively with medical staff, and interpret medical reports (Carroll & Lawson, 2014; Roll, Gray, Frank, & Wolkoff, 2015; Schofield, 2014; Schofield, 2017). Additionally, appropriate application of anatomy knowledge ensures the safety of

clients within clinical settings and in regard to their conditions, symptoms, and precautions (Carroll & Lawson, 2014; Schofield, 2014; Schofield, 2017).

The safety of our treatment populations is of utmost importance for occupational therapy clients, practitioners, and the facilities within which the interventions occur. In congruence with the *Occupational Therapy Code of Ethics*, doing no harm, or nonmaleficence, is placed first in the scientific implementation of the therapeutic plan (AOTA, 2015; Boyt-Schell & Schell, 2008). OTs (n=245) in physical rehabilitation and geriatric settings were surveyed in a quantitative study using closed and open-ended questions to explore occupational therapy practice errors (Mu, Lohman, & Scheirton, 2006). A primary reason for errors was insufficient knowledge and lack of experience in how to solve errors. Inadequate application of anatomical knowledge can lead to serious consequences in practice, resultant physical problems for clients, and greater financial burdens on healthcare payors and insurers (Schofield, 2014). To ensure adequate and appropriate application, reinforcement of learned anatomy concepts needs to occur across the clinical continuum.

Revisiting anatomy in OT practice. Anatomy knowledge can be difficult to retain if it is not used and reviewed regularly in the clinic. Therefore, revisiting anatomical knowledge during clinical practice is important to facilitate retention of information (Roll et al., 2015). The potential benefits of using sonography (ultrasound to obtain internal images of the body) in occupational therapy practice was explored in a qualitative study using open-ended questionnaires and interviews with findings supporting sonography as helpful for practitioners to master anatomy knowledge and strengthen clinical reasoning skills (Roll et al., 2015). Although this study seems to stand alone regarding the review of anatomy knowledge in practice, the findings suggest that anatomical knowledge is required when making some clinical decisions and needs to be periodically reviewed if not used on a consistent basis. However, the extent and manner in which post-graduate practitioners engage in anatomy review and continued education is unknown. More research is indicated in this specific area. It seems that revisiting anatomy in practice could benefit the development of clinical reasoning skills, which will be discussed in the following section.

Development of Clinical Reasoning and Use in Practice

OTs use various types of clinical reasoning, which Schell (2003) defined as “the process used to plan, direct, perform, and reflect on patient care” (as cited in Boyt-Schell & Schell, 2008, p. 5). The type of clinical reasoning style chosen is influenced by the particular theoretical lens-through which practitioners view and direct their therapy processes, the manner by which the chosen theory influences interventions, and level of experience (Liu et al., 2000). It was argued that practitioners need to be able to rationalize their clinical decisions through skills obtained via clinical rotations (Mattingly, 1991). With increased experience, clinical reasoning, and metacognition (thinking about thinking) surrounding their process, OTs become more advanced in practice (Boyt-Schell & Schell, 2008).

We propose that terms related to clinical reasoning have not been updated in recent years due to professional consensus regarding their definitions; therefore, we will utilize the most widely-used conceptual sources to provide definitions (Boyt-Schell & Schell, 2008; Fleming, 1994; Mattingly, 1991; Robertson, 2012; Schell & Cervero, 1993; Unsworth, 2001). There are seven types of clinical reasoning: (1) scientific, (2) procedural, (3) interactive, (4) pragmatic, (5) conditional, (6) ethical, and (7) contextual (Table 2; Appendix A). Although we do not explicitly address all of the clinical reasoning types, we will discuss the most relevant aspects for the purpose of our study in greater detail below. Schell and Cervero (1993) discussed the development of clinical reasoning in their conceptual view of practitioners advancing experience, simultaneously increasing their ability to integrate multiple types of reasoning into their practice. Integration begins with the most basic form of clinical reasoning, procedural, and gradually moves to, the intermediate, interactive and finally, the highest, conditional.

Types of Clinical Reasoning. Identification of a client’s functional problems and the underlying reason for the problem begins with pattern recognition, a skill directly related to procedural reasoning (Boyt-Schell & Schell, 2008; Fleming, 1994). Prior to applying this reasoning, however, a therapist needs to first recognize cues and patterns through scientific reasoning. Scientific reasoning involves generating hypotheses about the problem and then testing the hypotheses continuously throughout the therapeutic

process (Boyt-Schell & Schell, 2008). Detecting signs of improvement or deterioration of a client is another component of scientific reasoning (Boyt-Schell & Schell, 2008). As practitioners gain experience, their ability to recognize patterns becomes more intrinsic and tacit, thus improving the efficacy and efficiency of their clinical reasoning skills (Boyt-Schell & Schell, 2008; Mattingly & Fleming, 1994). Pattern recognition and cue recognition related to a particular diagnosis requires the utilization of anatomy and pathology knowledge, which facilitates practitioners' identification and generation of hypotheses throughout the scientific reasoning process.

Procedural reasoning focuses on the identification of client's functional problems and level of independence, putting less emphasis on the client's life roles and environment (Liu et al., 2000). OTs use procedural reasoning when determining and implementing interventions that are relevant and appropriate to the client (Unsworth, 2001). The practitioner utilizes his or her anatomical knowledge base to contribute to the selection of effective evidence-based interventions, an aspect of procedural reasoning.

In congruence with the practitioners involved in Schell's and Cervero's study (1993), novice therapist participants (n=2) in a mixed-methods empirical study more often used procedural reasoning alone, while the experienced therapists (n=3) used procedural reasoning in conjunction with interactive and conditional reasoning (Unsworth, 2001). The interactive reasoning of a practitioner dictates how he or she engages with the client (i.e. touching, body language, body positioning, tone of voice, etc.) throughout the therapy sessions.

With increased experience, therapists consider the bigger picture when engaging with the client. Conditional reasoning "involves the understanding of clients' disabilities in specific life contexts" (Liu et al., 2000, p. 174). Conditional reasoning encompasses all other dimensions of clinical reasoning in order to work toward a resolution to a client's current occupational deficits, and to envision what this means for the client's future (Schultz-Krohn & Pendleton, 2011). Conditional reasoning is most often used by experienced practitioners as it requires advanced skills to implement (Liu et al., 2000), and can be difficult for students to utilize.

Table 2. *Types of clinical reasoning*

Reasoning Type	Definition (Boyt- Schell & Schell, 2008)
Scientific	A systematic approach that applies logical and scientific method to creating, testing, and using knowledge to make decisions (p. 447)
Procedural	The thinking steps involved in working through the intervention routines for identified conditions (p. 447)
Interactive	Thinking directed toward building positive interpersonal relationships with clients, permitting collaborative problem identification and problem solving (p. 445)
Pragmatic	Practical reasoning that is used to attend to the contextual factors that inhibit or facilitate therapy. Attends to fitting therapy possibilities into the current realities of service delivery... (p. 447)
Conditional	A blending of all forms of professional reasoning for the purposes of flexibility responding to changes (p. 444)
Ethical	Reasoning directed to analyzing an ethical dilemma, generating alternative solutions, and determining actions to be taken. Systematic approach to moral conflict (p. 444)
Contextual	Goes beyond the pragmatic, forming an overarching meta-framework that should be considered first in order to orientate one's reasoning to a specific context of practice (Robertson, 2012, p. 67)

Development and Utility of Clinical Reasoning. Skilled use and understanding of all clinical reasoning types is required to engage in best practice (Boyt-Schell & Schell, 2008). In order to engage proficiently in clinical reasoning, a thorough understanding of the process must be established prior to entering practice (Table 2; Appendix A). Clinical reasoning begins to develop in the classroom, and advances throughout students' out-of-classroom learning experiences. Twelve inpatient rehabilitation OTs from Hong-Kong participated in a qualitative study which analyzed an occupational therapy program curricula and compared clinical reasoning of senior therapists (average of 8.1 years of experience) to junior therapists (average of 1.7 years of experience) (Liu et al., 2000). The findings of the study determined that students must master anatomical content and demonstrate competence in translating this information to practice within rehabilitation settings, thereby developing the clinical reasoning needed for competency standards. Translation of knowledge to clinical practice occurs through experiential learning, according to 25 OT students who participated in a quasi-experimental pre/post-test study design (Coker, 2010). These students reported that interacting with young clients with cerebral palsy in an experiential learning exercise, which involved the implementation of a treatment program, facilitated the translation of knowledge to practice. After transitioning into the practitioner role, clinical reasoning continues to develop throughout one's career.

The amount and type of clinical experience influences the forms of clinical reasoning skills used (i.e. procedural, interactive, conditional, pragmatic). We found there is limited updated research (Humbert, 2004; Li, Murai, & Chi, 2013; Liu et al., 2000; Unsworth, 2001) which demonstrates the process of clinical reasoning used by OTs, including occupational therapy assistants (OTAs), in practice. Liu et al. (2000) suggest the need for increased clinical experience to use and apply conditional reasoning. Additionally, a planned and supervised introductory period for practitioners when entering an unfamiliar setting is necessary to develop clinical reasoning skills (Adam, Gibson, Strong, & Lyle, 2011). Twelve OTs with varying years in practice participated in an empirical qualitative study that explored the types of clinical reasoning used when making clinical decisions for intervention (Liu et al., 2000). The OTs used conditional reasoning most often, followed by procedural reasoning, and lastly interactive reasoning. However, when differentiating between experienced and novice therapists, the results showed that 74% of experienced therapists and 10% of novice therapists used conditional reasoning. Sixty percent of novice therapists and none of the experienced therapists in the study used procedural reasoning alone (Liu et al., 2000). We speculate the results may be due to the already integrated procedural reasoning skills of the seasoned therapists. A similar study completed using a multiple case study approach addressed the clinical reasoning of 10 experienced OTA practitioners. The study found the clinical reasoning process that these individuals use is more complex and goes beyond the definitions of traditional types of clinical reasoning (Humbert, 2004) defined above. The complexity of the reasoning process could also be influenced by different patient contexts within the clinic and merits further discussion here.

The specific type of clinical reasoning used depends on the clinical problem presented to the OT. Types of practitioners' clinical reasoning were explored when determining the type of sling needed for a patient with a shoulder subluxation as a result of a stroke (Li et al., 2013). Practitioners who had more training in neuro re-education techniques were more likely to use procedural reasoning; their rationales correlated with anatomy concepts, such as joint alignment. Pragmatic reasoning was utilized by practitioners with less training in neuro re-education, considering practical solutions such as cost-effectiveness and feasibility, when making decisions. While Li et al. (2013) aimed to explore the clinical reasoning of OTs, the study also uncovered therapists' use of specific anatomical knowledge when making clinical decisions only related to one specific client area of need (i.e. shoulder subluxations). To our knowledge, there are no studies that explicitly explore how anatomical concepts contribute to clinical reasoning across multiple areas of occupational therapy practice and there were no studies identified that demonstrated client outcomes with the use of various clinical reasoning types.

Literature Review Conclusion

Through the comprehensive literature review, we discovered a paucity of empirical literature related to the anatomy knowledge needed to make competent clinical decisions as an OT practitioner.

Additionally, it is not overtly stated what anatomy concepts applied in practice are essential when making clinical decisions, and what concepts are imperative for OT students to know for competent generalist entry-level practice.

There is a dearth of objective empirical data about the specific anatomy knowledge required for competent occupational therapy practice. Most of these studies focused on clinician and student perceptions of anatomy education structure and teaching techniques (Table 1). Due to the differing perceptions, there may be an inadequacy of anatomy knowledge, and it is unknown if the variation in anatomy knowledge affects occupational therapy practice (Schofield, 2017). Currently, practitioners and educational professionals have yet to come to a consensus about the extent to which OT students need to know anatomy concepts or how these concepts should be applied to practice in order to achieve competency standards. The lack of grounding studies focusing on anatomy knowledge, practice, and clinical reasoning demonstrate a significant gap and a considerable need for research in these areas.

ACOTE standards also do not specify what is considered to be an adequate biological and anatomical knowledge outcome (ACOTE, 2011). Core anatomy knowledge may vary among practitioners, since no studies have been conducted to further explore what anatomy knowledge is actually clinically necessary in order to inform an OT's clinical decision-making. Subsequently, there is a lack of understanding about how practitioners' clinical reasoning relates to anatomy concepts in everyday clinical settings. It may be that the application of anatomy concepts relates to certain types of clinical reasoning more than to others.

The evidence suggests that the type of clinical reasoning used depends on a practitioner's level of expertise. Differences between the manner in which practitioners of varying levels of experience approach a clinical situation could result from enhanced metacognitive abilities of experienced therapists. Part of the development of metacognition involves the integration of one's knowledge so that it becomes tacit. From the reviewed literature, it is implied that once integration of knowledge, such as that of anatomy, occurs and the practitioner no longer needs to consciously think through certain concepts, the efficiency of clinical reasoning will likely improve. As a result, even though it will not be at the forefront of experienced practitioners' clinical decisions, the knowledge base that informed these decisions in a practitioner's early practice years will seemingly remain. It is unclear how the skill set that informs clinical reasoning relates to anatomical concepts.

Based on our thorough review of the literature, we found it to be concerning that there is a lack in clarity in the extent to which anatomical concepts contribute to OTs' competence in clinical reasoning skills. There is a need to determine the degree of anatomy knowledge that influences clinical reasoning in order to more inclusively capture educational standards which foster the development of competent entry-level practitioners. We are aware that there are extraneous variables present that also influence the clinical reasoning of an OT practitioner. Variables include variation in education for participating practitioners, differences in continued education, diversity in experience, and bias in certain therapy techniques based on interests and skills. While maintaining awareness of these variables, our study aim was to understand and enlighten the profession in terms of how practitioners use clinical reasoning as it applies to anatomy concepts in everyday practice in order to make applicable recommendations to anatomy education at Elizabethtown College. The research question is: How do OTs apply anatomy concepts during their clinical reasoning processes in everyday practice?

Methodology

The present study underwent expedited review and was approved by the Elizabethtown College Institutional Review Board. Prior to implementation of any research involving human subjects or participants, the scientific details of the study must be thoroughly reviewed by this group of individuals within an institution that represent a variety of professions and genders to ensure the rights of the research subjects are protected (Portney & Watkins, 2009). Through the guidance and expertise of our primary investigator, who has previous experience in studying the clinical reasoning of OT practitioners (Humbert, 2004), we determined an appropriate first step in addressing our research question was to

conduct interviews with experienced OTs. The research method and design of our qualitative study will be discussed, as well as the participant selection process, data collection measures, and data analysis.

Research Method and Design

We completed a qualitative methodology using a case study format framed with a metacognitive and phenomenological approach to answer the research question: How do OTs apply anatomy concepts during their clinical reasoning processes in everyday practice? Semi-structured interviews were conducted with each participant to facilitate their metacognition and critical analysis of clinical reasoning to better understand how OTs use anatomy knowledge to make clinical decisions.

Qualitative research promotes exploration of various human behaviors in order to develop an understanding of how individuals perceive their own experiences (Portney & Watkins, 2009). A qualitative case study approach was utilized as a comprehensive study method as it incorporates the perspectives of multiple individuals with detailed accounts of complex research phenomena in real-life contexts (Morgan, Pullon, Macdonald, McKinlay, & Gray, 2017). We selected a case study method since we considered each of our practitioners' responses individually in order to acquire an in-depth understanding of the clinical reasoning of OTs as it directly relates to anatomy knowledge.

As discussed previously, metacognition is an important aspect of practitioners' problem solving and clinical reasoning skills (Boyt-Schell & Schell, 2008). Therefore, we utilized a metacognitive approach for this research to allow our participants to reflect on their clinical reasoning skills in practice. Within this metacognitive approach, we wanted to understand how OTs use their underlying thought processes, specifically regarding knowledge of anatomical concepts, to make clinical decisions.

A phenomenological approach was necessary in order to better understand OTs perspectives of their experiences when making clinical decisions in practice, and the extent to which they incorporate various components of anatomical knowledge. The phenomenological methodology guides research regarding participants' perspectives and complex realities of a certain experience (Portney & Watkins, 2009), which, in our case, was how OTs understand and apply anatomical concepts to make day-to-day decisions in practice. The process involves in-depth investigation into a phenomenon utilizing a small number of similar participants (Glesne, 2016). A phenomenological approach also involves the examination of similarities and differences across experiences of all participants (Glesne, 2016). Although we anticipated that each participant would have a different perspective regarding client assessment and intervention, we aimed to explore similarities in clinical reasoning that exist amongst participants in order to identify the important anatomical concepts utilized by OTs across a variety of settings.

We did not disclose the complete intention of our study via the research title to the interviewees. Our reasoning was if we explained to the interviewees our aim to identify the extent of anatomy knowledge they utilize to make clinical decisions in practice, they may prepare their responses to reflect constructs of anatomy instead of responding without bias (Appendix B). However, as the interview questions progressed, we intentionally asked the participants to describe or clarify their use of anatomy knowledge. We did not deceive the participants as to the purpose of the study in gathering information about their clinical reasoning as it relates to their practice. How interview participants were selected will be discussed in the next section.

Participant Selection

Participants were contacted by email and selected via convenience and purposive sampling through our professional connections. Convenience sampling selects participants on the basis of convenience or availability (Glesne, 2016). Purposive sampling aims to select interviewees who are knowledgeable and allow for a full range of perspectives and experiences (Portney & Watkins, 2009). Purposive sampling is recommended for qualitative interviewing since each informant is selected according to his or her potential to aid the researcher in developing insights they are exploring (Rubin & Rubin, 2005).

Professional connections came from Pennsylvania and Maryland. Our connections with the OTs developed through prior fieldwork/clinical experiences in a variety of settings (including healthcare systems, outpatient facilities, school districts, and rehabilitation hospitals). Participants were initially contacted via email for recruitment in the study (Appendix B). All participants signed a Participant

Consent Form (Appendix C). We sought out licensed OTs with three or more years of practice in a designated field of study (i.e. pediatrics, physical rehabilitation, geriatrics, etc.) to participate in this study. Inclusion criteria were: licensed OTs with at least three years of experience. Nine participants were selected.

Experienced OTs were needed for this study as it was assumed these practitioners have higher metacognitive abilities and are well suited for reflecting on the factors that contribute to the making of their clinical decisions (Boyt-Schell & Schell, 2008). Three consecutive years within a given practice area was selected because practitioners are expected to be at the competent level or above after three years of experience according to the clinical reasoning continuum which ranges from novice, to advanced beginner, to competent, to proficient, and finally expert (Unsworth, 2001). Although updated resources do not exist to our knowledge for classifying practitioners' level of experience, Schofield (2017) notes a difference in the 832 U.S. practitioner perceptions of preparedness of entry-level practitioners based on years of experience. As mentioned previously, there was a significant difference between practitioners with three or more years of experience and those with less than three years of experience. We propose that differences indicate a potential distinction in reasoning based on the achievement of three or more years of experience in one or multiple occupational therapy settings.

A variety of clinical settings were explored in order to make comparisons across practitioners and clinical settings. Included participants came from one of a multitude of settings (acute care, acute inpatient rehabilitation, hand therapy, ICU, outpatient house calls, school-based practice, and skilled nursing) to represent the continuum of anatomy knowledge within occupational therapy practice (Table 3). We intended to acquire as representative of a sample as possible. If two individuals were selected from the same setting (i.e. acute care), we chose one practitioner with the minimum experience inclusion criteria and one with double the experience or more to compare.

Data Collection Measures

Qualitative semi-structured interviews, which use a general interview guide (Appendix D) and probing questions that may arise throughout the interview (Patton, 2002), were conducted with each participant to facilitate their metacognition and critical analysis of clinical reasoning with select client cases to better understand how OTs use anatomy knowledge to make clinical decisions. It is important to consider the components and the phrasing of the questions asked during the interview to ensure that we asked questions that prompted the information we were seeking (Laliberte-Rudman & Moll, 2001). We consulted a variety of references regarding interview question formatting in order to compose our research questions (Glesne, 2016; Laliberte-Rudman & Moll, 2001; Patton, 2002; Rubin & Rubin, 2005). The interview guide was first pilot tested with two OT faculty members at Elizabethtown College to ensure clarity and was then revised to promote pointed questions, to focus inquiry and to probe for greatest understanding of perceptions.

The interviews were audio-recorded to ensure analysis of accurate information. Audio recorders were stored in secured locations where only we had access. Data recorded on devices were permanently erased after being transcribed. The consent forms and transcriptions, which excluded identifying information, were kept in a locked and secure cabinet in the primary investigator's (PI) office. To ensure confidentiality during audio recorded interview transcription, researcher and participant information was removed so that the participant could not be connected to the transcript. However, we assigned an identification number to each participant and researcher (i.e. P1 for participant 1) which allowed us to link data/responses to specific individuals. Transcription data was stored on a password protected computer that only the four researchers had access to, and was deleted from computer storage after the study was completed. Paper transcriptions were returned to the PI immediately after data analysis and appropriately disposed. General demographics for this study included gender, practice area, and total years of experience. The process of analyzing the collected data is warranted.

Data Analysis

Transcription, coding, and data analysis accompanied the interviews to generate themes and draw conclusions. Triangulation is a verification strategy that uses multiple approaches to ensure trustworthiness and credibility of interpreting the acquired data (Casey & Murphy, 2009; Cope, 2014).

Data interpretation via triangulation occurred through member checking (verification that the researcher gathered accurate conclusions from the participant), theme-checking among each researcher (identification of themes and comparison of findings with the other researchers), and field notes (reflection of questions and concepts learned after each interview) (Glesne, 2016; Krefting, 1991).

We utilized second cycle coding (Figure 1). The first cycle of coding included structured and descriptive coding of the topic/content through narrative, point of view, coding and exploratory, holistic thematic coding (Saldaña, 2012). The second cycle of coding was completed and consisted of pattern coding and coding highlighting preliminary but salient ideas (Saldaña, 2012). In both cycles of coding, constant comparative analysis was utilized to identify common themes that emerged within and between all transcripts (Patton, 2002). Three major themes were identified using this method and will be discussed in the results.

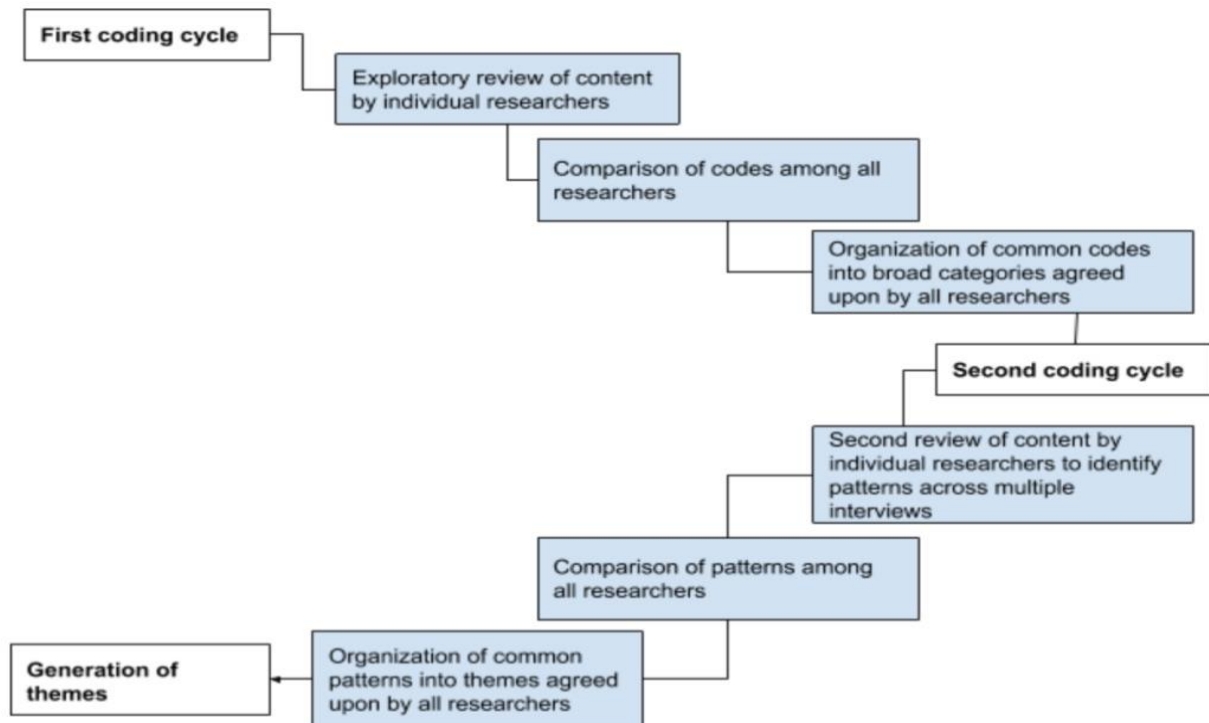


Figure 1. This figure illustrates the steps that were involved in the second cycle coding process to analyze data from interview transcripts. The process was initiated by an exploratory review of content throughout all interview and lead to the generation of themes.

Results

The researchers completed qualitative methodology using a case study format framed with a metacognitive and phenomenological approach to answer the research question, how do OTs apply anatomy concepts during their clinical reasoning processes in everyday practice? Qualitative semi-structured interviews were conducted with each participant to facilitate metacognition and critical analysis of practitioners' clinical reasoning process when making clinical decisions with client cases. Transcription, coding, and data analysis followed the interviews to generate themes and draw conclusions. Researchers utilized second cycle coding, after which three major themes were identified. Participant demographics, results acquired from data collection measures, and themes found related to the research question are discussed.

Participant Demographics

Nine participants were acquired through convenience and purposive sampling (Table 3). Participants came from a wide range of settings including acute care, ICU, acute inpatient rehab, home

health and skilled nursing, hand therapy, and school based practice. Participants ranged in clinical years of experience from four to 32 years. All participants were female.

Table 3. *Participant Demographics*

Participant	1	2	3	4	5	6	7	8	9
Experience (Yrs)	4	7.5	8.5	9	11	14	16	26.5	32
Current Clinical Setting	Acute care	ICU/ Acute care	Acute care	Acute inpt rehab	Outpt house calls	Hand therapy	School based	Skilled nursing facility (SNF)	School based

Results from Specific Data Collection Measures

Analysis of semi-structured interview transcripts revealed there were two factors that influenced the themes regarding clinical reasoning as it relates to the use of anatomical concepts. The first factor of “Ways of Knowing” and then the second factor of the “OT Process” will be discussed.

Ways of Knowing. There were various ways of knowing through which participants came to learn and understand concepts they use in practice which contribute to clinical decision-making (Table 4). These ways consisted of: (1) experience, (2) education including further credentials and professional interests, (3) theory, (4) research, (5) protocols, and (6) other resources.

When a participant mentioned she had known to make a specific clinical decision based on experience, the practitioner was referring to having had success in the past with the use of a particular intervention with other clients with similar conditions. Experience was the only example in ways of knowing that was reported by all nine participants. Knowing to make a clinical decision through education, further credentials, and professional interests was indicated by seven participants. Participants’ decisions were influenced by information they learned while acquiring formal degrees, including entry-level coursework and fieldwork, continuing education courses, in-services, training, and certifications (i.e. certified hand therapist or CHT).

Six participants included the use of theory to guide decisions made in practice. They explicitly stated a frame of reference or model of practice, such as Neurodevelopmental Theory and the Canadian Model of Occupational Performance. Six OTs also noted consulting research to influence the decisions they made in practice. The category of research included any reference to the literature and/or evidence-based practice.

Protocol use was indicated by five participants. They consulted formal guides for treatment approaches (i.e. LSVT Big Program) or made decisions based on the responsibility to follow established guides of the facility in which they work, as well as following established post-surgical precautions.

Other ways of knowing such as intuition, trial and error, and other resources were acknowledged by four participants. Some participants mentioned the use of intuition to guide clinical decisions by stating they “just knew” or “something didn’t feel right”. At times participants were unable to identify anything tangible that guided a particular decision made. Additionally, trial and error was noted when the participants tried an intervention or product to see if it worked, and continued the use of the intervention if it was found to be successful. Other resources included learning from other professionals both within

the occupational therapy profession and outside the profession through personal and professional relationships. The second factor that contributed to OT's clinical reasoning will now be discussed.

Table 4. *Participants' Ways of Knowing*

Components (represented in <i>n</i> interviews)	Component Definition
Experience (9)	Used with other clients who had similar conditions and has worked in the past
Education, Further Credentials, and Professional Interests (7)	Learned while acquiring formal degree, including coursework and fieldwork; CE courses, in-services, training, certifications (i.e. CHT), review of concepts learned in school
Theory (6)	Explicitly stated frame of reference, model of practice (i.e. NDT, CMOP)
Research (6)	Literature, evidence-based practice (EBP)
Protocols (5)	Formal guide for treatment (i.e.: LSVT Big), established guide of the facility, established precautions (i.e. hip, back)
Other (4)	Intuition, trial and error, or other professionals

The OT Process. The OT process as it is described in the *Occupational Therapy Practice Framework* (AOTA, 2014a) is the course of action in which occupational therapy is conducted. This was the the second factor that influenced clinical reasoning. The components of the OT process, as identified through the data analysis, included assessment, intervention, and professional collaboration. Each component was mentioned by all participating OTs (Table 5). Participants engaged in the assessment component through the use of various formal and informal methods of evaluating clients continuously throughout the therapy process in order to identify client's occupational profile, strengths, and needs. Additionally, participants engaged in the intervention component by selecting a variety of treatment techniques for the purpose of achieving improved occupational performance. The OT process included professional collaboration, or working alongside or with other professionals, in order to enhance service delivery. Findings from the present study showed that participants used various ways of knowing within the OT process when making clinical decisions. At times, these decisions also incorporated constructs of anatomy and other times, the decisions did not reference anatomy.

Table 5. *The OT Process*

Components	Component Definition
Assessment	Formal and informal methods of evaluation which were continuous throughout therapy process to identify clients' occupational profile, strengths, and needs
Intervention	Occupational therapy treatment selected for purpose of achieving improved occupational performance

Professional Collaboration	Working alongside or with other professionals to enhance service delivery
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Themes

Thematic analyses showed three themes that reveal insights into our research question regarding the extent of anatomical content utilized by participating practitioners to make clinical decisions. Based on the analysis of transcripts, the researchers of this study compiled the definition of anatomy to include all structures and functions of the systems of the body with and without disease processes. The three themes address the depth of anatomy knowledge used by participants when (1) considering client-centered care, (2) making clinical judgments, and (3) collaborating with other professionals.

Theme 1: Clinical reasoning is infused with the concept of client-centered care. Researchers included any situation in which participants considered the occupational profile during treatment in this theme. Aspects of the occupational profile that contributed to client-centered care decisions included the clients' interests, habits, environments, roles, and routines. Participants examined the components of the client in order to make a prediction of future occupational performance. For example, participant 6 described the factors of the occupational profile that influence her intervention process.

Everything is geared towards getting you back to that occupation. I really hone in on the person, who they are... because everybody is gonna come here with their own set of issues. People tell me everything... I use those two aspects of the person, who they are, and their environment and what they need to do in order to get them better... Then taking the person and their environment and their lifestyles and trying to create a plan for just them. I may have ten people in my clinic that have this type of injury... but their lifestyles are very different so I'm not gonna gear their treatment towards one cookie cutter approach.

Another instance of client-centered care was stated by participant 9 when she utilized the client's interests to guide natural opportunities for intervention.

But her strength is where she really has trouble. You can kind of see it in some of her self-help skills. She likes to shop, she is always wearing a different jacket, different sweaters, which is great because it's always providing a ton of different natural opportunities for OT to practice.

An occurrence of client-centered care was identified by participant 4 when she noted the importance of ensuring activities of daily living that can be accomplished in multiple contexts.

The nurse... taught him how to do it [insert catheter] in bed... an easy place to learn, but... what are you gonna do when you go out with your friends?... so we worked a lot on brainstorming together strategies for him... 'When you're out with your friends, how are you gonna carry your cath stuff...?'... We really worked a lot on... putting them [technical skills] into the functional piece of it – the real life piece, which I think is where OT comes in.

A final example of client-centered care was mentioned by participant 8 in reference to making a prediction of the client's performance in the future based on the supports in the environment as well as the occupational profile.

I don't expect to see her in our facility again, unless something else like this would happen. But she has gained the confidence, she knows what she needs to do, her family is extremely involved... her family is going to help with the medication management and financial management, and making sure she has food and stuff like that. I see her staying home, and I honestly don't think there's going to be that much of a problem, because family is more aware and are going to keep after her to stay hydrated, and do all that stuff that probably got her in [the hospital].

From the analysis of the interviews, it is evident that participants considered a variety of factors of the occupational profile when aiming to make clinical decisions that allow for the provision of client-centered care. Other decisions required a broad knowledge base to make skilled clinical judgments, which will be discussed next.

Theme 2: At times, knowledge of anatomy is suggested for clinical judgments and varies by setting. Throughout the interviews, the participants used a broad knowledge base to make skilled professional decisions throughout the OT process that included problem identification, functional performance and activity analyses. For example, participant 8 described her rationale for selecting a variety of interventions that addressed the client factors her client needs to engage in a particular activity.

You can take somebody and ADL them to death and never meet their needs... If I have them wash up, day after day... and they don't see themselves getting better, then I am not doing my job... I like to do a balance of therapeutic activities, strengthening,... neuro re-ed, with a combination of the ADL and going back and forth so they can see they're improving... she's building the muscle power now to endure the activity and the task, which she's going to need to carry the things in her kitchen... and building confidence.

Participant 4 observed her client and recognized cues in performance to identify underlying problems.

...attention versus vision... So you know if I'm evaluating someone's vision and they're....really fidgety while they're doing things. Or someone walks past in the clinic and they're having trouble focusing on me...when we're trying to test pursuits. Those things lead me to more of an attention [deficit].

Participants also considered broad concepts of body processes to articulate an understanding of the factors that may be influencing clients' performance.

It's important to understand the physiological response to our emotions... it's our body's response to a situation...not our choice of how we are respond[ing]. So many of the students are misunderstood... they're choosing to do this, and really it's a physiological response, like an autonomic, response to whatever the trigger is... We need to be better...at analyzing our behavior, and figuring out what we're doing to cause that physiological response... (Participant 7)

Further, aspects of the nervous system that contributed to her rationale for intervention selection was noted by participant 4.

Part of your central nervous system, your spinal cord has the two tracts that has the sensory tract and your motor tract...Your dermatomes are the areas of the skin innervated by the spinal nerves going into your spinal cord...You can have sensory deficits, motor deficits, depending on what area of the cord was injured. It's important to know what areas those are so you can plan interventions accordingly and educate patients.

Participant 1 articulated basic understanding of the musculoskeletal system that contributed to her client's care.

When the deltoid muscle isn't activating...part of the rotator cuff mechanism that keeps the humerus... in the shoulder joint, keeps it aligned... Subluxation in stroke is a high risk and... level of disability. Anything we can do to keep the patient in a functional... approximated position, is important to prevent further disability.

One other example of clinical judgment occurred when participants referenced the importance of understanding clients' diagnoses and monitoring symptoms.

So when you start seeing a worsening of...rigidity and the tremors... the shuffling, more freezing... It's [symptoms of Parkinson's] definitely coming from the brain. As far as affecting those movements, it's something that is just not quite connecting to the muscles. A lot of times it just seems like the client has a harder time moving and working past that rigidity which is coming

from the brain. Which goes back to like basic anatomy and learning about, these different neurological diseases... It's a lot of how you know what's going on more internally. (Participant 5)

As per the results of this study, the OT participants used a broad knowledge base, including basic anatomical concepts, for making clinical judgments related to assessment and intervention. Use of anatomical concepts was more prevalent in certain settings than others. For example, participants in physical rehab settings such as acute care, inpatient rehab, skilled nursing, and hand therapy mentioned anatomical concepts more than those in school based settings (Figure 2).

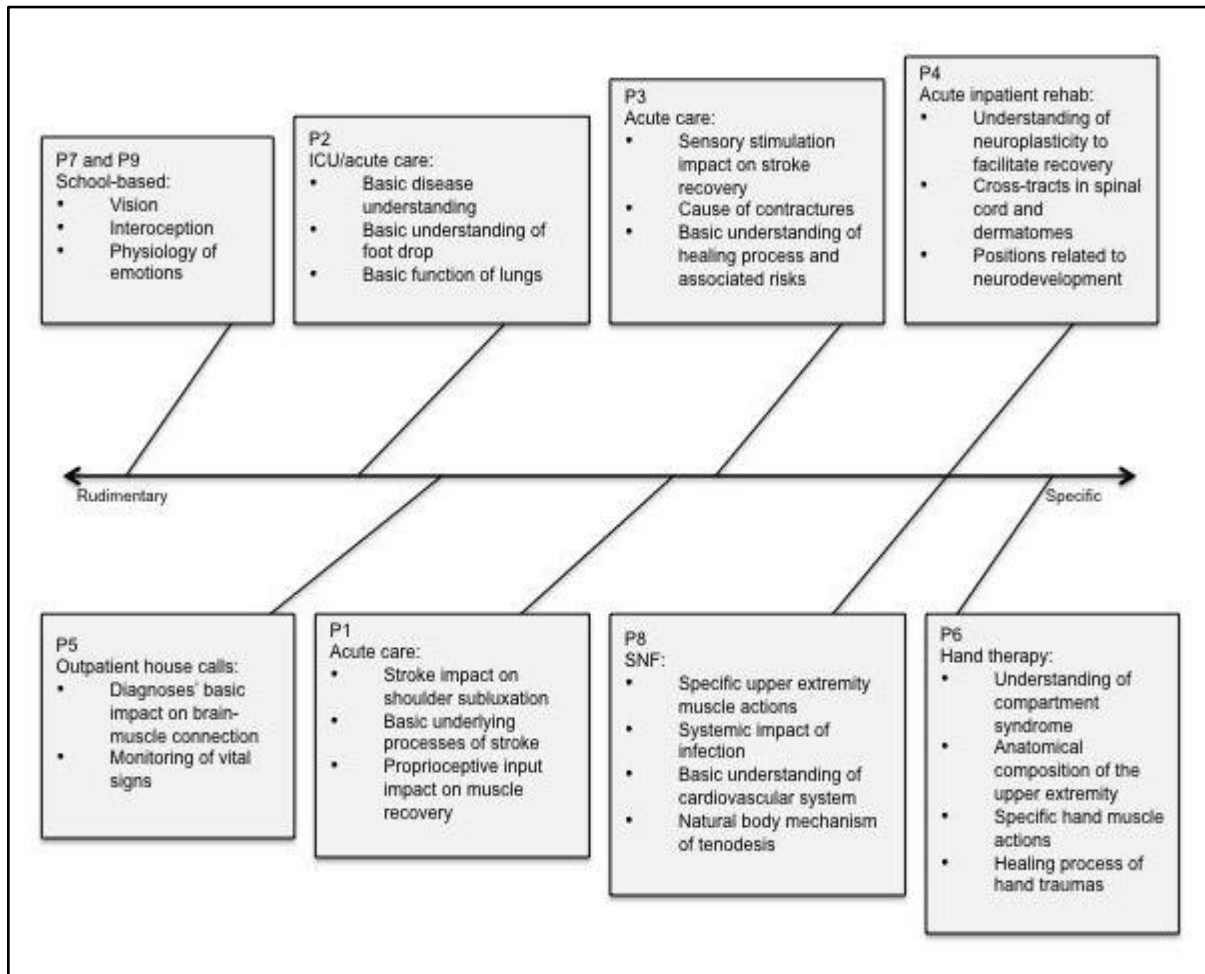


Figure 2. The image displays a continuum of anatomical concepts used by each participant, from rudimentary (basic) to more specific, to describe the impact of the diagnoses on occupational performance as well as to provide a rationale for intervention selection.

Additionally, at times, participants sought expertise of other healthcare professionals to make judgments outside of the scope of occupational therapy, which will be discussed within our next and final theme.

Theme 3: Practitioners identify when intervention is outside personal competency or the scope of OT practice and the need to collaborate with other professionals. We classified statements made by participants that demonstrated advocating for their clients by recognizing cues and pursuing

collaboration with other professionals to solve a problem. Participant 4, for example, recognized the cues that indicated her client required further medical attention.

She had a stroke and was very impaired to begin with...but she was very different. She wasn't following directions. Her speech was less...she was leaning more... I'm like, 'Something is wrong, something's wrong.' And everyone's like, 'No she's fine, she's fine.' And I'm like, 'No really, something's wrong.' I ended up calling the physiatrist directly, because no one else was giving me the answer I wanted, and she's like, 'Ok, we'll get a CT scan.' And she [patient] had had another stroke, actually.

Additionally, participating practitioners identified deficits that were previously unknown and undetected by the physician.

She had a stroke and the neurologist did not document a visual field deficit. I did my screen and I identified that; and then I had her do a functional task and she also presented in the task as she would if she had a visual field deficit. So I had to bring it to the attention of the neurologist because I feel like that was gonna be a big impact on her return to being a professor. (Participant 3)

Sometimes, the participants compiled cues and recognized that there was a problem, however they could not isolate what that problem was without referring a client to another professional.

I was like something's not right here, 'Why can't I move this girl's forearm,'... it wasn't feeling right... So I'm like, "You need to go see a hand surgeon," and it turned out that one of her bones had shifted... She ended up having surgery... So, just knowing when something isn't right and then trying to find the avenues to get those people to either a different service or a different way to treat it. (Participant 6)

Participant 9 referenced a situation when she needed to advocate for services related to her clients' vision deficits.

Sometimes it's vision. In the school we're a little bit limited. Directors are always like, 'Don't recommend an outside eval'. It can be a backdoor approach, like, 'Maybe you should talk to your pediatrician,' and you kind of flag all of these issues. The parents that have definitely been referred to vision have definitely followed up, and you have seen some changes with them [the kids].

Lastly, some participants described that advocating for adequate services does not always require identifying cues provided by the client, but instead may be recognizing when educating other healthcare staff on proper client care is needed. For example, participant 8 recognized the necessity of educating nursing staff on a client's bowel and bladder management.

Sometimes that takes a little boot-stomping, and working with the nursing staff to do that. And what was interesting was they [nurses] said, "She's incontinent." No she wasn't. Every time I saw her she had a dry brief. She was not incontinent. They were trying to use that as an excuse to not go in. "We" being the therapies and the nurse manager, had to be a little bit more forceful with the nursing staff, saying "No, let's do this right."

Participants emphasized the incorporation of other professionals when a pertinent problem is recognized and advocating for services that their clients need. The three described themes regarding collaboration, clinical judgment, and client-centered care composed participants' clinical reasoning process. A summation of the findings is discussed next.

Summation of Findings

The findings of our study indicated that participants use various ways of knowing during their clinical decision making in the OT process. Various ways of knowing included past experience;

education, further credentials, and professional interest; theory; research; protocols; and other ways of knowing such as intuition, trial and error, and other professionals. The OT process included assessment, intervention, and professional collaboration. Three themes generated about clinical reasoning include:

- 1) Clinical reasoning is infused with the concept of client-centered care.
- 2) At times, knowledge of anatomy is suggested for clinical judgments and varies by setting (predominately acute care, acute inpatient rehab, hand therapy, and skilled nursing).
- 3) Practitioners identify when intervention is outside personal competency or the scope of OT practice and collaborate with other professionals.

Discussion

The researchers of this study conducted interviews with nine practitioners from a variety of settings and who had varying years of experience, to answer the inquiry: How do OTs apply anatomy concepts during their clinical reasoning processes in everyday practice? Researchers asked questions about decisions practitioners have made and why they made them, as well as their metacognition throughout the decision-making process.

Researchers found there were two factors that influenced decisions made by OTs. The first was that participants came to learn or know concepts through various ways, which is in support of previous literature that states therapists use multiple ways to guide their clinical decisions (Palisano, 2010). Mentioned by all participants was the notion that experience influenced their decision-making, most of the participants referred to education as an additional source of knowing, and some of the participants referred to other select ways of knowing (Table 4). Past literature supports the findings of this current study that suggested OTs use their past experiences of having success in utilizing particular interventions with a certain client population to impact decisions regarding intervention (Kuipers, McKenna, & Carlson, 2006; Unsworth, 2001). Our findings are also consistent with the literature, which suggested therapists use not only experience but also their knowledge acquired through professional education to influence decisions (Leicht & Dickerson, 2002; Palisano, 2010). In addition to experience and education, participants at times referred to research to provide evidence-based practice as well as relied on theories to guide their decisions. This aligns with the *Occupational Therapy Practice Framework: Domain and Process, (OTPFIII)* which suggests the consultation of relevant evidence and theories to guide clinical reasoning in terms of intervention selection and occupational performance analysis (3rd ed.; AOTA, 2014a). Although other ways of knowing, such as the use of protocols, identified by participants are not mentioned in the *OTPFIII*, it was mentioned in existing literature (Kuipers et al., 2006; Kuipers & Grice, 2009). Intuition was another way of knowing that was not mentioned in the *OTPFIII*, however it was discussed in empirical and conceptual literature (Robertson, Warrender, & Barnard, 2015; Schell & Cervero, 1993; Unsworth, 2001). To our knowledge, the utilization of trial and error as a way of knowing was not clearly discussed in the existing literature.

The second factor that contributed to clinical decisions was the OT process. All participants used assessment, intervention, and collaboration with other professionals (Table 5). Practitioners engage in identifying problems related to clients' performance in activities, or occupational therapy diagnosis, as well as providing treatments continuously throughout the therapy process in a non-sequential manner (Leicht & Dickerson, 2002). The OT process is described in the *OTPFIII* (AOTA, 2014a), and "Scope of Practice" (AOTA, 2014b) which includes evaluation and intervention. The intervention process includes the selection of the appropriate service delivery model as well as the identification of who will provide the needed services (AOTA, 2014a). Further, it is perceived that anatomy knowledge helps OTs work effectively on a team, by facilitating communication using terminology all healthcare professionals understand (Schofield, 2014).

Participants used various ways of knowing to make clinical decisions, with and without anatomy constructs, throughout the OT process. From our analysis of the interviews, we found three themes regarding clinical reasoning that respond to our research question.

Client-Centered Care

Our first theme demonstrated that clinical reasoning is infused with the concept of client-centered care. Client-centered care considers the clients' interests, environments, habits, and roles. The results of our study suggest that anatomy was not frequently used for these types of clinical decisions associated with client-centered care; however, it is considered in the following themes related to clinical judgements and collaboration. Participants often looked past the clients' diagnoses when trying to provide holistic care. Mattingly (1991) believed that addressing medical-related deficits is a minor consideration of OTs during the therapy process, since their main consideration is the client's experience of the condition (as cited in Schell & Cervero, 1993).

Findings from this study are consistent with previous empirical and conceptual literature regarding OTs narrative, interactive, and conditional reasoning types regarding the utilization of the client's unique environment, roles, habits, routines and interests to make clinical decisions and predict future occupational performance (Boyt-Schell & Schell, 2008; Leicht & Dickerson, 2002; Liu et al., 2000; Mattingly & Fleming, 1994; Palisano, 2010; Schell & Cervero, 1993). Within the mentioned types of reasonings, specifically narrative, it is important to collaborate with the patient in order to engage in client-centered care (May, Greasely, Reeve, & Winters, 2008).

Our theme of client-centered care is consistent with the "Scope of Practice" and *OTPFIII*, which highlight the collaborative nature of the occupational therapy process as a result of making an effort, throughout the clinical reasoning process, to better understand clients' experiences (AOTA, 2014a, AOTA, 2014b). We will discuss the second theme regarding clinical judgment in the subsequent section.

Clinical Judgment

Our second theme illustrated that at times, knowledge of anatomy is suggested for clinical judgments and varies by setting. The consideration of disease processes and developmental and diagnostic challenges occurs within this theme. Our findings indicated that participants value understanding clients' diagnoses and monitoring symptoms in order to influence clinical judgements made, which is consistent with the literature (Kuipers et al., 2006). Participants used a broad knowledge base to make skilled professional decisions throughout the OT process which included problem identification, functional performance, and activity analyses. A rationale was provided for selecting interventions that addressed the client factor needs to engage in a particular activity. The research findings support previous literature (AOTA, 2014a; Palisano, 2010).

At times, participants utilized anatomical knowledge to make clinical judgments in their clinical reasoning process. The types of clinical reasoning that correspond with this idea include: (1) scientific, (2) diagnostic, and (3) procedural and are congruent with past literature (Leicht & Dickerson, 2002; May et al., 2008; Schofield, 2014; Schofield, 2017). Scientific reasoning serves as the groundwork to understand a client's condition that impacts their performance in occupation (Boyt-Schell & Schell, 2008; Leicht & Dickerson, 2002). Diagnostic reasoning, a component of scientific reasoning, encompasses a practitioner's ability to recognize cues and relate identified problems to occupational performance deficits throughout the assessment process, keeping biological concepts in mind (Leicht & Dickerson, 2002; May et al., 2008). Procedural reasoning, another aspect of the scientific reasoning process, allows the practitioner to select appropriate interventions in accordance with the client's occupational deficits, utilizing knowledge of disease and its impact on function (Mattingly & Fleming, 1994; Liu et al., 2000).

We concluded that anatomical concepts are not required for making all judgments related to client care. All of the participants initiated and/or responded to prompts regarding basic anatomy concepts used when making some decisions in practice. The use of anatomy ranged from a rudimentary understanding (stating basic functions of body systems) to utilization of distinct anatomical terms to describe a diagnosis or to rationalize their intervention. The range of anatomy addressed in previous studies related primarily to clinicians' opinions about anatomy use in practice (Schofield, 2014; Schofield, 2017). There are similarities between the results of the Schofield studies (2014; 2017) and our study, a comparison is

shown in Appendix E. It is still unclear, however, the depth of understanding of physiology as it relates to clinical judgments.

Collaboration

Our third theme demonstrated that practitioners identify when intervention is outside personal competency or the scope of occupational therapy practice and recognize the need to collaborate with other professionals. The participants of this study advocated for their clients by recognizing cues that indicate a scenario was beyond their scope of practice and needed another professionals' expertise to address the problem. In congruence with these findings, seeking additional professional opinions and referrals is part of occupational therapy intervention planning (AOTA, 2014a).

The literature does not explicitly describe occupational therapy's role in the medical problem-solving process. However, Fleming (1994) states that both physicians and OTs utilize cue recognition to identify problems. The literature describes occupational therapy diagnostic reasoning in terms of diagnosing occupational performance deficits, labeled as the "occupational therapy diagnosis" (Leicht & Dickerson, 2002, p. 114). To our knowledge, there is no available literature regarding OT's contributions to diagnostic reasoning in terms of identifying a patient's diagnosis. However, our findings suggest that participants, at times, may have contributed to the diagnostic reasoning of medical problem-solving. OTs recognize and report cues related to a particular diagnosis, and at times related to progress in therapy, which is then relayed to the appropriate medical professional in order to better understand the underlying problems impacting occupational performance and search for potential solutions to address the underlying problem.

Some practice settings may require more anatomical knowledge than others. The findings that suggested use of anatomy for clinical judgments varies by setting was further explained by noting the use of anatomical concepts as more prevalent in physical rehabilitation settings (i.e. acute care, inpatient rehabilitation, skilled nursing, and hand therapy) than in school-based settings. The awareness of variability of anatomical knowledge use has been documented in previous literature (Schofield, 2017). We still question the level that anatomy concepts are necessary to make competent clinical decisions.

Strengths and Limitations

The sample size of nine, retrieved via convenience and purposive sampling, is ample for a qualitative study. While these sampling techniques do not eliminate sampling bias, the participants came from a variety of settings, adding strength to the study. Although data triangulation was not used, analysis triangulation was utilized to increase trustworthiness of the results.

Implications for Practice and Education

Results demonstrated that clinicians sometimes consider anatomy concepts to influence clinical decisions and to better understand their clients' occupational performance. Some settings require more anatomical knowledge than others. The researchers question at what level are anatomy constructs necessary to make competent clinical decisions in practice.

Implications for Future Research

There is a need for future research to expand the transferability and utility of the results. Future research should explore the extent to which practitioners need anatomy knowledge to understand pathology and how diagnoses impact the client functionally. Researchers recommend exploration of therapists' metacognition regarding the concept of interprofessional collaboration as it relates to identifying cues in practice, and the extent that it relates to physiological concepts.

Conclusion

Currently, practitioners and educational professionals have yet to come to a consensus about the extent to which OT students need to know anatomy concepts or how these concepts should be applied in order to achieve competency standards in practice. The lack of grounding studies focused on anatomy knowledge used to make clinical decisions demonstrate a significant gap and a considerable need for research in this area. Core anatomy knowledge may vary among practitioners, since no studies have been conducted to further explore what anatomy content is clinically necessary to inform an OT's decision-making. Subsequently, there is a lack of understanding about how practitioners' clinical reasoning relates

to anatomy concepts in everyday clinical settings. It may be that the application of anatomy relates to certain types of clinical reasoning more than to others.

The need addressed in the present study was to determine the degree of anatomy knowledge that influences clinical reasoning in order to more inclusively capture educational standards which foster the development of competent entry-level practitioners. The aim of the present study addressed this need by exploring the extent of anatomical concepts that OTs use during their clinical reasoning process. Interviews provided insight into the research inquiry: how do OTs apply anatomy concepts during their clinical reasoning processes in everyday practice?

Findings exhibited two influential factors that guided decisions made by participants. One was that participants come to learn or know clinical expertise through various ways of knowing, especially their experience and education. The second factor that guided clinical decisions was the OT process. All participants used assessment and intervention throughout the OT process, as well as collaboration with other professionals when needed. Various ways of knowing and the OT process guided participants' clinical reasoning. From analysis of the interviews, three main themes were found and discussed regarding clinical reasoning that respond to our research question. The first theme, *client-centered care*, revealed that participants often looked past the clients' diagnoses when trying to provide holistic care, and did not consider anatomical concepts in conducting this type of reasoning. The second theme referenced participants utilizing anatomy to make certain *clinical judgments*. However, anatomical concepts were not required for making all judgments related to client care. Overall, participants used a broad knowledge base to make skilled decisions about identifying problems and analyzing clients' performance in their daily activities. The use of anatomy ranged from a rudimentary understanding (stating basic functions of body systems) to utilization of distinct anatomical terms to describe a diagnosis or to rationalize interventions. The depth of physiological understanding OTs need to make clinical judgments is still unclear. Lastly, as noted the third theme, our findings showed that an understanding of anatomy concepts may facilitate *collaboration* with other professionals. In particular, participants advocated for necessary services by recognizing specific diagnostic cues that indicate a problem was beyond OT's role and needed another professional's expertise.

Based on the findings of the present study, we suggest that OTs may at times contribute to medical problem solving of the underlying diagnostic issue impacting client performance. We still question the level that anatomy and physiology concepts are necessary to make competent clinical decisions. It is concluded that practitioners may benefit from a broad understanding of anatomy (nervous and musculoskeletal systems) and pathology to make clinical decisions in practice.

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Appendix A

Table A. *Types of Clinical Reasoning*

Reasoning Type	Definition (Boyt-Schell & Schell, 2008)	Example
Scientific	A systematic approach that applies logical and scientific method to creating, testing, and using knowledge to make decisions (p. 447)	Recognizing that a client has experienced a stroke based on cues such as slurred speech, unilateral weakness, and difficulty speaking.
Procedural	The thinking steps involved in working through the intervention routines for identified conditions (p. 447)	The use of preparatory methods in combination with occupation-based activities for patients with humeral fractures has been demonstrated as effective within the literature (Colaianne & Provident, 2010; Colaianne, Provident, DiBartola, & Wheeler, 2015; von der Heyde, 2011). Therefore, the therapist would select this intervention over others.
Interactive	Thinking directed toward building positive interpersonal relationships with clients, permitting collaborative problem identification and problem solving (p. 445)	Using body language, tone of voice, and therapeutic touch to establish rapport with a patient.
Pragmatic	Practical reasoning that is used to attend to the contextual factors that inhibit or facilitate therapy. Attends to fitting therapy possibilities into the current realities of service delivery... (p. 447)	Scheduling options, payment for services, equipment availability, therapist's skills, management directives, and the personal situation of the therapists (Boyt-Schell & Schell, 2008, p. 447)
Conditional	A blending of all forms of professional reasoning for the purposes of flexibility responding to changes (p. 444)	Imagining a client with a spinal cord injury improving to be able to complete desired occupations with modified independence.
Ethical	Reasoning directed to analyzing an ethical dilemma, generating alternative solutions, and determining actions to be taken. Systematic approach to moral conflict (p. 444)	Considering the ethical implication for a young patient with a traumatic brain injury who has plateaued. The insurance is no longer covering treatment. The team must decide if treatment is still necessary as there is research evidence that improvements can still be made, or to discontinue services due to the insurance restrictions.
Contextual	Goes beyond the pragmatic, forming an overarching meta-framework that should be considered first in order to orientate one's reasoning to a specific context of practice (Robertson, 2012, p. 67)	Being unfamiliar with the context of a cardiac rehabilitation unit, it would be important to explore the nature of the practice including typical goals for clients in this setting, the interprofessional team collaboration style, theoretical base, and client cultures in the surrounding area.

Appendix B

Participant Recruiting Email and Phone Script

Title of Research: Exploring the Clinical Reasoning of Experienced Occupational Therapists:
A Metacognitive Approach

IRB#: 1159667-1

Principal Investigator(s): Danielle Barattini, MOTS; Hannah Bowman, MOTS; and Katherine Reitz, MOTS, & Tamera Keiter Humbert, D.Ed, OTR/L

Explanation:

The purpose of our study is to explore the knowledge utilized to make clinical decisions everyday in practice. We anticipate that the results of this study will enable us to develop a better understanding of knowledge utilized by OTs in everyday practice to incorporate into the Elizabethtown College OT curriculum. Elizabethtown College Occupational Therapy Department supports our study. Contact principal investigators Danielle Barattini (barattinid@etown.edu), Hannah Bowman (bowmanh@etown.edu), Katherine Reitz (reitzk@etown.edu) or Dr. Tamera Keiter Humbert (humertt@etown.edu).

Script:

We will be conducting a semi-structured interview that will require about an hour to complete. The interview will be audio-recorded to ensure accurate information is acquired. We may need to contact you for a brief follow-up interview of about 30 minutes for clarification of discussion during the initial interview. The interview will take place in February and March at a secure and private location of your convenience. This interview is being conducted to explore and better understand your clinical reasoning when making decisions in clinical practice. Results of this study will have the potential to benefit and make improvements within the Elizabethtown College OT curriculum.

The data we retrieve during your interview will remain confidential, and will be stored on a password protected computer that only the four researchers have access to. Once the research has been completed, general data without identifying information will be incorporated into a presentation that will be shared with students and healthcare professionals during the annual Occupational Therapy Graduate Research Symposium at Elizabethtown College, as well as a manuscript for publication to occupational therapy and education related publications.

We have supplied you with a copy of the informed participant consent form that you may sign for your participation.

Appendix C

Informed Consent: Participant Consent Form

Title of Research: Exploring the Clinical Reasoning of Experienced Occupational Therapists: A Metacognitive Approach

Principal Investigator(s): Tamera Keiter Humbert, D.Ed, OTR/L

Student Investigators(s): Danielle Barattini, MOTS; Hannah Bowman, MOTS; and Katherine Reitz, MOTS

Purpose of Research:

The study aim is to understand and enlighten the profession in terms of the knowledge utilized to make clinical decisions in everyday practice.

Procedures:

We will be conducting an hour-long semi-structured interview which will focus on a practitioner's ability to critically analyze his or her clinical reasoning skills as it relates to intervention selection for the clients. The interview will be audio-recorded to ensure analysis of accurate information. We may need to contact you for a brief follow-up interview of about 30 minutes for clarification of discussion during the initial interview.

Risks and Discomforts

I understand that no risks or discomforts are anticipated from my participation in this study.

Benefits

I will receive no benefits from being in this study. Results of this study could have the potential to benefit and make improvements to the Elizabethtown College occupational therapy curriculum.

Compensation

I understand that I will not receive any compensation for participating in this study.

Confidentiality

The information gathered during this study will remain confidential with all records to be kept private and locked in a file and password protected computer during the study. Only the researchers listed on this form will have access to the study data and information. The results of the research will be published in the form of an undergraduate paper and may be published in a professional journal or presented at professional meetings. I understand that in any report or publication, the researcher will not provide any information that would make it possible to identify me.

Withdrawal without Prejudice

My participation in this study is strictly voluntary; I have the right to refuse to participate or withdraw from the study at any point in time with no penalty.

Contacts and Questions

If I have any questions concerning the research project, I may contact Danielle Barattini (barattinid@etown.edu), Hannah Bowman (bowmanh@etown.edu), Katherine Reitz (reitzk@etown.edu) or Dr. Tamera Keiter Humbert (humertt@etown.edu).

Should I have any questions about my participant rights involved in this research I may contact the Elizabethtown College Institutional Review Board Submission Coordinator, Pat Blough at (717)361-1133 or via email at bloughp@etown.edu.

Statement of Consent:

I am 18 years of age or older.

I have read the above information. I have asked questions and received answers.

My participation in this study is strictly voluntary; I have the right to refuse to participate or withdraw from the study at any point in time with no penalty.

A copy of this consent form has been provided to me.

Participant Signature _____ Date _____

Investigator Signature _____ Date _____

Appendix D

Interview Guide

1. Background information
 - a. How long have you been practicing as an occupational therapist?
 - b. Tell me a little about your work history. What settings have you worked in and for how long?
 - c. What level of education do you have (i.e. Bachelor's, Master's, OTD, etc.) and what certifications do you hold?
2. Without giving out any confidential or HIPAA protected information, tell me about one of your current clients.
3. What evaluation(s) did you administer and why?
4. How does [medical condition] impact that client's occupations.
5. Tell me about your interventions for that client.
6. What information or knowledge helped you decide the appropriate interventions?
7. Why did you choose that particular intervention?
8. How did you know that the intervention would be successful for the client?
9. What did you intend to accomplish in using that intervention?
10. How do you know that the client had [a specific deficit]? What were the clues that you observed?
11. As a therapist, how would you have encouraged or improved [specified deficit]?
12. Where do you see this patient in the next few months? What do you anticipate will happen in terms of recovery? Tell me why from a physiological standpoint.
13. Can you think of a time in your OT career in which you discovered a client had an underlying issue that was not detected by another healthcare professional? Tell me the story.

Probing Questions:

1. Describe the main concepts/ knowledge you feel you utilize most from your OT education to make these decisions.
2. Tell me about how your understanding of the underlying body structures and processes of this client impacted your decisions.
3. Walk me through how you made those decisions. Why did you choose to do ____ first?
4. How do you know that is physiologically possible?
5. What experiences led you to discover that you should select a particular [assessment or intervention]?

Appendix E

Table E. *Comparison of Study Results to Previous Literature*

Schofield (2014; 2017) OT's suggested knowledge and competence needed in addressing the following areas in practice:	Current Study
<ul style="list-style-type: none"> • Application of upper limb anatomy, upper limb biomechanics, and glenohumeral rhythm 	<ul style="list-style-type: none"> • Specific upper extremity and hand muscle actions • Understanding of compartment syndrome • Anatomical composition of the upper extremity
<ul style="list-style-type: none"> • Comprehensive knowledge of body system interactions 	<ul style="list-style-type: none"> • Systemic impact of infection • Basic disease understanding • Basic function of lungs • Basic understanding of cardiovascular system • Physiology of emotions
<ul style="list-style-type: none"> • Understanding of shoulder subluxation following a cerebral vascular accident 	<ul style="list-style-type: none"> • Stroke impact on shoulder subluxation
<ul style="list-style-type: none"> • Determining level of spinal cord injury based on available motor and sensory function 	<ul style="list-style-type: none"> • Cross-tracks in spinal cord and dermatomes
<ul style="list-style-type: none"> • Understanding and addressing altered muscle tone (i.e spasticity), and muscle length tension relationships 	<ul style="list-style-type: none"> • Cause of contractures
<ul style="list-style-type: none"> • Understanding of tenodesis for hand function 	<ul style="list-style-type: none"> • Natural body mechanism of tenodesis
<ul style="list-style-type: none"> • Understanding how tissues heal following injury 	<ul style="list-style-type: none"> • Basic understanding of healing process and associated risks • Healing process of hand traumas
<ul style="list-style-type: none"> • (For neurorehabilitation setting) muscular re-education, neurological control of systems, return of innervation, neuroplasticity and muscle tone 	<ul style="list-style-type: none"> • Brain-muscle connection • Proprioceptive input impact on muscle recovery • Sensory stimulation impact on stroke recovery • Understanding of neuroplasticity to facilitate recovery • Positions related to neurodevelopment

Note. Anatomy regions and systems deemed important to include in an OT anatomy courses were muscular, skeletal, and nervous systems (Schofield, 2014; 2017), which is consistent with the displayed findings.