

Title: Helping Kids with Hemiplegia Summer Camp: Background Information, Handling Techniques, and a Comparison Between Constraint-Induced Movement Therapy and Bimanual Intensive Therapy

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Databases Searched: PubMed, CINAHL, Web of Science

The following evidence table provides an overview of current research findings related to the comparison of Constraint-Induced Movement Therapy (CIMT) and Bimanual Intensive Therapy (BIT) in children with hemiplegia. For more information regarding my search strategy and results summary, please refer to my Critically Appraised Topic (CAT).

*Articles were chosen for inclusion based on evidence quality using the PEDro Scale for Randomized Controlled Trials

Author, Year	Study Design, Purpose, Subjects	Intervention		Outcome Measure(s)	Findings	Comments
		Group 1	Group 2			
Sakzewski et al., 2011 ¹	<p><u>Study Design:</u> Matched Pairs Randomized Controlled Trial</p> <p><u>Purpose:</u> To determine if CIMT versus bimanual intensive training (BIT) is more effective in improving involved upper extremity (UE) function and participation in children with hemiplegia</p> <p><u>Subjects:</u> Children between the ages of 5- and 16-years of age diagnosed with congenital hemiplegia</p>	<p><u>CIMT Group:</u> Subjects wore a tailor-made glove on the non-involved UE as the mode of constraint. Subjects participated in age-appropriate, goal-oriented tasks, which focused on fine and gross motor skill acquisition, functional use in the involved UE, and proper use of utensils during meal time.</p> <p>Activities were supervised by a physical therapist (PT), occupational therapist (OT) or camp volunteers.</p> <p>The intervention occurred 6 hrs/day for 10 consecutive days.</p>	<p><u>BIM Group:</u> Subjects participated in the same activities as CIMT group; however, BIM participants were encouraged to use both the involved and non-involved UE for all activities in unison.</p> <p>Activities were supervised by a physical therapist or camp volunteers.</p> <p>The intervention occurred 6 hrs/day for 10 consecutive days.</p>	<p>Primary:</p> <ul style="list-style-type: none"> Melbourne Assessment of Unilateral Upper Limb Function (MUUL) Assisting Hand Assessment (AHA) <p>Secondary:</p> <ul style="list-style-type: none"> Grip strength via hand-held dynamometer Sensation – Moving 2-point discrimination and stereognosis Jebson Taylor Test of Hand Function (JTTHF) <p>Measures obtained at baseline, 3 weeks, and 26 weeks post-intervention.</p>	<p>CIMT participants demonstrated significant improvements in MUUL, AHA, and JTTHF scores at 3-week follow-up visit and MUUL and JTTHF scores at 26-week follow-up visit.</p> <p>BIM participants demonstrated significant improvements in AHA scores at 3-week follow-up visit and AHA and JTTHF scores at 26-week follow-up visit.</p> <p>Changes in MUUL outcomes for the CIMT group did not reach nor exceed the minimal clinically important difference.</p>	<p>The effect size between CIMT and BIM AHA outcome scores was small, suggesting that neither intervention is deemed to be more effective at improving bilateral use of the UEs post-intervention. Instead, both groups demonstrated improvements in function, movement quality and efficiency, and overall participation in activities that require bilateral use of the UEs.</p> <p>Future research should consider studying the effectiveness of a combination of CIMT and BIM on bilateral UE function and participation.</p>

					The effect size for AHA scores between groups was small (0.22).	
Deppe et al., 2013 ²	<p><u>Study Design:</u> Single-blinded Randomized Controlled Trial</p> <p><u>Purpose:</u> To determine if modified CIMT (mCIMT) demonstrates greater improvement in involved UE function and participation than intensive bimanual therapy (IBT) in children with hemiplegia</p> <p><u>Subjects:</u> Children between the ages of 3- and 12-years of age diagnosed with unilateral spastic cerebral palsy (CP) or acquired, non-progressive central hemiplegia secondary to stroke, traumatic brain injury, or non-traumatic intracranial hemorrhage</p>	<p><u>CIMT Group:</u> CIMT program consisted of CIMT and IBT methods that were broken up into 2 parts:</p> <ul style="list-style-type: none"> • 60 total hrs CIMT • 20 total hrs IBT <p>Elastic bandages served as the mode of constraint, which fixated the entire UE to the trunk to promote use of the involved UE. Program used a multi-disciplinary approach as well as the principles of shaping: Sensation (10 minutes/day), mobilization (5-10 minutes/day), and activity (primary focus). Activities included donning/doffing clothing, meal prep, proper use of utensils during meals, and age-appropriate play.</p> <p>Activities supervised by PT, OT, sport/music therapist, or educational instructors.</p> <p>The intervention occurred 4 hrs/day, 5 days/week for 4 weeks.</p>	<p><u>IBT Group:</u> IBT program consisted of 80 total hrs of IBT methods.</p> <p>Like CIMT, the IBT program involved a multi-disciplinary approach as well as principles of shaping. Activities were the same as CIMT group, except subjects were encouraged to participate using bilateral UEs for all tasks.</p> <p>Activities supervised by PT, OT, sport/music therapist, or educational instructors.</p> <p>The intervention occurred 4 hrs/day, 5 days/week for 4 weeks.</p>	<p>Primary:</p> <ul style="list-style-type: none"> • MUUL • AHA <p>Secondary:</p> <ul style="list-style-type: none"> • Parents' Questionnaire on Self-Care Abilities from Pediatric Evaluation of Disability Inventory (PEDI) <p>Primary outcomes obtained pre- and post-intervention.</p> <p>Secondary outcome obtained pre-intervention and 2 weeks post-intervention.</p>	<p>Subjects who participated in the mCIMT group demonstrated greater overall MUUL scores when compared to IBT group subjects.</p> <p>However, based on AHA scores, IBT group participants demonstrated similar improvements when compared to the mCIMT group.</p> <p>Overall, children with greater disability levels at baseline demonstrated greater improvements in outcomes when compared to children with lower levels of disability.</p>	<p>MUUL scores served to represent isolated motor function in the involved UE. Based on the study's findings, mCIMT is considered to be superior to IBT in terms of promoting unilateral function in the paretic limb.</p> <p>AHA scores served to represent spontaneous use of the involved UE during bimanual tasks. Based on the study's findings, mCIMT is not superior to IBT in terms of promoting bilateral use of the paretic and non-paretic limbs in unison. This finding is clinically relevant, for the majority of functional tasks are performed using both UEs.</p> <p>mCIMT subjects participated in both mCIMT (60 hrs) and IBT (20 hrs). This makes it difficult to determine whether</p>

						the findings related to mCIMT are due to mCIMT alone versus a combination of mCIMT and IBT.
Gordon et al., 2011 ³	<p><u>Study Design:</u> Randomized clinical trial</p> <p><u>Purpose:</u> To compare the effectiveness of CIMT to hand-arm intensive bimanual therapy (HABIT) methods with equal dosing of frequency and duration in children with hemiplegic CP</p> <p><u>Subjects:</u> Children between the ages of 3.5- and 10-years of age diagnosed with hemiplegic CP</p>	<p><u>CIMT Group:</u> CIMT program consisted of engaging, age-appropriate activities tailored to the needs of each camp participant. Intervention included progressive unimanual activities that were executed using the hemiparetic UE.</p> <p>The mode of constraint included a sling that was worn on the non-involved limb at all times except when toileting or during breaks (≤ 15 minutes/day). The sling was secured to the child's trunk and sewn shut distally.</p> <p>Activities were supervised by PTs, OTs, or trained graduate/undergraduate students. Supervisor to child ratio was 1:1.</p> <p>The intervention occurred 6 hrs/day for 15 consecutive days.</p>	<p><u>HABIT Group:</u> HABIT program consisted of age-appropriate fine and gross motor activities with a focus on motor learning. Participants were encouraged to use bilateral UEs for all activities.</p> <p>Activities were supervised by PTs, OTs, or trained graduate/undergraduate students. Supervisor to child ratio was 1:1.</p> <p>The intervention occurred 6 hrs/day for 15 consecutive days.</p>	<p>Primary</p> <ul style="list-style-type: none"> • AHA • JTTHF <p>Secondary</p> <ul style="list-style-type: none"> • Quality of Upper Extremity Skills Test (QUEST) • Goal Attainment Scale (GAS) • Acceleration via wrist activity monitors (used to determine percentage of time each hand was used throughout AHA activities) <p>Measures obtained at baseline, day 2 of intervention, 1, and 6 months post-intervention.</p>	<p>Overall, there was no significant difference between CIMT and HABIT group participants in AHA and JTTHF outcomes.</p> <p>However, there was a significant difference between pre- and post-intervention outcomes for AHA and JTTHF in both CIMT and HABIT groups, which were maintained at 6-month follow-up.</p> <p>HABIT group participants demonstrated significantly greater improvements in GAS scores as compared to CIMT group participants following intervention.</p>	<p>Authors hypothesized specificity of training, implying that CIMT participants would demonstrate greater improvements in unilateral capacity whereas HABIT participants would demonstrate greater improvements in bimanual capacity. Instead, both programs exhibited similar improvements in AHA and JTTHF outcomes, suggesting that both intervention methods are successful in improving participation and function in the involved UE.</p> <p>However, study findings indicate that HABIT strategies may be superior to CIMT in terms of meeting established goals and the transferability to</p>

						<p>untrained goals based on GAS outcomes.</p> <p>Authors conclude that treatment intensity is an important factor to consider in CIMT/HABIT programs.</p>
<p>Facchin et al., 2011⁴</p>	<p><u>Study Design:</u> Multicenter, prospective, cluster-randomized controlled trial</p> <p>Three groups were included in the study:</p> <ol style="list-style-type: none"> 1. mCIMT 2. Bimanual intensive rehabilitation treatment (IRP) 3. Standard treatment (ST) <p><u>Purpose:</u> To compare the short- and long-term effectiveness of mCIMT with bimanual intensive rehabilitation treatment (IRP) in children with hemiplegic CP; furthermore, by including the ST group, researchers are able to learn more about the influence of training intensity on outcomes</p>	<p><u>mCIMT Group:</u> Children wore a fabric glove with a built-in volar stiff plastic splint on the non-involved UE as the mode of constraint. Participants were expected to wear the glove for 3 hrs consecutively per day.</p> <p>Children participated in a variety of goal-oriented, unimanual tasks based on motor learning approaches, including:</p> <ul style="list-style-type: none"> • Perceptual motor activities • Fine/Gross motor function (i.e. reaching, grasping, manipulating objects) • Posture and balance • Everyday activities (i.e. self-care). <p>Sessions lasted for 3 hrs/day. Therapist</p>	<p><u>IRP Group:</u> Activities for IRP participants were based on the same approach described for the mCIMT program, but children were encouraged to use both hands for all tasks. Supervision and intervention occurrence were also the same for IRP and mCIMT groups.</p> <p><u>ST Group:</u> Traditional treatment included 1-hr of standard rehabilitation, 1-2x/week for 10 weeks.</p> <p>Session frequency was variable based on the participant's age (infants 2x/week, older children 1x/week).</p>	<p>Primary:</p> <ul style="list-style-type: none"> • QUEST • Besta Scale <p>Secondary</p> <ul style="list-style-type: none"> • Medical history, physical examination • Cognitive via Wechsler/Griffith scales • Gross Motor Function Measure • Parenting Stress Index • Parents' Besta Scale • Child Behavior Checklist • Ad hoc questionnaire (satisfaction and compliance perceived by parents) <p>Measures obtained pre- and post-intervention.</p>	<p>Significant improvements were demonstrated based on QUEST and Besta Scale outcomes for both mCIMT and IRP group participants, whereas ST participants did not.</p> <p>mCIMT group participants demonstrated greater improvements in grasping abilities in the involved UE as compared to IRP participants.</p> <p>IRP group participants demonstrated greater improvements in bimanual UE function as compared to mCIMT participants.</p>	<p>The findings from this study imply that treatment intensity plays a significant role in improving the functional capacity of the paretic limb in children with hemiplegic CP.</p> <p>mCIMT may be more beneficial in improving unimanual capacity of the involved upper limb, whereas IRP may be more advantageous in improving bimanual capacity of both UEs.</p> <p>However, given the importance of both unimanual and bilateral functional capacity for basic hand movements (i.e. reaching, grasping), during play, and in performing activities</p>

	<p><u>Subjects:</u> Children between the ages of 2- and 8-years old with a confirmed diagnosis of hemiplegic CP</p>	<p>supervised initial 1.5 hrs of intervention, and parent(s) supervised the final 1.5 hrs.</p> <p>Intervention occurred 3 hrs/day, 7 days/week for 10 weeks</p>		<p>Secondary measures to be obtained at 3, 6, and 12 months post-intervention, but data was not provided.</p>	<p>Both mCIMT and IRP participants demonstrated improved independence in self-care activities, although the difference was not significant.</p>	<p>of daily living, a combination of both CIMT and IRP may be deemed best practice. This should be considered in the development of future research methods.</p>
<p>Sakzewski et al., 2011⁵</p>	<p><u>Study Design:</u> Single-blind, matched-pairs, randomized controlled trial</p> <p><u>Purpose:</u> To determine if CIMT demonstrates greater improvement in involved UE occupational performance and participation than bimanual training in children with congenital hemiplegia</p> <p><u>Subjects:</u> Children between the ages of 5- and 16-years old diagnosed with congenital hemiplegia</p>	<p><u>CIMT Group:</u> Children participated in motivational, goal-oriented, activity-based tasks that were based on the principles of motor learning.</p> <p>Daily program included fine motor activities, circus training, mealtime, gross motor function via games, and a time for debriefing.</p> <p>The mode of constraint included a tailor-made glove that was worn at all times except when addressing individual goals that were established by participants and their parent(s). Doffing of the glove was limited to ≤ 15 minutes/day.</p> <p>Supervised by OTs and PTs, and assistance provided by volunteers, trainers, and community</p>	<p><u>Bimanual Training:</u> Activities for bimanual training participants were based on the same approach described for the CIMT program, but children were encouraged to use both hands for all tasks. Supervision and intervention occurrence were also the same for bimanual training and CIMT groups.</p>	<p>Primary</p> <ul style="list-style-type: none"> Canadian Occupational Performance Measure (COPM) <p>Secondary</p> <ul style="list-style-type: none"> Assessment of Life Habits (LIFE-H) Children's Assessment of Participation and Enjoyment (CAPE) School Function Assessment (SFA) <p>Measures obtained at baseline, 3, and 26 weeks post-intervention.</p>	<p>Both CIMT and bimanual training participants demonstrated statistically significant differences in COPM outcomes both short- (3 weeks) and long-term (26 weeks).</p> <p>No significant difference between CIMT and bimanual training was observed for total LIFE-H outcomes, yet both groups showed significant improvements in personal care (subcategory) that was maintained 26 weeks post-intervention.</p> <p>No significant treatment effects noted in either group for CAPE and SFA outcomes.</p>	<p>In conclusion, there were minimal differences noted between CIMT versus bimanual training in terms of occupational performance and participation.</p> <p>Therefore, both methods of intense training can be used to promote function, enhance performance and optimize participation in the involved UE in children with congenital hemiplegia.</p>

		workers. Therapist to child ratio was 1:2.				
		Intervention occurred 6 hrs/day for 10 consecutive days.				
De Brito Brandao et al., 2012	<p><u>Study Design:</u> Randomized controlled trial</p> <p><u>Purpose:</u> To compare the effectiveness of CIMT versus HABIT in terms of functional skill development and independence with activities of daily living and to determine whether intense intervention results in improvements in caregivers' perception of performance on functional goals in children with hemiplegic CP.</p> <p><u>Subjects:</u> Children between the ages of 3- and 10-years old diagnosed with hemiplegic CP</p>	<p><u>CIMT Group:</u> Children wore cotton slings strapped to their trunk that were sewn shut distally to prevent use in the involved UE.</p> <p>Functional activities were motivational, individualized, and graded. Once child demonstrated improvement in performance, difficulty level of the task was increased. Children worked individually or in groups.</p> <p>Activities included:</p> <ul style="list-style-type: none"> • Fine/Gross motor function (beading, staking blocks, throwing/catching ball) • Board/Card games • Self-care (eating, dressing) <p>Parents were instructed to perform 1-hr home exercise program each day. Program focused on unimanual practice with</p>	<p><u>HABIT Group:</u> Activities for HABIT and CIMT groups were the same, but HABIT group participants were encouraged to use both involved and non-involved UEs in the completion of tasks. Supervision and intervention occurrence were also the same for HABIT and CIMT groups.</p> <p>Parents were instructed to perform 1-hr home exercise program each day. Program focused on bilateral UE practice with everyday activities and play.</p>	<p>PEDI</p> <ul style="list-style-type: none"> • Functional Abilities Self-Care • Independence Self-Care <p>COPM</p> <ul style="list-style-type: none"> • Performance Scale • Satisfaction Scale <p>Measures obtained pre- and post-intervention.</p>	<p>Both CIMT and HABIT group participants demonstrated significant improvements in daily functioning (PEDI) and satisfaction and performance (COPM) outcomes from pre- to post-intervention.</p> <p>Parents of HABIT group participants perceived greater improvements in the performance of tasks related to goals from pre- to post-intervention, but parents of children in both groups reported equal amounts of satisfaction with their child's overall performance following completion of the program.</p>	<p>Interestingly, the functional goals established by parents during the pre-intervention assessment primarily involved bimanual activities such as eating/drinking, grooming, dressing, throwing/catching a ball, playing games, drawing, using scissors, and carrying objects. Therefore, intense bilateral training should not be neglected in the development of interventions tailored to improve daily functioning outcomes in children with hemiplegic CP.</p> <p>Although some of the established goals were not addressed secondary to a variety of circumstances (i.e. lack of equipment availability), parents of children from both groups reported</p>

		<p>everyday activities (without constraint).</p> <p>Supervised by OTs, PTs, and graduate students assisted by PTs/OTs experienced in CIMT/HABIT protocols. Interventionist to child ration was 1:1.</p> <p>Intervention occurred 6 hrs/day for 15 consecutive days</p>				<p>improvements in performance and satisfaction with unpracticed goals. While this finding suggests the transferability of newly acquired abilities in this patient population, these improvements were smaller than improvements in practiced goals. Therefore, task-specific practice is another important factor in the development of interventions for these patients.</p>
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Sources

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