SURVEYING OCCUPATIONAL THERAPY PRACTITIONERS TO IDENTIFY THE USE OF MENTAL IMAGERY AND/OR ACTION OBSERVATION INTERVENTIONS FOR INDIVIDUALS POST-STROKE

A Thesis submitted to the faculty at Stanbridge University in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy

by

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Abstract

Our research objective is to determine the current use of mental imagery and/or action observation interventions in stroke rehabilitation and potential barriers to implementation. Through a literature review of current research, we identified the benefits of evidence-based interventions such as mental imagery and action observation in stroke rehabilitation for individuals with upper extremity dysfunction post-stroke. We surveyed occupational therapists to collect quantitative and qualitative data to understand their use of evidence-based interventions with patients post-stroke. Thirteen occupational therapists and two occupational therapist assistants completed the survey. Our results indicated there is no significant correlation between occupational therapists' years of experience in stroke rehabilitation and/or specific stroke certifications and the use of mental imagery or action observation interventions.

Keywords: occupational therapy, stroke, mental imagery, action observation, upper extremity, neuroplasticity

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Surveying Occupational Therapists to Identify the Use of Evidence-Based Mental Imagery and/or Action Observation Interventions for Individuals Post-Stroke

Each year, more than 795,000 Americans suffer from strokes, with about 610,000 being new or first-time occurrences (Centers for Disease Control and Prevention, 2024). Stroke, or cerebrovascular accident, remains a leading cause of long-term disability, often resulting in motor function deficits, including compromised upper extremity (UE) abilities (Maceira-Elvira et al., 2019). Approximately 3% of the U.S. adult population—around seven million individuals—are living with the aftermath of a stroke (Ovbiagele & Nguyen-Huynh, 2011). Cerebrovascular accidents are caused by blocked or hemorrhaging arteries in the brain, resulting in a lack of oxygen in that area of the brain, leading to cell death (Cleveland Clinic, 2022). This can lead to different impairments, such as paralysis or weakness of the limbs, difficulties with gross and fine motor skills, speech and language abilities, cognition, vision, and emotions (American Stroke Association, 2019).

Unilateral stroke can result in hemiparesis, defined as "weakness or inability to move on one side of the body, making it hard to perform everyday activities like eating or dressing" (American Stroke Association, 2019). This decrease in motor function may significantly impact the individuals' ability to complete activities of daily living (ADL) and instrumental activities of daily living (IADL; Borges et al., 2022). Stroke rehabilitation plays an important role in increasing UE function for individuals poststroke and in increasing their quality of life. As part of the rehabilitative process, occupational therapy practitioners (OTPs) can implement mental imagery (MI) and action observation (AO) interventions to improve a client's occupational engagement

and performance in a broad range of occupations, such as ADLs, instrumental ADLs, health management, sleep, education, work, play, leisure, and social participation (American Occupational Therapy Association, 2020).

Our research aims to determine how OTPs implement MI and/or AO interventions, in stroke rehabilitation to increase UE function. This aim addresses one of the Occupational Therapy Research Agenda's goals which states that intervention research is a priority in our profession (Occupational Therapy Education Research Agenda–Revised, 2018). Continued research is needed for OTPs to provide effective interventions that have been defined, described, and tested (Occupational Therapy Education Research Agenda–Revised, 2018). For the purpose of this thesis, the terms MI and motor imagery training will be used interchangeably to define "a cognitive process that involves imagining performing a movement without actually moving it or tensing your muscles" (Mulder, 2007, p. 1267). AO therapy is a mirror neuron-based approach that includes patients watching the movements of individuals on video and aiming to imitate and perform those actions afterward (Shamili et al., 2022). MI and AO interventions are often used in conjunction when addressing UE function for individuals post-stroke. According to Wang et al. (2023), the practice of motor imagery training is an effective and functional rehabilitation method for neuroplasticity in upper limbs for stroke recovery. Furthermore, when MI is paired with transcranial direct cranial stimulation, the combination suggests a significant improvement in the client's upper limb functioning compared to either method alone (Kashoo et al., 2022). These studies have demonstrated MI and AO as successful intervention methods, attributed to their beneficial effects on neuroplasticity. This, in turn, contributes to positive treatment

outcomes and enhances UE function in individuals post-stroke, while providing a cost-effective approach to stroke rehabilitation. Additionally, these interventions can be easily integrated into existing rehabilitation protocols and tailored to individual patient needs, further supporting their widespread clinical application.

While research has supported the effectiveness of MI in clinical practice, the literature does not explicitly state how OTPs are utilizing these interventions in stroke rehabilitation practice. This study aims to address knowledge gaps and potential barriers in implementing principles of MI and AO in clinical practice. Our population includes licensed occupational therapists and occupational therapy assistants working in stroke rehabilitation across the United States. The objective of our research is to survey OTPs within the United States to collect data on how they are implementing MI and AO, and if not, then what are the potential barriers in utilizing these concepts in practice. Our aim will be to assess the factors contributing to the insufficient implementation of MI and AO as a post-stroke intervention, thus enhancing our comprehension of the evidence-based approaches utilized by OTPs. Understanding how OTPs are implementing MI and/or AO will allow us to address the gaps in contemporary research and the benefits of OT interventions in UE function rehabilitation post-stroke.

Literature Review

Stroke is a leading cause of long-term disability, which often results in impairments in motor function, including loss of UE function (Demartino et al., 2019). Such loss has a significant impact on the individual's ability to complete ADLs and IADLs (Borges et al., 2022). MI involves cognitive processes to create or recreate sensory experiences without overt physical movements (McCormick et al., 2022). In

addition to MI, AO is a form of upper limb rehabilitation where patients watch the movements and actions of healthy subjects on a video or a live show, and afterward, the patients attempt to imitate and perform those actions (Shamili et al., 2022). The societal impact of this research rests in its capacity to empower stroke survivors, offering a non-intrusive and readily accessible intervention, consequently amplifying the importance of MI and AO in promoting UE limb function. Furthermore, the use of MI can be a potential intervention that reduces the burden on the healthcare system by offering a cost-effective method for improving UE function (McCormick et al., 2022). For these reasons, the research on the positive effects of MI and AO for patients post-stroke and its impact on UE function holds significant social importance. The use of the UE is an important function for most people to serve their ADLs like reaching, grasping, and stabilizing. By further researching MI and AO therapy interventions, we can contribute to the development of effective treatments that improve the lives of those whose UE function has been affected after a stroke.

Common Theme #1: MI and AO Interventions Impact on Neuroplasticity

Several studies have explored improvements in upper limb activities following stroke, particularly through the implementation of MI interventions. Studies by McCormick et al. (2022) and Shamili et al. (2022) display the innovative strategies for increased upper limb performance and rehabilitation in stroke survivors. Despite employing varied methodologies, their shared objective is to strengthen post-stroke upper limb function via technology-dependent or innovative interventions. Both articles mentioned highlight the value of MI interventions in improving upper limb function and ADL engagement. This is achieved by techniques such as incorporating visual and audio

cues to aid in MI practice, as well as integrating practical upper limb functional activities into rehabilitation therapy sessions.

In a study conducted by McCormick et al. (2022), compelling evidence emerged demonstrating that these techniques possess the capacity not only to enhance functional outcomes, but also to facilitate cortical regeneration within motor areas affected by damage through the mechanism of neuroplasticity. Neuroplasticity is defined as, "the ability of the nervous system to change its activity in response to intrinsic or extrinsic stimuli by reorganizing its structure, functions, or connections" (McCormick et al., 2022, p. 2). Such a phenomenon plays a pivotal role in relearning motor functions post-stroke, enabling individuals to adapt to both intrinsic and extrinsic stimuli and thereby fostering a shift in techniques necessary for everyday occupations. This emphasizes the significance of interventions that foster neuroplasticity to promote recovery and functional independence in stroke survivors.

Kashoo et al. (2022) explored the concept of MI, a cognitive process where individuals mentally simulate physical movements without engaging in actual voluntary motor activity. This cognitive rehearsal technique serves as a powerful tool in rehabilitation, as it allows individuals to repeatedly practice and refine motor tasks within their minds, ultimately facilitating improvements in functional movement for daily activities. MI can serve a crucial role in post-stroke recovery, as it aids in effectively training neural pathways, reinforcing motor patterns, and promoting neural plasticity.

A randomized control trial study by Shamili et al. (2022) identified the importance of incorporating meaningful occupations and a client-centered approach to

post-stroke rehabilitative interventions to improve functional outcomes. Incorporating meaningful occupations into AO therapy interventions can improve cortical excitation, which provides higher chances of persistent neuroplasticity in patients post-stroke. The study indicates that AO and MI provide the best method for optimal recovery for UE functioning. Additionally, using activities that are meaningful to the patient during AO therapy can become a source of motivation and volition during the treatment process, leading to greater therapy engagement.

Common Theme #2: Insights Into the Efficacy of MI and AO for Increasing UE Function

Another common theme that emerged in our literature review was the investigation of the efficacy of MI interventions in stroke rehabilitation while employing different methodologies and interventions. The literature provides insight on the effectiveness of MI interventions such as motor imagery training/MI, and AO, in improving upper limb function and neural activation in stroke survivors. OTPs can use such evidence to tailor their rehabilitation programs and interventions to meet the individual needs of stroke patients, ultimately enhancing their functional outcomes, neuroplasticity, and quality of life.

A study conducted by Wang et al. (2023) addresses the research of neural mechanisms of MI in stroke rehabilitation. The longitudinal study utilized functional magnetic resonance imaging (fMRI) to assess changes in brain activation and connectivity before and after motor imagery training intervention. They recruited stroke patients with moderate to severe upper limb motor impairment and assessed changes in brain activation and functional connectivity using fMRI. Results showed improvements in the Fugl-Meyer Upper Limb Scale and Barthel Index scores in the motor imagery

training group compared to those in the controlled group. This indicated the effectiveness of motor imagery training in enhancing upper limb function and promoting functional recovery. The study contributes knowledge about the efficacy of motor imagery training in improving outcomes and neural mechanisms underlying motor recovery post-stroke.

A study conducted by Choi et al. (2022) examined the effects of combined MI and AO on UE function and corticospinal activation in stroke patients. This study utilized motor evoked potential amplitude measurements and functional assessments including Wolf Motor Function, Motor Activity Log, and the Fugl-Meyer Assessment Upper Extremity. The results demonstrated significant improvements in the experimental group's Fugl-Meyer Assessment Upper Extremity and Motor Activity Log assessment scores compared to the control group. These findings indicate the effectiveness of combining MI and AO in enhancing UE function and corticospinal activation. The study contributes knowledge about the benefits of MI and AO in the recovery of post-stroke.

Additionally, the study conducted by Choi et al. (2022) addressed the effectiveness of combining MI and AO interventions to improve UE function post-stroke. The research provided Motor Activity Log, a qualitative evaluation tool that employs a structured interview-style evaluation. Consisting of 30 items related to daily life behavior, assessments are conducted on both the amount of use and quality of movement of the affected limb. Each item is scored on a scale of 0-5, culminating in an averaged score which provides insight into the level of UE function. With vigorous reliability indicators such as Cronbach's Alpha Coefficient, this approach offers a reliable means of gauging progress and guiding interventions in post-stroke rehabilitation.

The qualitative study by Binks et al. (2023) addresses AO and MI therapy as an exceptional supplementary alternative to neurorehabilitation for post-stroke recovery when traditional physical therapy is impractical. AO and MI therapy is advantageous compared to either AO or MI with increased activation of motor regions of the brain shown in imaging studies of healthy volunteers. Specifically, the study explores the AO and MI outcomes in a complex cup-stacking experimental design method to examine movement execution times. With the absence of physical therapy practice, AO and MI training is an advantageous method for motor skill acquisition. According to Binks et al., corticospinal excitability was significantly greater when a combination of AO and MI practice was used compared to practicing AO or MI in isolation without the other. This approach promotes functional connectivity and plasticity which facilitates motor execution as learning progresses. A fMRI study by Taube et al. (2015) displayed the significance of combining AO and MI together and reported greater brain activity in the premotor area, supplementary motor area, basal ganglia, and cerebellum. AO or MI alone does not prove to produce sufficient brain activation compared to a combination of AO and MI training.

Common Theme #3: Identifying Barriers to Implementing Evidence-Based MI/AO Interventions in Stroke Rehabilitation Practice

A common theme to address regarding EBP interventions such as MI and/or AO is identifying barriers to implementation. A study by Iqbal et al. (2023) discussed the barriers, facilitators, and use of EBP in practice over time for occupational and physical therapists. The mixed-methods study discovered barriers including time constraints, lack of access to databases, research opportunities, continuing professional development activities, and peer and financial support. By addressing barriers to implementation at

individual, educational, organizational, and policy levels, we can promote the use of evidence-based practice among occupational and physical therapy practitioners, ultimately enhancing the quality of patient care.

Another study by McCluskey et al. (2013) identifies barriers encountered by healthcare professionals in stroke rehabilitation settings. These included skills and knowledge barriers, lack of available treatment protocols, and beliefs and attitudes towards certain practices. For OTPs to implement MI and/or AO interventions into their clinical practice, addressing barriers and facilitating EBP in the workplace is essential to provide the best quality client-centered care.

Remaining Gaps in Evidence

A key challenge in studying MI's impact on post-stroke UE rehabilitation is the limited research on applying these techniques in practice. Small sample sizes in research limit the ability to prove reliability and validity. The recent use of MI training as a common recovery tool may partly explain this shortage of participants. The studies had barriers to finding appropriate criteria in their populations to run experimental designs for MI. McCormick et al. (2022) found evidence of technology-dependent therapy in UE rehabilitation, however, their study was limited due to a small sample size that was compounded by a long and tedious recruiting process. Likewise, Kashoo et al. (2022) found difficulties with small sample sizes and blinding procedures in their study of the clinical implication of transcranial direct current stimulation on stroke rehabilitation. In addition, both Wang et al. (2023) and Choi et al. (2022) had limitations in conducting research with a representative population due to confounding variables in the severity of stroke levels. Adhering to the ethical principles of nonmaleficence and beneficence is

essential for conducting ethical research, especially given the emerging application of MI training. The lack of established protocols for implementing MI in data collection presents challenges in upholding these principles, as traditional methods are sometimes set aside. Additionally, the novel nature of MI, coupled with the rapid advancement of technology, raises concerns about selecting appropriate assessments for accurate data measurement.

In addressing the gaps in the use of MI and AO interventions for stroke rehabilitation, it is crucial to understand how these EBPs are implemented by OTPs to improve UE function. McCluskey et al. (2013) and Iqbal et al. (2023) discuss the significance of identifying and overcoming barriers to EBP in healthcare, emphasizing the need for effective application in clinical settings. Our study aimed to survey OTPs to assess whether they utilize MI and AO interventions in their practice. Additionally, we investigated the barriers they encounter that may hinder the implementation of these interventions. By acknowledging these challenges, our research seeks to provide insights that could enhance the adoption and effectiveness of MI and AO in stroke rehabilitation, ultimately leading to improved patient outcomes.

Clinical Significance of the Evidence

The studies suggest a positive relationship between the use of MI training and improvements in UE functioning, especially in conjunction with AO and MI. According to Wang et al. (2023), the practice of motor imagery training is an effective and functional rehabilitation method for neuroplasticity in the upper limb for stroke recovery. Evidence suggests that MI is a cost-effective and accessible method to address ADLs for clients. For example, due to the expanding medium of telehealth, MI is an efficacious

accessory for OTPs to provide support to clients feasibly from their homes or who may have difficulties with transportation needs. Telerehabilitation is a remote and clinician-led therapy that is gaining popularity due to its convenience (McCormick et al., 2022). Motor imagery training supplements OT sessions by providing an effective rehabilitation method through tablet device applications, virtual reality simulations, or observation therapy. MI supplements traditional therapy, like OT, in both inpatient and outpatient settings for patients with hemiplegia in stroke rehabilitation (Wang et al., 2023). We found that there is strong evidence for MI as an emerging and convenient therapy practice that could be incorporated in a wide variety of ways to assist in the recovery process and OT interventions for ADLs.

Literature Review Conclusion

MI in post-stroke rehabilitation is highly instrumental for post-stroke recovery therapy because this intervention is cost-effective, easily accessible, and provides positive benefits to UE functioning. As the article by Wang et al. (2023) mentions, MI training can positively improve brain function resulting in improvements in UE motor function. The studies show that MI and other rehabilitative interventions improve post-stroke upper limb motor function favorably. MI proves to be a valuable tool in the rehabilitation of patients post-stroke when traditional therapy methods are not possible. The literature discussed above validates the contribution of applying stimulus through MI to enhance motor functioning in the UEs post-stroke, especially in combination with AO for optimal results. MI is an effective intervention approach due to the positive impacts on neuroplasticity, which improves UE function in patients poststroke.

Statement of Purpose, Research Question, and Hypothesis

Current research informs OTPs about the benefits of MI and AO but does not state how these interventions are implemented and carried out in clinical practice. The purpose of our study is to identify whether OTPs are implementing MI and AO interventions in stroke rehabilitation and to discover barriers to implementation in clinical practice.

Through addressing gaps in knowledge about how MI and AO are implemented, our study can highlight the value of both interventions in stroke rehabilitation. Our research question addresses how OTPs are implementing MI and/or AO interventions into clinical practice to increase UE function with individuals post-stroke. Through the approach of surveying OTPs in the United States, we can gain insight into evidence-based approaches such as MI and AO for UE dysfunction and identify what this looks like in current practice. This information will help us to assess the feasibility and use of MI and AO for individuals post-stroke and provide future clinicians with insights into the use of MI and AO for clients post-stroke. We hypothesize that OTPs may not incorporate current evidence-based MI or AO in stroke rehabilitation, due to a lack of access to current research knowledge, insufficient time, or support from work facilities.

Theoretical Framework

When addressing the needs of individuals post-stroke, OTPs should utilize a frame of reference to identify impairments and address functional goals. The motor control and learning frame of reference best addresses the need to improve UE function in individuals post-stroke. This framework assists in identifying the effectiveness and usability of MI/AO interventions within the stroke population. The motor control and learning frame of reference integrates the principles of nonlinear science and relies on

neuroplasticity and the brain's self-organization as focal points for therapeutic transformation (Cole & Tufano, 2020). This frame of reference focuses on motor learning as, "the study of the acquisition of and/or modification of movement" (Schumway-Cook & Woollacott, 2012, p. 21). Motor control refers to the capacity to regulate or guide the fundamental mechanisms involved in movement (Schumway-Cook & Woollacott, 2012). This frame of reference provides guidelines to restore functional movement for a wide range of populations with health conditions such as cerebral palsy, cerebrovascular accident, and traumatic brain injury. This will aid in determining the effectiveness of MI/AO interventions in improving UE function for individuals post-stroke. This theory identifies the importance of neuroplasticity, motivation, and reinforcement to facilitate therapeutic change.

According to Lundy-Ekman (2022), "neuroplasticity is the ability of neurons to change their function, chemical profile (quantities and types of neurotransmitters produced), and/or structure" (p.99). The literature we reviewed identified the role of neuroplasticity as a pivotal factor in relearning motor function and enabling individuals to adapt to both intrinsic and extrinsic stimuli post-stroke. Additionally, a study by Shamili et al. (2022), identified the importance of incorporating meaningful occupations and a client-centered approach to post-stroke rehabilitative interventions to improve functional outcomes by improving cortical excitation to provide higher chances of persistent neuroplasticity in patients. Integrating MI/AO interventions within the motor control and learning frame of reference offers a holistic approach for individuals post-stroke rehabilitation. By leveraging the principles of neuroplasticity, OTPs can facilitate

meaningful changes in motor function, while the emphasis on client-centered, meaningful occupations ensures that therapy aligns with individual goals and priorities.

The motor control and learning frame of reference includes two approaches for restoring motor function: neurodevelopmental theory (NDT) and the task-oriented approach. NDT is an approach that can be utilized for individuals with flaccidity or spasticity in UE post-stroke and may be combined with a biomechanical approach to address the range of motion, strength, and endurance (Cole & Tufano, 2020). This theory incorporates specific strategies such as hands-on techniques that allow therapists to address muscle tone and movement in an affected limb. “The occupational therapist places the client in positions to decrease spasticity and activate normal movement patterns” (Cole & Tufano, 2020, p. 303). NDT includes the use of handling techniques to inhibit abnormal movement and facilitate normal movement patterns aiming to retrain specific muscle groups. According to Cole and Tufano (2020), although NDT does not directly address patient motivation, researchers of NDT assume clients may be more motivated by functional movements that relate to their ordinary tasks and when used in the context of addressing meaningful activities. Additionally, task-oriented approaches use meaningful tasks to increase client motivation and improve relearning of voluntary motor skills. Identifying specific task accomplishments as goals for intervention provides OTPs with a focus on developing the client’s optimal motor and cognitive strategies to achieve functional goals (Cole & Tufano, 2020). Motor learning approaches require the practice of movement skills in order to increase the ability to adapt and refine motor skills when performing tasks. Incorporating MI/AO techniques can further enhance this process by providing alternative pathways for refinement and skill acquisition. Our study aimed to see how OTPs who work with client's post-stroke, utilize

MI/AO techniques, which are largely in line with the motor control and learning frame of reference.

Methodology

Design

We decided a mixed methods study approach was the most appropriate means to address the gap in the literature and identify the use of MI/AO evidence-based interventions in clinical practice. Through our collection of qualitative and quantitative data, our study aimed to assess the use of MI and AO interventions while exploring barriers to implementing MI and AO within clinical settings. First, we did a thorough review of studies on implementing MI/AO interventions within the post-stroke population. We then disseminated a survey to collect data from OT practitioners working with individuals post-stroke across the United States. The Stanbridge University Institutional Review Board approved all study procedures. Our approach generated qualitative and quantitative data, allowing us to address how evidence-based MI and AO are implemented and the barriers to implementation in stroke rehabilitation settings. The mixed-methods study design provided insights into OTP's perspectives and experiences in clinical practice settings, contributing to the existing literature and supporting our hypothesis.

Survey

The survey included a consent form at the beginning, outlining the purpose of the study and the participant's privacy rights, which can be viewed in Appendix A. The consent form specified participants had to be 21 years or older and required personal identifiers to verify that only licensed therapists participated in the study. Participation was voluntary, and participants were asked to check a box after reading the consent

form, indicating their agreement or disagreement to participate in the study. They were also informed that they could choose not to answer specific survey questions and could withdraw from the study at any time without consequence. Therapists who consented to participate were asked to complete our survey, which had an estimated 10-15 minute duration. The survey was provided as a Google Form consisting of multiple-choice and open-ended questions. Initially, demographic information was gathered, followed by the collection of qualitative data about the use of EBP MI and AO in stroke rehabilitation practice. Efforts were made to ensure the integrity and consistency of data collection procedures, with an emphasis on maintaining standardization and minimizing bias. A copy of the survey questionnaire can be found in Appendix B.

Subjects

The participants for this study consisted of licensed or registered occupational therapists with bachelor's, master's, or doctorate degrees in occupational therapy, as well as certified occupational therapy assistants with an associate’s degree, who met specific inclusion criteria. These criteria were designed to target OTPs with experience in addressing UE function in post-stroke rehabilitation. The inclusion criteria for participants were as follows: being a licensed occupational therapist or occupational therapist assistant, having at least six months of experience working with individuals post-stroke, being in good health standing with adequate cognitive function providing informed consent for the survey, and working in various clinical settings such as inpatient, acute or long-term, skilled nursing facilities, and outpatient care. Participants were also required to be able to read, speak, and write in English.

Procedure

The surveys were distributed through recruitment flyers to different clinical sites in California and different states throughout the United States. We also posted our flyers on LinkedIn. Participants were recruited by scanning a QR code on our flyer and consenting to participate. Surveys were conducted using Google Forms, and responses were analyzed by Google Results after the deadline. The personal data was protected and stored in a password-protected Google Drive folder.

Data Analysis

Our survey questions were analyzed to determine emerging common themes. The use of open and selective coding revealed common themes from the survey data analyzed. The purpose of analyzing themes is to determine how EBP is implemented by OTPs. We hypothesized that the participants would lack incorporation of current evidence-based practice, such as MI/AO interventions, due to lack of access to research knowledge, lack of time, and lack of support from work facilities. To analyze our survey data, we used the Dedoose software system (https://www.dedoose.com/) to code qualitative data and a statistician for our quantitative data.

Ethical Considerations

All participants were presented with a consent form detailing the study's procedures and objectives. It was emphasized that participation was voluntary, and individuals had the option to withdraw from the research at any stage in the questionnaire. To assure confidentiality, the survey responses were only reviewed by the research group members, statistician, and faculty advisor guiding this research to provide privacy and respect to the participants involved.

Results

Demographics

Fifteen participants responded to the survey representing different regions of the United States (Figure 1). Of the 15 participants, 86.7% are licensed occupational therapists and 13.3% are certified occupational therapist assistants. Of the 15 participants, 26.7% have had 1-3 years of clinical practice, 26.7% had 4-6 years of practice, 6.7% had 6-8 years of practice, 26.7% had 8-10 years of practice, and 13.3% had 10 or more years of experience in the occupational therapy field (Figure 2). The most common workplaces reported were skilled nursing facilities (26.7%) and outpatient settings (26.7%). The rest of the participants work in acute inpatient settings (13.3%), and (6.7%) work in outpatient hand therapy, (6.7%) school-based setting, (6.7%) academic setting, and (6.7%) in research (Figure 3).

Use of Interventions

The study participants included OTPs working in various clinical settings across the United States. The largest percentage of OTPs reported working in outpatient settings (20.0%) and skilled nursing facilities (20.0%). Other settings included acute inpatient (14.3%), and smaller percentages worked in academia and research (6.7%); outpatient hand therapy (6.7); school-based practice (6.7%); a combination of acute inpatient and outpatient care (6.7); and a combination of skilled nursing facilities and academia (6.7%; Figure 3). Regarding the use of MI/AO interventions, 26.7% of therapists reported uncertainty and indicated they do not use these approaches in practice. Among remaining therapists, 13.3% reported they have used MI/AO, 40% reported “yes, but rarely use MI/AO” and 20% reported “yes, I use this approach often” (Figure 4). Out of 15

participants, 46.7% (n=7) of them are aware of evidence-based MI or AO interventions while 53.3% (n=8) were unaware (Figure 5). Participants' experience levels also influenced their MI/AO usage. Participants with 1-3 years of experience reported: 25% have never used MI/AO, 25% have used it, and 50% have rarely used MI/AO in clinical practice. Participants with 4-6 years of experience reported as follows: 25% have never used MI/AO, 50% have rarely used it, and 25% use it often. Participants with 8-10 years of experience reported as follows: 25% were unsure, 50% rarely used it, and 25% use it often. The participants with over 10 years of experience reported as follows: 50% rarely use MI/AO and 50% use it frequently in clinical practice (Figure 6). Practitioners with no stroke-related certifications had varied responses on MI/AO use. One practitioner with a certified brain injury specialist certification reported frequent use of MI/AO, while another practitioner with a certified stroke rehabilitation specialist certification reported rare use. Among the four neuro-integrative functional rehabilitation and habilitation-certified practitioners, 25% reported no use, 25% reported rare use, 25% reported occasional use, and 25% reported frequent use of MI/AO in practice (Figure 7).

Discussion

Through the analysis gathered, we found the biggest factor as to why the two EBP interventions are not as frequently implemented was due to the lack of awareness of these interventions. We found that through coding our qualitative data, similar themes regarding awareness and familiarity of MI/AO interventions were a common barrier. One OTP stated, “I have not used AO interventions for people who are post-stroke because I was unaware of this method.” Another theme was the implementation of MI/AO interventions in clinical practice and how they implement MI/AO. An OTP

stated, “For patients with dense hemiplegia in the hospital, I instruct them to close their eyes and think about moving their affected UE and to imagine using their affected UE in functional activities,” as their approach to implementing MI in stroke rehabilitation. The last theme we discovered was that OTPs wanted to gain more knowledge about MI/AO interventions in stroke rehabilitation. Multiple OTPs stated they were interested in learning more about MI and AO interventions, one OTP stated, “I am interested in learning more about MI and AO for stroke recovery.” These emerging themes suggest OTPs are seeking additional knowledge on evidence-based interventions to implement in practice with the stroke population. Further research and training on MI and AO intervention implementation may benefit OTPs seeking to gain knowledge on these approaches. OTPs are eager to learn more about evidence-based interventions that are effective and feasible to implement in their clinical practice. We discovered 50% of OTPs with 10 years or more experience implement MI/AO interventions frequently in practice; whereas 50% of OTPs with less than 3 years' experience report rarely using MI and AO. Our participants identified a need for further research regarding MI/AO implementation in stroke rehabilitation.

Limitations

One of the primary limitations of this study was the findings being based on limited responses obtained from OTPs living in California, Arizona, Iowa, Missouri, and Nevada who have access to the Internet, which limits generalization to the rest of the country. Due to the limited time allotted to complete this research study, we were unable to further reach OTPs in more states around the country. This geographical limitation narrows the applicability of the findings to the broader OTP population across the United

States. Furthermore, by excluding other healthcare practitioners, such as nurses, physical therapists, or other rehabilitation specialists, our findings on MI and AO intervention cannot be generalized across other healthcare fields. Another significant limitation was the challenge of having a smaller sample size than anticipated due to the specificity of our inclusion criterion. We also faced a limitation regarding the restricted number of sites available to recruit participants from due to time constraints. These time constraints also limited our ability to recruit a larger, more diverse participant pool and impacted on the depth of our inquiry, as there was insufficient time to ask more comprehensive questions. We utilized self-reports to identify participants' work status and experience in the occupational therapy field without verifying their professional licenses, which may limit credibility as we did not ask for their license numbers. The study's findings were also influenced by several participants skipping the final question, which asked about their use of evidence-based interventions, such as MI and AO, in practice. This missing data further limits the strength and credibility of the study's conclusions.

Conclusion

OTPs' in stroke rehabilitation seek to implement evidence-based interventions as a means to provide client-centered care. In our literature review regarding implementing MI and AO for individuals post-stroke, we identified positive outcomes with UE limb function and an increase in neuroplasticity. Although proven as effective evidence-based approaches, OTPs face a lack of knowledge on how to use MI and AO effectively in stroke rehabilitation settings. We aimed to identify the use of MI and AO barriers to EBP implementation in stroke rehabilitation. Through our thesis research project, we aimed to gather relevant information on the current level of MI and/or AO implementation in

stroke rehabilitation settings. Our study outcomes can provide valuable statistics for OTPs in stroke rehabilitation settings by assessing the barriers to MI and AO application. Our research can be used as a further clinical guide to increase the resources needed for implementing MI and AO into current practice due to its feasibility and cost-effective approach. Further research is necessary to promote the use of MI and AO to increase UE function and ensure clients with UE dysfunction receive the best client-centered treatment to assist in their recovery journey. Research on the implementation of MI and AO is essential to stroke rehabilitation as these interventions can promote engagement in meaningful occupations and improve the quality of life and well-being for individuals post-stroke.

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Appendix A

Therapist Consent Form

Participant's Rights: You are being asked to participate in a **research** study. Your participation in this study is voluntary. You may choose not to participate or, if you agree to participate, you can withdraw your participation at any time without penalty or loss of benefits to which you are otherwise entitled.

If you have read and signed this form, you consent to participating in this research study. Participation in this study is voluntary and you have the right to withdraw without penalty at any point throughout your participation in the survey. You have the right to refuse to answer specific questions and any refusal to participate results in no penalty or loss of benefits to which you are otherwise entitled. You may choose to discontinue participation at any time or skip any questions during the data collection process without any penalty or loss of benefits. If you do not meet the eligibility criteria or choose not to enroll in the study or complete the survey, your survey answers will be discarded.

Purpose of Study: The purpose of this study is to identify barriers clinicians face when implementing evidence-based interventions into their clinical practice. More specifically, aiming to focus on barriers clinicians in stroke rehabilitation settings face when implementing mental imagery and action observation interventions for patients post-stroke.

Benefits Involved: We hope to identify the barriers to implementing evidence-based practice in stroke rehabilitation. We hope to discover which barriers impede occupational therapists' use of EBP in order for clinicians to feasibly implement mental imagery and action observation interventions into their clinical practice. Benefits include identifying current common barriers to intervention.

Risks Involved: The risks involved in the study include risk of breach of confidentiality for each participant, given the survey data is transmitted online. A step to protect personal data includes organizing and storing data in a password-protected Google Drive.

Your Time Involvement: The total length of time spent participating in our study should be a 15 minute timeframe. After consenting to participate there will be a google form survey to complete once for our data collection process. The google form is a questionnaire format with multiple choice and short answer questions consisting of demographic data and questions about clinical practice in stroke rehabilitation settings. This form should take approximately 10 minutes to complete and once submitted no further participation or questioning is necessary.

Withdrawal From Study: You may choose to stop participating in this study at any time. Your decision to stop will not affect the results and outcomes of this study. This will not affect how the researchers perceive the participants or have any negative standings on future research.

Compensation: There will be no monetary compensation for participants in this study.

Confidentiality: Per the code of Federal Regulations of the Department of Health and Human Services 45 CFR 45.115, the records of study data, consent records, and IRB documentation shall be retained for at least 3 years, and records relating to research which is conducted shall be retained for at least 3 years after completion of the research by the Faculty Advisor. The principal investigator and thesis students will have access to the data submitted from the survey. The personal information will be transferred into password protected Google Drive and no demographic information will be disclosed or included in any parts of the study.

Contact Information: Please contact the principal investigator if you have any questions about this research study.
Principal Investigator: Nichole Vasquez
Email: nichole.vasquez@stanbridge.edu
Phone Number: (714) 783-8721
If you have any concerns about this research and how it is conducted, please contact our institutional officer-in-charge: Stanbridge University VP of Instruction/Independent Contact: VP.instruction@stanbridge.edu

Cost to Participate: No exchange of money or added cost is needed to participate in this study. The study will require some time commitment in order to participate.

By marking yes, you consent to participating in this study and are willing to answer the questions in this survey.

Appendix B

Survey Questions

Below is a list of 11 questions that were included in the survey made using Google Forms and was posted to different healthcare facilities, LinkedIn, and personally emailed to OTPs. Prior to the start of the survey will be the consent form we had provided in the section above.

1. By marking yes, I consent to participating in this study.
    a. Yes, I consent
    b. No

2. Are you a licensed OT or COTA?
    a. OT
    b. COTA

3. Please state your email.
    a. Free response

4. What level of education did you receive?
    a. Associate's degree
    b. Bachelor's Degree
    c. Master's Degree
    d. Doctorate's Degree
    e. Certified Occupational Therapist Assistant – Accredited Program

5. Do you have any stroke-related certifications?
    a. NDT
    b. Neuro-IFRAH
    c. CSRS
    d. Other

6. What state do you practice in?
    a. Free response

7. How many years of practice experience do you currently have?
    a. 1-3
    b. 4-6
    c. 6-8
    d. 8-10
    e. 10+

8. What practice setting are you currently in?
    a. Acute inpatient

   b. Skilled nursing facility
   c. Long-term acute care
   d. Outpatient Setting
   e. Academia and Research

9. Have you ever administered or implemented Mental Imagery and/or Action Observation interventions into your clinical approach with clients? a. Yes
   a. Yes, I use this often in practice
   b. Yes, but rarely have I used this approach
   c. No
   d. No, I am unsure of how to implement this intervention
   e. No, I just stick to other interventions I prefer

10. Are you aware of evidence-based mental imagery or action observation interventions?
   a. Yes
   b. No

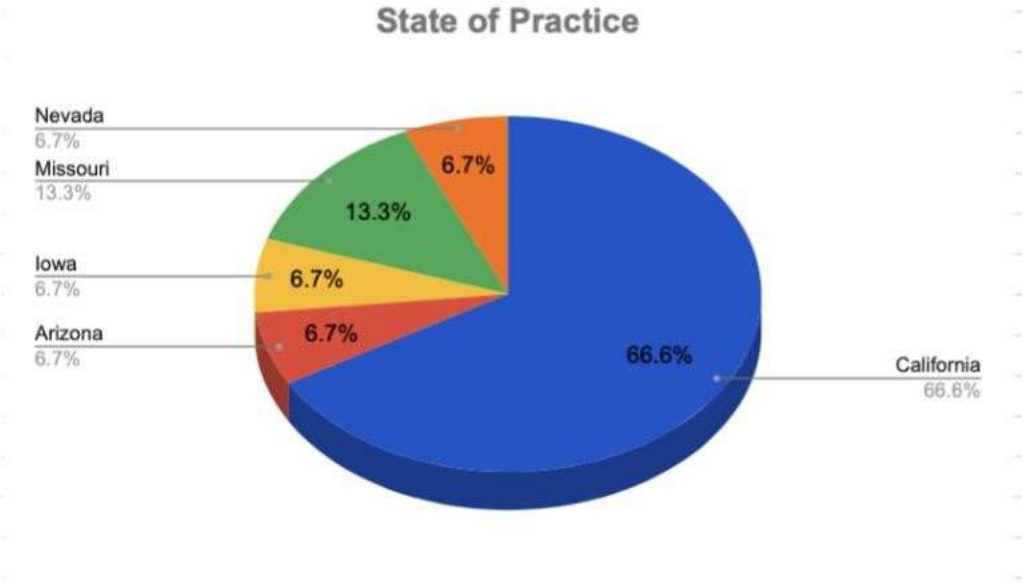
11. If you do not currently use Mental imagery and or Action Observation intervention with individuals post-stroke, what is the main reason why? If you do, how do you implement MI and AO interventions into practice?
   a. Free response

Appendix C

Data Analysis Figures

Figure 1

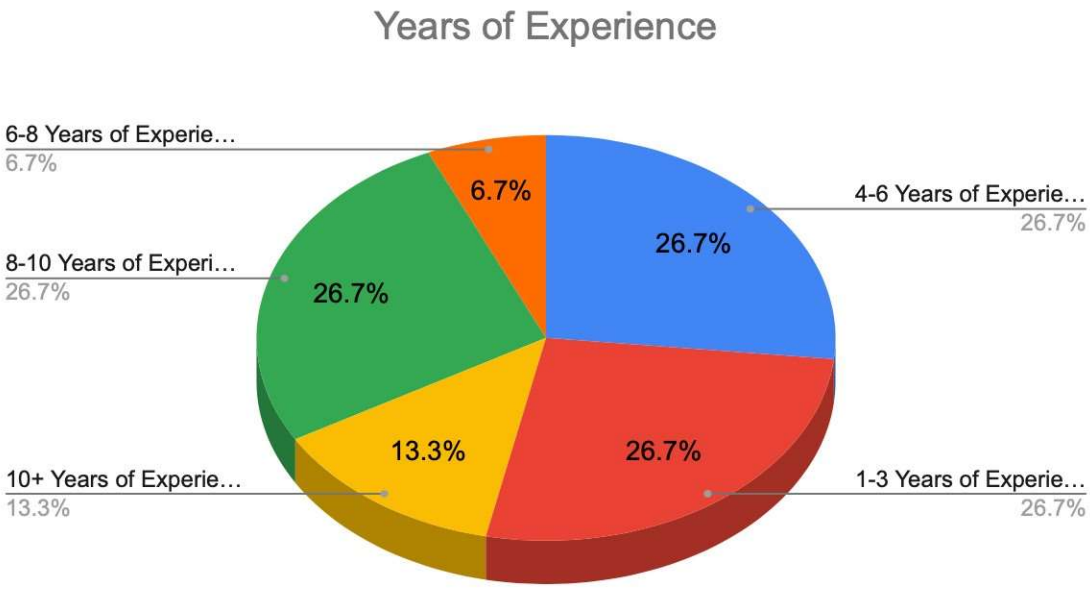
Representation of Different U.S. Regions



Note. Of the survey participants, 66.6% practice in California, 6.7% practice in Nevada, 13.3% practice in Missouri, 6.7% practice in Iowa, and 6.7% practice in Arizona.

Figure 2

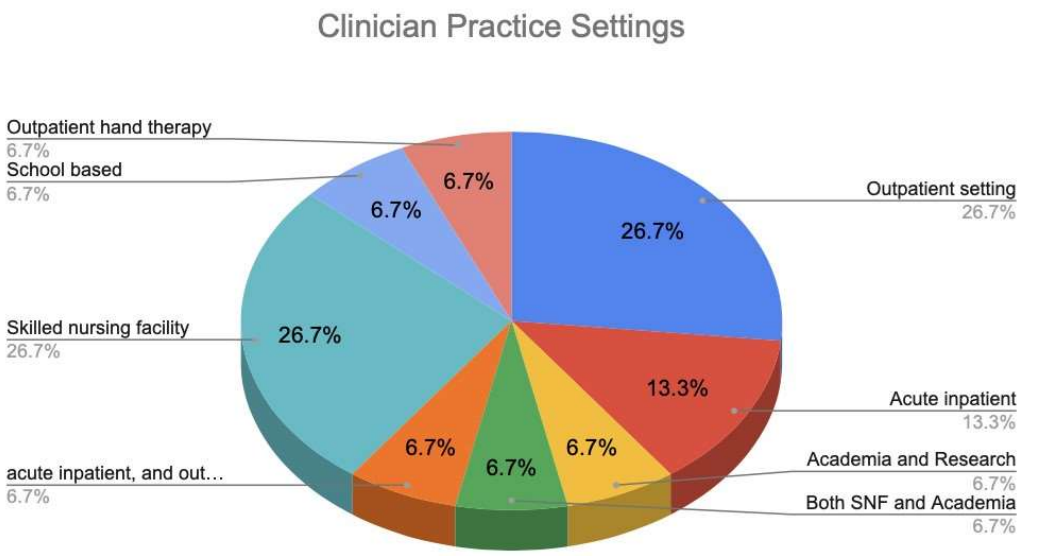
OT Experience Working as an Occupational Therapy Practitioner



Note. Of the 15 participants, 26.7% report to have 1 to 3 years of experience as a practicing OTP, 26.7% report to have 4 to 6 years of experience, 6.7% reported to have 6 to 8 years, 33.3% report to have 8 to 10 years of experience, and 13.3% report to have more than 10 years of experience.

Figure 3

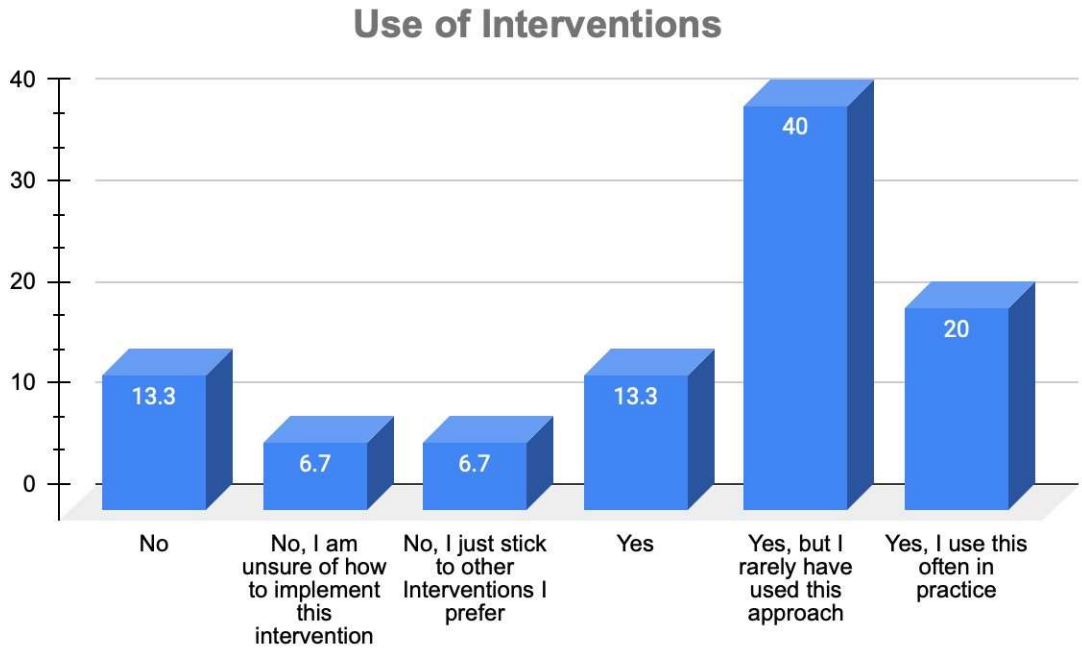
Clinician Practice Settings



Note. Of the survey participants, 6.7% practice in outpatient hand therapy, 6.7% practice in school-based setting, 26.7% report working in a skilled nursing facility, 6.7 practice in acute inpatient along with outpatient, 26.7% practice in the outpatient setting, 13.3% practice in acute setting, 6.7% report to practice in academia and research, and 6.7% report practicing in academia and skilled nursing facility.

Figure 4

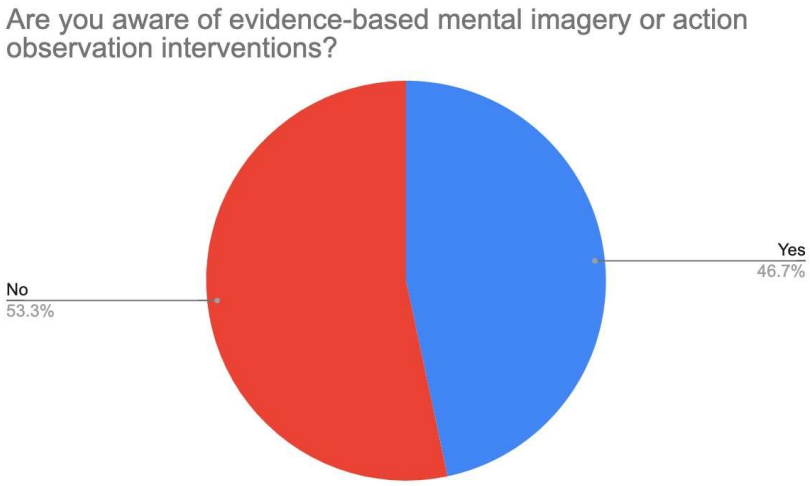
Use of MI/AO as an Intervention Post-Stroke



Note. Of the survey participants, 13.3% reported they have never implemented MI/AO as an intervention, 6.7% report no, I am unsure of how to implement this intervention, 6.7% report no, I just stick to other preferred interventions, 13.3% reported yes they have used this intervention, 40% reported yes, but rarely have I used this approach, and 20% reported yes, I use this approach often.

Figure 5

Awareness of Evidence-Based MI/AO Interventions



Note. Of the survey participants, 46.7% of participants were aware of evidence-based MI/AO interventions and 53.3% were unaware.

Figure 6

Comparison of Experience Among Participants and Use of MI/AO Interventions

Have you ever administered or implemented Mental Imagery and/or Action Observation interventions into your clinical approach with clients?	How many years of practice experience do you currently have?			
	1-3	4-6	8-10	10+
No	1 25.00%	1 25.00%	0 0.00%	0 0.00%
No, I am unsure of how to implement this intervention	0 0.00%	0 0.00%	1 25.00%	0 0.00%
No, I just stick to other interventions I prefer	0 0.00%	0 0.00%	0 0.00%	0 0.00%
Yes	1 25.00%	0 0.00%	0 0.00%	1 50.00%
Yes, but rarely have I used this approach	2 50.00%	2 50.00%	2 50.00%	1 50.00%
Yes, I use this often in practice	0 0.00%	1 25.00%	1 25.00%	0 0.00%

Note. Based on the survey, 25% of participants with 1-3 years of experience have never used MI/AO, 25% have used it, and 50% have rarely implemented it. For those with 4-6 years of experience, 25% have never used it, 50% have rarely used it, and 25% use it often. Among participants with 8-10 years of experience, 25% are unsure how to implement MI/AO, 50% have rarely used it, and 25% use it often. Finally, participants with 10+ years of experience report that 50% rarely use MI/AO, while the other 50% use it frequently in practice.

Figure 7

Neurorehabilitation Certifications and Use of MI/AO Interventions

Have you ever administered or implemented Mental Imagery and/or Action Observation interventions into your clinical approach with clients?	Do you have any stroke related certifications?			
	No related certifications	CBIS	CSRS	NEURO-IFRAH
No	1 11.1%	0 0.0%	0 0.0%	1 25.0%
No, I am unsure of how to implement this intervention	1 11.1%	0 0.0%	0 0.0%	0 0.0%
No, I just stick to other interventions I prefer	1 11.1%	0 0.0%	0 0.0%	0 0.0%
Yes	1 11.1%	0 0.0%	0 0.0%	1 25.0%
Yes, but rarely have I used this approach	5 55.6%	0 0.0%	1 100.0%	1 25.0%
Yes, I use this often in Practice	0 0.00	1 100.0 %	0 0.0%	1 25.0%

Note. Based on the survey, 100% of those with a CBIS certification were reported using this often in their practice. Among those with CSRS certification, 100% reported rarely using MI/AO interventions. Of those with no related certifications, 11.1% reported never using MI/AO, 11.1% were unsure how to implement it, 11.1% preferred other interventions, 11.1% had used it, and 55.6% had rarely used it. For participants with NEURO-IFRAH certification, 25% had never used MI/AO, 25% had used it, 25% had rarely used it, and 25.0% often used it in practice.