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Abstract

The purpose of this study was to explore student self-efficacy for performance of clinical skills learned virtually, the effectiveness of teaching clinical skills online, the relationships between students' feelings of self-efficacy and the performance of clinical skills, and the students' perspectives of learning clinical skills virtually. This is a one-group mixed methods study that included twenty-one Master of Occupational Therapy students. Self-efficacy was measured using the Learning Self-Efficacy Scale (L-SES), performance was measured using an instructor-created rubric, and qualitative data was collected using open-ended questions. Students presented with higher levels of self-efficacy for range of motion (ROM) than manual muscle testing (MMT). For MMT, self-efficacy ratings in the Affective Domain were statistically significantly higher than those in the Cognitive and Psychomotor Domains. There were no relationships between L-SES scores and the physical competency exam score. Common themes identified were factors that increased self-efficacy and factors that decreased self-efficacy. This study provides foundational evidence supporting the use of multi-media resources to teach clinical skills virtually and supports online instruction as an effective method for teaching clinical skills and for promoting sufficient self-efficacy for performance of clinical skills.

Keywords

Self-efficacy, occupational therapy students, clinical-skills, virtual-instruction, education

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ABSTRACT

The purpose of this study was to explore student self-efficacy for performance of clinical skills learned virtually, the effectiveness of teaching clinical skills online, the relationships between students' feelings of self-efficacy and the performance of clinical skills, and the students' perspectives of learning clinical skills virtually. This is a one-group mixed methods study that included twenty-one Master of Occupational Therapy students. Self-efficacy was measured using the Learning Self-Efficacy Scale (L-SES), performance was measured using an instructor-created rubric, and qualitative data was collected using open-ended questions. Students presented with higher levels of self-efficacy for range of motion (ROM) than manual muscle testing (MMT). For MMT, self-efficacy ratings in the Affective Domain were statistically significantly higher than those in the Cognitive and Psychomotor Domains. There were no relationships between L-SES scores and the physical competency exam score. Common themes identified were factors that increased self-efficacy and factors that decreased self-efficacy. This study provides foundational evidence supporting the use of multi-media resources to teach clinical skills virtually and supports online instruction as an effective method for teaching clinical skills and for promoting sufficient self-efficacy for performance of clinical skills.

Introduction

The education of occupational therapy students entails acquiring knowledge, critical thinking, and clinical skills specific to the profession. Development of clinical skills requires quality instruction, practice, and belief in one's ability to perform these tasks, known as self-efficacy (Schwoerer et al., 2005). Self-efficacy refers to how confident students feel about handling particular tasks, challenges, and contexts and is derived from Bandura's Social Cognitive Theory (Bandura, 1986; Bandura, 1997; Tsai et al., 2011). Bandura (1994) defined self-efficacy as an individual's belief "about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Tsai et al., 2011, p. 223).

Bandura (1977, 1982) postulated that self-efficacy affects choice of activities, effort expenditure, and persistence (Schunk, 1989). This suggests that learners with higher levels of self-efficacy are more likely to participate in learning experiences and are more likely to practice if they perform a task unsuccessfully (Conner et al., 2011). However, some students may have difficulty self-assessing their skill levels, as evidenced by over- or underestimating their capabilities (Rawlings, 2012). Other students may have adequate skills but lack confidence in those skills; still others may understand the specific skill to be performed but have varying beliefs about their ability to perform that skill (Conner et al., 2011).

What shapes a student's self-efficacy and confidence varies. "Practice makes perfect" is a saying often used to encourage practice as a means of learning a new skill. Holland et al. (2012) documented that student confidence emerges from several avenues, including repeated practice, observing, doing, and then receiving immediate feedback. Peer support and encouragement also increase levels of confidence and self-efficacy, as does a strong internal locus of control (Holland et al., 2012).

Cognitive motivation theory (CMT) proposes that students utilize past and current classroom experiences, including those related to receiving feedback on their performance, to help self-regulate and develop academic goals such as setting time aside for studying and practicing (Hart & Mueller, 2014). Cognitive motivation theory further describes how anticipated future outcomes influence motivation and self-regulation (Bandura, 1988; Hart & Mueller, 2014). Consistent with CMT, Holland et al. (2012) found that anticipating successful or unsuccessful application of a clinical skill played a significant role in confidence levels. When anticipating successful application of a skill, students demonstrated higher levels of confidence than when anticipating unsuccessful application of a skill.

Self-efficacy is a strong predictor of learning and performance (Schwoerer et al., 2005; Tsai et al., 2011). It is crucial for academic progress and is positively correlated with academic achievement (Kang et al., 2019). Self-efficacy plays an important role in a student's learning process and learning outcomes, especially in an internet-based classroom (Tsai et al., 2011). Tsai et al. (2011) found that students with higher self-efficacy had better performance in an online environment. Few published studies have examined occupational therapy students' self-efficacy for learning clinical skills virtually.

Student Self-Efficacy in Virtual Learning Environments

The 2020 COVID-19 pandemic forced occupational therapy programs to rapidly convert from face-to-face instruction to virtual instruction. This presented a number of potential challenges to student self-efficacy. In the online environment, many factors that increase confidence levels were not immediately available, such as having time to practice and receiving immediate feedback on their performance from instructors and peers. Instructors were challenged to creatively teach hands-on clinical skills and to facilitate the stability and sustainability of the learning process. Using technology, educators developed new teaching strategies and applied new educational models to improve the quality of online teaching of clinical skills (Barisone et al., 2019). A variety of learning methods and tools were used to ensure all students' needs were met and that students developed the self-efficacy needed to support academic progress and achievement (Eglseder & Littleton, 2021).

Despite the best efforts of instructors, online teaching materials used for virtual instruction may or may not result in effective learning of hands-on clinical skills, depending on each student's learning preferences and individual levels of self-efficacy (Stamm et al., 2021). Barisone et al. (2019) reported that students needed to talk to a teacher or tutor, especially when a technique was explained for the first time, and that practice labs were instrumental for improving hands-on skills. Likewise, in Stamm et al.'s (2021) study of occupational therapy students who preferred kinesthetic learning, students described their struggles learning clinical skills without hands-on, face-to-face practice. Online learning challenges instructors to provide a rich environment that affords students the opportunity to practice in a variety of ways, with consistent feedback from peers and instructors. Limitations of the online environment may therefore influence student self-efficacy for learning clinical skills.

Effectiveness of Face-to-Face Instruction for Performance of Clinical Skills and Self-Efficacy

Literature regarding the self-efficacy for clinical skills learned face-to-face in occupational therapy programs is limited, mostly qualitative in design, and does not compare the self-efficacy of clinical skills learned face-to-face versus virtually. For example, Hodgetts et al. (2007) examined perceptions of preparedness for practice of occupational therapy students from a traditional program who were near graduation. The researchers conducted focus groups and analyzed written responses to open-ended questions and found that the students did not feel confident or competent in their technical skills and that they desired more hands-on training. Additionally, Eberth et al. (2019) studied a hybrid approach for instructing students in patient handling skills. They utilized videos, photos, narrated online modules, and threaded discussions, as well as hands-on training to teach these skills. Despite the variety of approaches used, students expressed a desire for more hands-on training with the instructors. Regardless, the students demonstrated improved knowledge and self-efficacy after the hybrid instruction.

Effectiveness of Virtual Instruction for Performance of Clinical Skills and Self-Efficacy

A variety of multimedia and teaching methods have been used to teach clinical skills to healthcare students online, and researchers have demonstrated their effectiveness (Ismailoglue et al., 2020; Ozerbas & Erdogan, 2016; Schlupeck et al., 2020; Stone et al., 2020; Tsai et al., 2011; Worobey et al., 2020). For example, a systematic review concluded that online videos are a valuable tool for procedural skill knowledge acquisition and retention (Srinivasa et al., 2020). Ismailoglue et al. (2020) also found that students trained utilizing both video instruction and virtual simulation were successful in terms of knowledge retention and development of psychomotor skills. Schlupeck et al. (2020) created instructional videos and an online learning module to supplement traditional lecture. Medical students who utilized the videos and online module reported a higher level of competency in performing hands-on skills. They also reported learning more from the online modules than from traditional lectures. Coyne et al. (2018) reviewed literature regarding blended learning with the use of videos and discovered that these methods not only increased students' knowledge and skills, but they were also preferred by students because of their flexibility. Other researchers have also reported that blended learning models enhanced learning outcomes, led to correct performance of skills, and improved information retention and skill development in nursing and surgical residents (Barisone et al., 2019; Chick et al., 2020).

Evidence of student self-efficacy for clinical skills taught online is limited across healthcare professions. Ismailoglu et al. (2020) found that nursing students trained using a virtual simulator and video-assisted teaching to insert an intravenous catheter were satisfied and confident in their skills. Barisone et al. (2019) concluded that the use of an app to support nursing students through the learning process, along with instructional videos, could also be effective for improving levels of confidence.

There is limited occupational therapy literature regarding either performance of, or self-efficacy for, clinical skills taught virtually. Baus et al. (2021) reported that occupational and physical therapy students who watched videos and listened to recorded lectures found them helpful for learning the basics of neuroscience, but not specifically for improving self-efficacy. Students indicated that the ability to review the videos multiple times, pause them to take notes, and speed them up or slow them down made them particularly useful (Baus et al., 2021). Stamm et al. (2021) reported similar findings. The widespread use of virtual approaches for teaching clinical skills to occupational therapy students during the pandemic (Eglesder & Littleton, 2021; Stamm et al., 2021) and the obligation to provide evidence-based education calls for research to determine the effectiveness of virtual methods. Given the importance of self-efficacy for learning and performance, studies describing the influence of virtual learning on self-efficacy are also needed.

Minimal published literature exists that specifically investigates the self-efficacy of occupational therapy students for clinical skills taught virtually. Thus, the purpose of this research is to describe the effectiveness of remote instruction for teaching clinical skills to occupational therapy students, to determine the self-reported levels of occupational

therapy students' self-efficacy for learning those skills, and to describe the perspective of occupational therapy students who have learned clinical skills via remote instruction. Relationships between self-reported levels of self-efficacy and performance of clinical skills was also investigated. Specific research questions were: 1) What is the effect of remote instruction on occupational therapy students' learning of clinical skills? 2) What is the level of student self-efficacy for clinical skills taught via remote instruction? 3) What is the relationship between students' feelings of self-efficacy and performance of clinical skills taught remotely? and 4) What is the perspective of Master of Science in Occupational Therapy (MOT) students who learned clinical skills via remote instruction?

Methods

This one-group mixed methods study was granted approval by the university's Institutional Review Board.

Participants and Setting

Participants were recruited from one cohort of MOT students in the Southeastern United States. At the time of the study, the students were completing the summer term of the first year of the program, which included a Functional Human Motion lab course. They had completed gross anatomy and neuroanatomy courses in the initial two semesters of coursework on campus; however, no clinical skills were taught in these courses or previous courses. All 21 students in the cohort were recruited via an email from the professors conducting the study that included a link to the Qualtrics survey and Consent form. The students were informed that participation was anonymous, optional, and would not affect their course grade.

Description of the Virtual Course

During the summer of 2020, students were enrolled in the Functional Human Motion (FHM) Lab which was held virtually secondary to COVID-19. The FHM lab, a one credit-hour course, was the laboratory aspect to the FHM lecture which was taught simultaneously online. The course consisted of three contact hours per week for 12 weeks. Within the course, students learned skills such as measuring joint range of motion (ROM) using a goniometer and manual muscle testing (MMT), and principles of physics and kinesiology were applied to occupational performance. Students learned ROM and MMT through instructor created and PhysioU videos. Virtual lab sessions were utilized for discussion and to address student questions after watching the videos.

Typically, students were required to physically demonstrate competency in assessments of ROM and MMT. However, due to restrictions related to COVID-19, students completed a virtual oral competency exam at the end of the FHM Lab in 2020. In this exam, students were required to verbally state the procedures for measuring ROM and MMT. During the second week of the following fall semester, students participated in one, two-hour faculty-instructed clinical practice session for ROM and MMT. A physical competency exam was conducted two weeks after the practice session (see Figure 1).

Instruments

Learning Self-Efficacy Scale

Self-efficacy was measured using a 12-item self-report scale called the Learning Self-Efficacy Scale (L-SES, Kang et al., 2019). The scale consists of three domains, each comprising four questions. The cognitive domain includes statements related to students' knowledge of the clinical skills; the affective domain includes statements related to the amount of effort students expended in the course; and the psychomotor domain includes statements about the students' physical ability to perform the clinical skills. The L-SES is designed to be applicable to a variety of clinical skills, as specific clinical skills may be inserted into the questions. For example, in the psychomotor domain question, "I can precisely imitate the instructor's steps and actions of 'the clinical skill,'" the researcher substitutes a target skill such as "range of motion" for "the clinical skill." Students rate their level of agreement with each statement on a 5-point scale (1 = Disagree and 5 = Agree). In this study, self-efficacy was assessed for ROM and MMT.

In a study of 235 medical students learning basic clinical skills, the L-SES content validity index ranged from .88 to 1.0 (Kang et al., 2019). Item discrimination for all three domains were high. Item-total correlations varied from .640 to .822. Total test internal consistency reliability was high (Cronbach's alpha = .931). Scores were unaffected by sex. There is no normative data for the L-SES; however, average scores can be reported and described in relation to the median scores for the domains (median = 10.5) and total score (median = 30.5), as has been done for similar scales (Mitchell, 2015; Van Horn & Christman, 2017). Maximum scores for the domains are 20, and the maximum total score (the sum of the domain scores) is 60. Higher scores on the L-SES indicate greater self-efficacy.

Physical Competency Exam

The physical competency exam included 50 possible points, 24 for ROM and 22 for MMT. The remaining points addressed student communication and standard precautions (see Appendix). The physical competency rubric was created by the course instructors utilizing *Pedretti's Occupational Therapy: Practice Skills for Physical Dysfunction, 8th edition,* for guidance. To examine interrater reliability, the course instructors used the rubric to score YouTube videos of occupational therapy students performing ROM and MMT. The percentage of exact and adjacent agreement (Graham et al., 2012) was 75%, considered moderate to good.

Qualitative Data

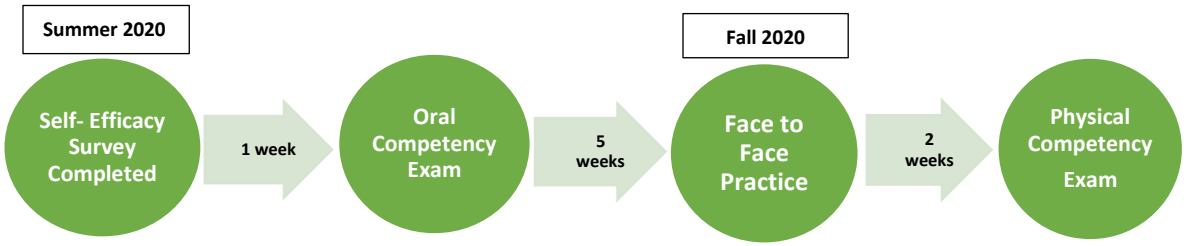
Prior to the oral competency, students were asked to respond in writing to three open-ended questions about their self-efficacy, including: 1) What contributed to your level of confidence? 2) What actions or experiences might have increased your confidence? and 3) What actions or experiences might have decreased your confidence? These questions were included in the Qualtrics Survey, along with the Learning Self-Efficacy Scale.

Procedure

Participants completed the L-SES and written questions one week before the end of the lab course (summer semester 2020), and the oral competency was administered the following week via Zoom. The two-hour face-to-face practice session was held in the second week of the fall semester of 2020, and the physical competency was administered two weeks later (see Figure 1). Students were assessed on the performance of two MMTs and two ROM measurements. The two researchers who scored the physical competency exam were unaware of which students participated. A researcher who was not involved in the scoring of the physical competency exam received informed consent forms provided by all participants, assigned participants random numbers, and entered all data in a password protected Excel file. Once all data was entered in the Excel file, all researchers were granted access to the de-identified data, which was after the completion of the physical competency exam.

Figure 1

Self-Efficacy Study Timeline



Data Analysis

The quantitative data were first checked for outliers. Descriptive statistics were used to describe students' performance on the physical competency exam and their L-SES scores for each clinical skill. To further characterize the students' self-efficacy, Repeated Measures Within Subject ANOVAs examined whether there were statistically significant differences between self-efficacy scores on the three domains of the L-SES for each clinical skill. A Chi-square test was used to determine whether there were statistically significant differences in the percentage scores on the ROM and MMT physical competency exam. Dependent *t*-tests were conducted to determine whether students' L-SES scores for MMT and ROM were significantly different. Pearson product-moment correlations were used to analyze relationships among students' physical competency exam performance and their self-efficacy for performing each clinical skill.

Qualitative data from the open-ended questions were analyzed using thematic analysis. Trustworthiness was enhanced through data source triangulation, investigator triangulation, and member checking. Verbatim quotes were used to illustrate themes that emerged from the data.

Results

The participant demographics are presented in Table 1.

Table 1

Participant Demographics

Category	Participants	
	Number	**Percentage**
Age: *M* = 25.6 years, Range = 22 years - 51 years		
Sex		
Male	4	19
Female	17	81
Ethnicity		
African American	7	33
Caucasian	14	67
Multiracial	2	10

Note. M = mean

Effects of Outliers

Two to three outliers were detected at the univariate level and one at the multivariate level. Profiling revealed nothing remarkable about these outliers, except that they were students who had the lowest competency scores or L-SES self-ratings. Removal of the outliers from the various analyses resulted in no substantive effect on the means or Repeated Measures Within Subjects ANOVA results. Therefore, the results for all 21 students are reported.

Research Question #1: What is the effect of remote instruction on occupational therapy students' learning of clinical skills?

As reported in Table 2, the students' mean scores on the ROM and MMT competency exam were well within the range considered acceptable by the course instructors. Differences in mean percentages on the ROM and MMT competency exam were not statistically significant.

Table 2

Means, Standard Deviations, and Comparisons for Competency Scores (n = 21)

Clinical Skill (Points Possible)	*M(SD)*	Percentage Correct
ROM (24)	22.26(2.23)	93
MMT (22)	19.4(2.48)	88
X^2 = .298, p = .59		

Note. MMT = Manual Muscle Testing; ROM = Range of Motion

Research Question #2: What is the level of student self-efficacy for clinical skills taught via remote instruction?

Mean scores on the L-SES domains were all above the median of 10.5, and the mean of the total L-SES score was above the median of 30.5 (see Table 3). All self-efficacy scores were statistically significantly higher for ROM than MMT, with a medium effect size, except for the Affective Domain, in which scores were almost identical (see Table 2).

For ROM, there were no statistically significant differences among the L-SES domain scores (Wilks' Lambda = .793, F (2,19) = 2.48, p = .11), but for MMT, differences were statistically significant (Wilks' Lambda = .617, F (2,19) = 5.90, p = .01). Three paired samples t-tests were used to make post hoc comparisons between the MMT L-SES domains, with a Bonferroni-corrected p value of .017 indicating statistical significance. There was a statistically significant difference between scores on the Affective and Psychomotor Domains (t(20) = 3.17, p = .005) and between scores on the Affective and Cognitive Domains (t(20) = 3.44, p = .003), but not between scores on the Cognitive and Psychomotor Domains (t(20) = -1.13, p = .274). This suggests that for MMT, students' self-efficacy in the Affective Domain was stronger than their self-efficacy in the Psychomotor and Cognitive Domains, but there was no difference between their self-efficacy in the Psychomotor and Cognitive domains.

Table 3

Means, Standard Deviations, and Comparisons for L-SES Scores for Each Clinical Skill (n = 21)

Outcome Measure	MMT *M(SD)*	ROM *M(SD)*	*t*	*p*	Cohen's *d*
L-SES Total Score*	44.91 (7.73)	46.71(6.69)	2.54	.02	.55
Cognitive Domain**	13.76 (3.94)	14.86(3.73)	2.32	.03	.51
Affective Domain**	16.76 (2.32)	16.76(2.36)	0.00	1.00	.00
Psychomotor Domain**	14.38 (3.23)	15.10(3.51)	2.20	.04	.48

Note. M = mean; *SD* = standard deviation; L-SES = *Learning-Self Efficacy Scale*
*Maximum = 60; Median = 30.5
**Maximum = 20; Median = 10.5

Research Question #3: What is the relationship between students' feelings of self-efficacy and performance of clinical skills taught remotely?
Pearson product-moment correlations revealed no statistically significant relationships between self-efficacy and physical competency scores for either clinical skill (see Table 4).

Table 4

Pearson r Correlations Among Physical Competency Scores and L-SES Scores (n = 21)

	Cognitive Domain	Affective Domain	Psychomotor Domain	Total Score
Manual Muscle Testing				
r	.005	-.113	.14	.03
p	.98	.63	.56	.91
Range of Motion				
r	.01	.20	.17	.14
p	.95	.39	.47	.54

Note. L-SES = *Learning-Self Efficacy Scale*

Research Question #4: What is the perspective of MOT students who learned clinical skills via remote instruction?

Two major themes emerged from the qualitative data: factors increasing self-efficacy and factors decreasing self-efficacy. Subthemes were also identified (see Table 5).

Table 5

Themes, Subthemes, and Example Quotes

Themes	Subthemes	Example Quote(s)
Factors Increasing Self-efficacy	Personal Actions	▪ "My level of confidence is knowing everything about ROM and MMT to a tee. Being able to verbally say all the steps and requirements for ROM and MMT helps my level of confidence. ▪ "Practicing on others, watching videos provided by professors and Physio U videos."
	Resources Provided	▪ "Having the recordings available to go back and watch while working by myself. Having PhysioU to go over bony landmarks and see things from different perspective."
Factors Decreasing Self-efficacy	Lack of Social Learning Opportunities	▪ "Not being able to receive feedback from professors in person, not always having someone to practice on, and not practicing regularly throughout the semester."
	Emotional Factors	▪ "The whole experience of having classes online and not being able to have in-person practice with others that are learning this material alongside me. This was a huge factor for me. Also due to having classes online, I felt incredible distanced the whole semester. It has been extremely difficult for me and though we meet weekly for class, I still did not feel anywhere near as mentally connected and prepared as I normally do in person. I am very much a kinesthetic learner so this has been extremely difficult for me."
	Resources-related	▪ "Having to use the text book Pedretti and use PhysioU because they contradict each other on how to perform some of the ROM and MMT."

Discussion

The results of this study provide interesting insights into students' self-efficacy for clinical skills learned virtually during the pandemic. Despite limited face-to-face instruction, all students successfully passed the physical competency exam and demonstrated sufficient levels of self-efficacy for both ROM and MMT, which suggests that virtual instruction for clinical skills is effective.

Students' physical competency exam mean scores for MMT and ROM indicated that students were able to competently perform the skills. This may suggest that the methods utilized during the remote course along with minimal face-to-face instruction can result in successful skill performance.

Students displayed higher levels of self-efficacy for ROM than MMT. ROM involves the use of bony landmarks, which are easier to visualize for goniometer alignment, whereas MMT is a kinesthetic skill. Therefore, lower self-efficacy for MMT may be related to the difficulty students described with learning clinical skills without hands-on practice or instructor feedback. The instructor created and PhysioU videos, which students stated were beneficial, may also have contributed to self-efficacy and the successful performance of both skills. The videos provided step-by-step instructions and visual guidance for skill performance which may have facilitated skill acquisition. However, the fact that appropriate application of pressure is challenging to teach via video may have impacted MMT self-efficacy.

Additionally, self-regulation may have contributed to successful performance on the physical competency exam and the students' self-efficacy. With self-regulated learning, students accept responsibility for their own learning, identifying, and addressing knowledge gaps and developing strategies for retaining and retrieving material (Booker, 2020; Hart & Mueller, 2014). Students in this study described using self-regulated learning techniques such as verbal and physical practice, studying resources, utilizing professors, and watching videos. These strategies may have helped students self-monitor and adjust their physical performance, regulate their learning, and increase self-efficacy.

The students demonstrated stronger self-efficacy in the Affective than the Cognitive or Psychomotor Domain for MMT. Due to the lack of immediate feedback from peers and instructors and the kinesthetic nature of MMT, students may have felt that more time was required to learn MMT. While students spent significant time learning MMT, they were not as confident in content knowledge or their ability to perform the skills. Despite this, students' scores for all L-SES domains were above the median score, suggesting sufficient self-efficacy in all domains. For ROM, there were no statistically significant differences among the L-SES domain scores, and all scores were above the median. This may indicate that students also spent significant time learning ROM, but they felt equally confident in their knowledge and performance of ROM.

There was no relationship between the L-SES total scores and the physical competency exam score, which contradicts the literature. Prior research indicates that students with higher levels of self-efficacy (Tsai et al, 2011) and those who anticipate good outcomes (Holland et al., 2012) generally perform well. The contradictory findings of this study may be attributed to the students' varying beliefs about their ability to perform the skills (Conner et al., 2011) and the fact that some students may have difficulty self-assessing their own skill levels (Rawlings, 2012). The small sample and restricted range of scores on the competency may have also influenced the results of this study.

The qualitative data revealed factors that increased students' self-efficacy for learning clinical skills virtually. Common factors identified were personal actions and resources, including practicing the skills, studying resources, and viewing instructor created and PhysioU videos. The most beneficial and supportive resources appeared to be the instructor-created and PhysioU videos and the availability of the professors. Two students mentioned their knowledge of ROM and MMT from previous employment as a rehabilitation technician or athletic trainer. Students also expressed appreciation for the professors' empathy related to the difficulty of learning clinical skills virtually during a pandemic.

Students also reported factors that decreased their self-efficacy. A common subtheme was the inability to practice on classmates or receive immediate instructor feedback regarding performance. Students also expressed that not having face-to-face practice with the professors and their classmates negatively impacted their self-efficacy; however, studies of face-to-face instruction have also found that students desire more face-to-face practice to increase their confidence for performing clinical skills (Eberth et al., 2019, Hodgetts et al., 2007). Students also emphasized the emotions they experienced during the pandemic, e.g., loneliness, lack of social support from peers and professors, insecurity due to lack of confirmation of accurate performance, and feelings of being distanced and overwhelmed.

Although students described resources provided as a factor that increased their self-efficacy, they also expressed frustration with the resources. The students noted contradictions between instructor-created videos based on textbook instructions and the PhysioU videos. As new learners, they were unaware of the variety of techniques for performing ROM and MMT, and these variations led to confusion and frustration.

Limitations and Suggestions for Future Research

This study included a small sample of occupational therapy students from a university in the southeast United States, which limits generalizability. The small sample also limits the statistical power of the study and inflates the Cohen's *d* statistic. Studies using self-report methodology may also be susceptible to response bias; however, student responses to the qualitative questions appeared to be honest and included negative as well as positive viewpoints. Focus groups or interviews could have strengthened the trustworthiness of the data, but the qualitative data was analyzed separately by each

author, and member checking was performed. Students received faculty-directed face-to-face practice for ROM and MMT prior to the physical competency, which may have contributed to better performance; however, this was limited to one, two-hour session.

Future research with larger samples is recommended to confirm these results. Examination of students' anticipated outcomes may also help determine whether anticipation of being successful impacts self-efficacy and performance. Administering the L-SES again after hands-on practice may also help determine the influence of physical practice on self-efficacy. Research comparing self-efficacy for clinical skills learned face-to-face versus those learned remotely would also be beneficial.

Implications for Occupational Therapy Education

Educators faced with the challenge of teaching clinical skills via remote instruction can be encouraged by the results of this study. Students demonstrated successful performance and adequate self-efficacy for these clinical skills, despite very little face-to-face instruction.

Although occupational therapy students prefer to learn hands-on skills face-to-face and desire immediate feedback on physical performance, successful performance and sufficient self-efficacy can be accomplished using remote instruction. Utilizing a variety of multi-media resources may enhance students' skill performance and self-efficacy during virtual instruction. This study adds to the literature by helping educators understand student self-efficacy for learning clinical skills virtually. While comparisons with face-to-face instruction were beyond the scope of this study, these findings may assist instructors as they problem-solve approaches for improving self-efficacy and performance.

Conclusion

As a result of the pandemic and virtual learning, students experienced loneliness, insecurity, and lack of social support and connectedness. Students also expressed a feeling of being overwhelmed. Virtual instruction also contributed to successful performance of clinical skills and sufficient levels of self-efficacy. The availability and support of professors and multi-media resources seemed to contribute to student success. These results extend knowledge of the importance of self-efficacy when learning hands-on clinical skills virtually and how occupational therapy educators can facilitate student self-efficacy and performance.

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Appendix

Physical Competency Exam Rubric

ROM – Joint 1	Yes	No	Notes/Scores
1. Patient Positioned Appropriately (seated vs. standing; if seated the proximal joints are stabilized)			
2. Screen of Opposite Extremity			
3. Joint to be measured is uncovered			
4. Axis Landmark Palpated and verbalized			
5. Stationary Arm Landmark Palpated and verbalized			
6. Mobile Arm Landmark Palpated and verbalized			
7. Axis Positioned Correctly over Landmark			
8. Stationary Arm positioned Correctly toward Landmark			
9. Mobile Arm positioned Correctly toward Landmark			
10.Goniometric Measurement is verbalized correctly, and prior to removal off patient instructor has viewed the measurement			
11. Goniometric Measurement is recorded correctly			
12. Able to State Normative Value for Joint measured			

ROM – Joint 2	Yes	No	Notes/Scores
1. Patient Positioned Appropriately (seated vs. standing; if seated the proximal joints are stabilized)			
2. Screen of Opposite Extremity			
3. Joint to be measured is uncovered			
4. Axis Landmark Palpated and verbalized			
5. Stationary Arm Landmark Palpated and verbalized			
6. Mobile Arm Landmark Palpated and verbalized			
7. Axis Positioned Correctly over Landmark			
8. Stationary Arm positioned Correctly toward Landmark			
9. Mobile Arm positioned Correctly toward Landmark			
10. Goniometric Measurement is verbalized correctly, and prior to removal off patient, instructor has viewed the measurement			
11. Goniometric Measurement is recorded correctly			
12. Able to State Normative Value for Joint measured			

MMT – Action 1	YES	NO	Notes/Scores
1. Body positioned in a stable position that allows the muscle group to perform against gravity			
2. Both extremities screened for AROM of muscle selected			
3. Patient Positioned in Testing Position			
4. Appropriate Command for motion tested			
5. Appropriate GRADUAL Resistance in Proper Direction			
6. Does Not Cross More Than One Joint with hand providing resistance			
7. Proximal Stabilization Provided in appropriate location			
8. Able to give appropriate muscle grade			
9. Able to verbalize Gravity Minimized Position			
10. Able to state a Primary Mover			
11. Palpates appropriate muscle/Tendon			

MMT – Action 2	YES	NO	Notes/Scores
1. Body positioned in a stable position that allows the muscle group to perform against gravity			
2. Both extremities screened for AROM of muscle selected			
3. Patient Positioned in Testing Position			
4. Appropriate Command for motion tested			
5. Appropriate GRADUAL Resistance in Proper Direction			
6. Does Not Cross More Than One Joint with hand providing resistance			
7. Proximal Stabilization Provided in appropriate location			
8. Able to give appropriate muscle grade			
9. Able to verbalize Gravity Minimized Position			
10. Able to state a Primary Mover			
11. Palpates appropriate muscle/Tendon			

All items are worth 1 point, Total for each section is stated at the top of the grading sheet. 12 possible points for each ROM and 11 possible points for each MMT, plus 4 points total for appropriate communication, introduction and cleansing of hands (SP).

Student used Hand Sanitizer Prior to beginning Assessment _____Yes _____No

Good Communication with Patient during Practical _____Yes _____No

Appropriate Introduction, Who and Why performing ROM/MMT _____Yes _____No

ROM:_____/24

MMT:_____ /22

Intro:_____/1

Communication: _____/2

Standard Precautions (SP):_____/1

TOTAL :_____/50