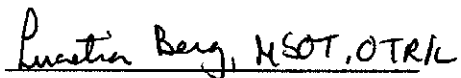


Casts for Creating Success:


An Activity Manual for Pediatric Modified Constraint-Induced Movement Therapy

May 2013

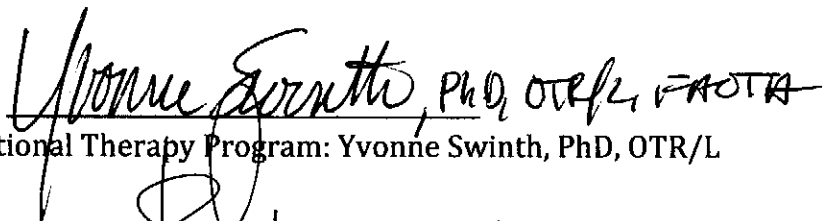
This project, submitted by Lindsay Johnson and Min Kim, has been approved and accepted in partial fulfillment of the requirements for the degree of Master of Occupational Therapy from the University of Puget Sound.



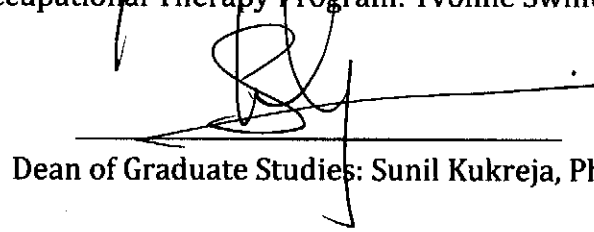
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### Abstract

Unilateral paralysis or paresis of an upper extremity can cause gross and fine motor functional impairments. These impairments can severely impact bilateral function of the upper extremities, thereby affecting a child's participation in daily activities.

Modified constraint-induced movement therapy (mCIMT) is an emerging and potentially effective treatment for children with unilateral upper extremity impairment that can profoundly improve their functional ability. Thus, the purpose of this project was to create an activity manual for occupational therapists to conduct a mCIMT program for children with unilateral upper extremity impairment through Children's Therapy Unit at Good Samaritan Hospital in collaboration with the University of Puget Sound. This manual includes progressively graded gross and fine motor activities that promote active functional use of the involved upper extremity for unilateral and bilateral tasks. The manual was designed to provide ease of access for therapists to set-up, conduct, and grade the mCIMT activities up or down depending on the child's motor function.

### **Acknowledgments**

This project would not have been possible without the countless hours of support, guidance, and feedback from Lucretia Berg, MSOT, OTR/L. All activities included in the activity manual originated from the mCIMT program that she planned, organized, and directed. Through participation in her mCIMT program at the Children's Therapy Unit of Good Samaritan Hospital, we were able to directly observe and record the activities that are listed in the activity manual. We would also like to thank the children and families that so graciously allowed their photographs to be taken and used to illustrate each activity in the manual. This project is dedicated to all the children with whom we were so fortunate to work with in the mCIMT program. Their perseverance and determination was an inspiration to us all.

### Casts for Creating Success:

#### An Activity Manual for Pediatric Modified Constraint-Induced Movement Therapy

Unilateral paralysis or paresis of an upper extremity (UE) can cause gross and fine motor functional impairments. These impairments can severely impact bilateral function of the upper extremities, thereby affecting the child's participation in daily activities (Brayman et al., 2004). Thus, significant attention is warranted for treatment that will effectively maximize function of the affected UE in the context of daily tasks (Rosenbaum, 2003). Recent research has shown that the use of constraint-induced movement therapy (CIMT), which involves the use of a constraint on the unaffected UE to force use of the affected UE, has been effective in improving unilateral UE functioning of the involved UE in daily activities (Dickerson & Brown, 2007; Taub et al., 2011; DeLuca, Echols, Law, & Ramey, 2006).

While CIMT can be conducted by various health care professionals, it is relevant to occupational therapy by its very nature of focusing on functional activities. Treatment activities focus on areas of occupation as outlined by the Occupational Therapy Practice Framework: Domain and Process (OTPF) (American Occupational Therapy Association [AOTA], 2008), such as activities of daily living (ADL), instrumental ADL, play, leisure and social participation. The use of functional activities in occupational therapy during a CIMT program supports carryover at home by encouraging habits in which the child's affected UE is used in daily tasks. However, lack of reimbursement and large expenses for CIMT are major issues. In fact, most medical insurance policies do not reimburse for this type of treatment (American Stroke Association, 2010). A CIMT program can cost up to \$15,000 for 20 days of intervention (Pediatric Neuromotor Research Clinic, n.d.). A modified version

of CIMT with less than the traditional six hours of intervention daily may be a more cost effective alternative. Recent research has shown that participants in a modified constraint-induced movement therapy (mCIMT) program make similar gains to those participants in traditional CIMT programs (Case-Smith, DeLuca, Stevenson, & Ramey, 2012).

## **Background**

### **Cerebral Palsy**

A population that can be well served by mCIMT is children with cerebral palsy. Cerebral palsy is a common motor disability in children (Centers for Disease Control and Prevention [CDC], 2012a). Cerebral palsy is a neurodevelopmental disorder that is caused by a non-progressive lesion or brain injury that occurs during the development of the brain (Bax, 1964). The incidence of children born with cerebral palsy in the United States has not shown any significant changes in the last several years. The Centers for Disease Control and Prevention asserts that cerebral palsy does not have a cure but that treatment can improve the condition (CDC, 2012b). Cerebral palsy is the most common physical disability in children, with about 1 in 303 children living with cerebral palsy in the United States (CDC, 2012a). This diagnosis can cause impairments in movement, coordination, muscle tone, and postural control (Knis-Matthews et al., 2011). One third of cerebral palsy diagnoses are categorized as hemiplegic or hemiparetic cerebral palsy, in which one side of the body is more impaired than the other side (Brady & Garcia, 2009).

Children with hemiparetic cerebral palsy tend to develop skills that rely exclusively on the use of the unaffected UE. Therefore, the functional potential of the affected UE is not fully developed, which especially impacts the child's bilateral UE function (Brady & Garcia, 2009). Studies suggest that children with cerebral palsy experience difficulties with

performing ADL (Fedrizzi, Pagliano, Andreucci, & Oleari, 2003, Engel-Yeger, Jarus, Anaby, & Law, 2009). This can cause a burden on children with cerebral palsy, as well as their parents and caregivers due to an increased level of assistance needed (Rosenbaum, 2003). Van Zelst, Miller, Russo, Murchland and Crotty (2006) conducted a study to evaluate the limitations experienced by children with hemiplegic cerebral palsy while performing daily activities in the home environment. Fifty-four children with hemiplegic cerebral palsy ages three to twelve years old were assessed by occupational therapists while performing two chosen ADL in familiar environments. The Assessment of Motor and Process Skills (Fisher & Bray Jones, 2010) was used to investigate the children's level of activity and participation limitations. The motor skills for children with hemiplegic cerebral palsy were two to three standard deviations below the mean of typically developing children. The results demonstrated that children with hemiplegic cerebral palsy had significant deficits in motor and process skills while performing ADL tasks. This study suggested that children with cerebral palsy may have impaired abilities to perform functional tasks, which can ultimately affect their level of independence and participation in social and community activities. The study also concluded that motor performance skills decrease as a child with hemiplegic CP ages (Van Zelst et al., 2006).

Children with decreased muscle strength and limited motor functions in one UE secondary to hemiparetic cerebral palsy may experience impairments in daily activities, including self-care, feeding, playing and exploration, thus warranting occupational therapy services to assist them in gaining bilateral function of their upper extremities (Fedrizzi et al., 2003) and therefore improved participation. One form of treatment that has been found

to be particularly effective in promoting functional use of the impaired UE is CIMT (Hoare, Imms, Carey, & Wasiak, 2007).

### **Constraint-Induced Movement Therapy**

Constraint-induced movement therapy has proven to be effective for individuals with hemiparetic cerebral palsy to regain function of the UE (Taub et al., 2011; Hoare et al., 2007; Brady & Garcia, 2009; Santamato, Panza, Ranieri, & Fiore, 2011). CIMT is designed to improve unilateral UE functioning by placing some form of a restraint, such as a cast or splint, on the unaffected arm (Brady & Garcia, 2009; Naylor & Bower, 2005). Constraining the unaffected arm reinforces use of the affected arm while the individual engages in activities (Taub et al., 2011).

Brady and Garcia (2009) defined the three essential features of CIMT:

- (1) some method of constraint of use of the unimpaired upper extremity,
- (2) intensive, repetitive practice of motor activities for up to 6 hr per day, for 2-4 weeks, and
- (3) shaping of more complex, functional motor acts by breaking the desired task into its components of movement and rewarding successive approximations toward the target task. (p. 102)

### **Underlying Theory of Constraint-Induced Movement Therapy**

Constraint-induced movement therapy was founded by behavioral neuroscientist Dr. Edward Taub and his colleagues through testing sensory and motor learning in non-human primates (Taub et al., 1994). In this study, researchers temporarily decreased the motor function of monkeys by shocking their spinal cords and then observed their resulting behaviors. The researchers observed that when the monkeys would use their affected side, they would drop objects or fall down or both. Furthermore, when the monkeys recovered

from the decreased motor outflow, they continued to not use their affected side. This occurrence was termed “learned non-use,” (Taub et al., 1994) that is, after deafferentation led to an inability to use their affected side in simple tasks, they learned to not use their affected extremity, even after afferent function was returned. However, after the monkeys’ unaffected sides were restrained, they began to use their affected sides once again. This research facilitated the basic principles underlying CIMT that is known as “overcoming learned non-use,” involving restraint of the unaffected side along with repetitive practice with the affected side (Brady & Garcia, 2009; Hoare et al., 2007; Vaz et al., 2010).

Constraint-induced movement therapy is based on the principles of cortical reorganization of the brain (Sutcliffe, Gaetz, Logan, Cheyne, & Fehlings, 2007). Studies have suggested that the brain reorganizes its neural pathways in order to adapt to the environment. In a series of neuroplasticity studies on animals, it was discovered that repetitive movements of specific muscles expanded the motor cortex representation for that particular muscle. When animals with cortex lesions were tested, imaging demonstrated that their cortical pathways had rewired to other areas surrounding the lesion in order to accomplish certain movements (Nudo, Milliken, Jenkins, & Merzenich, 1996). One study was conducted to determine whether CIMT would result in cortical reorganization for an eight-year-old boy with hemiparetic cerebral palsy. His unaffected arm was continuously constrained with a cast for three weeks and he received one hour of occupational therapy weekly. Following this intervention, functional magnetic resonance imaging (MRI) and magneto-encephalography showed an increased cortical activation and reorganization of his brain. In the six-month follow up study, this cortical reorganization was maintained (Sutcliffe et al., 2007).



Another study investigated immature mice with brain injuries to test whether CIMT would be an effective therapeutic strategy for improving upper body function. Researchers from this study concluded that CIMT contributed significantly to neurogenesis and reorganization of the brain. However, the findings from this study are limited as the mice's immature brain injuries can only be loosely correlated with humans with cerebral palsy, plus human brains may not reorganize in the same way (Rha et al., 2011). Research has suggested that CIMT does result in cortical reorganization. Studies also have indicated that children may benefit from CIMT more than adults due to a greater plasticity of their brains (Taub & Crago, 1995), suggesting that children are prime candidates to see beneficial results from CIMT.

### **Pediatric Constraint-Induced Movement Therapy**

Originally, CIMT was used in rehabilitation for people with cerebral vascular accidents who demonstrated UE spasticity (Knis-Matthews et al., 2011). Recent research has ascertained the efficacy of CIMT in pediatrics (Charles & Gordon, 2005), particularly in children with hemiparetic cerebral palsy (Brady & Garcia, 2009; Hoare et al., 2007). In 2004, Taub, Ramey, DeLuca, & Echols conducted a controlled clinical trial, in which 18 children diagnosed with hemiparetic cerebral palsy were randomly assigned to receive either CIMT or conventional treatment. The CIMT protocols included using a bivalved full arm cast on the less affected UE to promote the use of the more affected UE, coupled with intensive 1:1 training for six hours per day for 21 consecutive days (Taub et. al., 2004). The bivalved fiberglass cast constrained the lesser-involved UE in 90 degrees of elbow flexion and neutral forearm supination. Six hours of 1:1 therapy per day included the use of shaping, as well as providing rewards for the child's participation in activities. In this

program, “Tasks such as reaching, grasping, holding, manipulating an object, bearing weight on the arm, and making hand gestures were divided into their small component skills, which were worked on individually and later chained together to comprise a target activity” (Taub et al., 2004, p. 306). Thus, if a child demonstrated competency in a particular motor skill, then the demands for that task would be increased. Therapy also consisted of ADL, including dressing, eating, and grooming. Compared to the control group, these children gained more new motor skills, increased the mean amount and quality of the affected arm use at home, as well as increased unprompted use of the affected UE. These gains were maintained six months post CIMT (Taub et al., 2004).

In addition to physical gains, CIMT has produced positive psychosocial outcomes for children and their families. A qualitative study by Knis-Matthews et al., (2011) was performed whereby parents of children with hemiparetic cerebral palsy were interviewed to illustrate their experience with CIMT. The parents felt satisfied with not only the physical gains their children made from CIMT, but the resulting psychosocial benefits associated with the increased function. One parent described her child’s experience, saying, “The things he can do with his right hand amaze me. It makes him more aware of it and more functional. He gets very proud of himself. That helps with his self-esteem. It is just a very positive thing” (Knis-Matthews et al., 2011, p. 271). The parents also commented on the additional social benefits from their children participating in therapy in a group setting. For instance, one parent expressed that “He sees the other kids with the same condition and same problems. He feels like he belongs. Jake became a part of it. Even the cast became cool” (Knis-Matthews et al., 2011, p. 271).

A study by Gordon, Charles and Wolf (2006) investigated whether or not the effectiveness of CIMT was influenced by the age of the child. In this study, 20 children with hemiplegic cerebral palsy ages 4 to 13 years old received CIMT while wearing a sling on the non-involved UE for six hours per day for 10 of 12 consecutive days. Effectiveness of treatment was determined through the Jebsen-Taylor Test of Hand Function (Jebsen, Taylor, Trieschmann, Trotter, & Howard, 1969) and subtest eight of the Bruininks-Oseretsky Test of Motor Proficiency (Bruininks, 1978). The results from these tests demonstrated improvement in hand-movement efficiency for all the children, with no significant differences between ages (Gordon et al., 2006).

### **Modified Constraint-Induced Movement Therapy**

Traditional CIMT is designed for two to four weeks of intensive training for six hours per day while wearing a cast for 24 hours per day. However, modified forms of CIMT, mCIMT, have been developed to increase clinical feasibility and ease for children and families. Modifications include different types of constraints, various lengths of intervention, and varying environment settings (Wallen, Ziviani, Herbert, Evans, & Novak, 2008). For instance, one such modification studied is a reduced length of intervention. Researchers, Case-Smith, DeLuca, Stevenson, and Ramey, (2012) completed a randomized controlled study comparing mCIMT for three hours per day with traditional CIMT of six hours per day. Both groups participated in a total of 21 days of treatment. The results from the study demonstrated that children in both groups experienced significant functional gains in their UE function, with no significant difference between groups. The result showed that both groups maintained moderate to high levels of gains six months post the

study (Case-Smith et al., 2012). Thus, a major implication from this study was that a reduced duration of intervention may be more cost-effective for CIMT participants.

Researchers Brandão, Mancini, Vaz, Melo and Fonseca (2010) conducted a randomized controlled study that further demonstrated the effectiveness of a mCIMT program. This study involved a single-blind randomized clinical trial in which two groups of eight children participated in the study. One group received intervention, whereas the control group did not. The intervention consisted of constraining each participant's non-affected arm for ten hours per day along with participating in occupational therapy for three hours per day for two weeks. The results were measured through the Jebsen-Taylor Test of Hand Function (Jebsen et al., 1969) and the Pediatric Evaluation of Disability Inventory (Haley, Coster, Ludlow, Haltiwanger, & Andrellos, 1998). The results demonstrated that mCIMT was effective in improving functional skills and independence in ADL (Brandão et al., 2010). In addition, this study also demonstrated the efficacy of mCIMT, with less than six hours of intervention per day.

### **Modified Constraint-Induced Movement Therapy in the Community**

As demonstrated in the literature, mCIMT is an emerging and potentially effective treatment for children with unilateral UE impairment. It may be a cost-effective, intensive treatment that can profoundly improve a child's functional ability and ultimately his or her ability to participate in daily activities.

During the summer of 2012, two mCIMT camps were held in the Children's Therapy Unit at Good Samaritan Hospital in collaboration with the University of Puget Sound for children with unilateral UE limb involvement. This program was three weeks long with three hours of intervention daily for five days per week. The camp participants were

divided into two different sessions based upon age: 4 to 7 years and 8 to 12 years. The interventions were conducted by skilled occupational therapists from Children's Therapy Unit with 1:1 therapy support provided by first year occupational therapy students from the University of Puget Sound. The program required the children to wear the casts during intervention for three hours per day Monday through Friday. The children, with support from their parents, were instructed to continue to wear the cast at home for an additional three hours of training Monday through Friday.

Lucretia Berg, MSOT, OTR/L, an occupational therapist who directed a mCIMT program in 2011, identified some challenges that arose with the camp. She expressed that organizing the day-to-day plan of activities, while simultaneously managing all the volunteers and camp participants was challenging. She reported a significant need for an activity manual for occupational therapists working at the camps to be able to refer to in order to improve the productivity and consistency of this program (L. Berg, personal communication, February 2, 2012). A manual would be beneficial for occupational therapists, as it will provide an organized plan of activities including how to set-up, complete, and grade up or grade down activities, while specifying the targeted muscle groups and functional actions. Ms. Berg stated that a manual may increase the efficiency of the program so that more treatment activities could be included in a single session and the children will have increased opportunities to use the affected UE. In addition, a manual would enable therapists to easily grade activities up or down and better direct occupational therapy students and volunteers on daily set-up. Thus, an activity manual may be a valuable resource for busy clinicians by providing a ready-made mCIMT plan to follow and

potentially reduce costs related to program development (L. Berg, personal communication, February 2, 2012).

Therefore, the purpose of this project was to provide an activity manual for occupational therapists to conduct a three-week duration, three hours of weekday mCIMT program for children with unilateral UE impairment. This manual includes progressively graded gross and fine motor activities that promote active functional use of the involved UE for unilateral and bilateral tasks.

## **Procedure**

### **Overview of the Project**

This activity manual serves as a resource for occupational therapists participating in mCIMT camps through Children's Therapy Unit at Good Samaritan Hospital in collaboration with the University of Puget Sound. The purpose of this activity manual was to provide ease of access for therapists to set-up, conduct, and grade up or down the mCIMT activities depending on the child's motor function.

The manual consists of six different sections. Section I: background of mCIMT including underlying theories. Section II: various types of constraints used (see Appendix A). Section III: gross and fine motor activities (see Appendix B). Each activity includes its name, materials required, purpose, targeted muscle actions, steps for set-up, and modifications to grade the activity up or down depending on the child's ability. Bilateral hand activities were also included in the manual for the last three days of a program. Photographs of activities were included to improve clarity of understanding. Section IV: use of volunteers and occupational therapy students (see Appendix C). Section V: various tools and assessments for outcome measurements (see Appendix D). Section VI: references and

resources. The activity manual was created on *Pages '09* by Apple Inc. and color printed on card stock paper with spiral-binding. Dividers were used to distinguish separate sections.

The following steps were completed in order to create the activity manual. An interview was conducted with Lynda Johnson, OTR/L, Director of the Orthotic Program at Children's Therapy Unit, for a needs assessment (L. Johnson, personal communication, February, 2012). Additionally, an interview was conducted with Lucretia Berg, MSOT, OTR/L in order to determine the particular needs for an activity manual. Furthermore, published journals and articles were reviewed to gain knowledge regarding CIMT and mCIMT. Participation in a mCIMT camp during the summer of 2012 (July 16-August 3) at Children's Therapy Unit at Good Samaritan Hospital in collaboration with the University of Puget Sound allowed for observations of camp participants and other occupational therapy students, as well as the opportunity to take photographs and notes for the activity manual. An outline of activities was created, based on the mCIMT camp that was observed. The background section was completed, including a literature review and background information on CIMT. Types of constraints were researched in order to include in the activity manual. Additional photographs of children participating in the activities were taken at Children's Therapy Unit to include in the manual as examples. Permission for photographs and use were obtained from all participants and their parents on the day of the session. A list of tasks and duties for volunteers and occupational therapy students was created. Also, tools and assessments for outcome measures was obtained from a colleague's unpublished master's thesis (Sheehan, 2012) and modified to incorporate into the manual. A list of references was created to include in the thesis, as well as the manual. The program *Pages '09* by Apple Inc. was used to create the activity manual.

### **Skills and Knowledge Needed**

In order to complete the activity manual the authors needed specific academic knowledge, including that of the diagnosis of cerebral palsy, activity analysis, and neuromuscular body functions (see Appendix E). The authors also needed experience, such as with mCIMT, pediatric occupational therapy, and working with client families or caretakers (see Appendix E). Interpersonal skills were required such as time management skills and the ability to work well with a partner (see Appendix E).

### **Target Population**

The activity manual serves occupational therapists involved in mCIMT at Children's Therapy Unit at Good Samaritan Hospital and the University of Puget Sound Occupational Therapy Program. This manual provides detailed activity instructions that facilitate improved functional use of the affected upper extremities of children with hemiplegia or hemiparesis.

The Children's Therapy Unit at Good Samaritan Hospital serves infants, children and adolescents with many diagnoses, disorders or impairments, including neuromuscular disorders, sensory processing disorders, genetic syndromes, and autism spectrum disorders, to identify a few. Services are provided by physical, occupational and speech and language therapists, psychologists and physicians to improve children's function and independence. The mission of Good Samaritan Hospital states: "We provide quality health care in the compassion and spirit of Christ's love. We meet individual and community needs as a team, reflecting our belief that health is wholeness in body, mind and spirit" (MultiCare Good Samaritan Hospital, n.d.).



The key player for this project was Lucretia Berg, MSOT, OTR/L, a professor in the School of Occupational Therapy at the University of Puget Sound and an occupational therapist at Children's Therapy Unit. Ms. Berg played an instrumental role in the mCIMT program as the coordinator and she guided the specific needs for this activity manual.

### **Description of the Final Product**

The manual consists of six different sections. Section I: background of mCIMT including underlying theories. Section II: various types of constraints. Section III: gross and fine motor activities. Section IV: use of volunteers and occupational therapy students. Section V: various tools and assessments for outcome measurements. Section VI: references and resources.

Section I includes information on cerebral palsy, protocols for CIMT, underlying theories behind CIMT, pediatric CIMT, mCIMT, and mCIMT in the community. Section II consists of the descriptions of resting hand splints, slings, univalved and bivalved full arm casts, mitt/glove restraints, and puppets. The advantages and disadvantages of using a certain type of cast are included in this section (see Appendix A). Section III outlines the gross and fine motor activities. Each activity includes the activity name on the top, required materials, steps for set-up, purpose of activity, targeted muscle actions, and modifications to grade the activity up or down depending on the child's ability (see Appendix B). A sample outline of activities was also included in the manual, so that therapists can use it as a guideline for choosing the order of activities. Section IV consists of information on how to use volunteers and occupational therapy students. It includes a list of duties for volunteers and occupational therapists (see Appendix C). Section V consists of information on outcome measurement tools. Each tool is intended to measure one of these three areas: areas of

occupation, performance skills and body function (see Appendix D). Each tool has further information on its purpose, target population (age and diagnosis), administration time and mode of administration (standardized/non-standardized, observation, interview, questionnaire, etc.). Section VI consists of references and resources that were used for the background, as well as the University of Puget Sound's contact information.

### **Project Goals and Objectives**

The long-term goals and short-term objectives for this project are listed below.

#### **Goal 1**

After reading the introductory section of this activity manual, therapists will be educated on the basic principles underlying mCIMT to improve functional use of a participant's affected UE.

**Objective 1.** After reading the introductory section of this activity manual, therapists will be able to identify three primary purposes for using mCIMT with the pediatric population.

**Objective 2.** After reading the introductory section of this activity manual, therapists will be able to identify three different types of constraints used for a pediatric client.

#### **Goal 2**

Upon reading section III of this activity manual, therapists will be educated about activities and interventions that foster unilateral use of the affected UE.

**Objective 1.** After reading section III of this activity manual, therapists will be able to identify three fine or gross motor activities to perform each day of camp.

**Objective 2.** After reading section III of this activity manual, therapists will be able to identify the targeted muscle group(s) for three different activities.

**Objective 3.** After reading section III of this activity manual, therapists will be able to identify one way to grade up an activity and one way to grade down an activity.

### **Goal 3**

Upon reading section IV of this activity manual, therapists will be educated about how to effectively use volunteers or occupational therapy students.

**Objective 1.** After reading section IV of this activity manual, therapists will be able to identify five tasks for each volunteer or occupational therapy student to complete for set-up of the activities for each day.

**Objective 2.** After reading section IV of this activity manual, therapists will be able to identify five roles for each volunteer or occupational therapy student to complete each day.

### **Outcome of the Project**

The outcomes for this project were to increase occupational therapists' and occupational therapy students' knowledge of mCIMT and its activities. The activity manual for mCIMT contains information on how to properly prepare for and conduct activities during the camps. The manual provides occupational therapists with a resource on mCIMT, different types of constraints, unilateral and bilateral gross and fine motor activities, use of volunteers and occupational therapy students, as well as various outcome measures. As a result, occupational therapists are able to conduct a mCIMT program through activities that are gradually graded to become more difficult as participants improve. Various unilateral activities were included in the manual, so the therapists can choose activities that would be

beneficial for children in order to increase the function of the child's affected UE. Bilateral activities were included to promote bilateral use of the upper extremities and encourage transfer of these skills into the child's daily occupations.

To measure the effectiveness of the activity manual in the short term, it was reviewed by treating therapist Lucretia Berg, MSOT, OTR/L. Specifically, the therapist was asked to provide feedback regarding the ease of use, clarity of activity instructions, and age-appropriateness of the activities. In the long term, to ascertain the effectiveness of the mCIMT program, various pre and post outcome measures were included in section V, consisting of range of motion and strength of the children's UE function, to gauge level of improvement.

Occupational therapists will be able to use the activity manual as a means to create the daily activities during three weeks of camps. This manual provides thorough instructions for conducting a mCIMT program. The manual is detailed enough so that occupational therapists, without additional training in CIMT, can conduct these activities during camp. The full-color manual is composed of concise, brief sentences, and organized for ease of access and use. This manual will be kept in the School of Occupational Therapy at the University of Puget Sound, as well as at Children's Therapy Unit of Good Samaritan Hospital to address the specific need of intervention for this population within the community. Finally, therapists at Children's Therapy Unit will update and sustain the activity manual. Use of this manual as a functional outcome will be incorporated into the summer 2013 mCIMT program.

### **Implications for Occupational Therapy**

The activity manual for mCIMT is inherently linked to the field of occupational therapy. While mCIMT can be conducted by various health care professionals, it is relevant to occupational therapy in particular by its very nature of focusing on functional activities. The treatment activities are based on areas of occupation such as ADL, instrumental ADL, play, leisure, and social participation. The use of occupation-based activities in mCIMT supports carry-over at home by promoting the development of the habit of including the affected UE into daily tasks. Therefore, occupational therapy practitioners are well suited to develop mCIMT activities that ensure better carry-over than those that rely more on preparatory or rote exercises. This project provides occupational therapists with a tool for a potential therapeutic intervention to maximize function of an affected UE in the context of daily tasks and thus ultimately increasing the child's participation in activities.

### **The Occupational Adaptation Model**

The Occupational Adaptation model (Schkade & Schultz, 1992) describes how the interaction between the person and the occupational environment influences the achievement of occupational adaptation. The person, environment, and interaction between the two are dynamic states that influence occupation. In this model, the person is composed of cognitive, sensorimotor, and psychosocial systems, as well as the desire for mastery in occupation. Experience, genetics, and the environment influence these systems. The environment is defined as where occupations take place and includes physical, social and cultural systems. Varying environmental circumstances and personal factors require different demands for mastery. The interaction between the person and the environment may produce an occupational challenge, in which case an individual employs an adaptive

strategy response to master that particular occupation. The Occupational Adaptation model emphasizes the use of practice to effectively use one's own ability to adapt (Schultz, 2009). Occupational therapists use the Occupational Adaptation model to help increase the individual's ability to adapt to environments while considering personal factors in order to master the occupations successfully.

The Occupational Adaptation model is well suited to the mCIMT program as intervention can be structured in order to increase UE function through using an adaptation process (shaping, repetitive use, forced use, etc.). Children with unilateral UE impairment may have challenges with cognitive, sensorimotor and or psychosocial systems, thus impacting the quality of occupational performance. Taking into consideration the person and the environment, occupational therapists purposely select various activities that can be adapted for each individual to participate in the mCIMT program. Instructions on adaptation strategies are not taught directly in the program, although participants may develop their own adaptation strategies through repetitive practice, as well as trial and error. The desired outcome for the use of this project was to gain UE function in order to increase the use of an affected side, and as a result, to be able to generalize the skills of increased UE function into different activities in various environments. This mCIMT program may contribute to individuals developing transferable skills for various occupations and adaptive strategies.

### **Application of the Occupational Therapy Practice Framework: Domain and Process**

The Occupational Therapy Practice Framework's (OTA, 2008) domain includes all occupations in the areas of education, play, social participation and self-care tasks that take place in various environments. The OTPF recognizes the importance of maintaining good

health through engaging in desired or necessary occupations in different contexts and environments. Challenges secondary to unilateral UE impairment may interfere with ADL, instrumental ADL, education, play, leisure and social participation. The interference may be caused by impairments in body functions, body structures, motor and praxis skills, sensory-perceptual skills, and communication and social skills. Occupational therapists can help minimize these challenges through different interventions. Successful intervention approaches will improve an individual's overall health and wellness and, potentially, quality of life. Individuals may gain increased participation in activities and role competency by accomplishing desired tasks (AOTA, 2008).

This project uses play as a therapeutic tool to promote occupational participation. Play is any activity that provides contentment for occupational therapy clients (AOTA, 2008). Considering the client factor of limited use of an individual's affected side, therapists design interventions that are suitable for this particular population of children with unilateral UE impairment. Participants engage in structured play that targets hand and UE function to increase motor and praxis performance skills in order to meet desired outcomes. These gains in function will promote improved participation in occupational performance areas of education, play, social participation and ADL tasks and, potentially, one's overall quality of life.

### **Special Circumstances or Considerations for the Project**

In developing this activity manual, it was important to use language that was easily understood by its readers. Considering occupational therapists are the target users of this manual, it was written in professional language with terms and verbiage appropriate for

the field of occupational therapy. To promote enhanced understanding of the activities, pictures were included in the manual.

Considering the environment factors for a mCIMT program, the therapists need to have a large enough space for activities and must be flexible when planning out the activities. The proposed mCIMT program uses both indoor and outdoor facilities. The indoor room requires a high ceiling due to gross motor activities involving reach, utensil use, and moving targets. The room needs to be large enough (size of a large classroom or a therapy gym) to store supplies needed for the activities and to allow sufficient space for the camp participants, therapists, and volunteers to engage in the various activities. Set-up time would be greatly reduced if the room were a dedicated space for the three weeks. The therapists must be flexible when planning outdoor activities due to weather changes and possibly needing to share the outdoor space with other therapists, clients, or the general public.

### **Limitations of the Project**

The activity manual does not clearly outline the specific timeline and duration of activities, nor does it explain the specific order of activities for each day. As no two therapy sessions look the same, it was difficult to provide these specifics. Therefore, the manual was kept more general with a suggested outline of activities, however this may not have been as beneficial as outlining exactly the order and duration of activities. Additionally, due to time constraints, the authors were unable to pilot the use of the activity manual during a mCIMT camp, and resorted to using a review by a treating therapist, Lucretia Berg, MSOT, OTR/L, for feedback to make changes to the manual.



### **Recommendations for Future Projects**

Based upon the limitations of this project, it would be beneficial to add a daily schedule that outlines the exact order and duration of activities for all three weeks of the program. This would provide a ready-made mCIMT program manual, with minimal planning and preparation needed to administer a camp. Additionally, some of the activities listed in this manual can be played in multiple ways, therefore it is recommended that each method of play be included.

### **Sustainability**

A copy of the activity manual and the thesis was given to Children's Therapy Unit at the Good Samaritan Hospital in Puyallup. The manual will be kept as a reference for the therapists, so they can use it when administering a mCIMT program. In addition, a copy of the manual is kept in the resource room in Weyerhauser Hall at the University of Puget Sound. The manual will be useful for student therapists working with pediatric clients during spring Occupational Therapy Clinic. Similarly, if a mCIMT camp is run during the summer of 2013 at the University of Puget Sound, occupational therapy students and camp administrators may use it as a reference.

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### **Human Resources**

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*Appendix A***Resting Splint**

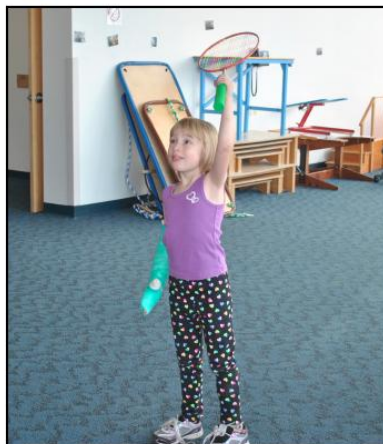
Custom-made resting splints are molded to fit the contour of the unaffected upper extremity. They cover about  $\frac{2}{3}$  the length of the forearm,  $\frac{2}{3}$  the circumference of the arm and extend beyond the fingertips. One inch diameter velcro straps are used to secure the arm in position in the splint. Resting splints allow for immobilization of the unaffected upper extremity by placing the joints of the hand in a fixed position. This type of splint is used to restrict wrist, finger, and thumb movement during therapeutic intervention. An advantage to using this splint is that it is lightweight and easily removable (Colditz, 1996).





*Appendix B***Balloon Volley****How to Play:**

- Blow up enough balloons for one per pair
- Need one racquet per person
- Hit balloon back and forth between partners or in a circle with multiple people
- Count how many times the balloon can be hit back and forth

**Desired Movements:**

- Shoulder forward flexion, humeral external/internal rotation, elbow flexion/extension, wrist neutral, sustained grip strength

**Modifications:****Grade down:**

- Use Coban® wrap to provide assistance for holding the racquet
- Child hits the balloon him/herself to keep balloon in the air

**Grade up:**

- Child stands on a rocker board
- To increase complexity add more balloons
- Add a beach ball, which increases the weight of the object, requiring more strength
- Try actual Badminton Birdies to see if child is able to sustain hitting the birdie to a partner

**Materials:**

Racquets  
 Balloons  
 Coban® (optional)  
 Large Space

*Appendix C***Volunteer Duties:**

- Clean-up and set-up for the activities- to facilitate smooth transitions, volunteers can begin gathering materials before an activity ends and set-up for the next activity
- Snack preparation- storing and gathering food from the refrigerator, distributing food on plates, washing dishes as needed
- Craft activities- pre-cutting and assembling materials, making copies, gathering materials needed for the activity (scissors, glue, etc.)
- Run therapists' errands as requested
- Clean and wipe down equipment
- Report any incidents and promote safety awareness
- Photographs & record-keeping of daily activities
- Contribute to discussion of daily clinical observations
- Provide assistance during group games or act as an extra set of hands

*Appendix D*

**Tools to Measure Areas of Occupation:**

	Purpose	Target Population	Administration Time	Mode of Administration
ABILHAND-kids	Measure manual ability in children with CP	Children with CP 6yr -15 yr	10 min.	Parent questionnaire
COPM	Identify performance problems important to clients	Any disability, Any age	30 - 45 min. (7 - 12 min. re-admin)	Semi-structured interview
GAS	Identify client and/or care provider goals	Any disability, Any age	40 - 60 min. (7 - 12 min. re-admin)	Semi-structured interview
PEDI	Assess child's performance in mobility self-care and social interaction	Children with developmental delays, 6 m.o -7.5 yr	45 - 60 min.	Observation or parent interview

(Sheehan, 2012)

ABILHAND, Canadian Occupational Performance Measure (COPM), Goal Attainment Scaling (GAS), Pediatric Evaluation of Disability Inventory (PEDI)

*Appendix E**A list of academic knowledge needed to complete the manual*

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**Academic Knowledge**

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Knowledge of cerebral palsy and its impact on occupations  
 Knowledge of pediatric mCIMT  
 Knowledge of neuromuscular body functions and body structures  
 Knowledge of a variety of gross motor and fine motor activities  
 Knowledge of age-appropriate play and activities  
 Knowledge of activity analysis and how to grade up or down activities  
 Knowledge of hypertonicity or hypotonicity  
 Knowledge of OTPF and models

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*A list of experience knowledge needed to complete the manual*

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**Experience Knowledge**

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Experience with mCIMT  
 Experience with pediatric occupational therapy  
 Experience working with client families or caretakers  
 Experience with the temporal aspect of activities for children  
 Experience with co-writing  
 Experience with editing of photographs  
 Experience working with Office Depot for printing  
 Experience with Apple Pages

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*A list of interpersonal skills needed to complete the manual*

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**Interpersonal skills**

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Therapeutic use-of-self  
 Problem-solving skills  
 Communication skills  
 Creativity (design, templates, color, pictures)  
 Time management skills  
 Ability to work with a partner  
 Organizational skills (multiple sections, layout)  
 Ability to engage in play with children

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