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Can Occupational Therapy Take a HIT? A Guide to High-Intensity Training in Stroke Rehabilitation

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CAN OCCUPATIONAL THERAPY TAKE A HIT? A GUIDE TO HIGH-INTENSITY TRAINING IN STROKE REHABILITATION

By

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Abstract

Objective: Stroke has been considered a leading cause of functional impairment (Tsao et al., 2022). Recent evidence has supported a treatment approach that increases dosage (Scheets et al., 2021). High-intensity training (HIT) has shown promising evidence for functional recovery post-stroke (Crozier et al., 2018). There have been minimal programs related to Occupational therapy (OT) and HIT have been created (Lamoureux, 2023). This doctoral capstone focused on program development of the *OT-based HIT* program. Theoretical frameworks included the Model of Human Occupation and Motor Learning Theory to provide a foundational structure.

Methods: A needs assessment was performed at the Saint George Regional Hospital Neuro-Specialty Rehabilitation Center. Methods included interviews, observation, and quality improvement questionnaires from clinician input. The program was evaluated for perceived feasibility and quality using a SWOT analysis.

Findings: The SWOT analysis indicated two overarching themes: *patient empowerment* and *reluctance to change*. Information acquired through feedback from these questionnaires and findings was disseminated into meaningful content. The program was redesigned based on input from the participants. No differences were seen in Likert Scale responses within the quality improvement questionnaire between participants with or without formal training with HIT.

Conclusion: Findings from this capstone project and experience suggested that the OT-based HIT program was perceived as a viable program that can contribute to the quality of the profession, clearly delineating physical therapy and OT-driven HIT regarding scope of practice. Future projects and research are needed to understand the program's feasibility with patient care.

Keywords: high-intensity training, occupational therapy, program development, stroke, occupation-based

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Introduction

Stroke is among the most widespread reasons for disability and death in the United States (Tsao et al., 2022). Among the many deficits associated with stroke, hemiparesis frequently occurs, which results in limited function of one side of the body. Such individuals experience the inability to control their affected limbs with accuracy. Hemiparesis and cognitive deficits may negatively affect the sensorimotor system (Al-Qazzaz et al., 2014). Having a stroke can be life-altering, including losing independence with activities of daily living (ADLs). Occupational therapists (OTs) specialize in helping individuals remediate their skills in occupations such as ADLs, and they predominantly focus on remediating self-care skills during inpatient rehabilitation. Some examples of self-care ADLs include dressing, bathing, toileting, and performing functional mobility to complete these occupations. Evidence for the effectiveness of ADL training has been moderate (Alsubiheen et al., 2022), and it has been challenging to replicate and demonstrate the efficacy of this therapeutic approach, as OTs can use various intervention styles (Wolf et al., 2015). Some research has suggested that stroke survivors may have experienced a decline in ADL performance long before the onset of their cerebral vascular accident, potentially increasing the challenge for OTs who train patients in skill acquisition (Capistrant et al., 2013).

Current ADL training has been highly instructive, with minimal repetition, resulting in lower intensity. However, the principles of neuroplasticity have suggested that intensity matters (Rodrigues et al., 2022). Neuroplasticity is the capability of the nervous system to adjust according to an individual's experience (Mateos-Aparicio & Rodríguez-Moreno, 2019). Because skills are affected by activities performed, task specificity is essential to neurorehabilitation (Hubbard et al., 2009). Evidence has supported that high-intensity training (HIT) at 60-80% heart

rate reserve increases neurotransmitters, such as dopamine, serotonin, and brain-derived neurotrophic factor (BDNF). These neurotransmitters have shown promising findings with neuroplasticity (Mang et al., 2023). Therefore, the desire with intensity in neurological rehabilitation has been to improve these neuro-components while completing functional tasks and enhancing independence in everyday living.

A trend in the research literature has shown that older models and interventions targeting high instruction for kinematics, such as neurodevelopmental treatment, have minimal to moderate effectiveness for stroke rehabilitation (Pathak et al., 2021). Recently, there has been growing support for higher repetition, specificity, and intensity that target experience-dependent learning. High-intensity functional mobility training has been an emerging area of practice for stroke rehabilitation that exemplifies essential neuroplasticity principles (Nudo, 2013). Evidence has also signified that the central nervous system's ability to adapt its structure and function is based on experience-dependent learning (Hubbard et al., 2009). It has been suggested that training, rather than treatment, is required to facilitate neuroplasticity in stroke rehabilitation (Kleim & Jones, 2008). This therapeutic perspective requires the active participation of its recipients, meaning that patients who have experienced a stroke are expected to reacquire motor learning skills needed for safe discharges.

There are 10 principles of neuroplasticity, and successful motor learning requires a combination of each. In high-intensity functional mobility training, four neuroplasticity principles demonstrate the most significant influence: salience, repetition, intensity, and specificity. Intensity has been measured through heart rate or rate of perceived exertion (RPE) using the Borg/Modified Borg RPE scale. Around 75-85% of age-predicted max heart rate has

been considered safe for patients who have had a stroke and are medically stabilized (Billinger et al., 2014; Liguori et al., 2022; Tsao et al., 2022).

Occupational therapy may benefit from high-intensity functional mobility training because it is a basic ADL in the profession's scope of practice. Occupational therapists may also benefit from magnifying this research by applying neuroplasticity principles to other tasks. Doing so may lead to added salience, variability in practice, and functional outcomes while providing evidence-based therapeutic dosages of intensity.

Regardless of HIT's benefits, OT has minimal direction for implementing high-intensity stroke rehabilitation while maintaining its unique scope. Physical therapy has supported High-intensity gait training (American Physical Therapy Association, 2024), yet whether it belongs to OT remains a question of interest. Lamoreaux (2023) initiated the development of a high-intensity stroke rehabilitation program for OT to be practiced within inpatient rehabilitation. His *Life Hardening* program aimed to operationalize a protocol therapists could follow to increase their patients' intensity dosage within occupation. Lamoreaux's program has been the only known OT-based HIT protocol manualized for operation. This manuscript encompasses a doctoral capstone that has also developed a HIT program for OT to be implemented in practice and researched for effectiveness.

Project Problem

The Centers for Disease Control and Prevention has suggested that nearly 795,000 people suffer from a stroke annually, indicating a high incidence rate for the total population (Centers for Disease Control and Prevention [CDC], 2022). The CDC also has identified that stroke is the leading cause of long-standing disability in the United States. Although HIT has shown to be beneficial for stroke rehabilitation, there have been minimal programs that can guide OTs

through HIT to increase remediation post-stroke. Therefore, further research on OT and HIT may be warranted.

Rationale for Project

High-intensity training has become a viable intervention approach for remediating functional independence post-stroke (Anjos et al., 2022; Crozier et al., 2018; Luo et al., 2020; Luo et al., 2019). However, most work has been done through physical therapy. On the other hand, OT has not found a place in implementing HIT for remediating skills related to daily living or functional mobility. There has been a need for evidence-based interventions for those who have suffered from a stroke. High-intensity interventions in OT may enhance the application of neuroplasticity principles within rehabilitation, which enforces evidence-based practice. Because there are limited programs to direct OTs implementing HIT, it is necessary to develop an evidence-based program to fulfill this need.

Statement of the Problem

Stroke survivors have been provided with therapeutic interventions to help restore function. However, there is a need for training with appropriate dosages of intensity that are safe and effective for these individuals. Although HIT may increase functional gains for subacute and chronic stroke, there have been limited programs to guide OTs. Therefore, developing a manualized occupation-based HIT program can feasibly direct therapists when implementing HIT within their scope of practice. The profession may benefit from increasing therapeutic dosage to enhance stroke recovery in OT. This capstone project has aimed to develop such a program and obtain practitioner feedback concerning its quality and perceived feasibility.

PIO Question

From a practitioner's perspective, what is the feasibility of an occupation-based HIT program designed for stroke survivors?

Significance of this Problem for OT

The Profession of OT has been making a paradigm shift with its Vision 2025 to enhance health-related outcomes for all people through *effective solutions* to enhance occupational engagement (American Occupational Therapy Association [AOTA], 2017). Evidence has suggested that HIT is an effective solution (Crozier et al., 2018). Implementing HIT has also indicated a shift from treatment to training (Kleim & Jones, 2008). In addition to the concepts previously discussed, OT has faced the challenge of monitoring an intensity dosage outside observation. An evidenced-based HIT program tailored to satisfy OT's scope of practice may benefit patient outcomes and help the profession reach its Vision of being client-centered, cost-effective, and evidence-based (AOTA, 2017). Therefore, this capstone aimed to understand the quality and feasibility of an occupation-based program through clinician feedback.

Anticipated Outcomes

This capstone aimed to develop an occupation-based HIT program for individuals with stroke and obtain feedback related to its quality.

Operational Definitions

In this document, operational definitions have been defined:

- *Occupational therapy* has been defined as a profession that enhances health and wellness through meaningful experiences or occupations.
- *High-intensity training* has been defined as rehabilitation practice that elevates the heart rate to 60-80 % heart rate reserve, 75-85% age-predicted max heart rate using the Tanaka formula of 207-(.7xage), or an RPE of 14-17 on the Borg RPE scale.
- *Occupation-based* has been described as a form of therapy that uses occupations to guide goal-oriented interventions.
- *Skill acquisition* has been defined as an activity that can be completed with trial-and-error practice.
- *Skill retention* has been defined as an activity that has a successful carryover effect when practiced on a different day from when the skill was initially acquired.
- *Skill transference* has been defined as the successful performance of the activity under different contexts.
- *Variability* has been defined as increasing task novelty and task demands.
- *Functional mobility* has been defined as a means of locomotion and has been used interchangeably with gait, walking, and stepping.

These definitions have clearly defined the program's intention to minimize ambiguity and have been consistently used throughout the comprehensive program. The benefit of having

operational definitions has allowed this capstone project to fulfill its purpose of manualizing a program for clinical application.

Literature Review

This literature review aimed to identify evidence for OT and HIT specific to stroke-related deficits. The inclusion criteria consisted of articles related to HIT and stroke. Other key terms used during this search included task-specific training, functional training, occupation-based, and high-intensity with OT. Level-one evidence research was initially sought after but showed little relevance to OT. Therefore, the inclusion criteria expanded to pre/post and qualitative research designs. Exclusion criteria removed articles older than 10 years, except a few to provide a historical, theoretical context for defining occupation. The first section focused on definitions for occupation across the literature so that the program for this doctoral capstone appropriately described occupation. The following section targeted various intensity exercise regimens for patients poststroke to identify the current most effective style of HIT intervention. The following section aimed to locate available research on high-intensity occupations, as doing so provided support and direction for principles, protocols, and regimens to support an occupation-based HIT program. Lastly, a discussion of the information related to this capstone's topic of interest was provided.

Defining Occupation

The definition of occupation has been a subject of long-standing debate and remains elusive in the history of this profession. In OT, the goal has been to foster meaningful, satisfying engagement in and through occupation. However, it has been challenging for clinicians to delineate the successful use of this process. Pierce (2001a) described occupation as a meaningful, subjective, and non-repeatable experience with a distinct shape, pace, beginning, and ending. Pierce also underscored the importance of differentiating occupation from activity rather than using these terms interchangeably. She explained that activities are social and cultural constructs

that can be repeated across society. In contrast, occupations are personalized experiences that carry significance to one's identity. Therefore, according to Pierce, the profession of OT may benefit from developing treatment plans that target occupations, as this approach allows for more meaningful and effective therapeutic outcomes.

In an ethnographical analysis, Clark (1993) identified core concepts that trend throughout the therapeutic experience. These included past occupational experiences and how they impact present contexts through the modes of story-telling and story-making. Interviews were conducted with an individual who had survived a stroke, and codes, categories, and themes were identified to understand how occupation influences spatial and temporal contexts throughout the rehabilitation process. Clark discovered that a rite of passage occurred when an individual transitioned from being cared for by their healthcare team to being "abandoned" or discharged into a state of expected independence. Clark's work highlights the challenge that many stroke survivors may face when undergoing the recovery process. It also identifies how occupation is embedded throughout the lives of individuals and acts as a support, a barrier, and a therapeutic mode to enhance the lives of such individuals. From Clark's work, the discipline of occupational science and the profession of OT are interwoven into one unique conceptual therapeutic approach, where occupation builds context and impacts health.

Furthermore, Barry et al. (2016) identified that occupation could change depending on the individual's context, and satisfaction may affect the presence of occupation, whether the experience was occupation or activity (Pierce, 2001a). According to the American Occupational Therapy Practice Framework (OTPF), context can exist in various forms, including environmental or personal origins (AOTA, 2020). These can then be broken down into further subcomponents of contextual realities, including physical, emotional, social, cultural, and virtual.

Environmental and personal contexts can act as facilitators or inhibitors toward occupation and subsequent satisfaction or dissatisfaction (Barry et al., 2016).

Discussing Definitions of Occupation

Overall, occupation is complex and difficult to define based on the available literature. Many definitions remain theoretically based and arguably inconsistent. Meaningfulness is a common theme identified in the literature (AOTA, 2020; Barry et al., 2016; Clark, 1993; Pierce, 2001a). However, measuring occupation within a program may yield its challenges. For example, in Pierce's (2001a) definition, there may be challenges with measuring reliability should occupations remain a nonrepeatable experience. One method for measuring occupation for program development might include a valid and reliable instrument, such as the Canadian Occupational Performance Measure (COPM). This instrument has been tested for good validity and moderate test-retest reliability (Cup et al., 2003). It also measures perceived performance and satisfaction with productivity, self-care, and leisure. Therefore, using such an instrument may be beneficial when identifying occupations through therapy during program development. In essence, Occupations comprise fluid characteristics that change depending on contextual factors and perceived meaningfulness (Barry et al., 2016; Clark, 1993; Pierce, 2001a). Therefore, sensitive measurements composed of mixed methods may be needed to understand its unique properties.

Evidenced-Based HIT Regimens

Carl et al. (2017) conducted a single-session crossover design to identify the feasibility and safety of HIT interventions on individuals with cardiovascular disease and stroke. Carl et al. had their 18 participants complete 54 individual HIT exercise bouts categorized into three types of training procedures. Physician-directed stress tests were completed before joining the study to

ensure safety and reduce the potential of sudden cardiac events during the HIT intervention. The participants demonstrated safe cardiovascular responses throughout the study and had no orthopedic injuries due to the exercise type. However, a limitation of Carl et al.'s research may have been that it lacked the long-term effects of HIT training. For example, although no orthopedic injuries were identified in Carl et al.'s study, chronic overuse of the musculoskeletal system may or may not occur after long periods of HIT protocols. Further research might be needed to understand the long-term effects of HIT and its associated safety concerns. However, the findings, overall, have indicated that HIT is not only a viable but also a safe practice for individuals poststroke, instilling confidence in its feasibility.

Steen-Krawcyk et al. (2019) conducted a single-blind randomized control trial (RCT) of 71 lacunar stroke participants. The study analyzed the safety and viability of a 12-week home-based high-intensity interval training (HIIT) program in congruence with usual care compared to standard care alone. Baseline and 3-month mark post-intervention outcome measures were taken. Findings relevant to this capstone consisted of well-being and participation in self-reported physical activity. Well-being was measured using the World Health Organization's Five Well-being Index questionnaire. Outcomes presented statistically significant variances between the experimental and control groups in vigorous physical activity participation with no statistical improvements in well-being. Steen-Krawcyk concluded that an early home-based HIIT protocol was feasible and safe for mild stroke patients. This study's limitations included a homogeneous sample that minimized its generalizability toward stroke patients with larger arterial infarcts. The study also lays bare recruitment bias because participants were attracted to exercise before starting the survey. Potential recall bias may have been present since some outcome variables

were self-reports. Nevertheless, the findings have indicated relevance to this capstone and support the evidence for the safety of HIT.

Discussing Safety of HIT

There has been moderate evidence with high rigor that suggests HIT is a safe option across multiple contexts. However, the potential presence of confounding variables may include selection, recall, and response bias should HIT be transferred to stroke survivors outside of professional supervision (Steen-Krawcyk et al., 2019). Additionally, the long-term effects of HIT have not been strongly supported, which indicates that HIT should be done with skilled clinical reasoning (Carl et al., 2017; Steen-Krawcyk).

HIT Versus Moderate Intensity

Boyne et al. (2019) examined the effects of HIT and moderate continuous training (MCT) on BDNF upregulation and corticospinal excitability using a within-subjects crossover design for 16 individuals greater than 6 months poststroke. They discovered that HIT showed statistically significant differences compared to MCT across various forms of practice, including treadmill and stair-stepping. Stair stepping produced similar results with BDNF composition compared to treadmill walking but did not stay at the same level when intensity dropped. Therefore, the specificity of practice had less to do with BDNF as intensity, which remained the constant determinant for serum BDNF release at higher volumes. Transcranial magnetic electrical stimulation was used to measure corticospinal stimulation and inhibition of paretic limbs. Serum BDNF was assessed periodically throughout intensity treatment, pre-, during, and post-intervention. These findings suggested significant favor to HIT compared to MCT, and BDNF release was strongly related to intensity through aerobic activity more than the type of practice. The exercise protocol for HIT included short bursts of aerobic activity with a work-to-rest ratio

of 30/60 seconds. This protocol effectively elicited the target heart rate of 75-85% age-predicted max heart rate with a peak heart rate of 89%. A clinically important finding from Boyne et al.'s work included the relationship between high serum BDNF release and blood lactate with a positive linear association. Some limitations of this research included reduced aptitude to generalize the findings and protocol to more severe patients with stroke, such as non-ambulatory patients. The subjects within this study were more than 6 months poststroke and could walk with assistive devices as needed. Therefore, it is unclear how effective this aerobic priming may have been on more severe acute stroke survivors.

Boyne et al. (2016) completed a pre/post preliminary RCT that compared the effects of HIIT and MCT for individuals poststroke. Boyne et al.'s efforts aimed to determine the viability and validation for a decisive RCT. Participants were included in the study if they had steady cardiovascular conditions and unilateral stroke symptoms. Additionally, participants were excluded if they had an incidence of stroke less than 6 months before the beginning of the intervention. Using treadmills to intervene with HIIT and MCT, Boyne et al. assessed the volume of max oxygen consumption (VO_2 max) using a graded exercise test. The 10-meter Walk Test (10MWT) and the 6-minute Walk Test (6MWT) were used to measure physical gain from the interventions. After completing the 4-month intervention, the HIIT group demonstrated statistically significant differences in the fastest treadmill speed and ventilatory threshold. Although Boyne et al.'s findings indicate benefits towards HIIT compared to MCT interventions for individuals post-stroke, they should be considered cautiously. Some of Boyne et al.'s limitations included the study taking place in a laboratory, which reduced its external validity. In addition, the effect size of Boyne et al.'s research remained small; however, a power analysis suggested an adequate effect size for allowing meaningful results.

Discussing HIT Versus MCT

Strong evidence with high rigor has compared the benefits of HIT to MCT, favoring HIT statistically significantly more (Boyne et al., 2016; Boyne et al., 2019). Concerning physical performance skills, HIT outcompetes MCT. Although MCT remains a viable option compared to low intensity, the benefits of BDNF release have favored higher intensities for stroke survivors more than the type of practice.

Feasibility of HIT for Stroke

Holleran et al. (2014) conducted a pre/post-test pilot study to understand the feasibility and efficacy of highly intense step training across various surfaces for individuals poststroke. The sample consisted of subacute and chronic stroke who demonstrated hemiparesis. The intervention group used highly intense step training across 4 weeks, with the intensity at 70%-80% heart rate reserve. Holleran et al. took precautious measures to ensure the participants' safety, considering hypertension and seeking a physician's guidance before pursuing further training. Additionally, no medical injuries occurred in the participants. However, some participants reported discomfort with the step training protocol. Statistically significant improvements were seen in the paretic single limb stance and the 6MWT from baseline to post-intervention. Overall, Holleran et al.'s findings indicated that high-intensity step training had beneficial training effects on physical function poststroke. However, additional research may have been needed to solidify Holleran et al.'s findings as they lacked internal validity to delineate the source of functional gains, whether they stemmed from the training procedures' variability, intensity, or volume. If all these components were responsible for such functional improvements, additional research might help to identify to what extent they attribute success in

functional mobility for stroke survivors. Such information allows clinicians to optimize their therapeutic interventions for their patients.

Charalambous et al. (2018a) designed a HIT protocol to enhance implementation feasibility within neurorehabilitation. They used biomarkers such as blood lactate, RPE, and estimated percentage of age-predicted heart rate max to determine program parameters. Using a pre-post design, 37 participants who had experienced stroke completed exercise activities to assess the feasibility of the tasks. Participants within the intervention groups completed either treadmill stepping or cycle ergometer exercises. Charalambous et al. (2018a) emphasized blood lactate as an essential biomarker due to the evidence supporting its function on motor learning and memory and its positive relationship with BDNF (Skriver et al., 2014). Their findings indicated that HIT sessions could be feasibly implemented in unity with other modalities for practice and learning. These findings argue against the critique that HIT may be infeasible within neurorehabilitation due to the extensive time constraints needed to complete the activities, including preparation for equipment, measuring vitals, and ensuring safety. Contrary to Boyne et al.'s (2019) findings on intensity over specificity for BDNF release, Charalambous et al. (2018a) identified that whole-body exercises (e.g., cycle ergometer) versus part-body activities (walking) demonstrated higher blood lactate levels. Such activities also controlled for poor balance and the need for harness equipment to prevent falls, which was helpful for lower functioning participants. However, emphasizing cycling over walking should be done with clinical judgment and caution before suggesting that one is more effective. Although cycling may have increased lactate more efficiently, it did not challenge balance in the same way as walking. Therefore, task-specificity was considered during the development of this capstone program.

Discussing The Feasibility of HIT for Stroke

Evidence has supported the feasibility of HIT for at-risk populations, including stroke (Charalambous et al., 2018a; Holleran et al., 2014). However, additional research may be needed to support the safety of the long-term use of HIT. Intensity has been shown to be a primary driver for neuro-subcomponents such as BDNF and blood lactate. It has remained unclear what the most effective protocol to follow is to ensure safety and optimize patient outcomes. Nevertheless, implementing HIT has been shown as a plausible solution to patient training on skills needed for independent living or securing a more sustainable discharge.

Effects of HIT and Functional Mobility

To further explain the effects of variable stepping compared to high-intensity step training on walking symmetry, Hornby et al. (2019) conducted a blinded RCT. Participants consisted of those with unilateral hemiparetic symptoms who had suffered from a stroke. They were randomly placed into four groups: a high-intensity forward stepping on the treadmill, a high intensity across variable terrain, a low intensity across variable context, or the control group who received usual care. A pressure-sensitive walkway was used while participants completed self-selected gait speeds, and the fastest possible speeds were used to measure gait symmetrical function. The 6MWT was also utilized to identify ambulation speeds compared to community normative data. Hornby et al. identified that both high-intensity groups improved functional ambulation symmetry compared to the low-intensity variable stepping group and control. The group that completed high intensity across variable context also demonstrated increased balance compared to the high-intensity forward-stepping group. From these findings, there is reason to believe that high-intensity training can yield beneficial results in functional skills such as stepping and balance, often impaired in individuals who have experienced a stroke. It is difficult

to understand how the motor learning strategy of salience was included in the research of Hornby et al., which may be a limitation or at least limits relevance to occupation. Further studies would benefit from attending to meaningfulness to identify how they apply to HIT.

Madhavan et al. (2016) aimed to understand the effects of a single HIT session on corticomotor excitability using a pre-post design. They carefully selected 11 chronic stroke participants to increase homogeneity within their sample. The participants completed a HIT session using treadmill stepping with outcome measures for cortico-excitability of both paretic and nonparetic lower extremities. Findings suggested that a single HIT could reduce asymmetrical excitability throughout the lower extremities, which can frequently cause ataxia. Madhavan et al. determined that in some chronic stroke survivors (7/11), these positive results occurred with statistical significance. The implications of such findings suggest that HIT may be a beneficial primer to other task-related skills needed for independent living among this population. The limitations of this study included a small sample, which the authors took measures to control. However, generalization toward other stroke survivors may be limited. Overall, these findings have supported HIT as an effective modality for neurorehabilitation.

Moore et al. (2021) developed a HIT regimen for patients with neurological conditions, including stroke and partial spinal cord injury. The program prioritized high-intensity steps using the Knowledge to Action Framework, which aims to transition evidence information into application. The program was assessed using a quasi-experimental design to determine outcome measures, and qualitative data analysis was used to gather therapists' perceptions of the Knowledge Translation program. Results showed positive results for the high-intensity stepping protocol, emphasizing the dose-response relationship between stepping and functional recovery. The program demonstrated effective functional outcomes using the Berg Balance Scale (BBS),

10MWT, and 6MWT. Additionally, when therapists were asked about barriers to program implementation, they reported that organizational readiness to make changes was a major barrier. Moore et al. saw less than desired program adherence concerning fidelity. The Knowledge to Action Framework served to adjust and modify the program throughout the evaluation process. The findings from this quasi-experimental study have indicated that program fidelity and adherence remain significant barriers to implementation regardless of the positive advantages of an evidence-based program.

Boyne et al. (2015) conducted a pre-post design to gather within-session physiologic responses to three different lengths of HIT training approaches on 19 chronic stroke survivors. Each had a 1:1 work-to-rest ratio; one had 30 seconds, another 60 seconds, and the third with 120 seconds. A combination of VO_2, heart rate, stepping, and peak treadmill speed was assessed throughout the interventions. Boyne et al. identified statistically significant improvements in reaching target hear-rate intensity and showed the highest results in VO_2 and steps performed. The findings suggested that the 30:30 seconds and 60:60 work-to-rest ratio combination demonstrated the most effective results with desired physiological outcomes related to HIT. Performing HIT at a 120-second max effort workload yielded the least effective responses. Therefore, HIT may be most effective with lower-time bouts, and short rest breaks elicit peak performance and exercise adherence. These findings have limited external validity to more severe neurological conditions and subacute phases, making training effects unknown for such conditions. The participants in Boyne et al.'s research were ambulatory and had experienced their stroke over 6 months before participating in the study. Individuals with lower levels of function may not have been able to complete the treadmill training within short periods to reach

the target heart rate. Future research may be needed to determine the effects of HIT protocols for subacute stroke and lower levels of function.

Henderson et al. (2020) determined the predictive value of high-intensity, dose-response stepping training on balance, paretic limb strength, and discharge success/eligibility for home with independence. They identified that BBS scores as low as 5.5/56 at admission were capable of walking independently by discharge from subacute care, and the number of steps per day was the primary indicator of success in recovery. These findings suggested that task-specific stepping was an essential contributor to independence skill acquisition for functional mobility. Steps performed by the 257 participants ranged from 533-2297 steps per day, and the number of steps had a direct relationship with outcome measures, such as the BBS, which also led to further independence in functional mobility. Steps and cadence showed positive predictive indications toward functional mobility without needing assistive devices. Henderson et al.'s research limitations include the absence of a control or comparison group to filter out other extraneous variables that may have led to participant recovery. However, the statistical analysis helped to reduce these limitations to control for compounding factors. Overall, evidence supported that HIT and functional mobility training increase the physiological outcomes necessary for independence and safe discharges.

Discussing The Effects of HIT and Functional Mobility

Overall, substantial evidence has supported the benefits of HIT with functional mobility training (Boyne et al., 2015; Henderson et al., 2020; Hornby et al., 2019; Madhavan et al., 2016; Moore et al., 2021). Although the research has varied on optimal program parameters (Boyne et al., 2015; Moore et al., 2021), the combined evidence has strongly favored higher over lower

intensities. Therefore, a program designed for OTs needs to optimize HIT while following successful protocol trends related to this practice modality.

Effects of HIT and Motor Learning

A brief HIT session may increase motor learning in healthy adults (Roig et al., 2016; Skriver et al., 2014; Snow et al., 2016; Thomas et al., 2016). However, limited research has been conducted on the population with neurological impairments such as stroke. Charalambous et al. (2018b) examined learning retention with novel skills for 37 poststroke patients. Using a single bout of HIT after learning a new functional task (e.g., split-belt treadmill walking), Charalambous et al. assessed retention skills 24 hours later. They saw no significant differences between the experimental and control groups regarding skill retention regardless of intensity. Future research is needed to examine the effects of HIT and motor learning for novel tasks. One limitation of these findings was that they assessed skill retention with an unfamiliar task. Little can be said about skill reacquisition for previously mastered tasks, such as ADLs or IADLs. Also, the high-intensity group demonstrated less time in the target heart rate zone due to fatigue, which may have limited the effects of intensity on other biomarkers, such as BDNF. Charalambous et al. indicated no difference in novel task learning with HIT compared to low-intensity.

These findings have differed from those of other studies examining HIT and motor learning. For example, in an RCT performed by Nepveu et al. (2017), 22 chronic stroke patients were separated into either experimental or control groups. The experimental group completed 15 minutes of HIT with graded exercise, while the control group rested after learning a new motor skill (e.g., single-arm tracking). Most biomarkers, such as serum BDNF or blood lactate, demonstrated no statistically significant difference. However, skill retention showed significant

improvement compared to the control group, indicating that a single session of HIT could improve motor learning in chronic stroke patients. Limitations in this research included the type of skill acquired and tested, as the single-arm tracking skill has arguably little functional value because of a high ceiling effect. However, improvements were found to have arguably little functional value because this research suggests that HIT has the potential to increase learning capability even in neurologically impaired individuals. The combination of Nepveu et al. and Charalambous et al.'s (2018b) research indicates mixed results on the effectiveness of HIT and motor learning skill retention. However, both studies showed limited differences between control and high-intensity groups concerning biomarkers such as BDNF, which may have impacted the learning capability and progress of the participants.

In a randomized crossover trial of 12 chronic stroke survivors, Abraha et al. (2018) identified that a single session of HIT increased nerve conduction toward the affected upper extremity. These results differed from tone reactions and spasticity, which have been thought to appear during HIT. Abraha et al. specifically looked at the latency of nerve conduction, which indicated reduced spasticity effects. Other outcome measures included pinch and grip strength, with no difference in grip strength. However, significant improvements in pinch strength were seen after HIT, even with the affected side, which was uninvolved during the exercise. The HIT session included increasing speed every 2 minutes until exhaustion. No adverse effects were seen within this sample during the intensity training. Implications from this study included the potential that HIT may have on nerve conduction excitability to help control the affected upper extremity. Abraha et al. concluded that these findings might have clinical relevance for including HIT within neurorehabilitation and priming the upper extremity for other task-specific training. The limitations of this study included reduced external validity for other stroke survivors, as the

sample size was small. However, homogeneity was propulsively selected to increase this study's generalization.

Discussing The Effects of HIT and Motor Learning

These studies suggest mixed results for HIT to improve motor learning through skill retention (Abraha et al., 2018; Charalambous et al., 2018b; Nepveu et al., 2017). However, the concept of skill acquisition toward retention may have more variables, and intensity training does not act as a sole influencer on this phenomenon (Charalambous et al., 2018b). More evidence has been needed to understand the learning effect of HIT on stroke survivors. Cognition may also have a role in motor learning and intensity training.

High-Intensity and Cognition

Cognition has been a crucial area of performance skills needing attention during neurorehabilitation. When 76 OTs were surveyed regarding the primary reasons for dressing difficulty with stroke survivors, they reported predominately cognitive-related barriers to successful ADL performance, such as neglect, apraxia, memory, orientation, and sequencing (Walker et al., 2003). Therefore, OTs applying HIT should also consider the effects on cognitive performance skills. Compared to MCT, HIT has been shown to improve cognitive function, memory, and skill acquisition/retention in healthy adults and animal studies, with a trend to benefit stroke survivors as well (Hugues et al., 2021).

In a randomized clinical trial, Maeneja et al. (2023) compared the effectiveness of aerobic exercise to dual-task cognitive walking interventions. The participants consisted of 34 subacute and chronic stroke patients, who were stratified into either the aerobic exercise or the dual-tasking group. Members of the study were trained three times per week for 12 weeks. The Borg RPE was used to measure intensity with exercise. Cognitive-related outcomes were

measured at baseline, post-acute, and post-chronic intervention using the d2 attention test and the Mini-Mental State Exam. Results strongly favored aerobic exercise compared to the dual-tasking group regarding cognition, with statistically significant improvements. These findings underscore the value of intensity with aerobic activity on other essential components of occupational engagement, such as cognitive functioning and attention. Maeneja et al. argued the value of increasing cognitive function post-stroke, as it has been shown to play a significant role in successful discharge. They also identified that aerobic activities increased cognitive-related performance skills and could reduce the cerebral load, which dual-tasking tended to upsurge. Limitations to this study included a heterogeneous sample, which limited its generalizability or the ability to control for confounding variables. However, this study has supported the trend in evidence with aerobic activity toward cognition in healthy and neurologically impaired adults.

On the other hand, Tang et al. (2016) discovered no cognitive functioning difference between community-dwelling chronic stroke survivors performing high or low intensity compared to the control. In this secondary analysis with blinded assessors on an RCT, associations between cognition and intensity were measured on 47 randomly assigned to one of the three groups: HIT, low-intensity training, and the control. They performed 60-minute sessions three times per week for six months. Tang et al. saw no difference between groups concerning selective attention, working memory, and conflict resolution. These findings suggest there may be more to increasing cognitive functioning than aerobic activity at high intensities. However, these findings also have limitations with statistical power as other variables may have played a role in cognitive function that were not controlled for during the long RCT since this secondary analysis was using an RCT that aimed to understand the effects on aerobic capacity

between various intensities. However, the results of this study have indicated less support for intensity alone in increasing cognition for stroke survivors.

In a single-blind RCT of 133 chronic stroke survivors, Bo et al. (2018) identified that aerobic exercise could increase cognition scores measured by the Trail-Making Part B, Stroop, Mental Rotation Test, and forward digit span. Each of these assessments has been evaluated as valid and reliable for measuring various cognitive domains. Each participant was selected with purposive sampling because they met the inclusion criteria of having vascular cognitive impairment from stroke. Participants were randomly separated into four groups: the aerobic exercise with cognitive retraining, the aerobic exercise only, the cognitive retaining alone, and the control. The study took place over 12 weeks with a 6-month follow-up. Statistically significant improvements were seen in each previously mentioned assessment for intervention groups compared to the control. Cognitive retraining was performed using a computer-based learning model. Statistically significant improvements were also seen in the combined exercise and cognitive retraining groups compared to those that received only one of these interventions. From this research, implications have suggested that aerobic exercise combined with cognitive retraining interventions may be beneficial for stroke survivors who have experienced vascular cognitive impairment. The generalizability of these findings may have been limited by potential type-one errors when comparing multiple variables with repeated measures. However, the findings have suggested that intensity training may benefit stroke survivors, especially when combined with cognitive training.

Discussing HIT and Cognition

Overall, the results on HIT and cognitive-related performance skills have demonstrated mixed results (Bo et al., 2018; Maeneja et al., 2023; Tang et al., 2016). Whereas Tang et al.

(2016) support less evidence for intensity training and cognitive skills, Maeneja et al. (2023) identified that aerobic intensity training is more effective for cognitive skills such as attention. Bo et al.'s (2018) findings have indicated that a combination of intensity and cognitive training may yield the most significant results. Although some evidence has supported a trend for intensity training and cognition improvements, the literature has demonstrated mixed findings, which may require additional future research to determine the effectiveness of HIT on cognition. However, these findings have indicated that intensity training may have positive effects on cognition, especially when they are combined with task-specific cognitive-related training (Bo et al., 2018). Such findings have supported the principles of neuroplasticity and Motor Learning Theory.

Elements of Occupation and HIT

Added Salience to HIT

Park et al. (2017) randomized 26 participants and compared a seated boxing intervention with conventional physical therapy with physical therapy without the boxing routine. Park et al.'s outcome measurements included the BBS, the 10MWT, and the Stroke-Specific Quality of Life Questionnaire (SSQOL). These measurements helped obtain a more holistic understanding of high-intensity effectiveness for stroke survivors. Although occupation was not directly identified in this study, Park et al. discovered that an engaging intervention such as the seating boxing routine had additional salience to rehabilitation. Therefore, the added meaningfulness of the experimental group has elements of occupation, namely salience. The participants in this study had the therapeutic interventions three times per week for 6 weeks. Park et al. discovered statistically significant improvements in the BBS 10MWT and the SSQOL within the experimental group compared to only the control receiving physical therapy. Park et al.

concluded that postural control gains from the seating boxing routine significantly contributed to the improvements seen within the intervention group. Nevertheless, a small sample size impacts the generalizability of Park et al.'s findings. Additionally, it may be problematic when delineating whether the seated boxing routine was truly occupation-based. However, improvements in the SSQOL and the participants' self-reports of the intervention's added meaningfulness may infer elements of occupation within the intervention.

Upper Extremity and Intensity Training

Strong evidence has supported intensity training of the upper extremity with constraint-induced movement therapy (CIMT), including both traditional and modified CIMT (Huai et al., 2017). Traditional CIMT included a behavioral contract, task-oriented training, and shaping. In traditional CIMT, 90% of waking hours are spent with the unaffected side gloved so that ADLs are spent using the affected arm to challenge *learned nonuse*, which is a concept where the affected side becomes debilitated due to inadequate practice. To understand the effectiveness of very early constraint-induced movement therapy during stroke rehabilitation (VECTORS), Dromerick et al. (2009) conducted an RCT where VECTORS was compared to traditional OT or usual care. The performance in the VECTORS group showed equally effective results with upper extremity function measured by the Action Research Arm Test (ARAT). Both intervention groups and control showed no difference in performance, and the VECTORS group had an inverse dose-response relationship after 90 days. These findings indicate that massed practice may have a point of diminishing return after prolonged use. Limitations to this study comprised inclusion criteria that were moderately inconsistent with the CIMT inclusion criteria. Thus, the participants were potentially inappropriate for the VECTORS intervention from baseline. These considerations may contaminate the internal validity of the findings when comparing VECTORS

to usual care. Nevertheless, the inverse dose-response relationship suggests valuable information when designing a program for OT and HIT, as participation in occupation often requires manipulation of the upper extremities. Although this study took place a little more than ten years ago, it has been one of the only studies concerning CIMT and modified CIMT that was performed within the early stages of stroke recovery, making it meaningful to this capstone's purpose, as it provides essential information to upper extremity recovery for this population, which arguably is a significant aspect of OT and occupational remediation.

Hogg et al. (2020) conducted an RCT with 43 patients who had moderate stroke deficits. The study sought to understand the effects of upper extremity HIT exercises. These patients were within the subacute phases of stroke recovery and were divided into HIT, low-intensity training, or usual care (control) groups. This study aimed to compare HIT's effectiveness to other training forms. Intensity was measured using the American College of Sports Medicine guidelines for resistance training. However, RPE and heart rate were measured, and intensity parameters for aerobic exercise were reached throughout the training activities. Resistance training also included using functional everyday household items within the interventions. Results demonstrated no statistical difference between group subjects after a 3-day per week 3-week intervention. However, all groups showed significant changes in function within-group comparisons, pre-and post-intervention. Outcome measures entailed grip strength, Fugl-Meyer, Goal Attainment Scale, Box and Block Test, and the Modified Ashworth Scale. Hogg et al. conclude that HIT showed equal but not greater effects to low-intensity activities for the upper extremity. Low intensity produced more repetitions, which the authors suggested might have benefitted upper extremity recovery. However, the added weight with HIT resistance may have affected driving motor output more. Limitations to the study have included reduced external

validity toward varying levels of stroke deficit, as the participants had moderate impairment, making the findings for this study more selective without generalization to the population.

Functional Task Specificity in HIT

In an RCT of 36 chronic stroke patients, Martins et al. (2020) examined task-specific training and its effects on mobility, physical activity levels, strength, and quality of life improvements. Using task-specific circuit training for both upper and lower extremities, the experimental group received the intervention thrice weekly for 12 weeks. The control received memory exercises, health education, and stretching. Outcome measures were initially evaluated at baseline, post-intervention, and 16-week follow-up. Functional recovery was assessed with the 10MWT, 6MWT, the human activity profile, and the stroke-specific quality of life scale. Together, these assessments provided a greater understanding of the functional recovery and outcomes gathered from the study. Martins et al. did not see statistically significant improvements in the experimental compared to the control group except for quality of life, which was statistically significantly different ($p = 0.02$). Martins et al. concluded that task-specific circuit training did not improve functional mobility. However, quality of life was positively affected by the intervention. This study has limitations of a small sample, which limits external validity and statistical power. The status of a chronic stroke may have also contaminated the effectiveness of the intervention, as time matters with stroke recovery and neuroplasticity. Lastly, no measurement tool was used to assess the intervention's intensity. Therefore, one must infer that this intervention used high intensity due to its circuit fashion functional tasks for the upper and lower extremities.

Alternating HIT with Functional Task Training

Sandburg et al. (2016) studied the effects of high-intensity cycling alternating with low-intensity functional activities. Fifty-six participants completed this 12-week exercise protocol, and the control group only received education concerning the importance of physical activity. Sandburg et al. saw significant improvements in balance, aerobic capacity, walking patterns, and health-related quality of life in the intervention compared to the control group. These results indicate that elevating the heart rate and performing functional activities can demonstrate increased improvements in deficits common for stroke survivors. Limitations to this study comprise possible selection bias because nearly one-third of individuals approached to participate in the study rejected the opportunity, leaving the actual participants with greater bias and interest toward the concepts being researched in this study. Several outcome variables were measured with self-reports, which may have increased type I errors. Lastly, no previous fitness levels were accounted for, which may have affected between-group variance.

Rosenfeldt et al. (2019) performed a secondary analysis of data from two RCTs to determine the effects of intensity and aerobic exercise with repetitive task practice on health-related quality of life. Data was analyzed from 40 chronic stroke survivors randomly assigned preselected aerobic exercise with RPT, a group where participants selected their aerobic exercise with RTP, and those receiving education with RTP. Outcomes measures favored both exercise plus RTP groups, and health-related quality of life had no statistically significant difference. However, statistically significant enhancements were seen in the Stroke Impact Scale domains of ADLs, strength, hand function, and mobility for exercise groups compared to those receiving education only plus RTP. The greatest improvements in quality of life were seen in the preselected aerobic exercise group, which the Center for Epidemiological Studies-Depression

Scale assessed. However, these scores were not statistically significant. These findings indicate the value of aerobic activity as a primer to task-specific training. Limitations of this study included a heterogeneous sample, which may have reduced the external validity of the findings. Also, the Stroke Impact Scale is not a performance measure but rather a recording of how one perceives success in various domains. Potential accuracy and internal validity limitations might have occurred when such measurements were not triangulated with performance-based assessments.

Intensified Occupational and Physical Therapy

Ko et al. (2015) conducted a case study to inspect variations in ADLs, quality of life, and motor function. Participants consisted of six individuals who had experienced stroke and performed an occupational and physical therapy group task-oriented circuit training throughout 31 weeks. Outcome variables were balance, functional impairment severity, ADLs, and psychometrics, which were assessed before and after the intervention. Ko et al.'s program included functional ambulation and ADL training with higher intensities. Their findings indicated statistically significant improvements in mood/emotion ($p = 0.042$), balance ($p = 0.27$), and ADL performance ($p = 0.14$). Ko et al. identified that the tasks-oriented circuit training intervention was an appropriate approach for improving ADLs, mood, and balance in individuals with chronic stroke. Limitations were a small, heterogeneous sample, absence of control, and randomization, with variability in baseline deficits/functioning. Future research should consider the effectiveness of intensified functional ambulation training with ADL training.

Discussing Elements of Occupation and HIT

Overall, there has been moderate evidence to support elements of occupation in HIT and suggest favorability with its success toward stroke survivors (Dromerick et al., 2009; Ko et al.,

2015; Martins et al., 2020; Park et al., 2017; Rosenfeldt et al., 2019; Sandburg et al., 2016). No accurate comparison has been performed on OT implementing HIT toward conventional HIT, which leads to little evidence to guide OTs in using HIT within their practice scope. Added salience may be an essential component (Ko et al., 2015; Martins et al., 2020; Park et al., 2017; Sandburg et al., 2016). However, salience is a concept that is not easily measured in the literature, as it may require mixed methods to assess. However, with gleaning for relevance toward OT and occupation in combination with moderate to high rigor, the overall evidence for elements of occupation in HIT and its effectiveness has been moderate.

Discussion of The Literature

Overall, the research has suggested strong evidence for the effectiveness of HIT with stroke patients (Boyne et al., 2016; Boyne et al., 2019; Carl et al., 2017; Holleran et al., 2014; Hornby et al., 2019; Moore et al., 2021 Steen-Krawcyk et al., 2019). Evidence has shown that HIT promotes the synthesis of BDNF and blood lactate to promote neuroplasticity (Boyne et al., 2019; Charalambous et al., 2018a; Madhavan et al., 2016; Mang, 2013; Nepveu et al., 2017). Dissimilar to the research on HIT toward memory and motor learning in healthy adults (Roig et al., 2016; Skriver et al., 2014; Snow et al., 2016; Thomas et al., 2016), the evidence has had mixed results for neurological conditions with motor learning (Abraha et al., 2018; Charalambous et al., 2018b; Nepveu et al., 2017). Literature on HIT has had mixed findings for cognitive performance within the population of stroke survivors (Bo et al., 2018; Maeneja et al., 2023; Tang et al., 2016). However, research on HIT has been supportive of motor learning with performance skills practiced adjacently to HIT-related tasks (Rosenfeldt et al., 2019; Sandburg et al., 2016). These findings have supported Motor Learning and the principles of neuroplasticity, indicating that a combination of neuroplastic principles is needed for optimal recovery. Existing

evidence-based HIT programs have faced barriers to fidelity and adherence regardless of whether research supports their effectiveness (Charalambous et al., 2018; Moore et al., 2021). However, the research has remained unclear on which program parameters are most effective for intensity, as some may limit meaningful task-specific practices such as functional mobility.

In contrast, other programs may not have included enough skill acquisition for self-care-related ADLs (Boyne et al., 2015; Charalambous et al., 2018a; Holleran et al., 2014; Moore et al., 2021). Such limited information has raised the challenge of determining when and where ADL training should be included with HIT. Indeed, further exploration needs to be completed to understand OT's role in HIT. No available research has been conducted specifically on this topic, and most information has been extracted from other disciplines, such as physical therapy, with themes reflecting the elicitation of elements in occupation. Although aspects of occupation and HIT may have promoted functional improvements, there have been unclear explanations of the effectiveness of intensifying self-care-related ADLs (Ko et al., 2015; Martins et al., 2020; Park et al., 2017; Sandburg et al., 2016). Because OT has remains a holistic profession that does not separate individuals from their context and the salience derived from engaging in meaningful occupations (Barry et al., 2016; Clark, 1993; Pierce, 2001a), the profession of OT may benefit by including HIT training while applying its unique occupation-centered style. It may be necessary to use such interventions and develop the essential research to support them. These interventions may include the valuable motor learning strategy of meaning and the neuroplasticity principles. Currently, HIT protocols have been predominately exercise-based. Although OT can use therapeutic exercise to help patients obtain their goals, it has not typically been the primary focus of the profession, as the core tenets have remained occupation-centered, focused, and based (Fisher, 2013). Therefore, the question of the effects of intensifying occupations such as IADLs

and ADLs within the scope of OT has remained unanswered. To begin the process of researching OT and HIT, manualizing an occupation-based HIT protocol has been necessary, specifically one that embodies therapeutic power (Pierce, 2001b), grounded in Motor Learning Theory and well-established OT models of practice.

Capstone Statement of Purpose

This doctoral capstone aimed to help fill the gap in the literature related to OT and HIT. It has focused on preparing research opportunities by developing a program that could be studied in the future. Program development was also operationalized for clinical practice implementation. The program was titled *OT-based HIT*: *A Comprehensive Guide to Stroke Rehabilitation*. Throughout this document, the name has been shortened into OT-based HIT.

Previous HIT-related programs have used Kou and Donelan's (2010) four subcomponents of functional ambulation. These consisted of stance control, limb swing, propulsion, and postural stability. By integrating these four subcomponents of functional ambulation and adding the principles of high-intensity stepping training, significant progress has been found within individuals poststroke (Holleran et al., 2014; Hornby et al., 2019; Hornby et al., 2015). Lamoreaux (2023) expanded upon Kou and Donelan's (2010) work and proposed four subcomponents to activity that were applied within OT. He identified these activity subcomponents as object manipulation, postural control, limb mobility, and core management. Overall, Lamoreaux's (2023) program aimed to systematically provide a series of modules that a therapist would apply into practice. In addition to the previous literature and HIT-related protocols, this capstone integrated several research concepts concerning neuroplasticity. Initially, it aimed to expand upon Lamoreaux's (2023) program. However, it extended into the new OT-based HIT program with parameters reflective of the facility's needs for which it was developed.

Theoretical Frameworks

Model of Human Occupation

The Model of Human Occupation (MOHO) has shaped this program's development. The MOHO is a renowned theoretical model of practice that incorporates three main components:

habituation, volition, and performance capacity (Kielhofner, 2008). These three elements of MOHO interact with each other and the environment to affect an individual's satisfaction with occupation. This program incorporated MOHO's various components by including and attending to how individuals who have experienced stroke pursue, maintain, and acquire meaningful occupations. Although, ideally, occupation in therapy would be the sole type of intervention, it is often unrealistic for patients with stroke to engage in their preferred occupation with salience immediately. Hence, rehabilitation aims to help individuals return to the prior level of function. Therefore, occupation as an end is often an approach taken by OTs. The MOHO incorporates either occupation as an end or means with the therapeutic approach. OT-based HIT consists of volition through the desire to return to a prior level of function while performing desired occupations. Habituation is a part of the occupation-based high-intensity program, which includes everyday activities, characteristics, and patient patterns. The occupation-based high-intensity training program aimed to implement all aspects of an individual's occupational experience while intensifying various components to remediate functional recovery so such individuals can more readily return to the desired prior level of function. Elements of MOHO can either act as facilitators or barriers to performance. Additionally, the therapist can take on a strength-based approach to highlight an individual's strengths versus an impairment-based approach, where deficits are primarily addressed with little attention to one's strengths. The various subparts of MOHO that serve as strengths in the program can increase adherence and success with occupational engagement.

Motor Learning Theory

Motor Learning Theory has been an essential component of this capstone, as it provides various strategies that guide stroke survivors' recovery process (Kafri, 2019). Specific areas of

Motor Learning Theory pertinent to this project included error-based learning, salience, knowledge of performance and results, and explicit versus implicit learning. These motor learning strategies provided evidence-based approaches to therapeutic interventions and enhanced insight into how individuals acquire skills until they have been mastered through variability. Individuals who have experienced a stroke need reacquisition for occupations such as ADLs. Motor Learning Theory is a well-established approach to therapy. It has been applied to this capstone program and complements the principles of neuroplasticity. However, the OT-based HIT program has not been researched for effectiveness. This capstone aims to prepare it for future research. To increase the strength of this program and sustain it as evidence-based, the principles within it have needed to be well-established, research-oriented, and evidence-based, thus supporting the program's strength for clinical application. Therefore, OT-based HIT has been based on strong theories such as Motor Learning and MOHO.

Capstone Objectives

This capstone aimed to fulfill a learning contract drafted by the doctoral student and signed by the faculty and site mentors. This learning contract has been titled the memorandum of understanding (MOU). Within the MOU, specific and measurable learning objectives were created. By the end of this capstone experience, the following objectives were accomplished:

- obtained an understanding of program development,
- applied knowledge of activity analysis throughout program design,
- expanded upon concepts from the Life Hardening (occupation-based HIT) program and developed for clinical practice with OTs, and
- advanced clinical practice in stroke rehabilitation was accomplished.

See Appendix A for the fulfillment of advanced clinical practice objectives through the completion of a HIT continued education unit (CEU) provided by the Institute of Knowledge Translation. Each of these learning objectives helped to guide progress throughout the 14-week capstone experience and ensured goal orientation for the student-led project. See Appendix B for a comprehensive portrayal of goals, objectives, activities, methods for evaluating and measuring such experiences, and a completed version of the MOU.

Methodology

The methodology for this doctoral capstone included multiple components of program development, such as planning, implementation, and evaluation phases. During the planning phase, a needs assessment was conducted to understand the gaps in OT and HIT. The implementation consisted of designing the program to help meet the determined areas of need. A website was created and designed to relay the program's information. The evaluation included comments for quality improvement. Evaluation methods consisted of ordinal and nominal data. This approach was taken for feasibility and timeliness while still providing input from essential stakeholders. Performing this program on individuals with stroke would have raised safety concerns and would have been classified as an experimental practice with greater than minimal risk for such participants. Therefore, this program was not implemented on patients due to inadequate time to obtain full board review from the University of Nevada's Institutional Review Board (IRB). See Appendix C for notice of IRB exclusion from full board review.

Participants

The participants for this capstone project were recruited through a convenience sampling method with clinicians at the Saint George Regional Hospital. This specific group was chosen to gain insights into the perceived effectiveness and practicality of the program among those already familiar with HIT. It has been essential to note that the goal of this doctoral capstone was not to persuade therapists to adopt HIT but to understand the perceived accuracy and effectiveness of occupation in this practice area. Therefore, this facility was beneficial to this capstone's intention. The Neurospecialty Rehab at this facility had ample resources for HIT, making it a viable option for piloting this program. See Figure 1 for an image of the therapy gym and available harness systems for safely implementing HIT. Recruitment was conducted during

both the preparation and evaluation phases of program development, using a combination of face-to-face and email communication. While face-to-face communication was more effective in gathering participants, email was valuable in accommodating busy schedules.

Figure 1: Therapy Gym

Note. Neuro Specialty Rehabilitation Center at Saint George, Utah. Intermountain Health provided the image. Attached to the ceiling is a track and harness system to challenge stepping and balance. It can also be applied to other occupations, such as simulated grocery shopping, house cleaning, or yard work.

Needs Assessment

An on-the-ground needs assessment was completed to increase understanding of the gaps in service related to OT at the neuro-specialty rehab. Methods for understanding and gathering this information during this on-the-ground needs assessment included observation and interviews. Both focused on HIT and gaps in serving patients with occupation-based HIT interventions. See Appendix D for guiding questions for an interview completed during this phase of the program development process and Appendix E for informed consent for an audio interview recording. An audio recording was initially intended during the interview to increase the accuracy of the data gathered. However, according to the key informant's preference, permission was not obtained to record the interview. Therefore, notes were taken during and immediately after the interview to reduce errors in data gathering. A member check was conducted with the data obtained, including thematic identification. Names and identities of those interviewed remained anonymous throughout the capstone. During the observation portion of this needs assessment, the focus was on how OT was currently implementing HIT. Observing how various OTs implement HIT within the profession's scope of practice helped to provide a foundation of knowledge and potential gaps with OT implementing HIT interventions that were occupation-centered, based, and focused (Fisher, 2013). The OTPF was the criterion reference for occupation-based during this observational portion of the on-the-ground needs assessment (AOTA, 2020).

Measurements for Quality Improvement

Each participant was provided informed consent before sharing their feedback. Their comments during the quality improvement questionnaires remained anonymous (see Appendix F, the written disclosed consent documents). After the clinicians examined the program, their

feedback was gathered for program quality improvement. After obtaining such feedback, adjustments were made to the program. Because the primary focus of this doctoral capstone was to know the program's quality in the context of clinicians' perspectives, a quality improvement questionnaire was used to answer this question and provide feasibility for completion. This questionnaire was piloted with the faculty and site mentor and reviewed for clarity before being administered to other participants. The quality improvement questionnaire had two parts: a five-point Likert scale to understand its accuracy with occupation, HIT, practicality, appeal, and transferability. The second part assessed feedback concerning the program's strengths, weaknesses, opportunities, and threats (SWOT) perceived by the participants. See Appendix G for an example of this questionnaire. Answers were kept private and anonymous for each participant and stored in a 2-step authenticated password-protected Google Drive. Using Microsoft Excel, data from the quality improvement questionnaires was analyzed to understand if significant differences occurred in responses between those who completed a HIT CEU and those who had not. Information from the SWOT analysis was organized into codes, categories, and themes (Daniel, 2016; Sullivan & Sargeant, 2011). Member checks were performed to reduce data gatherer bias and enhance the credibility of the information analyzed (Varpio et al., 2017). Another method for reducing bias was peer review for data analysis, which increased the accuracy of the themes identified.

Ethical Considerations

Because the OT-based HIT program expanded upon concepts from the Walk the Walk and Life Hardening programs, permission was received from these parties to expand upon similar concepts. It was essential to ensure that the information did not discredit Lamoreux's work and that copyright considerations were included. See Appendix H for a permission letter.

Additionally, the Skill Acquisition Chart designed by the Institute of Knowledge Translation was used within OT-based HIT and combined with the Transtheoretical Model of Change to help shape patient engagement through making SMART goals (specific, measurable, achievable, realistic, and time-bound). Permission was received to use the Skill Acquisition Chart. See Appendix I for details on copyright permission.

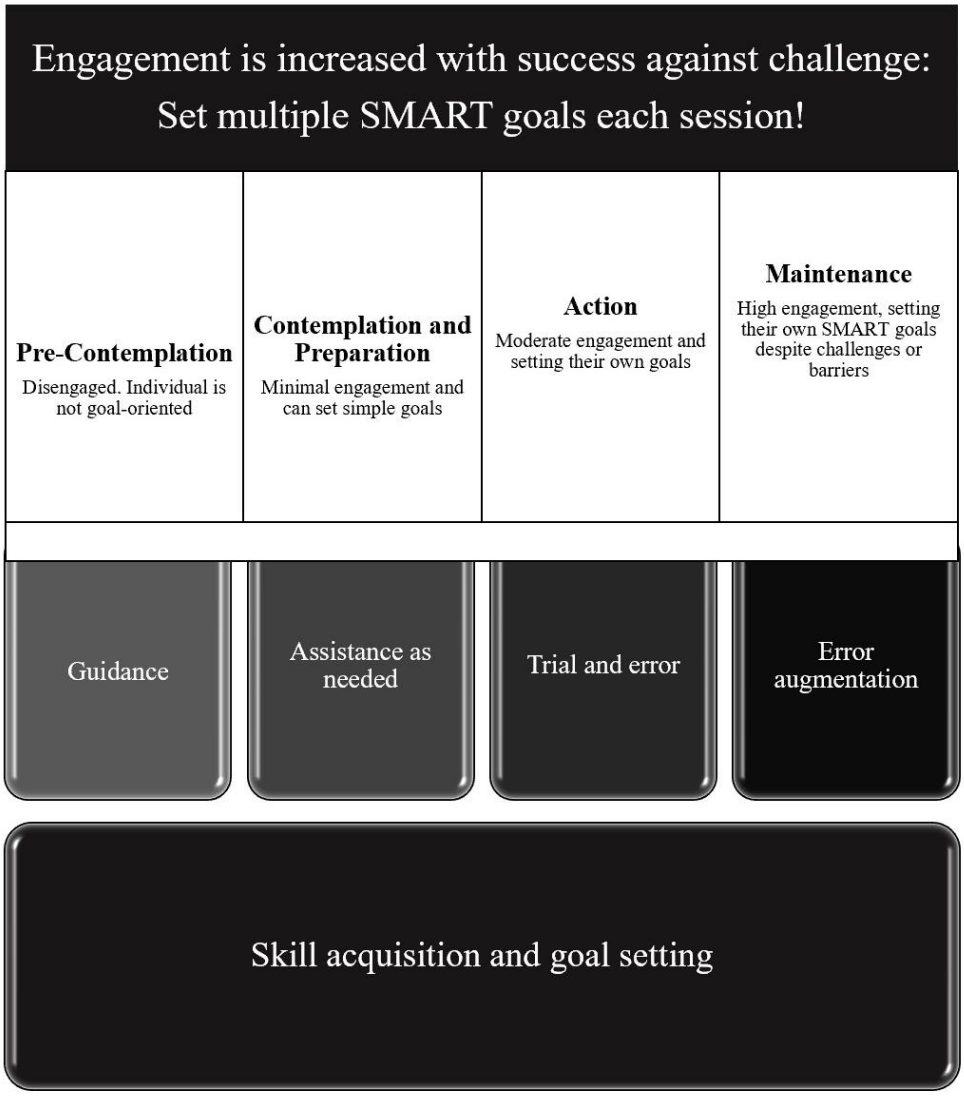
The Transtheoretical Model of Change has been open to the public without copyright infringement should it be accessed, modified, or distributed (National Institutes of Health, n.d.). DiClemente and Prochaska (1998) have been credited for the model.

Lastly, no program implementation was done on the patients at the site by this capstone student, thus ensuring their safety since time was limited for a full board review institutional review board (IRB), and applying HIT to patients with new intervention methods might have placed them at more than minimal risk. The IRB process was completed with the faculty mentor, Jonathan Legarte, as the primary investigator. As stated earlier, informed consent was obtained from all participants, and the freedom to end participation was ensured at any time. Anonymity was protected by storing documents from questionnaires in 2-step password-protected accounts and not linking names to data.

Program Overview

OT-based HIT was developed with occupation as the core foundation of the program. The definition of occupation has also been a topic of debate, making measuring this concept challenging for researchers and clinicians. Using instruments such as the COPM may enhance the accuracy of using occupation within the profession. However, this instrument only accounts for the perception of performance and satisfaction with the subparts of occupation, including self-care, productivity, and leisure. The COPM may have limitations when engaging in volitional ownership of occupational performance. OT-based HIT has aimed to fulfill this need through the lens of MOHO and the creation of the *Volition Tool*, which integrates skill acquisition with SMART goal-setting. This tool has aimed to optimize patient engagement within inpatient rehabilitation and has been designed as an essential element of OT-based HIT. The Volition Tool has combined the Transtheoretical Model of Change and the Skill Acquisition Chart in the context of SMART goal setting toward occupation, as measured by the COPM. See Figure 2 for a depiction of the Volition Tool.

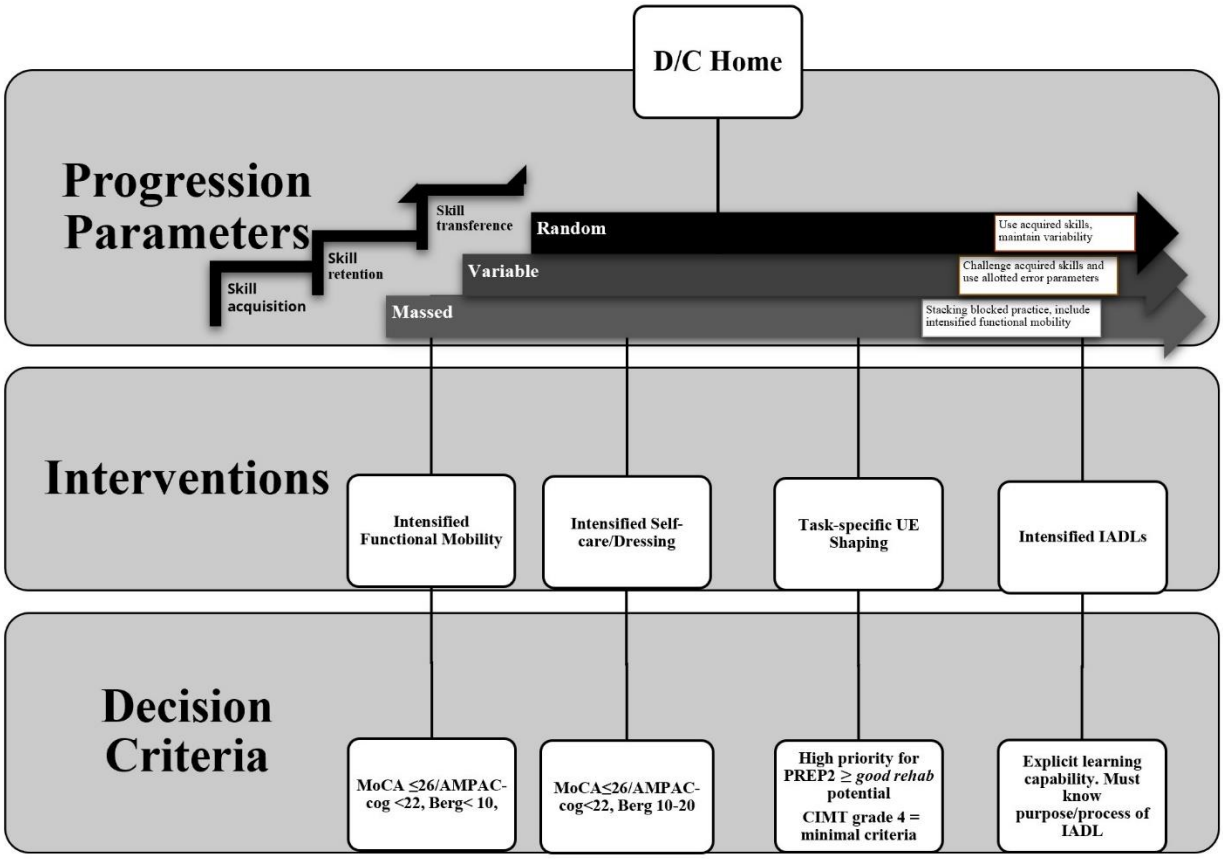
Figure 2: Volition Tool



Note. This figure guides a clinician through SMART goal-setting via skill acquisition. The OT uses the transtheoretical model of change to identify readiness for SMART goal setting. The OT uses the Skill Acquisition Chart on a spectrum from guiding goal setting to challenging the patient's independent goals.

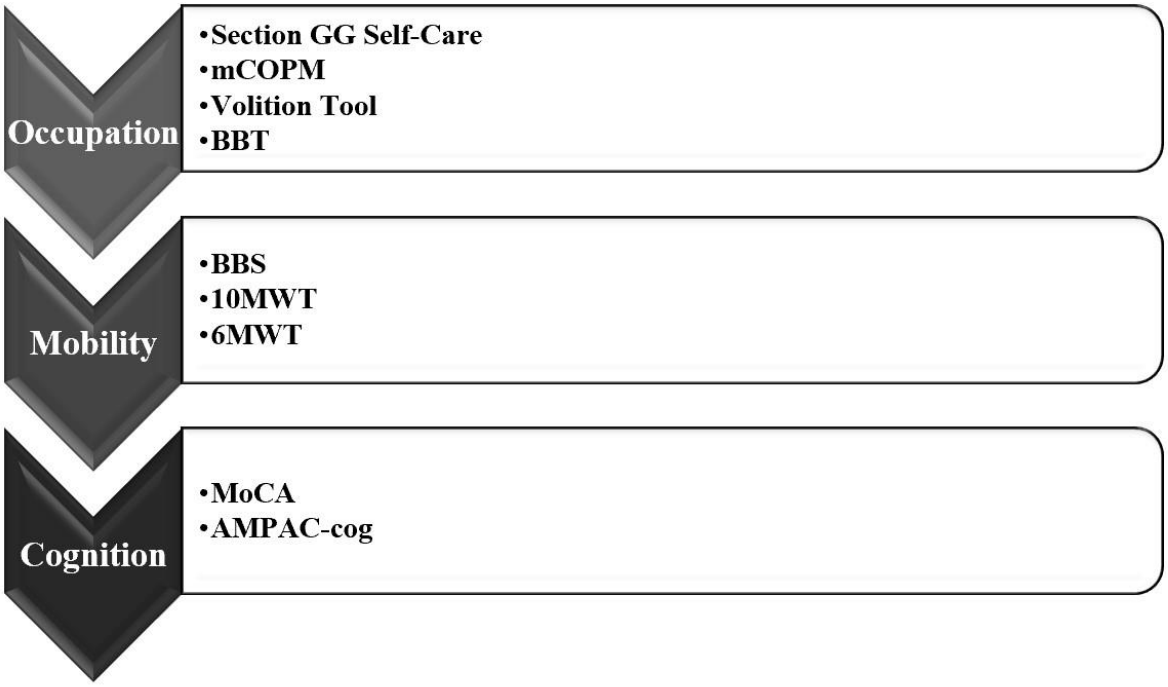
OT-based HIT has incorporated motor learning strategies to help patients progress from skill acquisition to transference. The program has recommended blocked practice for skill acquisition and random practice for skill transference. A patient advances through skill development in occupation through increasing task variability. The program has recommended variability with error-based learning using a preselected allotted error parameter. Functional mobility and HIT have been selected as foundational occupations within the program, and the evidence on HIT has been incorporated from the literature. The Volition Tool has served the purpose of ensuring meaningful, occupation-based interventions. Additionally, when a patient has explicit learning capability, OT-based HIT has recommended instrumental ADL practice with an emphasis on stepping practice. The program has suggested practicing self-care skills with alternating functional mobility and the self-care task (e.g., dressing), using functional mobility as an aerobic *primer* to prepare the intensified ADL. Figure 3 illustrates the program's protocol and progression parameters. The program has also included prediction algorithms, such as the second edition of the Predict Recovery Potential (PREP 2). These assessments have served as guides for an OT in prioritizing interventions. The program has used outcome measures to assess occupational performance at eval, weekly, and discharge. The measurements used within the program have incorporated multiple assessments that the Saint George Regional Hospital has been using. See Figure 4 for an illustration of outcome measures within the program.

Figure 3: OT-based HIT Protocol



Note. OT-based HIT uses predictive algorithms to prioritize interventions. Decision-making has a trade-off between cognitive and balance scores. The concept of degrees of freedom from Motor Learning Theory has been applied to the exchange between cognition and balance. Higher balance/cognition scores allow for more complicated task practice. D/C = discharge; MoCA = Montreal Cognitive Assessment; AMPAC-cog = Activity Measure for Post-Acute Care; Berg = Berg Balance Scale.

Figure 4: OT-based HIT Outcome Measures

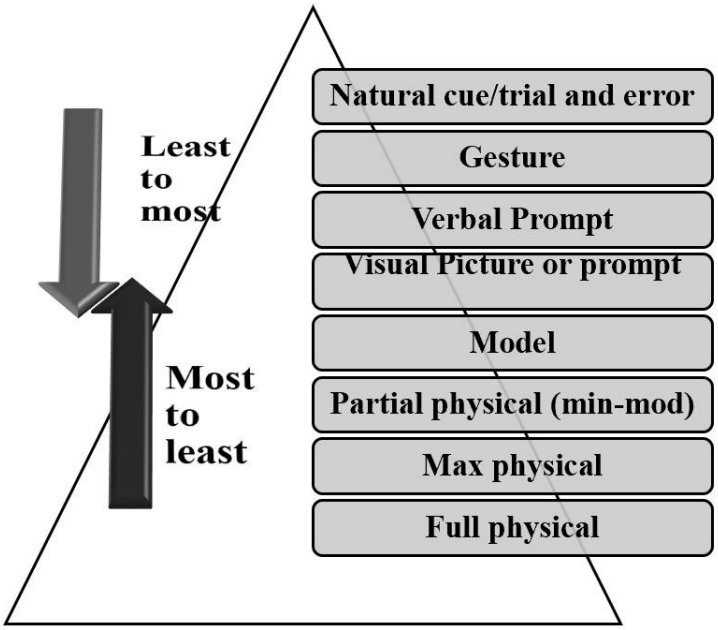


Note. Outcome measures are assessed weekly to identify progress in occupation, mobility, and cognition, and they are assessed and supported with validity and reliability for their intended purposes. mCOPM = Modified Canadian Occupational Performance Measure; BBT = Box and Blocks Test = BBS = Berg Balance Scale; 10MWT = 10 Meter Walk Test; 6MWT = 6 Minute Walk Test; MoCA = Montreal Cognitive Assessment; AMPAC-cog = Activity Measure for Post-Acute Care

Although error-based learning has been recommended in OT-based HIT, skill acquisition with self-care occupations, such as lower and upper body dressing, uses more invasive prompting when cognition is limited. Otherwise, less invasive prompting has been recommended to increase error-based learning. See Figure 5 for a depiction of the prompting hierarchy used in

OT-based HIT to guide the therapist on the spectrum of prompting. This phase of intervention has been recommended during the assist-as-needed portion when using the Skill Acquisition Chart from the Institute for Knowledge Translation.

Figure 5: Prompting Hierarchy



Note. Least-to-most promotes error-based learning and has been recommended for patients with higher cognitive scores on the Montreal Cognitive Assessment. Most-to-least has been recommended for those with lower scores.

Overall, the program has incorporated occupation and HIT to enhance positive patient outcomes. Task-specific practice has been valued based on motor learning strategies for skill acquisition and error-based learning. The time frame of the program varies with each patient. However, examples have been provided within OT-based HIT to facilitate the navigation of concepts covered. The program has been developed using a website format to enhance learnability. The website has been shared with the capstone site. For additional information on OT-based HIT, see Appendix J for accessing the completed program (Demke, 2024).

Findings

Participants

Of the eight therapists asked to participate, three responded and answered the interview questions during the needs assessment. These participants consisted of two OTs and one physical therapist. Only one of these OTs continued to participate in program evaluation. For the evaluation phase, the outreach for enhancing participant size increased to 10 clinicians. Of those asked to appraise the program, four completed all parts, including reviewing the OT-based HIT website, providing consent, and completing the quality improvement questionnaire. Participants answered demographic questions concerning years of experience, their profession's name, age, gender identity, and if they had completed the Walk the Walk course, a HIT CEU provided by the Institute for Knowledge Translation. See Table 1 for details on demographics. Parametric data was not obtained due to limited participants, and participants did not display normal distribution across these various categories. However, they were only moderately skewed for the profession category. Participants comprised two OTs, one speech-language pathologist, and one physical therapist. Their gender identity was cisgender, with a 50/50 split between male and female. Participants had varied results with years of experience at the current location. Those who reported working at the unit with minimal time still had years of experience within their respective profession. For example, one speech therapist had over 20 years of experience but only worked at the current location for 1-2 years. Nevertheless, understanding the time employed at the current location was a means of determining familiarity with HIT based on the unit's work culture. Seventy-five percent of participants were within or older than the 45-54 age range, and all identified as White for their ethnicity classification. Only one participant (25%) had not completed or was in the process of completing the HIT CEU.

Table 1: Participant Demographics

Category	Response Distribution		Descriptive Statistics		
	n	%	*M*	*SD*	95% CI
Profession			1.33	0.57	[1.98, 0.68]
OT	2	50			
PT	1	25			
SLP	1	25			
Other					
YCL			1.33	0.57	[1.98, 0.68]
1-2	1	25			
2-4	1	25			
4-6					
>6	2	50			
Gender			2	0	0
M	2	50			
F	2	50			
Other					
Age			1.33	0.57	[1.98, 0.68]
18-24					
25-34	1	25			
35-44					
45-54	1	25			
55-64	2	50			
Ethnicity			4	0	0
AA					
PI/NH					
NA					
H/L					
A					
W	4	100			
HIT CEU			2	1.41	[3.96, 0.04]
Yes	3	75			
No	1	25			

Note. Participant demographic information and whether they completed formal HIT education (N = 4). PT = physical therapy; SLP = speech-language pathologist; YCL = year at the current location; M = male; F = female; AA = African American; PI/NH = Pacific Islander/Native Hawaiian; NA = Native American; H/L = Hispanic or Latino; A = Asian; W = White. HIT CUE = high-intensity training continued education unit.

Needs Assessment Findings

Initially, interviews were attempted verbally; however, reception and participation were minimal due to the limited availability of the informants. Therefore, to increase participation, interviews were conducted optionally in two forms. One interview was conducted via interpersonal communication with the key informant, and a member check was completed for accuracy. The other interviews were conducted remotely using 2 step password-protected email. Forms were sent with prewritten questions. Codes, categories, and themes were identified during this process (Daniel, 2016; Sullivan & Sargeant, 2011). These interviews yielded five themes: *a need for evidence*, *safety*, *progression parameters, informed instruction,* and *patient engagement*.

The participants articulated the importance of evidence-based practice during therapeutic interventions. Occupational and physical therapists would intervene with HIT using high-intensity stepping training, and this approach was strongly valued among the informants. Safety considerations were a theme identified during these interviews, as there has been little evidence to support HIT and ADL/IADL training. Lastly, progression parameters were included as a concern with OT-based HIT. Participants were unsure how an OT would advance someone through a HIT program and what measurements should be included. Informed instruction meant educating patients on the importance of recovery, making space for their personal goals, and including communication on the expectation of recovering specific skills to reduce caregiver burden. The findings from these interviews indicated that a program should have a portion of communicating recovery expectations instead of targeting solely occupations that a patient might want to do (informed instruction). Interview findings also suggested that the program should have a means for measuring patient engagement with operational definitions to reduce variability in clinicians' interpretation. Interventions should be tailored to increase engagement with goal-

orientated behaviors (patient engagement). Lastly, the program should be easy to navigate with multiple objective measures (Anonymous, personal communication, January 22, 2024).

Quality Improvement Findings

Quantitative Analysis

Feedback was received for quality improvement concerning this program's perceived feasibility. Chi-Square was used to determine if there were any significant differences between observed and expected values when comparing Likert scale responses from those who completed a HIT CEU and those who had not. Questions from the quality improvement questionnaire were categorized into summarized content to enhance readability. Findings from the question categories were as follows: Chi-Square $\chi 2(4, N = 4)$ ($p<.05$); *Occupation-based* $p=.41$; *appropriate HIT application* $p=.93$; *navigation simplicity* $p=.86$; *willingness to implement* $p=.86$; and *program transferability* $p=.41$. See Table 2 for a breakdown of responses to various question content.

Table 2: Comparing Question Content with HIT Experience

[a]Question Content	Completed HIT CEU	Response Frequency				
		Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
Occupation-based	Y					3
	N				1	
Appropriate HIT application	Y				1	2
	N				1	
Navigation simplicity	Y				1	2
	N				1	
Willingness to implement	Y				1	2
	N				1	
Program transferability	Y				2	1
	N			1		

Note. This table illustrates the response distribution for the quality improvement questionnaire and compares respondents who completed a HIT CEU with those who did not participate (N=4). Y = yes, N = *no*.

[a] Question content was derived from complete questions from the quality improvement questionnaire.

Qualitative Analysis

Themes were identified and separated into each subcomponent of the SWOT analysis, as illustrated in Table 3. Two overarching themes were recognized: *patient empowerment* and *reluctance to change*. These two themes incorporated both the positive and negative halves of the SWOT analysis. Patient empowerment consisted of the OT-based HIT program's approach to patient engagement through SMART goal setting and its systematic advancement with skill

acquisition. Participants identified that, in OT-based HIT, patients learn and practice skills rather than receive them from their provider (training versus treatment).

Subthemes for patient empowerment were distributed between the strengths and opportunities of the SWOT analysis. Strengths included being *evidence-based*, *occupation-focused*, *patient-engaging*, having a *user-friendly layout*, and being *easy to understand*. These subthemes represented multiple aspects of the program and its aim to increase patient independence through HIT training. The program's opportunities identified by the participants consisted of providing a *holistic approach* and *positive patient outcomes*, allowing *HIT within OT's scope of practice*, *enhancing interdisciplinary teamwork*, and increasing *evidence-based practice in ADLs*. Having OT embrace such areas of practice through HIT suggested improvements in the overall quality of care in the profession. Such themes were displayed during the SWOT analysis, leading to the overarching theme of patient empowerment.

Subthemes were also identified with the weaknesses and threats components of the SWOT analysis, which contributed to the overarching theme of reluctance to change. *Transferring to other settings* was a perceived weakness of OT-based HIT. One informant described that performing HIT has limited use throughout inpatient rehab, let alone within OT. Other settings, such as skilled nursing facilities, may not see the value of OT-based HIT. Being *challenging to change past paradigms*, having *limited buy-in*, and *lacking implementation* with patients were considerable subthemes that led to the weaknesses concerning OT-based HIT. Additional subthemes included *unwillingness to apply new evidence*, *paternal traditional thinking*, and *cost*, which were identified as perceived threats to the program. All information obtained through the quality improvement questionnaire was used to modify and enhance the program to meet better the needs of the unit for which it was designed. Member checks and peer

reviewing were performed with the participants to increase the credibility of information obtained from data analysis.

Table 3: SWOT Analysis Overarching Themes

[a]SWOT Analysis Categories	Themes	Subthemes	Open Ended Feedback
Strengths	*Patient empowerment*	evidence-based, occupation-focused, patient engagement, user-friendly layout, clear to understand	"Shift away from impairment focus and into re-engaging patients in occupation."
Opportunities		holistic application, positive outcomes for patients, HIT within scope of practice, increased interdisciplinary teamwork, evidence-based practice with ADLs	"As the program develops, if the overarching focus is on engaging the patient, and we implement the means to measure that, then we will have something that is more in line with where the research is directing us to go."
Weakness	*Reluctance to change*	transference, lacking implementation, difficulty changing past paradigms, buy-in difficulty	"HIT should become the standard. All appropriate patients should have the opportunity to participate in HIT programming."
Threats		cost, paternal traditional thinking, unwillingness to apply new evidence into practice	

Note. This table demonstrates thematic information derived from SWOT analysis gathered from clinician feedback (N=4). The data was gathered and used to enhance program development. Open-ended feedback quotes remain anonymous (Personal Communication, March 2024).

[a]SWOT is within a mixed sequence to enhance the table formatting alignment.

Discussion

In stroke rehabilitation, interventions are incorporated to increase functional deficits caused by a vascular incident. With a recent trend in HIT supporting functional gains overwhelmingly more significant than those of traditional therapeutic approaches, using HIT warrants consideration (Boyne et al., 2016; Boyne et al., 2019; Carl et al., 2017; Holleran et al., 2014; Hornby et al., 2019; Moore et al., 2021 Steen-Krawcyk et al., 2019). There are aspects of HIT that necessitate a paradigm shift. For example, traditional therapy favors low repetition with an emphasis on kinematics, while HIT focuses on high repetition, reaching the target heart rate, and error-based learning. Kinematics are not prioritized to the same degree. Throughout OT's history, the scope of practice has made multiple paradigm shifts. Therefore, current traditional therapy arguably has little traditionality when reviewed far enough back in history, as OT has its roots from multiple backgrounds. Therefore, the conceptual meaning of traditional OT should not imply that it is fully reflective of the profession.

At one point in the profession's history, mental health and life skills were strongly emphasized. For example, in 1889, Adams and Starr established Hull House to train underserved populations on the skills needed to maintain a job and home (Adams, 1910). In the early 1900s, the profession expanded into the arts and crafts movement, where the approach was to enhance health and well-being through participation in these activities (Levine, 1987). World War II demanded a paradigm shift with the reductionist movement (Friedland, 1998). Wounded soldiers needed care, and OT saw an opportunity to meet this need. With this shift in practice came an emphasis on the biomechanical frame of reference, where the objective of therapy was to remediate the deficit. Arguments have been made concerning this approach, explaining that it is not holistic and may lack OT's unique purpose of using occupation as the core therapeutic

modality (Peirce, 2001b). However, shortly after World War II, this method fulfilled the needs of the time. In her 1961 Eleanor Clarke Slagle Lecture, Reilly argued that individuals could take ownership of their health through determination and effort, implying that occupation might enhance health-related outcomes (Reilly, 1962). Such statements demand a reason to study the effectiveness of OT further. In recent years, society has demonstrated its unique needs, and OT has been answering with emerging areas of practice that meet the service gap. Although these solutions may differ, the end goal has been to center occupation throughout any intervention.

Implementing HIT has been a paradigm shift for physical therapy, but OT has limited exposure to this practice modality. Should OTs use HIT to the same degree as physical therapy, there may be a risk of creating potential role conflicts. Therefore, clearly designed programs are needed to ensure the scope of practice. OT-based HIT aims to fill this gap in service to guide clinicians who wish to use it with their patients and enhance functional outcomes. As HIT has been a paradigm shift from treatment to training (Kleim & Jones, 2008), OT-based HIT also suggests a shift in clinical reasoning and a callback concerning Peirce's (2001b) statements on therapeutic power, which integrates appeal, intactness, and accuracy (Peirce, 2001b).

This capstone answers the PIO question as it gathers information concerning what should be included within an occupation-based HIT program from clinicians' perspectives. Similar to the current literature, the findings from this capstone suggest that HIT is a feasible and effective modality within neurorehabilitation. Clinician participants from this program's evaluation added valuable insight concerning the perceived feasibility of OT-based HIT. Although obtaining input from stroke survivors might have increased the understanding of the program's accuracy with being occupation-based, limitations with IRB approval have prevented such information from being acquired. Therefore, the focus has been placed on the clinician's perception of HIT. The

participants overwhelmingly indicate that the program is occupation-based, as identified within the questionnaire and SWOT analysis.

Previous research and programs have unclear representations of OT and HIT. To the best of this doctoral student's knowledge, there has only been one previous program that has incorporated HIT within OT (Lamoreaux, 2023), making this capstone project avant-garde for the profession and supporting the paradigm shift from treatment to training (Kleim & Jones, 2008). OT-based HIT merges the evidence for HIT and incorporates occupation using MOHO as a lens for unique occupational applications. Motor Learning Theory is implemented throughout OT-based HIT to direct the process of skill acquisition.

The findings from the SWOT analysis indicate that the program is perceived as feasible. The qualitative data suggest that the program is perceived as evidence-based and remains occupation-centered. It is regarded as an easy program to navigate and simple to follow. Perceived threats and weaknesses include multiple components external to the program, such as past paradigms and traditional practices interfering with change. In other words, the program may not be readily implemented because clinicians may not want to change what they are comfortable doing in practice. Such findings imply that the program should enhance its approach with a quality "buy-in to convince practitioners of its value. This convincing should focus on the evidence of HIT instead of ethos-related components so as not to display misunderstanding. For instance, HIT is not a trend but rather an evidence-based intervention. Therefore, the focus should be on the evidence. Additional threats include the cost of harness equipment, which might be a barrier if the program were to transfer to another setting lacking the funds to support this equipment. However, the OT-based HIT is designed to utilize cost-effective approaches to

ensure safety. For example, manually assisting a patient through HIT is a skill that can be acquired and implemented when more expensive equipment is not available.

The overarching challenge throughout this capstone experience has been timeliness and fulfilling all demands for time and attention. Initially, the goal was to expand upon the Life Hardening program designed by Lamoreaux (2023). However, during the needs assessment, it was clear that an entirely different program should be developed to fill the identified service gap. Therefore, the capstone experience became robust in the sense of program development. Software skills were needed and acquired to design the OT-based HIT program using a medium that enhances readability and accessibility (e.g., website). Such additional challenges demanded more time to complete the project with satisfactory work. The OT-based HIT program has had a positive reception at the Saint George Regional Hospital for which it was designed, and some therapists have begun implementing the program with their patients, which demonstrates the evidence for positive reception.

For the Likert Scale section of the quality improvement questionnaire, the purpose of running this association was to identify if any difference in response occurred between those with professional training in HIT and those who had not completed professional training. Findings indicate no significant differences between categories as they pertain to question content when $p<.05$. One reason why no differences were seen might include a ceiling effect for this portion of the questionnaire. This section may risk low internal validity and a ceiling effect because the items have not been assessed for validity and reliability. Although the instrument was piloted and reviewed for appropriateness, no internal validity has been evaluated for this questionnaire. Additionally, a more prominent participant size may have helped to identify differences between these responses.

The goal of this capstone has been to design a high-intensity program for OTs that could be readily available for practice implementation and prepare it for further research. Therefore, the SWOT analysis portion of the quality improvement questionnaire shows an implication for the capstone's goal. OT-based HIT is a program that aims to guide clinicians through effectively implementing HIT with stroke survivors. From the information within the SWOT analysis, the program is perceived to be feasible and valuable across various professions. The program utilizes evidence on HIT and motor learning, with particular attention paid to MOHO as a theoretical platform. The assessments within OT-based HIT follow the trends in current literature and address the needs of the site where this capstone has been completed. Overall, this capstone has both strengths and limitations regarding its quality. However, the MOU's overarching goals, intentions, and learning outcomes have been accomplished.

Limitations

No program development procedural methodology is without limitations. Some of the limitations within the methodology are that the quality improvement questionnaire had been created specifically for this capstone, and no testing related to reliability and validity was performed. This reality limits the trustworthiness of the information gathered from the data analysis. However, to mitigate the lack of dependability from creating a new questionnaire, member checks were administered to increase credibility.

Although SWOT analyses are frequently used in program evaluation, this capstone lacks the actual implementation with patients to identify feasibility. The data gathered only assesses this program's perceived feasibility for quality improvement. Many variables may arise during program implementation, which this capstone does not identify. Because this capstone lacks implementation with patients who have experienced a stroke, the actual feasibility of OT-based

HIT is unclear. Lastly, the information gathered from data analysis is categorical and reduces the strength of the findings. Therefore, the lack of robust data analysis and methodology limits the understanding of this program's effectiveness.

Implications

The findings from evaluating OT-based HIT's perceived feasibility indicate that this capstone project produces a program with potential merit. The feedback from clinician participants suggests that the program is worth implementing in practice. Future progress concerning OT-based HIT should include its application with stroke survivors. Additional feedback via formative assessments may provide valuable insight concerning the program's effectiveness. SWOT analyses may be beneficial for assessing the quality of OT-based HIT as it is implemented into practice. Future research is needed to understand the effectiveness of OT and HIT. Overall, OT-based HIT has been developed to promote research on the effectiveness of OT and HIT in contributing to the body of literature to enhance understanding of these phenomena.

Conclusion

Stroke is among the most substantial contributors to debilitation (Tsao et al., 2022) and necessitates interventions to increase functional recovery. Neuroplasticity is a desired outcome post-stroke. The evidence supporting HIT in remediating function and independence for stroke survivors is strong, and there is also a growing body of evidence of BDNF proliferation and blood lactate build-up during aerobic exercise (Boyne et al., 2019; Charalambous et al., 2018a; Mang, 2013; Nepveu et al., 2017). While the long-term effectiveness of HIT in stroke survivors is yet to be fully understood, research indicates an advantage of HIT over MCT for achieving desirable therapeutic outcomes, functional gains, and amplifying the principles of neuroplasticity (Boyne et al., 2016; Carl et al., 2017; Holleran et al., 2014; Hornby et al., 2019; Mang et al., 2023; Steen-Krawcyk et al., 2019). However, OT has not found a place for implementing HIT in stroke rehabilitation that comprises occupation-centered, focused, and based interventions of appeal, accuracy, and intactness (Fisher, 2013; Pierce, 2001b). The profession may benefit from incorporating HIT within individuals post-stroke, yet little research has been completed to support the concept of OT implementing HIT. Therefore, there is a need for program development of an occupation-based protocol to prepare it for future research and clinical application.

There are limited evidence-based programs in OT that promote HIT in practice. Lamoreaux (2023) initiated the development of a pilot program to help fill this gap in service, basing it on evidence-based principles of neuroplasticity, motor learning, and HIT. This doctoral capstone contributes to OT and HIT through additional program development. The OT-based HIT program uses the available research to help guide OTs through decision-making when implementing HIT. It recognizes how cognition plays a role in occupational performance and

emphasizes motor learning strategies for skill acquisition. Motor learning and the MOHO are highly involved throughout the OT-based HIT program. Although HIT has been well-established in physical therapy, OT currently lacks a means for implementing this modality within its scope of practice. By designing a thorough program based on previously established evidence, this capstone project helps to pave the way for increasing OT's use of HIT as an effective intervention, complementing the profession's holistic approach to practice. Occupational therapy's Centennial Vision includes increasing evidence-based, client-centered practice through occupation (AOTA, 2017). This capstone contributes to the OT's Vision by expanding the wealth of information and designing a program for OTs seeking to enhance their patients' occupational performance.

Appendix A

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KNOWLEDGE
TRANSLATION

CERTIFICATE OF COMPLETION

This is to certify that

Jared Demke

Has pursued studies and completed all the requirements for

Walk the Walk: High-Intensity Gait Training in Rehabilitation (Winter 2024)

The Indiana Physical Therapy Association has approved the entire course for 35 continuing education units. Indiana Board Approval Numbers 006987887C2596. This specific online component of the course consisted of 12.75 continuing education units.

Jennifer Moore PT, DHS, NCS
Founder, Institute for Knowledge Translation
jmoore@knowledgetranslation.org

Issued: 2024-04-18

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Appendix B

UNLV | SCHOOL OF INTEGRATED HEALTH SCIENCES

Department of Brain Health

Occupational Therapy Doctorate Capstone Project and Experience Proposal
Individualized MOU

This form is to be completed by the student with assistance from the faculty mentor and site mentor prior to the Capstone Experience.

Student Name: Jared J. Demke, OTD/S

Capstone Experience Dates: January 16 – April 17, 2024

Capstone Experience Site Mentor: Steven Wallenfels, OTR/L

Site Mentor's expertise related to Capstone Experience: Steven Wallenfels OTR/L has appropriate credentials and years of experience and specialization in high-intensity training for neurorehabilitation.

Site Mentor's Email: stevewallenfels@gmail.com

Faculty Advisor for Capstone: Johnathan Legarte OTD, OTR/L

Faculty Advisor Email: jonathan.legarte@unlv.edu

Description of Capstone Project and Experience – (Written by student)
PICO/PIO From a practitioner's perspective, what is the feasibility of an occupation-based HIT program designed for stroke survivors?

Needs Assessment: How will your capstone project and experience contribute to knowledge in the profession, and what gap are you hoping to fill? A brief 2-3 paragraph essay with references
Stroke is one of the leading causes of death and disability in the United States (Tsao et al., 2022). Evidence supports the effectiveness of high-intensity training (HIT) for stroke patients through increasing balance, functional mobility, and functional independence (Boyne et al., 2016; Holleran et al., 2014; Hornby et al., 2019;). High-intensity training has also been shown to be safe for individuals poststroke (Carl et al., 2017; Steen-Krawcyk et al., 2019). During high-intensity training, increased brain-derived neurotropic factor is synthesized in the brain and promotes neuroplasticity (Mang, 2013), a desired outcome for stroke rehabilitation. Evidence shows that including interventions like occupational therapy (OT) with HIT can improve function and quality of life (Ko et al., 2015; Martins et al., 2020; Park et al., 2017; Sandburg et al., 2016). However, minimal occupational therapy-based programs are available to guide therapists' decision-making (Lamoreaux, 2023). Some neuro-specialty rehabs, such as the Saint George Regional Hospital, currently implement HIT to remediate functional recovery in their patients. However, occupational therapists (OTs) do not have a clear protocol when implementing HIT specific to their practice lens. Therefore, a program to direct OTs when using HIT can be beneficial for helping patients recover poststroke. There is a need for more evidence-based programs to guide OT interventions when remediating functional recovery in neuro-rehabilitation. The Saint George Regional Hospital Neuro-Specialty Rehab would benefit from having additional OT-based programs that lead interventions grounded on clinical decision-making, available resources, and evidence-based principles supported by research. Expanding upon an OT-based program to increase variety, appeal, intactness, and accuracy for recovery in neuro-rehabilitation can help fill this clinical resource gap for implementing OT-based programs in individuals poststroke and enhance the quality of therapeutic power at the Saint George Regional Hospital. **References** Boyne, P., Dunning, K., Carl, D., Gerson, M., Khoury, J., Rockwell, B., Keeton, G., Westover, J., Williams, A., McCarthy, M., & Kissela, B. (2016). High-Intensity Interval Training

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Write three measurable goals (objectives) for your learning experience during your Capstone Experience and potential activities to meet those objectives. The student, faculty mentor, and site mentor should discuss and agree.

Goal One: The student will obtain knowledge, skills, and competence in high-intensity training with stroke rehabilitation by completing a CEU by week 2

Learning Objectives	**Learning Activities**	**Evaluation**
A. Understand how HIT can be implemented in stroke rehabilitation	1. Complete continued education course (Walk the Walk)	1. Obtain certification from the CEU

Goal Two: The student will demonstrate hands-on skills for implementing HIT in stroke rehab as currently practiced in the capstone site for the purpose of identifying program parameters and evaluated by the site mentor for competence by week 4

Learning Objective	**Learning Activities**	**Evaluation**
B. Demonstrate HIT in stroke rehab to obtain skills related to current practice	1. Co-intervene with site mentor to increase my skills for implementing HIT in OT and stroke rehabilitation	1. Self-reflect on my self-efficacy for implementing HIT and OT and obtain feedback from the site mentor about my competence with such skills.

Goal Three: The student will demonstrate an understanding of program development for OT in stroke rehab by analyzing and reviewing the initiated program (Life Hardening) by week 5

Learning Objectives	**Learning Activities**	**Evaluation**

C. Program development/design with OT-based HIT	1. Consult with Dr. Lamoreux the current initiated program (life hardening) 2. Develop the program's budget 3. Design the program/expand the concept of occupation in the Life Hardening pilot program	1. Feedback related to the quality improvement of the program and self-reflection related to my knowledge of program development 2. Feedback from faculty and site mentor 3. Feeback from site mentor

Goal Four: The student will apply knowledge of Occupation-centered HIT through activity analysis with OT-based HIT by designing a wide variety of intensified occupations to be incorporated into the program by week 6.

Learning Objectives	Learning Activities	Evaluation
D. Apply and enhance knowledge of activity analysis.	1. Design modules on intensified occupations using activity analysis and principles of HIT and neuroplasticity	1. Feedback from participants (clinicians)

Goal Five: The student will complete program data analysis by analyzing clinicians' perceptions of the program's quality through feedback by week 8-10

Learning Objectives	Learning Activities	Evaluation
E. Obtain data gathering and analysis skills for program development	1. Perform educational in-service (seminar) related to the capstone project to present the program to the therapists	1. Gather feedback related to the quality improvement of the program

---

Occupational Therapy Doctorate Capstone Experience Hours and Supervision Log

(Through EXXAT)

The Weekly Activities and Related Learning Objectives are to be documented by the student, Faculty Mentor, and Site Mentor prior to the Capstone Experience start date. Each week the Site Mentor will document the hours and student progress towards those activities and objectives, including signature and date completed.

Mentoring Agreement:

Student and Site Mentor will meet at least one time per week for 15-30 minutes.

Dates	Weekly Activity Description	Related Learning Objective	# Hours	Mentor Signature and Date
Week 1 [January 16-20]	On-the-ground needs assessment	C. Program completion and development/design with OT-based HIT		
Week 2 [January 21-27]	Complete continued education course (Walk the Walk)	A. Understand how HIT can be implemented in stroke rehabilitation		
Week 3 [January 28-February 3]	Develop the program's budget	C. Program completion and development/design with OT-based HIT		
Week 4 [February 4-10]	Co-intervene with site mentor to increase my skills for implementing HIT in OT and stroke rehabilitation	B. Demonstrate HIT in stroke rehab to obtain skills related to current practice		
Week 5 [February 11-17]	Consult with Dr. Lamoreux the current initiated program (life hardening) Design the program/expand the concept of occupation in the Life Hardening pilot program	C. Program development/design with OT-based HIT C. Program development/design with OT-based HIT		
Week 6 [February 18-24]	Design modules on intensified occupations using activity analysis, principles of HIT, and neuroplasticity	D. Apply and enhance knowledge of activity analysis.		

Week 7 [February 25-March 2]	Complete first draft of program (an expansion of Life Hardening). Prepare it for presentation	C. Program development/design with OT-based HIT		
Week 8 [March 3-9]	Present the program to the participants (Perform educational in-service/seminar related to the capstone project to present the program to the therapists [participants]) Administer the quality improvement questionnaires	C. Program completion and development/design with OT-based HIT E. Obtain data gathering and analysis skills for program development		
Week 9 [March 10-16]	Analyze the information/data	E. Obtain data gathering and analysis skills for program development		
Week 10 [March 17-23]	Modify the program based on feedback obtained	C. Program development/design with OT-based HIT		
Week 11 [March 24-30]	Readminister quality improvement questionnaires (program modifications presented at convenience of participants [therapists])	E. Obtain data gathering and analysis skills for program development		
Week 12 [March 31-April 6	Modify the program a final time base on feedback from quality improvement questionnaires and conduct member checks for accuracy	C. Program development/design with OT-based HIT E. Obtain data gathering and analysis skills for program development		
Week 13 [April 7-13]	Disseminate the findings and write capstone manuscript	C. Program development/design with OT-based HIT		

		E. Obtain data gathering and analysis skills for program development		
Week 14 [April 14-20]	Disseminate the findings and write capstone manuscript	C. Program development/design with OT-based HIT E. Obtain data gathering and analysis skills for program development		

I agree with the above stated objectives and activities to be completed within a 14-week timeframe. The site mentor and/or student can add additional objectives at any time as the experience dictates with approval of the faculty mentor. Any removal of goals (objectives) will need to be approved by the **faculty mentor and capstone coordinator**.

x _____ 11/21/2023
Student Signature Date

x _____ 11/21/2023
Faculty Mentor Signature Date

11/16/2023
x _____
Site Mentor Signature Date

Appendix C

ORI-HS, Non-Committee Review
Notice of Excluded Activity

DATE: November 8, 2023

TO: Jonathan Legarte
FROM: Office of Research Integrity - Human Subjects

PROTOCOL TITLE: UNLV-2023-574 High-Intensity Training in Occupational Therapy: Expanding a Pilot Program for Occupational Therapists
SUBMISSION TYPE: Initial

ACTION: No Human Subjects Research
REVIEW DATE: November 8, 2023
REVIEW TYPE: ADMINISTRATIVE REVIEW
Thank you for your submission of materials for this proposal. This memorandum is notification that the proposal referenced above has been reviewed as indicated in Federal regulatory statutes 45 CFR 46.
The Office of Research Integrity - Human Subjects (ORI-HS) has determined this request does not meet the definition of â€˜research with human subjectsâ€™ according to federal regulations, and there is no further requirement for IRB review.
Note: **Since this project does not meet the definition of 'research with human subjects,' please replace the terms "research" and "study" to "project" in the consent form, recruitment materials, or any other project-related materials. Also remove the following language from the consent form/information sheet: "*For questions regarding the rights of research subjects, any complaints, or comments regarding the way the study is being conducted, contact the UNLV Office of Research Integrity â€ "Human Subjects at 702-895-0020 or via email at IRB@unlv.edu."***

Any changes to the excluded activity in this proposal could require IRB review. Please contact ORI-HS to discuss any anticipated changes.
If you have questions, please contact the Office of Research Integrity - Human Subjects at IRB@unlv.edu or call 702-895-2794. Please include your project title and project ID in all correspondence.

Office of Research Integrity - Human Subjects
4505 Maryland Parkway. Box 451047. Las Vegas, Nevada 89154-1047
(702) 895-2794. IRB@unlv.edu

Appendix D

Guiding Questions for On-The-Ground Needs Assessment

1. What concerns are there with implementing occupational therapy and high-intensity training?

2. How do occupational therapists in this setting ensure they are implementing occupation-based HIT?

3. How are ADLs and IADLs addressed in this setting while also implementing HIT?

4. What areas must be addressed to ensure an occupation-based HIT program benefits an occupational therapist's decision-making with HIT interventions?

5. Anything else you would like to add related to this topic?

Appendix E

Informed Consent

Department of Brain Health

Title of program: Occupation-Based High-Intensity Training Program
Investigator(s): Jared J. Demke
For questions or concerns about the program, you may contact Johnathan Legarte at jonathan.legarte@unlv.edu.

It is unknown as to the level of risk of transmission of COVID-19 if you decide to participate in program and its evaluation. The activities will utilize accepted guidance standards for mitigating the risks of COVID-19 transmission: however, the chance of transmission cannot be eliminated.

Purpose of the Program
You are invited to participate in program evaluation. The purpose of this program is to develop an occupation-based pilot program that can be operationalized and implemented in clinical practice.

Participants
You are being asked to participate in the program because you fit these criteria: Clinician with experience working in stroke rehabilitation.

Procedures
If you volunteer to participate in this program, you will be asked to do the following: Provide feedback toward the program for quality improvement. This will be done through quality improvement questionnaires.

Benefits of Participation
There may be direct benefits to you as a participant in this program and its evaluation, as the program may apply to your professional area of practice. However, the hope is to learn what areas need to be improved concerning the program that will be designed and presented during this process.

Risks of Participation
There are risks involved in all circumstances. This program evaluation may include only minimal risks. *(i.e., you may feel uncomfortable when answering some questions or not feel that your answers are pertinent or helpful).*

Cost /Compensation
There may not be a financial cost to you to participate in this program's evaluation. The program evaluation will take 30-60 minutes of your time. You will not be compensated for your time. However, your time is greatly appreciated.

Confidentiality
All information gathered in this program will be kept as confidential as possible. No reference will be made in written or oral materials that could link you to this program. All records will be stored in a locked facility at UNLV for 5 years after completion of the program. After the storage time, the information gathered will be shredded and disposed of.

Voluntary Participation
Your participation in this program is voluntary. You may refuse to participate in this program or any part of this program. You may withdraw at any time without prejudice to your relations with UNLV. You are encouraged to ask questions about this program at the beginning or any time during the program evaluation.

Participant Consent:
I have read the above information and agree to participate in this program. I have been able to ask questions about the program. I am at least 18 years of age. A copy of this form has been given to me.

_____ _____

Signature of Participant Date

_____

Participant Name (Please Print)

Audio/Video/Written: The interview will be recorded to increase the accuracy of your information, including comments. The interviewer will later use this audio recording only to gather this information accurately. The recording will be stored with password protection, and no information will be traced back to you to ensure anonymity.

I agree to be audio recorded for the purpose of this program's development.

_____ _____

Signature of Participant Date

_____

Participant Name (Please Print)

Appendix F

Informed Consent

Department of Brain Health

Title of program: Occupation-Based High-Intensity Training Program
Investigator(s): Jared J. Demke

For questions or concerns about the program, contact Johnathan Legarte at jonathan.legarte@unlv.edu**.**

It is unknown as to the level of risk of transmission of COVID-19 if you decide to participate in program and its evaluation. The activities will utilize accepted guidance standards for mitigating the risks of COVID-19 transmission: however, the chance of transmission cannot be eliminated.

Purpose of the Program
You are invited to participate in program evaluation. This program aims to develop an occupation-based pilot program that can be operationalized and implemented in clinical practice.

Participants
You are being asked to participate in the program because you fit these criteria: Clinician with experience working in stroke rehabilitation.

Procedures
If you volunteer to participate in this program, you will be asked to provide feedback toward the program for quality improvement. This will be done through quality improvement questionnaires.

Benefits of Participation
There may be direct benefits to you as a participant in this program and its evaluation, as the program may apply to your professional area of practice. However, the hope is to learn what areas need to be improved concerning the program that will be designed and presented during this process.

Risks of Participation
There are risks involved in all circumstances. This program evaluation may include only minimal risks. *(i.e., you may feel uncomfortable answering some questions or not feel that your answers are pertinent or helpful).*

Cost /Compensation
There may not be a financial cost to you to participate in this program's evaluation. The program evaluation will take no more than 60 minutes of your time (during an in-service, it is typically completed during your lunch hour). You will not be compensated for your time. However, your time is greatly appreciated.

Confidentiality
All information gathered in this program will be kept as confidential as possible. No reference will be made in written or oral materials that could link you to this program. All records will be stored in a locked facility at UNLV for 5 years after completion of the program. After the storage time, the information gathered will be shredded and disposed of.

Voluntary Participation
Your participation in this program is voluntary. You may refuse to participate in this program or any part of this program. You may withdraw at any time without prejudice to your relations with UNLV. You are encouraged to ask questions about this program at the beginning or any time during the program evaluation.

Participant Consent:
I have read the above information and agree to participate in this program. I have been able to ask questions about the program. I am at least 18 years of age.

_____ _____

Signature of Participant Date

_____

Participant Name (Please Print)

Appendix G

Quality Improvement Questionnaire

Rate questions 1-5 using the Likert scale (circle your answer). Questions 6-10 are short answer.

1) **Does this program stay true to the core tenets of occupational therapy by being occupation-based?**

   1 = *strongly agree*, 2 = *agree*, 3 = *neutral*, 4 = *disagree*, and 5 = *strongly disagree*

2) **Does this program appropriately use high-intensity training principles?**

   1 = *strongly agree*, 2 = *agree*, 3 = *neutral*, 4 = *disagree*, and 5 = *strongly disagree*

3) **Is this program clear and easy to follow?**

   1 = *strongly agree*, 2 = *agree*, 3 = *neutral*, 4 = *disagree*, and 5 = *strongly disagree*

4) **Would you implement this program in practice?**

   1 = *strongly agree*, 2 = *agree*, 3 = *neutral*, 4 = *disagree*, and 5 = *strongly disagree*

5) **Would this program transfer well to other locations?**

   1 = *strongly agree*, 2 = *agree*, 3 = *neutral*, 4 = *disagree*, and 5 = *strongly disagree*

6) **In a few words, what are the perceived strengths of this program?**

7) **In a few words, what are the perceived weaknesses?**

8) **In a few words, what opportunities are there for this program?**

9) **In a few words, what threats (challenges) might contest this program?**

10) **What other feedback do you have related to this program?**

Appendix H

Dear Copyright Holder: Phillip Lamoreaux

I understand that you are the copyright holder for an article titled: "The development of a pilot program related to the application of high-intensity in occupational therapy."

I wish to include the tables, figures, and intellectual information from the above-mentioned article in a doctoral capstone, as the aim of this capstone is to expand upon the pilot program you have initiated and developed. I will also ensure you have full credit to your work as sole owner of your intellectual property. Proper acknowledgement will be included with the reproduction of my capstone manuscript. If you agree to provide me with permission, please sign both copies of this permission letter and return one copy to me via email (a scanned version is fine) or regular mail.

I appreciate your consideration of our permissions request.

Sincerely,

UNLV

Jared Demke, OTS
Doctoral Student of Occupational Therapy
Department of Brain Health
School of Integrated Health Sciences
University of Nevada, Las Vegas

demke@unlv.nevada.edu
Cell: 435-215-5491

By signing below, I warrant that I have the right to grant the permission requested in this letter, and that I provide you with that permission.

Signature: 

Date: 11/21/2023

Appendix I

Jared Demke <demke@unlv.nevada.edu>

Copy right inquiry

Jared Demke <demke@unlv.nevada.edu> Sat, Mar 2, 2024 at 4:09 PM

To: Jenni Moore <jmoore@knowledgetranslation.org>

Hi Dr. Moore,

I am an OT student completing my doctoral capstone at the Saint George Regional Hospital Neurospecialty Rehab with Steven Wallenfels as my mentor. I am also taking the Walk the Walk course. For my capstone project, I am designing an OT-based HIT program specific to this unit here in Saint George, Utah. I have noticed that the Skill Acquisition Chart provided by the Institute of Knowledge Translation has shown to be highly effective with high-intensity gait training. I want to use it throughout the program I am designing to guide OTs through HIT while remaining occupation-centered. I would like to have permission to access the Skill Acquisition Chart and apply it to other skills beyond stepping (i.e., ADLs, IADLs, and SMART goal setting). I am happy to provide any additional information and will ensure all use of the Skill Acquisition Chart remains under the authorization of the Institute of Knowledge Translation. If this is something that you are willing to do, please let me know. If there is another person, I would need to reach out to for writing a copyright permission letter, please refer me to them, and I will draft an official copyright request letter. Thank you very much for the education I have received so far during the Walk the Walk course. I look forward to hearing from you soon.

Sincerely,

UNLV

Jared Demke, OTS
Doctoral Student of Occupational Therapy
Department of Brain Health

School of Integrated Health Sciences
University of Nevada, Las Vegas

demke@unlv.nevada.edu
Cell: 435-215-5491

Jared Demke
<demke@unlv.nevada.edu>

Copy right inquiry

Jenni Moore <jmoore@knowledgetranslation.org> Wed, Mar 6, 2024 at 4:02 AM

To: Jared Demke <demke@unlv.nevada.edu>

Cc: George Hornby <tghornby@iu.edu>

Hi Jared -

This is fine. We have a manuscript submitted that includes the chart. Hopefully, it will be published soon so you can reference the publication in the work.

Jenni

On Mar 2, 2024, at 6:09 PM, Jared Demke <demke@unlv.nevada.edu> wrote:

Appendix J

Below is a link to access the complete OT-based HIT program. Google Sites was used to make the website and served as a cost-effective means for relaying the program's information to the neuro-specialty rehab. The link is available to the public. Further progress with establishing this recourse will continue to be made, making it a resource for OTs everywhere wishing to implement HIT with stroke survivors.

https://sites.google.com/unlv.nevada.edu/ot-basedhit/home

Figure 6**:** Example of OT-based HIT Brand Image

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Curriculum Vitae

Jared J. Demke
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Education

University of Nevada Las Vegas **Estimated May 2023**
Doctor of Occupational Therapy
Utah Tech University **May 2020**
Bachelor of Science in Exercise Science

Research Interest

- Hight-intensity training in occupational therapy
- Occupational therapy and primary care
- Assistive Technology for Parkinson's Disease

Research Experience

- Graduate coursework on research methods (quantitative/qualitative)
- CITI training completion and certification **Expires January 2024**

Internship Experience

Intern | Wasatch Family Services: Stretch and Grow **August 2019-December 2019**

- Trained youth on physical activity with a variety of age-appropriate exercise routines
- Designed exercise regimens
- Presented information on the value of physical activity to parents and caregivers

Leadership Experience

Member | Student Occupational Therapy Association **August 2021-Present**

- Collaborate with the student body to bring awareness of occupational therapy
- Volunteer throughout the community to enhance community function and wellness
- Advance student body toward scholarship and academic success through study groups of scholarly learning

Publications and Conferences

Demke, J. J. (2024). High-intensity training in occupational therapy: Expanding a pilot program for occupational therapists. *UNLV Theses, Dissertations, Professional Papers, and Capstones*.
Estimated May-July 2024

Technology & Skills

Assistive Technology Design | Evidence-Based Practice | Experience with Classroom Management | Voluntary Teaching Experience in Religious Organization | Public Speaking

Professional Associations

American Occupational Therapy Association, **Member since 2021**
Nevada Occupational Therapy Association, **Member since 2022**
American College of Sports Medicine, **Member since 2020**

Honors

Phi Theta Epsilon | Member
Phi Kappa Phi | Member