

INTERVENTION ACTIVITY KIT FOR PEDIATRIC CONSTRAINT INDUCED
MOVEMENT THERAPY

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

by

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Certification of Approval

I certify that I have read Intervention Activity Kit for Constraint Induced Movement Therapy by Kristina Egbert and Gianna Poidmore, and in my opinion, this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy at Stanbridge University.

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Abstract

All children must have the opportunity to play to develop the skills necessary to become independent occupational beings. For children with cerebral palsy, the opportunity to grow and develop through play-based exploration is often hindered by reduced ease of movement and difficulties associated with poor strength and coordination. Constraint induced movement therapy is an effective therapeutic intervention offered at The United Cerebral Palsy of Orange County's (UCPC-OC) pediatric therapy clinic. Although pediatric constraint induced movement therapy has been successful in improving movement and use, it is often a very challenging intervention for children. To combat these frustrations, occupational therapists provide client-centered play-based interventions to motivate children to action despite their frustrations. To assist the therapists at UCPC-OC in motivating their clients, we designed an intervention activity kit for pediatric constraint induced movement therapy that includes 72 different activities. The intervention kit is designed with themed activities that are motivating to children and effective in producing outcomes related to the Pediatric Motor Activity Log. The intervention kit was designed as a manual, complete with descriptions and step-by-step suggestions regarding each activity, and presented to UCP-OC to implement as desired. Although the intervention kit was made for UCP-OC, it can be seamlessly integrated at any pediatric clinic. Motivation is an essential component of therapy and providing the just-right challenge is vital to fostering development and well-being in children with disabilities. Further research should be done to assess the intervention kit's effectiveness at motivating children to engage in constraint induced movement therapy.

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Intervention Activity Kit for Pediatric Constraint Induced Movement Therapy

Occupational therapy is concerned with every individual's right and ability to engage in meaningful occupations. For children, play is considered the primary occupation and the key to successful development and well-being (Jasem, Darlington, Lambrick, Grisbrooke, & Randall, 2019). It is imperative that each child has the opportunity to explore because it is through play, especially in the earliest years, that developmental milestones in motor skills, cognition, communication, social, and self-help skills develop (Brady & Garcia, 2009). These foundational skills are necessary for optimal development and future success. However, children with disabilities often experience significant limitations in their ability to engage in play (Movahedazarhouligh, 2018). Children with motor impairments are at a disadvantage as they may not have the strength or coordination to play in a variety of ways. This inhibits development of both fine and gross motor skills that are needed to perform activities of daily living (ADLs) such as independently getting dressed or brushing their teeth (Movahedazarhouligh, 2018).

A specific disability that impedes a child's physical development is hemiparesis (Brady & Garcia, 2009). Hemiparesis is the term used to describe paresis or weakness affecting one side of the body that is usually caused by a brain lesion (Atchison & Drette, 2017). Children with diagnoses such as cerebral palsy, stroke, traumatic brain injury, or brachial plexus damage could experience limited use of one side of their body as a result of hemiparesis (Taub et al., 2011). Due to the challenges they face regarding quality of movement and the overall use of their affected upper extremity (UE), children

with hemiparesis are at a severe disadvantage when it comes to play (Aarts, Jongerius, Geerdink, van Limbeek, & Geurts, 2011).

The United Cerebral Palsy of Orange County (UCP-OC), is a pediatric therapy clinic that has recognized the severity of this childhood impairment. In efforts to mitigate the effects of hemiparesis on a child's life, UCP-OC has recently established a constraint induced movement therapy (CIMT) program for those ages 18 months to 21 years, with UE hemiplegia (UCP-OC, n.d.). CIMT is an intensive therapeutic intervention in which the child's unaffected UE is immobilized with a cast, requiring the use of their affected UE (Aarts et al., 2011). The CIMT approach aims to rewire the brain to stimulate greater use and functional improvement in hemiparetic UEs (Aarts et al., 2011).

The program at UCP-OC is adapted from the University of Alabama at Birmingham's (UAB) protocol. UAB's system is the first of its kind and the leading CIMT clinical training program to date (Constraint Induced Therapy Research Group, n.d.) Dr. Edward Taub is a behavioral neuroscientist at UAB and is credited for the initial development of CIMT. Dr. Taub and his colleagues continue to expand their research, proving CIMT to be an effective rehabilitation technique to rewire the brain and improve the use of weakened extremities. Currently, The UAB Constraint Induced Therapy Research Group, led by Dr. Taub, offers a program to train health professionals in the application and principles of CIMT in order to establish an effective CIMT program at their individual clinics (Constrain Induced Therapy Research Group, 2020). Following the guidelines of Dr. Taub's research, UCP-OC has developed a CIMT program offered to individuals eighteen months to twenty-one years of age for three hours of therapy, five days a week, for three consecutive weeks (UCP-OC, n.d.).

A number of research studies have continued to illustrate the efficacy of CIMT as a beneficial intervention. DeLuca, Ramey, Trucks, and Wallace (2015) found evidence to support pediatric CIMT as an effective intervention for gaining functional skills, such as holding a cup, pushing an arm through a sleeve of clothing, and throwing a ball. The study also illustrated that CIMT is beneficial for a wide variety of children and can be clinically implemented. Although CIMT has proven to be an effective treatment method, research has indicated that such an intensive treatment can cause frustration related to the difficulties of using their affected limb and participants are consequently less motivated to engage in therapy (Gilmore, Ziviani, Sakzewski, Shields, & Boyd, 2010; Mancini et al., 2013). Another study by Majnemer, Shevell, Law, Poulin, and Rosenbaum (2010) compared the motivation of children 6-12 years old with hemiplegic cerebral palsy to typically developing children. Results indicated that children experiencing greater limitations in motor skills were less motivated to engage in cognitive, social, and motor tasks. This is problematic for the pediatric CIMT intervention because children need to be actively engaged in meaningful activities to foster therapeutic effects. Occupational therapists implementing the therapy are concerned with the ability to provide lengthy treatment sessions while navigating through a child's undeniable frustration of being casted (Christman, McAllister, Claar, Kaufman, & Page, 2015; Reidy et al., 2012). Gilmore et al. (2010) researched the effects of themed activities on motivation. The study assessed the perspectives of children participating in a circus themed CIMT day camp and found that participants described wearing the constraint on their unaffected UE as frustrating; however, the themed activities made the therapy fun and more enjoyable to

participate in. These results outline the necessity of providing both motivational and engaging CIMT interventions when working with the pediatric population.

The Occupational Therapy Practice Framework (OTPF) is a document used across all areas of occupational therapy to guide clinicians in the values and goals of the profession (AOTA, 2014). The OTPF outlines the importance of a child's ability to engage in play, as well as their ADLs. Children learn and develop by engaging in play, thus pediatric therapy is most effective when it is play-based (Movahedazarhouli, 2018). To implement the CIMT program, UCP-OC must provide play-based interventions to instill natural motivation. As a result, occupational therapists can facilitate engaging treatment that will strengthen a child's success in functional life tasks. This will require a great deal of time and attention to detail in the treatment planning process. Creative intervention activities are needed that will engage and motivate the child throughout the lengthy period required for effective CIMT interventions, as well as provide appropriate tasks that meet the just right challenge to prepare the child for future success and independence.

To assist UCP-OC with the task of involving their clients in CIMT, we created an "Intervention Activity Kit for Pediatric Constraint Induced Movement Therapy." This intervention kit was designed to be implemented by occupational therapists at UCP-OC. The intervention kit includes uniquely designed theme-based interventions devised to maintain the engagement and motivation of each child, while keeping the playful occupation of a child at the core of the intervention process.

Literature Review

CIMT is a prominent intervention for improving the use of UEs affected by hemiplegia (Mancini et al., 2013). CIMT was developed as a means to ameliorate hemiparesis by placing emphasis on the restoration of function rather than compensation (Brady & Garcia, 2009). This treatment method is effective in children who have limited use of UEs due to diagnoses including cerebral palsy, stroke, traumatic brain injury, and brachial plexus damage (Cimolin et al., 2012; DeLuca, Case-Smith, Stevenson, & Ramey, 2012; Taub et al., 2011). For these children, the reduced use of their extremities interferes with their ability to explore, play, participate in self-care, and a multitude of other activities of daily living (Brady & Garcia, 2009). Ultimately, this disrupts both typical development and a child's occupation of play (Movahedazarhouligh, 2018).

In pediatrics, developmental disregard is a term associated with hemiparesis and is used to describe the insufficient use of a child's UE, resulting in greater dependence on the non-affected extremity (Aarts et al., 2011). The goal of CIMT is to help individuals overcome developmental disregard by learning to use their hemiparetic extremity in functional tasks (Aarts et al., 2011). To achieve this goal, programs offering CIMT follow three basic components: some form of constraint of the unaffected UE, intensive motor stimulation for three to six hours a day for a period of two to four weeks, and shaping of the participant's movements by the therapist (Brady & Garcia, 2009).

By constraining the unaffected extremity, the intervention promotes use of the affected limb, providing greater opportunities for gains in the amount and quality of movement (Aarts et al., 2011) The constraint can be done in a number of ways depending on the appropriateness for each individual client. In some cases, a full arm-fingers cast is

used (DeLuca et al., 2015). A sling, mitt, or splint have also been found to be effective (Aarts et al., 2011). However, young children often attempt to remove mitts and slings, and splints are less restrictive than casts (Ramey et al., 2019). Research has found that using a full-arm cast is the most restrictive form of constraint and facilitates opportunity for the child to rely on their hemiparetic side to integrate more movement and use (Ramey et al., 2019). Brady and Garcia (2009) stated that the constraint used for pediatric CIMT should be child friendly, thus the typical cast used is a full axillary to fingers univalve cast. The univalve cast is appropriate for children because it is padded for comfort and has a split to allow the cast to be removed by the occupational therapist for skin inspection each week (Ramey et al., 2019).

To assess the effectiveness of pediatric CIMT, the Pediatric Motor Activity Log (PMAL) is commonly used to measure how well and how often the child uses their affected UE when engaging in specific functional tasks in their natural environment (Taub, Griffin, & Uswatte, 2012). When implementing the PMAL, therapists interview caregivers using a Likert scale regarding their child's proficiency in 22 functional tasks (Taub et al., 2012). Each of these tasks requires purposeful arm use to facilitate many of the movements necessary for participation in ADLs (Taub et al., 2012). Research has found that using the PMAL to track progress during CIMT interventions has been successful (DeLuca et al., 2012; DeLuca et al., 2015; Taub et al., 2011). For example, in a clinical cohort study of 28 children who received CIMT for 21 consecutive days, it was found that the children gained a mean of 13.2 new functional skills from the PMAL (DeLuca et al., 2015). Additionally, a randomized control trial of 20 children with hemiparesis was used to examine the efficacy of CIMT compared to typical therapy

(Taub et al., 2011). The children, ages two-six years old, were divided evenly into a CIMT group or a customary care group and each received treatment for 15 days. This study also utilized the PMAL as a way to measure improved arm use. It was found that children who received 15 days of CIMT on average improved by two out of five points on the PMAL Likert scale, compared to children who received typical therapy who did not improve (Taub et al., 2011). Together, these findings illustrate the effectiveness of CIMT on producing clinically measurable functional gains for children with hemiparesis.

Although pediatric CIMT has proven to be effective, success in this intensive intervention may not come easily (Gilmore et al., 2010). Research suggests that children and occupational therapists alike have both difficulties and frustrations with aspects of CIMT (Christman et al., 2015; Gilmore et al., 2010; Mancini et al., 2013). A CIMT day camp for children ages 5 to 16 years old that lasted six hours a day for five days over two weeks illustrated many of the common frustrations that children experience (Gilmore et al., 2010). The 32 participants expressed that frustrations typically stem from the difficulty of completing tasks with their hemiparetic extremity, the lengthiness of the session, as well as the uncomfortableness of wearing the constraint. Despite the frustration in participating in the therapy camp, the children reported satisfaction with improved bimanual activities at home.

To ameliorate the frustrations of the participants, the researchers used motivating yet functional activities to help the children overcome the challenges associated with CIMT. To motivate the day camp attendees, a circus theme was implemented. The children expressed enjoyment in circus activities and felt the camp was “different to usual therapy” (Gilmore et al., 2010, p. 90). An additional research study implemented a pirate

themed CIMT intervention for a group of six children (Aarts et al., 2011). During this intervention, the children were told their arm was casted due to a pirate accident and they participated in various pirate games and activities (Aarts et al., 2011). The article reviewed the impact of the intervention on one two-year-old participant. The participant demonstrated improvement in the use of his affected UE over the span of the intervention. These findings support the use of a theme based CIMT program.

In combination with a randomized controlled trial which found CIMT to be an effective intervention, researchers qualitatively assessed the perspectives of the participating children and their caregivers (Brandão, Mancini, Vaz, Melo, & Fonseca, 2010; Mancini et al., 2013). Participants' responses revealed that both children and their caretakers saw benefits to CIMT such as increased use of the affected UE and decreased reliance for help (Mancini et al., 2013). While many responses acknowledged that the treatment was challenging, the results indicated that the participants believed the gains outweigh the difficulties they encountered (Mancini et al., 2013). The researchers noted many of the child's frustrations and concluded that interventions and tasks should include activities that provide satisfaction, are age appropriate, and of interest to the child participants.

Additionally, children with hemiplegia display lower levels of motivation than typically developing children (Majnemer, Shevell, et al., 2010; Miller, Ziviani, Ware, & Boyd, 2014). One reason that individuals do not use their affected arm and hand relates to them having experienced repeated failure when attempting to use this hand (Aarts et al., 2011). When using the Dimensions of Mastery Questionnaire to compare the mastery and motivation of children 6-12 years old with hemiplegic cerebral palsy to typically

developing children, it was found that children with greater limitations in motor skills were less motivated and less persistent in engaging in cognitive, social, and motor tasks (Majnemer, Shevell, et al., 2010). The study suggests that motivation is an important factor that determines whether or not a child chooses to do certain actions or tasks.

Another study was conducted using the Dimensions of Mastery Questionnaire comparing children ages 5-16 years old with congenital hemiplegia to typically developing children of the same age (Miller et al., 2014). Findings indicated that children with greater UE functionality were more motivated than those with less functionality. Overall, the research supports the assumption that children with hemiplegia find motor tasks to be frustrating, resulting in lower motivation to complete difficult tasks and activities.

The child's decreased motivation to participate in such demanding tasks has proven to be a significant barrier that therapists face while implementing CIMT (Christman et al., 2015). Many therapists find it challenging to motivate their clients throughout the high duration and physically demanding interventions. A sample of 272 occupational therapists reported concerns of the feasibility of pediatric CIMT (Christman et al., 2015). Of the surveyed therapists, 78.7% reported moderate to high concerns about the child's frustration while attempting daily tasks wearing the cast and 94.3% reported moderate to high concerns in the child's ability to participate in the required duration of the therapy sessions. This concern is significant because children with hemiparesis frequently experience impairments in attention, activity tolerance, and inhibition that may escalate due to the frustrations of participating in such a high-duration protocol. The study concluded that in order to increase the feasibility of CIMT it is essential to develop

a protocol that can produce lasting changes in function while remaining motivating and client-centered.

When children are unable to participate in play-based activities they may experience limitations in their health and overall quality of life (Clark & Kingsley, 2020). In early childhood, cerebral palsy can be a barrier to participation in play. Play based activities have been shown to increase motivation in typically developing children, as well as children with hemiplegia (Aarts et al., 2011; Gilmore et al., 2010). In a cross-sectional study, researchers surveyed 98 typically developing children and their parents regarding the perception of children's enjoyment in activities (Rosenberg & Bart, 2016). The study found that children and their parents had different perceptions on children's enjoyment of participation in daily activities. Children perceived enjoyment to be connected to the emotional experience associated with their strengths and difficulties while participating. The results suggest that a pathway to greater enjoyment in participation is to simply include fun when working with children. Therefore, to address the physically and emotionally demanding nature of CIMT, interventions should have a play-based design.

Additionally, 55 school-aged children with cerebral palsy were interviewed to assess their activity preferences (Majnemer, Shikako-Thomas, et al., 2010). The participants preferred social and recreational activities such as puzzles, board games, arts and crafts, video games, imaginary play, toys and watching TV. Younger children preferred physical, skill-based and self-improvement activities more than older children, but social and recreational activities were equally preferred. The participants also preferred spontaneous activities over structured and planned activities. Similarly,

Graham, Mandy, Clarke, and Morriss-Roberts, 2019) explored the play experiences and preferences of children with a high level of physical disability. The participants included six children, ages 6-12 years old with a diagnosis of cerebral palsy. Each child was interviewed regarding their perceptions of play. The children universally expressed that making choices as a means of controlling play was important to them and facilitated greater enjoyment and participation. This is attributed to the fact that children with cerebral palsy experience play differently than their typically developing peers. Thus, the ability to make choices provides a greater sense of independence, confidence, and desire. These findings support using activities children prefer to guide CIMT interventions in order to engage and motivate pediatric clients while learning to use their affected limb.

Play is the primary occupation of a child and is essential to successful growth and development (Clark & Kingsley, 2020). Those with diagnoses such as cerebral palsy face a number of physical and emotional barriers to participation (Graham et al., 2019). Consequently, these children experience both occupational injustice and deprivation leading to a further degree of disability (Clark & Kingsley, 2020). Occupational therapists strive to support individuals of all ages and abilities in overcoming many of the obstacles that hinder their occupational performance (Clark & Kingsley, 2020). Pediatric CIMT is used by occupational therapists to promote functional use of a child's hemiparetic UE (DeLuca et al., 2015). Although CIMT has shown to produce positive results, it is a physically demanding and frustrating experience (Mancini et al., 2013). Research has shown that children experiencing frustration are less motivated to engage in activities, making promising interventions such as CIMT less effective (Aarts et al., 2011). To combat the demanding aspects of CIMT, play-based themed interventions have

been successfully implemented to encourage participation in the interventions (Aarts et al., 2011; Gilmore et al., 2010). Finally, addressing the relationship between play and motivation must be considered when creating intervention activities to promote optimal success in pediatric CIMT (Gilmore et al., 2010; Majnemer, Shevell, et al., 2010).

Statement of Purpose

The purpose of this project was to increase UCP-OC's CIMT clients' engagement in therapeutic play to enhance their functional abilities and self-efficacy through the creation of the intervention kit. The occupational therapist research agenda calls for a focus on intervention-based research that is client-centered, occupation based, theory driven, and manualized (American Occupational Therapy [AOTA] & American Occupational Therapy Framework [AOTF], 2011). The AOTA encourages research to focus on high priority populations including developmental disorders and physical impairments (AOTA & AOTF, 2011). The focus of the intervention kit aligns with the research agenda of the AOTA. The therapeutic activities in the intervention kit target the priority populations of children with physical disabilities who experience limitations in their abilities to play (Movahedazarhouligh, 2018).

Each of the interventions were designed with flexibility so that they can be adapted and modified for each child receiving CIMT at UCP-OC. A large selection of activities with varying themes is included in the intervention kit, allowing the therapists to individualize their clients learning through activity selection. We creatively designed the interventions and provided them to UCP-OC in a manualized fashion for the therapists to decide when and how to best use the resources with their clients. To ensure a client-centered approach, the interventions were designed specifically to meet the

developmental needs of the clients participating in UCP-OC's CIMT program. Play is the primary occupation for children and engagement in playful activities promotes healthy development and well-being (Jasem et al., 2019). Thus, each activity in the intervention kit strives to facilitate greater use and movement of the clients affected UE and ultimately engage them in their occupation of play.

Theoretical Framework

The Ecology of Human Performance (EHP) framework outlines the transaction between a person and their surroundings. EHP encourages practitioners to focus on promoting independence through either teaching or restoring skills to promote independence. As explained by Dunn, Brown, and McGuigan (1994), interventions aligned with this theory are centered around supporting the person, their context, and the tasks they have identified as meaningful and beneficial to their occupational roles, values, and beliefs. The main constructs of the EHP are the person, tasks, context, and person-context-task transaction. According to the EHP, each person has a unique and complex skill set. The tasks they engage in are sets of behaviors needed to accomplish a goal. These behaviors shape their occupations. The temporal and environmental conditions that make up a person's surroundings contribute to their context. Temporal aspects of context include age, developmental stage, life cycle, or disability status. The environmental aspects of context are physical, social, and cultural.

The person-context-task transaction ties together each construct, which defines the way a person engages in a task which results in occupational performance (Dunn et al., 1994). Occupational performance refers to a person's active participation in activities that are meaningful to them. Within the EHP model, disability is defined as the inability

for a person to complete tasks within their specific context. To overcome disability, change and motivation are necessary factors amongst EHP to facilitate healthy and balanced human performance. UCP-OC's Pediatric CIMT program is designed to assist the participating children in overcoming their disability by expanding their ability to complete a variety of tasks to improve occupational performance.

According to EHP, effective intervention strategies are: prevent, establish and restore, alter, adapt and modify, and create (Dunn et al., 1994). Each of these strategies are used during a CIMT program and the intervention kit will assist the therapists at UCP-OC in implementing these strategies throughout their clients' treatments. *Prevent* focuses on minimizing the development of performance problems (Dunn et al., 1994). This strategy is a key component of pediatric CIMT because the goal is to prevent learned disuse of the affected UE. By *establishing and restoring behaviors*, therapists use interventions to teach skills needed to participate in occupations (Dunn et al., 1994). This strategy is a primary focus of CIMT, and the activities included in the intervention kit will be designed to target specific functional tasks for improvement. *Altering* focuses on the context chosen for tasks to be performed (Dunn et al., 1994). Within the therapy clinic, the therapist chooses the best environment for the client to improve. The strategy of *adapt and modify* enables the therapist to change the context or tasks used during a treatment session (Dunn et al., 1994). The activities in the intervention kit will be adapted to address the developmental level and physical abilities of the participating children. The therapist will use their clinical judgement to further modify the activities to match the needs of each participant. The strategy of *create* focuses on promoting enriching opportunities within one's context (Dunn et al., 1994). The intervention kit will provide

activities to foster engagement and participation in the children's occupation of play. Used together, these intervention strategies promote increased functional use of the affected UE in the children participating in UCP-OC's CIMT program.

Methodology

The goal of this project was to create an intervention activity kit that motivates children through the challenges of CIMT while facilitating opportunities for greater use and movement of their hemiparetic UE. We contacted the Director of Clinical Services at UCP-OC to offer assistance with the development of their program. Together, we discussed the specific program needs for the implementation of CIMT. Our project is based upon observation of a CIMT intervention session at the clinic, careful consideration of the program needs, and a comprehensive review of evidence-based literature. Hence, we created an intervention kit for occupational therapists to utilize during the lengthy CIMT intervention sessions. We obtained written approval from the UCP-OC and the Institutional Review Board at Stanbridge University for this research (see Appendix A).

The intervention kit was delivered to UCP-OC in the form of an organized binder with activity templates outlining three weeks of potential themes and activities that the therapist can choose to use within their intervention sessions. The activities are designed for children between the ages of 18 months to 6 years due to the typical demographics at UCP-OC. Each activity includes modifications for increasing or decreasing the challenge to accommodate for many developmental abilities. The weekly themes included in the intervention kit are animals, food, and careers. These themes were strategically chosen because they are typically of interest to children up to age 6 with a wide variety of

abilities. For the purpose of replication and consistency, the activities were outlined in a uniformed fashion following a template that describes the theme, activity name, functional skills that the activity targets, necessary supplies, options for increasing or decreasing the challenge, and the estimated activity duration (see Appendix B). Due to the recent events of COVID-19, we adapted the template to include ways that the activities can be modified for telehealth purposes. The activities were creatively designed based on milestones of typically developing children, as well as the PMAL (see Appendix C). UCP-OC utilizes the PMAL as a guideline to creating interventions that will promote greater success in the child's ability to engage their affected UE in functional tasks.

Using the PMAL as a guide, we created 27 animal-themed interventions, 27 food-themed interventions, and 18 career-themed interventions to date. Many of the activities were inspired from online resources and modified for the context of CIMT, while others were independently developed. Each week, we presented newly created activities to our thesis advisor who provided feedback regarding the feasibility and developmental appropriateness of each activity. Taking this into consideration, we made the necessary changes to create safe and beneficial interventions for the children receiving CIMT at UCP-OC. Lastly, the intervention kit was provided to an occupational therapist at UCP-OC for review. After receiving feedback, we modified the activities to ensure they were appropriately designed and beneficial to children with hemiparesis. The final intervention kit was delivered to UCP-OC for the occupational therapists to independently use the activities throughout their CIMT intervention planning.

Ethical Considerations

The AOTA states that occupational therapy is grounded in seven core values: altruism, equality, freedom, justice, dignity, truth, and prudence (2015). These values provide a foundation that guides occupational therapy personnel in maintaining ethical interactions with others. Undoubtedly, children with disabilities are members of a vulnerable population (AOTA & AOTF, 2011). Consequently, these children are at risk for experiencing occupational injustice as they are restricted in their ability to perform their occupations (Prellwitz & Skär, 2016). Although we had no direct contact with the children in the CIMT program, their rights and wellbeing remained of utmost importance and was consciously adhered to throughout all aspects of the intervention kit.

Altruism and freedom were essential considerations for this project. Altruism was maintained by providing developmentally appropriate intervention activities. Doing so fostered a safe environment for the child to engage in during therapy. Freedom in occupational therapy refers to the concept of client-centricity. All clients, regardless of their age, should guide the intervention planning process. In this project, a child's motivation determines what activities he or she wants to participate in, and their freedom was preserved through the creation of multiple themes and interventions that the child may participate in during CIMT sessions.

The profession of occupational therapy is also grounded in six principles and standards of conduct: beneficence, nonmaleficence, autonomy, justice, veracity, and fidelity (AOTA,2015). Beneficence promotes concern for the wellbeing and safety of all participants. This standard requires that occupational therapy personnel provide appropriate interventions that are specific to the unique needs of each client, and continuously reevaluate whether the interventions should be adjusted. Each activity

included suggestions for modifications that can either increase or decrease the challenge of the activity. The goal was to find the just-right challenge for each child so that they may safely participate during therapy. Nonmaleficence entails refraining from any actions or interventions that may cause harm to others (AOTA, 2015). To adhere to this standard, the intervention kit was designed with minimal risks for anyone who chooses to refer to it. We reviewed the literature surrounding the population of children that UCP-OC serves in the CIMT program. By understanding the various diagnoses and abilities associated with hemiparesis, appropriate intervention activities were made in order not to harm the participating child. Lastly, autonomy refers to the client's right to self-determination, privacy, consent, and confidentiality (AOTA, 2015). The client's autonomy was considered throughout the project by providing motivating and engaging themed activities to help facilitate the client's right to choose the therapeutic activities they engage in.

We had no direct contact with the clients in the CIMT intervention program at UCP-OC. The intervention kit was provided to UCP-OC as a resource; therefore, no identifiable information or consent was collected for this project. Additionally, there were no legal concerns in regard to patient care as it is the responsibility of the occupational therapist directly implementing the activities to decide if the task is appropriate for the client's current abilities. The therapist is not obligated to use the activities provided in the intervention kit at any point in time. Modifications to make each activity more or less challenging were included in the project so that the resource is beneficial to a wide variety of the clients served at UCP-OC. Additionally, many of the activities in the intervention kit were inspired and adapted from online resources such as Pinterest, blogs,

and social media webpages. All the interventions were given proper citations and references within the intervention kit. Lastly, one of the researchers is employed part time with UCP-OC. However, this researcher does not work directly in the clinic and does not interact with the children in the CIMT program, therefore no conflict of interest was identified.

Occupational Therapy Implications

The American Occupational Therapy Association's Societal Statement of Play calls all occupational therapy practitioners to support, enhance, and defend a child's right to play (AOTA, 2008). Play is a child's primary occupation and an activity that is crucial to the development of overall health and well-being (Jasem et al., 2019). Many children with disabilities, including those with hemiparesis, experience challenges in play when compared to their typically developing peers (Movahedazarhouligh, 2018). As a result of this deprivation, children with hemiparesis often lack the fundamental skills needed to grow, learn, and ultimately find occupational satisfaction (Brady & Garcia, 2009).

CIMT has proven beneficial in improving the movement and use of hemiparetic UEs (DeLuca et al., 2015). However, it is also incredibly frustrating, demanding, and challenging for a child (Gilmore et al., 2010). Occupational therapy is built on client centricity; therefore, it is simply not enough to engage a child in CIMT for the sake of improved movement. Gilmore et al. (2010) found that incorporating motivating themed activities into CIMT interventions improved many of the child's frustrations, increased their willingness to participate, and ultimately led to the greater functional use of their hemiparetic UE. The culmination of these findings indicates the necessity of considering the child's motivation and playful occupation throughout CIMT intervention.

To assist the occupational therapists at UCP-OC with the challenge of providing functional CIMT interventions while maintaining the playful occupation of children, creating an intervention kit is necessary. By providing a variety of activities with inspiring themes, the children in the CIMT program at UCP-OC will have increased motivation and a more significant opportunity for improvement. Additionally, by providing activities that assist in the overall effectiveness of the CIMT intervention, further progression of disability from hemiparesis can be significantly minimized. This is vital to the field of occupational therapy as preventing disability and enabling independence is a stated focus of the AOTA (2014).

The nature of the intervention kit allows it to be replicated and used amongst a wide variety of pediatric populations and settings, including telehealth. As the world continues to change in response to new healthcare policies and crises, including COVID-19, occupational therapy must adapt. Telehealth service delivery is rapidly growing in the health care environment, and there is a growing body of evidence that suggests many occupational therapy services can be delivered in this manner (Cason, 2014). As a result, occupational therapists implementing CIMT must have reliable resources, such as the intervention kit, readily available to effectively implement CIMT for children with hemiparesis. The kit has been adapted to include resources for therapists and clients in a telehealth setting.

Ultimately, the intervention kit for pediatric CIMT will benefit the field of occupational therapy by enhancing the opportunity for growth and development in children with hemiparesis. While the intervention kit is designed specifically for UCP-OC, the activities can be seamlessly used by any therapists providing therapy to children

with hemiparesis. The intervention kit provides functional tasks while maintaining client centricity through the use of playful CIMT interventions that will significantly impact the child's health, wellbeing, and quality of life.

Conclusion

We designed the intervention kit to assist UCP-OC in implementing their pediatric CIMT program. The intervention kit includes activities specifically designed to motivate children to engage in the taxing CIMT sessions. The intervention kit includes three weekly themes, animals, food, and careers, with 24 activities designed for each theme. Thus, there are a total of 72 treatment ideas included in the intervention kit. To tailor the interventions kit to pediatric CIMT, each intervention targets specific functional tasks in the PMAL. The intervention kit was initially planned as a resource for use within the clinic. However, as COVID-19 changed the course of therapy delivery to an online platform, we expanded the kit to include interventions that are easily adaptable to the telehealth setting. The final copy of the intervention kit was given to UCP-OC to assist the therapists with their in-person and telehealth interventions. While we predict the three themes of animals, food, and careers to be universally motivating for the child participants, if a child is not interested in one of the themes, the therapist would be left creating another theme for the week. The creation of additional themes would target more specific interests of the participating children. A potential continuation of our project can include other themes for the therapists to better individualize the treatment sessions. Future research should also assess the intervention kit's overall effectiveness at motivating children to engage in CIMT.

References

Aarts, P. B., Jongerius, P. H., Geerdink, Y. A., Van Limbeek, J., & Geurts, A. C. (2011).

Modified constraint-induced movement therapy combined with bimanual training

(mCIMT–BiT) in children with unilateral spastic cerebral palsy: How are improvements in arm-hand use established? *Research in Developmental Disabilities*, 32(1), 271–279. doi:10.1016/j.ridd.2010.10.008

American Occupational Therapy Association. (2008). AOTA's societal statement on play. *American Journal of Occupational Therapy*, 62(6), 707–708. doi:10.5014/ajot.62.6.707

American Occupational Therapy Association. (2014). Occupational therapy practice framework: Domain and process (3rd ed.). *American Journal of Occupational Therapy*, 68(Suppl. 1), S1– S48. doi:10.5014/ajot.2014.682006

American Occupational Therapy Association (2015). Occupational therapy code of ethics. *American Journal of Occupational Therapy*, 69(Suppl. 3), 1-8. doi:10.5014/ajot.2015.696S03

American Occupational Therapy Association & American Occupational Therapy Foundation. (2011). Occupational therapy research agenda. *American Journal of Occupational Therapy*, 65(Suppl.), S4–S7. doi:10.5014/ajot.2011.65S4

Atchison, B., & Durette, D. P. (2017). *Conditions in occupational therapy: Effect on occupational performance*. Philadelphia, PA: Wolters Kluwer.

Brady, K., & Garcia, T. (2009). Constraint-induced movement therapy (CIMT): Pediatric applications. *Developmental disabilities research reviews*, 15(2), 102–111. doi:10.1002/ddrr.59

Brandão, M. B., Mancini, M. C., Vaz, D. V., Melo, A. P. P., & Fonseca, S. T. (2010). Adapted version of constraint-induced movement therapy promotes functioning in

- children with cerebral palsy: A randomized controlled trial. *Clinical Rehabilitation*, 24, 639–47. doi:10.1177/0269215510367974
- Cason, J. (2014). Telehealth: A rapidly developing service delivery model for occupational therapy. *International Journal of Telerehabilitation*, 6(1), 29–35. doi:10.5195/ijt.2014.6148
- Christman, E., McAllister, K., Claar, K., Kaufman, S., & Page, S. J. (2015). Occupational therapists' opinions of two pediatric constraint-induced movement therapy protocols. *American Journal of Occupational Therapy*, 69(6), 1–7. doi:10.5014/ajot.2015.019042
- Cimolin, V., Beretta, E., Piccinini, L., Turconi, A. C., Locatelli, F., Galli, M., & Strazzer, S. (2012). Constraint-induced movement therapy for children with hemiplegia after traumatic brain injury: A quantitative study. *The Journal of Head Trauma Rehabilitation*, 27(3), 177–187. doi:10.1097/HTR.0b013e3182172276
- Clark, G. F. & Kingsley, K. L. (2020). Occupational therapy practice guidelines for early childhood: Birth–5 years. *American Journal of Occupational Therapy*, 74(3), 1–42. doi:10.5014/ajot.2020.743001
- Constraint-Induced Therapy Research Group. (n.d.). Retrieved from <https://www.uab.edu/citherapy/>
- DeLuca, S. C., Case-Smith, J., Stevenson, R., & Ramey, S. L. (2012). Constraint-induced movement therapy (CIMT) for young children with cerebral palsy: Effects of therapeutic dosage. *Journal of Pediatric Rehabilitation Medicine*, 5(2), 133–142. doi:10.3233/PRM-2012-0206

- DeLuca, S. C., Ramey, S. L., Trucks, M. R., & Wallace, D. A. (2015). Multiple treatments of pediatric constraint-induced movement therapy (pCIMT): A clinical cohort study. *American Journal of Occupational Therapy, 69*(6), 1–9. doi:10.5014/ajot.2015.019323
- Dunn, W., Brown, C., & McGuigan, A. (1994). The ecology of human performance: A framework for considering the effect of context. *American Journal of Occupational Therapy, 48*, 595–607. doi:10.5014/ajot.48.7.595
- Gilmore, R., Ziviani, J., Sakzewski, L., Shields, N., & Boyd, R. (2010). A balancing act: Children's experience of modified constraint-induced movement therapy. *Developmental Neurorehabilitation, 13*(2), 88–94. doi:10.3109/17518420903386161
- Graham, N., Mandy, A., Clarke, C., & Morriss-Roberts, C. (2019). Play experiences of children with a high level of physical disability. *American Journal of Occupational Therapy, 73*(6), 1–10. doi:10.5014/ajot.2019.032516
- Jasem, Z. A., Darlington, A., Lambrick, D., Grisbrooke, J., & Randall, D. C. (2019). Play in children with life-threatening and life-limiting conditions: A scoping review. *American Journal of Occupational Therapy, 74*(1), 1–14. doi:10.5014/ajot.2020.033456
- Majnemer, A., Shevell, M., Law, M., Poulin, C., & Rosenbaum, P. (2010). Level of motivation in mastering challenging tasks in children with cerebral palsy. *Developmental Medicine & Child Neurology, 52*(12), 1120–1126. doi:10.1111/j.1469-8749.2010.03732.x

- Majnemer, A., Shikako-Thomas, K., Chokron, N., Law, M., Shevell, M., Chilingaryan, G., . . . Rosenbaum, P. (2010). Leisure activity preferences for 6- to 12-year-old children with cerebral palsy. *Developmental Medicine & Child Neurology*, *52*(2), 167–173. doi:10.1111/j.1469-8749.2009.03393.x
- Mancini, M. C., Brandão, M. B., Dupin, A., Drummond, A. F., Chagas, P. S. C., & Assis, M. G. (2013). How do children and caregivers perceive their experience of undergoing the CIMT protocol? *Scandinavian Journal of Occupational Therapy*, *20*(5), 343–348. doi:10.3109/11038128.2013.799227
- Miller, L., Ziviani, J., Ware, R. S., & Boyd, R. N. (2014). Mastery motivation as a predictor of occupational performance following upper limb intervention for school-aged children with congenital hemiplegia. *Developmental Medicine & Child Neurology*, *56*(10), 976–983. doi:10.1111/dmcn.12471
- Movahedazarhouligh, S. (2018). Teaching play skills to children with disabilities: Research-based interventions and practices. *Early Childhood Education Journal*, *46*(6), 587–599. doi:10.1007/s10643-018-0917-7
- Prellwitz, M., & Skär, L. (2016). Are playgrounds a case of occupational injustice? Experiences of parents of children with disabilities. *Children, Youth and Environments*, *26*(2), 28–42. doi:10.7721/chilyoutenvi.26.2.0028
- Ramey, S., DeLuca, S., Stevenson, R., Case-Smith, J., Darragh, A., & Conaway, M. (2019). Children with hemiparesis arm and movement project (CHAMP): Protocol for a multisite comparative efficacy trial of pediatric constraint-induced movement therapy (CIMT) testing effects of dosage and type of constraint for

children with hemiparetic cerebral palsy. *British Medical Journal*, 9(1), 1–11.
doi:10.1136/bmjopen-2018-023285

Reidy, T. G., Naber, E., Viguers, E., Allison, K., Brady, K., Carney, J., & Pidcock, F. (2012). Outcomes of a clinic-based pediatric constraint-induced movement therapy program. *Physical & Occupational Therapy in Pediatrics*, 32(4), 355–367. doi:10.3109/01942638.2012.694991

Rosenberg, L., & Bart, O. (2016). Different pathways to children's enjoyment of participation in daily activities. *Scandinavian journal of occupational therapy*, 23(5), 366–373. doi:10.3109/11038128.2015.1130169

Taub, E., Griffin, A., & Uswatte, G. (2012). *Pediatric upper extremity motor activity log-revised (PMAL) manual*. University of Alabama at Birmingham Constraint Induced Therapy Research Group. Retrieved from https://www.uab.edu/citherapy/images/pdf_files/CIT_PMAL_Manual.pdf

Taub, E., Griffin, A., Uswatte, G., Gammons, K., Nick, J., & Law, C. R. (2011). Treatment of congenital hemiparesis with pediatric constraint-induced movement therapy. *Journal of Child Neurology*, 26, 1163–1173.
doi:10.1177/0883073811408423


United Cerebral Palsy of Orange County. (n.d.). Retrieved from <https://www.ucpoc.org/therapy>

Appendix A

Institutional Review Board Approval

Dear Dr Emas,

The Stanbridge University Institutional Review Board has completed a review of your application entitled " Intervention Activity Kit for Pediatric Constraint Induced Movement Therapy". Your research protocol (MSOT009-003) is formally accepted as completed and categorized as exempt.

IRB Application Number	MSOT009-003
Date	03/25/2020
Level of Review	EXEMPT
Conditional Approval	
List Modifications	
Approval	Yes
Signature of IRB Chair	<input type="text"/> 

Should you wish to make modifications to this approved protocol, please submit a modification form for IRB review and approval. No changes may take place without IRB approval.

Sincerely,

Dominique N. Wascher, Ph.D.

Appendix B
Activity Template

Weekly theme
Daily theme
“Activity name”

Intervention Description:

Estimated duration:

PHOTO HERE:

Targeted Skills: *(Tentative Ideas)*

-

PMAL Functional Tasks:

-

Set-up Supplies:

-

Set-up Steps:

Estimated set up time:

-

Intervention Supplies:

-

Intervention Steps:

-

Modifications:

Upgrade:

Upgrade:

Downgrade:

Downgrade:

Telehealth:

-

Links:

-

References

Appendix C

Pediatric Motor Activity Log

1. Eat finger foods (picking it up and bringing it to the mouth)
2. Pick up small item (using lateral or neat pincer)
3. Self-feed with fork/spoon (grasping handle, scooping food, and bringing to mouth)
4. Brush teeth (brining brush up to mouth and moving back and forth)
5. Gesture (e.g., wave bye-bye or hello, blow kisses, reach to be held, play peek-a-boo)
6. Push arm through a sleeve of clothing
7. Turn a page in a book (after page is separated)
8. Point to a picture in a book (isolated finger use)
9. Reach for an object above head
10. Push a button or key (can push with an open hand, using only 1 finger)
11. Steady self (must be able to support weight while leaning or transitioning)
12. Open a door or cabinet (push or pull)
13. Turn a knob (e.g., toy, door; does not have to open a door)
14. Use arm to move across floor (e.g., creep, crawl, scoot, bunny hop; child's wrist must be extended and bear weight, bund fingers can be flexed)
15. Take off shoes (can be age appropriate; only has to push shoe off of dominant side foot)
16. Take off socks (must be able to independently remove sock from dominant side foot)
17. Push large object across floor (e.g. box, chair, stool; child's wrist extended and pushing coming from whole arm and not trunk)
18. Hold a ball (item can be placed inside hand, but child must be able to independently hold item for at least 5 seconds)
19. Throw a ball or other object (must have some shoulder flexion and follow through, and release of ball; some fluidity is present)
20. Use a cylindrical object (e.g., crayon, marker, chalk; object can be placed into hand but child has to purposefully color or scribble)
21. Hold a handle while riding, pulling, or pushing a toy (e.g., tricycle, shopping cart, baby buggy; child must independently grasp handle and keep hand on handle while performing activity)
22. Placement of object (e.g., puzzle piece, shape sorter, game piece, item placed into cup; item can be placed into hand but child must accurately place it in desired location)