Kinesthetic Learners During the COVID-19 Pandemic: Occupational Therapy Students' Perspective on E-learning

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Abstract

The purpose of the study was to understand the perspective of kinesthetic learners in an online learning environment. A Microsoft Forms survey was created and distributed to the sample population using the university electronic mailing list. If self-identified as kinesthetic learners, subjects were asked to participate in a semi-structured focus group. Twenty-six subjects responded to the survey, with 73% (n=19) identifying as kinesthetic learners. Quantitative results showed subjects felt most confident in content comprehension but less confident in clinical application. Qualitative data collection led to emergence of the following four themes—*advantages, disadvantages, accommodations to e-learning, and external factors*. The study suggested kinesthetic learners' decreased confidence in comprehension and acknowledged making accommodations for effective learning. Students reported instructional improvements to facilitate e-learning. They suggested instructors can show more concern for well-being and provide academic support for clinical skills competence.

Keywords

VARK model, kinesthetic learning, e-learning, occupational therapy, COVID-19

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Acknowledgements

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ABSTRACT

The purpose of the study was to understand the perspective of kinesthetic learners in an online learning environment. A Microsoft Forms survey was created and distributed to the sample population using the university electronic mailing list. If self-identified as kinesthetic learners, subjects were asked to participate in a semi-structured focus group. Twenty-six subjects responded to the survey, with 73% (n=19) identifying as kinesthetic learners. Quantitative results showed subjects felt most confident in content comprehension but less confident in clinical application. Qualitative data collection led to emergence of the following four themes—*advantages, disadvantages, accommodations to e-learning, and external factors*. The study suggested kinesthetic learners' decreased confidence in comprehension and acknowledged making accommodations for effective learning. Students reported instructional improvements to facilitate e-learning. They suggested instructors can show more concern for well-being and provide academic support for clinical skills competence.

The coronavirus (COVID-19) pandemic in the spring 2020 semester greatly impacted school systems around the world and caused considerable uncertainty about the future of education in both virtual and in-person formats. *COVID-19* is an infectious respiratory disease spread through viral transmission between individuals (World Health Organization [WHO], 2020c). With numbers beginning to rise globally as well as nationally in mid-March of 2020, the United States government declared the COVID-19 outbreak as a national state of emergency and directed citizens to review the Centers for Disease Control and Prevention (CDC) guidelines to take steps to prevent the spread of the virus (Trump, 2020). As a result of this declaration and increasing public concern, the CDC presented public and private institutes of higher education with the

recommendation to temporarily suspend in-person instruction for classes as a strategy to prevent viral spread. As an alternative, the CDC recommended the continuation of learning through electronic learning (e-learning) using online platforms (CDC, 2020b).

E-learning is an educational method that uses virtual technologies to teach students (Casteleijn & Steyn, 2010). E-learning utilizes web-based education methods, social networking software, internet video conferencing, and computer assisted instruction. During the pandemic, occupational therapy (OT) programs were required to modify educational instruction to a virtual format while aiming to maintain quality. Students needed to adapt to e-learning quickly due to the unexpected change in content delivery method. Student adaptation may have been challenging depending upon their learning style. *Learning style* refers to how an individual learns through perceptions, processes, and preferences (Brown et al., 2009). According to Grasha and Yangarber-Hicks (2000), learning style preferences are tied to students' performance when working with technology and educators ought to adapt to suit the different styles.

The relationship between attitudes towards e-learning and learning styles has received moderate attention in literature to date. The VARK Model describes the sensory preferences and processing of learning (Othman & Amiruddin, 2010), and indicates there are four types of learning styles categorized as (a) visual learners, (b) auditory learners, (c) kinesthetic learners, and (d) reading/writing learners (Fleming & Mills, 1992). Kinesthetic learners prefer hands-on learning, so the transition to e-learning may have been more difficult for them. Therefore, the purpose of this study was to examine Occupational Therapy Doctorate (OTD) students' perspectives on e-learning during the COVID-19 pandemic. More specifically, the objective was to explore viewpoints and adaptations of kinesthetic learners during the transition from a traditional classroom setting to e-learning.

Literature Review

E-learning
With the expedited adoption of e-learning, past advancements in the field of e-learning came to the forefront of educational programs during the pandemic. Fortunately, many educational programs in the industrialized world were well-positioned to meet this challenge. Ashill and Eom (2016) implemented a poll that indicated the industrialized world entered a golden age of e-learning and that e-learning could be at a tipping point in improving e-learning platforms. In the past several years, online schooling options have increased due to ease in accessibility, lower cost rates, and flexibility. As Bidwell (2014) reported, online schooling continued to become more popular and the American people's trust in the effectiveness of e-learning also improved. This report noted that although a minority of Americans believed universities and colleges offered a high-quality online education, the amount of support increased from previous years (Bidwell, 2014). Harrison and colleagues (2017) examined the perceptions of academics at higher education institutions towards the quality of e-learning programs. The majority of academics recognized opportunities and advantages for teacher innovation, time management skills for students, and to allow students to monitor individual progress in

e-learning programs. Interestingly, the survey responses indicated that educators did not expect students to recognize the potential benefits of e-learning regarding overall educational experience (Harrison et al., 2017).These studies indicate trust in the quality of e-learning grew more than 20% in recent years as e-learning has become a widely used method in educational settings (Ashill & Eom, 2016).

According to Brown and colleagues (2009), e-learning aims to educate students that are identified as innovative, problem solvers, and flexible. E-learning may be viewed as an open system with three components continually interacting and affecting one another: students, instructors, and the e-learning management system (Ashill & Eom, 2016). Special consideration should be given to ensure that all three components are being taken into account and interact effectively to optimize e-learning outcomes and student satisfaction (Ashill & Eom, 2016).

The wide variety of e-learning resources and available delivery methods, whether synchronous or asynchronous, were major contributing factors in the ease of use for programs that chose to use this educational strategy during the pandemic. Some educational experts such as Elango and colleagues (2008) reported that e-learning and courses offered online were more interactive in nature than traditional in-person instruction. Researchers in the study suggested that e-learning methods made it easier for students who were slower learners to participate in the classroom, as online methods may allow for more time to respond. Based on student perceptions within the study, a short-coming reported with the use e-learning methods was the lack of access to tutors and other peers to meet and collaborate on course content. Students in the same study also reported that the instructor's knowledge level was an essential component in quality e-learning programs (Elango et al., 2008). Ashill and Eom (2016) recommended that individual student characteristics and the effect on student satisfaction and learning outcomes should be considered when using e-learning. These factors included learning management confidence levels, prior experience, computer experience, self-efficacy, motivation, and especially learning styles (Ashill & Eom, 2016).

VARK Model
The VARK model identified four different learning styles used to describe how people best obtain information being presented to them: visual (V), auditory (A), read/write (R), and kinesthetic (K), as well as multimodality (MM), which is a combination of any of the four (Fleming & Mills, 1992). Used across many disciplines, the VARK inventory questionnaire measures individuals' learning preference, to both receive and deliver information (Baykan & Nakar, 2007; James et al., 2011; Rahiminia & Rahiminia, 2017).

According to the VARK, individuals who identify as visual learners prefer gathering information through diagrams and symbols, otherwise known as graphics. Auditory learners rely on heard or spoken information, while reading/writing learners prefer information displayed as words such as in PowerPoint, lists, and dictionaries. Kinesthetic learners desire information provided through simulated or real experiences

through hands-on activities. Hands-on activities give kinesthetic learners a connection with reality and allowed the learner to associate themselves with the information in real-time (Fleming & Mills, 1992).

By understanding a student's learning style, instructors promote the best learning environment for students based on individual learning styles. The VARK model did not base learning style on the student's ability to learn but rather how a student can come to gain new knowledge. Researchers suggest educators adapt learning and teaching environments when transitioning to e-learning, depending on which learning styles they are instructing (Othman & Amiruddin, 2010).

Kinesthetic Learning

In relation to the VARK model, the term *kinesthesia* derived from the Greek words kinein- meaning "motion" and -aisthēsis meaning "perception," coming together to mean the sensation or perception of motion (Merriam Webster, n.d.). Fleming and Mills (1992) defined *kinesthetic learning* as a preference related to experience and practice, either simulated or real, that produces sensory information through physical activities. Kinesthetic learners prefer receiving information through tactile senses rather than writing, visual, or auditory input; they learn best by performing tasks and physically experiencing the material (Vincent & Ross, 2001).

Theories supporting the use of kinesthetic learning include that of Maria Montessori, an Italian physician who wrote *The Montessori Method* (Rusinko, 2011). Montessori theorized that muscle memory served as a key component in the learning process. Within her theory, Montessori believed when an individual continuously performed a movement, the experience was easier to recall later (Rusinko, 2011). Rusinko (2011) stated that sensory information passed through fibers within tendons, joints, and muscles assisted students and gave a physical sensation to the theories and principles learned. When physically experiencing and learning this new information, the students developed a substantial link to reality in order to further process the information (Fleming & Mills, 1992).

Research on students within medical and nursing/midwifery programs by Baykan and Nakar (2007) and James et al. (2011) concluded that kinesthetic learning was the preferred learning style for both sample populations (Rahiminia & Rahiminia, 2017). More specific to the field of OT, the Accreditation Council of Occupational Therapy Education (ACOTE) Standards and Interpretive Guide placed emphasis on language such as demonstrate, perform, and modify to define student competence in areas of OT related to hands-on demonstrations of learned concepts (ACOTE, 2018). Although ACOTE did not include any specific requirements for hands-on learning experiences, aside from fieldwork, doctoral capstone experiences, and baccalaureate projects, these skills translate to learned knowledge of the course material and the skills applied to later demonstration and use of the skills (ACOTE, 2018). Kinesthetic performance of skills are key requirements within curriculum for OT programs and valuable in the learning of OT concepts. OT students have placed value on the limited amount of hands-on classroom assignments and exercises included in educational programs (Fisher, 2000).

Kinesthetic Learning and E-learning

Surjono (2011) suggested kinesthetic learners relied on experience-based modalities and preferred hands-on labs and simulations in order to receive information most effectively; through traditional e-learning curriculums "hands on" activities were not always feasible. In the same study, adaptive e-learning demonstrated a concept in which online-based learning took each learning style into account and developed a system design that combined variations in presentation based on individual preference. In the study, the two concepts involved in e-learning were adaptivity, in which the system was responsible for initiating a conducive environment, and adaptability, in which the student was held accountable for initiating a change. Adaptability, although essential to academic success in kinesthetic learners, was limited to the system's capability of supporting a student's ability for modification (Surjono, 2011).

A study demonstrated that 50-70% students relied on kinesthetic or multimodal models for learning information, and some researchers predicted outcomes of academic achievement relied on the learning style in which a student preferred (Wood & Sereni-Massinger, 2016). Based on the same study, initiating active learning strategies in an online environment using critical thinking activities, and replication of real-life experiences, allowed students to engage and receive a hands-on perspective on the content. Role-playing and practical application such as simulations, interactive technology, and gaming interfaces allowed kinesthetic learners to immerse themselves in experience during this study. According to Wood and Sereni-Massinger (2016), a perceived barrier was e-learning for kinesthetic learners due to its distant and non-interactive nature; however, online education inspired creativity and critical thinking in students by encouraging students to create and connect new ideas to apply to a practical setting.

Kinesthetic learners benefit from hands-on learning opportunities which may be limited by the virtual format brought on by the current global situation. Students involved in high-level learning, such as in graduate level health care programs, benefit from hands-on experience due to relevance in a clinical setting. With the advancement of e-learning, health care programs could adapt a conducive online-environment to allow students resources to develop a foundation of knowledge transferable to clinical practice.

Methods

Design

The study used a mixed methods approach to discover perceptions of kinesthetic learners' experience with e-learning within an OTD program in a Midwest city. An explanatory approach was used to examine perceptual reactions through quantitative analysis and then further extrapolate meaning through analysis of individual qualitative discussion. The researchers formulated the study to interpret student perceptions of e-learning to initiate changes in virtual instruction strategies. The Huntington University Institutional Review Board reviewed and approved this project as an exempt study.

Sample

Prospective participants included first-year, third semester OTD students who attended a private university in a Midwest city. In March 2020, the participants were required to switch from in-person instruction to e-learning due to the COVID-19 pandemic and completed the remainder of the semester through e-learning. Given the nature of COVID-19, these students had only experienced five weeks of in-person Level I fieldwork in psychosocial settings, prior to cancellations. These students had completed coursework in kinesiology, pathophysiology, neuroscience, analysis of occupation, and psychosocial implications in OT. This cohort was chosen for the study given their experiences in the program, which included one entire semester with in-person learning followed by a hybrid semester that started with in-person learning followed by a transition to e-learning.

An email was sent out to the cohort. The email contained a cover letter which included the purpose of the study and link to a Microsoft Forms survey. Inclusion criteria required participants to be 18 years or older, enrolled in the OTD program at the chosen university, and self-identified as a kinesthetic learner on the survey. Additionally, participants must have experienced the transition from in-person instruction to e-learning during the time of COVID-19. Participants who met the inclusion criteria had the option to participate in a focus group held at a later date. Researchers contacted participants who met the inclusion criteria and volunteered to participate in a focus group.

Instrumentation

Quantitative

The survey consisted of a statement obtaining informed consent from the participant, a definition for self-identification as a kinesthetic learner, and provided participants with a link for those interested in participation in a focus group. The two demographic questions asked age and level of education achieved. There were ten items that participants were asked to rate on a 5-point Likert scale from strongly disagree to strongly agree, where 1 indicated strongly disagree and 5 indicated strongly agree. Three items addressed virtual lectures, three items addressed studying, two items addressed group projects, and the final two items addressed laboratory experiences during e-learning. Multiple peers and OTD faculty reviewed the survey and it was revised based on the feedback to increase face validity of the instrument.

Qualitative

Focus group questions focused on the strategies that the kinesthetic learners used during e-learning and how the students' learning styles were adapted to succeed (see Table 1). Multiple experts reviewed focus group questions to increase face validity of the approach. Two researchers facilitated the group, supplied a statement of informed consent, and asked the questions.

Acceptance of informed consent was received through written statements from all participants prior to the start of the focus group. Each participant was assigned an identification number upon arrival to the focus group room to ensure data was kept confidential. Two iPads were used to record the audio of the focus group.

Table 1

Kinesthetic Learners Perspective of E-Learning Focus Group Questions

Question	Follow-Up Question
When you heard there was going to be a transition to e-learning, what were your initial thoughts?	
Was your home environment conducive to participation in e-learning? Why or why not?	What factors did you find to be beneficial or distracting regarding your ability to focus?
How did professors adapt their teaching style to facilitate effective e-learning?	Were you able to implement any hands-on strategies at home?
	What could your professors do differently to facilitate more effective e-learning?
What strategies did you have to personally use while adjusting to e-learning?	
Did you feel using breakout rooms to participate in smaller class discussion was helpful? Why or why not?	
Are there any additional comments?	

Procedure

Quantitative
The survey was sent to students through a Microsoft Form link to all available participants to be filled out anonymously and voluntarily. The survey was open for one day following the initial email. Participants' initial survey responses were kept confidential, and there were no identifiers associated with the results.

Qualitative

Upon closure of the survey, the first six participants who identified as kinesthetic learners and were willing to participate in the focus group received an email from one of the researchers that included the specifics of the upcoming focus group and the confirmation of the student's participation. A 15-minute focus group was conducted in a live environment within a private room with closed doors, where participants complied with the proper precautions and guidelines put forth by the CDC and the university related to COVID-19. The policy included health screenings, temperature checks, use of masks, conforming to social distancing regulations, and following sanitation procedures for the environment.

An additional two researchers acted as scribes and documented participants' audible, emotional, and physical responses throughout the focus group session and made note of the assigned random number as an identifier. One researcher transcribed verbatim the audio recording. The remaining researchers listened to the audio recording and reviewed the transcription for confirmation of transcription accuracy. Upon completion of the transcription review, the recordings were deleted. All data kept as paper copies will be maintained for three years and stored in a locked room at the university.

Data Analysis

Quantitative

At the close of the survey, researchers gathered the Microsoft Forms data that summarized survey results. Descriptive statistics were used to analyze demographic information. Results of the Likert scale statements were analyzed using mean and standard deviation to analyze collective tendencies of the sample population.

Qualitative

Prior to review of qualitative data, researchers identified potential themes based on anticipated data observed during the focus group. These potential themes were then revised based upon the subsequent review of the transcript. All researchers independently coded the qualitative data using an online document of the transcription through use of thematic analysis. Individual data analyses were compared between all researchers and a consensus was met for finalized themes, which are reported in the results below.

Results

Quantitative

Analysis of survey results began upon closure of the survey link. Frequencies of demographic data were calculated and all participants reported holding a bachelor's degree. Of 26 survey responses, 73% (n=19) of students self-identified as kinesthetic learners. Of those 19 responses, 37% (n=7) were between ages 24-26 and the remaining 63% (n=12) of participants between ages 21-23. All subsequent data reflects that of subjects who self-identified as kinesthetic learners.

Data regarding student perceptions of e-learning experiences is displayed in Table 2 categorized with mean and standard deviation. Survey statements were split into four categories regarding a) virtual lectures during e-learning, b) studying during e-learning, c) group projects during e-learning, and d) labs during e-learning. Participants had the most agreement with Statement 1 of the survey, with a mean response of 3.74 (±0.733). Participants reported the lowest Likert rating regarding labs during e-learning. The section of the survey in which participants had lowest Likert rating, majority of participants either choosing disagree or strongly disagree, was labs during e-learning. Statement 9 of the survey, had a mean response of 2.21 (± 0.918) with 73.7% of participants disagreeing or strongly disagreeing with the statement. The responses ranged between 2.79 and 3.51 for the other two sections of the survey, studying and group projects during e-learning.

Table 2

Kinesthetic Learner Perception of Transition from In-Person Instruction to E-learning Due to the COVID-19 Pandemic

Statements	Mean	Standard Deviation
Virtual Lectures During E-learning		
1. I was able to comprehend the content presented during virtual lecture.	3.74	0.733
2. I was engaged in learning during virtual lecture.	2.88	1.00
3. Based on my personal learning style, I was able to engage in learning during the virtual lectures.	2.74	1.10
Studying During E-learning		
4. I used studying methods tailored to my learning style during e-learning.	3.26	1.05
5. I was able to recall content I learned from virtual lectures during e-learning activities (i.e. case studies, practicals).	2.79	1.03
6. Based on the content I absorbed during virtual lectures, I felt confident in my test scores.	2.79	1.13
Group Projects During E-learning		
7. I felt confident participating in virtual group meetings with the members of my various groups.	3.26	1.05
8. I felt my group was productive in completing assignments when meeting virtually.	3.53	0.905
Labs During E-learning		
9. Based on my personal learning style, I was able to comprehend the concepts presented during virtual lab instruction.	2.21	0.918
10. I am confident in my ability to perform the clinical concepts presented during virtual lab instruction for future clinical practice.	2.00	0.943

Qualitative

Following the finalization of the themes, researchers interpreted and categorized perceptions of the transition to e-learning among graduate students. Four themes were determined to encompass both common and individual experiences explained throughout the focus group: Advantages of E-learning, Disadvantages of E-learning, Adaptability to E-learning, and External Factors. Subthemes were included within many of the themes to further emphasize commonalities among the collected data. A summary of themes and subthemes is provided in Table 3.

Table 3

Kinesthetic Learners Perspective of E-Learning Focus Group

Themes	Subthemes	Significant Statements
Advantages		"[Professors] did a great job of giving us a lot of resources and describing how to [activities]." "I do like however, that we did have more time...we could take as much time as we needed." "I feel like I got, in some ways, a better experience at home where I was able to spend more time doing it."
Disadvantages	Feelings	"There was a lot of uncertainty and I just wasn't sure how things were gonna run." "I think [I was] anxious about the unknowns of...things concerning just how classes would be run...how labs would be run."
	Perceptions	"Some [professors] ended up having to add more work because we were missing out on some of like the original assignments… made it more stressful." "[E-learning] didn't meet what I needed in the sense of the hands-on learning."
Adaptability to E-learning		"I did a lot of drawing and repeating the drawings over and over to try to get them in my mind." "I did speak out loud as if I was trying to teach it to somebody else." "It would've been nice if they could have just also recorded [virtual lectures] and sent it out." "I was able to take one of my bedrooms and make it an office."
External Factors	Social Distractions	"My mom kissed me on the forehead during class."
	Environmental Distractions	"People were mowing the lawn right by the window or kids in the neighbor's yard were playing." "I did stay in my environment where I lived during on-campus classes."

Triangulation of Data
The convergence of qualitative and quantitative data provided insight into kinesthetic learners' transition to e-learning. Data collection also examined engagement in e-learning. The average rating for Statement 3 was 2.74 (±1.10). Based on data collected, 74% of participants who answered chose neutral, disagree, or strongly disagree. Participants reported poor engagement in e-learning as " all [the] lectures were online, well I can just turn off my camera and…really not pay attention at all," (p. 3, lines 80-81); the qualitative data supported the quantitative findings. With convergence of the data, participants reported poor engagement in e-learning and confidence levels.

The mean score for Statement 4 was 3.26 (±1.05) indicating neutrality about kinesthetic learning. During the focus group, one participant stated, "I didn't use kinesthetic learning whenever I was at home" (p. 5, line 176). Data indicated kinesthetic learners did not report major positive advantages with the switch to e-learning.

Quantitative data showed participants lacked confidence in lab abilities. The average response for Statement 10 was 2.00 with a standard deviation of ±0.943. Of the 19 participants who answered this question, 15 selected "disagree" or "strongly disagree." Qualitative data supplied a complementary perspective on the underlying meaning of this trend. One participant said, "For our competency…I memorized it, but if I was to go out there and try to do it right now I'd have no clue what I'm doing" (p. 5, lines 201-203). This statement further indicates poor confidence levels in lab application.

Discussion

Advantages to E-learning
The theme of advantages of e-learning considered the participant's responses related to the positive experiences of e-learning and supports that benefited participants in the transition to e-learning. "[I] found my family sometimes they would hurt but sometimes they would help cause sometimes they would [ask] don't you have homework to do today" (p. 3, lines 93-94). Participants found reminders from family and friends to be a support in the transition to e-learning.

Based on student perceptions collected from current literature, a disadvantage reported in using e-learning methods was the lack of access to tutors and other peers to meet and collaborate on course content (Elango et al., 2008). When asked about the use of breakout rooms to facilitate class discussion, participants found smaller group discussions to be an advantage of e-learning, "[I] felt more intimidated speaking in front of like the whole class versus like a breakout room" (p.6, line 216). The findings concurred with Elango et al. (2008), which reported the use of breakout rooms during e-learning allowed for increased confidence in peer collaboration.

Stated advantages related to virtual labs included "more time" and "less social distractions" compared to in-person labs. Current literature reported e-learning and courses offered online were more interactive in nature than traditional in-person instruction (Elango et al., 2008). With virtual labs, professors were available throughout

designated lecture time and additional time following lecture to answer questions at the students' convenience. This provided students easier access to professor support and interaction, compared to in-person instruction.

Participants generally had a more positive view of studying during the transition to e-learning. Quantitative data supported the finding that participants could tailor studying to reflect the kinesthetic learning style. These results reflected positive perceptions through participants stating they studied by drawing out concepts and verbally talking through concepts as if teaching someone else.

Elango and colleagues (2008) suggested that interaction in the classroom can occur for longer periods which allows students who learn at a slower pace to actively engage in class. For some courses, the lectures were pre-recorded and sent out to students prior to scheduled class time. Some participants reported a fondness for "having the recorded thing [so] I can rewind it if I zone out for a minute" (p. 4, line 151). Participants found pre-recorded lectures to be an advantage of e-learning as the viewing of lectures were self-paced, and the lecture could be accessed later for studying.

Disadvantages to E-Learning
During analysis, kinesthetic learners identified a variety of disadvantages to e-learning. Common patterns and subthemes emerged, such as loss of "hands-on" learning, less in-person interactions with peers and professors, and negative feelings and perceptions towards e-learning. Negative feelings included "uncertainty," "very anxious," and "overwhelmed." The perceptions of e-learning described as "challenging" or "hard" were the most repetitive words associated with disadvantages of e-learning, possibly showing how difficult the transition to e-learning was for kinesthetic learners. In a research study done by Harrison et al. (2017), survey responses indicated that educators did not expect students to recognize the potential benefits of e-learning regarding overall educational experience. Due to pre-conceived notions of the challenges associated with e-learning, students could not recognize the potential benefits that online instruction could yield. Data suggested that the transition to e-learning was difficult for many students as one participant stated, "This time was really challenging... some people were going through stuff that... really affected their motivation and stress levels" (p. 4, lines 131-132). This statement demonstrated the transition to e-learning in conjunction with the rising pandemic with increased difficulty and stress levels for participants.

Although 73% of participants identified as kinesthetic learners, the sample population felt this learning style was not well integrated into e-learning during virtual lectures, with a mean of 2.74 (±1.10). Additionally, participants reported not engaging in virtual lectures as well as in-person instruction prior to COVID-19. Wood and Sereni-Massinger (2016) stated kinesthetic learners viewed e-learning as a non-interactive barrier, blocking engagement. The survey results reflected that the participants viewed e-learning as a non-interactive barrier to engagement with a mean response to engagement of 2.88 (±1.00).

Participants in the focus group mentioned the ability to learn and become competent in lab activities, such as the use of physical agent modalities (PAMs) decreased. When talking about PAMs, a participant mentioned "if I was to go out there and try to do it right now, I'd have no clue what I'm doing" (p. 5, lines 202-203). Kinesthetic learners struggled with the application aspect as the participants did not have the repetitive hands-on approach required to learn specific techniques. This conclusion supported the findings of past literature presented in the *Montessori Method* regarding muscle memory (Rusinko, 2011). Kinesthetic learners may benefit from in person practice, such as PAMS, to feel competent in recalling information for use of modalities during future practice.

When reviewing labs during e-learning, participants conveyed a negative perception towards learning style-based comprehension of lab topics and confidence in clinical concept performance. Participants reported not being able to comprehend these concepts in relation to course material, 2.21 (±0.918), and less confidence in the ability to apply concepts from virtual labs to future practice, 2.00 (±0.943). With the emphasis of kinesthetic skills within the field of OT, data suggested participants were unable to translate lab concepts without "hands-on" experiences.

Adaptability to E-learning
Participants within the focus group emphasized the importance of introducing new techniques to enhance educational performance and ensure productivity and competence through the learning environment. "[I] eventually ended up getting a desk to put in my room and then I had like a study area in my room" (p. 2, lines 45-46). The participants found benefits in securing a quiet, structured area within the quarantined environment which was dedicated solely to the educational experience. "I bought a white board...and then I hung it to the wall so I could like implement [it to] study" (p. 4, line 124). The transition to e-learning allowed participants to address the need to combine old and new strategies to compensate for kinesthetic tendencies. "I didn't use kinesthetic learning whenever I was at home" (p. 5, line 176). The participants of the study were forced to "strengthen other ways of learning" or explored other study methods that fulfilled what they needed in regard to hands on learning (p. 5, lines 178-180). Many were able to incorporate visual, auditory, and read/write learning strategies throughout the e-learning portion of the semester to facilitate their learning experience. However, according to Othman and Amiruddin (2010), this could be maladaptive as "educators may need to adapt learning and teaching environments when transitioning to e-learning." Students are not expected to change learning styles to accommodate for the class, as the class itself should allow for the inclusion of all learning styles and accommodate for each equally.

Adaptability, in which the student is held accountable for initiating a change to support a conducive learning environment is only limited to programs' capability of supporting the modification (Surjono, 2011). The participants' perspectives suggested limited adaptability for kinesthetic learning in a virtual environment due to the need "to find other ways to [incorporate hands on learning]" (p. 5, line 181). However, participants found ways to accommodate for kinesthetic learning to understand the presented

material by "record[ing] [themselves] teaching…drawing out things" and "to physically imagine placing [PAMs and other lab techniques] on [themselves]"(p. 5, lines 185-187). The participants found difficulty in transitioning to online education after previously relying on "experience-based modalities and referred hands-on labs and simulations" (Surjono, 2011). During group projects, participants reported confidence in participation abilities in virtual group meetings, with a mean of 3.26 (±1.05), as well as felt the group was productive during meetings, with a mean of 3.35 (±0.905). The adaptability of e-learning was able to facilitate productive collaboration between group members.

These findings emphasize a need for adapting an online program to allow for accommodations for kinesthetic e-learners mandated to transition to an online format. Utilization of an adaptive online program would allow kinesthetic learners to depend less on accommodation and allow more time for education and application of hands-on strategies.

External Factors: Social and Environmental Distractions
A major aspect of switching to e-learning was the environmental conditions that changed; instead of attending live, in-person lectures, lectures were online within each student's personal environment. The suspension of in-person classes in conjunction with the stay at home orders in place, limited students' ability to change their learning environment.

Students stated when attending virtual lectures, they would stay in bed, resulting in difficulty focusing on course content. One participant stated, "It was just easy for me to turn off my camera and go do other things during the lectures" (p. 3, lines 82-83). Participants expressed that environmental distractions related to quarantining with family members such as prioritizing socializing over studying had a negative effect on participants' learning. Environmental distractions were a common concern as many students found temptation completing tasks outside the scope of lectures which may have led to disengagement in presented course materials.

Implications for Occupational Therapy Education
Participants provided suggestions and recommendations for future e-learning experiences similar to previous literature. Some participants appreciated when instructors provided, "pre-recorded or more self-paced," materials but also would have preferred instructors "have live [virtual] class, recorded it and sent it out on [the learning management system]" (p. 4, lines 152-153). Given the circumstances, participants hoped that instructors could have been more, "understanding of what [they were] going through and how challenging everything was" (p. 4, lines 129-130), during the pandemic and e-learning transition. Levels of stress and motivation varied across focus group participants and some felt that they, "just needed grace" (p. 4, line 134), regarding the amount and depth of classwork. The participants suggested that instructors verbalize their understanding that kinesthetic learners may struggle with online learning, allow more time to submit assignments, and provide complete demonstrations through recorded lectures when possible. According to Brown and colleagues (2009), e-learning is designed to be a flexible experience and used as a new way of teaching, therefore,

participant suggestions may be able to be implemented in the future when using e-learning. Some of these suggestions may enable a balance between the students, instructors, and learning management system, which can all interact to enhance a successful learning experience.

Future implications for the study include the successful facilitation and implementation of e-learning programs for students enrolled in OTD programs. Evaluating different contributing factors to successful e-learning can increase the learning outcomes and satisfaction of students participating in e-learning OTD programs. Additionally, exploration of student perceptions on e-learning can assist OT program educators in adapting e-learning programs to meet students' needs and create an engaging and effective e-learning environment. When implementing e-learning programs, the learning styles of OT students should be identified to assist in adapting strategies to meet the needs of a variety of students enrolled in OTD programs. Graduate-level OT students may also learn to implement these strategies into work as clinicians or future educators.

Limitations
The response rate of the survey represented a small percentage of OTD students from a university within the Midwest, which limits generalizability (Elango et al., 2008; Willems, 2011). A primary limitation of the survey instrument was that researchers did not pilot the instrument or employ validity and reliability testing. The focus group responses were not as extensive or tailored to a kinesthetic learning perspective as expected. In addition, participants may have been more inclined to share in-depth perspectives had there been more than 15 minutes allotted to the focus group. In-depth individual interviews may have been beneficial in place of the focus group to allow for elaboration and extended interview time (Rahiminia et al., 2017). Researchers did not address the learning management system used for the e-learning experience. Elango and colleagues (2008) found that the learning management system in use with their participants was useful, therefore, it could be addressed in future research regarding kinesthetic learners.

Implications for Future Research
Areas to expand this study may start with increasing the sample size; the inclusion of a greater sample size, from more than one cohort can increase generalizability (Castelejin et al., 2010). A follow-up study may be completed with the original cohort of students to assess grade point average at the time of the study compared with that of previous cohorts of students. Although 73% of study participants self-defined as kinesthetic learners, it is common for students to present with preferences of more than one style (James et al., 2011). Further research may also include focus groups separated by learning styles to determine the most valuable instructional methods for each style. Researchers could also compare e-learning experiences of students who identify with the other three learning styles. Reliability and validity testing of our survey instrument is also indicated for future research which is supported by Elango and colleagues (2008). As educational programs have transitioned more of their curriculum to online formats, educators should be aware of the learning preferences of their students to ensure successful content delivery.

Conclusion

The purpose of the study was to explore how OTD students as kinesthetic learners perceived the transition to e-learning due to COVID-19 and to understand what adaptations the students employed to succeed academically. Kinesthetic learners revealed decreased levels of confidence in the content learned during e-learning but acknowledged they made the necessary changes to enable their own learning. Students acknowledged that instructors implemented changes in many courses to facilitate e-learning, but also felt that instructors could have provided additional support for the students academically to become competent in clinical skills required for future practice.

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