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Promoting Action Observation in Stroke Rehabilitation by Facilitating Knowledge Translation

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Promoting Action Observation in Stroke Rehabilitation by Facilitating Knowledge Translation

by

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CAPSTONE FINAL PAPER APPROVAL FORM

The Capstone Final Paper is the final product that the OTD students need to complete to report his/her Capstone Project and his/her Capstone Experience.

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We, the undersigned, recommend that the Capstone Final Paper completed by the student listed above, in partial fulfillment of the degree requirements, be accepted by Georgia State University.

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Abstract

Occupational therapists can improve stroke survivors' hand and arm movement and participation in daily activities through action observation (AO). AO involves watching another person's hand or arm complete a movement or task. While research supports the use of AO with stroke survivors, there is a delay in applying the information from AO research studies to stroke rehabilitation. Also, limited AO videos are available to occupational therapists which makes applying AO challenging. The purpose of this capstone project was to increase awareness of AO and access to AO videos for stroke survivors, occupational therapists, and researchers. Collaboration with experts on AO and stroke rehabilitation was used to guide the development of over 400 AO videos that were uploaded to YouTube for stroke survivors at an outpatient clinic. Educational materials about AO were created and given to the occupational therapists and stroke survivors at the outpatient clinic. The AO videos were also delivered to researchers from Georgia State University and the Georgia Institute of Technology to be used in future research endeavors. The AO resources developed in this project will help increase the use of AO in stroke rehabilitation and be used by researchers to better understand the mechanisms of AO and create better guidelines for applying AO.

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Summary Pages

Background. Action observation (AO) is a relatively new intervention used by occupational therapists for hand and upper extremity rehabilitation to facilitate motor recovery for stroke survivors (Buchignani et al., 2019; Braun et al., 2013; Borges et al., 2022). AO facilitates neuroplasticity by rearranging partially damaged motor circuits and promotes motor learning to improve stroke survivors' upper limb function (Borges et al., 2022; Franceschini et al., 2022; Yu & Park, 2022). AO is also a useful rehabilitative tool as demonstrated by multiple studies concluding AO can enhance engagement in various occupations (Yu & Park, 2022; Goldberg & Nilsen, 2020; Shamili et al. 2022).

Existing Problem. Current literature indicated that there were several issues related to implementing AO into clinical practice. For instance, there was a lack of clear intervention protocols, high heterogeneity in how AO is implemented with stroke survivors, and a lack of understanding about which clients are appropriate for this intervention (Franceschini et al., 2022; Ietswaart et al., 2015). There was also a need for further understanding of the mechanisms for this intervention (Zhang et al., 2019). If clinicians have conceptual confusion about AO and its methods and lack guidance on how to implement this into clinical practice, it can lead to underutilization of AO in clinical practice (Ietswaart et al., 2015). To increase clinician utilization of AO, more clarity on the fundamentals and benefits of AO and easier access to AO videos are needed (Ietswaart et al., 2015).

Purpose and Specific Aims. The purpose of this capstone project was to facilitate knowledge translation (KT) for AO to increase the use of this intervention in stroke rehabilitation and future research endeavors. Specific aims were to: 1) create AO videos to help facilitate the

use of AO in clinical practice and research; 2) deliver educational resources about AO to occupational therapists by amassing existing literature.

Outputs and Outcomes. The immediate products of this capstone project included a YouTube channel with over 400 AO videos, an educational handout about AO for stroke survivors and caregivers, a video presentation about AO for stroke survivors and caregivers, and a video presentation about AO for occupational therapists at Rehab Without Walls (RWW) in Lawrenceville, Georgia. The content of the AO videos on the YouTube channel ranged from simple exercises to daily activities. The YouTube channel was provided to occupational therapists, clients, and caregivers from RWW to be used for stroke rehabilitation. The AO videos were also delivered to researchers from Georgia State University and the Georgia Institute of Technology to be used in future research endeavors. The educational handout and video presentation about AO were provided to stroke survivors and caregivers to increase their understanding of this intervention and promote the use of AO at home. The video presentation for occupational therapists at RWW reviewed the evidence for AO and available AO resources to promote KT and facilitate increased utilization of this intervention with stroke survivors. In the long term, the AO videos and educational resources are expected to improve the upper limb function and independence of stroke survivors and be used in future research at Georgia State University and the Georgia Institute of Technology to better understand the mechanisms of AO and create clearer protocols for AO.

CHAPTER 1

Literature Review

Each year in the United States, over 795,000 individuals have a stroke, most of which are first or new strokes (Centers for Disease Control and Prevention, 2022). Following a cerebrovascular accident, stroke survivors often require caregiving because stroke is a primary cause of long-term disability (Mack & Hildebrand, 2023). Strokes can significantly impair an individual's body structures and body functions which can affect a person's motor control, sensation, and proprioception (Raghavan, 2015). Nearly 80% of stroke survivors have a motor impairment, with upper limb impairments leading to more functional deficits than lower limb impairments since upper limbs are involved in many daily activities (Pollock et al., 2014; Raghavan, 2015). Also, upper limb impairments can result in learned nonuse, which is when a stroke survivor learns to stop using their affected upper limb because it is easier to use their unaffected upper limb (Raghavan, 2015). Limited use of the affected upper limb can contribute to soft tissue changes and complications such as pain and contractures (Raghavan, 2015). It is important to address upper limb impairments in stroke rehabilitation, given they can lead to physiological changes and hinder participation in daily activities (Raghavan, 2015; Pollock et al., 2014).

Action observation (AO) is one relatively new intervention used by occupational therapists for hand and upper extremity rehabilitation to facilitate motor recovery for stroke survivors (Buchignani et al., 2019; Braun et al., 2013; Borges et al., 2022). AO involves viewing video recordings or in-person demonstrations of meaningful, goal-directed actions to stimulate the mirror neuron system (MNS; Kim et al., 2017; Buchignani et al., 2019). During AO, clients are instructed to closely watch the actions of healthy individuals and then attempt to replicate

those actions to the best of their abilities (Peng et al., 2019; Zhang et al., 2023). Actively practicing the actions shown in AO videos is known as action execution (AE).

The discovery of AO began in the 1990s when researchers studying monkeys discovered a group of neurons in the premotor cortex that could be activated through both observation of a movement and motor execution of the same movement (Cengiz et al., 2018). This group of neurons was coined the MNS (Cengiz et al., 2018). Further research determined that humans also have an MNS that can be activated by observing movements, even in the absence of movement (Cengiz et al., 2018; Goldberg & Nilsen, 2020). The MNS has four key features: it is purposeful, context-dependent, experience-based, and multisensory (Shamili et al., 2022). The discovery of the MNS led to investigations in AO as an intervention to promote motor learning and enhance motor performance for various populations including individuals with stroke, cerebral palsy, Alzheimer's disease, and Parkinson's disease (Buchignani et al., 2019; Kim et al., 2017).

AO has been found to activate "a bilateral premotor, parietal, and sensorimotor network" in the brain which "might facilitate movement execution and motor learning by facilitating the excitability of the motor system" (Borges et al., 2022, p. 5). Observing functional tasks in AO videos appears to stimulate the MNS more than simple actions because functional activities better reflect the four key features of the MNS (Shamili et al., 2022). Further, the effectiveness of AO is enhanced when the observer is able to hear the sounds of the actions being performed in the videos and when the tasks in the videos are broken into individual components, e.g., separating the task of drinking into multiple videos like pouring, reaching, and bringing the drink to mouth (Mancuso et al., 2021).

Stroke survivors with different levels of upper limb impairments can benefit from AO (Mancuso et al., 2021). AO is an appropriate intervention for stroke survivors because it

promotes neuroplasticity by rearranging partially damaged motor circuits and does not require movement of a paretic upper limb (Borges et al., 2022; Franceschini et al., 2022; Craighero et al., 2023). Upper limb impairments after stroke can include long-lasting motor dysfunction and limited voluntary movement of the upper limb, and stroke survivors with these impairments must relearn motor skills or acquire new motor skills for improved upper limb performance (Zhang et al., 2019; Borges et al., 2022). By facilitating neuroplasticity through the activation of damaged motor circuits, AO can promote motor learning and recruit the motor system to improve stroke survivors' upper limb function, even if they are unable to perform the observed tasks with their upper limbs (Yu & Park, 2022; Mancuso et al., 2021; Craighero et al., 2023).

Although AO can be beneficial for stroke survivors with varying degrees of impairment, the AE phase may be challenging for those with severe impairments who have little to no upper limb movement (Mancuso et al., 2021; Rungsirisilp et al., 2023). Some studies have used mental imagery (MI) with AO in place of AE (Rungsirisilp et al., 2023; Binks et al., 2023). MI is performed by mentally rehearsing an action, practicing an action in one's mind without attempting to physically perform the action (Rungsirisilp et al., 2023). Using MI with AO involves simultaneously imagining oneself performing the AO tasks while watching the AO videos (Rungsirisilp et al., 2023; Binks et al., 2023). This allows stroke survivors with severe upper limb impairments to mentally practice the AO tasks rather than physically practice the AO tasks. Combining MI with AO can result in motor improvement, "cortical excitation of the affected sensorimotor hand region," and improved upper limb function (Rungsirisilp et al., 2023, p. 4940). Moreover, using AO and MI together "activates motor execution-related brain regions more effectively than either technique alone" (Rungsirisilp et al., 2023, p. 4932).

While AO is utilized to promote neuroplasticity for stroke survivors with mild to severe impairments, there is currently mixed evidence regarding the effectiveness of AO for stroke survivors. The most recent Cochrane Review on AO revealed that this intervention can lead to improved upper limb motor function for stroke survivors (Borges et al., 2022). While AO was shown to have a large effect on hand function, AO had a small effect on arm function (Borges et al., 2022). The Cochrane Review also indicated that the certainty of current evidence was very low to low, leading to limited confidence in the effect estimates (Borges et al., 2022). At the time of publication for the Cochrane Review, four other systematic reviews on the effects of AO for stroke survivors had been published (Borges et al., 2022). Overall, the results of these systematic reviews aligned with the conclusions of the Cochrane Review, but Peng et al. (2019) found that the effect size of AO on arm function was larger than that of the Cochrane Review, and Ryan et al. (2021) found stronger evidence for AO compared to the Cochrane Review. Despite the few differences among these systematic reviews and the limited certainty of current evidence, these studies demonstrated that AO does not have adverse effects, is inexpensive, and can improve upper limb function, so it can be considered a useful occupational therapy intervention for stroke survivors (Borges et al., 2022).

Like the mixed evidence about the effects of AO on upper limb motor function, there is also conflicting evidence regarding the effects of AO on activities of daily living (ADLs). The latest Cochrane Review showed there was no effect of AO on ADL performance for stroke survivors compared to the control groups (Borges et al., 2022). In contrast, multiple other studies have found that AO may enhance engagement in various occupations. Yu & Park (2022) found AO can lead to improvements in ADL performance, with greater improvements when AO videos were shown from a first-person perspective. They reported significant differences in ADL

performance before and after AO for personal hygiene, feeding, toilet transfers, and dressing (Yu & Park, 2022). Goldberg & Nilsen (2020) conducted a systematic review that also concluded that AO can significantly improve ADL performance. A randomized clinical trial by Shamili et al. (2022) found that using meaningful activities for AO can improve cortical excitation, actual task performance, and perceived performance and satisfaction of meaningful occupations. This is because using tasks and activities selected by and meaningful to stroke survivors likely leads to more intrinsic motivation and volition during AO sessions and improved occupational performance (Shamili et al., 2022). In a meta-analysis by Peng et al. (2019), AO had a moderate to large effect size on ADL outcomes, likely because the analyzed videos included goal-directed and functional activities. Additionally, Mancuso et al. (2021) reported AO resulted in clinically meaningful improvements in functional outcomes for stroke survivors which could lead to increased independence in daily activities. Due to the discrepancies among existing literature, more research is needed to better understand the impact of AO on occupational performance.

Several issues related to implementing AO into clinical practice are present in the literature. For instance, there is a lack of clear intervention protocols for AO, high heterogeneity in how AO is implemented with stroke survivors, and a lack of understanding about which clients are appropriate for this intervention (Franceschini et al., 2022; Ietswaart et al., 2015; Peng et al., 2019). There is also a need for further understanding of the mechanisms for this intervention (Zhang et al., 2019). If clinicians have conceptual confusion about AO and its methods and lack guidance on how to implement this into clinical practice, it can lead to underutilization of AO in clinical practice (Ietswaart et al., 2015). Clarity on the fundamentals and benefits of AO is needed to promote clinician utilization (Ietswaart et al., 2015).

To clarify the protocol for implementing AO in stroke rehabilitation, Zhang et al. (2023) recently conducted a systematic review addressing confusion surrounding its clinical application. By reviewing 29 studies, Zhang et al. (2023) provided valuable insights on how to implement AO with stroke survivors. They found that a majority of studies on AO for stroke survivors used short video lengths for the AO intervention, typically a few minutes long, and provided the stroke survivors with rest in between watching the videos. Also, stroke survivors who began AO more than a month after stroke onset had better outcomes and required fewer weeks of intervention to achieve significant differences in outcome measures than those who began the intervention less than one month after stroke onset. Consequently, Zhang et al. (2023) recommended starting AO at least 23 days after stroke onset. Further, they determined that AO should be performed for 30-40 minutes in a single session to account for stroke survivors' limited attention and still achieve effective results. Finally, although Zhang et al. (2023) was unable to determine the optimal duration for implementing AO based on the literature, it was suggested that stroke survivors should perform AO at least three to five times a week for a minimum of four weeks.

Zhang et al. (2023) helped create a more defined protocol for AO for stroke survivors. However, this study was published less than a year ago, and it is likely that the findings have not yet been implemented in clinical settings due to overall delays in applying current evidence to stroke rehabilitation (Bayley et al., 2012; Juckett et al., 2020). In fact, Juckett et al. (2020) stated there is a 17-year lag in implementing research into clinical practice for healthcare settings. Therefore, based on current problems listed in the literature, including the lack of clarity for AO delivery and dosage, it appears there is a lack of knowledge translation (KT) for AO and hesitation to use AO in clinical practice (Ietswaart et al., 2015).

KT can be defined as "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve health, provide more effective health services and products, and strengthen the health care system" (Straus et al., 2009, p. 165). KT leads to the use of knowledge in clinical practice after knowledge is created through research studies and disseminated (Straus et al., 2009). KT targets stakeholders beyond just healthcare professionals, such as patients and policymakers (Straus et al., 2009). Two forms of KT are end-of-grant KT and integrated KT (Barwick et al., 2020). End-of-grant KT involves a one-way process where stakeholders have limited involvement in knowledge creation, while integrated KT involves a collaborative process between knowledge producers and stakeholders throughout all stages of knowledge creation and translation (Barwick et al., 2020). Integrated KT aims to create research that is more pertinent to stakeholders than end-of-grant KT (Canadian Institutes of Health Research, 2015). Effective KT is critical in healthcare because inadequate KT can lead to a lack of evidence-based practice causing healthcare professionals to provide suboptimal care and use ineffective methods (Straus et al., 2009; Graham et al., 2006).

Although research supports many occupational therapy interventions for stroke rehabilitation, including AO, translating research to occupational therapy practice continues to be a challenge (Walker et al., 2013). In general, occupational therapists do not fully incorporate recent research into intervention sessions for stroke survivors (Bayley et al., 2012). One barrier to evidence-based practice is a lack of time for occupational therapists to find and read articles and determine how to implement research into clinical practice (University of Pittsburgh, n.d.; Lindström & Bernhardsson, 2018). Another obstacle is accessibility to resources such as scholarly magazines, journals, and databases (University of Pittsburgh, n.d; Lindström &

Bernhardsson, 2018). Some occupational therapists have poor confidence in their research skills or lack research skills, leading to difficulty understanding and implementing research into intervention sessions (University of Pittsburgh, n.d; Lindström & Bernhardsson, 2018). Also, occupational therapists have difficulty implementing evidence-based practices due to the costs of interventions, logistical challenges, and insufficient access to equipment and resources (Juckett et al., 2020).

A delay in KT limits patient outcomes and hinders evidence-based practice (Bayley et al., 2012). The delay between research dissemination and implementation of research into clinical practice for stroke rehabilitation needs to be reduced, especially as the number of individuals with stroke increases. Therefore, this capstone project aimed to answer the following PICO question: "To what extent can KT (I) increase the utilization of AO for hand and upper extremity rehabilitation (O) for stroke survivors (P)?" The purpose of this capstone project was to facilitate KT for AO to increase the use of this intervention in stroke rehabilitation and future research endeavors. The focus of this capstone project was to create AO videos and educational resources about AO to deliver to occupational therapy practitioners and researchers.

CHAPTER 2

Needs Assessment

Informal Interview with Rehab Without Walls Stakeholder

The objective of this interview was to determine if and how AO is currently being used at Rehab Without Walls (RWW), an outpatient neurological rehabilitation clinic. An informal interview was completed with Madison Compton. Madison is one of the site mentors for this capstone project and is an occupational therapist at RWW. Madison revealed that at RWW, the current use of AO with videos is limited. She explained that it is challenging to find suitable videos of functional tasks to use for AO (e.g., toothbrushing). Rather, clients with paresis and motor planning deficits at RWW primarily engage in AO by observing their non-affected side complete a task and then attempting to simulate the task using the affected side. This interview revealed that occupational therapists at RWW currently have difficulty implementing AO due to a lack of access to AO resources, demonstrating the need for more AO videos. Madison stated she especially needs AO videos that demonstrate functional activities that are age-appropriate for adults since many functional videos online, such as shoe-tying and buttoning, are tailored to children and therefore are not suitable for the clients at RWW.

Semi-Structured Interviews with AO Experts

A second interview was conducted in person with Dr. Veronica Rowe, a professor of Occupational Therapy at Georgia State University and the second site mentor for this project. Dr. Rowe has experience in stroke rehabilitation practice and research and AO research. The purpose of this interview was to determine the need for AO videos for research purposes. Through a semi-structured interview, Dr. Rowe revealed she plans to perform a grant-funded research study

on AO to better understand AO and the mechanisms behind the action with varying levels of stroke severity. For this study, she indicated that she needs a variety of AO videos to be created to use with participants. Since Dr. Rowe plans to use a protocol from Franceschini et al. (2022) in her study, she needed AO videos to include tasks from the three categories used in the protocol by Franceschini et al. (2022). These categories were non-finalized actions, non-functional finalized actions, and functional finalized actions. Non-finalized actions include upper limb movement without a specific goal. Non-functional finalized actions involve moving simple objects. Functional finalized actions include dynamic actions of reach, grasp, and lift for ADLs. Dr. Rowe also needed AO videos that displayed tasks from the Functional Test for the Hemiplegic Upper Extremity (FTHUE) because these tasks will be used as part of the intervention in her study.

Following the interview with Dr. Rowe, I needed further clarification about the types of AO videos that would be most effective with stroke survivors for clinical and research use since the literature review revealed there are discrepancies and ambiguity in the types of AO videos used in current literature. Thus, a third interview was completed with Dr. Lewis A. Wheaton, a professor of Biological Science at Georgia Institute of Technology, because he has conducted research on AO related to prosthetics training and stroke recovery. The objective of this interview was to gather information to inform the protocol for filming the AO videos for this capstone project.

During the semi-structured interview with Dr. Wheaton, the types of camera angles for AO videos were discussed. While a first-person perspective for AO videos is typically recommended in current literature, he mentioned a first-person perspective in the AO videos can obstruct the view of the entire arm and not allow a gazing process to occur. Dr. Wheaton has

investigated the gaze patterns of individuals watching AO videos and discovered that when people watch a video of the same action repeatedly, their gaze travels up the arm (i.e., from the fingers/hand to the shoulder) with additional trials. Only filming in first-person would not allow a stroke survivor's gaze to travel from the hand towards the elbow and shoulder upon subsequent viewings of the videos. Dr. Wheaton also stated using a third-person perspective is appropriate for AO videos because people's brains are accustomed to observing the actions of others sitting across from them. This discussion revealed filming AO videos from both first-person and third-person perspectives would be appropriate for this capstone project.

Another topic discussed with Dr. Wheaton was the length of each AO video. Dr. Wheaton mentioned there is a lack of empirical evidence defining the ideal length for AO videos, but AO videos for stroke survivors should probably be between 20-30 seconds to sustain their attention to the videos. Also, Dr. Wheaton provided insights about the types of individuals that should be featured in the AO videos. While his research has not evaluated the effects of physical attributes on the effectiveness of AO, he believed matching perceived factors of a stroke survivor, such as age and race, to an individual featured in the AO videos could likely impact the effectiveness of AO. However, matching the physical attributes of stroke survivors to the individuals in the AO video seems to be more important when filming from a first-person perspective because it is more immersive. Therefore, he concluded that representing various physical attributes may be a significant factor to consider when recruiting individuals to be in the AO videos.

Moreover, Dr. Wheaton discussed the importance of hand dominance in AO videos because hand dominance can affect how people perform tasks with their upper limbs. He recommended including both left-handed and right-handed individuals in the AO videos to make

the videos relevant for stroke survivors with either hand dominance. Finally, at the end of the interview, Dr. Wheaton suggested that when the videos are completed, they could be rated on a scale of perceived difficulty and visual complexity to reveal if some of the AO videos are too visually complicated to be used in future research or clinical practice.

Overall, the needs assessment interviews with Madison Compton and Dr. Rowe revealed that there was a need for AO videos for clinical and research purposes. Dr. Wheaton then provided suggestions for planning and filming AO videos to guide the development of effective AO videos for this capstone project.

CHAPTER 3

Capstone Experience Protocol

Project Focus Areas

The project focus areas of this capstone project were clinical practice skills and research skills. The long-term objectives related to increasing my clinical practice skills included:

1. The student will obtain advanced clinical knowledge of occupational therapy assessments and interventions that can be used to improve the occupational performance of patients with neurological conditions.
2. The student will promote knowledge translation for AO as an intervention for stroke survivors.

To advance my clinical practice skills throughout this project, learning activities included completing continuing education courses, participating in a virtual internship for a neuro occupational therapist, observing occupational therapists in various neurorehabilitation settings, and pursuing an advanced neuro certification. Additionally, these opportunities were used to better understand the gaps in knowledge related to AO, assess how AO is currently used in clinical practice, and learn more about stroke survivors' challenges and functional goals to inform the creation of AO videos.

The long-term objectives related to increasing my research skills included:

1. The student will contribute to current and/or future research studies by creating AO videos to increase understanding of the mechanisms of AO.
2. The student will increase understanding of the research process.

In addition to promoting the use of AO in clinical practice and understanding the types of AO videos needed in clinical practice, learning activities in this project were used to support ongoing research on AO at the Georgia Institute of Technology. Projects on AO at the Georgia Institute of Technology aim to increase the available evidence regarding AO mechanisms. Future research endeavors at the Georgia Institute of Technology will address some of the current problems related to AO highlighted in the literature and assist occupational therapists in better understanding the mechanisms of AO. This research can be used to assist occupational therapists in implementing AO more effectively and justifying AO to clients and caregivers. In order to make a meaningful contribution to the AO research projects, I participated in research activities at the Georgia Institute of Technology. This allowed me to gain a better understanding of the research process and work collaboratively with Georgia Institute of Technology students and faculty to create AO videos that are tailored to their specific needs for current and future AO projects.

Specific Aims

Aim 1: The student will create AO videos to help facilitate the use of AO in clinical practice and research.

Aim 2: The student will deliver educational resources about AO to occupational therapists by amassing existing literature.

Site Descriptions

The clinical site for this project was RWW which is located in Lawrenceville, Georgia. RWW is an outpatient clinic that specializes in neurological rehabilitation for clients who have had complex physical and neurological injuries (RWW, n.d.-b). RWW offers physical therapy,

occupational therapy, and speech-language pathology services. The mission of RWW is "providing quality care services and helping individuals live fulfilling lives" (RWW, n.d.-a). At RWW, clients with various conditions are treated including Parkinson's disease, stroke, multiple sclerosis, traumatic brain injury, and spinal cord injury. Clients receiving occupational therapy services at RWW present with a variety of deficits in the following areas: vision, cognition, balance, motor planning, strength, dexterity, visual perception, fine motor coordination, gross motor coordination, sensation, motor control, and range of motion. These deficits impact their clients' participation in meaningful occupations. Therefore, the occupational therapists at RWW create individualized treatment plans and perform client-centered intervention sessions to address each patient's deficits to maintain or improve their occupational performance and prevent complications. This site was selected for this capstone project because RWW has a variety of stroke survivors that could benefit from AO and the occupational therapists at this clinic have limited access to AO resources.

The research site for this project was the Cognitive Motor Control Laboratory at the Georgia Institute of Technology in Atlanta, Georgia. This lab "seeks to understand neurophysiology guiding skillful human-object interactions in upper extremity motor control" and considers "how to utilize surrogate neural circuits in restorative motor therapies" (Georgia Tech, n.d.). Dr. Wheaton is the director of the Cognitive Motor Control Laboratory and has research interests in "neuroplasticity, neurorehabilitation, cognitive motor control, motor physiology, [and] clinical neurophysiology" (Georgia Tech, n.d.). Georgia State University's occupational therapy program has an ongoing relationship with this lab because Dr. Rowe and Dr. Wheaton collaborate on research projects. Working with Dr. Rowe and Dr. Wheaton in addition to the undergraduate students and graduate students from this lab aligned with this

capstone project because they have extensive knowledge of motor control, they have ongoing research projects about neurorehabilitation and AO, and they need AO videos to conduct future research studies.

IRB Approval

An application for designation of not human subjects research for this capstone project was submitted to the Georgia State University Institutional Review Board (IRB). IRB approval was granted, and the submission was determined to be not human subjects research.

Development of AO Videos

Phase 1: Planning AO Video Content

To inform the content for the AO videos, I needed to better understand how AO was currently being utilized in clinical practice. Although RWW is the clinical site for this project, I wanted to learn how occupational therapists at other sites are utilizing AO with their clients to determine if any existing AO resources could be utilized at RWW. Observations of occupational therapists occurred at Encompass Health Rehabilitation Hospital, Emory Johns Creek Hospital, Children's Healthcare of Atlanta, and the Shepherd Center, and I had informal discussions about AO with occupational therapists at each site. No AO resources were discovered at these sites. However, while observing clients at these sites, I gained insight into clients' deficits and functional goals which helped establish the basis for the AO content.

Next, observations were completed at RWW to determine the types of tasks that would be appropriate for AO videos for stroke survivors receiving occupational therapy services in an outpatient setting. At RWW, a variety of functional deficits were observed including challenges with folding laundry, tying shoes, pulling up pants, feeding oneself with a spoon, writing

personal information with good legibility and letter placement, navigating a cell phone to make calls or send text messages, opening food packaging, cutting with scissors, and putting on a zip-up jacket. Additionally, my clinical site mentor described other common deficits that clients have, and clients and their caregivers at RWW described functional challenges. These conversations helped me identify meaningful activities to include in the AO videos.

An initial list of AO tasks was formed based on the observations of stroke survivors and discussions of common functional challenges experienced by stroke survivors at RWW. Also, during AO task ideation, I conducted a task analysis of typical daily activities performed by stroke survivors. The task analysis broke down daily activities, like feeding, grooming, and meal preparation, into their task components to determine which components should be included in AO videos. Further, I reviewed existing AO videos on YouTube to identify if any of these task components were already readily available as AO videos or if these tasks were missing from the current library of AO videos on YouTube. All FTHUE items were also included in the draft of AO tasks per the request of my research site mentor.

While drafting the list of tasks for the AO videos, my clinical site mentor advised me to consider how stroke survivors' challenges with balance and functional mobility may impact their ability to safely perform the tasks shown in AO videos while standing. Another important consideration was the variability of how daily tasks can be performed. For instance, how one person ties their shoes or folds shirts may not be the same as how another person performs those activities. Thus, we discussed the importance of offering task variations in the AO videos to allow clients to choose videos that align with their personal task performance.

When the draft of AO tasks was completed and approved by my clinical site mentor, it was then reviewed by my research site mentor. While my clinical site mentor emphasized a need

for AO videos to represent functional activities and their task components, my research site mentor requested AO videos include more tasks demonstrating non-functional finalized actions and non-finalized actions to be used in her future research. The list of AO tasks was revised to include more tasks displaying non-functional finalized actions and non-finalized actions since the list previously primarily contained functional finalized actions. Additionally, the AO task list was revised to remove any FTHUE items that only required isometric contraction of the upper limb since these tasks didn't require active movement of the arm. After the list of AO tasks was updated based on initial feedback from my site mentors, the list was reviewed again by both mentors. At this stage in the development, the list contained over 200 tasks. To create a more concise list of AO tasks, the site mentors were consulted to remove less relevant and low-priority tasks.

Next, the list of AO tasks was shared with Dr. Wheaton and students from the Cognitive Motor Control Laboratory to determine if any tasks should be added or removed. Rather than suggesting modifications to the tasks on the list, they recommended categorizing the tasks on the list. This was recommended to ensure a sufficient number of tasks were included in each task category and to verify if there were enough appropriate tasks for research and clinical applications. Therefore, I organized the tasks into categories and analyzed the groupings for any gaps or disproportions. The number and types of tasks in the categories were not disproportionate. Hence, the tasks listed in these categories did not require further modification and were selected to be filmed for the AO videos.

Phase 2: Planning AO Videos

The Creative Media Industries Institute (CMII) is a content creation center at Georgia State University and has several production and post-production studios (CMII, n.d.). Students

and faculty from the CMII have expertise in filming and editing for film and TV production and have access to high-quality technology (CMI, n.d.). Therefore, a student and faculty member from the CMII were chosen to partner with this capstone project to assist with planning and filming the AO videos.

Ola Gardner, a faculty member from the CMII, was contacted to discuss the AO videos. Ola provided recommendations for the AO videos, including filming locations, camera equipment, lighting, and editing. She was also asked if any students from the CMII would be interested in assisting with this project. Ola connected me to Hadija Primus, a sophomore film and media student from Georgia State University, who volunteered to provide some assistance with planning and filming the AO videos. Hadija and I had a few meetings to discuss the purpose of the project, the types of videos that needed to be filmed, and potential filming angles and locations. An outline containing specific details for filming each task was provided to Hadija. The outline had information regarding filming angles, filming locations, necessary objects for each task, the amount of time or repetitions for each task, and whether the tasks were to be performed unilaterally or bilaterally.

I collected all the supplies needed for the AO videos. The tasks for the AO videos primarily required common household items. Most items were collected from my house, and the remaining items were purchased at the dollar store. The FTHUE has a specific protocol and list of items needed for administration. My research site mentor provided the supplies needed for filming the FTHUE tasks because she had access to the FTHUE items from prior use.

Phase 3: Recruiting Volunteers to Feature in the AO Videos

The individuals featured in the AO videos needed to be healthy volunteers with no upper limb impairments. The inclusion criteria for volunteers for the AO videos were adults between 18 - 89 years old who had no upper limb impairments to either arm, did not use upper limb prosthetics, could read and write in English, and could understand spoken English. Volunteers were excluded if they were under 18 years old, over 89 years old, unable to follow instructions in English due to cognitive abilities or language barriers, had an amputated upper limb, or had limited upper limb motor function (e.g., hemiplegic arm).

Convenience sampling was utilized to recruit volunteers. Family and friends meeting the inclusion criteria were contacted electronically via text message and asked if they were interested in volunteering for the AO videos. Volunteers who agreed to participate were asked to sign a media release form, giving their approval to use videos with their images for educational and research purposes. The media release form was verbally reviewed with volunteers and any questions were answered. Voluntary consent was obtained with the volunteers' signatures on the hard copy media release form. There was no compensation for volunteers. The costs to the volunteers that may have resulted from participation in the project included transportation costs for commuting to film sites. There was no direct benefit to the volunteers, however, these videos will benefit occupational therapists, researchers, and stroke survivors. The risk of this study was equivalent to that of engaging in everyday activities, however, this was minimal. In order to minimize this risk, volunteers could have terminated their participation in filming at any point.

Phase 4: Filming AO Videos

Georgia State University was initially selected as the filming location due to its proximity to Hadija and the availability of various filming locations. Room options for filming at Georgia State University were discussed with Ola, Dr. Rowe, and Hadija, and several buildings were toured to determine the best filming locations. Two rooms at Georgia State University were chosen for filming. One room was chosen because it included a kitchen and bedroom that could be used for filming some of the functional activities (see Figures 1 and 2). The second room was

Figure 1: Kitchen Filming Location

Figure 2: Bedroom Filming Location

chosen because it had a table, chairs, and a white wall that could be used as a blank background for filming (see Figures 3 and 4). A table and chairs were necessary for a variety of the AO tasks, so a majority of tasks could be filmed in this room. The gathered filming supplies were transported to these two filming locations. All filming was completed on an iPhone 15 Plus. The small size of the iPhone made filming close to the volunteers' bodies easier, and it captured the wide-angle shots needed for some videos filmed from a first-person perspective.

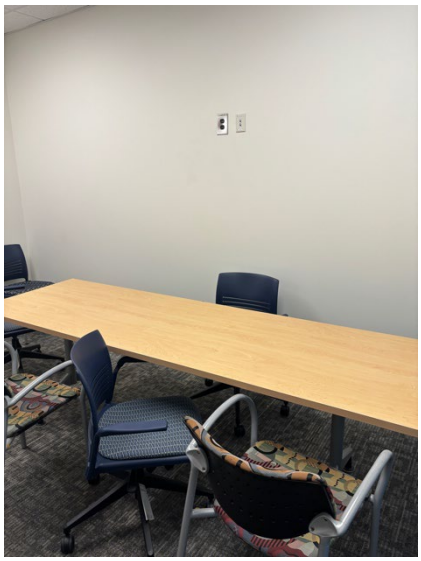

Figure 3: Filming Location with Blank Background

Figure 4: Initial Filming Session

Two volunteers were filmed at Georgia State University. The first filming session lasted four hours and filming was only completed in the room with the table and chairs due to time constraints. Hadija was responsible for filming the actions with the iPhone while I directed the movements of the volunteer. A variety of third- and first-person videos were filmed during this session. However, when the videos from this film session were reviewed, it was noted that there was a need for increased front lighting, especially for the third-person videos, since the room only had overhead lighting. While there was adequate lighting for the first-person videos, these tasks would have benefited from increased lighting as well to increase the brightness and clarity of the videos.

For the second film session, I purchased a small magnetic LED light that could be attached to the back of the iPhone to increase the lighting for the videos. This lighting attachment wasn't bright enough to increase lighting for videos filmed far away from a third-person perspective. However, it increased lighting for tasks that were filmed up close from a first-person perspective. Therefore, most videos filmed for the second film session were tasks from a first-

person perspective. The volunteer for this film session was only available for 2.5 hours, so Hadija and I attempted to film as many videos as possible in that timeframe. Like the first film session, Hadija's role was to film the videos while my role was to direct filming.

After the initial two film sessions, another challenge that was encountered was recruiting more individuals to film at Georgia State University. Most of the family and friends contacted through convenience sampling were located over 20 miles away from Georgia State University. These individuals were less willing and available to participate in filming if they were required to commute to Georgia State University. Therefore, due to poor lighting and limited volunteer availability for filming at Georgia State University, a new film location was chosen. Hadija was unable to film the remaining videos because the rest of the tasks were filmed off campus. As a result, I was responsible for directing and filming the remaining AO videos.

Through a personal connection, I gained access to a third filming location at a local church. The church was located very close to the individuals who were recruited for this project, which increased volunteer participation. The church had a film set with multiple standing lights, a white cyc wall, and tables and chairs (see Figure 5). The filming supplies were transported to this location. Since Hadija was no longer filming the videos, I purchased a tripod with a Bluetooth remote to film the third-person videos to make the filming process more efficient and minimize video shakiness. First-person videos could not be filmed with the tripod since the phone had to be positioned very close to the volunteers' bodies and the phone angle varied among tasks.

Figure 5: Church Film Set

The volunteer from the first film session returned to finish filming the AO tasks at the church film set. Most AO tasks filmed from a third-person perspective for this volunteer were re-filmed at the new location because the lighting was better than when she was previously filmed at Georgia State University. Three new volunteers also participated in filming at this location. At the church film set, the filming duration ranged from 1 to 3 hours for each film session. One volunteer filmed at this location on one occasion, while three volunteers filmed at this location on two occasions. A few of the tasks could not be filmed at the film site because the necessary task items were not available (i.e., door handles, lock and keys, drawers, and lamp switches). Since these items are commonly found in a home, the remaining few videos were filmed in a house with one returning volunteer and one new volunteer.

Phase 5: Editing and Uploading AO Videos

All video files were shared from the iPhone to a MacBook Air using AirDrop, and the files were uploaded to iMovie for editing. Each video was edited individually. Examples of edits made to the videos using iMovie included trimming videos, cropping videos, altering the brightness, flipping videos horizontally, rotating videos clockwise, copying and pasting sections of the videos, modifying video speed (i.e., slow speed by 15-50%), removing background noise, reversing videos, stabilizing shaky videos, adding fade to black transitions, adding freeze frames, removing audio from a video, and adding text to the videos.

Title slides for all videos were created using Canva. A screenshot from each video was uploaded to Canva, and for most of the screenshots, the background of the image was removed using Canva's background remover tool. When the tool didn't accurately remove the background of the photo, I manually erased or restored parts of the image using a computer brush tool on Canva. The images were then positioned next to text that described the primary action of the video. The final title slides were downloaded as JPEGs, uploaded to iMovie, and inserted at the start of each corresponding video on iMovie. An end screen slide was also designed on Canva and uploaded to iMovie. The end screen was the same for all videos and was added at the end of each video. The length of the end screen was set to at least five seconds for each video because this was a required end screen length from YouTube.

A YouTube channel was created to compile all final AO videos into a video library for clinical use. A logo and a banner were designed on Canva and uploaded to the YouTube channel. The edited videos were uploaded to the YouTube channel. The videos were given a YouTube video title, and time stamps were added to the description of the videos. Videos were assigned to a playlist on the YouTube channel, the intended audience was set in the video settings, the title

slide JPEGs were uploaded as thumbnails, and the visibility of the videos was set to public. Then, end screen templates were created on the YouTube channel. The end screen template was selected and uploaded separately for every video.

For research purposes, the AO videos that were uploaded to the YouTube channel were modified on iMovie to remove the end screen. These modified videos were then saved, and the files were named based on the tasks shown in the videos. The files were uploaded to a flash drive for Dr. Rowe and Dr. Wheaton. On the flash drive, the videos were categorized into four folders.

Development of Educational Materials

Educational materials about AO were created for RWW. A handout using plain language was created on Canva to provide an overview of AO for stroke survivors and their caregivers. Recommendations from Zhang et al. (2023) were included in this handout. Bullet points and short sentences were used to present the information, and graphics were added to make the handout appear professional and aesthetic. A QR code to the YouTube channel playlists was generated through Adobe and added to the handout so people can easily access the AO videos on the YouTube channel. The handout was reviewed by both site mentors. Based on their feedback, the handout was revised to include more information about AE, and pictures were added to distinguish the difference between AO and AE. A link to the PDF of the final AO handout was provided to my clinical site mentor.

The content from the AO handout was used to create a video presentation about AO for the YouTube channel. The goal of this video was to introduce AO to users of the YouTube channel and help them understand the benefits of AO and how to apply the AO videos as part of a home exercise program. The presentation slides were made on Canva using some of the same

content from the handout. Additional information about the AO videos and how to best utilize the AO videos was included at the end of the presentation. A voice-over recording of the presentation and several screen recordings of the YouTube channel were uploaded to iMovie for editing. The edited video presentation was uploaded to YouTube, and the visibility was set to public. A thumbnail was designed on Canva and then uploaded to the YouTube video. Time stamps for each topic in the video were added to the video description.

The last educational resource was a presentation about AO for RWW occupational therapists. This presentation was aimed to help occupational therapists increase their awareness of AO, understand the current evidence for AO, learn how to apply AO, and learn about the AO resources I created for this project to facilitate the utilization of the AO resources. Presentation slides were made using Canva. Recent literature about AO was reviewed, and key takeaways from the research studies were added to the slides. The types of AO videos on the YouTube channel were described, and links to all the AO resources were provided. A voice-over recording of the presentation and screen recordings of the AO resources were uploaded to iMovie. The following iMovie features were used to edit the videos: trimming, cropping, splitting the video, slowing the speed of the video, minimizing background noise, removing audio, detaching audio, and adding freeze frames. The final video presentation was uploaded to the YouTube channel, and the visibility of the video was set to "unlisted" so only occupational therapists with the video link could have access to the video. The links to the Canva presentation and all AO resources mentioned in the video were included in the description of the video.

Chapter 4

Output

Current AO Resources

When observing occupational therapists at the four sites in metro-Atlanta, the informal discussions revealed that these clinicians are not currently implementing any AO resources into their treatment sessions. Additionally, they were not aware of any AO resources available at their sites. Moreover, all of these occupational therapists were unfamiliar with AO and had not previously learned about AO. After I introduced AO to the clinicians, most of them asked follow-up questions to better understand AO and asked how to access AO resources, such as the AO videos I was creating. Some of these occupational therapists responded by stating AO would be beneficial for their current clients which demonstrates occupational therapists perceive AO resources would be useful in various rehabilitation settings.

After searching YouTube for AO resources, I only found 10 channels with AO videos. Some of these channels were dedicated to AO while others also had some content unrelated to AO and even unrelated to occupational therapy. The number of AO videos on these channels ranged from 1 to 32 videos; the channel with 32 AO videos had some content that was more relevant for speech therapy and physical therapy. Most of these channels had five or fewer AO videos. While many existing AO videos on YouTube could be used for AO and AE for stroke survivors, the videos had areas that could be improved.

Firstly, some of the videos had very poor quality (i.e., 240 p) or low lighting, leading to difficulty seeing the tasks due to how blurry or dark the videos were. A few videos were filmed at odd angles that obstructed the view of the fingers, and other videos demonstrating fine motor

tasks were filmed far away making it difficult to see how the fingers were completing the tasks (i.e., buttoning). Also, problems with several videos' audio were noted. Since research suggests AO is more effective when an individual can hear the associated sounds when watching a task, audio is an important factor to consider when evaluating AO videos (Mancuso et al., 2021). Various AO videos on YouTube had removed the videos' audio; while stroke survivors could watch these AO tasks, they wouldn't be able to hear any task sounds, limiting the effectiveness of AO. In contrast, some AO videos included audio but were filmed in very noisy environments. These videos had a lot of background noise that could be distracting to stroke survivors watching the videos. Finally, one channel with 18 AO videos only used the left upper limb for unilateral tasks, and another channel only included instructions written in Filipino. A limited number of stroke survivors would be able to utilize the videos on these channels. Altogether, there were several problems identified with the current library of AO videos available on YouTube which further highlighted the need for high-quality AO videos that demonstrate many functional tasks.

List of AO Tasks

150 tasks were included on the final list of AO tasks. Most of the AO tasks were seated to promote safe AE for stroke survivors who have diminished coordination and balance. 15 of the 17 FTHUE items were included in the list of AO tasks. The FTHUE items excluded from the AO task list were "associated reactions" and "hold a pouch" since these items required a static upper limb position. The 150 AO tasks were grouped into different categories for researchers and clinicians. For research purposes, AO tasks were categorized into functional finalized actions, non-functional finalized actions, and non-finalized actions. For clinical purposes, AO tasks were placed into 17 categories that best described the primary actions of the videos (see Appendix C). All tasks required no to minimal supplies, and those that required supplies used common

household items. The AO tasks intentionally used easily accessible and inexpensive supplies to minimize a potential barrier to completing AO and AE at home.

Volunteers

Six individuals volunteered to be featured in the AO videos. The volunteers included three white females, one black female, and two white males. All volunteers were between 23 and 31 years old and right-handed. Volunteers were asked to wear solid-colored clothing and remove accessories including watches and jewelry. For all filming sessions, volunteers were instructed to complete each task at a slightly slow pace to make their hand and arm movements easier for stroke survivors to watch. The volunteers primarily used their dominant arm for unilateral tasks. For activities that required repetitions of a movement or task, such as range of motion movements and opening and closing containers, volunteers completed between three to five reps of the movements. A small number of repetitions was used for AO tasks to reduce overall filming time for volunteers. For many of the functional tasks, such as brushing teeth or folding clothes, volunteers typically performed the tasks for 20 to 40 seconds. This timeframe was chosen based on the needs assessment interview with Dr. Wheaton.

AO YouTube Channel

A YouTube channel named ActionObservationOT was developed to host the final AO videos for clinical use. The AO video library was uploaded to YouTube for RWW occupational therapists, clients, and caregivers because it is a free and widely available platform. Several versions of a YouTube channel logo and banner were designed on Canva. The final logo included an outline of a brain with the letters “AO”, and the banner had a simple design that displayed a clapboard graphic and included text stating “Action Observation” (see Figures 6 and

7). A description of the YouTube channel was added to help users understand the purpose of the channel.

Figure 6: YouTube Logo

Figure 7: YouTube Banner

Approximately 700 videos were filmed of the volunteers. Each of the videos was reviewed and outtakes were deleted. A total of 419 AO videos were edited on iMovie and uploaded to the YouTube channel. Only a few AO videos demonstrating FTHUE items were uploaded to the YouTube channel because most of the FTHUE items were less relevant for clinical purposes. Each video was given a title that described the task in the video and a thumbnail showing a screenshot of the task (see Figure 8). The AO videos were set to public visibility to make the YouTube channel easy to navigate, especially for individuals who have limited experience using YouTube.

All the videos were categorized by areas of function and assigned to one of 18 available playlists (see Figure 9). Examples of playlists were fine motor activities, kitchen tasks, upper body dressing, and laundry tasks. The purpose of the playlists was to improve the organization of the channel to allow stroke survivors and their caregivers to easily find AO videos that are most relevant to their goals. Further, when a playlist is selected on YouTube, it will automatically play

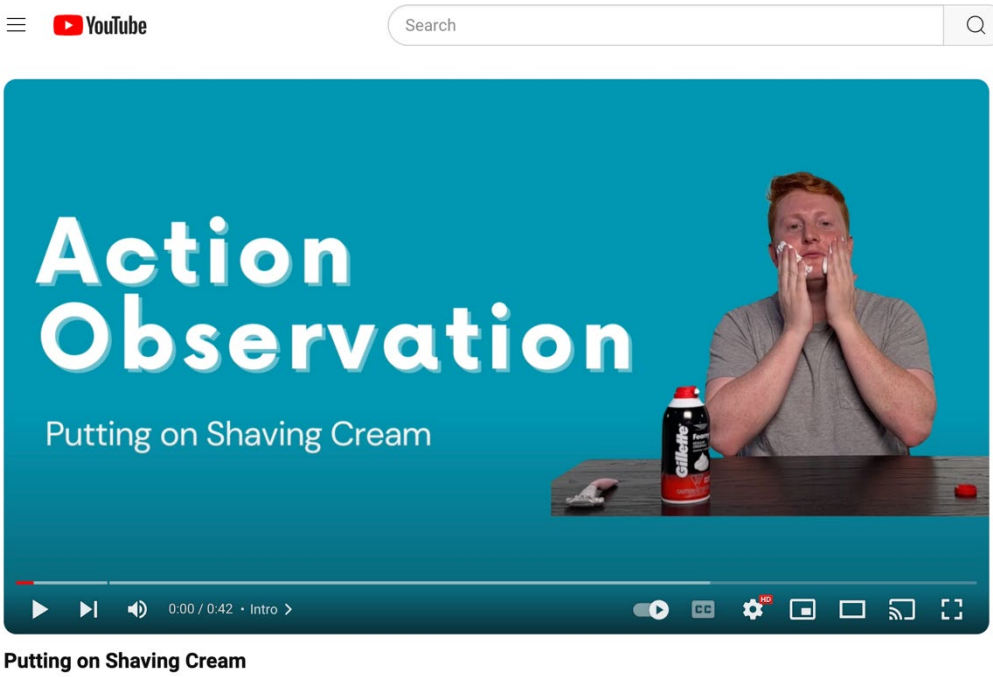

Figure 8: Example of an AO Video Thumbnail

other videos from that playlist. This will reduce the amount of time users spend searching for similar AO videos. To make the playlists easily accessible, a clickable link to the related playlist was included at the end screen of each AO video. Using playlists to group the AO videos aimed to enhance the usability of the YouTube channel.

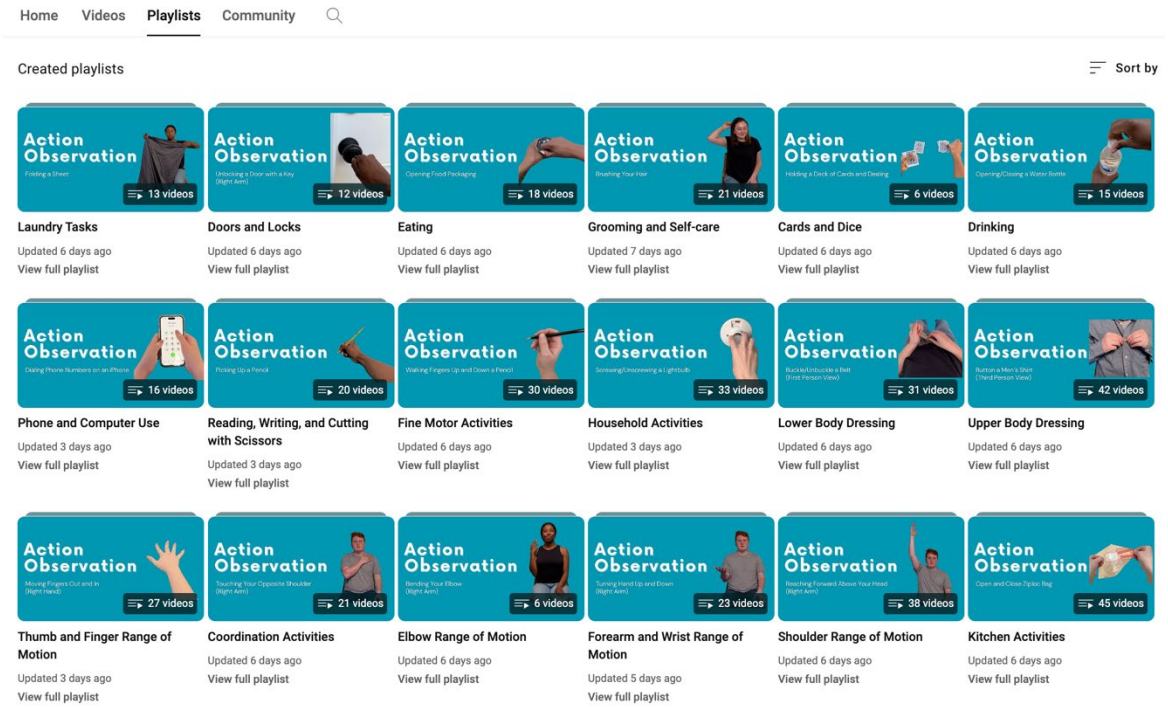

Figure 9: All YouTube Playlists

Finally, all videos that were uploaded to YouTube were modified in iMovie to remove the end screen so they could be used for future research. These modified videos were uploaded to flash drive folders for Dr. Rowe and Dr. Wheaton and grouped into the following categories: functional finalized actions, non-functional finalized actions, non-finalized actions, and FTHUE items. A flash drive was preferred to YouTube for sharing the files with Dr. Rowe and Dr. Wheaton because it would allow them to download the videos, edit the videos, and use the files as needed for their future research.

Educational Materials

A two-page educational handout about AO was developed for RWW clients and caregivers (see Appendix D). The first page of the handout defines AO and explains how AO leads to motor re-learning. The first page lists the medical conditions that may be appropriate for AO and includes practical information about how to apply AO at home based on the most recent guidelines from researchers. A QR code to the YouTube channel playlists and the link to the YouTube channel were included at the bottom of the page. The second page of the handout emphasizes the importance of completing AE after AO. This section also highlights how important repetition is for neuroplasticity and motor recovery. Additionally, photos displaying an individual completing AO and AE were included to help stroke survivors and caregivers better visualize how these interventions are applied.

The educational handout was adapted into a video presentation for the YouTube channel to introduce AO to users. A 10-minute voice-over presentation was developed and uploaded to YouTube. The presentation slides included the same content from the handout, but additional considerations about watching the AO videos were included to help users most effectively perform AO and AE. The considerations for the AO YouTube videos included the following:

1. Minimize distractions in your room
2. Pay close attention to the hand(s) and arm(s)
3. Replay videos as needed
4. Make safe choices
5. Be aware of variations in task performance
6. Action execution: sitting vs standing
7. Understanding first person view vs third person view
8. All individuals featured in the videos are right-handed
9. Choose playlists meaningful to you
10. Change video speed as needed
11. Your OT may suggest using mental imagery as a different way to practice the activities shown in the AO videos

These considerations provided practical tips for using the YouTube channel, described how to get the best results from AO and AE, and explained some of the limitations of the videos, such as that all videos feature right-handed individuals. After this video was uploaded to the YouTube channel, the link to this video was added to the end screen for all AO videos (see Figure 10). Linking this educational video at the end of the AO videos encourages all users to review the AO recommendations as needed and encourages new users to access and watch the introductory video prior to practicing AO and AE.

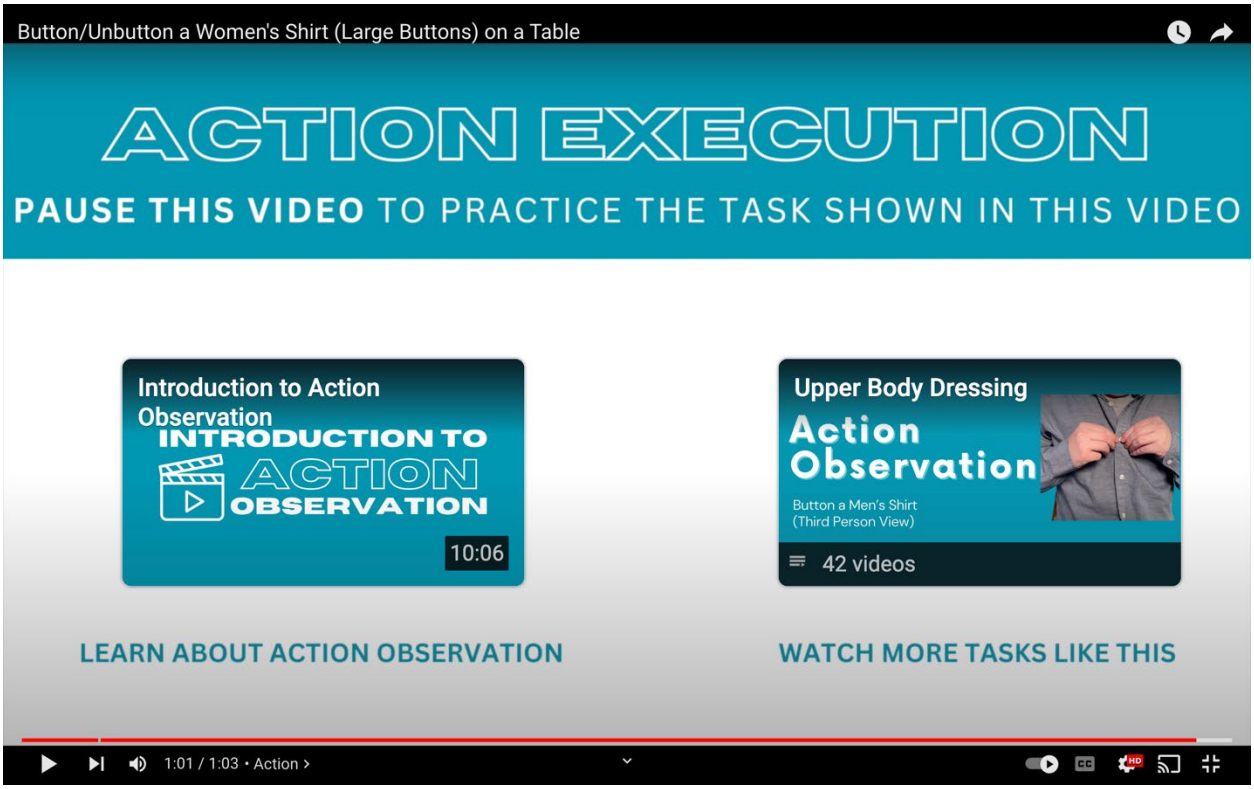

Figure 10: Example of an AO Video End Screen

The final educational resource was a pre-recorded presentation for RWW occupational therapists. A 24-minute voice-over presentation about AO and stroke rehabilitation was developed and uploaded to YouTube. The presentation began by reviewing the prevalence of stroke and the significant impacts stroke can have on an individual's upper limb performance and function. Next, the presentation defined AO and AE, discussed the involvement of the MNS, and explained why AO is suitable for neurological rehabilitation. A review of AO literature was also included, and the discrepancies among AO studies and the need for additional research on AO were highlighted. Then, a brief explanation of how MI can be used with AO was given. Current

challenges for AO implementation and the guidelines from Zhang et al. (2023) regarding implementing AO were discussed.

The remaining slides of this presentation provided an overview of the AO resources I created for this capstone project and how to access these resources. Links to four AO resources discussed in this presentation were listed in the YouTube video's description. The links will direct occupational therapists to the AO YouTube channel, a PDF of the AO handout, a Google folder with PDFs of the YouTube channel playlists, and a Google document with links to AO research articles. The Google folder containing PDFs of the YouTube channel playlists was created so occupational therapists can efficiently review the AO videos available in each playlist and choose videos that are appropriate for a client's home exercise program. The Google document with links to AO research articles was provided so occupational therapists can easily locate AO articles to review the evidence about AO. Overall, the goal of this presentation was to educate current and future occupational therapists at RWW about the levels of evidence for AO, why AO is appropriate for stroke rehabilitation, and how to access AO resources developed from this capstone project. This presentation was uploaded to the YouTube channel for ease of access, but the video visibility was set to "unlisted" so only occupational therapists from RWW can watch the video since they are the intended audience for this presentation.

CHAPTER 5

Discussion and Impact

During this capstone project, gaps in KT for AO and underutilization of AO were identified in AO literature and clinical practice. In general, there appears to be a lack of awareness about AO among occupational therapists in a variety of settings. Further, applying AO in stroke rehabilitation is currently challenging due to a variety of barriers, such as unclear implementation protocols and limited AO resources. Thus, the educational materials developed in this project were used to facilitate KT for AO, increasing occupational therapists' knowledge about AO and its application, and the AO video library increased access to AO resources, reducing a barrier to applying AO in stroke rehabilitation. Further, since the AO videos were developed in collaboration with researchers from Georgia State University and the Georgia Institute of Technology and delivered to these researchers, the videos will be utilized in future AO research.

The deliverables from this capstone project will have several long-term impacts. Increasing awareness of AO among occupational therapists working in stroke rehabilitation will promote evidence-based practice which can lead to improved client outcomes. Also, having easier access to AO videos and educational resources about AO will increase the likelihood that AO will be implemented with stroke survivors. Increased utilization of AO with stroke survivors can improve their upper limb motor function and independence in ADLs, ultimately reducing caregiver burden and improving the quality of life of stroke survivors and their caregivers. Moreover, since a variety of AO videos are now available to researchers, they can use the videos to conduct additional research on AO. Future research can develop clearer intervention protocols for AO and further investigate the mechanisms of AO. These findings would assist occupational

therapists in most effectively applying AO with stroke survivors, maximizing stroke survivors' upper limb motor recovery and enhancing their occupational performance. Finally, since this capstone paper will be publicly available through Georgia State University, the protocol used to develop the AO videos in this capstone project can be used to inform the development of future AO resources by occupational therapy students, practitioners, or researchers.

Future Directions

Future capstone projects or research studies can expand the advocacy efforts for AO started in this project to other sites. Occupational therapists working in inpatient, outpatient, and home health settings would likely benefit from education about AO and access to AO resources tailored to their needs. Furthermore, more AO videos can be created and feature individuals of various ages, races, and hand dominance. This would increase the diversity of AO videos and allow stroke survivors to be better matched to the individuals featured in the AO videos. Finally, this project can be expanded to increase AO education and resources for other medical conditions such as Parkinson's disease, cerebral palsy, or Alzheimer's disease.

Limitations

The AO videos developed for this project are limited because only young adults of two races were represented. A lack of diversity in the AO videos may increase the difficulty of matching stroke survivors to the AO videos and limit the outcomes of AO and AE (Robinson-Bert, 2023). Also, only right-handed individuals were featured in the videos which may make the videos less relevant to left-handed stroke survivors. Future AO videos should feature people of more races and ages and include left-handed individuals.

Also, limitations were present in the number of variations in task performance for the AO tasks. Most videos only showed one way of performing a task, but the way a task was performed on the YouTube channel is probably not how all stroke survivors perform that task. More variations in task performance would allow stroke survivors to choose the task performance that is most similar to their performance.

Additionally, while research supports AO tasks being filmed from a first-person perspective, some tasks for this project were only filmed from a third-person perspective due to logistical challenges. When attempting to film some tasks from a first-person perspective, volunteers' hands and arms moved out of the video frame because the camera was close to their bodies. More guidance for filming from a first-person perspective would be helpful for future AO video development.

Lastly, since these videos were primarily filmed in public spaces, including a university and church, the noise in these environments could not be controlled. Some of the videos included significant background noise from people in the environment, and consequently, the audio was removed from these videos during the editing process. Ideally, the audio would have been included in all of the AO videos to increase the effectiveness of AO (Mancuso et al., 2021).

Sustainability Plan

The introduction to AO video and AO videos were delivered to RWW occupational therapists. These videos are available on a public YouTube channel. Thus, current and future RWW stroke survivors can access and view the videos as frequently as needed. The pre-recorded introductory video is intended to sustain the YouTube channel by instructing new users on how to implement the AO videos. While these videos were created for RWW, these videos are free

and publicly available on YouTube for use by stroke survivors and occupational therapists worldwide.

The educational presentation about AO for occupational therapists was pre-recorded and uploaded to the YouTube channel to train current and future RWW occupational therapists about AO. A link to this Canva presentation was added to the description of this YouTube video so occupational therapists can download the presentation and reference the presentation slides in the future. The links to the AO resources created for this project, including the AO handout, were also included in this video's description to make the resources easy for current and future occupational therapists to find and access.

AO videos were delivered to Dr. Rowe and Dr. Wheaton via a flash drive. These videos can be downloaded by Dr. Rowe and Dr. Wheaton when they are needed for future research endeavors. They will be able to review the video files and select specific AO tasks that are appropriate for their research in the future. Since they have access to the video files, they can edit and adapt the AO videos to better fit their future research.

Finally, since this capstone paper will be published on Georgia State University's website, future occupational therapy students can use the information in this paper to expand on this project. For instance, students can adapt the AO resources for other medical conditions, educate occupational therapists about AO at other sites, or create a more diverse library of AO videos. Occupational therapy students can refer to the future directions section of this paper to develop future capstone projects.

CHAPTER 6

Conclusion

Research on AO reveals this intervention can promote neuroplasticity for stroke survivors and lead to improvements in upper limb function and ADL performance. While there is sufficient evidence supporting AO for stroke rehabilitation, implementing AO into clinical practice has been limited due to a lack of AO resources and poor awareness of AO. In this capstone project, AO videos of simple movements and daily tasks were developed by collaborating with an occupational therapist working in stroke rehabilitation and researchers with expertise in AO. Over 400 AO videos were edited and uploaded to a public YouTube channel for use by stroke survivors. These AO videos were also delivered to researchers to be used in future research on AO. Additionally, educational materials were developed to facilitate KT and increase awareness of AO among stroke survivors, caregivers, and occupational therapists in an outpatient neurological rehabilitation clinic. The AO resources developed in this project will reduce barriers to AO implementation, promote the use of AO in stroke rehabilitation, and aid in future research to strengthen the evidence for AO. Future capstone projects or research studies should develop more diverse AO videos and continue advocating for AO in neurological rehabilitation in a variety of occupational therapy settings.

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Appendix A: Learning Objectives

Learning Objectives	Short-term objectives	Learning Activities
1. The student will obtain advanced clinical knowledge of occupational therapy assessments and interventions that can be used to improve the occupational performance of patients with neurological conditions.	**1a**. The student will analyze how action observation is currently implemented across the continuum of care for neurological rehabilitation.	**1a.** The student will observe occupational therapists working with patients with neurological conditions throughout the continuum of care in at least two different settings (e.g., acute care, inpatient, home health, etc.). **2a**. The student will perform informal interviews with occupational therapists about how action observation is currently used or could be implemented in at least two different settings. **3a.** The student will listen to books and podcasts to understand topics related to neurological conditions, the continuum of care, and rehabilitation for neurological conditions.
	1b. The student will gain specialized clinical knowledge and skills pertaining to neurological rehabilitation.	**1b.** The student will complete the Certified Neuro Practitioner (CNP) certification. **2b.** The student will complete at least one CEU or certification course related to neurological rehabilitation (e.g., PWR, LSVT BIG, kinesiotaping, or IASTM). **3b.** The student will observe a Driver Rehabilitation Specialist (DRS) that works with patients with neurological conditions for a minimum of 8 hours.
2. The student will contribute to current and/or future research studies by creating action observation videos to increase understanding of the mechanisms of action observation.	**2a.** The student will finalize the plan and details for the action observation videos.	**1a.** The student will utilize tasks from assessments and research studies to develop a list of possible tasks that may be included in the action observation videos. **2a.** The student will have the proposed list of action observation tasks reviewed by Dr. Wheaton, Dr. Rowe, and an occupational therapist that works with stroke patients to evaluate the list's clinical and scholarly significance. **3a**. The student will create an outline describing how and where each task from the finalized list of action observation tasks will be filmed.
	2b. The student will collaborate with GSU Creative Media Industries Institute (CMII) students to develop action observation videos.	**1b**. The student will educate Creative Media Industries Institute GSU students about the goals of the capstone project and plan for the action observation videos and discuss a strategy for filming. **2b.** The student will recruit at least 1 healthy female adult and 1 healthy male adult of different ages and ethnicities. **3b**. The student will assist the Creative Media Industries Institute GSU students with directing and filming the action observation videos at GSU.
3. The student will promote knowledge translation for action observation as an intervention for stroke patients.	**3a**. The student will educate occupational therapists about imagery techniques in an outpatient clinic.	**1a.** The student will create a presentation about action observation based on current literature. **2a.** The student will perform an in-service on action observation for occupational therapists in an outpatient clinic. **3a**. The student will complete the Inspiring Change 2.0 mini course to better understand how to implement science into clinical practice.
	3b. The student will provide action observation videos for use with stroke patients in an outpatient clinic as part of intervention sessions and/or home exercise programs (HEPs).	**1b.** The student will upload and organize action observation videos onto an online platform for use during occupational therapy sessions or as part of a patient's HEP. **2b.** The student will create a handout or a video introduction that explains the purpose of action observation and describes instructions for how to use the videos for patients and caregivers in layman's terms. **3b.** The student will create a handout or a video introduction to explain the purpose of action observation and describe instructions for how to use the videos for occupational therapy practitioners.
4. The student will increase understanding of the research process.	**4a**. The student will apply research skills from the OTD program to current research projects at Georgia Tech.	**1a.** The student will participate in preparatory components for a grant-funded research project such as assisting with background justification, methodology, participant recruitment, or budgets. **2a.** The student will contribute to current research projects as a participant.
	4b. The student will participate in lab activities for research at Georgia Tech.	**1b.** The student will prepare lab materials and equipment for data collection. **2b.** The student will assist Dr. Wheaton and/or his research students with activities in the lab.

Appendix B: Supervision Plan

Doctoral Capstone Experience Roles and Responsibilities	
Student will demonstrate at minimum:	Site mentor will demonstrate at minimum:
1. Perform tasks in a safe and ethical manner and adhere to a site's policies and procedures, including those related to patients at the clinic or participants in a research study 2. Learn, practice, and apply knowledge from the classroom and practice settings at a higher level than prior fieldwork experiences with simultaneous guidance from site mentors 3. Complete tasks assigned by site mentors to ensure the success of the experience to advance skills related to clinical practice and research 4. Take initiative to communicate with site mentors regularly and remain committed to self-directed learning and fulfillment of all expectations for the capstone project 5. Demonstrate respectful interactions and positive interpersonal skills with faculty, site mentors, capstone coordinator, healthcare professionals, patients, researchers, and any other individuals who may be a part of this capstone 6. Complete the Midterm Doctoral Capstone Experience Evaluation form and send it to site mentors during week 7 7. Complete the Final Doctoral Capstone Experience Evaluation form and send it to site mentors during week 14 8. Maintain a journal that accurately tracks progress each week, complete the GSU Doctoral Capstone Time Log and Objective Monitoring Form each week, and email the form to site mentors weekly 9. Respect site mentors' time by communicating at appropriate hours and being timely for meetings 10. Adhere to requirements for attendance and appropriate number of hours, including on site hours, for the capstone project	1. Model and reinforce professional behaviors 2. Adhere to the mentoring guidelines for this capstone project 3. Review and sign the Midterm Doctoral Capstone Experience Evaluation form during week 7 4. Review and sign the Final Doctoral Capstone Experience Evaluation form during week 14 5. Review and sign the GSU Doctoral Capstone Time Log and Objective Monitoring Form each week 6. Meet with the student on a consistent basis either in person or virtually to review progress and provide guidance 7. Provide mentorship throughout the duration of the capstone 8. Proactively correspond with the capstone team regarding any potential concerns 9. Provide meaningful feedback on drafts of deliverables for the capstone project, as appropriate 10. Providing appropriate resources for the student to support progression toward project objectives

Supervision Items	Clinical Site Mentor (Madison Compton)	Research Site Mentor (Dr. Rowe)
Scheduled meetings	Bi-weekly meetings will be performed either in person or virtually with the site mentor and student. The bi-weekly meeting will be set for the same day and time. The meeting day and time will be discussed via email or call in December 2023 or January 2024 prior to week 1 of the doctoral capstone experience. If one or more meeting times need to be changed by either the site mentor or student throughout the capstone experience, it should be communicated via email or in person.	Weekly meetings will be performed either in person or virtually with the site mentor and student. The weekly meeting will be set for the same day and time. The meeting day and time will be discussed via email or call in December 2023 or January 2024 prior to week 1 of the doctoral capstone experience. If one or more meeting times need to be changed by either the site mentor or student throughout the capstone experience, it should be communicated via email or in person.
Communication methods	The student and site mentor will communicate via email, calls, text messages, virtual meetings, and/or in-person meetings. The site mentor and student have previously communicated as fieldwork educator and fieldwork student, and they will discuss what forms of communication worked best in the past to establish preferred methods of communication during week 1 of the capstone experience.	The student and site mentor will primarily communicate via email and meetings, virtually or in person. The student and site mentor will communicate at least once a week in the formal weekly meetings but may communicate more frequently depending on the objectives for each week. The student and site mentor will communicate about when to have meetings with other individuals such as Dr. Wheaton or individuals from the Creative Media Industries Institute.
Specific requirements of the project	The student will keep a journal of activities completed each week to track progress toward goals and learning activities. The student will also complete the GSU Doctoral Capstone Time Log and Objective Monitoring Form each week. The student will email this form to the site mentors for approval and signatures every week. The site mentors will email the signed copies back to the student within 5 days. The student will complete the Doctoral Capstone Experience Evaluation form by the end of week 7 for a midterm evaluation and by the end of week 14 for the final evaluation. The student will email the midterm evaluation form and the final evaluation form to the site mentors for approval and signatures. The site mentors will email the signed copies back to the student within 5 days.	
Timeline of deliverables	See Supervision/Progress Plan	

How to resolve possible disputes	Disputes will be first discussed in person or virtually with my site mentor after designating a time to meet to discuss the issue that may be separate from the bi-weekly meetings. If the issue does not become resolved, the student will discuss the issue with my faculty mentor to determine how to proceed with the issue.	Disputes will be first discussed in person or virtually with the site mentor after designating a time to meet to discuss the issue that may be separate from the weekly meetings. If the issue does not become resolved, the student will discuss the issue with the capstone coordinator to determine how to proceed with the issue.
Types of expertise desired from site mentor	Since I will not be in the clinic as frequently as other sites, I expect to need routine supervision. I desire this mentor to provide her clinical expertise, specifically her knowledge on neurological rehabilitation. Her expertise as an OT that has worked with stroke patients will help me understand how to best serve stroke patients when developing action observation resources and how to best promote knowledge translation for OTs working with this population. She will also help me as I pursue advanced clinical skills in neurological rehabilitation because we will have ongoing conversations about topics I learn more about during observation and educational courses. She can help me improve my clinical reasoning by discussing various topics that I want to learn more about or topics that she thinks would be helpful for me to gain more knowledge about before working as a new grad.	As both my faculty and site mentor, I expect to have more direct to routine supervision from Dr. Rowe. I will utilize her understanding of the stroke population from years of working as an OT in neurological rehabilitation to guide the development of the action observation videos for stroke patients. I will seek guidance from her throughout the entire video development process. Her expertise in research will also be important as I work towards growing my research skills as one area of focus for my project. I will communicate with her about the steps of the research process as I complete activities for research projects. Also, I desire to use her expertise in research to refine my ability to write various sections of a research paper or grant.
Roles and responsibility of each person	See Roles and Responsibilities Chart	
Follows OTD program curricular design	Three of the GSU OTD curricular design ideas are “Understanding and utilizing occupation to promote health and wellness,” “Use of evidence-based practice to support the doctoral capstone project,” and “Enhancing advocacy and leadership skills.” This capstone project will follow these OTD curricular design ideas. 1. Firstly, the problems identified in this capstone project are within the domain of occupational therapy practice concerns. Stroke can negatively impact clients and their caregivers by having negative effects on various outcomes listed in the fourth edition of the Occupational Therapy Practice Framework: Domain and Process (OTPF-4) including their health and wellness, quality of life (QOL), occupational performance, and participation in valued occupations (Mack & Hildebrand, 2023; American Journal of Occupational Therapy [AJOT], 2020). This project aims to increase the use of action observation in clinical practice to increase occupational engagement by facilitating motor recovery of the upper limb.	

	2. Next, the OTPF-4 highlights the importance of occupational therapists performing evidence-based practice by basing their interventions on current evidence (AJOT, 2020). Increasing available evidence through research and promoting knowledge translation will facilitate evidence-based practice as described in the OTPF-4 (AJOT, 2020). However, there is currently a delay in knowledge translation in stroke rehabilitation which is a relevant problem within occupational therapy practice (Walker et al., 2013). I will use literature to guide the development of action observation videos to create more resources for occupational therapists to promote evidence-based practice in neurological rehabilitation. 3. Lastly, I will enhance my leadership and advocacy skills by advocating for action observation to occupational therapists. I will have to use effective written and verbal communication to promote the use of action observation in clinical practice. The supervision of both site mentors will ensure that my project stays on track with the OTD curricular design, especially for the above ideas, and makes steady progress towards completing the long-term and short-term goals for my capstone project.

Supervision/Progress Plan (Dr. Rowe)

Learning activities	Outcome measures	Timeline for completion (of deliverables)	Supervision Plan with Site Mentor
1a. The student will observe occupational therapists working with patients with neurological conditions throughout the continuum of care in at least two different settings (e.g., acute care, inpatient, home health, etc.). **2a**. The student will perform informal interviews with occupational therapists about how action observation is currently used or could be implemented in at least two different settings. **3a.** The student will listen to books and podcasts to understand topics related to neurological conditions, the continuum of care, and rehabilitation for neurological conditions. **1b.** The student will complete the Certified Neuro Practitioner (CNP) certification. **2b.** The student will complete at least one CEU or certification course related to neurological rehabilitation (e.g., PWR, LSVT BIG, kinesiotaping, or IASTM). **3b.** The student will observe a Driver Rehabilitation Specialist (DRS) that works with patients with neurological conditions for a minimum of 8 hours.	**1a.** The student will submit at least 2 signed time logs of hours spent on-site with occupational therapists that work with patients with neurological conditions. **2a.** The student will synthesize the information discussed during the informal interviews in the Future Research section of the final capstone paper. **3a.** The student will keep a journal documenting which podcasts or books she listens to each week. **1b.** The student will submit a certificate of completion for the CNP certification. **2b.** The student will submit a certificate of completion for at least one CEU or certification course. **3b.** The student will submit a signed time log of hours spent on-site with a Driver Rehabilitation Specialist.	**1a.** Complete observation in 2+ settings by end of week 10 **2a**. Complete capstone paper by end of week 14 **3a.** Complete weekly between week 1 – week 14 **1b**. Complete CNP certification by end of week 3 **2b**. Complete 1+ CUE or certification course by end of week 12 **3b.** Complete at least 8 hours of observation with a DRS by end of week 8	**1a.** I will compare and contrast settings and explain what I learned with my site mentor through informal discussion during our weekly meetings. **2a.** I will verbally explain my progress toward writing my capstone paper during weekly meetings. After I complete a draft of each section of the capstone paper (Methods, Results, Future research, etc.), I will email it to my site mentor to review. **3a**. Email time logs each week which include the podcasts or books I've listened to. **1b.** I will explain my key takeaways from the CNP course to my site mentor during our weekly meetings. **2b.** I will explain my key takeaways from the CEU course(s) to my site mentor during our weekly meetings. **3b.** I will explain what I learned from the DRS with my site mentor through informal discussions during our weekly meetings.

1a. The student will utilize tasks from assessments and research studies to develop a list of possible tasks that may be included in the action observation videos. **2a.** The student will have the proposed list of action observation tasks reviewed by Dr. Wheaton, Dr. Rowe, and an occupational therapist that works with stroke patients to evaluate the list's clinical and scholarly significance. **3a**. The student will create an outline describing how and where each task from the finalized list of action observation tasks will be filmed. **4a**. The student will contribute to the norming of the action observation videos by gathering feedback about the perceived difficulty and visual complexity of each video. **1b**. The student will educate Creative Media Industries Institute GSU students about the goals of the capstone project and plan for the action observation videos and discuss a strategy for filming. **2b.** The student will recruit at least 1 healthy female adult and 1 healthy male adult of different ages and races that will be filmed performing tasks for the action observation videos. **3b**. The student will assist the Creative Media Industries Institute GSU students with directing and filming the action observation videos at GSU.	**1a.** The student will create a feedback form that includes the comprehensive list of tasks for action observation videos and an area for suggestions or comments. **2a.** The student will utilize responses on the feedback form to revise the list of tasks for the action observation videos. **3a.** The student will create a detailed list outlining the locations, required objects, tasks, and camera locations for each video of the action observation tasks. **4a.** The student will analyze the norming data and summarize the results in a written format. **1b.** The student will collaborate with the CMII GSU students to develop a timeline for filming the videos. **2b.** The student will submit signed informed consent forms for each participant. **3b.** The student will provide a link or folder with the finalized action observation videos.	**1a.** Create feedback form by end of week 1 **2a**. Revise list using feedback by beginning of week 3 **3a.** Create detailed list by end of week 3 **4a.** Submit results by end of week 12 **1b.** Meet with GSU CMII students by end of week 4 **2b**. Recruit at least 4 participants by end of week 5 **3b.** Complete filming and editing videos by end of week 10	**1a.** I will discuss progress for the comprehensive list of action observation videos and feedback form throughout week 1. I will email her the final versions for approval before sending them to other individuals. **2a.** I will collaborate with my site mentor to determine how to incorporate feedback for the action observation videos. **3a.** I will send the finalized detailed plan for the action observation videos to my site mentor via email by end of week 3. **4a.** I will collaborate with my site mentor to develop a plan for collection and analysis of norming data in a weekly meeting. **1b.** I will inform my site mentor of the timeline developed with CMII GSU students during our weekly meetings. **2b.** I will send the informed consent form to my site mentor by end of week 2 for her to review. I will discuss a plan for recruitment of healthy adults for the action observation videos during our weekly meetings. I will update the site mentor on progress of

			recruitment during weeks 2-5 during weekly meetings. **3b.** I will discuss the filming process and collaborate with my site mentor on how to develop the videos during a weekly meeting.
1a. The student will create a presentation about action observation based on current literature. **2a.** The student will perform an in-service on action observation for occupational therapists in an outpatient clinic. **3a**. The student will complete the Inspiring Change 2.0 mini course to better understand how to implement science into clinical practice. **1b.** The student will upload and organize action observation videos onto an online platform for use during occupational therapy sessions or as part of a patient's HEP. **2b.** The student will create a handout or a video introduction that explains the purpose of action observation and describes instructions for how to use the videos for patients and caregivers in layman's terms. **3b.** The student will create a handout or a video introduction to explain the purpose of action observation and describe instructions for how to use the videos for occupational therapy practitioners.	**1a.** The student will submit the finalized PowerPoint on action observation. **2a**. The student will record the date of the presentation in her weekly journal. **3a.** The student will submit a certificate of completion for the Inspiring Change 2.0 mini course. **1b.** The student will upload the link or file containing the online action observation resources. **2b**. The student will submit the handout or video introduction using laymen's terminology for patients and caregivers. **3b**. The student will submit the handout or video introduction for occupational therapists.	**1a.** Completed presentation by end of week 13 **2a**. Perform in-service by end of week 14 **3a**. Complete course by end of week 12 **1b**. Upload and organize action observation videos by end of week 12 **2b**. Finish instructions for patients and caregivers by end of week 13 **3b**. Finish instructions for occupational therapy practitioners by end of week 13	**1a.** During weekly meetings, I will ask questions to my site mentor to understand what information is important for OTs to understand about action observation by the end of week 10. This will clarify the type of information I will need to include in the presentation. I will email the presentation to the site mentor by end of week 13 for her to review. **2a.** I will discuss the presentation during a weekly meeting. **3a.** I will summarize what I learned from the mini course during a weekly meeting with my site mentor. **1b.** I will discuss platform options for the videos with my site mentor during a weekly meeting by week 10. I will upload the videos to the desired platform by week 12 and email my site mentor when it Is completed. **2b.** During week 11, I will email a draft of instructions for patients in layman's term for my site mentor

			to review. I will use her feedback to make revisions. **3b.** During week 11, I will email a draft of instructions for occupational therapists for my site mentor to review. I will use her feedback to make revisions. I will email my site mentor the instructions for OTs by the end of week 13.
1a. The student will participate in preparatory components for a grant-funded research project such as assisting with background justification, methodology, participant recruitment, or budgets. **2a.** The student will contribute to data analysis or dissemination for a research project. **1b.** The student will prepare lab materials and equipment for data collection. **2b.** The student will assist Dr. Wheaton and/or his research students with activities in the lab.	**1a.** The student will keep a journal of activities completed for the grant-funded research project. **2a**. The student will submit the written work for data analysis or dissemination. **1b.** The student will keep a journal of activities that are performed in the lab. **2b**. The student will keep a journal of activities that are performed in the lab.	**1a.** Submit any written documents by week 14 **2a**. Submit any written documents by week 14 **1b**. Complete lab tasks by week 10 **2b**. Complete lab tasks by week 10	**1a.** I will collaborate with my site mentor during weekly meetings to determine which components to address and plan for how to accomplish these tasks. **2a.** I will collaborate with my site mentor during weekly meetings to determine which components to address and plan for how to accomplish these tasks. **1b.** I will review my journal entries with the site mentor during our bi-weekly meetings. **2b.** I will collaborate with my site mentor during weekly meetings to determine which activities would be most appropriate for me to assist with and plan for how to accomplish these tasks.

Supervision/Progress Plan (Madison Compton)

Learning activities	Outcome measures	Timeline for completion (of deliverables)	Supervision Plan with Site Mentor
1a. The student will observe occupational therapists working with patients with neurological conditions throughout the continuum of care in at least two different settings (e.g., acute care, inpatient, home health, etc.). **2a**. The student will perform informal interviews with occupational therapists about how action observation is currently used or could be implemented in at least two different settings. **3a.** The student will listen to books and podcasts to understand topics related to neurological conditions, the continuum of care, and rehabilitation for neurological conditions. **1b.** The student will complete the Certified Neuro Practitioner (CNP) certification. **2b.** The student will complete at least one CEU or certification course related to neurological rehabilitation (e.g., PWR, LSVT BIG, kinesiotaping, or IASTM). **3b.** The student will observe a Driver Rehabilitation Specialist (DRS) that works with patients with neurological conditions for a minimum of 8 hours.	**1a.** The student will submit at least 2 signed time logs of hours spent on-site with occupational therapists that work with patients with neurological conditions. **2a.** The student will synthesize the information discussed during the informal interviews in the Future Research section of the final capstone paper. **3a.** The student will keep a journal documenting which podcasts or books she listens to each week. **1b.** The student will submit a certificate of completion for the CNP certification. **2b.** The student will submit a certificate of completion for at least one CEU or certification course. **3b.** The student will submit a signed time log of hours spent on-site with a Driver Rehabilitation Specialist.	**1a.** Complete observation in 2+ settings by end of week 10 **2a**. Complete capstone paper by end of week 14 **3a.** Complete weekly between week 1 – week 14 **1b**. Complete CNP certification by end of week 3 **2b**. Complete 1+ CUE or certification course by end of week 12 **3b.** Complete at least 8 hours of observation with a DRS by end of week 8	**1a.** I will compare and contrast settings and explain what I learned with my site mentor through informal discussion during our bi-weekly meetings. **2a.** I will verbally explain my progress toward writing my capstone paper during bi-weekly meetings. After I complete a draft of each section of the capstone paper (Methods, Results, Future research, etc.), I will email it to my site mentor to review. **3a**. Email time logs each week which include the podcasts or books I've listened to. **1b.** I will explain my key takeaways from the CNP course to my site mentor during our bi-weekly meetings. **2b.** I will explain my key takeaways from the CEU course(s) to my site mentor during our bi-weekly meetings. **3b.** I will explain what I learned from the DRS with my site mentor through informal

			discussions during our bi-weekly meetings.
1a. The student will utilize tasks from assessments and research studies to develop a list of possible tasks that may be included in the action observation videos. **2a.** The student will have the proposed list of action observation tasks reviewed by Dr. Wheaton, Dr. Rowe, and an occupational therapist that works with stroke patients to evaluate the list's clinical and scholarly significance. **3a**. The student will create an outline describing how and where each task from the finalized list of action observation tasks will be filmed. **4a**. The student will contribute to the norming of the action observation videos by gathering feedback about the perceived difficulty and visual complexity of each video. **1b**. The student will educate Creative Media Industries Institute GSU students about the goals of the capstone project and plan for the action observation videos and discuss a strategy for filming. **2b.** The student will recruit at least 1 healthy female adult and 1 healthy male adult of different ages and races that will be filmed performing tasks for the action observation videos. **3b**. The student will assist the Creative Media Industries Institute GSU students with directing and filming the action observation videos at GSU.	**1a.** The student will create a feedback form that includes the comprehensive list of tasks for action observation videos and an area for suggestions or comments. **2a.** The student will utilize responses on the feedback form to revise the list of tasks for the action observation videos. **3a.** The student will create a detailed list outlining the locations, required objects, tasks, and camera locations for each video of the action observation tasks. **4a.** The student will analyze the norming data and summarize the results in a written format. **1b.** The student will collaborate with the CMII GSU students to develop a timeline for filming the videos. **2b.** The student will submit signed informed consent forms for each participant. **3b.** The student will provide a link or folder with the finalized action observation videos.	**1a.** Create feedback form by end of week 1 **2a**. Revise list using feedback by beginning of week 3 **3a.** Create detailed list by end of week 3 **4a.** Submit results by end of week 12 **1b.** Meet with GSU CMII students by end of week 4 **2b**. Recruit at least 4 participants by end of week 5 **3b.** Complete filming and editing videos by end of week 10	**1a.** I will email my site mentor the feedback form by end of week 1 for her to fill out and return before the end of week 2. **2a.** I will send the finalized list of action observation videos to my site mentor via email by end of week 3. **3a.** I will send the finalized detailed plan for the action observation videos to my site mentor via email by end of week 3. **4a.** I will discuss what I learned from the results during a bi-weekly meeting. **1b.** I will inform my site mentor of the timeline developed with CMII GSU students during our bi-weekly meetings. **2b.** I will send the informed consent form to my site mentor by end of week 2 for her to review. I will discuss a plan for recruitment of healthy adults for the action observation videos during our bi-weekly meetings. I will update the site mentor on progress of recruitment during weeks 2-5 during bi-weekly meetings.

			3b. I will email my site mentor a link to the action observation videos or folder with action observation videos by end of week 10. We will discuss her feedback on the videos during a bi-weekly meeting.
1a. The student will create a presentation about action observation based on current literature. **2a.** The student will perform an in-service on action observation for occupational therapists in an outpatient clinic. **3a**. The student will complete the Inspiring Change 2.0 mini course to better understand how to implement science into clinical practice. **1b.** The student will upload and organize action observation videos onto an online platform for use during occupational therapy sessions or as part of a patient's HEP. **2b.** The student will create a handout or a video introduction that explains the purpose of action observation and describes instructions for how to use the videos for patients and caregivers in layman's terms. **3b.** The student will create a handout or a video introduction to explain the purpose of action observation and describe instructions for how to use the videos for occupational therapy practitioners.	**1a.** The student will submit the finalized PowerPoint on action observation. **2a**. The student will record the date of the presentation in her weekly journal. **3a.** The student will submit a certificate of completion for the Inspiring Change 2.0 mini course. **1b.** The student will upload the link or file containing the online action observation resources. **2b**. The student will submit the handout or video introduction using laymen's terminology for patients and caregivers. **3b**. The student will submit the handout or video introduction for occupational therapists.	**1a.** Completed presentation by end of week 13 **2a**. Perform in-service by end of week 14 **3a**. Complete course by end of week 12 **1b**. Upload and organize action observation videos by end of week 12 **2b**. Finish instructions for patients and caregivers by end of week 13 **3b**. Finish instructions for occupational therapy practitioners by end of week 13	**1a.** During bi-weekly meetings, I will ask questions to my site mentor to understand what information is important for OTs to understand about action observation by the end of week 10. This will clarify the type of information I will need to include in the presentation. I will email the presentation to the site mentor by end of week 13 for her to review. **2a.** My site mentor will attend the presentation along with other occupational therapists by the end of week 14. **3a.** I will summarize what I learned from the mini course during a bi-weekly meeting with my site mentor. **1b.** I will discuss what platform would be preferred by my site mentor during a bi-weekly meeting by week 10. I will upload the videos to the desired platform

			by week 12 and email my site mentor when it Is completed. **2b.** During week 11, I will email a draft of instructions for patients in layman's term for my site mentor to review. I will use her feedback to make revisions. I will email my site mentor the instructions in layman's terms for patients by the end of week 13. **3b.** During week 11, I will email a draft of instructions for occupational therapists for my site mentor to review. I will use her feedback to make revisions. I will email my site mentor the instructions for OTs by the end of week 13.
1a. The student will participate in preparatory components for a grant-funded research project such as assisting with background justification, methodology, participant recruitment, or budgets. **2a.** The student will contribute to data analysis or dissemination for a research project. **1b.** The student will prepare lab materials and equipment for data collection. **2b.** The student will assist Dr. Wheaton and/or his research students with activities in the lab.	**1a.** The student will keep a journal of activities completed for the grant-funded research project. **2a**. The student will submit the written work for data analysis or dissemination. **1b.** The student will keep a journal of activities that are performed in the lab. **2b**. The student will keep a journal of activities that are performed in the lab.	**1a.** Submit any written documents by week 14 **2a**. Submit any written documents by week 14 **1b**. Complete lab tasks by week 10 **2b**. Complete lab tasks by week 10	**1a.** I will discuss progress towards this goal during our bi-weekly meetings. **2a.** I will discuss progress towards this goal during our bi-weekly meetings. **1b.** I will review my journal entries with the site mentor during our bi-weekly meetings. **2b.** I will review my journal entries with the site mentor during our bi-weekly meetings.

Appendix C: Clinical and Research AO Video Categories

Green = Functional Finalized Actions

Yellow = Non-Functional Finalized Actions

Blue = Non-Finalized Actions

Shoulder - Reaching Forward

1. Shoulder flexion
2. Hand to lap
3. Reach to turn on faucet
4. Reach to turn off faucet
5. Fill a pot with water
6. Reach and pump soap
7. Hang clothes in closet
8. Reaching and grasping a bottle of water
9. Reach to place dish on counter
10. Wipe table with cloth
11. Wipe window with cloth
12. Connect a plug to the socket - phone charger
13. Place large box on shelf
14. Box to shelf (e.g., cereal box)
15. Turning on a lamp - pull down

Shoulder - Reaching Backward

16. Grasp toothpaste and bring close to self
17. Taking phone in hand and put it in the pants or jacket pocket
18. Opening/closing a drawer

Shoulder - Reaching Across Body

19. Shoulder abduction/adduction
20. Shoulder horizontal adduction
21. Shoulder horizontal abduction
22. Shoulder internal rotation/hand to lumbrical spine
23. Touching the shoulder with the palms of the hands - Same side
24. Touching the shoulder with the palms of the hands - Across body
25. Blocks into box
26. Shirt tuck
27. Apply lotion to arm
28. Apply solid deodorant
29. Put lid on cylindrical container
30. Hold pot lid and pour water from pot

Shoulder - Reaching to Back of Head

31. Shoulder external rotation - touch hair/back of head
32. Shoulder external rotation - to side
33. Brushing hair

Elbow - Hands Toward Face

34. Elbow flexion
35. Elbow extension
36. Don/doff baseball hat
37. Brush teeth
38. Drink from bottle
39. Drink from open cup
40. Drink from mug
41. Bringing fruit to the mouth using gross grasp
42. Bring phone to ear
43. Cleaning the nose with a tissue
44. Bring a cracker to the mouth
45. Feed self with fork
46. Feed self with spoon - yogurt
47. Feed self with spoon - applesauce
48. Feed self with spoon - water

Forearm Movements

49. Forearm supination
50. Forearm pronation
51. Pick up and roll dice
52. Open/close door and pull open- knob
53. Lock a door by turning the lock on handle
54. Turning key to unlock a door
55. Dry hands on paper towel
56. Pouring water into a glass
57. Scoop with measuring cups/spoons - large
58. Pour from cup/spoon to bowl - large
59. Scoop with measuring cups/spoons - small
60. Pour from cup/spoon to bowl - small
61. Move water from pot to a bowl with ladle

Wrist Movements

62. Wrist flexion
63. Wrist extension
64. Wrist ulnar deviation
65. Wrist radial deviation
66. Wrist circumduction
67. Wash hands
68. Wring rag
69. Spread jelly on toast
70. Whisk - water
71. Turn on faucet
72. Turn off faucet

Gross Grasp/Release

73. Hand - Mass flexion
74. Hand - Mass extension

75. Grasp toothbrush
76. Release toothbrush
77. Grasp hair brush
78. Release hair brush
79. Grasp dish from counter
80. Release dish on counter
81. Squeeze spray bottle on table
82. Use single hole puncher and squeeze holes on paper
83. Squeeze toothpaste onto toothbrush
84. Squeeze spray bottle on window while reaching
85. Sort silverware

Thumb Movements

86. Hand - thumb abduction/adduction
87. Hand - thumb palmar abduction/palmar adduction
88. Typing sentences on a phone notes app
89. Hold phone and dial phone number
90. Cutting paper with scissors
91. Flipping through the pages of a book

Writing

92. Pick up a pencil
93. Writing uppercase alphabet with a pencil on paper
94. Writing lowercase alphabet with a pencil on paper

Computer Use

95. Hand - finger tapping on table
96. Hand - finger abduction/adduction
97. Hand - thumb abduction/adduction
98. Typing on computer keyboard
99. Use computer mouse

Pinch

100. Hand - Sequential finger touching/Opposition
101. Turning pages of a book (cookbook, novel)
102. Deal cards into piles
103. Flip over coins on table
104. Coin into gauge
105. Open food containers (Ziploc - pull apart)
106. Open food containers (Ziploc - zip open)
107. Open food containers - Tupperware containers
108. Ripping paper
109. Pick up cracker
110. Braiding string
111. Sort cards by suit (card pile on table)
112. Open condiment bottles
113. Tying shoes – Two loops method
114. Tying shoes - One loop method

Finger Extension

115. Hand – Mass extension
116. Remove rubber band
117. Cat's cradle
118. Lock a door by pushing the lock button

In-hand Manipulation - Translation

119. Crumbling paper scraps into a tight ball
120. Picking up small coins one at a time, keeping them in the palm, and then placing to target
121. Picking up 5 small items with one hand and then put them back on table

In-hand Manipulation – Shift

122. Walk fingers up and down a pencil/pen
123. Separating two magazine/book pages that are stuck together with one hand
124. Fastener manipulation - buttoning and unbuttoning shirt (men's shirt vs women's shirt)
125. Fastener manipulation - buttoning and unbuttoning jeans (zip and button jeans)

In-hand Manipulation - Simple and Complex Rotation

126. Open water bottle lid
127. Assembling a nut and bolt
128. Open/close toothpaste
129. Turning on a lamp - twist
130. Spin a pen/pencil end over end with one hand
131. Rotating a ball in the fingers
132. Stabilize jar
133. Screw in light bulb

Pinch Stabilization and Gross Motor

134. Upper body dressing - donning/doffing overhead shirt (short sleeve t-shirt)
135. Upper body dressing - donning/doffing front open top (zip-up jacket)
136. Upper body dressing - donning/doffing front open top (button-up shirt)
137. Lower body dressing - donning/doffing pants figure 4 method
138. Lower body dressing - donning/doffing pants reaching to floor method
139. Lower body dressing - donning/doffing socks and shoes
140. Fastener manipulation - buckling and unbuckling
141. Fastener manipulation - zipping and unzipping jacket
142. Place shirt on hanger
143. Fold sheet
144. Put pillowcase on and off pillow
145. Stabilize pillow
146. Fold laundry - shirt
147. Fold laundry - pants
148. Stabilize package
149. Make paper airplane
150. Fold paper

ACTION OBSERVATION (AO)

What is AO?

AO is a rehabilitation tool that involves watching videos of another person's hands and arms doing movements, simple activities, or daily tasks.

AO is similar to what you do when you go to YouTube to watch a video about how to do something.

AO stimulates areas of your brain that can help you move your hand and arm better. AO may help you re-learn how to use your hand and arm for daily activities such as getting dressed, personal grooming, feeding, meal preparation, household chores, etc.

Medical Conditions AO is for:

- Stroke
- Alzheimer's Disease
- Parkinson's Disease
- Cerebral Palsy

AO at Home:

Your occupational therapist (OT) can suggest which AO videos may help you achieve your goals.

You can watch the AO videos recommended by your OT as part of your home exercise program:

- Watch the videos **3-5 days per week**
- After watching each video, **practice** the task
  - See the back of this handout for more information about practicing **(action execution)**
- **Take short breaks** between each video
- Only do AO for up to **30-40 minutes at one time**

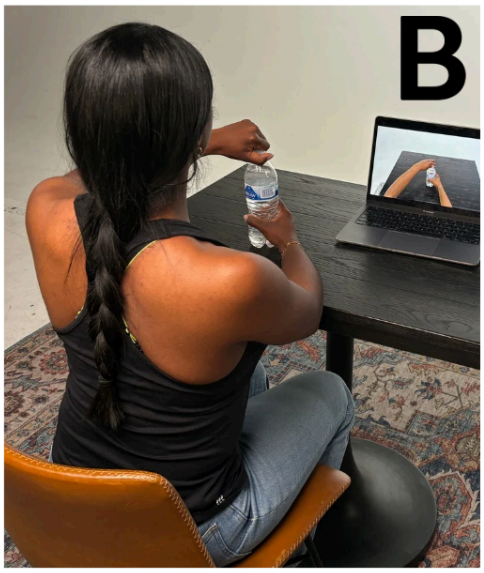
SCAN TO ACCESS AO VIDEOS

To access AO videos, visit https://www.youtube.com/@ActionObservationOT

ACTION OBSERVATION (AO)

Action Execution

- Action execution (AE) is the **active doing** of the task.
- Repeatedly practicing the tasks with AE is important to do after watching the AO videos.
- **High repetitions** of the movements and tasks during AE will lead to more long-term changes in your brain than doing low repetitions.
    - The more you practice the tasks, the better you can create new connections and strengthen connections in your brain because of neuroplasticity.
        - This can improve how your hand and arm move.
        - This can help you relearn motor skills to get better at doing the tasks shown in the AO videos.
- Your OT may suggest using mental imagery as a different way to practice the activities shown in the AO videos.



Action observation of opening a bottle (**A**)
followed by **action execution** of opening a bottle (**B**)

For more information, visit https://www.youtube.com/@ActionObservationOT