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Faculty Experiences Using Synchronous Videoconference Technology to Assess Student Psychomotor Performance

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This is to certify that the doctoral dissertation by

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Walden University
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Abstract

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DPT, University of Saint Augustine for Health Sciences, 2012

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

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Abstract

Psychomotor skills are an essential aspect of physical therapy (PT) education. Recent studies supported using videoconference technology (VCT) for psychomotor instruction, but research on the use of VCT for psychomotor assessments is limited. Determining VCT's usefulness for psychomotor exams is vital to establish best pedagogical practices. The purpose of this basic qualitative study was to explore the faculty experience using synchronous VCT to assess PT student's psychomotor skills. The conceptual framework for this study was the unified theory of acceptance and use of technology (UTAUT). The research question investigated how PT educators described the psychomotor skill assessment of students using VCT, related to the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions. Purposive sampling was used to collect qualitative data via online semistructured interviews of 15 U.S. physical therapy professors. Data were analyzed using emergent coding and thematic analysis. Key findings were that faculty participants perceived the use of VCT to assess psychomotor skills as a feasible alternative modality to face-to-face practicals. The use of VCT did not sacrifice achieving good learning outcomes. Faculty identified VCT assessment benefits as convenience, adaptability, and skill acquisition and recognized the challenges of a static camera angle and connectivity and resource issues. This study may foster positive social change by informing PT educators of the value of using VCT for psychomotor assessments, which provided additional educational opportunities, exposed students to telehealth, promoted acceptance of online learning, and improved accessibility for individuals in rural locations.

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Dedication

This dissertation is dedicated to my family, who sacrificed so much for me to achieve this milestone. Thank you all for your support and motivation, and thank you for allowing me the opportunity to take my own unique path. I am eternally grateful.

The Road Not Taken
By Robert Frost

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear
Though as for that the passing there
Had worn them really about the same,

And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I —
I took the one less traveled by,
And that has made all the difference.

Acknowledgments

I want to acknowledge the guidance and mentorship provided to me by my committee members. Thank you, Dr. Tyrrell and Dr. Perry, for your direct feedback and consistent encouragement throughout this process. Thank you, Dr. Stanciu, for your responsiveness and constructive critiques.

I would also like to acknowledge my family, without whom this would not be possible. Thank you to my supportive and loving husband, Jason. I am grateful for your loyalty and encouragement. Thank you to my children, Aaliyah and Mason, for allowing me the time to pursue something so challenging and for inspiring me to achieve great things. To my brother, Brian, thank you for understanding my nerdiness and still loving me. To my amazing parents, Mike and Diane, you have been the perfect role models. You have taught me to believe in myself, follow my passion, and persevere. I am truly grateful for your guidance, and I absolutely could not achieve this without your constant care and sage advice.

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Chapter 1: Introduction to the Study

This chapter begins with background information related to the problem and identifies the gap in the literature that my study addressed. The sections in this chapter provide a rationale for the study, explain the conceptual framework, and outline the research questions. Subsequently, this chapter provides information on the methodology for my study, defines key terms related to educational technology and physical therapy education, and identifies assumptions or limitations that may be present in this study.

Background

The development of mobile phones, the internet, computers, and other telecommunication software has made videoconferencing technology (VCT) standard in society today. VCT provides secure, high-quality, real-time audio and visual capabilities almost anywhere in the world (Liu & Chen, 2018; Mukan & Lavrysh, 2020; Rahayu, 2020). Nearly every facet of society utilizes VCT, including personal communication, commercial settings, corporate settings, telemedicine, and distance education (Al-Balas et al., 2020; Becker et al., 2018; Farooq et al., 2020).

The COVID-19 pandemic resulted in many professional and educational institutions transitioning from in-person to virtual modes of communication, making VCT well known to students and teachers (Al-Azzam et al., 2020; Farooq et al., 2020; Iwai & Lusk, 2020; McGann et al., 2020; Utama et al., 2020). Many studies noted a difficult transition from face-to-face education to online learning and assessment during the COVID-19 pandemic but demonstrated ways to continue education using videoconferencing and other online learning management systems technology (Al-Azzam

et al., 2020; Farooq et al., 2020; Iwai & Lusk, 2020; McGann et al., 2020; Utama et al., 2020). Using VCT in educational institutions, students and faculty adapted to this new modality by incorporating VCT into their learning and assessment practices (Donkin et al., 2019; Dost et al., 2020; McGann et al., 2020). Many researchers have explained the impact on student learning using VCT from a student perspective (Kenny et al., 2020; Liu & Chen, 2018; Lockwood et al., 2018; Mansoor, 2020; McGann et al., 2020; Rahayu, 2020; Romero-Hall & Vicentini, 2017). However, authors investigating the transition to online learning during the COVID-19 pandemic (Dost et al., 2020; Farooq et al., 2020; Iwai & Lusk, 2020; Utama et al., 2020) indicated a need to conduct further research to investigate the experiences of faculty utilizing VCT. My study investigated the experiences of faculty using synchronous VCT to assess psychomotor skills in physical therapy programs.

Psychomotor assessment is an integral part of physical therapy education. Multiple researchers have recommended integrating synchronous face-to-face instruction using VCT in medical education (Becker et al., 2018; Cherry & Flora, 2017; Kemery & Morrell, 2020; Liu & Chen, 2018; Tuma et al., 2021). Additional researchers demonstrated synchronous and asynchronous VCT to teach psychomotor skills (Donkin et al., 2019; McGann et al., 2020). However, little evidence exists regarding synchronous VCT for psychomotor assessment. Understanding the experience of faculty administering psychomotor assessments via VCT provided additional insight regarding the usefulness of this assessment strategy.

Problem Statement

There is a growing need for physical therapists within the United States. The U.S. Bureau of Labor and Statistics (2021) expects the physical therapy profession to grow by 21% over the next 10 years. Thus, there is a need to graduate students to meet the demand within this profession. As the physical therapy profession advances, education must also evolve to ensure quality instruction and assessments in the cognitive, affective, and psychomotor domains. The field of physical therapy follows the lead of medical education to use VCT as demonstrated in healthcare via telemedicine (Hong et al., 2020; Lee, 2020). Physical therapists use VCT in clinical practice via telemedicine to evaluate a patient's psychomotor ability (Hong et al., 2020; Lee, 2020). Faculty and students using VCT for psychomotor assessment is analogous to telemedicine because telemedicine utilizes the same audiovisual modes of communication to evaluate a patient's psychomotor abilities. Thus, VCT may be useful for exposing faculty and students to this modality for psychomotor assessment because the experience of using VCT can function as an introduction to telemedicine and provide some clinical experience (Hong et al., 2020).

The problem investigated in my study was the limited understanding of the faculty experience using synchronous VCT to assess the psychomotor skills of physical therapy students. The detrimental consequences of ignoring the faculty experience using current technology include misuse of educational resources, poor student experiences, ill-prepared physical therapists in the workplace, and limited diversity within the profession (Becker et al., 2018; Hong et al., 2020; Lee, 2020). Failure to understand the experiences

of faculty using VCT for psychomotor assessment impeded establishing the best pedagogical practices in educational technology. Likewise, not identifying the faculty experience using VCT could negatively impact student clinical readiness and overall patient care due to a lack of understanding of the technology (Dupre et al., 2020). It was essential to expand the educational technology literature to fill the gap and identify how successes and failures of using VCT may impact pedagogical approaches.

The gap in the literature identified by my study included the unknown experiences of faculty when using VCT to assess psychomotor skills. Multiple studies used VCT to assess medical skills (Becker et al., 2018; Geary et al., 2019; Kemery & Morrell, 2020; McGann et al., 2020; Tuma et al., 2021). However, these skills focused more on confidence, communication, and clinical reasoning than any specific kinesthetic ability (Becker et al., 2018; Kemery & Morrell, 2020; Tuma et al., 2021). Multiple quantitative studies in medical education evaluated student and faculty perceptions of online learning (Cherry & Flora, 2017; Dost et al., 2020; Kalaimathi et al., 2020). However, these studies did not address psychomotor assessments. In other quantitative studies, researchers identified various teaching and evaluation methods to assess psychomotor skills (Becker et al., 2018; Geary et al., 2019; Kemery & Morrell, 2020; McGann et al., 2020), but none of these studies used synchronous VCT to conduct the assessments. Researchers demonstrated success teaching physical therapy students using synchronous VCT; however, assessment methods only examined knowledge-based competency and not psychomotor performance (Becker et al., 2018; Volansky, 2019). Thus, the gap in literature addressed through my study was that the faculty experience using synchronous

VCT to assess the psychomotor skills of physical therapy students lacked exploration. My study helped fill the gap by providing insight into innovative assessment strategies and expanding the literature within the educational technology field.

The physical therapy profession acknowledges the importance of adapting to the needs of students, faculty, clinicians, and administrators to graduate competent, skilled, and caring healthcare providers. Graduating qualified and capable physical therapists will fulfill the future workforce and meet the societal demand. (American Council of Academic Physical Therapy, 2021). However, few physical therapy schools utilize remote technology for assessment (Online Physical Therapy Program, 2021). Limited virtual assessment opportunities may delay or restrict educational opportunities for some students and hinder graduating competent healthcare professionals (Lee, 2020). If students cannot graduate and become practicing clinicians, there may be a lack of future healthcare providers.

Assessing students using VCT can reach more students at a distance, provide additional educational opportunities, and may create a more diverse professional population (Becker et al., 2018; Volansky, 2019). Recently, medical education institutions demonstrated virtual assessment capabilities with students (Kemery & Morrell, 2020; Lowenthal, 2020; Mukan & Lavrysh, 2020; Tuma et al., 2021; Volansky, 2019). Previously researcher have shown that online videoconference technology might supplement face-to-face assessments in some areas of medical education (Kemery & Morrell, 2020; Lowenthal, 2020; Mukan & Lavrysh, 2020; Volansky, 2019). Exploring the faculty experience using VCT when assessing students' psychomotor skills may

provide further insight into implementing this technology to offer alternative types of evaluation. Furthermore, VCT may provide an alternative assessment method without geographical barriers to help educate more physical therapy students and meet the expected 21% growth within the physical therapy profession (U.S. Bureau of Labor and Statistics, 2021).

Purpose of the Study

The purpose of this basic qualitative study was to explore the faculty experience using synchronous VCT to assess the psychomotor skills of physical therapy students. Understanding the faculty experience using this technology for psychomotor skill assessment may help expand educational assessment opportunities for students and faculty.

Research Questions

The overarching research question (RQ) that guided this study follows.

RQ: How do physical therapy educators describe the psychomotor skill assessment of students using VCT related to the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions?

Additionally, four RQs apply the four constructs of UTAUT, one construct per question, as follows:

RQ1: What do physical therapy educators describe as their effort expectancy when using videoconference technology to assess student psychomotor skills?

RQ2: What level of performance expectancy do physical therapy educators report when using videoconference technology to assess student psychomotor skills?

RQ3: What conditions help facilitate teachers using videoconference technology to assess student psychomotor skills?

RQ4: What social influences are experienced by physical therapy educators while using videoconference technology to assess student psychomotor skills?

Conceptual Framework for the Study

The theory that grounds my study is the unified theory of acceptance and use of technology (UTAUT). Venkatesh et al. (2003) developed UTAUT with four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions related to determining behavioral intention for technology use in adults. This theory was initially developed for informational systems but applies to many other areas, including educational institutions (Venkatesh et al., 2016). My study used Venkatesh et al.'s (2003) UTAUT constructs to explore faculty experiences using synchronous videoconferencing technology to assess students performing a psychomotor skill.

Medical education often pioneers the use of technology in education. Several studies used UTAUT to examine its usefulness in online medical education. For example, Utama et al. (2020) used the UTAUT model to explore medical students' perceptions of distance learning and found that not only did students have positive perspectives for online education, but that performance expectancy influenced students' technology use and resulted in increased cognitive demand. The constructs of UTAUT apply to medical

education, yet no studies investigated faculty perceptions using technology for assessment, nor have they investigated its usefulness for assessing a psychomotor skill. Abdekhoda et al. (2016) found statistically significant relationships between the UTAUT constructs and technology acceptance by faculty at a medical university with a 56% variance. Considering Venkatesh et al. (2003) found 53% variance, the findings of Abdekhoda et al. support the utilization of UTAUT in medical education. While some studies showed evidence to support technology's use by students and faculty, faculty perceptions of using technology as an assessment modality are still unclear. Exploring the faculty experience using videoconference technology to assess students performing a psychomotor skill may affect all constructs related to UTAUT.

Educational technology in the medical field, specifically physical therapy education, is expanding and becoming more common (Becker et al., 2018; Cherry & Blackinton, 2017; Volansky, 2019; Westervelt et al., 2020). Researchers demonstrated success teaching physical therapy students using synchronous VCT; however, assessment methods only examined knowledge-based competency and not psychomotor performance (Becker et al., 2018; Volansky, 2019). Very few physical therapy schools feature online curricula and remote technology for assessment (Online Physical Therapy Program, 2021). Exploring the faculty experience using VCT to assess psychomotor skills may provide an alternative assessment method, without geographical barriers, to help educate more physical therapy students and fill the demand in this growing profession. Because very few schools utilize remote technology for assessment (Online Physical Therapy Program, 2021), there was a logical connection between the framework and the

qualitative nature of my study to build upon the immediate need to graduate physical therapy students to meet the professional demand (U.S. Bureau of Labor and Statistics, 2021). Thus, understanding the faculty experience using technology provided insight into alternative assessment methods and supported the education of physical therapy students. VCT showed promise in medical fields to assess students' psychomotor skills without geographical barriers (McGann et al., 2020). When using new technology to enable assessment at a distance, it is essential to understand the faculty acceptance (Abdekhoda et al., 2016; Cherry & Flora, 2017; Venkatesh et al., 2003). Using UTAUT to examine the faculty experience with VCT provided a lens to direct the study. Also, Venkatesh et al. (2016) recommended further research using UTAUT to assess novel technology applications. Building on the recommendations by Venkatesh et al. (2016), my study examined faculty experiences related to using synchronous VCT to assess students' psychomotor skills.

Nature of the Study

The specific research design included a basic qualitative approach to explore the lived experiences of physical therapy faculty while using VCT to assess students' psychomotor skills. This basic qualitative research study explored the lived experiences, attitudes, opinions, perceptions, beliefs, or feelings about a particular issue or event (Percy et al., 2015). Semistructured interview questions aligned with the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). Concepts and themes identified in the semistructured interviews facilitated a thematic analysis (Percy et al., 2015). I conducted individual

interviews using VCT and recorded only the audio portion. Transcription and coding of the interviews identified common themes that highlighted the faculty experience using VCT to assess student psychomotor skills.

Definitions

Videoconference technology: Provides secure, high-quality, real-time audio and visual communication via the internet or satellite worldwide (Liu & Chen, 2018; Mukan & Lavrysh, 2020; Rahayu, 2020).

Psychomotor skills: Hands-on activity related to clinical or practical care (Bayram & Caliskan, 2019; Geary et al., 2019; Mansoor, 2020).

Performance expectancy: The degree of an individual's belief that using technology improves performance (Venkatesh et al., 2003).

Effort expectancy: The perceived ease of using the technology (Venkatesh et al., 2003).

Social influence: An individual's perceptions about what other people think of technology or how others will view that individual after using technology (Venkatesh et al., 2003).

Facilitating conditions: Considers the available resources, including technical or organizational infrastructure, that the individual believes will support technology's use (Venkatesh et al., 2003).

Assumptions

As the researcher, I identified three assumptions for the study. First, I assumed that participants wanted to participate in my study, given its significance to educational

technology research. Additionally, I assumed that the inclusion criteria were appropriate for the study and that individuals interested in participating would meet the inclusion criteria. Lastly, I assumed that the participants in my study would provide authentic, accurate, and honest information related to their experiences assessing students' psychomotor performance via VCT.

Scope and Definitions

Limited research exists on the experiences of physical therapy educators (Becker et al., 2018). Similarly, psychomotor assessments using various technologies are also lacking in research (Fritz et al., 2019; McGann et al., 2020). My study explored the faculty experience using VCT to assess physical therapy students' psychomotor skills. VCT provided an assessment modality to improve access to educational opportunities for both students and faculty. Understanding the faculty experience using VCT for assessment was critical to integrating this technology. My study only included faculty from the Physical Therapist Educators Association working in a doctoral physical therapy program.

Results from my study may be generalized to other healthcare education fields such as medical, dental, nursing, occupational therapy, ophthalmology, chiropractic, athletic training, and others. Results from my study may inform future research regarding psychomotor assessment via VCT and other educational technology assessment tools in healthcare education. Results from my study may inform key stakeholders about the faculty experience using VCT for psychomotor skill assessment and may provide insight into other educational technology assessment modalities. Administrators, professors, and

instructional designers may better understand how to utilize VCT for psychomotor assessments and provide alternative assessment opportunities for faculty and students.

Limitations

The potential for limitations exists in all research studies. I took many efforts to safeguard the quality, relevance, and validity of my study. Qualitative designs typically yield smaller sample sizes due to the time-consuming data collection and analysis process (Hackshaw, 2008). As a result, small sample sizes allow for detailed descriptions of participants' experiences which would otherwise not be found in quantitative research. However, a small sample size impacts the transferability and generalizability of a study. Potential limitations of my study include a sample size of 15 participants. While some researchers can achieve rich data from samples of 12-15 (Ravitch & Carl, 2016) larger sample sizes may provide a better understanding of the faculty experience using VCT to assess students' psychomotor skills (Guest et al., 2006). Small sample size may also impact data saturation. I ensured data saturation occurred when no new ideas or themes emerged from the data (Fusch & Ness, 2015; Guest et al., 2006; Mason, 2010). Furthermore, I carefully selected my research design and employed a rigorous methodology of processing and interpreting the data while applying a relevant and rich conceptual framework.

I used a purposive sampling strategy which can result in biased samples. However, by keeping the inclusion criteria simple, I attempted to attract a heterogenous population of participants with diversity in location, teaching experience, and digital competency. Another potential limitation in my study relates to the unique circumstances

of when it was conducted. While the study steps might be repeatable, the context of repeating these steps in an environment where faculty were coming out of a pandemic may pose challenges. I conducted this study when the COVID-19 pandemic was coming to an end and most universities were resuming in-person learning and assessments. If a researcher attempts to recreate my study, the responses from faculty may yield different results due to the circumstances occurring during my data collection.

Significance

Research has shown successful integration of VCT into medical education for learning and assessment purposes (Becker et al., 2018; Geary et al., 2019; Kemery & Morrell, 2020; McGann et al., 2020). However, the use of VCT for psychomotor assessments is not well understood (Becker et al., 2018; Donkin et al., 2019; Fay et al., 2019; Iwai & Lusk, 2020, Volansky, 2019). My study was significant because it contributed new knowledge to the educational technology field by presenting findings related to teacher experiences when using VCT to assess student psychomotor skills and could improve access to physical therapy education. The information gained from this study may be applied to physical therapy education and used by faculty, administrators, or instructional designers.

My study was original in researching a novel way to use synchronous VCT for assessments in physical therapy education by exploring the faculty's experiences using VCT for psychomotor practicals. VCT provides real-time audiovisual communication to mimic face-to-face scenarios and provides relevant clinical experience by paralleling many aspects of telehealth. Insights from the results of my study may foster positive

social change by informing PT educators of the value of using VCT for psychomotor assessments, which provided additional educational opportunities, exposed students to telehealth, promoted acceptance of online learning, and improved accessibility for individuals in rural locations. Additionally, results from my study may aid in future research endeavors regarding the use of VCT for psychomotor assessments in physical therapy or other medical education fields. Determining VCT's usefulness for psychomotor exams may help to establish best pedagogical practices in educational technology and may impact student clinical readiness for telehealth.

Summary

This chapter provided background information on VCT and psychomotor assessment in physical therapy education. The chapter also included the rationale for the study, addressed the problem, and identified the gap in the literature. Additionally, this chapter included the methodology and outlined both the conceptual framework, and RQs. The next chapter includes additional details of the conceptual framework and background literature to support my study.

Chapter 2: Literature Review

Video conference technology (VCT) expanded access to quality education without regard to time, distance, or geographical location (Becker et al., 2018). Researchers in education including Fritz et al. (2019), Ismailoglu et al. (2020), and McGann et al. (2020) demonstrated that VCT could be a valuable medium for teaching and learning psychomotor skills. Additional research from Becker et al. (2018), Geary et al. (2019), and Rawle et al. (2017) showed that VCT could provide educational opportunities to those in rural and remote areas. More recently, medical education integrated VCT, especially as telehealth continued to grow (Becker et al., 2018; Fay et al., 2019; Iwai & Lusk, 2020). Donkin et al. (2019) and McGann et al. (2020) showed that psychomotor skills could be assessed using synchronous and asynchronous VCT. However, little research exists on the faculty experiences using VCT to assess student psychomotor skills. Therefore, the purpose of this qualitative study was to explore the experiences of faculty using VCT to assess physical therapy students' psychomotor skills. Researchers investigated topics within the field of medical education involving VCT and other educational technologies. Using Venkatesh et al.'s (2003) UTAUT conceptual framework, my study explored the faculty experiences using VCT to assess physical therapy students' psychomotor skills.

This chapter includes current and relevant literature that provides background information to support my study. It starts by describing the literature search strategy, then an in-depth explanation of the UTAUT conceptual framework and its application in

medical education is provided. Next, I discussed key variables and concepts, including a synthesis of current research in areas of VCT in graduate education, VCT in medical education, VCT in rural and remote areas, teaching and assessing psychomotor skills in medical education, faculty perceptions of online medical education, faculty perceptions of synchronous VCT in medical education, and student perceptions of online medical education and VCT.

Literature Search Strategy

The broad scope of literature collected for my study pertained to VCT in medical education for the assessment of psychomotor skills. I used the Walden University Library system to access the following databases: CINAHL, MEDLINE, EBSCO, Education Source, ERIC, SAGE, and Science Direct. Within each of these databases the following keywords or search terms were used: *medical education* OR *medical school* OR *medical student*, *nurse education* OR *nursing student*, *online learning* OR *e-learning* OR *distance learning* OR *virtual learning*, *educational technology* AND *medical education*, *faculty* OR *instructor* OR *teacher* OR *educator* AND *perceptions* OR *attitudes* OR *beliefs* OR *experiences* OR *perspectives*, *videoconference technology* OR *video conference* OR *zoom* OR *video feedback* OR *synchronous*, *psychomotor skill* OR *hands-on* OR *hands on* OR *skill*, *online assessment* OR *authentic assessment* OR *synchronous assessment*, *physical therapy*, *physical therapy education*, AND *UTAUT* OR *Unified Theory of Acceptance and Use of Technology.*

Initial search attempts separated these keywords, but later, they were combined to identify the gap in the literature and justify this study. I used the following combinations of keywords for the literature review search:

- (*medical education* OR *medical school* OR *medical student*) *AND* (*online learning* OR *e-learning* OR *distance learning* OR *virtual learning*) AND (*psychomotor skill* OR *hands-on* OR *hands on* OR *skill*, *online assessment* OR *authentic assessment* OR *synchronous assessment*).
- *(nurse education* OR *nursing student*) AND (*online learning* OR *e-learning* OR *distance learning* OR *virtual learning*) AND *(psychomotor skill* OR *hands-on* OR *hands on* OR *skill*, *online assessment*) OR (*authentic assessment* OR *synchronous assessment*).
- (*educational technology* AND *medical education*) AND (*UTAUT* OR *Unified Theory of Acceptance and Use of Technology*).
- *educational technology* AND *medical education*.
- (*faculty* OR *instructor* OR *teacher* OR *educator*) AND (*perceptions* OR *attitudes* OR *beliefs* OR *experiences* OR *perspectives*) AND *(UTAUT* OR *Unified Theory of Acceptance and Use of Technology*).
- (*videoconference technology* OR *video conference* OR *zoom* OR *video feedback* OR *synchronous*) AND (*UTAUT* OR *Unified Theory of Acceptance and Use of Technology*).

- (*psychomotor skill* OR *hands-on* OR *hands on* OR *skill*, *online assessment* OR *authentic assessment* OR *synchronous assessment*) AND (*physical therapy* OR *physical therapy education*).

I used these terms to identify research articles directly related to VCT in medical education. These search terms also helped identify research related to psychomotor skill assessment in medical education. Most of the current literature on VCT was related to other medical professions such as surgery, radiology, nursing, dental, and ophthalmology due to a lack of published research in physical therapy education. This extensive literature review included current peer-reviewed research articles from 2016 to 2021.

Conceptual Framework

The conceptual framework to support my study was the UTAUT. Venkatesh et al. (2003) established UTAUT by incorporating eight different technology models to understand individuals' acceptance and usage of technology. These models include the theory of reasoned action (TRA), the original and updated technology acceptance model (TAM/TAM2), the motivational model (MM), the theory of planned behavior (TPB), the combined TAM and TPB (C-TAM-TPB), the model of PC utilization (MPCU), the innovation diffusion theory (IDT), and the social cognitive theory (SCT; Venkatesh et al., 2003). These models are from technology and psychology that address both individuals' perceptions, understanding, and acceptance of technology, and challenges, limitations, or barriers to using technology. The UTAUT addresses an individual's use of technology better than the original eight models and is a valuable tool for understanding factors that drive technology acceptance (Venkatesh et al., 2003). UTAUT was developed by

thoroughly investigating the eight models for similarities and validity. Each model included in UTAUT was empirically validated and compared. Then four primary constructs were formulated: performance expectancy, effort expectancy, social influence, and facilitating conditions, related to determining behavioral intention for technology use in adults. (Venkatesh et al., 2003). My study used Venkatesh et al.'s UTAUT constructs to explore faculty experiences using synchronous videoconferencing technology to assess students performing a psychomotor skill, a novel application.

The first of the four UTAUT constructs is *performance expectancy*. Performance expectancy is an individual's belief that using technology improves performance and is noted as the strongest predictor to use technology (Venkatesh et al., 2003). The construct of performance expectancy pertains to perceived usefulness, extrinsic motivation, job fit, and relative advantage related to the previous technology models (Venkatesh et al., 2003). When individuals believe that technology will enhance their job performance, the acceptance of that technology increases.

Effort expectancy is another primary construct of the UTAUT model. Venkatesh et al. (2003) defined effort expectancy as the perceived ease of use of the technology. Effort expectancy was derived from three previous models: perceived ease of use from the TAM/TAM2, complexity or difficulty of use from MPCU, and ease of use from IDT (Venkatesh et al., 2003). Venkatesh et al. tested the UTAUT in scenarios where technology use was voluntary and mandatory to compare individuals' use of technology and determined that effort expectancy was significant regardless of technology usage being voluntary or mandatory. However, effort expectancy is most noticeable in the early

stages of technology adoption when there are typically more challenges integrating technology (Venkatesh et al., 2003).

Another primary construct of the UTAUT model is *social influence*. Social influence refers to an individual's perceptions about what other people think of technology or how others will view that individual after using technology (Venkatesh et al., 2003). The social influence construct was derived from three areas of the previous models and included subjective norms, social factors, and image. Each concept has significant overlap and similar defining characteristics related to social influence (Venkatesh et al., 2003). Although each model uses different terminology to define social influence, they imply that the intention to use technology is influenced by how other people view them using the technology. Venkatesh et al. found that social influence impacts individual behavior, particularly in the early stages of technology adoption and when technology use is mandated. When technology use is mandatory, compliance creates additional social pressures that influence an individual's behavioral intention to use technology (Venkatesh et al., 2003).

Facilitating conditions is the final construct of the UTAUT model. Facilitating conditions consider the available resources, including technical or organizational infrastructure, that the individual believes will support technology's use (Venkatesh et al., 2003). The definition of facilitating conditions was created from three concepts based on the previous models: perceived behavioral control (TPB/DTPB, C-TAM-TPB), facilitating conditions (MPCU), and compatibility (IDT) (Venkatesh et al., 2003). These concepts focus on the environment, operational aspects, and barriers related to

technology use (Venkatesh et al., 2003). Venkatesh et al. explained that facilitating conditions are related to effort expectancy and performance expectancy and can be used to predict behavioral intention to use technology because when there are minimal barriers to technology, technology is easy to use, the individual perceives technology as valuable, and the behavioral intention to use technology is increased.

Application of UTAUT in Medical Education

Medical education often pioneers the use of technology in education. The UTAUT model was initially developed for informational systems but applied to many other areas, including educational institutions (Venkatesh et al., 2016). Several studies used UTAUT to examine its usefulness in online medical education. Previous research applied the constructs of UTAUT to medical education, yet none investigated faculty perceptions using technology for assessment, nor did they investigate its usefulness for assessing a psychomotor skill. Using the UTAUT model, Abdekhoda et al. (2016) conducted a cross-sectional study of 190 medical faculty to examine faculty perceptions of online learning in medical education. They found statistically significant relationships between the UTAUT constructs and technology acceptance by faculty with 56% variance (Abdekhoda et al., 2016). Considering Venkatesh et al. (2003) found a 53% variance in individual behavioral intention to use technology in information technology settings, the findings of Abdekhoda et al. support the application of UTAUT in medical education. While some studies showed evidence to support technology's use by students and faculty, faculty perceptions of using technology as an assessment modality are still unclear.

Exploring the faculty experience using videoconference technology to assess students performing a psychomotor skill affected all constructs related to UTAUT.

Performance Expectancy

The definition of performance expectancy is the individual's belief that using technology will improve performance and is noted as the strongest predictor to use technology (Venkatesh et al., 2003). Multiple studies used the UTAUT model to demonstrate individuals' technology acceptance. For example, a quantitative study by Abdekhoda et al. (2016) found that performance expectancy was significantly related to behavioral intention to use technology. Briz-Ponce et al. (2017) conducted a similar study applying the UTAUT model by surveying 150 medical students to find factors that influenced the use of mobile technology for learning. Briz-Ponce et al.'s study indicated that performance expectancy is a primary predictor of behavioral intention to use technology. When individuals perceive technology to be valuable and easy to use, there is a positive impact on the behavioral intention to use technology. Although one study investigated students (Briz-Ponce et al., 2017) and another faculty (Abdekhoda et al., 2016), these researchers demonstrated the usefulness of applying the UTAUT model in medical education to understand the perceptions of technology acceptance and use.

In a quantitative study, Cherry and Flora (2017) surveyed 216 radiography faculty using 5-point Likert scales to assess perceptions of performance expectancy and effort expectancy on technology acceptance in medical education. Results indicated a strong positive correlation between perceived usefulness and acceptance of technology

(Cherry & Flora, 2017). In other words, when faculty expected technology to be helpful and improve performance, the acceptance of that technology increased.

Findings from Cherry and Flora (2017) are similar to Abdekhoda et al. (2016) and Briz-Ponce et al. (2017), who showed performance expectancy to be a standard indicator of individuals' behavior toward technology usage. These results support my plans to explore the faculty experience using VCT with a UTAUT lens.

Effort Expectancy

Venkatesh et al. (2003) defined effort expectancy as the perceived ease of using the technology. In a cross-sectional study by Sattari et al. (2017), 229 medical students were surveyed about their experience using technology in education and found that effort expectancy had a significant relationship toward acceptance of technology. Researchers in other quantitative studies including Abdekhoda et al. (2016), Briz-Ponce et al. (2017), and Cherry and Flora (2017) found that effort expectancy had a direct impact on an individual's perception to use technology in medical education. Utama et al. (2020) surveyed 189 medical students and analyzed themes from responses to understand medical students' perspectives toward technology and online learning. Contrary to previous quantitative studies (Abdekhoda et al., 2016; Briz-Ponce et al., 2017; and Sattari et al., 2017), Utama et al. found effort expectancy was not related to behavioral intention to use technology due to complications such as internet speed, bandwidth, and cost.

Although the Utama et al. (2020) participants were medical students and not faculty, the themes addressed in this qualitative study inform my planned study to

expand the constructs of UTAUT to faculty. Thus, researchers (Abdekhoda et al., 2016; Briz-Ponce et al., 2017; Cherry & Flora, 2017; Sattari et al., 2017; Utama et al., 2020) demonstrated that the ease of technology use by individuals is complicated and requires further investigation. My qualitative study explored the effort faculty expect to invest while using VCT to assess student psychomotor skills.

Social Influence

Social influence refers to an individual's perceptions about what other people think of technology or how others will view that individual after using technology (Venkatesh et al., 2003). Briz-Ponce et al. (2017) and Sattari et al. (2017) found that social influence was directly related to students' intention to use technology. Abdekhoda et al. (2016) found similar results in a study of medical faculty participants. All three quantitative studies consistently found that social influence was critical for an individual's acceptance and implementation of technology. On the contrary, Utama et al. (2020) found that social influence prevented optimal technology usage because students had difficulty transitioning to an online platform and adjusting to their learning environment. The discrepancy in the findings by Utama et al. may be due to the students in this study transitioning from face-to-face learning to online learning during the 2020 COVID-19 pandemic. Recent mandates and social distancing restrictions led to significant changes in educational delivery. Similar to Utama et al., my research design will explore the faculty experience using VCT to assess psychomotor skills.

Facilitating Conditions

Facilitating conditions consider the available resources, including technical or organizational infrastructure, that the individual believes will support technology's use (Venkatesh et al., 2003). Abdekhoda et al. (2016) found no direct effect between facilitating conditions and technology acceptance for faculty teaching in medical education. However, multiple studies showed that specific resources and infrastructures are needed to implement and use technology in medical education successfully. Sattari et al. (2017) found a significant relationship between facilitating conditions and behavioral intention to use technology for medical students, not faculty. Lowenthal (2020) interviewed four faculty about their perceptions of using technology for asynchronous instruction and found that situational factors such as home set-up, broadband capabilities, and access to necessary resources were common barriers to technology usage.

Kalaimathi et al. (2020) conducted a cross-sectional study surveying 2,375 nursing faculty to identify the benefits and barriers to online medical education. Results from the Likert-style questions indicated major institutional policy barriers, system operating barriers, and limited training for faculty (Kalaimathi et al., 2020). These limitations impacted how faculty used and accepted technology. Kalaimathi et al.'s use of closed-ended Likert rating scales provided limited information about the barriers which impact conditions to use technology. Plans for my study include semistructured questions to explore perceived barriers to using VCT. During the semistructured

interviews, I inquired about suggestions to address these barriers, which provided information that would not be available from a quantitative study.

In another study utilizing the UTAUT model, Utama et al. (2020) addressed major barriers to the conditions, such as faculty not viewing all students on one screen during videoconferencing. Other conditions that hindered technology's use for students and faculty were internet connectivity, computer literacy of students and faculty, domestic obligations while learning and working from home, and daily routines due to the COVID-19 pandemic (Utama et al., 2020). In line with Venkatesh et al. (2003), studies by Abdekhoda et al. (2016), Lowenthal (2020), Sattari et al. (2017), and Utama et al. (2020) demonstrated that by providing appropriate resources and infrastructure, the acceptance and use of technology in medical education improved.

The UTAUT model was the conceptual framework for my study because it incorporated eight other models involving technology adoption and use. The findings from these studies (Abdekhoda et al., 2016; Briz-Ponce et al., 2017; Sattari et al., 2017; Utama et al., 2020) informed my decision to use the UTAUT model as the conceptual framework for my study. Venkatesh et al. (2016) published a synthesis of current UTAUT literature and indicated how the framework had applied to many other fields, including education.

Literature Review Related to Key Variables and/or Concepts

The key variables and concepts in this section start by introducing the use of VCT in graduate education, then specify the utilization of VCT in medical education along with a section on meta-analyses and systematic reviews about technology in medical

education. Next, this section identifies the usefulness of VCT in rural and remote areas and the assessments of psychomotor skills in medical education. Lastly, this section discusses the faculty perceptions of online medical education and the perceptions of synchronous VCT in medical education.

VCT in Graduate Education

Romero-Hall and Vicentini (2017) conducted a qualitative case study involving three graduate-level students participating in synchronous instruction using VCT to investigate the challenges and benefits of this educational modality. The participants reported benefits of synchronous instruction using VCT, which allowed flexibility in their schedules, helped to streamline communication with their teachers, facilitated access to other educational tools, and improved their study habits. Challenges included poor internet connection and difficulty collaborating with peers online (Romero-Hall & Vicentini, 2017). Liu and Chen (2018) conducted a quantitative study of 41 graduate-level students to investigate how online learning could be improved using synchronous VCT for assessment. Results indicated that synchronous VCT was a useful medium to assess students' factual, conceptual, procedural, and metacognitive knowledge (Liu & Chen, 2018). Liu and Chen showed that using synchronous VCT for assessment allowed instructors to obtain qualitative and quantitative information from the students and provide additional immediate guidance or feedback to enhance learning. Neither Romero-Hall and Vicentini nor Liu and Chen assessed psychomotor skills using VCT; however, both studies demonstrated successful integration of this educational modality highlighting

benefits, challenges, and usefulness. Currently, Liu and Chen is the only study investigating synchronous VCT for assessment.

Mukan and Lavrysh (2020) surveyed 34 engineering professors at two universities to understand their experiences using synchronous VCT for education. Instructors positively responded to integrating synchronous VCT, indicating a similar face-to-face approach for teaching, improved classroom participation, opportunities for collaboration, flexibility, and improved accessibility for students (Mukan & Lavrysh, 2020). Challenges for instructors in the Mukan and Lavrysh study were similar to the challenges experienced by students in the Romero-Hall and Vicentini (2017) study, such as technical problems, internet connectivity, and social engagement. Despite these challenges, Liu and Chen (2018), Mukan and Lavrysh, and Romero-Hall and Vicentini identify synchronous VCT as an effective tool that can facilitate the expansion of educational opportunities for both students and teachers.

Rahayu (2020) conducted an exploratory sequential study design to explore the perceptions of 62 higher education students' experience using synchronous VCT in an online English class at a university in Indonesia. Survey results indicated students responded well to synchronous VCT, noting improved communication with peers and instructor, increased opportunities to participate during the class session, better access to learning materials, and a learning environment similar to the traditional face-to-face classroom. These findings are in line with previous research by Romero-Hall and Vicentini (2017), Liu and Chen (2018), and Mukan and Lavrysh (2020) that demonstrated successful integration of synchronous VCT in education, indicating strong

similarities of synchronous VCT to traditional face-to-face learning reported by both students and instructors.

In a case study by Knapp (2018), the author discussed the advantages and disadvantages of six different approaches utilizing synchronous VCT in education, including whole group discussion, break out groups, show and tell, small independent groups, online conferences, and virtual poster presentations. The case study by Knapp reflects on comments from the end-of-term course evaluations by students and does not focus on student assessment or learning outcomes but instead identifies the pros and cons of integrating VCT into an online course. Disadvantages included technical problems, internet connectivity, poor audio quality or background noise, and personal student conflicts in small groups (Knapp, 2018). Advantages included improved communication, enhanced collaboration, and social engagement, as well as the resemblance of a traditional in-person classroom (Knapp, 2018). These findings are consistent with the benefits and challenges of synchronous VCT found by Rahayu (2020), Romero-Hall and Vicentini (2017), Liu and Chen (2018), and Mukan and Lavrysh (2020).

Kastner (2020) surveyed 61 higher education instructors in a quantitative correlational design to examine the instructor experience with blended learning compared to traditional face-to-face. Results indicated that instructors rate the blended learning format, which includes synchronous VCT, as superior to traditional face-to-face learning (Kastner, 2020). Kastner also identified technological barriers to blended learning, consistent with other educational research on synchronous VCT (Liu & Chen, 2018; Mukan & Lavrysh, 2020; Rahayu, 2020; Romero-Hall & Vicentini, 2017). Another main

barrier to success in blended learning using synchronous VCT was a lack of professional development (Kastner, 2020). Kastner identified barriers such as limited shared resources by instructors, lack of collaboration, and poor strategy for integrating blended learning and synchronous VCT into education. The study by Kastner focused on instructor experiences teaching in a blended learning format but did not specify the use of any particular modality or assessment tool such as VCT. Many studies support online learning in education and have integrated VCT into the curriculum to replicate face-to-face teaching and assessment (Knapp, 2018; Liu & Chen, 2018; Mukan & Lavrysh, 2020; Rahayu, 2020; Romero-Hall & Vicentini, 2017). Liu and Chen (2018), Knapp (2018), and Kastner (2020) suggest further investigation of online learning, including the use of VCT in other areas of education.

VCT in Medical Education

Many areas of education utilized VCT, including the medical field. This section focuses on studies involving meta-analyses and systematic reviews of technology in medical education. Next, this section identifies research about VCT in medical education with student and faculty participants. There is one study with only faculty participants using VCT. Lastly, the final section includes studies with student participants.

Videoconference technology is a relatively novel technology but is present in many aspects of medical education. Several studies demonstrated the impact of VCT on learning and assessments. For example, McGann et al. (2020) conducted a quantitative study surveying 86 medical students and 21 medical faculty about their experience learning and teaching surgical psychomotor skills in a fully online course using

asynchronous and synchronous VCT. Results indicated that students and faculty preferred the synchronous VCT session and found it comparable to traditional face-to-face assessments because it allowed direct communication and immediate feedback on performance (McGann et al., 2020).

Kenny et al. (2020) conducted a quasi-experimental study by surveying 42 nursing students and interviewing four faculty to investigate the impact of using mobile technology on nursing students' anxiety levels during a clinical internship. Results indicated significant decreases in anxiety levels of the nursing students when scanning quick response codes using their mobile phones (Kenny et al., 2020). Kenny et al. revealed that faculty recognized decreased student anxiety levels while using mobile technology and recommended integrating mobile technology into the curriculum. The study by Kenny et al. assessed student psychomotor performance using a consistent rubric. The psychomotor skill involved scanning quick response codes using a mobile device. Students in this study responded positively to the integration of educational technology by performing a psychomotor skill with decreased anxiety levels noted by both students and faculty. My study will parallel Kenny et al. because it will involve interviews with faculty to understand their experience using VCT as an educational technology tool to assess clinical psychomotor skills. Perceived student anxiety will be a topic of the semistructured interview. Findings from Kenny et al. are similar to McGann et al. (2020) because they both involve the assessment of psychomotor skills. Kenny et al. involved the direct integration and use of mobile technology while performing a kinesthetic skill, whereas McGann et al. used VCT.

The following study included only faculty participants. To date, this is the only study in physical therapy education involving faculty participants. Using a mixed-methods approach, Volansky (2019) surveyed 72 faculty members and interviewed four faculty members about their perceptions regarding the benefits and challenges of teaching physical therapy psychomotor skills using technology in a hybrid environment. Benefits of using technology to teach psychomotor skills included flexibility, improved student engagement, increased student satisfaction, and streamlined communication, whereas challenges included difficulties catering to various learning styles, higher teacher workload, and lack of technology support (Volansky, 2019). Volansky did not use synchronous VCT; however, the study identified many areas where video-based learning was helpful in physical therapy education. Volansky showed that psychomotor skills could be taught using technology in the physical therapy curriculum, but the study does not focus on assessing psychomotor skills, as does McGann et al. (2020) and Kenny et al. (2020). Kenny et al., McGann et al., and Volansky demonstrated that teaching and assessing hands-on medical skills in an online environment could be challenging. Volansky's findings supported those of McGann et al. by showing successful implementation and positive faculty feedback using technologies such as VCT to assist in acquiring psychomotor skills.

The next studies include medical education students using VCT. In a mixed-methods study involving 28 medical students, Donkin et al. (2019) compared asynchronous VCT to traditional, live, face-to-face feedback approaches for student laboratory skills in a histology course. Results showed marked improvement in the

psychomotor performance of the students that participated in the asynchronous VCT format. To mitigate the lack of face-to-face opportunities, the experimental group had access to additional video content online and was required to participate in one asynchronous VCT session with their instructor (Donkin et al., 2019). Both Donkin et al. and McGann et al. (2020) showed successful learning and assessing psychomotor skills in medical education by incorporating VCT. Donkin et al. used asynchronous VCT, which is different from the synchronous VCT used by McGann et al. because the feedback is not immediate. However, both modalities demonstrated an active learning approach that closely replicated traditional face-to-face assessments. While Donkin et al.'s participants used a blended learning approach involving online and face-to-face approaches, McGann et al.'s participants learned solely online. Students in both studies (Donkin et al., 2019; McGann et al., 2020) earned high psychomotor assessment scores and reported improved confidence in their skills and understanding of the material. While the skills assessed in McGann et al. and Donkin et al. were related to the medical profession, they were not specific to the field of physical therapy, as was Volansky (2019). Findings from Donkin et al., McGann et al., and Volansky inform my study by supporting the use of VCT for student psychomotor skill assessment in medical education. However, my study investigated the faculty experience of physical therapy students' psychomotor skill assessment using synchronous VCT.

In a qualitative study, Lockwood et al. (2018) surveyed 168 dental students to assess the impact of instructional videos on psychomotor skill acquisition. Results indicated that the instructional videos helped improve student confidence and reduce

stress while performing a new psychomotor task (Lockwood et al., 2018). Decreased stress or anxiety during a clinically related psychomotor task by integrating educational technology tools, specifically mobile technology, was a similar finding noted by Kenny et al. (2020).

Fritz et al. (2019) investigated the use of live-streaming and pre-recorded video lectures on student summative exam performance and personality traits. Four hundred fifty-eight medical students were surveyed and found that students who preferred to view the live-stream lectures had higher summative exam scores and increased levels of conscientiousness (Fritz et al., 2019). Students attending the live-streaming sessions may preferred this instructional delivery method because of their high conscientiousness and had higher summative scores because conscientiousness is related to organization, dependability, and high achievement (Fritz et al., 2019). Fritz et al. identified that medical students who prefer live-streaming videos instead of pre-recorded videos performed better on a summative exam. However, this contradicts the findings of Donkin et al. (2019), Lockwood et al. (2018), and McGann et al. (2020), which found improved performance and decreased anxiety when students had access to pre-recorded instructional videos. Kenny et al. (2020) also showed decreased anxiety levels when students used mobile technology for learning. The summative exam in Fritz et al.'s study did not involve assessing psychomotor skills as examined by Donkin et al., Lockwood et al., Kenny et al., and McGann et al.

Mansoor (2020) conducted a quantitative study surveying 41 dental students about their experience using synchronous VCT for their education during the COVID-19

pandemic. Results from the study indicated a high satisfaction rate; however, the author notes that the acquisition of clinical psychomotor skills needed for dental students lacked due to the limitations of only teaching via synchronous VCT (Mansoor, 2020). Mansoor concluded that learning essential clinical knowledge could be achieved via synchronous VCT, but the inability to practice in a face-to-face setting may impact kinesthetic skills. Multiple educational research studies supported the concept of integrating synchronous VCT with face-to-face practice (Kastner, 2020; Knapp, 2018; Volansky, 2019) to develop a blended approach. However, Donkin et al., McGann et al., and Volansky specifically demonstrated that VCT can be used to assess psychomotor skills in the medical field.

Fay et al. (2019) used a quantitative approach to survey 178 physical therapy students over four years, to investigate the usefulness of conducting a fully online Virtual Grand Rounds on student's clinical reasoning and application of evidence-based research into practice. The rationale for this study stems from the idea that implementing evidence-based research occurs with practice and exposure during real clinical experiences. These clinical experiences were mimicked in a virtual online setting using case scenarios, discussion, and reflection. Results indicated that at the end of four years and after participating in the Virtual Grand Rounds, students felt more confident using evidence-based research and successfully translate it to their clinical practice (Fay et al., 2019). Fay et al. used an online multimedia approach to teach clinical skills to physical therapy students. From a faculty perspective, Volansky (2019) demonstrated this approach to be successful in physical therapy education. Previously cited literature included assessing clinical skills related to the psychomotor domain (Donkin et al., 2019;

Kenny et al., 2020; McGann et al., 2020). However, Fay et al. focused on clinical skills related to the cognitive domain. Fay et al. demonstrated that medical education, specifically physical therapy education, may benefit from incorporating VCT to improve clinical performance.

Alexander et al. (2019) conducted a mixed-methods study to investigate physical therapy student satisfaction and cognitive ability with a virtual learning environment for 79 students taking a movement science course. Quantitative results obtained via student surveys showed that students were satisfied with the inclusion of educational technology, facilitating knowledge acquisition (Alexander et al., 2019). Qualitative results identified common themes from student focus groups, including the need for quality content, technical difficulties, alignment with learning objectives, and satisfaction with resources (Alexander et al., 2019). Previous studies showed that integrating educational technology or other multimedia learning tools facilitated knowledge acquisition for physical therapy students (Fay et al., 2019) and nursing students (Kenny et al., 2020). Findings from Alexander et al. are similar to Volansky (2019) because both are specific to physical therapy. However, Alexander et al. investigated a student population, whereas Volansky offered a faculty perspective.

Lindenmaier et al. (2018) conducted a randomized controlled trial of 114 medical students to investigate the impact of online learning on students' venipuncture skill confidence, understanding, and performance. Students were randomly assigned to either a study group that received additional multimedia-based online educational resources or a control group that did not have access to the multimedia learning tools; all students

received that same face-to-face instruction (Lindenmaier et al., 2018). Results indicated that the study group had higher test scores indicating improved knowledge and understanding of the skill (Lindenmaier et al., 2018). Both groups had increased confidence after completing the course, and results indicated no significant difference in psychomotor performance between the groups (Lindenmaier et al., 2018). Findings by Lindenmaier et al. are consistent with previous studies by Fay et al. (2019) and Alexander et al. (2019), who found that students had improved cognitive understanding by integrating online multimedia learning modules into medical education. Like Lindenmaier et al., Lockwood et al. (2018) also found improved student confidence with psychomotor skills by including online instructional videos for medical students.

Meta-Analysis and Systematic Reviews Related to Technology in Medical Education

Chelak and Kaviani (2018) conducted a meta-analysis involving 54 studies in Iran from 2005 to 2017 to investigate the effectiveness of various technologies in medical education. Results found that multimedia education was the most influential technology in medical education; however, Chelak and Kaviani concluded that complimenting educational technologies with traditional in-person teaching approaches improved the overall effectiveness of learning. A limitation to Chelak and Kaviani is that only studies from Iran were included in the meta-analysis, making it hard to draw a significant conclusion from the research. However, previous literature in graduate education (Kastner, 2020; Knapp, 2018; Liu & Chen, 2018; Mukan & Lavrysh, 2020; Rahayu, 2020; Romero-Hall & Vicentini, 2017) demonstrated that blending learning with face-to-face learning is an effective learning and teaching format.

Gegenfurtner and Ebner (2019) conducted a meta-analysis and systematic review of 12 randomized controlled trials in higher education from 2003 to 2018 to investigate the effectiveness of using VCT for webinars in graduate education. Most of the studies included in this meta-analysis included graduate medical and health science education. Findings indicated that students developed more knowledge and skills from learning via synchronous VCT than traditional face-to-face settings. Additional findings concluded that synchronous VCT offers flexibility in time, limits travel, and minimizes costs for education (Gegenfurtner & Ebner, 2019). The findings from Gegenfurtner and Ebner are in line with previous literature in higher education (Kastner, 2020; Knapp, 2018; Liu & Chen, 2018; Mukan & Lavrysh, 2020; Rahayu, 2020; Romero-Hall & Vicentini, 2017) that supports the use of VCT to promote flexibility and minimize the monetary burden for students.

Singh and Reyes-Portillo (2020) conducted a systematic review of 24 articles from 2007-2018 that investigated the use of VCT to educate licensed healthcare professionals. Findings from the study indicated that VCT was equivalent to traditional face-to-face learning for medical professionals to increase clinical knowledge and skills (Singh & Reyes-Portillo, 2020). The findings of Singh and Reyes-Portillo are consistent with Chelak and Kaviani (2018) and Gegenfurtner and Ebner (2019), who both promoted VCT in medical education and professional training. The possible bias or limitations confine these meta-analyses and systematic reviews to the individual studies included in the research. Furthermore, the meta-analyses and systematic reviews included articles over a 10 to 15-year span in which time technology significantly changed. Despite these

limitations, Chelak and Kaviani, Gegenfurtner and Ebner, and Singh and Reyes-Portillo demonstrated that VCT is widely accepted in medical education. The next studies include students and faculty participants using VCT.

VCT in Rural and Remote Areas

Videoconference technology improved access to educational opportunities in the medical profession by expanding access to rural and remote areas. For example, in a quantitative study, Rawle et al. (2017) implemented VCT in two rural hospitals to investigate supervision requirements for radiology technicians and the impact on radiograph image quality. Sixty-five radiology technicians were surveyed and found that using synchronous VCT to provide immediate feedback allowed the technicians to get advice from a supervisor about the patient position, set-up, and image quality, which resulted in significant improvement in radiograph images (Rawle et al., 2017). The implementation of VCT in rural radiology settings successfully provided additional feedback via visual and oral communication, which resulted in overall improved efficiency for the medical facility and improved patient care (Rawle et al., 2017).

Using quantitative analysis, Geary et al. (2019) evaluated synchronous VCT to provide additional surgical training for seven licensed, practicing ophthalmology surgeons at a distance. The ophthalmologists in this study utilized VCT during surgery to receive real-time feedback from a highly trained, licensed ophthalmology surgeon regarding technique and skill. Participants were surveyed on the usefulness of synchronous VCT during their mentorship and its impact on their confidence and skill level. The use of synchronous VCT to provide immediate feedback for ophthalmologists

during surgery improved the confidence and skill of the practicing surgeon and resulted in improved surgical outcomes for the patient (Geary et al., 2019). Although radiology technicians and ophthalmologists have significantly different levels of education and training, they both use various psychomotor skills in a medical setting daily. Both Rawle et al. (2017) and Geary et al. demonstrated the successful application of synchronous VCT in the medical profession, which allowed additional educational opportunities and improved patient outcomes in remote areas at a distance.

Videoconference technology allowed medical universities to expand geographically. Becker et al. (2018) conducted a mixed-methods study to explore perceptions of 19 faculty and 121 students at an allied health university using synchronous VCT after expanding to a rural campus. The university's allied health fields included areas of study for physician assistants, physical therapy, and medical imaging. Results from student participants indicated positive perceptions about the effectiveness of distance learning conducted over synchronous VCT. Faculty perceived the educational experience and curriculum delivery using VCT as similar to a live face-to-face setting (Becker et al., 2018). Geary et al. (2019) and Rawle et al. (2017) used synchronous VCT for ophthalmologist and radiology technician mentorship, while Becker et al. expanded the application field using VCT in physical therapy education. However, none of these studies (Becker et al., 2018; Geary et al., 2019; Rawle et al., 2017) focused on assessing a particular psychomotor skill using synchronous VCT. Research showed that synchronous VCT is effective for learners in medical education (Becker et al., 2018) and professional

training (Geary et al., 2019; Rawle et al., 2017) to promote knowledge and skill acquisition (Gegenfurtner & Ebner, 2019).

In a quantitative study, Al-Balas et al. (2020) surveyed 652 students at medical universities in Jordan to investigate current online medical education perspectives and identify challenges and limitations to a distance learning approach. Findings indicated that synchronous VCT was the most common educational delivery method yet had challenges such as poor internet connection (Al-Balas et al., 2020). Overall, student satisfaction was higher for students with experience in online learning but also increased when teachers had an online presence and utilized multimedia tools for learning (Al-Balas et al., 2020). Al-Balas et al. did not focus on assessing psychomotor skills. However, this study demonstrated the popularity of synchronous VCT in medical education because 65% of students reported using it. Similar to Becker et al. (2018), Geary et al. (2019), and Rawle et al. (2017), Al-Balas et al. showed that synchronous VCT is commonly used as an educational modality and has supported the expansion of medical education to rural and remote areas to reach more students without geographical barriers.

In a case study, three faculty members at medical universities in Pakistan shared their experiences transitioning to online learning during the COVID-19 pandemic (Farooq et al., 2020). The author explained that Pakistan is a developing country that does not have well-established online learning programs. Participants reported that challenges to transitioning medical education online included poor infrastructure, limited access to the internet, low bandwidth, and inexperience in using VCT and other

multimedia functions to teach online. Farooq et al. explain that VCT was commonly used to conduct synchronous lecture classes; however, faculty struggled to maintain student engagement and did not utilize other multimedia tools due to lack of experience using the technology and limited exposure to teaching online. Limitations to the study by Farooq et al. include a small sample size of three participants from a developing country. However, the findings are consistent with other studies from rural and remote areas that noted online teaching barriers to medical education (Becker et al., 2018; Geary et al., 2019; Rawle et al., 2017).

Westervelt et al. (2020) conducted a mixed-methods study that involved eight licensed physical therapists that worked in isolated or rural areas and four expert physical therapists that provided instruction and mentorship via synchronous VCT to the eight isolated physical therapists (Westervelt et al., 2020). Quantitative results indicated significant improvement in the isolated physical therapists' confidence and clinical reasoning skills (Westervelt et al., 2020). Qualitative results revealed common themes such as the addition of alternative perspectives, opportunities for reflection, perceived clinical benefits, and general feasibility (Westervelt et al., 2020). Findings from Westervelt et al. demonstrated that synchronous VCT allowed physical therapists in rural areas to access a mentor quickly and that VCT can help provide education and mentorship to individuals that would otherwise be professionally isolated. The findings from Westervelt et al. are similar to those by Rawle et al. (2017) and Geary et al. (2019) who utilized VCT for mentorship opportunities to improve continuing education for practicing clinicians in rural and remote areas.

Teaching and Assessing Psychomotor Skills in Medical Education

The development of clinical psychomotor skills is a critical component of health care education (Becker et al., 2018; Geary et al., 2019; Lindenmaier et al., 2018; McGann et al., 2020; Volansky, 2019). Obtaining competency in these skills can reduce clinical errors and minimize patient risk (Becker et al., 2018; Geary et al., 2019; Lindenmaier et al., 2018; McGann et al., 2020; Volansky, 2019). Physical therapy education includes evaluation and assessment of student psychomotor performance. Several studies researched various methods to assess psychomotor performance in medical education. These studies include medical faculty, medical students, and one integrated review.

Kemery and Morrell (2020) performed a quantitative study surveying 49 nursing faculty to understand common assessment practices for summative medical psychomotor skills. Findings indicated various evaluation methods used to examine psychomotor skills, and faculty used a consistent rubric that specified key criteria assessed and automatic failures. (Kemery & Morrell, 2020). Kemery and Morrell concluded that no single evidence-based strategy exists for evaluating summative psychomotor performance in a synchronous format.

McDonald et al. (2018) conducted an integrated review that included 20 articles from 2006 to 2016 about the assessment of nursing students. Common themes identified in McDonald et al. included student self-evaluation, clinical reasoning measurements, educational technology use, and the need for continued training. The findings of McDonald et al. are similar to those found by Kenny et al. (2020), who had success integrating mobile learning into nursing education to improve psychomotor skills. Results

from Kemery and Morrell (2020) also support the findings of McDonald et al. by addressing the importance of psychomotor assessment in medical education and outlining various methods to assess these clinical skills.

In a quantitative, longitudinal study of 161 occupational therapy students over four years, Jay and Owen (2016) investigated the addition of self-evaluation opportunities on occupational therapy-related psychomotor skill performance. Findings from Jay and Owen indicated that students who practiced self-evaluation had higher psychomotor performance scores. Jay and Owen used a consistent rubric for this study which allowed for transparency in scoring and helped guide the student self-evaluation process. Kemery and Morrell (2020) support using a consistent rubric that details specific performance criteria assessed. The findings of Jay and Owen are consistent with other findings by McDonald et al. (2018), who also found that self-evaluation tactics improved psychomotor performance.

Using a mixed-methods approach, Johnson et al. (2020) explored the effect of deliberate skilled practice combined with deliberate practice during a high-fidelity simulation activity for urinary catheter insertion on 28 nursing students. Findings demonstrated that students with opportunities for deliberate practice before and during high fidelity simulation activities performed significantly better by demonstrating the lowest amount of errors in their psychomotor skills (Johnson et al., 2020). Qualitative findings indicated that students found that deliberate practice provided them with time to concentrate on the individual steps of the skill, work directly with peers in a less stressful environment to identify their mistakes, self-reflect, and improve their psychomotor skill

abilities (Johnson et al., 2020). Limitations to this study included a small sample size and the particular psychomotor skill assessed.

The research by Johnson et al. (2020), McDonald et al. (2018), and Jay and Owen (2016) investigated psychomotor skill assessment of various healthcare students, including nurses and occupational therapists, in a face-to-face setting. Jay and Owen (2016), Johnson et al. (2020), Kemery and Morrell (2020), and McDonald et al. (2018) supported using a consistent rubric for psychomotor assessment grading; however, the assessments in these studies occurred in face-to-face settings. Other studies found that psychomotor skills can be assessed in a virtual format using synchronous VCT (Becker et al., 2018; Geary et al., 2019; Kenny et al., 2020; Lockwood et al., 2018; McGann et al., 2020; Rawle et al., 2017; Volansky, 2019). My study discovered faculty perceptions about using VCT to assess psychomotor skills.

In an integrative review of 150 articles ranging from 1980-2020, Swerdlow et al. (2020) investigated the use of VCT to conduct medical-based simulation for anesthesia students learning at a distance. Studies included in Swerdlow et al. were specific to anesthesia screen-based simulation, which involved clinical reasoning and decision making. Results indicated the benefits of VCT for medical-based simulation because it provided high fidelity audio and visual aspects but was limited in kinesthetic and tactile elements (Swerdlow et al., 2020). Additional results from Swerdlow et al. found VCT decreased financial costs associated with traditional in-person simulation. The high fidelity and low associated costs with VCT in medical simulation make this a reasonable technology to implement for distance education (Swerdlow et al., 2020). Previous studies

support the findings of Swerdlow et al., which showed that VCT could be integrated into medical education and facilitate clinical reasoning (Fay et al., 2019) and medical skill acquisition (Geary et al., 2019; Lockwood et al., 2018; McGann et al., 2020; Rawle et al., 2017).

Ismailoglu et al. (2020) conducted a quasi-experimental study that involved 60 students randomly sorted into two groups, a virtual simulator group, and a video-assisted group. The virtual simulator group used a software program that simulated intravenous catheter insertion, whereas the video group watched a training video demonstrating intravenous catheter insertion (Ismailoglu et al., 2020). This study indicated confidence increased in both groups, but the psychomotor performance was higher in the simulation group. Research by Geary et al. (2019) and Rawle et al. (2017) also found increased confidence in learners after using VCT to receive direct feedback and enhance clinically related psychomotor skills. Ismailoglu did not use VCT but instead used video simulation and video training to facilitate the acquisition of clinically related psychomotor skills.

Bayram and Caliskan (2019) examined 86 nursing students to investigate using a virtual reality mobile phone application to perform a clinically related psychomotor skill. Results indicated that students who participated in the mobile phone virtual simulation performed significantly better during psychomotor assessment than students who received only traditional theory, knowledge, and laboratory instruction (Bayram & Caliskan, 2019). Bayram and Caliskan focused on assessing psychomotor skills using a mobile-based technology but did not use VCT. Similar to Ismailoglu et al. (2020) and Swerdlow et al. (2020), Bayram and Caliskan showed how educational technology could

facilitate psychomotor skill performance for medical students. My study investigated the faculty perceptions using VCT to assess psychomotor skill performance.

Rourke (2020) conducted a systematic review of nine quasi-experimental studies to assess the impact of virtual reality simulation versus face-to-face simulation on psychomotor skill acquisition. The nine studies each utilized virtual reality in different ways: computer-based, audio, haptic device, or a combination of the three (Rourke, 2020). Results indicated that virtual reality simulation was superior to a traditional face-to-face assessment of psychomotor skills in knowledge and skill performance (Rourke, 2020). The results from Rourke are similar to Bayram and Caliskan (2019), Ismailoglu et al. (2020), and Swerdlow et al. (2020), indicating that the implementation of novel educational technology, specifically VCT, improved psychomotor skill performance for medical students.

Park et al. (2016) qualitatively investigated the use of blended learning for cardiopulmonary resuscitation and defibrillation skills on nursing students' cognitive and psychomotor skills. Results indicated that student performance was excellent, with most students earning 90% proficiency. However, the performance level was low in some of the psychomotor aspects of the practical (Park et al., 2016). Park et al. demonstrated that the development of cognitive and affective occurred through blended learning practices, but psychomotor skills are lacking with this approach in education. Mansoor (2020) found similar challenges teaching kinesthetic skills to dental students and noted that face-to-face instructions were ideal. Park et al. did not incorporate VCT into this study's teaching, learning, or assessment practices. However, studies by Donkin et al. (2019),

Lockwood et al. (2018), and McGann et al. (2020) demonstrated successful teaching of psychomotor skills in an online environment.

Geary et al. (2021) conducted a quantitative study of 21 ophthalmology students and investigated the impact of learning surgical skills via synchronous VCT on psychomotor performance. Results indicated that students were satisfied using VCT to learn surgical skills and that participation in VCT-based learning correlated with improved psychomotor performance (Geary et al., 2021). The authors conducted an earlier study that also demonstrated positive results implementing VCT to improve surgical skills for practicing ophthalmologists in rural areas (Geary et al., 2019). The findings of Geary et al. (2021) are consistent with other studies in the medical field (Chelak & Kaviani, 2018; Geary et al., 2019; Gegenfurtner & Ebner, 2019; Mansoor, 2020; McGann et al., 2020) that showed how learning clinically-related skills via synchronous VCT enhanced psychomotor performance.

In a multi-center randomized controlled study, Mizota et al. (2018) investigated the use of synchronous VCT for remote training of laparoscopic skills for 20 surgical residents. There were two randomly assigned groups: a stepwise group, which received step-by-step instructions, and a comprehensive group that received instructions all at once (Mizota et al., 2018). Results indicated that all students achieved proficiency in laparoscopic surgical skills via VCT, but the stepwise group was more efficient, requiring shorter coaching sessions (Mizota et al., 2018). Findings from Mizota et al. are similar to Geary et al. (2021), Mansoor (2020), and Swerdlow et al. (2020), who found positive results from students by using VCT to teach medical-based psychomotor skills.

Faculty Perceptions of Online Medical Education

The following studies in this section focus on faculty perceptions, perspectives, and experiences teaching medical education online. In addition, many of these studies highlight the use of synchronous VCT. Cherry and Flora (2017) conducted a quantitative study by surveying 216 radiography faculty to assess perceptions of effectiveness, satisfaction, self-efficacy, and overall acceptance of technology in online medical education. Results indicated that faculty were satisfied with the communication, ease of access, and student interactions but concerned about the lack of face-to-face contact (Cherry & Flora, 2017). Cherry and Flora also found that as years of faculty experience increased, their satisfaction with online engagement and interaction increased. Cherry and Flora included the following topics in their survey: usefulness of technology, ease of use with technology, faculty satisfaction using technology, teaching experience, online teaching experience, perceived competence using technology, and perceived effectiveness of technology in medical education. This study informed the development of semistructured interview questions using the same concepts in my qualitative study.

Kalaimathi et al. (2020) conducted a cross-sectional study surveying 2,375 nursing faculty to identify benefits and challenges to online nursing education. Findings indicated that most nursing faculty have positive perceptions of the benefits of online nursing education (Kalaimathi et al., 2020). Identified barriers included training and technology limitations, challenges with communication and interpersonal relationships online, and other institutional policy or system operating barriers. These results are similar to studies at non-medical higher education institutions (Kastner, 2020; Knapp,

2018; Mukan & Lavrysh, 2020). Kalaimathi et al. also found a correlation between instructor experience teaching online and overall satisfaction, similar to the findings of Cherry and Flora (2017).

Using a content analysis approach, Keshavarzi et al. (2019) interviewed 28 faculty members at a medical university in Iran to understand faculty perceptions about challenges teaching medical education virtually. Challenges included lack of tools and training for online teaching, limitations in infrastructure such as low internet speed and poor audio-visual quality, legal-ethical issues such as unclear delineation of intellectual property rights, and increased workload to create online content. These findings align with studies by Cherry and Flora (2017) and Kalaimathi et al. (2020), who found similar challenges teaching medical students online.

In a case study at a medical university in Malaysia, Nik-Ahmad-Zuky et al. (2020) interviewed three faculty to understand their challenges with transitioning medical education online. Common themes from the interviews included limited access to technology, exam security and rigor, and the inability to conduct clinical psychomotor skill assessments. Nik-Ahmad-Zuky et al. explained that synchronous videoconferencing was the best way to replicate face-to-face teaching except for psychomotor skills. Nik-Ahmad-Zuky et al. claimed that faculty time constraints and limited access to medical equipment hinder the teaching and assessment of hands-on medical skills. Nik-Ahmad-Zuky et al. assessed psychomotor skills from a cognitive standpoint by having the student explain their thought process and clinical reasoning rather than perform the necessary kinesthetic skill. Results from Nik-Ahmad-Zuky et al.'s study came from a small sample

size in Malaysia and cannot be generalized to all medical universities. Studies by Donkin et al. (2019), McGann et al. (2020). Kenny et al. (2020), Lockwood et al. (2018), and Volansky (2019) contradict the findings of Nik-Ahmad-Zuky et al. because they showed success integrating video conferencing and other educational tools for the assessment of psychomotor skills.

In a quantitative study, Jabali et al. (2019) investigated 30 faculty member's use and perceptions of using mobile phones to promote learning in medical education. Findings from Jabali et al. indicated that not only do faculty use mobile devices in their curriculum, but they also have positive perceptions and attitudes toward using this relatively new technology. Integrating new technology into the curriculum can be challenging, but Jabali et al. found that it promoted student engagement and improved access to content for many students. Previous studies found many barriers to integrating new educational technologies into their classroom (Al-Balas et al., 2020; Becker et al., 2018; Farooq et al., 2020; Geary et al., 2019; Keshavarzi et al., 2019; Lowenthal, 2020; Rawle et al., 2017). However, Jabali et al. concluded student distractions as the most significant deterrent to why faculty chose not to incorporate mobile devices into their teaching. The findings from Jabali et al. demonstrated successful integration of mobile devices into medical education and support its use in the classroom.

Perceptions of Synchronous VCT in Medical Education

This section details the perceptions of synchronous VCT in medical education. This section begins with studies using only faculty participants to understand the faculty perspectives using VCT in medical education. Because faculty are the participants in the

study, they were mentioned first. Later in this section, studies with student participants are identified to understand the students' viewpoint using VCT in medical education. Lastly, this section explains studies involving both students and faculty perspectives using VCT in medical education.

Tuma et al. (2021) conducted a quantitative cross-sectional survey with 81 instructors at a medical university to understand the perceptions of synchronous online medical education during the COVID-19 pandemic. Results indicated that 51% of instructors found synchronous VCT equivalent to face-to-face teaching to meet learning outcomes (Tuma et al., 2021). However, barriers to using synchronous VCT for teaching included limited available technology, challenges with an internet connection, and unfamiliarity with online teaching (Tuma et al., 2021). These barriers are similar to those found in other studies involving VCT (Cherry & Flora, 2017; Kalaimathi et al., 2020; Keshavarzi et al., 2019).

Iwai and Lusk (2020) conducted a case study of two instructors hosting narrative medicine workshops using synchronous VCT to understand its usefulness along with challenges and barriers. Findings from this study indicated successful integration of synchronous VCT into medical education, with students and faculty having minimal difficulties using this technology. VCT allowed instructors to shift the face-to-face environment to a safe and supportive classroom online (Iwai & Lusk, 2020). Previously cited studies (Becker et al., 2018; Mansoor, 2020; McGann et al., 2020; Volansky, 2019) supported the findings from Iwai and Lusk and Tuma et al. (2021) that concluded synchronous VCT provided a similar educational experience compared to live face-to-

face assessments. However, the studies by Tuma et al. and Iwai and Lusk are some of the few that investigate faculty perspectives using VCT in medical education. Both studies showed positive faculty experiences using this technology; however, neither of these studies addressed student assessment or the assessment of psychomotor skill, which this research study investigated.

This last section identifies studies investigating student perspectives using VCT in medical education. I included studies with student participants in this literature review due to the lack of studies involving faculty perspectives. It is important for faculty to understand the student perspectives using VCT to find ways to address student concerns and improve student engagement.

Using a Q-sort analysis, Cherry and Blackinton (2017) investigated the perceptions of 125 physical therapy students. In this study, there were two groups; one with 54 physical therapy students participating in a hybrid learning program which included the use of synchronous and asynchronous VCT, and another with 71 traditional physical therapy students that only received face-to-face instruction. Students identified common themes such as self-initiation, time management, problem-solving, and organization that indicated success in the hybrid program (Cherry & Blackinton, 2017). The themes of self-initiation and problem solving were unique only to the hybrid group of students and were not identified by the traditional group of physical therapy students to influence their success (Cherry & Blackinton, 2017). Cherry and Blackinton concluded that self-initiation is necessary for hybrid learning because students must learn independently, which requires time management and organization skills. Furthermore,

problem-solving is necessary for those in a hybrid curriculum because these students must often troubleshoot technical problems and investigate online content before reaching out to the instructor for answers (Cherry & Blackinton, 2017). The authors found that students learning in a hybrid curriculum face challenges with time management, organization, and problem-solving skills (Cherry & Blackinton, 2017). Identifying student perceptions of hybrid learning, including the use of synchronous and asynchronous VCT, may help faculty understand how to adapt the curriculum and learning content to address the needs of the students better.

Al-Azzam et al. (2020) conducted a cross-sectional survey with 488 medical and dental students to understand students' preferences for online learning, including synchronous VCT. Results indicated that 32% of students preferred online learning, and factors that enhanced preference for virtual learning included easy access to online content, ease of attendance, time savings, increased grade point average, and decreased anxiety (Al-Azzam et al., 2020). Similar to Al-Azzam et al., previously cited studies (Cherry & Flora, 2017; Iwai & Lusk, 2020; Kalaimathi et al., 2020; Tuma et al., 2021) demonstrated faculty support of VCT in medical education due to its feasibility, ease of access, lower financial cost, and time-saving opportunities.

Dost et al. (2020) surveyed 2721 medical students in a national cross-sectional study to investigate medical students' perceptions of online learning. Results found that the most significant perceived benefit of online learning was the flexibility offered to students (Dost et al., 2020). Al-Azzam et al. (2020) and Cherry and Blackinton (2017) also noted the opportunity for flexibility with online learning. Dost et al. also identified

perceived barriers by students that included distractions at home, internet connection, and other technical issues (Dost et al., 2020). Previously cited studies involving faculty in medical education supported the findings of Dost et al. related to medical students' perceived online barriers (Cherry & Flora, 2017; Farooq et al., 2020; Iwai & Lusk, 2020; Kalaimathi et al., 2020; Tuma et al., 2021).

Dost et al. (2020) noted that students ranked synchronous VCT and short video tutorials as the most effective online resource in medical education. Dost et al. explained that synchronous VCT permitted real-time communication and discussion, necessary for clinical practice. The findings of Dost et al. are similar to those by Becker et al. (2018), Geary et al. (2019), and Rawle et al. (2017), who supported the utilization of synchronous VCT to facilitate mentorship and additional learning opportunities for practicing clinicians.

The following two studies represent student and faculty perceptions of synchronous VCT in medical education, an underrepresented topic. Sharpe et al. (2021) qualitatively surveyed 24 nurse practitioner students and four nursing faculty after participating in a clinical simulation experience using synchronous VCT. Results indicated that both students and faculty performed well with the virtual simulation experience and found value in the activity (Sharpe et al., 2021). The faculty reported that when using synchronous VCT for the simulation experience, students achieved desired outcomes and reported increased confidence with communication and managing difficult clinical situations (Sharpe et al., 2021). Sharpe et al.'s study utilized synchronous VCT to conduct a clinical simulation experience for students; however, the simulation focused on

communication, professionalism, and clinical reasoning, without assessing a specific psychomotor skill. The faculty perspectives in Sharpe et al.'s study were similar to Iwai and Lusk (2020) and Tuma et al. (2021), who supported using VCT in medical education because of similar online learning outcomes.

Harris et al. (2020) surveyed 19 nurse practitioner students and five faculty to investigate their perspectives using synchronous VCT to conduct virtual site visits for nurse practitioner students while on internship. Results indicated that students and faculty had positive experiences with synchronous VCT for site visits (Harris et al., 2020). There were 15 virtual site visits, but two resulted in failed attempts due to technical difficulties (Harris et al., 2020). Many studies cited technical difficulties and poor internet connection as barriers to utilizing synchronous VCT in medical education (Al-Azzam et al., 2020; Becker et al., 2018; Cherry & Flora, 2017; Dost et al., 2020; Farooq et al., 2020; Geary et al., 2019; Iwai & Lusk, 2020; Kalaimathi et al., 2020; Rawle et al., 2017; Tuma et al., 2021). Harris et al. found that conducting virtual site visits using VCT for nurse practitioner students allowed direct communication, feedback, and access to rural or remote areas that would otherwise be time-consuming and costly to visit in-person. The study by Harris et al. is in line with previous studies (Becker et al., 2018; Geary et al., 2019; Rawle et al., 2017) that showed successful integration of VCT in rural areas to facilitate learning in the medical field.

Summary and Conclusions

Multiple studies demonstrated successful utilization of VCT in various areas of graduate education (Knapp, 2018; Liu & Chen, 2018; Mukan & Lavrysh, 2020; Rahayu,

2020; Romero-Hall & Vicentini, 2017). Additional studies acknowledged the integration of VCT into medical-based education (Al-Balas et al., 2020; Cherry & Flora, 2017; Dost et al., 2020; Iwai & Lusk, 2020; Kalaimathi et al., 2020; Tuma et al., 2021) and continuing education for practicing clinicians (Becker et al., 2018; Geary et al., 2019; Rawle et al., 2017). Many of the findings related to psychomotor skill teaching and assessment apply to the field of physical therapy education. However, very few articles exist that address the use of VCT in this field (Becker et al., 2018; Volansky, 2019). No studies assessed physical therapy psychomotor skills using VCT or the faculty experiences using this technology.

This literature review included 32 quantitative studies, 13 qualitative studies, four mixed methods studies, and six systematic reviews or meta-analysis. Only five qualitative studies looked at VCT in medical education, and only two specifically identified faculty participants. There is an abundance of quantitative research supporting the teaching and assessing of psychomotor skills, however, qualitative research is lacking. Also, there was only one qualitative article that applied the UTAUT model to medical education. This study contributed to the body of knowledge related to UTAUT in medical education and specified the experiences of faculty using VCT to assess physical therapy students' psychomotor skills, something that no study had investigated prior.

The purpose of this basic qualitative study was to understand the faculty experiences using VCT to assess physical therapy students' psychomotor skills. Many studies investigated the use of VCT in graduate medical education (Fay et al., 2019; Kenny et al., 2020; Mansoor, 2020; McGann et al., 2020; Volansky, 2019), however,

little research existed on the use of VCT for the assessment psychomotor skills (Donkin et al., 2019; McGann et al., 2020). Similarly, no research existed on the faculty experiences using VCT for psychomotor skill assessment for physical therapy education. I examined the experiences of physical therapy faculty using VCT to assess students' psychomotor skills.

Chapter 3: Research Method

This chapter begins by justifying the research design chosen for my study, defining the role of the researcher, identifying the population, and explaining the participant selection process. Next, this section will explain the interview protocol I developed to use during interviews for my study. This section also includes the procedures for recruitment, participant, and data collection along with the plan for data analysis. Finally, this section will conclude by identifying issues of trustworthiness and other ethical considerations related to my study.

Research Design and Rationale

The overarching RQ that guided this study follows.

RQ: How do physical therapy educators describe the psychomotor skill assessment of students using VCT related to the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions?

Additionally, four RQs using the four constructs of UTAUT for each include:

RQ1: What do physical therapy educators describe as their effort expectancy when using videoconference technology to assess student psychomotor skills?

RQ2: What level of performance expectancy do physical therapy educators report when using videoconference technology to assess student psychomotor skills?

RQ3: What conditions help facilitate teachers using videoconference technology to assess student psychomotor skills?

RQ4: What social influences are experienced by physical therapy educators while using videoconference technology to assess student psychomotor skills?

The experiences of faculty using VCT to assess psychomotor skills were integral to understanding the utility of this educational technology approach. Using VCT to assess psychomotor skills may allow expanded educational assessment opportunities, reduce financial burden, and minimize travel or time commitments for both faculty and students (Becker et al., 2018; Geary et al., 2019; Lockwood et al., 2018; Rawle et al., 2017). Likewise, expanding educational opportunities may help to meet the demand of the growing physical therapy profession. Investigating the faculty experiences using VCT may help administration, students, and faculty to understand the utility of this educational technology, as well as advantages and disadvantages that influenced its adoption.

I chose to use a basic qualitative research approach for this study. A basic qualitative research study was selected as the most appropriate research design because it allowed the exploration of the lived experiences, attitudes, opinions, perceptions, beliefs, and feelings (Percy et al., 2015) of faculty using VCT for psychomotor skill assessment. I used semistructured interviews with open-ended questions to obtain rich data that would not be observed or discovered otherwise (Ravitch & Carl, 2016). Interviews with closed-ended questions or surveys requires a quantitative approach and may not expose the true lived experience of an induvial (Ravitch & Carl, 2016). A quantitative or mixed-method study was not appropriate because no numerical data was collected, no hypothesis

generated, and no statistical variables measured (Ravitch & Carl, 2016). My study involved more than a single case or single culture, which is why neither a case study nor an ethnographic study was selected. A grounded theory approach was not appropriate because there was no new theory tested. Thus, I decided that a basic qualitative approach was the most appropriate methodological design.

Semistructured interview questions aligned with the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). I conducted individual interviews using videoconference technology, audio recorded, transcribed, and coded to identify common themes that highlighted the faculty experience using VCT to assess student psychomotor skills. Then, I performed a theoretical thematic analysis (Percy et al., 2015) based on the data collected from the semistructured interviews.

Role of the Researcher

My role as the researcher for this study was to recruit and interview doctoral physical therapy faculty with experience using VCT for psychomotor assessment. I was responsible for designing the procedures, recruiting participants, conducting interviews, transcribing, coding, analyzing and interpreting the data. In qualitative research, the role of the researcher is to collect detailed information using open-ended questioning to understand an individual's experiences, attitudes, beliefs, or opinions (Sloan & Bowe, 2014). I conducted semistructured interviews to gather information about individuals' unique experiences, perceptions, and feelings.

Reflexivity of the researcher was critical throughout the research process to address the researcher's assumptions and possible biases (Mauthner & Doucet, 2003). I had assessed students' psychomotor skills using VCT prior to my study and thus, had my own beliefs and experiences related to this phenomenon. To mitigate bias, I employed reflexive journaling after each interview and throughout the coding and analysis process (Mauthner & Doucet, 2003). I used reflexive journaling to create an audit trail while also identifying possible bias and preventing personal experiences from influencing the interview, coding, or analysis processes (Schwandt et al., 2007; Shenton, 2004).

I used the Physical Therapist Educators' member directory to recruit qualified participants. Colleagues at my institution of employment were interested in participating in this study. I did not hold any supervisory or authoritative position that would cause coercion or conflict, nor did they have any personal relationships with members of the Physical Therapist Educators. I conducted interviews via video conference technology using Zoom. I recorded the audio portion of the interviews for transcription and coding. Then I conducted member checking by emailing the participant a one-page summary of the interview transcription and asked if additional information should be added or edited. Member checking promoted validity to confirm that the transcript summary was representative of the participant's answers and that the interview was accurate for the researcher to interpret responses for analysis (Ravitch & Carl, 2016). Once all interviews were completed, transcribed, and coded, I conducted a thematic analysis of the data and reported the results in Chapter 4.

Methodology

This section includes the logic used for participant selection, researcher-developed instrumentation, procedures for recruitment, participation, data collection, and data analysis plan.

Participant Selection Logic

Study participants had experience with the phenomenon of interest (Rubin & Rubin, 2012). Inclusion criteria for participants required being a faculty member teaching in a doctoral physical therapy program with experience using VCT to assess students' psychomotor skills. Prior to interviews, participants completed a brief survey via Google Forms to confirm they met the eligibility criteria to participate in my study.

The brief survey included the two questions below:

1. Do you currently teach in a doctoral physical therapy program? If *Yes*, please proceed to question 2. If *No*, end survey.
2. If yes, do you have experience using video conference technology (also known as: Zoom, Skype, tele-conferencing, web conferencing) to assess students' psychomotor skills?

Individuals that answered *Yes* to both questions were included in the participant pool. Individuals that answered *No* to one or both questions were excluded from participating in my study.

The nature of the study influenced the number of participants needed for a study to reach saturation (Guest et al., 2006). Data saturation occurred when no new ideas or themes emerged from the data (Fusch & Ness, 2015; Guest et al., 2006; Mason, 2010).

Failure to achieve data saturation could have negatively impacted the content validity and the overall quality of the study (Fusch & Ness, 2015). Depending on the qualitative approach, researchers recommend recruiting between three to 30 participants for a qualitative study (Creswell & Creswell, 2018; Mason, 2010). Some researchers reached data saturation with as little as five participants in a study (Mason, 2010). Guest et al. (2006) interviewed 60 participants but reached data saturation after the first 12. Ravitch and Carl (2016) reported that qualitative studies should aim for approximately 12 participants to reach saturation. To confirm saturation occurred, I conducted three additional interviews for a total of 15 participants. Saturation occurred when no new data, themes, ideas, or insights were revealed (Creswell & Creswell, 2018; Guest et al., 2006). In a qualitative study, Kumi-Yeboah et al. (2017) reached saturation after interviewing 20 culturally diverse graduate students about their experience with online learning. Wright and Honey (2016) interviewed nine registered nurses about their experience using VCT for medical consultation to provide care to those in remote areas to reach saturation. Wallace et al. (2021) reached saturation by interviewing 11 nursing students about their transition to virtual learning during the COVID-19 pandemic. These researchers (Kumi-Yeboah et al., 2017; Wallace et al., 2021; Wright & Honey, 2016) focused more on the concepts of data saturation outlined by Guest et al. (2006) and less on the actual number of participants to ensure no new data, concepts, codes, ideas, or themes were identified.

I recruited participants from the Physical Therapist Educators member directory. This professional association predominantly included physical therapy educators but also practicing physical therapist clinicians. Physical therapy educators within the Physical

Therapist Educators were the primary source of recruitment. An email was sent to all members of the Physical Therapist Educators, approximately 2,900 individuals, inviting them to participate in my study. The email included a URL to the brief survey screening tool as mentioned above. If individuals met the inclusion criteria, they provided their contact information and I followed up to schedule an interview. When individuals provided their contact information, they were reminded that their information was kept secure, confidential, and their personal information was never shared or redistributed in any way. Furthermore, the email clearly explained that participation in my study was completely voluntary, and they could opt out at any time during the study without question.

Based on the participant pool of 2,900 individuals and the goal of recruiting 12-15 participants, the recruitment rate for my study was less than one percent.

Instrumentation

I developed the interview protocol to align with the RQs and the conceptual framework. The interview questions also aligned with the four constructs of the UTAUT. Appendix A shows the interview guide and the alignment of the interview questions with the four UTAUT constructs. The interview questions were open-ended, intending to facilitate a discussion between the participant and the researcher. I employed additional follow-up questions to probe further, gain additional insight, or clarify ideas. Previously Cherry and Flora (2017) and Kalaimathi et al. (2020) supported the questions in the interview protocol and are discussed in the section on Researcher-Developed Instrument. After the interview, the participant received a one-page summary of the transcript via

email for member checking. In this email, I asked each participant to confirm the interview summary and add any additional relevant insight.

Researcher-Developed Instruments

I developed the questions for the semistructured interviews as well as the protocol for this study. I designed the interview questions to answer the RQs and align with the four constructs of the UTAUT. The interview questions used by Kalaimathi et al. (2020) and Cherry and Flora (2017) informed my interview questions. I created four to five questions related to each of the UTAUT constructs. I also included an introduction question to begin the interview and introduce the topic of technology in education. I incorporated a few questions at the end of the interview regarding the challenges and benefits of using VCT for psychomotor assessments in case those details did not emerge from previous questions. Lastly, I ended the interview question list with a closing question to ensure the participant had the opportunity to share any additional information. I collected demographic information via an online survey (see Appendix B) before the interview including age, gender, highest education completed, and years of experience. I replicated the demographic information from Kalaimathi et al. (2020) and Cherry and Flora (2017). Concepts from Kalaimathi et al. included benefits and barriers to VCT in education. Concepts from Cherry and Flora's study support many of the questions in my interview such as faculty satisfaction with teaching online, interacting online, and having institutional support. Kalaimathi et al.'s study focused on nursing education and Cherry and Flora's study used radiography faculty which are both different from physical

therapy education. Thus, I adapted the concepts and questions from Kalaimathi et al. and Cherry and Flora to align with this research study.

I established content validity by using two expert reviewers to provide feedback for the researcher-developed instrument. One expert reviewer was an Assistant Professor in the occupational therapy program at the same institution the researcher works. They are a licensed occupational therapist with 20 years of clinical experience. They hold a PhD in Education and have experience with qualitative research. The second expert reviewer was the Director of Clinical Education at a different institution. They are a licensed physical therapist with 10 years of clinical and teaching experience They are a PhD candidate in Educational Psychology and have experience with both quantitative and qualitative research methods. The abstract of the study, a summary of the UTAUT constructs, and the researcher-developed instrument were emailed to the expert reviewers for feedback to improve content validity for my study.

Feedback from the expert reviewers was to condense or remove some interview questions for efficiency. The expert reviewers both mentioned that there were too many interview questions, and the concern was that this would result in a lengthy interview, leading to a lengthy transcription process, and create difficulty with coding. Based on the expert reviewers' feedback, I edited the number of interview questions from 20 to 10. Originally, each construct of UTAUT had four to five interview questions associated with it. Based on feedback from the expert reviewers, I minimized interview questions to two to three questions per UTAUT construct.

Procedures for Recruitment, Participant, and Data Collection

I recruited participants from the Physical Therapist Educators member directory. The online directory provides a list of names and emails of all the active members in the Physical Therapist Educators. I obtained an email from the Physical Therapist Educators granting permission to use the organization's member directory. I attended IRB office hours and was advised that the email from the Physical Therapist Educators was sufficient to allow recruitment from this professional organization. An email (see Appendix C) was sent to the 2,900 members of the Physical Therapist Educators explaining the study and inclusion criteria. I sent 40 email batches with approximately 50 members contacted in each batch. Embedded in the email was a link to a Google Form survey (Appendix D). Participants clicked on the link and completed the Google Form to confirm whether they met the inclusion criteria. The participant included their email within the Google Form, so I used their preferred email address.

All respondents were notified about whether they met the inclusion criteria based on their responses to the Google Form. I selected the first 15 participants to respond to the email and met the inclusion criteria. The inclusion criteria survey used skip logic and immediately notified the respondent if they did not meet the inclusion criteria (see Appendix E). If the individual met the inclusion criteria for the study, the survey initiated the informed consent. Once the respondent consented to participating in the study by answering "Yes, I consent" to the informed consent, the survey then showed the demographic information questionnaire (see Appendix B). Once the demographic questionnaire and informed consent were completed, I emailed the participant to schedule

an interview. The inclusion criteria, informed consent, and demographic information were completed using the same link and were completed in chronological order. A summary of the interview was emailed to the participants within two weeks to confirm that the information was an accurate depiction of the participants thoughts, feelings, or experiences. This is known as member checking and helped improve the content validity of my study (Shenton, 2004).

The recruitment for the study remained low one week after I sent the first recruitment email. Because of the low recruitment, I sent a second email (see Appendix F) through the Physical Therapist Educators member directory reminding individuals that there was still an opportunity to participate in the study. I also incorporated a snowball strategy at the end of the interview to help with recruitment.

I conducted one-hour interviews with each participant via Zoom for data collection. Each interview was audio recorded, transcribed, and coded. It was anticipated that 12 to 15 participants would allow saturation to occur (Guest et al., 2006). Once I believed saturation was achieved, I interviewed three additional participants to confirm saturation occurred. I recorded the audio portion of the interview and used this for the transcriptions. Then, I used the transcriptions as the primary data reference source. All files, including audio files, were stored in a password protected cloud-based storage system.

Data Analysis Plan

The data was analyzed using a thematic analysis and included coding categories that aligned with the four constructs of UTAUT: performance expectancy, effort

expectancy, social influence, and facilitating conditions. Thematic analysis helped to identify similarities or differences within the data (Ravitch & Carl, 2016). A codes-to-theory model per Saldana (2016) was used to conduct the thematic analysis. The codes-to-theory model helped to streamline the process by first identifying codes from the data, linking them to major categories, or constructs for the UTAUT in the case of my study, and then identifying the themes or concepts that emerged from those categories (Saldana, 2016). The themes also aligned with the conceptual framework (Saldana, 2016).

Discrepant cases may arise during data analysis. Discrepant cases are also known as outliers, or cases that are atypical from other participant responses and may show contrast in the findings. I did not identify any discrepant.

Saldana (2016) recommended that novice researchers code by hand, reviewing all data individually because a software program may overlook some meaningful data. Thus, I did not use any coding software for data analysis. I coded the data by hand, and Microsoft Excel was used to help with organizing and storing the information. These files were kept in a secure, password protect cloud-based storage system.

Issues of Trustworthiness

Trustworthiness in qualitative research can occur by incorporating four main criteria: credibility, transferability, dependability, and confirmability (Shenton, 2004). The following sections are organized based on these four unique criteria to promote trustworthiness in qualitative research according to Shenton (2004).

Credibility

Credibility attempts to answer the question "how congruent are the findings with reality?" (Shenton, 2004, p.64). One way to support credibility and thus improve the trustworthiness of the study was to use well established research methods that were appropriate for the concept studied (Shenton, 2004). Interview questions used by Kalaimathi et al. (2020) and Cherry and Flora (2017) informed my interview questions. Furthermore, the RQs were related to the UTAUT to further support the credibility of my study (Shenton, 2004). In order to ensure participants understood their rights, they completed an informed consent and were reminded before, during, and after the interview that they had the right to refuse or withdraw from the study at any time and for any reason. Ensuring participants understood their rights promoted honesty and credibility in my study (Shenton, 2004). Similarly, during the interview, participants were encouraged to provide information freely during the interview, with no wrong answers.

Shenton (2004) recommended the researcher familiarize themselves with the culture or phenomenon before data collection begins. Familiarization with the phenomenon was facilitated through an exhaustive literature review. Furthermore, credibility was achieved via peer scrutiny on the study prior to data collection. Before beginning data collection, two experts in the field of higher education with experience conducting psychomotor assessments via VCT were consulted for feedback on interview questions, instrumentation use, data collection method, and other suggestions to ensure the credibility of my study.

Shenton (2004) suggested iterative questioning to ensure the information extracted from interviews was what the participant was trying to convey. Follow up questions, probing questions, time for summary and re-statements were placed strategically throughout the interview to ensure iterative questioning occurred and the correct information was extracted from the data. However, member checking is the most important aspect to facilitate credibility is member checking (Shenton, 2004). Member checking relates to the accuracy of the data collected from the participant and ensured the researcher understands the answers provided by the participant (Creswell & Miller, 2000; Schwandt et al., 2007). Member checking occurred after the interview. I sent the participant a summary of the main points and information gathered from the interview via email to ensure the data collected captured what the participant was trying to convey to the researcher. Member checking for data accuracy supports both credibility and validity of my study.

Transferability

Another aspect of trustworthiness was transferability. Transferability assesses to what extent the findings can be extrapolated or generalized to other populations (Shenton, 2004). Rich descriptions of the study provided detail about how the study was conducted (Creswell & Miller, 2000; Schwandt et al., 2007). Providing a thorough description of the faculty experience using VCT may allow educators to make a comparison or apply the findings to a similar scenario. The defined participant group included eligibility criteria for the study, the number of participants intended for the study, and the pool of candidates from which they were recruited. Providing a thorough description of the

methodology, including participant pool criteria and sampling procedures, ensured transferability within my study (Shenton, 2004).

Dependability

The third component of trustworthiness was dependability. Dependability strategies included aspects of reliability and repeatability which allow the study to be repeated (Anney, 2015). Thus, if the study were to be repeated in a similar environment, with similar participants, and under similar contexts, the information obtained from the study would have a similar outcome (Shenton, 2004). The methodology, data sources, and instrumentation were clearly outlined and detailed in this section to support the dependability of my study. Shenton (2004) explained the close relationship between credibility and dependability because the reader must first understand the approach to the study, then they could understand how the study could be repeated. Reflexive journaling was employed after each interview and during the data analysis to serve as an audit trail. According to Shenton and Schwandt et al. (2007) an audit trail allowed the researcher to systematically trace decisions and procedures systematically. Lastly, through reflexive journaling, I identified and acknowledged any researcher bias to further promote trustworthiness and objectivity during my study.

Confirmability

The last aspect of trustworthiness is related to confirmability. The ability to maintain objectivity supported the confirmability of the study (Anney, 2015; Shenton, 2004). Providing a detailed description of the methodology helped the reader understand the rationale for the approach (Shenton, 2004). Maintaining an audit trail was another

way to ensure confirmability occurred in my study. The audit trail included a data-oriented approach that allowed the researcher to show how the data was gathered, analyzed, and led to the study's results (Anney, 2015; Schwandt et al., 2007; Shenton, 2004). Utilizing an audit trail allowed the researcher to evaluate the confirmability and identify if bias was present in my study. Identifying areas of possible bias along with reflexive journaling promoted objectivity. Trustworthiness of my study was ensured by incorporating the measures of credibility, transferability, dependability, and confirmability into this qualitative research study.

Ethical Procedures

I received IRB approval (#03-24-22-0935186) from Walden University before beginning data collection. Participants completed an informed consent and confirmed they understood the risks and benefits to participating in my study. The informed consent included the scope of the study and the researcher's contact information. Additionally, participants were informed of their right to refuse to participate or withdraw from the study at any time, for any reason, without question.

I kept the participants' information confidential and all personal information was stored in a secure, password protected computer. To maintain confidentiality during transcription and data analysis, participants were given a number to serve as a unique identifier rather than using personal names. Audio recordings, transcripts, and journals were kept in a secure, password protected, online storage system. Paper notes or other hand-written documents were kept in a locked file drawer at the researcher's home. All

data, both digital and physical copies, were securely stored for five years and then destroyed.

Summary

This chapter included details regarding the researcher's role in this study, the research design and rationale, procedures for recruitment, and participant selection. This chapter also described the researcher-developed instrument used during interviews and the alignment of this instrument with the conceptual framework, the UTAUT. This chapter concluded with an explanation of the data analysis plan, ethical considerations, and additional ways I employed trustworthiness in my study.

Chapter 4: Data Analysis and Findings

The purpose of this basic qualitative study was to explore the lived experiences of faculty using synchronous VCT to assess the psychomotor skills of physical therapy students. The UTAUT from Venkatesh et al. (2003) was the conceptual framework used for my study. The RQs and interview questions were derived based on the UTAUT model to understand how physical therapy educators described the psychomotor skill assessment of students using VCT related to the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions. The RQs aligned with each construct from the UTAUT, one construct per RQ. The findings from my study may contribute to the literature in the field of educational technology and physical therapy education by expanding on the lived experiences of physical therapy faculty using VCT for psychomotor skill assessment.

This chapter begins by describing the study's setting and any influential factors. Then, this section identifies the participants' demographics, along with the process selection and analysis. Additionally, this chapter provides evidence of the four domains of trustworthiness: credibility, transferability, dependability, and comfortability. This chapter concludes with the results from my study and explains how this study addresses the RQs.

Setting

Data collection for my study occurred during the spring of 2022, when the COVID-19 pandemic ended. Most universities were returning to in-person activities, which could have impacted reliance on virtual or distance modes of communication in

the education sector. Participants reflected on their experiences using synchronous VCT, which occurred during the COVID-19 pandemic and may have brought some emotional or psychological distress.

Study participants worked in various physical therapy educational institutions across the United States. All interviews were conducted via Zoom at my home office on my personal password-protected computer. Using Zoom allowed me to reach more participants in distant areas, thus providing a diverse study population with varying experiences. Furthermore, Zoom allowed me to meet with participants at any time of day and anywhere around the world, where travel would have been expensive or inconvenient. Interviews were audio-recorded and stored on my password-protected Google Drive. I set up each Zoom meeting link and emailed it to the participant before each interview using my Walden University email. I did not have control over the conditions or environment of the participants; however, participants were encouraged to be in a comfortable and quiet place to conduct the interview.

Demographics

Participants in my study were physical therapy educators working within a doctoral physical therapy program. The study included seven men and eight women. All participants resided within the United States, but participants' locations varied across five

different states and seven different campuses. Table 1 shows the teaching experience across all participants including traditional face-to-face teaching and online teaching.

Table 1

Years of Experience Teaching and Teaching Online

Years of experience	Teaching	Teaching online
1-5 years	4	6
5-10 years	4	6
10-15 years	4	3
15+ years	3	0

Participants had a span of one to more than15 years of experience teaching and a range of one to 15 years of teaching online. Table 2 outlines the highest degree earned. Eight participants held an academic doctorate as their highest degree earned (Doctor of Health Science, Doctor of Education, or Doctor of Philosophy). Seven participants had a professional clinical degree of Doctor of Physical Therapy as the highest degree earned. Five of the seven participants were currently enrolled in an academic doctorate program.

Table 2

Highest Degree Earned

Highest degree earned	Number of participants
Academic doctoral degree (DHSc, EDD, Ph.D.)	8
Professional/Clinical doctorate degree (DPT, OTD)	7

The participants rated themselves on a five-point scale regarding their perceived digital competency. The five-point scale ranged from beginner to advanced. Two participants rated themselves as an advanced beginner, and seven participants rated

themselves as intermediate. Four participants rated themselves as advanced intermediate, and two rated themselves as having advanced digital competencies. Table 3 displays the results regarding the participants' perceived digital literacy.

Table 3

Perceived Digital Competency

Perceived digital competency	Number of participants
Beginner	0
Advanced beginner	2
Intermediate	7
Advanced intermediate	4
Advanced	2

Data Collection

The data were collected as outlined in Chapter 3 without variations or unusual circumstances. I received IRB approval (#03-24-22-0935186) on March 24, 2022 and proceeded to send the recruitment email to all members of the Physical Therapist Educators on March 31, 2022. Approximately 2900 members of the Physical Therapist Educators, but only 1,957 members listed their emails. I sent 40 separate emails, which included 50 email addresses in each batch. Each email included a link to a Google Form to screen for inclusion criteria. If the respondent answered *Yes* to the questions on the inclusion criteria, the survey populated the informed consent for the respondent to complete. Once the respondent agreed to and signed the informed consent, the survey prompted the demographic data. Once the respondent entered their demographic data, the survey was complete. I checked the Google Form responses daily and contacted each participant via email to schedule a one-hour interview via Zoom. I sent the Zoom link to

the participant before the scheduled meeting time. I entered the meeting at the set scheduled time. When the participant joined the session, I introduced myself, gained verbal permission to audio record, and began the interview.

The fifteen interviews took place from April 4, 2022, through May 5, 2022. Each interview was scheduled for 60 minutes, and most interviews lasted 45 to 60 minutes. After each interview, I transcribed the data using the audio recording and created a one-page transcript summary. The one-page transcript summary was emailed to the participant within one week of the interview to confirm the participants' thoughts, feelings, perceptions, attitudes, and lived experiences were interpreted and represented correctly. At that time, the participant had the opportunity to add additional information if needed. All participants approved the transcript summaries, and no additions were provided.

Data Analysis

I used a basic qualitative approach to examine the interview data collected. I transcribed each interview by hand using the audio recordings from the participants' interviews and used Microsoft Excel to organize the data. No discrepant cases were identified. I created a separate sheet for each transcript and organized the transcript based on the responses to the interview questions. The Microsoft Excel file held all the 15 transcripts in one file labeled *coding*. There were additional sheets within the coding file for the coding definitions, tallying, transitioning codes to categories, and transitioning categories to themes. I used multiple sheets within the same coding file to easily access the data.

I began the coding process by reviewing each transcript individually. Next to each response on the transcript, I summarized the response, identified keywords, phrases, or ideas, and labeled them in a separate column to the right of the response. I repeated this process for each response on all 15 transcripts. The keywords or phrases became the initial codes. For example, Interview Question 3 asked, "did the technology perform as you expected?" Faculty responded that the technology did perform as they expected, but there were limitations that they anticipated. I identified this reoccurring statement and coded it as *performance expectancy*. The definition of *performance expectancy* in this study is the technology worked as expected, but there were some limitations or challenges that the faculty had anticipated. In this example, the definition helped to identify the code. However, there were other instances where I identified a specific code and then created a definition for that code based on the responses from the transcripts. For example, keywords such as *camera angle*, *IT support*, or *LMS, hardware, software* occurred in the transcript. I identified these recurring keywords and created a code for them, then provided a definition that explained these codes in more detail.

I then grouped the codes based on the UTAUT constructs and color-coded each code. The codes, categories, and themes were color-coded to assist the organization process and align the data with the UTAUT constructs. Codes, categories, and themes related to performance expectancy were yellow, effort expectancy was blue, social influence was orange, and facilitating conditions was green. The categories of benefits and new skills gained were gray and this color corresponded to the theme of lessons learned. No specific codes were initially designated for the categories of benefits and new

skills gained. Instead, these categories emerged from a compilation of other codes related to the UTAUT constructs. Appendix G displays the color-coding strategy for the codes, categories, and themes in more detail.

Once I coded all 15 transcripts, I reviewed the codes and created a master list of codes with corresponding definitions. Appendix H displays the list of codes and their definitions. Additional codes emerged during the coding process, and subsequent codes and definitions were added to the master code list with a total of 53 codes and supporting definitions. Each transcript was coded individually and then analyzed based on the shared experiences of all participants. Next, I tallied all codes based on how often that code appeared within the 15 transcripts. A code was only tallied once per transcript. For example, if the participant mentioned the camera angle 10 times in the interview, the code of *camera angle* received a single tally for that transcript. Appendix I details the tally chart for each code.

Once I completed the initial coding process and tallied all codes, I applied emergent coding strategies per Saldana (2016) to formulate categories. I grouped the codes into categories that encompassed similar ideas or concepts. Some codes appeared in multiple categories. I had one category for each construct of UTAUT and additional categories that did not align precisely with the UTAUT constructs. I condensed the 53 codes into 11 categories, as seen in Appendix J.

The final cycle of coding involved transitioning categories into themes. As part of the thematic analysis process, I scrutinized the definitions of the codes and categories and their relationship to the UTAUT constructs to identify patterns or similarities within the

data. Further analysis revealed major themes related to the participant's responses, and four of the five themes identified in the data analysis aligned with the UTAUT constructs.

I defined each category by incorporating the definitions of each code grouped in the category. Appendix K outlines the category definitions. Later, I condensed the categories into themes using the same approach. Figure 1 also shows the transition from categories to themes. Themes were created based on the UTAUT constructs, codes, and categories identified during the coding process. I incorporated the definitions of each category to create the themes. Five themes emerged from the study: effort expectancy, performance expectancy, facilitating conditions, social influence, and lessons learned. I addressed the RQs by organizing the themes to align with the constructs of UTAUT. In the following sections, I explain the data analysis related to each final theme. The interpretation of each theme is detailed in Chapter 5.

Effort Expectancy

The first theme, *effort expectancy*, encompassed 21 codes in two categories. The category of *effort expectancy* was the largest of all the categories because it included 15 different codes. I combined the two categories, *effort expectancy* and *students were adaptable*, to create the first theme and aligned the themes with the constructs of UTAUT. Appendix L outlines the codes, definitions, and corresponding categories for the theme of *effort expectancy*.

I identified codes such as *students were adaptable*, *set up for students*, *variable environment for students*, *more real-world setting*, *faculty making assumptions when grading*, and *limited resources/equipment* and combined them into the category labeled

students were adaptable. All these codes appeared to have a snowball effect on one another, which I describe in more detail in Chapter 5. I chose s*tudents were adaptable* because they seemed to encompass all the aforementioned codes. The category of *students were adaptable* was described by faculty reports that the students were versatile because students set up their testing environment, and required them to improvise things like treatment tables, wheelchairs, crutches, canes, ultrasound machines, modalities, walkers, and other resources.

I used the same process to create the category of *effort expectancy*. The category of effort expectancy included anything related to setup, preparation, and perceived effort during the online psychomotor assessments. The definition for the category of *effort expectancy* emerged from the faculty reports that using VCT for psychomotor assessment required a lot of effort at first but became easier with experience and repetition. The category of *effort expectancy* included codes such as *faculty development*, *communicate with colleagues*, *adjust rubrics*, and *troubleshoot during assessments*. These codes related to the increased effort faculty experienced while learning to use VCT for psychomotor examinations. Other codes in the category of effort expectancy were *easier with experience*, *less effort/setup for faculty*, and *more efficient/time-saving,* which corresponded with the faculty reports of the technology eventually becoming easier and more convenient to use.

Performance Expectancy

The theme of performance expectancy included 17 codes grouped into three different categories. Some of the codes appeared in more than one category. I condensed

the three categories into a single theme of *performance expectancy* to align with the UTAUT construct. Appendix M details the codes, definitions, and categories for the theme of *performance expectancy*.

The category of *performance expectancy* was composed of codes related to how faculty expected technology to perform, including benefits and challenges to technology's performance. Codes such as *adequate assessment* and *percentage* related to how faculty perceived VCT usage for psychomotor assessments compared to face-to-face assessments. In most cases, I used the same name from a code to label a category. In other words, the *performance expectancy* code was the primary descriptor, encompassing all other codes and thus, identified as the category title. Other codes such as *faculty skeptical of VCT* and *faculty expectations exceeded* related to the faculty experiences while using VCT for psychomotor assessment and then being surprised at how well the technology performed for them. Codes such as *camera angle* and *limited equipment/resources* related to the limitations of technology's performance and fit well in the category of *performance expectancy*.

The category of *student performance* included codes related to the faculty perceptions of students' performance using VCT for psychomotor assessment. Codes like *faculty making assumptions when grading* and *student performance same* related to the faculty's perceptions of how technology influenced the student's performance. Additionally, I identified a third category of *performance anxiety* based on the following group of codes; *student anxiety higher*, *student anxiety lower*, and *student anxiety different*. There was significant carryover noted between these three categories. Thus, I

combined them into a single theme of performance expectancy, which also aligned with the UTAUT constructs.

Facilitating Conditions

The theme of *facilitating conditions* included one category with five distinct codes. Specific codes such as *limited equipment/resources*, *hardware, software*, *issues with connectivity*, and *camera angle* fit into this category. Because there was only one category for *facilitating conditions*, the definition for this category is the same as the theme. The description for the category and theme of *facilitating conditions* is the resources that enabled faculty to deliver assessments via VCT, which included access to wireless fidelity (Wi-Fi), learning management system (LMS), the software applications, and hardware. Appendix N outlines the codes, definitions, and categories for facilitating conditions.

Social Influence

The theme of *social influence* incorporated three categories and 16 codes. Social factors and other influential factors impacted the faculty's use of VCT for psychomotor assessment. Appendix O outlines the codes, definitions, and categories for Social Influence.

The category *influential factors impacting effort* related to the faculty's prior experience and rationale for using VCT. Codes such as *previous experience with VCT*, *prior online learning experience*, and *prior online teaching experience* influenced faculty to use VCT for psychomotor assessments. Codes such as *colleagues had influence* emerged from faculty reports about colleagues influencing their choice to incorporate

VCT into the psychomotor examinations. This category overlapped with the effort expectancy category. However, the distinction between the effort expectancy and social influence codes came from the influence of prior social experiences, either teaching, learning, or communicating with colleagues, and, thus, fit best in the theme of *social influence*. The category of *social influence* included codes related to perceived pressures felt by faculty. Codes such as *no pressure but no choice*, *high internal pressure*, or *high external pressure* are related to the perceived pressures faculty experienced to incorporate technology into their curriculum. The third category related to the theme of social influence was titled *feedback from students and global perspective*. Faculty reported receiving positive feedback from students, and student appreciation, which I coded as *feedback from students was positive* and *students appreciate continuing academics*. The code of *online assessment is now more acceptable* was placed in this category because it identified a unique perspective on accepting technology within the community.

Lessons Learned

The final theme, *lessons learned*, emerged from the data but did not align with the UTAUT constructs. This theme incorporated 17 codes and two categories. The theme of *lessons learned* encompassed reflections from faculty and their experiences using VCT to assess psychomotor skills. The two categories within this theme are *benefits* and *gained new skills*. The category titled *benefits* related to the benefits faculty experienced while using VCT for psychomotor assessments and included codes such as *convenience*, *synchronous is similar to face-to-face*, and *more real-world setting*. The other category, *gained new skills*, related to new skills faculty acquired using VCT for psychomotor

assessments. Codes in this category included *could only provide verbal feedback* or *inability to provide tactile feedback* which forced faculty to provide feedback in new and unique ways using VCT. Other codes in this category were *faculty more competent with technology* and *troubleshooting during assessment* which refers to the faculty experience navigating VCT and learning new skills. I combined the categories of *benefits* and *gained new skills* into the theme of *lessons learned*, which incorporated the experiences of faculty learning to use VCT in a new way.

Evidence of Trustworthiness

Evidence of trustworthiness in qualitative research promotes objectivity and maintains rigor during the data collection and analysis (Shenton, 2004). I incorporated various strategies based on the four main aspects of trustworthiness: credibility, transferability, dependability, and confirmability to ensure the study was academically sound (Shenton, 2004). This section describes the implementation of trustworthiness for my study and identifies any adjustments made to each strategy during the data collection and analysis process.

Credibility

My study addressed credibility in multiple ways. First, I employed well-established research methods using a basic qualitative approach that was most appropriate for the concept studied (Shenton, 2004). Secondly, the RQs aligned with the UTAUT to promote credibility in my study (Shenton, 2004). I based the interview questions on prior qualitative research studies (Kalaimathi et al., 2020; Cherry & Flora, 2017) with similar populations and concepts. Additionally, two experts in the field of

higher education with experience conducting psychomotor assessments via VCT reviewed and edited the interview questions. These two experts provided feedback on the interview questions, instrumentation, and data collection method, to ensure the credibility of my study.

All participants completed an informed consent and could withdraw from the study anytime without question or stigma. The informed consent promoted honesty and credibility of the study by ensuring the participants understood their rights (Shenton, 2004). Another aspect of credibility demonstrated in my study was the use of member checking (Shenton, 2004). Member checking relates to the accuracy of the data collected from the participant and ensured that I understood the answers provided by the participant (Creswell & Miller, 2000; Schwandt et al., 2007). After each interview, I created a one-page summary of the transcription and emailed it to the participant. The participants had the opportunity to make any corrections or provide additional insight. All participants replied to the email to confirm they received the one-page summary of the transcriptions. One participant made minor corrections, and none of the participants provided additional comments at the time of member checking.

During the interviews, I used a script to support credibility. The script ensured a consistent order for the same prompts, transitions, explanations, and questions. Additionally, iterative questioning, such as follow-up questions, time for re-statements, and a summary, was strategically placed in the script to ensure iterative questioning and promote credibility in my study Shenton (2004).

Reflexivity of the researcher was critical throughout the research process to address the researcher's assumptions and minimize biases (Mauthner & Doucet, 2003). I had experience using VCT to assess students' psychomotor skills before my study and thus, had my own beliefs related to this phenomenon. I employed reflexive journaling after each interview to create an audit trail to mitigate bias. During the coding and data analysis, I used specific words and phrases from the participants to prevent personal experiences or feelings from influencing the coding and analysis processes (Schwandt et al., 2007; Shenton, 2004). Collectively, I promoted credibility throughout my study by using reflexive journaling, an informed consent, an interview script, member checking, expert reviewers, and well-established research methods.

Transferability

In qualitative research, transferability occurs when the results of the study can be applied to a broader population or context (Shenton, 2004). To ensure transferability in my study, I provided detailed descriptions of the methodology, including the sampling criteria and participant population (Creswell & Miller, 2000; Schwandt et al., 2007). Characteristics of the participant population included information regarding demographics, teaching experience, and digital competency. Providing explicit details of the methodology gives the reader a frame of reference to compare or apply the findings to their settings or populations, which enhanced the transferability of my study.

Dependability

Dependability strategies refer to reliability, which allows the study to be repeated (Anney, 2015). I clearly outlined the methodology, data sources, and instrumentation to

support my study's dependability. I provided specific descriptions of the participants and explanations of the data collection and analysis process. Additionally, I utilized audit trails via the interview transcripts, member checking summaries, and reflexive journaling. The audit trail allowed the researcher to trace decisions and procedures systematically and help identify possible biases (Schwandt et al., 2007; Shenton, 2004).

Confirmability

The ability to maintain objectivity supports the confirmability of the study (Anney, 2015; Shenton, 2004). I ensured confirmability during my study by maintaining an audit trail, clearly articulating the methodology, and detailing the data collection and analysis processes. The audit trail and clear explanations helped the reader understand what led to the study's results (Anney, 2015; Schwandt et al., 2007; Shenton, 2004). I used member checking to confirm that I interpreted the participant's lived experiences, feelings, attitudes, and perceptions correctly during the interview. Participants were sent a one-page summary of the interview transcript and asked to provide clarification, correct any misconceptions, or add additional insight.

Furthermore, I promoted confirmability via reflexive journaling after each interview to identify areas of bias and maintain objectivity throughout the study. I listened to each interview multiple times while transcribing and reviewed the transcripts numerous times while coding by hand. In doing so, I ensured the objectivity of the information obtained from the interviews and eliminated researcher bias.

Results

This basic qualitative study explored the experiences of faculty using synchronous VCT to assess physical therapy students' psychomotor skills. I collected data from comprehensive interviews with physical therapy instructors. The results answered the RQs, which were organized based on the four constructs of UTAUT. The overarching RQ that guided this study was as follows.

> RQ: How do physical therapy educators describe the psychomotor skill assessment of students using VCT related to the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions?

Additionally, four RQs using the four constructs of UTAUT one construct per question, as follows:

RQ1: What do physical therapy educators describe their as effort expectancy when using videoconference technology to assess student psychomotor skills?

RQ2: What level of performance expectancy do physical therapy educators report when using videoconference technology to assess student psychomotor skills?

RQ3: What conditions help facilitate teachers using videoconference technology to assess student psychomotor skills?

RQ4: What social influences are experienced by physical therapy educators while using videoconference technology to assess student psychomotor skills?

The answer to the overarching RQ is complex and summarized in the following five themes: performance expectancy, effort expectancy, social influence, facilitating

conditions, and lessons learned. The first four themes align with the four constructs of UTAUT and address each of the four respective RQs. The fifth theme, lessons learned, emerged from the data and highlighted a unique perspective of the faculty experience, including newly gained skills after using VCT for psychomotor assessment. I explain each theme in more detail within this section. After each code, I identified the tally in parenthesis, demonstrating the number of participants who reported that idea or concept. For example, (10/15) means that 10 out of the 15 participants reported that code or idea.

Theme 1: Effort Expectancy

The first theme of *effort expectancy* answers RQ1. Participants reported that the effort expectancy was initially high when using VCT for psychomotor assessment because they had to learn the technology, attend faculty development sessions (10/15), communicate with colleagues for consistency (10/15), provide explicit instructions to the students (11/15) and adjust rubrics for online assessment (7/15). P5 explained that some of the tasks to prepare for VCT online practicals included

> setting up the schedule, making sure the links are working, having the rubrics ready, talking with other instructors to make sure we are all on the same page, explaining to the students how we are going to do this and how they should have their camera set up.

The details mentioned by P5 demonstrate the increased workload on faculty to set up and organize VCT psychomotor assessments.

Almost all participants (14/15) reported that initially, there was a high level of effort to work through connection issues and troubleshoot during assessments. However,

troubleshooting became easier with experience, and participants reported more minor connection issues with repeated use. Participants said that the VCT practicals initially took longer than face-to-face assessments but with repeated use, the length of time decreased, the process became easier, required less effort, and was more convenient and efficient overall. Over half the participants (8/15) reported the students were adaptable and may have encountered more effort than if they had taken the exam in a face-to-face setting. P14 explained that the "efforts are more put onto the students for the set up than us as an instructor…I just have to sit there and watch." The participants reported the students had to set up their testing environment, which required them to improvise for many things like treatment tables, wheelchairs, crutches, canes, ultrasound machines, modalities, and walkers. P1, P12, and P14 mentioned that the adaptability and improvision required by students created more real-world scenarios. For example, P1 credited their previous home health experience for helping them adapt and explained that in "a home environment the chair is too low or too high and it's too hard or too soft, and it has arms or doesn't have arms, and you need what it doesn't have. You have to think about it." The participants agreed that the ability of the student to be adaptable is a clinically relevant skill for a physical therapist.

In regard to effort expectancy, the participants discussed test security and rigor. A few participants (3/15) mentioned that using VCT for assessment might have allowed for increased opportunities for cheating and that the student may not take the evaluation as seriously compared to an in-person practical. P14 alluded to VCT providing opportunities for the students to cheat, stating, "I feel like they [the students] think that it's a lot easier.

I think they feel like they can get away with more." Participants felt that hosting practicals via VCT created an illusion/perception that the practicals were less serious or that the stakes were lower than traditional face-to-face practicals. Similarly, P15 reported being skeptical of the student environment and setup, explaining, "I feel if a student has an environment they know and they can strategically place items for cheating…and would know where the camera doesn't pan…" it creates an unsecured assessment. P15 indicated that the variability in the student's environment and the inability of the faculty to develop a consistent and secure testing environment might compromise the test security and make the practicals susceptible to cheating. Participants perceived their efforts related to testing security when using VCT for psychomotor assessments were challenging.

Theme 2: Performance Expectancy

The second theme is *performance expectancy* and addresses RQ2. All participants reported that the technology performed as expected, but there were some limitations, specifically the camera angle and the inability to provide a 360-degree view. P14 highlighted these issues, explaining, "you expect hiccups on VCT. When you are face-to-face, there are no disconnections. You are always there and able to see." Similarly, P12 stated that VCT "worked most of the time; however, if there is an area I needed to zoom in and get a different perspective, I was limited as far as seeing what the camera could see." Almost all participants (14/15) reported that VCT could give them a "big picture" view to confirm if the student met the learning objectives and was safe and competent in their skills. However, a substantial number of participants (12/15) noted that the limited

camera angle sometimes made them make assumptions about what was happening and likely impacted the objectivity of the assessment. For example, P13 explained that faculty made assumptions if there were limitations to the student's environment or provided exceptions if there were technical challenges. Participants reported making assumptions when grading due to limited resources or technical issues, which they perceived as potentially providing leeway for the student and inhibited consistency when grading psychomotor assessments via VCT.

Many of the participants (11/15) reported higher grades than in previous face-to-face practicals. For example, P6 stated that "our grades were higher virtually, so there was a perceived improvement, that performance was better. As we came back to campus, we noticed these deficiencies in their hand skills." P6 explained that VCT psychomotor assessments created a perception of improved student performance not because of the student's preparedness but because of the inability to view all aspects of the skill and potential assumptions made by the grader. Many participants (12/15) noted they made some assumptions when grading via VCT because of the static camera angles, inability to view all aspects of the skill, the lack of student resources, and the variability in each student's environment.

Limited resources was another cited limitation (7/15). Almost half the participants commented that students did not have access to necessary resources for testing, such as assisted devices, wheelchairs, or hospital beds, which they would typically have in a traditional in-person testing environment. Students were pretending a stick was a cane or a dining room chair was a wheelchair which altered the objectivity of the assessments.

The participants indicated that they assumed the student knew how to operate the assisted device or other equipment based primarily on verbal explanations. For instance, P1 explained,

> you had to adapt your own thinking about what the student was demonstrating based on what they had available to them. And because you are accomplished to go from a dining room chair to a sofa or a bed does not mean you are going to do it equally as well with a wheelchair.

P1, P7, P8, P9, P13, and P14 emphasized that the limited resources forced participants to make assumptions while grading and may have influenced the objectivity of the assessment.

Most participants (10/15) reported that student anxiety, including performance anxiety, was lowered in the VCT environment compared to face-to-face practicals, which could have resulted in improved performance. Participants attributed the reduced performance anxiety to students being comfortable in their homes and working with a close family member or friend during the assessment. Other participants (5/10) noted that stress was higher for students but only when they experienced technical difficulties. Participants reported that high and low performance anxiety levels likely impacted the student's experience using the technology.

Overall, participants were satisfied with the performance of VCT to assess psychomotor skills. P1 stated that the technology's performance surpassed their expectations, explaining, "I go into this expecting technology not to work, not that the technology doesn't work, but not work in my hands. So, I was pleasantly surprised that

things went much better than I ever anticipated." Similarly, P8 noted, "I feel like anything I can observe in a face-to-face classroom, I can observe in a virtual environment." Many participants reported that VCT psychomotor assessments captured about 75-90% of what a traditional in-person practical could. In other words, participants perceived that they could use VCT to assess psychomotor skill performance about 75-90% as well as a conventional face-to-face evaluation, with the primary limitation being the static camera angle.

Theme 3: Facilitating Conditions

The third theme of *facilitating conditions* answers RQ3 and relates to conditions and resources that impacted participants using VCT for psychomotor assessments. Resources that facilitated participants to deliver assessments via VCT included access to the online LMS, the software applications, and hardware such as a university-issued or personal laptop (12/15). Other essential resources that facilitated the delivery of VCT assessments were quality Wi-Fi and institutional information technology (IT) support (10/15).

Almost all participants (14/15) reported connectivity issues, although these problems decreased with repeated use and better knowledge of managing technical issues. P6 provided this example, stating, "initially there were more bad moments than in the latter part. On some occasions, we were using the Wi-Fi, and we realized that any time we could plug in (hardwire), that would help the signal." Repeated use of the technology helped individuals learn strategies to manage technical issues. For instance, P2 reported, "I had to ensure I had enough bandwidth at certain times [and the students]

had to ensure they had the correct bandwidth and were going to be able to get through the assessment without an interruption." It was also noted that connectivity issues affected the participants and students using VCT for psychomotor assessments.

The two challenging conditions that negatively impacted the participants experience using VCT for assessment were a lack of resources for students (such as assisted devices, wheelchairs, and hospital beds) and the static view of the camera (15/15). All participants reported these two limitations. For example, P7 stated that the students "didn't have any muscle memory of working with the equipment because they hadn't practiced with the equipment." The participants reported that although the students verbalized the instructions and completed the task, their inability to directly use the assisted devices impacted their performance and the objectivity of the assessment. Additionally, P8 explained that limited resources affected the faculty's ability to assess student safety because "there are challenges related to setting up the student for safety situations. Like having a wheelchair, we can simulate locking brakes, but in the home environment, they didn't have one, so it wasn't to the same extent." During the assessment, students had to pretend with makeshift canes, crutches, walkers, and wheelchairs, which sometimes made it unclear if the student understood how to utilize these assisted devices.

Aside from tangible resources, support from IT personnel and professional colleagues were noted as an essential resource for faculty to deliver assessments via VCT. Sixty-seven percent of participants reported support from IT helped them facilitate their assessments using VCT. For example, P6 stated, "I think our entire IT department

was extremely supportive" of our needs. While IT support was a necessary resource, other participants noted that important resources were the support of their colleagues. P12 explained, "I think our people are our biggest resources. We got the hardware and software, but our people are really amazing resources." While participants noted tangible resources like computers, hardware, software, access to the learning management systems, and Wi-Fi within the theme of facilitating conditions, it was also noteworthy to acknowledge the comments from participants regarding the importance of having professional and personal support to incorporate technology. Results from my study noted that specific conditions and resources, including institutional and collegial support required to conduct psychomotor assessments via VCT, and that access to necessary resources impacted the participant's experience using VCT.

Theme 4: Social influence

The fourth theme of *social influence* answers RQ4 as it relates to factors influencing faculty participants and their students using VCT for psychomotor assessments. Participants reported few options existed to allow students to continue their education. Many participants (13/15) commented there was no specific pressure, but there was no other choice. P5 explained, "I didn't feel pressured. I just knew it was something we had to do…the alternative was nothing…VCT was good given the circumstances." Similarly, P1 stated that during the COVID-19 lockdown, transitioning to learning and assessments via VCT was "essential." Ninety-three percent of participants agreed that during the unprecedented experience of the COVID-19 pandemic, conducting psychomotor assessments via VCT was a necessary, logical, and comparable alternative.

Internal and external social pressures fall under the theme of *social influence*. Over 50% of participants reported feeling pressured to use technology. Participants said they experienced high levels of pressure to find a way for the students to progress with their academics during the COVID-19 pandemic and to continue providing quality education in an online environment. Some participants worried there would be negative consequences if they did not incorporate technology into their classroom. P10 provided an example of the external pressure they experienced, stating, "I think I felt pressure from the administration that I wasn't going to be relevant as an instructor if I didn't learn the technology." Many participants reported external pressure from the administration within their institution, but participants also mentioned internal pressure related to the quality of their teaching. For example, P10 stated, "I take pride in my work…taking on all this new technology was like the first year of teaching… It's like starting over." Participants reported there were challenges to successfully incorporating technology into their curriculum but that the influence of the COVID-19 shutdown forced them to immerse themselves in technology and accept it.

All participants reported previous experience using VCT in some capacity, but none had used it for assessment before. Participant-perceived factors that influenced using synchronous VCT for psychomotor examinations were prior online teaching and learning experiences (12/15) and influence from their colleagues (8/15). Almost all participants (14/15) chose to utilize synchronous practicals via VCT rather than asynchronous because they perceived synchronous assessments function similar to a traditional face-to-face practical regarding time and communication. Most participants

(11/15) reported that synchronous practicals occurred in real-time and allowed both the student and faculty member to ask questions and gain clarity in the moment. P8 explained that the synchronous VCT practicals provided better communication and personalization, which would not occur in an asynchronous practical. P8 stated that synchronous practicals give "you a few minutes of one-on-one time with the student where you get to interact and talk with them… you don't get in the asynchronous practical." Participants reported that it was vital to get to know their students in a virtual environment and felt that synchronous VCT helped to streamline communication.

Over half of the participants (8/15) reported that their colleagues influenced their decision to use VCT for psychomotor assessments. P10 explained that they consulted the faculty working in hybrid programs for advice on incorporating technology during the COVID-19 pandemic. P10 stated, "I think it was really a time that I leaned on the flex (hybrid) faculty to get pointers about what works for them and what doesn't." Sixty-seven percent of participants reported they spent additional time communicating with colleagues to ensure they agreed on how to utilize VCT best. The added time of conferring with colleagues was an extra step that participants took when learning to use VCT for psychomotor assessments. P6 explained that consulting with colleagues was part of a learning curve, "we would hear of different approaches or what worked for other individuals, so I was definitely influenced by other individuals going through a similar experience." Participants reported collegial influence as a leading contributor to implementing VCT for psychomotor assessments in their classrooms.

Most of the participants (12/15) reported the feedback from their students was positive. Participants said they felt the students appreciated their ability to continue academics by using VCT to assess their psychomotor skills. P13 explained, “I think the students did appreciate the work that was done for us to deliver our assessments in the way we did.” Additionally, over half of the participants (8/15) reported that online learning and assessments are now more widely accepted by the medical education community including administrations, faculty, students, and clinicians. P14 explained that “the pandemic reinforced that a lot of things can be done virtually. I think it showed that we can use it to assess psychomotor skills and do it in a practical setting.” Using VCT for psychomotor assessments demonstrated the technology’s versatility and influenced the acceptance of online learning in physical therapy education.

All participants noted influential factors that impacted their acceptance and use of VCT for psychomotor assessments. Colleagues, students, personal pressures, and other perceived pressures influenced participants’ experience. Additionally, all participants reported that the COVID-19 pandemic significantly influenced incorporating technology into their curriculum.

Theme 5: Lessons Learned

In addition to the UTAUT constructs, one other theme emerged from the data analysis. The theme of *lessons learned* incorporates benefits and positive outcomes from using VCT for psychomotor assessments. Two-thirds of the participants reported a steep learning curve while trying to include VCT for psychomotor examinations but

acknowledged that they gained new skills from this experience. P9 stated that now they feel more competent and comfortable with technology explaining,

> Initially, I was not very savvy in my technological abilities. Now I feel like I have learned so much …and I have a lot of freedom to enhance things that I would never have thought about doing if I hadn't been forced.

Other participants noted similar experiences in which they appreciated the new skills and confidence they gained from being forced to incorporate technology into their classroom. Similarly, P12 stated, "I have had a lot of faculty come to me still asking questions (like) how to turn on the Zoom… It's nice to be that person that people can rely on." Similar to the responses provided by P9 and P12, other participants recognized that from this experience, they became a technology mentor for their institution.

Sixty-seven percent of participants reported that they had become better teachers because they have many new skills and are more competent in using technology. Participants said the inability to provide tactile feedback during or after the psychomotor assessment challenged them to find new ways to explain concepts to students, which helped them grow and gain new skills as an instructor. For example, P11 stated they have grown as a teacher by learning to use "verbal cues instead of hands-on tactile cueing for the students. I had to use my brain a little differently and be able to explain better verbally." Similarly, P12 explained, "I think it made me better at using my communication skills to talk through pieces with a student." While participants reported some growing pains in initiating psychomotor assessments via VCT, overall, they noted that they acquired new skills which they will continue to use in their classroom.

Most participants (10/15) also reported that using VCT for psychomotor assessment made them more comfortable with technology. P1 said that their "comfort zone with technology" was improved, and at times, they reported feeling "more comfortable than a lot of my students felt using the technology." The participants reported spending more time learning how to implement VCT into their curriculum. Some participants reported learning how to troubleshoot issues with VCT (6/15) and spent time revising rubrics (7/15) to accommodate online assessments. A majority of participants reported attending faculty development sessions (10/15) and meeting with other colleagues (10/15) to help them learn how to optimize VCT for psychomotor assessments. P1 explained that learning to use VCT took some time and patience because "you can't just walk in and do it. you need some training." Faculty development sessions offered instructors the opportunity to learn how to incorporate VCT into their classroom and helped them learn to troubleshoot common issues. P2 stated, "there was significant faculty development assistance whenever needed, and I think there were plenty of faculty development webinars and meetings, and I had accessibility to any mentor or anybody that could help." Aside from attending faculty development sessions, participants reported having to revise rubrics and communicate with colleagues for consistency. P9 summarized their experience incorporating technology into their classroom, stating, "it's much more time-consuming to reinvent your entire course to make it more amenable to the virtual setup, so I think I changed just about everything in the course to make it more interactive." Although the participants reported increased workload to start using VCT for psychomotor assessments, they also noted that this experience helped them become

more competent with technology and learn new ways to use it in medical education. Furthermore, the participants reported a better understanding of the technology and its implications for medical education. P6 explained,

> If we are in a situation where we need to assess something g from a virtual way, now we are more comfortable doing that. We are more comfortable understanding the limitations and opportunities or what areas we feel we can truly assess.

Participants reported the benefits and limitations of using VCT for psychomotor assessments, and many participants promoted its continued use in the classroom as both a learning and assessment tool.

Eighty-seven percent (13/15) of participants reported convenience as a primary benefit of using VCT for psychomotor assessment. Participants acknowledged the flexibility that the VCT medium provided them and their students. P3 stated, “there was so much more flexibility.” Other participants echoed similar comments. P3 said, “I think it was convenient as far as getting a lot of testing done… Being able to do that on your own time, on your own schedule, from a remote location made it an advantage.” P5 commented on how they appreciated the flexibility that VCT allowed. Participants were able to assess students anywhere and at any time. P5 noted

> I was able to not be at home. We took a trip back to the Midwest. One of the assessments fell on a day that I could just sit where we were, and meet with the students. So there is some convenience in being able to be flexible with your location.

Participants noted the flexibility and convenience that VCT provided for both them and their students. Similarly, P9 explained that the main benefit was that no one had to move, and there was no classroom to set up, "I could stay in one spot and get to the students easily…you didn't have to travel, it was less taxing on my body." A consensus of 13/15 (87%) participants described instances similar to P3, P5, and P9 and reported convenience as a primary benefit of using VCT for psychomotor assessments.

Additionally, the participants noted the importance of incorporating VCT into assessments to prepare physical therapy students for telehealth. The ability to appropriately prepare students for telehealth using VCT for a psychomotor evaluation is described in more detail in the Implications section in Chapter 5. Ninety-three percent (14/15) of participants reported synchronous practicals functioning similar to face-to-face practicals, and several noted that VCT practicals provided students with real-world clinical scenarios. The participants noted the similarities of VCT practicals to telehealth evaluations. P7 stated, "To demonstrate a student's competence of telehealth-type material, you would have to do at least one exam on Zoom where you are doing some type of mock evaluation." P7, P12, P14, and P15, felt that using synchronous VCT to conduct psychomotor assessments exposed physical therapy students to similar telehealth experiences and highlighted the many advantages and usefulness of telehealth within the healthcare profession. For example, P12 explained,

> I think that it's important to show that it is possible, to show that you can measure range of motion in an online medium, and you don't have to be hands-on in

person to give good online care. I think proving that to students early on is really important.

The participants recognized the need to incorporate aspects of telehealth within the physical therapy curriculum and acknowledged that VCT psychomotor assessments might be an appropriate alternative.

Summary

In summary, I aligned the results with the UTAUT constructs and the faculty's use of VCT for psychomotor assessment. Results indicated that the technology performed as expected but that participants also anticipated some issues. The effort for faculty participants to deliver assessments via VCT was higher on the front-end, which included learning, preparing, and organizing the evaluation in this new medium. However, executing the practical exams online often required less effort and was more efficient than in-person assessments. Many factors influenced participants to use VCT for assessment purposes, such as prior experience using the technology, previous online teaching and learning experiences, collegial influence, and the immediate need to find new ways to assess students virtually during the COVID-19 lockdown. Conditions that facilitated the use of VCT were quality Wi-Fi, IT support, access to the LMS, a computer or laptop, and access to the software to conduct VCT assessments. In the next chapter, I interpret the findings, explain the limitations of my study, and provide recommendations for future research.

Chapter 5: Discussion, Conclusions, and Recommendations

This chapter reviews the key findings and provides an in-depth interpretation of the results. I offered peer-reviewed literature to support the findings of my study. Other aspects of this chapter include the study's limitations, recommendations for future research, and implications for social change.

The purpose of this basic qualitative study was to explore the faculty experience using synchronous VCT to assess the psychomotor skills of physical therapy students. I interviewed 15 physical therapy faculty participants via Zoom to explore their lived experiences, attitudes, opinion, perceptions, beliefs, and feelings (Percy et al., 2015) while using VCT to assess students' psychomotor skills. Interview questions aligned with the four constructs of UTAUT: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). The primary data source was the transcripts from the interviews.

I identified codes, categories, and themes that emerged from the transcripts and aligned these with the four constructs of UTAUT to facilitate a thematic analysis. Key findings from my study included the five themes from the results: performance expectancy, effort expectancy, social influence, facilitating conditions, and lessons learned. Results indicated that many factors impacted the participants' use of VCT for psychomotor assessment and all these factors related to the constructs of UTAUT. While each construct of UTAUT is a distinct and separate idea, the constructs are also dependent on one another and all impact an individual's intention to use technology (Venkatesh et al., 2003)

Interpretation of Findings

This section is organized based on the themes found in the results section. It starts with the researcher's interpretation of *performance expectancy* and *effort expectancy*, followed by *social influence* and *facilitating conditions*, as these all align with the constructs of UTAUT. The final theme, *lessons learned*, is interpreted and its uniqueness explained.

Effort Expectancy

Effort expectancy is the perceived ease of using technology and impacts an individual's acceptance and use of technology (Venkatesh et al., 2003). Findings from my study confirmed the impact of effort expectancy and its influence on faculty to use VCT for psychomotor assessments. All participants reported using VCT assessment during the COVID-19 lockdown when policies and procedures prevented traditional in-person contact. The conditions that prompted the need to use VCT for assessment were unexpected, and the faculty had little time to prepare. Most participants reported using VCT practicals for at least two semesters. Participants reported the first semester was very challenging, requiring extensive training, trial and error, organization, and setup. Thus, the effort expectancy for participating faculty was high when first using VCT for psychomotor assessments because they were unaccustomed to virtual assessments. The uncertainty and stress during the COVID-19 lockdown created a perception of increased effort for participants to successfully find a way to teach and assess students in a virtual environment. However, findings from my study indicated that the effort on faculty to use VCT for assessments became easier with experience. Most participants reported that the

second semester of using VCT for psychomotor examinations was easier because they had experience using it and knew what to expect.

Results indicated that some participants were skeptical of using VCT for assessment but later stated that it exceeded their expectations. These results confirmed the findings of Abdekhoda et al. (2016), Briz-Ponce et al. (2017), and Cherry and Flora (2017), who found that effort expectancy had a direct impact on an individual's perception to use VCT for psychomotor assessments in medical education.

Findings from my study indicated that participants perceived students also had to put forth great effort in learning to use VCT. The participants noted that students had to find the necessary resources for the assessment, set up their testing environment, and ensure the faculty member could view all aspects of the practical. Despite the participant's perception of increased effort on the students, faculty participants reported the students were able to use VCT with minimal issues. The results from my study are in-line with Mizota et al. (2018), who also found positive experiences from students when using VCT to learn medical-based psychomotor skills. Sattari et al. (2017) noted that effort expectancy significantly impacted an individual's acceptance of technology such as VCT.

Utama et al. (2020) found effort expectancy was not related to behavioral intention to use technology due to complications such as internet speed and bandwidth. Results from my study noted similar challenges that impacted effort expectancy at first, such as connectivity and audiovisual issues. However, participants noted fewer challenges with repeated use of VCT. In other words, my participants perceived that the

technology became easier to use with experience and thus, impacted the effort expectancy to continue to use VCT for psychomotor assessments. Results from my study aligned with findings from Iwai and Lusk (2020), who reported that students and faculty had minimal difficulties using VCT in medical education as they shifted from in-person to virtual learning during the COVID-19 pandemic.

Results from my study indicated faculty experienced increased effort to adapt rubrics for virtual assessments. Participants reported changing some of the skills assessed so they could maintain a good camera view. Other participants reported removing some psychomotor skills from the rubric and replacing them with cognitive-based clinical reasoning questions. Jay and Owen (2016), Johnson et al. (2020), Kemery and Morrell (2020), and McDonald et al. (2018) found that creating an objective rubric with specific criteria for psychomotor assessments was a critical component of successful practicals in medical education. Results from my study confirm these findings, as most participants reported the need to adjust their rubrics to accommodate online psychomotor assessments.

Performance Expectancy

Performance expectancy is an individual's belief that using technology will improve performance (Venkatesh et al., 2003). Venkatesh et al. (2003) explained that technology's performance influences an individual's experience, thus impacting their acceptance and use of technology. Findings from my study confirmed the value of performance expectancy and its influence on faculty's use of technology for psychomotor assessments. Results from my study indicated that the theme of performance expectancy

had the highest number of associated codes and categories compared to all other themes. Venkatesh et al. noted performance expectancy was the strongest predictor of technology acceptance. My interview questions that related to the performance expectancy construct had the highest number of responses, codes, and categories compared to all other interview questions for UTAUT constructs. The high number of associated interview responses, codes, and categories demonstrated the importance of VCT performing how the individual expected. Briz-Ponce et al. (2017) found that performance expectancy was the main predictor of medical students' behavioral intention to use technology.

Responses from interview questions related to perceptions about performance expectancy demonstrated that my participants could use VCT for psychomotor assessment to get a general idea of whether students understood the concepts, could perform the skill, and met the learning objectives. In other words, my participants reported they could identify if the students were competent and safe with their psychomotor skills. These results are in-line with Becker et al. (2018), Geary et al. (2019), and Rawle et al. (2017), which incorporated VCT in medical education to assess psychomotor skills. During the interviews for my study, the participants clearly stated that the technology performed as expected with some limitations. The findings from my study align with prior research by Abdekhoda et al. (2016) and Briz-Ponce et al. (2017) that explained when students or faculty perceive technology to be valuable and easy to use, there is a positive impact on their intention to use technology. My participants reported that they valued the flexibility and convenience of using VCT for psychomotor assessment. Similar findings by Cherry and Flora (2017) noted a strong positive

correlation between perceived usefulness and acceptance of technology and thus, supported the results in my study. Because my study participants found value and convenience in using VCT, it increased their acceptance and use of the technology.

However, my participants also identified challenges to using technology which impacted both the technology's performance and the faculty's experience while using technology. These challenges included the static camera angle, connectivity issues, and limited resources such as assisted devices and hospital beds. The challenges noted in my study align with Utama et al. (2020), who found similar limitations in using VCT in higher education and reported faculty could not view the entire classroom and frequent connectivity-related issues. However, no other studies discussed the lack of resources and static camera angle while using VCT for psychomotor assessments.

Results from my study showed that faculty utilized synchronous VCT for psychomotor assessment because it allowed direct communication and immediate feedback, which are similar to results noted by Liu and Chen (2018), Mukan and Lavrysh (2020), McGann et al. (2020), and Volansky (2019). Additionally, the participants in my study reported that the real-time communication and the ability of the student and faculty member to view each other during the examination mimics aspects of in-person practical assessments. Geary et al. (2019) and Rawle et al. (2017) stated that synchronous VCT resembled traditional face-to-face experiences for learning, instruction, and examination purposes. Findings from my study also noted similarities between synchronous VCT practicals and in-person which are in-line with previous research (Geary et al., 2019; Rawle et al., 2017).

The findings in my study noted similarities between synchronous VCT practicals and in-person assessments which are in-line with previous research by Geary et al. (2019) and Rawle et al. (2017) which noted in medical education, and stated that synchronous VCT resembles traditional face-to-face experiences for learning, instruction, and examination purposes.

Within the theme of *performance expectancy* was a category labeled *performance anxiety*. Previous research noted that testing anxiety might negatively impact student performance in psychomotor assessments (Bayram & Caliskan, 2019; Kenny et al., 2020; Lockwood et al., 2018). Results from my study indicated that faculty perceived lower student anxiety levels when testing psychomotor skills using VCT. Bayram and Caliskan (2019), Kenny et al. (2020), and Lockwood et al. (2018) confirmed findings of lowered student anxiety when using technology for assessments in medical education. My participants noted that synchronous VCT provided a platform to conduct assessments similar to traditional face-to-face practicals. Multiple research studies align with my finding that physical therapy faculty participants successfully used synchronous VCT as a modality for their students' psychomotor skill acquisition (Dost et al., 2020; Harris et al., 2020; Nik-Ahmad-Zuky et al., 2020; Sharpe et al., 2021; Volansky, 2019).

Facilitating Conditions

Facilitating conditions consider the available resources that the individual believes will support technology's use (Venkatesh et al., 2003). The theme of *facilitating conditions* comprised only one category with the fewest number of associated codes. However, my study found that the theme of *facilitating conditions* impacted other

UTAUT constructs. Similarly, Utama et al. (2020) found that all UTAUT constructs appeared to rely on the conditions which facilitate technology's use. My study confirmed the findings of Utama et al. because aspects related to facilitating conditions appeared in all other themes. The faculty participants in my study discussed aspects of facilitating conditions such as challenges or limitations to technology's performance, the faculty's effort expectancy, and the influential factors impacting technology's use.

Participants reported the primary resources required to conduct psychomotor assessments via VCT included hardware such as a computer or laptop, access to the LMS software or VCT applications, and a high-quality internet connection. Institutional support services like information technology assistance and faculty development training were critical to successfully implementing online psychomotor assessments. Quality Wi-Fi and institutional IT support were essential resources that facilitated faculty to deliver their assessments via VCT. The majority of participants reported there were connectivity issues, although these problems decreased with repeated use and better knowledge of managing technical issues. These results extended the knowledge of Abdekhoda et al. (2016), Lowenthal (2020), and Sattari et al. (2017), who demonstrated the acceptance and use of technology in medical education improved by providing appropriate resources and infrastructure.

Barriers that challenged the conditions of VCT psychomotor assessments included the inability to obtain a 360-degree view, limited resources for students such as hospital beds and assisted devices, and occasional connectivity issues. The static camera angle was the most frequently cited limitation of using VCT for psychomotor

assessments and impacted all other UTAUT constructs. The participants reported limitations in viewing all aspects of the student's performance due to the static camera angle, which affected the overall assessment. In a traditional in-person setting, the participants reported opportunities to walk around and see everything occurring in real-time. The inability to zoom in and out on the camera required the faculty to interrupt the student during the exam and ask them to move the camera, which impacted the exam flow and potentially increased the student's anxiety. I provided a detailed account of the faculty participant's perception of student anxiety in the Results section of Chapter 4 under Performance Expectancy. The barriers and challenges discovered in my study align with those found by Briz-Ponce et al. (2017), Lowenthal (2020), Sattari et al. (2017), and Utama et al. (2020), who also identified poor internet and audiovisual quality as significant challenges of the conditions to use technology. However, no prior researchers reported limitations such as the inability to obtain a 360-degree view and limited student resources during psychomotor testing. Thus, the results from my research extend awareness to the discipline of physical therapy education by identifying additional resources necessary to assess students' psychomotor skills using VCT.

Faculty participants expressed challenges with technology when first using VCT for assessments. However, the participants reported that with repeated use and additional training such as faculty development sessions or one-on-one mentoring, the connectivity issues decreased, and the overall experience improved. If connectivity issues occurred, participants remarked that it impacted the performance and effort expectancy constructs of UTAUT. For example, poor connectivity issues affected how the technology

performed and increased the effort required for faculty to find a solution. Study participants reported receiving assistance from their institution's information technology team or resolving issues independently. These findings align with previous research (Farooq et al., 2020; Knapp, 2018; Liu & Chen, 2018; Romero-Hall &Vicentini, 2017) in medical education that identified internet connectivity issues and poor audiovisual quality as major concerns for implementing technology into the curriculum. However, when faculty were provided with the hardware, software, knowledge, training, and IT support, it enhanced the acceptance and use of technology.

Participants commented that they felt they had the necessary resources to conduct VCT assessments, such as a laptop with a webcam, internet, and access to VCT platforms. However, most participants also noted that many students did not have access to physical therapy supplies such as assisted devices, walkers, canes, crutches, wheelchairs, and hospital beds for their assessments. The participants reported the students had to adapt many of their resources from home, and the faculty often made assumptions about what the student was doing. Results from my study indicated that the faculty perceptions regarding the limited resources hindered the conditions for students and faculty and impacted the performance expectancy and effort expectancy constructs of UTAUT. The participants explained that students could verbally explain how to use the equipment but had no real-life experience working with it, adjusting it, or handling it properly. The limited resources and situational factors noted in my study extend to Lowenthal (2020) and Sattari et al. (2017), which also identified home setup, broadband

capabilities, and access to necessary resources as common challenges to technology usage for faculty and students.

Social Influence

Social influence refers to an individual's perceptions about what others think of technology or how others will view that individual after using technology (Venkatesh et al., 2003). Results of my study indicated social influence had a significant impact on faculty's use of VCT for psychomotor assessments. Participants reported receiving positive feedback from their students regarding the online psychomotor evaluations. Additionally, the participants said that the needs of the students influenced the faculty to incorporate technology into the curriculum to test psychomotor skills. These findings align with Briz-Ponce et al. (2017) and Sattari et al. (2017) that noted social factors, such as peer pressure, directly influenced an individual's intention to use technology. My study demonstrated that the participants felt conducting psychomotor assessments via VCT was necessary to allow students to progress academically during the COVID-19 pandemic, where face-to-face interactions were limited. The participants felt that the students appreciated the opportunity to perform assessments using VCT because it allowed them to progress academically when in-person instruction was limited. These findings align with Geary et al. (2021) and Mizota et al. (2018), which indicated students were satisfied with the instruction and assessment of medical-based psychomotor skills using VCT for surgical skills.

Participants described feeling high levels of pressure from their institution's administration and colleagues to incorporate technology into their instruction and

assessments, which influenced their use of VCT. The pressures that influenced faculty participants in my study are similar to those noted by Abdekhoda et al. (2016), who found that social influence impacted an individual's acceptance and use of VCT in the classroom. Although participants in my study reported experiencing high levels of pressure from their institution's administration and colleagues to implement VCT practicals, they also reported positive experiences, increased opportunities to communicate with colleagues and students, and becoming more competent with technology. These results of my study align with the findings by Geary et al. (2019), Geary et al. (2021), and McGann et al. (2020), which concluded that faculty had positive perceptions when integrating VCT into distance medical education to learn and assess psychomotor skills.

My study's results indicated that using VCT to conduct psychomotor assessments may provide students with increased opportunities for cheating. Participants reported that students might strategically place notes or conveniently be disconnected during the evaluations if they do not know the answers. These results extend the work of Nik-Ahmad-Zuky et al. (2020), who also reported that online assessments might compromise exam security and rigor by providing similar opportunities for students to cheat during an exam. Nik-Ahmad-Zuky et al.'s study referred to online asynchronous electronic multiple-choice exams, whereas my research identified cheating opportunities in synchronous psychomotor assessments. However, participants in my study emphasized concern regarding students cheating during online practicals using VCT. Faculty participants in my study reported that using synchronous VCT to assess psychomotor

skills may influence students to resort to cheating because they either do not take the exam seriously or feel they can get away with more in an online environment. Some participants recounted potential instances of students cheating. However, no participants identified an actual occurrence where they caught a student cheating.

Participants described many factors that influenced their use of VCT for psychomotor assessments, such as their colleagues, prior online teaching and learning experiences, and previous experience using VCT for work-related communication. Utama et al. (2020) found that social influence prevented technology's acceptance and usage due to challenges transitioning to an online learning environment during the COVID-19 pandemic. However, my study demonstrated that faculty perceived that they and their students successfully transitioned to virtual learning and assessments.

Lessons Learned

One unique theme emerged from the findings in my study and did not coincide with the UTAUT constructs. The final theme, *lessons learned*, identified the growth that participants reported after using VCT for psychomotor assessments. Participants reported developing new skills, improving their competence with technology, and becoming better teachers. Volansky (2019) found similar benefits when they examined faculty perceptions of teaching psychomotor skills. My study focused on assessing psychomotor skills, but the participants identified similar benefits by incorporating technology. Participants reported the inability to provide tactile feedback during or after the psychomotor assessment challenged them to find new ways to explain concepts to students, which helped them grow and gain new skills as instructors. This adaptation to teaching was

challenging initially, but the participants noted that they now have more strategies for teaching these skills, such as new explanations, examples, and demonstrations. Results from my study extended findings from Jabali et al. (2019) and Mizota et al. (2018), who identified positive experiences and perceptions integrating technology in medical education such as improved student engagement, improved access to learning content, and increased efficiency of studying. Participants also reported that using VCT for psychomotor assessment made them more comfortable with technology. They reported spending more time learning the technology, including troubleshooting issues with VCT, attending faculty development sessions, and meeting with colleagues.

Limitations of the Study

In this section, I identified possible limitations of my study related to various aspects of trustworthiness and the role of the researcher. I noted limitations within the transferability, dependability, and credibility domains of trustworthiness, but no limitations to confirmability were noted in this study. A limitation to my study begins with the potential for researcher bias. As an online physical therapy educator, I inadvertently have my experiences, feelings, and beliefs about using VCT for psychomotor assessments. To mitigate these biases, I employed reflexive journaling to help identify my own biases and decrease the possibility of my personal views impacting the interpretation of the participants' responses. Similarly, as the sole interviewer for my study, a potential bias may exist. I developed my interview questions based on previous studies in medical education (Cherry & Flora, 2017; Kalaimathi et al., 2020), and two experts in the field of physical therapy education and qualitative research reviewed my

interview questions to ensure objectivity and minimize bias. I also utilized member checking by providing a summary of the transcript to each participant after the interview to ensure the participant's responses were accurately interpreted (Ravitch & Carl, 2016).

Another limitation is related to transferability. The participants in my study only included the experiences of doctoral physical therapy educators, limiting the generalizability of the results to physical therapy faculty. I included many peer-reviewed studies from various medical disciplines regarding learning and assessing psychomotor skills in an online environment. The research is limited to the physical therapy education field, thus forcing researchers to analyze similar ideas from different disciplines. All areas of healthcare education need additional research to extrapolate these findings further.

Qualitative designs typically yield smaller sample sizes due to the time-consuming data collection and analysis process (Hackshaw, 2008). A small sample size impacts the transferability of a study. Additionally, a small sample size limits generalizability to other populations. My study included 15 participants from various institutions and locations with diverse age ranges and experience levels that provided unique experiences and contributed to the generalizability of my study within the field of physical therapy education. Despite the diversity noted within my study's population, small sample size may limit data saturation. Of the 1,957 members of the Physical Therapist Educator's organization, only 15 individuals agreed to participate, which means that this data represents less than 1% of the population. Although I saw data saturation in my participants' replies, the diversity noted in the participants' experiences does not

guarantee that the results represent all experiences, perceptions, feelings, or attitudes within this population.

Credibility in my study may have been limited due to member checking responses. After I transcribed each interview, they emailed a one-page transcript summary to the participant for member checking. I instructed the participant to review the summary and ensure the information obtained from the interview accurately depicted the individual's thoughts, feelings, and beliefs. I encouraged the participant to clarify misconceptions and provide additional insight if warranted. Every participant responded to the email with the transcript summary, one participant made edits, and no participants added additional information. If participants did not thoroughly review their summary, credibility problems might occur.

I identified potential limitations in the dependability of my study given the unique circumstances of when it was conducted. While the study steps might be repeatable, the context of repeating these steps in an environment where faculty are coming out of a pandemic may pose challenges. I conducted this study when the COVID-19 pandemic was coming to an end, and most universities were resuming in-person learning and assessments. If a researcher attempts to recreate my study, the responses from faculty may yield different results due to the circumstances occurring during my data collection.

Recommendations

Using VCT for student psychomotor skill assessment provided convenient access to additional learning opportunities for students and faculty worldwide during the COVID-19 pandemic. I recommend faculty, administration, and instructional designers

consider the information in my study when incorporating VCT for psychomotor assessments. Although some limitations exist, the faculty's acceptance of technology demonstrated that psychomotor skills could be assessed in a virtual environment. My study identified challenges such as poor internet connectivity, limited resources, and static camera angle, but future research should address these limitations and conduct a study with them accounted for. In my research, some faculty reflected on their experiences during the COVID-19 pandemic when they were testing virtually. At that time, many faculty had to immediately shift to virtual learning with little time to prepare. Because there was minimal preparation for virtual assessments, it impacted the availability of resources and infrastructure, which affected technology's performance and created increased effort for faculty to initiate. Future research should address challenges such as internet connection and equipment availability by providing students and faculty with appropriate resources to conduct assessments to determine its impact on the faculty's acceptance and use of technology.

I also recommend future qualitative research address the student experience while using VCT to assess their psychomotor skills. While my study identified the faculty experiences, it is crucial to understand the student perspectives regarding their assessments to facilitate a collaborative learning environment and address all parties involved.

All areas of medical education, specifically physical therapy education, need additional research to demonstrate the versatility and value of using VCT for psychomotor assessments. I recommend quantitative studies investigate the student's

psychomotor skill performance in using VCT compared to their performance in a face-to-face testing environment. My study identified that faculty perceived student anxiety differently while using VCT, which they believed impacted the student's performance. Understanding the impact of technology on a student performing a psychomotor skill has implications for instructional design and future assessment methods.

Implications

Using VCT for assessment may function similar to a telehealth evaluation which is an integral component of the physical therapy curriculum and helps to mimic clinical evaluation scenarios. The similarities noted between synchronous VCT and traditional face-to-face practicals support the acceptance of online assessments and learning in medical education.

Results of my study provided positive social change by identifying alternative methods for psychomotor assessments which impacted physical therapy students and faculty. Additionally, my study promoted positive social change by understanding ways to expand physical therapy education using VCT for assessment. VCT provided a convenient, useful, and necessary modality to conduct psychomotor assessments, which allowed additional educational opportunities for faculty and students using this medium.

As the physical therapy profession advances, education evolved to ensure quality instruction and assessments in the cognitive, affective, and psychomotor domains. My study's results have educational and clinical implications because VCT psychomotor assessments parallel many aspects of telehealth evaluations and treatments. Physical therapists use VCT in clinical practice via telemedicine to evaluate a patient's

psychomotor ability (Hong et al., 2020; Lee, 2020). Thus, exposing students to VCT psychomotor assessments can function as an introduction to telemedicine and provide clinical relevance (Hong et al., 2020). Results from my study confirm that faculty could assess students' psychomotor skills using VCT and achieve the course learning outcomes.

Conducting psychomotor assessments via VCT exposed students to technology and was a unique way to assess an individual in a virtual medium. The experience assisted faculty and students in identifying barriers and challenges to the technology early, so they learned to troubleshoot and adapt as needed. Westervelt et al. (2020) demonstrated that VCT provided unique clinical benefits and improved access to individuals in rural areas. My study's increased acceptance of online learning and assessment was an important finding because it supported the need to continue integrating technology into medical education, specifically physical therapy education. Furthermore, results from my study support the need to expose students and faculty to telehealth evaluations via VCT psychomotor assessments.

Conclusion

The COVID-19 pandemic resulted in many professional and educational institutions transitioning from in-person to virtual modes of communication, making VCT well known to students and teachers, and facilitated the basis of my study. (Al-Azzam et al., 2020; Farooq et al., 2020; Iwai & Lusk, 2020; McGann et al., 2020; Utama et al., 2020). Results from my study promoted an understanding of the faculty experiences using VCT for psychomotor assessment and may facilitate establishing the best pedagogical practices in educational technology. Additionally, results from my study

expanded on the educational technology literature to fill the gap and identified how successes and failures of using VCT impacted pedagogical approaches.

Study findings indicated that using VCT for psychomotor assessment was analogous to telemedicine because telemedicine utilizes the same audiovisual modes of communication to evaluate a patient's psychomotor abilities. Faculty reported that online psychomotor examinations functioned as an introduction to telemedicine and provided a clinical technological experience for the students.

Faculty reported that virtual psychomotor assessments expanded educational opportunities and allowed students to continue with their academics during the COVID-19 lockdown. Faculty said synchronous VCT psychomotor assessments temporarily replaced in-person assessments, making VCT practicals an acceptable alternative.

Exploring the faculty experience using VCT for psychomotor assessments provided insight into implementing this technology and offered alternative approaches to evaluate students' kinesthetic performance. My study demonstrated that faculty perceived VCT as a useful alternative assessment method, reaching students worldwide, which helped educate physical therapy students when in-person assessments were prohibited. The versatility of using VCT for psychomotor examinations in physical therapy education expanded educational opportunities, which helped to graduate competent physical therapy clinicians and fulfill the growing need within the physical therapy profession.

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Appendix A: Interview Guide

Topic	Interview questions and script
Introduction and demographic information	1. Please tell me a little about yourself and your teaching experience. 2. Please explain how you integrated technology into your teaching. Script: Now I'm going to be asking you about your experience using VCT related to the four constructs of the unified theory of acceptance and use of technology (UTAUT). The first construct is performance expectancy. Please answer the next five questions based on the following definition of performance expectancy. The definition of performance expectancy is the individual's belief that using technology will improve performance.
UTAUT construct: Performance Expectancy What level of performance expectancy do physical therapy educators report when using videoconference technology to assess student psychomotor skills?	3. While using VCT for psychomotor assessment, did the technology perform as you expected? 4. In what ways do you feel you can adequately assess psychomotor skills using VCT? 5. When assessing a psychomotor skill, how does VCT perform compared to face-to-face assessments? 6. What type of performance did you assess from your students when assessing via VCT? 7. Was VCT a useful modality for assessment, why or why not? Script: Thank you for providing me your experiences related to performance expectancy. The next construct is effort expectancy. Please answer the next four questions based on the following definition of effort expectancy. Effort expectancy is defined as the perceived ease of using the technology.
UTAUT construct: Effort Expectancy How do physical therapy educators describe their effort expectancy when using videoconference technology to assess student psychomotor skills?	8. How much effort (preparation, set up, time, organization, communication) does it take to deliver assessments via VCT? 9. How did using VCT make it easier or harder to assess psychomotor skills compared to face-to-face? 10. How do you prepare to deliver assessments via VCT? 11. Is there anything you have changed to make it easier for you to conduct psychomotor assessments using VCT now, compared to the first time using it? (i.e., training, faculty experience, better technology, student more familiar)? Script: Thank you for providing me your experiences related to effort expectancy. The next construct is social influence. Please answer the next five questions based on the following definition of social influence. Social influence refers to an individual's perceptions about what other people think of technology or how others will view that individual after using technology.
UTAUT construct: Social Influence What social influences are experienced by physical therapy educators while	12. Prior to using VCT for psychomotor assessment, describe your personal or professional experience with VCT. 13. Has anything or anyone influenced you using VCT?

Topic	Interview questions and script
using videoconference technology to assess student psychomotor skills?	14. What influenced you to use synchronous VCT for psychomotor assessments, as opposed to other methods? (i.e., traditional face-to-face or asynchronous recordings) 15. What levels of pressure did you encounter to use VCT to assess psychomotor skills in your educational institution? 16. How do you think your students or other faculty view your pedagogical practices after using VCT to assess psychomotor skills?
	Script: Thank you for providing me your experiences related to social influence. The next construct is facilitating conditions. Please answer the next four questions based on the following definition of facilitating conditions. Facilitating conditions consider the available resources, including technical or organizational infrastructure, that the individual believes will support technology's use.
UTAUT construct: Facilitating Conditions What conditions help facilitate teachers using videoconference technology to assess student psychomotor skills?	17. What conditions at your university helped facilitate you to deliver assessments via VCT? 18. What type of institutional support facilitated you delivering assessments using VCT (i.e., IT support, adequate Wi-Fi, audio/visual equipment, faculty development sessions, one-on-one mentoring, or additional learning opportunities)? 19. What was the video/audio quality like while using VCT to assess student psychomotor performance? 20. What challenges facilitating VCT did you experience compared to hosting the assessments in a traditional classroom? (i.e., lighting, angles, sound, connection)
	Script: Thank you for providing me your experiences related to facilitating conditions. The final section relates to any benefits, challenges, or additional thoughts you would like to share from your experiences assessing psychomotor skills via VCT.
Challenges and benefits	21. What challenges did you encounter when using VCT for assessment? 22. What benefits did you notice when using VCT for psychomotor assessment?
Conclusion	23. In closing, are the any other thoughts, ideas, or stories you would like to share about your experience using VCT to assess psychomotor skills?

Appendix B: Demographic Questionnaire

Demographic information

Please provide information to the following questions.

Age *

- 20-30
- 31-40
- 41-50
- 51-60
- 61-70
- 71-80
- 80+

Gender *

- Male
- Female
- Non-binary
- Prefer not to state

Years of experience teaching

- less than one year
- 1-5 years
- 5-10 years
- 10-15 years
- 15+ years

Years of experience teaching ONLINE *

- less than one year
- 1-5 years
- 5-10 years
- 10-15 years
- 15+ years

Highest degree earned *

- Certificate or Associate degree
- Bachelor degree (BS or BA)
- Master degree (MA, MS, MPT)
- Professional/Clinical doctorate degree (DPT, OTD)
- Academic doctoral degree (DHSc, EDD, PhD)

How would you rank your digital competency? *

- Beginner
- Advanced Beginner
- Intermediate
- Advanced Intermediate
- Advanced

Based on the previous question, please provide a brief rationale explaining the ranking of your digital competency. *

Long answer text

What classes do you currently teach? Please list them. *

Long answer text

Of these classes, which involve psychomotor skill assessments? Please list them. *

Long answer text

Appendix C: Initial Recruitment Email to Members of Physical Therapist Educators

Seeking faculty participants

Do you have experience with web conferencing software? Have you used Zoom, Microsoft Teams, or other web conferencing tools to assess students' psychomotor skills?

My study is called
"The Faculty Experience Using Videoconference Technology
to Assess Student Psychomotor Performance"
that could help educators understand the usefulness of this technology as an assessment modality and expand educational opportunities for students and faculty.

For this study, you are invited to describe your experiences using videoconference technology to assess physical therapy students' psychomotor performance.

This research is part of a doctoral study for
Heather Disney, a Ph.D. candidate at Walden University.

About the study:
Complete one 60-minute interview via Zoom
Confidentiality will be maintained throughout the study

Volunteers must meet these requirements:
Teaching at a doctoral physical therapy program
Have experience using videoconference technology for student psychomotor assessment.

To confidentially volunteer

CLICK HERE

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Appendix D: Inclusion Criteria Form

Seeking faculty participants with experience using video conference technology to assess psychomotor skills

There is a new study called "The Faculty Experience Using Videoconference Technology to Assess Student Psychomotor Performance" that could help educators understand the usefulness of this technology as an assessment modality and expand educational opportunities for students and faculty. For this study, you are invited to describe your experiences using videoconference technology to assess physical therapy students' psychomotor performance.

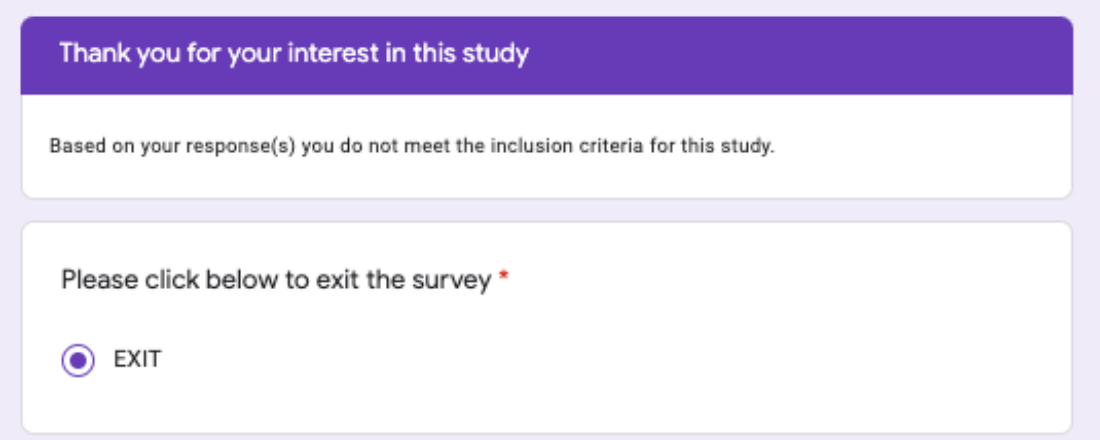
This survey is part of the doctoral study for Heather Disney, a Ph.D. student at Walden University.

About the study:

- Complete one 60-minute interview via Zoom
- Confidentiality will be maintained throughout the study

1. Are you currently teaching at a doctoral physical therapy program?
    a. Yes
    b. No
2. Do you have experience using videoconference technology (such as Zoom or other web conferencing software) to assess students' psychomotor performance?
    a. Yes
    b. No

Appendix E: Message Respondent Receive Who Do Not Meet Inclusion Criteria



Appendix F: Second Recruitment Email to Members of Physical Therapist Educators

Still seeking faculty participants

Do you have experience with web conferencing software? Have you used Zoom, Microsoft Teams, or other web conferencing tools to assess students' psychomotor skills?

My study is called
"The Faculty Experience Using Videoconference Technology
to Assess Student Psychomotor Performance"
that could help educators understand the usefulness of this technology as an assessment modality and expand educational opportunities for students and faculty.

For this study, you are invited to describe your experiences using videoconference technology to assess physical therapy students' psychomotor performance.

This research is part of a doctoral study for
Heather Disney, a Ph.D. candidate at Walden University.

About the study:
Complete one 60-minute interview via Zoom
Confidentiality will be maintained throughout the study

Volunteers must meet these requirements:
Teaching at a doctoral physical therapy program
Have experience using videoconference technology for student psychomotor assessment.

To confidentially volunteer

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Appendix G: Color Coding for Codes, Categories, and Themes

CODES	CATEGORY	FINAL THEMES
Performance expectancy	Performance expectancy	Performance expectancy
	Student performance	
	Performance anxiety	
Effort expectancy	Students were adaptable	Effort expectancy
	Effort expectancy	
Social influence	Things that influenced how much effort it took	Social influence
	Social influence	
	Feedback from students and global perspective	
Facilitating conditions	Facilitating conditions	Facilitating conditions
	Benefits	Lessons Learned
	New skills gained	

Appendix H: Codes and Code Definitions

Code	Definition
Adjusting rubrics for online assessment	Faculty reported needing to change, adjust, or adapt their current rubrics to be able to complete the assessment online more efficiently.
Anxiety different	Faculty reported anxiety was not higher or lower but a different type of anxiety compared to face to face.
Anxiety lower	Faculty reported student anxiety may be lower using VCT for assessment because the student is in their own home, they are testing with a familiar family member, and the faculty member is not in the same room, not hovering over the student trying to watch.
Camera angle	Faculty reported not being able to walk around and see all aspects of the student performance like they would be able to in a face-to-face assessment. They were not able to see 360-degree view.
Can get adequate assessment/big picture/safety	Faculty reported that they could get an accurate assessment using VCT to assess psychomotor skills. They were able to determine if a student was safe and competent and they were able to get a "big picture" idea of how the student understood the material and whether or not the learning objectives were met
Colleagues had influence	Faculty reported their colleagues had an influence on them using VCT. Faculty reported that watching other faculty use or implement various types of technology helped them to understand the utility of VCT for instruction and assessment.
Communicate with other faculty to make sure we are on same page	Faculty reported the need to communicate with their team and/or with other colleagues to make sure they all understood how to use the technology, how to troubleshoot if needed, and make sure they understood how to appropriately grade the student in this new medium.
Convenience	Faculty reported convenience and flexibility using VCT because it was easy to use with little set up, no travel, and could be used anywhere at anytime.
Easier with experience	Faculty reported that the technology became easier to use and more efficient with experience.
Explicit instructions	Faculty reported improving their instructions to provide very detailed and explicit instructions on camera set up, what to expect, how to prepare, and/or what resources would be needed to complete the assessment.
Faculty development/training	Faculty reported there were multiple training sessions available to them to help learn how to use the technology.

Code	Definition
Faculty expectations were exceeded	Faculty reported that using synchronous VCT for assessment exceeded their expectations.
Faculty making assumptions when grading	Faculty report that assumptions were made when grading due to the inability to see all aspects of the student performance, the variations within each student's environment, lack of resources for students to demonstrate skills with, and also faculty often giving the student the benefit of the doubt if things were unclear.
Faculty more competent with technology	Faculty reported being more confident and competent with technology after using VCT for psychomotor assessments.
Faculty were skeptical of using VCT for assessment	Faculty reported being skeptical and having low expectations before and during initial experiences using VCT for psychomotor assessment.
Feedback from students was positive	Faculty reported that the feedback from students was positive. The students understood the limitations due to the global pandemic and were adaptable to the situation.
Grades were higher/assumptions grading	Faculty reported the grades were higher or the same compared to face-to-face settings. This was thought to be due to assumptions being made by the faculty, inability to see the entire student performance, or increased opportunities for students to cheat.
Having to only provide verbal feedback	Faculty reported they were unable to provide tactile feedback and thus, only able to use verbal feedback during and after the assessment. Faculty reported it was challenging, inefficient, and exhausting at times to only use verbal feedback. However, faculty reported personal/professional growth from this experience and feel they now have better skills for using both verbal and tactile feedback.
High external pressure	Faculty reported a high external pressure from administration to use VCT for psychomotor assessment.
High internal pressure	Faculty reported a high internal pressure to provide quality learning opportunities and find ways to allow the student to advance in their education.
I am a better teacher	Faculty reported they have gained new skills, feel more comfortable with technology, and have become a better teacher from using VCT for assessment.
I am a technology mentor	Faculty reported their previous experience integrating technology into the classroom, taking faculty development sessions, and/or having experience teaching online, made them a technology mentor for others.
Inability to provide tactile feedback	Faculty reported the inability to provide tactile feedback was a limitation of the assessment. Feedback, specifically

Code	Definition
	tactile feedback during a psychomotor assessment is a critical component to student learning and also helps the faculty member to be more efficient with their explanations.
Issues with connection	Faculty reported technology issues occurred frequently when first starting to use VCT for assessment. However, technology issues decreased with continued use and the faculty learned appropriate troubleshooting strategies which helped.
Issues with connectivity/AV quality	Faculty reported connectivity issues, difficulty with Wi-Fi, and poor AV quality, for both the instructor and the student at times.
IT support	Faculty reported they frequently sought out IT support for help with setting, running, and troubleshooting with VCT.
Less effort/time for faculty set up	Faculty reported using VCT for psychomotor assessment was often easier and more efficient compared to traditional face to face assessment. The faculty did not have to set up their room, they only had to log on to the VCT link.
Limited equipment/resources	Faculty reported that resources were limited and this impacted the psychomotor assessment. There was a lot of pretending with fake canes, crutches, walkers, wheelchairs, and it was never entirely clear during the assessment if the student truly knew or understood how to utilize these assisted devices.
LMS, hardware, software	Faculty reported the learning management system (LMS), hardware such as a computer or laptop, and software such as access to the VCT platforms were critical elements to successfully conducting psychomotor assessment online
More efficient/time saving	Faculty reported VCT was more efficient than testing in a face-to-face environment. It allowed faculty to flow from testing one student to the next. It was convenient and required minimal set up.
More effort for faculty	Faculty reported using VCT for psychomotor assessment often required more effort, especially when technology issues arose. Increase effort was noted on the front end; organizing, scheduling, adapting rubric, communicating with other faculty, proving explicit instructions to students, etc.
More real-world setting	Faculty reported that the limited resources and variability in student environments help to replicate what students will experience in real-world settings, especially in a home health setting.

Code	Definition
Never used VCT for assessment before	Faculty reported they had experience using VCT either personally and/or professionally yet they had never utilized it for assessment before.
No other option, had to find a way for students to continue	Faculty reported that the global pandemic was not an influencer but significantly limited the availability of face-to-face education, thus influencing the need to use VCT.
No pressure but no choice	Faculty reported there was no specific pressure to use VCT but there was no choice. Technology had to be integrated into education in order to continue due to the strict COVID-19 lockdown policies. Additional university policies at that time also made it difficult to do any testing in person.
Online learning and assessment is now more acceptable	Faculty reported that since almost all health science universities had to transition to online education during the global pandemic, online learning in physical therapy education now appears to be better accepted within the health community.
Opportunity for cheating	Faculty reported that using VCT for psychomotor assessment increased the opportunities for students to cheat and provided more leeway for students which may have impacted grading.
Percentage	Faculty reported a percentage that they felt VCT was able to provide an accurate depiction of the assessment. In other words, considering face to face provided 100% of an adequate assessment, VCT allowed for a lesser, yet still reasonable percentage.
Performance expectancy	The technology worked as expected but there were some limitations or challenges which faculty had anticipated.
Previous experience working with VCT	Faculty reported they had some previous work experience using VCT for communication at work and/or in their personal lives. However, they had never used VCT for assessment purposes. While faculty had experience with the technology, they had never used it in this way before.
Prior learning experience online	Faculty reported their prior online education helped them to implement various instruction and assessment strategies using VCT for synchronous and asynchronous approaches
Prior teaching experience online	Faculty reported that working at an institution that offered online education and/or prior online teaching experience helped influence them to incorporate VCT for assessment
Provides more opportunities for feedback/communication	Faculty reported that using VCT for psychomotor assessments provides additional opportunities for students to receive feedback and helps improve communication between students and faculty.

Code	Definition
Self-taught	Faculty reported teaching themselves how to use VCT, using trial and error, and/or tinkering with it on their own time
Set up for students was challenging/more effort	Because students were testing in their own home, the student was responsible for creating their own testing environment and adapting household items to function as the necessary resources for the practical. Faculty noted this created more effort for the student.
Student anxiety higher	Faculty reported the student anxiety was higher when using VCT to assess psychomotor skills. Faculty thought this might be due to the novel approach to this assessment. Faculty also noted that anxiety was higher when technology issues arose.
Student performance was same	Faculty reported the grades were about the same compared to face-to-face settings.
Students appreciate being allowed to continue with academics	Students were appreciative that faculty found a way to assess students virtually and allowed them to continue progressing with their academics.
Students were adaptable	Faculty reported the students being adaptable to using VCT for psychomotor assessment. In most cases, the students had to create their own testing environment and had to adapt or create their own resources for testing such as using a bed/couch as a treatment table, using a dining room chair as a wheel chair, using objects around the house to function as a cane/crutches/walker.
Synchronous is similar to a face a face practical	Faculty reported that using synchronous VCT for assessment functions very similar to a traditional face to face practical. Depending on the skill, VCT could substitute or replace a face to face practical
Synchronous provides interaction, personalization, better communication	Faculty reported the benefits to using synchronous VCT for assessment included the ability to directly communicate in real time, allow for personalization, and better interactions with the students.
Took as long or longer compared to face to face	Faculty reported that using VCT for assessment often took longer or as long as traditional face to face assessments, especially on the front end; organizing, scheduling, training, communicating with other faculty.
Troubleshooting during assessment	Faculty report having to trouble shoot for connectivity issues or work to improve either their own audiovisual quality or that of the students. This was time consuming, distracting, and impacted the quality of the assessment

Code	Definition
Variable environment for students	Students had to create their own environment and because of the variability of each students' environment it impacted the quality of the assessment.

Appendix I: Codes Tally

Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	Totals
Adjusting rubrics for online assessment			1	1			1	1				1	1	1		7
Anxiety lower	1	1	1	1			1				1	1	1	1	1	10
Camera angle	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
Can get adequate assessment/big picture/safety	1	1	1		1	1	1	1	1	1	1	1	1	1	1	14
Colleagues had influence	1		1				1			1	1	1	1		1	8
Communicate with faculty, make sure we are on same page		1		1		1	1	1	1	1			1	1	1	10
Convenience	1	1	1	1	1		1	1	1	1		1	1	1	1	13
Could only provide verbal feedback			1	1	1				1		1	1				6
Easier with experience	1	1	1	1	1	1	1	1		1	1	1	1	1	1	14
Explicit instructions		1	1	1	1	1	1	1	1	1		1		1		11
Faculty development/training	1	1	1		1	1		1	1	1	1		1			10
Faculty expectations were exceeded	1											1				2
Faculty making asummptions when grading	1	1	1			1	1	1	1	1	1		1	1	1	12
Faculty more comfortabe with technology	1		1	1	1	1			1	1	1		1		1	10
Faculty skeptical of VCT at first	1								1		1		1			4
Feedback from students was positive	1	1	1	1	1	1		1	1		1	1	1	1		12
Grades higher/assumptions grading	1	1				1	1	1	1	1	1		1	1	1	11
High extrenal pressure	1		1				1			1	1				1	6
High internal pressure	1			1			1		1	1	1					6
I am a better teacher									1		1	1				3
I am a technology mentor								1	1			1		1		4
Inability to provide tactile feedback		1	1	1	1	1			1					1		7
Issues with connectivity high, decreased with repeated use	1	1	1	1	1	1	1	1	1	1		1	1	1	1	14
IT support		1		1		1	1		1	1	1	1	1		1	10
Less effort/time for faculty setup		1	1	1	1		1					1		1	1	8
Limited equipment/resources	1				1		1	1	1				1	1		7
LMS, hardware, software		1	1	1	1	1	1			1	1	1	1	1	1	12
More efficient/time saving		1	1				1				1		1	1	1	7
More effort for faculty						1			1		1		1			4
More real-world setting	1											1		1		3
Never used VCT for assessment before		1		1		1	1	1		1	1	1	1		1	10
No other option, had to find a way for students to continue	1	1	1	1	1	1	1	1	1		1			1		11
No presssure but no choice	1	1	1	1	1	1		1	1		1	1	1	1	1	13
Online learning/assessment is more acceptable	1		1	1		1	1			1		1		1		8
Opportunity for cheating													1	1	1	3
Percentage							80	90			75	85	80	75	75	80
Performance expectancy	1	1	1	1	1	1	1	1	1	1	1	1	1	1		14
Previous experience working with VCT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
Prior learning experience online			1	1				1				1				4
Prior teaching experience online	1		1		1	1	1	1					1	1		8
Provides more opportunities for feedback/communication			1			1				1		1				4
Self-taught	1			1			1		1	1			1			6
Set up for students was challenging/more effort		1	1				1	1			1	1		1	1	8
Student anxiety higher							1		1		1	1	1			5
Student performance was same	1			1			1					1	1		1	6
Students appreciate opportunity to continue academics	1		1		1	1	1						1			6
Students were adaptable	1				1		1					1	1			5
Synchronous provides interaction and better communicatior	1	1				1	1	1	1	1		1	1	1	1	11
Synchronous similar to face-face		1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Took as long or longer compared to face to face		1					1	1	1							4
Troubleshooting during assessment						1	1	1	1	1					1	6
Variable environment for students								1		1		1	1	1	1	6

Appendix J: Codes to Categories

Category	Codes	Codes	Codes	Codes	Codes	Codes	Codes	Codes	Codes
Performance expectancy	Performance expectancy	adequate assessment/big picture/safety	Percentage	Camera angle	faculty skeptical of VCT at first	faculty expectations were exceeded	Limited equipment/resources		
Student performance	making asummptions when grading	student performance was same	opportunity for cheating	faculty skeptical of VCT at first	faculty expectations were exceeded	variable environment for students	Limited equipment/resources		
Performance anxiety	anxiety higher	anxiety lower	anxiety different	opportunity for cheating					
Students were adaptable	students were adaptable	Set up for students challenging, more effort	variable environment for students	More real-world setting	making asummptions when grading	Limited equipment/resources			
Effort expectancy	Explicit Instructions	easier with experience	self-taught	convenience	less effort/time for faculty set up/	more efficient/time saving	Faculty development/training	communicate with other faculty	colleagues had influence
	troubleshooting during assessment	more effort for faculty	took longer compared to face to face	adjusting rubrics for online assessment	Inability to provide tactile feedback	could only provide verbal feedback			
Things that influenced how much effort it took	Previous experience working with VCT	prior learning experience online	prior teaching experience online	colleagues had influence	never used VCT for assessment before	communicate with other faculty			
Social influence	no other option	no presssure but no choice	high internal pressure	high extrenal pressure	student anxiety higher	anxiety lower	anxiety different		
Feedback from students and global perspective	feedback from students positive	students appreciate continuing wth academics	online learning & assessment more acceptable						
Facilitating conditions	Limited equipment/resources	LMS, hardware, software	IT support	issues with connectivity occurred, less with repeated use	Camera angle				
Benefits	synchronous similar to face-face	provides opportunities for feedback	synchronous provides better communication	online learning & assessment more acceptable	More real-world setting	Convenience			
New skills gained	I am a better teacher	faculty more competent with technology	Inability to provide tactile feedback	could only provide verbal feedback	I am a technology mentor	troubleshooting during assessment	Faculty development/training	self-taught	adjusting rubrics for online assessment

Appendix K: Category Definitions

Category	Category Definition
Performance expectancy	Faculty reported they were initially skeptical and had low expectations for how psychomotor assessments via VCT would work. All faculty reported that the technology performed as they expected but there were some limitations. The most frequently cited limitation was the camera angle Faculty reported that VCT psychomotor testing performed about 75-90% as well as a face-to-face practical.
Student performance	Faculty reported the student performance was about the same as a traditional face to face practical, but also reported grades were higher. Faculty noted there were many assumptions made when grading via VCT because of the static camera angles, the lack of student resources and the variability in each student's environment.
Performance anxiety	Faculty perceived that the students experienced varying levels of anxiety during testing. Faculty perceived student anxiety levels increased when they experienced technical difficulties.
Students were adaptable	Faculty reported the students were adaptable because they had to set up their own testing environment which required them to improvise for many things like treatment tables, wheelchairs, crutches, canes, ultrasound machines, modalities, and walkers.
Effort expectancy	Faculty reported that using VCT for psychomotor assessment was more effort at first because they had to learn the technology, attend faculty development sessions, communicate with colleagues for consistency, and adjust rubrics for online assessment. However, this got easier with experience and repetition.
Things that influenced how much effort it took	All faculty had previous experience using VCT in some capacity but none had used it for assessment before. Factors that influenced faculty to use synchronous VCT for psychomotor assessment were prior online teaching and learning experiences, as well as their colleagues.
Social influence	Faculty reported that transitioning to learning and assessments via VCT were a necessity during COVID-19 lockdown. Faculty reported high levels of pressure that influenced them to incorporate VCT into their curriculum.
Feedback from students and global perspective	Faculty reported the feedback from their students was positive and that online learning and assessment has become more widely accepted by the medical education community including administrators, faculty, students, and clinicians.
Benefits	Faculty reported the benefits of synchronous practicals were that they occurred in real-time, improved communication, was convenient, provided flexibility, and mimic aspects of a telehealth evaluation.
Gained new skills	Faculty reported they feel they are a better teacher now because they have many new skills and are more comfortable with technology.
Facilitating conditions	Resources that facilitated faculty to deliver assessments via VCT included access to the LMS, the software applications, Wi-Fi, IT support, and hardware such as a university-issued or personal laptop.

Appendix L: Theme 1 Effort Expectancy: Codes, Definitions, and Categories

Codes	Definitions	Categories
Students were adaptable	Faculty reported the students being adaptable to using VCT for psychomotor assessment. In most cases, the students had to create their own testing environment and had to adapt or create their own resources for testing such as using a bed/couch as a treatment table, using a dining room chair as a wheel chair, using objects around the house to function as a cane/crutches/walker.	Students were adaptable
Set for students challenging and more effort	In traditional face-to-face assessments the faculty member creates the environment and has all the necessary resources available. Because students were testing in their own home, the student was responsible for creating their own environment and adapting household items to function as the necessary resources for the practical. This created more effort for the student to set up their environment.	Students were adaptable
Variable environment for students	Students had to create their own environment and because of the variability of each students' environment it impacted the quality of the assessment.	Students were adaptable
More real-world setting	Faculty reported that the limited resources and variability in student environments help to replicate what students will experience in real-world settings, especially in a home health setting.	Students were adaptable
Faculty making assumptions when grading	Faculty report that assumptions were made when grading due to the inability to see all aspects of the student performance, the variations within each student's environment, lack of resources for students to demonstrate skills with, and also faculty often giving the student the benefit of the doubt if things were unclear.	Students were adaptable
Limited equipment/resources	Faculty reported that resources were limited and this impacted the psychomotor assessment. There was a lot of pretending with fake canes, crutches, walkers, wheelchairs, and it was never entirely clear during the assessment if the student truly knew or understood how to utilize these assisted devices. While the student could verbalize the instructions and teach the skill to a patient, the inability to directly use these assisted devices impacted the student's performance and impacted the objectivity of the assessment.	Students were adaptable
Explicit instructions	Faculty reported improving their instructions to provide very detailed and explicit instructions on camera set up, what to expect, how to prepare, and/or what resources would be needed to complete the assessment.	Effort expectancy

Codes	Definitions	Categories
Easier with experience	Faculty reported that the technology became easier to use and more efficient with experience.	Effort expectancy
Self-taught	Faculty reported teaching themselves how to use VCT, using trial and error, and/or tinkering with it on their own time.	Effort expectancy
Convenience	Faculty reported using VCT for psychomotor assessments was convenient for scheduling, provided flexibility, and minimized travel burdens. It also allowed students and faculty to continue to communicate during COVID-19 lockdown	Effort expectancy
Less effort/set-up for faculty	Faculty reported using VCT for psychomotor assessment was often easier and more efficient compared to traditional face-to- face assessment. The faculty did not have to set up their room, they only had to log on to the VCT link.	Effort expectancy
More efficient/time saving	Faculty reported VCT was more efficient than testing in a face-to-face environment. It allowed faculty to flow from testing one student to the next. It was convenient and required minimal set up.	Effort expectancy
Faculty development	Faculty reported there were multiple training sessions available to them to help learn how to use the technology.	Effort expectancy
Communicate with other faculty	Faculty reported the need to communicate with their team and/or with other colleagues to make sure they all understood how to use the technology, how to troubleshoot if needed, and make sure they understood how to appropriately grade the student in this new medium.	Effort expectancy
Colleagues had influence	Faculty reported their colleagues had an influence on them using VCT. Faculty reported that watching other faculty use or implement various types of technology helped them to understand the utility of VCT for instruction and assessment.	Effort expectancy
Troubleshooting during assessment	Faculty report having to trouble shoot for connectivity issues or work to improve either their own audiovisual quality or that of the students. This was time consuming, distracting, and impacted the quality of the assessment	Effort expectancy
Took as long compared to face to face	Faculty reported that using VCT for assessment often took longer or as long as traditional face to face assessments, especially on the front end; organizing, scheduling, training, communicating with other faculty.	Effort expectancy
Adjusting rubrics for online assessment	Faculty reported needing to change, adjust, or adapt their current rubrics to be able to complete the assessment online more efficiently.	Effort expectancy
Inability to provide tactile feedback	Faculty reported the inability to provide tactile feedback was a limitation of the assessment. Feedback,	Effort expectancy

Codes	Definitions	Categories
	specifically tactile feedback during a psychomotor assessment is a critical component to student learning and also helps the faculty member to be more efficient with their explanations.	
Could only provide verbal feedback	Faculty reported that because they were unable to provide tactile feedback, and because of the VCT medium for assessment, they were limited to using primarily verbal feedback during and after the assessment. This impacted the student's learning depending on the type of learner they were (kinesthetic, auditory, visual). Faculty reported it was challenging, inefficient, and exhausting at times to only use verbal feedback. However, faculty reported personal/professional growth from this experience and feel they now have better skills for using both verbal and tactile feedback.	Effort expectancy

Appendix M: Theme 2 Performance Expectancy: Codes, Definitions, and Categories

Codes	Definition	Categories
Performance expectancy	The technology worked as expected but there were some limitations or challenges which faculty had anticipated.	Performance expectancy
Adequate assessment	Faculty reported that they could get an accurate assessment using VCT to assess psychomotor skills. They were able to determine if a student was safe and competent and they were able to get a "big picture" idea of how the student understood the material and whether or not the learning objectives were met.	Performance expectancy
Percentage	Faculty reported a percentage that they felt VCT was able to provide an accurate depiction of the assessment. In other words, considering face to face provided 100% of an adequate assessment, VCT allowed for a lesser, yet still reasonable percentage.	Performance expectancy
Camera angle	Faculty reported not being able to walk around and see all aspects of the student performance like they would be able to in a face-to-face assessment. They were not able to see 360-degree view. In some cases, the faculty member had to interrupt the student to change their body position or change the position of the camera for the faculty to see better. This limitation may have impacted the quality and objectivity of the assessment.	Performance expectancy
Faculty skeptical of VCT	Faculty reported being skeptical and having low expectations before and during initial experiences using VCT for psychomotor assessment.	Performance expectancy
Faculty expectations exceeded	Faculty reported that using synchronous VCT for assessment exceeded their expectations.	Performance expectancy
Limited equipment and resources	Faculty reported that resources were limited and this impacted the psychomotor assessment. There was a lot of pretending with fake canes, crutches, walkers, wheelchairs, and it was never entirely clear during the assessment if the student truly knew or understood how to utilize these assisted devices. While the student could verbalize the instructions and teach the skill to a patient, the inability to directly use these assisted devices impacted the student's performance and impacted the objectivity of the assessment.	Performance expectancy/ Student Performance
Faculty making assumptions when grading	Faculty report that assumptions were made when grading due to the inability to see all aspects of the student performance, the variations within each student's environment, lack of resources for students to demonstrate skills with, and also faculty often giving the student the benefit of the doubt if things were unclear.	Student Performance

Codes	Definition	Categories
Student performance same	Faculty reported the grades were about the same compared to face-to-face settings.	Student Performance
Opportunity for cheating	Faculty reported that using VCT for psychomotor assessment increased the opportunities for students to cheat and provided more leeway for students which may have impacted grading.	Student Performance/ Performance Anxiety
Variable environment for student	Students had to create their own environment and because of the variability of each student's environment it impacted the quality of the assessment.	Performance Expectancy/ Student Performance
Student anxiety higher	Faculty reported the student anxiety was higher when using VCT to assess psychomotor skills. Faculty thought this might be due to the novel approach to this assessment. Faculty also noted that anxiety was higher when technology issues arose.	Performance Anxiety
Student anxiety lower	Faculty reported student anxiety may be lower using VCT for assessment because the student is in their own home, they are testing with a familiar family member, and the faculty member is not in the same room, not hovering over the student trying to watch.	Performance Anxiety
Anxiety different	One faculty member reported it was "different" not higher or lower but a different type of anxiety compared to face to face.	Performance Anxiety

Appendix N: Theme 3 Facilitating Conditions: Codes, Definitions, and Categories

Codes	Definitions	Category
Limited equipment and resources	Faculty reported that resources were limited and this impacted the psychomotor assessment. There was a lot of pretending with fake canes, crutches, walkers, wheelchairs, and it was never entirely clear during the assessment if the student truly knew or understood how to utilize these assisted devices. While the student could verbalize the instructions and teach the skill to a patient, the inability to directly use these assisted devices impacted the student's performance and impacted the objectivity of the assessment.	Facilitating Conditions
LMS, hardware, software	Faculty reported the learning management system (LMS), hardware such as a computer or laptop, and software such as access to the VCT platforms were critical elements to successfully conducting psychomotor assessment online.	Facilitating Conditions
IT support	Faculty reported they frequently sought out IT support for help with setting, running, and troubleshooting with VCT.	Facilitating Conditions
Issues with connection	Faculty reported technology issues occurred frequently when first starting to use VCT for assessment. However, technology issues decreased with continued use and the faculty learned appropriate troubleshooting strategies which helped.	Facilitating Conditions
Camera angle	Faculty reported not being able to walk around and see all aspects of the student performance like they would be able to in a face-to-face assessment. They were not able to see 360-degree view. In some cases, the faculty member had to interrupt the student to change their body position or change the position of the camera for the faculty to see better. This limitation may have impacted the quality and objectivity of the assessment.	Facilitating Conditions

Appendix O: Theme 4 Social Influence: Codes, Definitions, and Categories

Codes	Definitions	Categories
Previous experience with VCT	Faculty reported they had some previous work experience using VCT for communication at work and/or in their personal lives. However, they had never used VCT for assessment purposes. While faculty had experience with the technology, they had never used it in this way before.	Influential factors impacting effort
Prior online learning experience	Faculty reported their prior online education helped them to implement various instruction and assessment strategies using VCT for synchronous and asynchronous approaches.	Influential factors impacting effort
Prior online teaching experience	Faculty reported that working at an institution that offered online education and/or prior online teaching experience helped influence them to incorporate VCT for assessment.	Influential factors impacting effort
Colleagues had influence	Faculty reported their colleagues had an influence on them using VCT. Faculty reported that watching other faculty use or implement various types of technology helped them to understand the utility of VCT for instruction and assessment.	Influential factors impacting effort
Never used VCT for assessment	Faculty reported they had experience using VCT either personally and/or professionally yet they had never utilized it for assessment before.	Influential factors impacting effort
Communi-cation with faculty	Faculty reported the need to communicate with their team and/or with other colleagues to make sure they all understood how to use the technology, how to troubleshoot if needed, and make sure they understood how to appropriately grade the student in this new medium.	Influential factors impacting effort
No other option	Faculty reported that the global pandemic was not an influencer but significantly limited the availability of face-to-face education, thus influencing the need to use VCT.	Social Influence
No pressure but no choice	Faculty reported there was no specific pressure to use VCT but there was no choice. Technology had to be integrated into education in order to continue due to the strict COVID-19 lockdown policies. Additional university policies at that time also made it difficult to do any testing in person.	Social Influence
High internal pressure	Faculty reported a high internal pressure to provide quality learning opportunities and find ways to allow the student to advance in their education.	Social Influence
High external pressure	Faculty reported a high external pressure from administration to use VCT for psychomotor assessment.	Social Influence
Student anxiety higher	Faculty reported the student anxiety was higher when using VCT to assess psychomotor skills. Faculty thought this might be due to the novel approach to this assessment. Faculty also noted that anxiety was higher when technology issues arose.	Social Influence

Codes	Definitions	Categories
Student anxiety lower	Faculty reported student anxiety may be lower using VCT for assessment because the student is in their own home, they are testing with a familiar family member, and the faculty member is not in the same room, not hovering over the student trying to watch.	Social Influence
Feedback from students was positive	Faculty reported that the feedback from students was positive. The students understood the limitations due to the global pandemic and were adaptable to the situation.	Feedback from students and global perspective
Students appreciate continuing academics	Students were appreciative that faculty found a way to assess students virtually and allowed them to continue progressing with their academics.	Feedback from students and global perspective
Online assessment is now more acceptable	Faculty reported that since almost all health science universities had to transition to online education during the global pandemic, online learning in physical therapy education now appears to be better accepted within the health community.	Feedback from students and global perspective

Appendix P: Theme 5 Lessons Learned: Codes, Definitions, and Categories

Codes	Definitions	Categories
Convenience	Faculty reported using VCT for psychomotor assessments was convenient for scheduling, provided flexibility, and minimized travel burdens. It also allowed students and faculty to continue to communicate during COVID-19 lockdown	Benefits
Synchronous similar to face to face	Faculty reported that using synchronous VCT for assessment functions very similar to a traditional face to face practical. Depending on the skill, VCT could substitute or replace a face to face practical.	Benefits
Provides more opportunities for feedback	Faculty reported that using VCT for psychomotor assessments provides additional opportunities for students to receive feedback and helps improve communication between students and faculty.	Benefits
Synchronous provides interaction, personalization, better communication	Faculty reported the benefits to using synchronous VCT for assessment included the ability to directly communicate in real time, allow for personalization, and better interactions with the students.	Benefits
Online learning and assessment now more acceptable	Faculty reported that since almost all health science universities had to transition to online education during the global pandemic, online learning in physical therapy education now appears to be better accepted within the health community.	Benefits
More real-world setting	Faculty reported that the limited resources and variability in student environments help to replicate what students will experience in real-world settings, especially in a home health setting.	Benefits
I am a better teacher	Faculty reported they have gained new skills, feel more comfortable with technology, and have become a better teacher from using VCT for assessment.	Gained new skills
Faculty more competent with technology	Faculty reported being more confident and competent with technology after using VCT for psychomotor assessments.	Gained new skills
Inability to provide tactile feedback	Faculty reported the inability to provide tactile feedback was a limitation of the assessment. Feedback, specifically tactile feedback during a psychomotor assessment is a critical component to student learning and also helps the faculty member to be more efficient with their explanations.	Gained new skills
Could only provide verbal feedback	Faculty reported that because they were unable to provide tactile feedback, and because of the VCT medium for assessment, they were limited to using primarily verbal feedback during and after the assessment. This impacted the student's learning depending on the type of learner they were (kinesthetic, auditory, visual). Faculty reported it was challenging, inefficient, and exhausting at times to only use	Gained new skills

Codes	Definitions	Categories
	verbal feedback. However, faculty reported personal/professional growth from this experience and feel they now have better skills for using both verbal and tactile feedback.	
I am a technology mentor	Faculty reported their previous experience integrating technology into the classroom, taking faculty development sessions, and/or having experience teaching online, made them a technology mentor for others.	Gained new skills
Troubleshooting during assessment	Faculty report having to trouble shoot for connectivity issues or work to improve either their own audiovisual quality or that of the students. This was time consuming, distracting, and impacted the quality of the assessment	Gained new skills
Faculty development	Faculty reported there were multiple training sessions available to them to help learn how to use the technology.	Gained new skills
Communicate with other faculty	Faculty reported the need to communicate with their team and/or with other colleagues to make sure they all understood how to use the technology, how to troubleshoot if needed, and make sure they understood how to appropriately grade the student in this new medium.	Gained new skills
Colleagues had influence	Faculty reported their colleagues had an influence on them using VCT. Faculty reported that watching other faculty use or implement various types of technology helped them to understand the utility of VCT for instruction and assessment.	Gained new skills
Self-taught	Faculty reported teaching themselves how to use VCT, using trial and error, and/or tinkering with it on their own time.	Gained new skills
Adjusting rubrics for online assessment	Faculty reported needing to change, adjust, or adapt their current rubrics to be able to complete the assessment online more efficiently.	Gained new skills