Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
Aarts et al., 2010 The Netherlands RCT 7/10 High quality	**N** = 52 children **Age at enrollment:** 2.5 – 8 yrs old; Intervention group: 4.8 ± 1.3 yrs old; Control group: 5.1 ± 1.7 yrs old. **CP diagnosis:** 100% were diagnosed at enrollment. **CP Type:** Unilateral, spastic **GMFCS (Gross Motor Function Classification System) :** Level I: 48/50 (96%) Level II: 2/50 (4%) (n=2 withdrew). **MACS (Manual Ability Classification System):** Level I: 18/50 (6%) Level II: 22/50 (44%) Level III: 12/50 (24%)	Modified constraint-induced movement therapy combined with bimanual training (mCIMT-BiT) (n=28) vs. Usual care (n=24) **_Intervention details_:** 3-hr clinic sessions, 3 times/week for 8 weeks for a total of 9 hrs/week of therapy time. *mCIMT – BiT:* Consists of putting a sling on the unaffected arm and hand and use the affected arm for all activities (e.g. holding a sword in a pirate game) for the first 6 weeks. Shaping and repetitive task practice were provided, with immediate feedback on performance. The last 2 weeks, the emphasis was on task-specific exercises in goal-directed bimanual play and self-care activities without restraint.	**At post-treatment (9 weeks):** *Spontaneous use of the assisting hand in bimanual activities:* (+) Assisting Hand Assessment (AHA) *Manual ability:* (+) ABILHAND-Kids *Quality of upper extremity movement:* (-) Melbourne Assessment of Unilateral Upper Limb Function *Parent perception of infant current performance:* (+) Canadian Occupational Performance Measure (COPM) – performance *Parent satisfaction with infant current performance:* (+) Canadian Occupational Performance Measure (COPM) –satisfaction *Goal attainment:* (+) Goal Attainment Scaling (GAS) **At follow-up (17 weeks):** Between-group differences not provided. The following improvements were

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		Usual care: Consists of individual OT and PT, 2 times per week for 0.5 – 1 hr sessions, where the child engaged in exercises to stretch the affected arm, improve weight-bearing capacity, and use the affected arm and hand as a good assist. Caregivers were asked to stimulate children in daily activities and received oral and written instructions.	maintained for the intervention group: (+) AHA (+) ABILHAND-Kids
Chamudot et al., 2018 Israel RCT 7/10 High quality	**N = 36 infants with hemiplegic CP** **Age of enrollment:** 11.1 ± 2.2 months **CP diagnosis:** 100% **CP Type:** Spastic Hemiplegia 100% **GMFCS Level:** N/A	Modified constraint induced movement therapy (mCIMT) (n=18) vs. Bimanual therapy (BIM) (n=18) **Intervention details:** 1-hour daily play sessions with parents, 7 days/week for 8 weeks (1 hour session could be divided into 2x 30-minute sessions). *mCIMT*: Infants were required to wear a soft custom-	**At post-treatment (8 weeks):** *Bimanual hand use:* (-) Mini-AHA (the infant version of the assisting hand assessment) (-) The Functional Inventory (FI) – Bilateral Hand Use (BHU) *Unilateral hand use:* (-) The Functional Inventory (FI) – Unilateral Hand Use (UHU) *Gross motor function:* (-) The Functional Inventory (FI) –Gross motor skills (GMS)

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		made mitt throughout play session on their functional hand. Toys/activities provided encouraged unilateral hand use (ex: knock down tower, eat cookie) of their affected hand *BIM*: Toys/Activities encouraged use of both hands symmetrically (e.g. pull beads off stick, take blocks out of container). *Both interventions:* - Home programs (individualised based on Mini-AHA results & designed to encourage use of affected hand) - Treatment performed in sitting position (trunk support provided) - Professional guidance 1x/week at home by OT. Therapist's guidance was based on principles of motor learning using highly motivating activities with specific task practices & repetitive practices. - When necessary the therapists supplied parents with appropriate toys for the activities. - Parents were guided on how to ensure the infants were receiving positive reinforcement from the activities.	

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
Christmas et al., 2018 United Kingdom RCT 7/10 High quality	**N =** 62 children with hemiplegic cerebral palsy **Age at enrollment:** Children 18m - 4 years **CP diagnosis:** 100% **CP Type:** Unilateral CP: 100% **GMFCS Level:** N/A	Prolonged Restraint (n=30) vs. Manual Restraint (n=32) **Intervention details:** 1 hour total per day (intermittent execution allowed) for 6 weeks (3 blocks of 2 weeks – interspersed with 2 weeks of rest). Intervention flexible but completed within 10 weeks. *Prolonged Restraint:* 24 hour short-arm device applied by the therapist, in place throughout the two-week intervention blocks. Either a semi-rigid (3M soft) custom-made cast, or wrist splint extending from metacarpal heads to above the wrist (with crepe bandage enclosing the fingers and thumb). Caregivers could easily remove it if needed.	**At post-treatment (10 weeks):** *Bimanual performance:* (-) Assisting Hand Assessment (AHA) (+) Birmingham Bimanual Questionnaire (parent reported) *Upper limb quality of movement:* (-) Quality of Upper Extremity Skills Test (QUEST) *Quality of life (physical, emotional, social and cognitive functioning):* (-) The Pediatric Quality of Life Inventory[GI4] 4.0 Generic Core Scale (Children 2 years and above) (-) The Pediatric Quality of Life Inventory Infant Scale (children less than 2 years) *Therapy dose:* (+) Parent Diaries/Questionnaire **Follow-up (24 weeks):** *Bimanual function:* (-) Birmingham Bimanual Questionnaire

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		Manual Restraint: Hand-over-hand holding of the unaffected upper limb to encourage use of affected upper limb. *Both interventions:* Therapy executed intermittently during play or functional tasks for a total of 1 hour/day by caregivers (parents and pre-school workers) in usual environment(s). Interventions aimed to promote mass practice of the affected upper limb to improve grasp, release, reaching, in-hand manipulation and use of an assisting hand during bimanual activity. Substantial verbal encouragement and praise promoted during interventions. Caregivers were asked to record a daily diary of a child's cooperation and participated in a weekly questionnaire to monitor a child's overall cooperation and the amount of prescribed therapy completed.	*Quality of life (physical, emotional, social and cognitive functioning):* (-) The Pediatric Quality of Life Inventory 4.0 Generic Core Scale (Children 2 years and above) (+) Pediatric Quality of Life Inventory Infant Scale (children less than 2 years)
Deluca et al., 2006 USA	**N** = 9 children with hemiparesis CP **Age at enrollment:** Under 8 years old (7-96 months)	Pediatric constraint induced therapy (n=9) vs. Crossover group (n=8)	**Post-treatment (3 weeks from baseline):** *Motor function:* (-) Quality of Upper Extremity Skills Test (QUEST)

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant

RCT (randomised controlled crossover trial)
 	
 5/10
 	
 Fair quality
	CP diagnosis: 100%
	
	 CP Type: Hemiparesis 100%
	
	 GMFCS Level: N/A
		Intervention details:
		
		 Pediatric constraint induced therapy:
		
		 • 6 hours/day (if child needed breaks or nap, additional time was added to ensure full dose of 6 hours of active treatment)
		 • 21 consecutive days
		 • Treatment was one on one, same therapist for all 21 days
		 • Intervention done by OT or PT that had specialised training from authors
		 • Child's less involved UE was casted from upper arm to fingertips
		   - Lightweight fiberglass cast
		   - Bivalved to provide weekly removal to check skin integrity, clean arm, allow for ROM
		 • Treatment included tasks such as:
		   - Bearing weight on arm
		   - Reaching, grasping, holding, manipulating an object
		   - Fine motor hand skills
		   - ADLs (dressing, undressing, eating, grooming)
		 • Frequent & immediate praise or rewards were used
		 • Behaviour was shaped to promote increasingly more advanced levels. Increasing precision, strength, fluency, automaticity and functional versatility.
		 • Tasks were divided into small component skills and then chained together as the child's ability increased
			(+) Pediatric Motor Activity Log (PMAL): frequency of use
			
			 (+) PMAL: quality of movement
			
			 (+) Emerging Behaviors Scale
			
			 Post-treatment 2 (6 weeks from baseline):
			
			 Motor function:
			
			 (-) QUEST
			
			 (+) PMAL: frequency of use
			
			 (+) PMAL: quality of movement

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		• On average a child participated in 2 distinct UE activities each hour with many opportunities for the child to return to favourite activities to keep the child interested and motivated. • Parents were encouraged to join in therapy related activities and learn how to facilitate/give frequent praise *Control/crossover group:* • Continued participation in their previously established EI programs, school based therapy or private therapy sessions • Control children received their above interventions for a mean of 2.2 hours/week (low of 1 session in the 21 days to a high of 4x1 hour sessions/week) • Then children crossed over to receive the pediatric constraint-induced therapy(8 out of 9 control crossed over, one child could not due to conflict in family schedule)	

Eliasson et al., 2018
 	
Sweden
 	
RCT
	N = 37 infants with clinical signs of unilateral CP
	
	Age at enrollment: 3 months- 8 months corrected age
		Baby constraint induced movement therapy (Baby-CIMT) group (n=19)
		
		vs.
		
		Baby massage group (n=18)
			At post-treatment (18 weeks):
			
			Manual abilities:
			
			Hand Assessment for Infants
			    (-) Both hand measure
			
			    (+) Affected hand raw score and

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
6/10 High quality	**CP diagnosis:** 89% (33/37) of those who participated in study received a CP diagnosis **CP Type:** 94% (31/33) of those diagnosed with CP at 12 months had unilateral CP 6% (2/33) had bilateral CP and were excluded from analysis **GMFCS Level:** N/A	**Intervention details:** 30-minute sessions, daily, 6x/week for 12 weeks for a total of 36hrs. For both treatments, there was 6 weeks of intervention, followed by 6 weeks pause, followed by 6 weeks intervention. *Baby-CIMT:* • The non-affected hand was restrained (mitten or something similar) • Training done at home by parents • Parents received coaching and supervision by OT • Weekly home visit by OT • Infant was seated upright and stable • Grasping and toy exploration was the main focus • Each week the focus was based on infants ability and progress • Duration of training was noted in a dairy *Baby massage:* • Full body massage once each day, 6 days/week • 12 weeks duration • Total 72 occasions • Sessions could be 5-30 minutes depending on infants mood	interquartile range (IQR) (-) Non-affected hand raw score and IQR *Parents' sense of confidence and satisfaction of the parenting (mother):* (-) Parenting Sense of Competence Scale (PSCS) *Parents' sense of confidence and satisfaction of the parenting (father):* (+) Parenting Sense of Competence Scale (PSCS)

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		• Parents received 3 sessions of individual instruction from a certified instructor in baby-massage • The number of massages was noted in a diary	

Facchin et al., 2011
 	
Italy
 	
RCT
 	
5/10
 	
Fair quality
	N = 105 children with hemiplegic cerebral palsy
	
	Age at enrollment: 3-8 years
	
	CP diagnosis: 100%
	
	CP Type:
	
	Hemiplegic 100%
	   • right side: 56/105 (53%)
	   • left side: 49/105 (47%)
	
	CP Level (GMFCS) (%):
	
	Level I: 26 (25%)
	Level II: 45 (43%)
	Level III: 34 (32%)
		Modified Constraint-Induced movement therapy (mCIMT)
		(n=39)
		
		vs.
		
		Bimanual Intensive Rehabilitation Program (IRP)
		(n=33)
		
		vs.
		
		Standard Treatment (ST)
		(n=33)
		
		Intervention details:
		
		mCIMT:
		
		• 3 hrs./day, 7 days/week
		• 10 weeks
		• 3x/week at rehabilitation center (1.5 hrs. with therapist leading while parents were present, 1.5 hours with parents leading)
		• 4x/week at home with parents leading
		• Restraint used on dominant hand:
			Post-treatment (10 weeks post baseline):
			
			mCIMT vs. ST
			
			Upper limb function:
			
			(+) Quality of Upper Extremity Skills Test (QUEST): Dissociated movements
			(-) QUEST: Grasps
			(-) QUEST: Weight bearing
			(+) QUEST: Protective extension
			(+) QUEST: Global score
			(+) Besta Scale (BS): Global score
			(+) BS: Grasp
			(-) BS: Bimanual spontaneous use
			
			Activities of daily living:
			
			(-) BS: Activities of daily living in 2-6 yrs old
			(+) BS: Activities of daily living in 7-8 yrs old *
			
			* favoring ST vs. mCIMT
			
			mCIMT vs. IRP

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant

		- Fabric glove with a built in volar stiff plastic splint
		- Prevents flexing fingers/prevents grasping
		- Thumb is kept fixed tight against index finger
		• Intensive rehabilitation program based on unimanual activities
		• Motor learning approach during play sessions and ADLs
		• Child encouraged to solve tasks requiring unilateral use of the paretic hand
		• Tasks goals referred to 4 main domains
		  - Perceptual motor activities
		  - Activities of reaching, grasping, holding, and manipulating
		  - Postural and balance activities
		  - Self care and ADL's
		
		IRP:
		
		• 3 hrs./day, 7 days/week
		• 10 weeks
		• 3x/week at rehabilitation center (1.5 hrs. with therapist while parents were present, 1.5 hours with parents leading)
		• 4x/week at home with parents leading
		• Intensive rehabilitation program based on bimanual tasks/activities
		• Motor learning approach during play sessions and ADLs
		• Child encouraged to solve tasks using both hands
			Upper limb function:
			
			(-) QUEST: Dissociated movements
			(-) QUEST: Grasps
			(-) QUEST: Weight bearing
			(-) QUEST: Protective extension
			(-) QUEST: Global score
			(-) BS: Global score
			(-) BS: Grasp
			(-) BS: Bimanual spontaneous use
			
			Activities of daily living:
			
			(-) BS: Activities of daily living in 2-6 yrs old
			(-) BS: Activities of daily living in 7-8 yrs old
			
			IRP vs. ST
			
			Upper limb function:
			
			(-) QUEST: Dissociated movements
			(-) QUEST: Grasps
			(+) QUEST: Weight bearing
			(-) QUEST: Protective extension
			(+) QUEST: Global score
			(+) BS: Global score
			(-) BS: Grasp
			(-) BS: Bimanual spontaneous use
			Activities of daily living:

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant

		• Tasks goals referred to 4 main domains
		  - Perceptual motor activities
		  - Activities of reaching, grasping, holding, and manipulating
		  - Postural and balance activities
		  - Self care and ADL's
		
		ST:
		
		• 10 weeks
		• 1 hour session, 1-2x/week
		• Frequency and type of intervention depended on age:
		  - Infants received physiotherapy 2x/week
		  - Preschool/school age children received occupational therapy 1x/week
			(-) BS: Activities of daily living in 2-6 yrs old
			(-) BS: Activities of daily living in 7-8 yrs old

Gelkop et al., 2015 Israel RCT 7/10 High quality	**N** = 12 children with congenital hemiplegic cerebral palsy **Age at enrollment:** 1.5 - 7 years **CP diagnosis:** 100% **CP Type:** Unilateral (hemiplegic) 100%	Modified Constraint-Induced Movement Therapy (modified CIMT) (n=6) vs. Hand-Arm Bimanual Intensive Therapy (HABIT) (n=6) **Intervention details:** *Baseline Period* (2 months prior to CIMT or	**At post-treatment (8 weeks):** (Post Baseline Period to Immediate post-intervention) *Bimanual performance:* (-) Assisting Hand Assessment *Upper extremity function:* (+) Quality of Upper Extremity Skills Test (QUEST): Dissociated movement (-) QUEST: Grasp (-) QUEST: Protective extension (-) QUEST: Weight bearing

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
	CP Level (GMFCS): N/A **CP level (MACS):** *Only available for children under 4 years old (n=9): Level I: 2/9 (22%) Level II: 4/9 (45%) Level III: 3/9 (33%)	HABIT intervention): • 2-3 sessions per week (40-60 min/session) of occupational therapy (OT) and physical therapy • Focus of sessions was to improve strength, range of motion, and awareness of hand through guided movements (neurodevelopmental theory) • Stretching included in sessions *Intervention Period (CIMT and HABIT)* • CIMT or HABIT was provided for 2 hrs./day, 6 days/week for 8 weeks • Intervention provided during the children's regular preschool or kindergarten hours • CIMT or HABIT sessions were divided into 1 hour individual sessions (1:1 with OT) and 1 hr. group session with 2-3 interventionalists (ratio of 1:2 or 1:1 interventionist to child ratio) • Interventionists included OTs and therapist assistants • Each child was given an individualized program according to their specific abilities • Both approaches involve intensive, progressive task practice based on motor learning approaches • Age specific encouragement provided to ensure activities were motivating • Activities included activities of daily	

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		living and a variety of child-friendly games which could be carried out indoors or outdoors *CIMT:* • Restraint of the less-affected upper extremity with practice of unimanual tasks using affected upper-extremity • Custom made gloves on less-affected hand was worn in only the second hour of CIMT • Fine-motor and gross motor activities catered to the age of the child were performed to elicit movements of the more affected hand (unimanual activities) *HABIT:* • Absence of restraint • Task practice using fine and gross motor movements was progressed bimanually • Activity selection was based on the ability of the child's paretic hand and focused on using the assisting hand for tasks requiring complex bimanual coordination • Children were encouraged to participate in identifying movements to complete an action (problem solving)	

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant

Hoare et al., 2013
 	
Australia
 	
RCT
 	
8/10
 	
High quality
	N = 34 children with unilateral CP
	
	Age at enrollment: 18 months - 6 years old
	
	CP diagnosis: 100%
	
	CP Type: Unilateral
	
	GMFCS Level: N/A
		BoNT-A and modified constraint-induced movement therapy (mCIMT) (n=17)
		
		vs.
		
		BoNT-A and Bimanual Occupational Therapy (BOT) (n=17)
		
		Intervention details:
		
		Interventions began 1 month after BoNT-A injection
		• 60 min 2x/week for 8 weeks
		• Individual clinic-based treatment sessions
		• Individualised home program provided to each child
		
		mCIMT:
		
		• Neoprene glove worn on dominant, least impaired hand to restrict use of that limb
		• Glove worn 3 hours per day, 7 days per week for 8-week treatment period, inclusive of therapy time and home programme
		• Glove use limited to 30 min duration in therapy sessions
		• Unimanual tasks used to facilitate
			At post-treatment (8 weeks):
			
			Bimanual performance:
			
			(-) Assisting Hand Assessment (AHA)
			
			Quality of upper limb movement:
			
			(-) Quality of Upper Extremity Skills Test(QUEST): Grasp
			
			(-) QUEST: dissociated movement
			
			Occupational performance:
			
			(-) Pediatric Evaluation of Disability Inventory (PEDI) (Caregiver reported)
			
			    Self-Care Domain
			       (-) Functional skills
			       (-) Caregiver assistance
			
			(-) Canadian Occupational Performance Measure (COPM) (caregiver responses)
			
			    (-) Performance
			    (-) Satisfaction
			
			Goal attainment:
			
			(-) Goal Attainment Scale (GAS)

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant

		repetitive practice of movement and skills of impaired limb
		
		BOT:
		
		• Repetitive practice of bimanual activities
		• AHA item difficulty hierarchy used to guide selection of specific activities
		• Home programme had no time requirements
			Follow-up (6 months post BoNT-A Treatment)
			
			Quality of upper limb movement:
			
			(+) QUEST: Grasp
			(-) QUEST: dissociated movement
			
			Occupational performance:
			
			(-) PEDI
			
			    Self-Care Domain
			      (-) Functional skills
			      (-) Caregiver assistance
			
			(-) COPM
			
			    (-) Performance
			    (-) Satisfaction
			
			Goal attainment:
			
			(-) Goal Attainment Scale (GAS)

Taub et al., 2004 USA RCT	**N =** 18 Children diagnosed with hemiparesis associated with cerebral palsy **Age at enrollment:** 7-96 months. (mean age - 41.5 months)	Pediatric Constraint-Induced Therapy (n=9) vs. Conventional Treatment (n=9)	**At post-treatment (3 weeks):** *Upper extremity movement:* (+) Emerging Behaviors Scale (+) Pediatric Motor Activity Log – parent reported questionnaire (+) Toddler Arm Use Test

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
5/10 Fair quality	**CP diagnosis:** 100% **CP Type:** Unilateral: 13/18 (72%) Bilateral: 5/18 (28%) **GMFCS Level:** N/A	**Intervention details:** *Pediatric Constraint-Induced Therapy:* • 6 hours/day of treatment for 21 consecutive days • Treatments provided by occupational therapists, physical therapist (PT) or PT assistant • Focused on encouraging the use of the more-affected arm and hand (referred to as "shaping") during tasks that were motivating to child • Reaching, grasping, holding, manipulating an object and bearing weight on the arm, and making hand gestures were broken down to component skills and worked on individually • Everyday tasks also practiced • Bivalved casting (upper arm to fingertips) of the child's less-affected upper extremity was used during treatment period. *Control Group:* • Children continued their participation in conventional treatments from a PT and/or OT for a mean of 2.2 hours per week	

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
Wallen et al., 2011 Australia RCT 8/10 High quality	**N** = 50 children with hemiplegic CP **Age at enrollment:** mean age = 48mths **CP diagnosis:** 100% **CP Type:** Hemiparesis 100% **CP Level** **GMFCS (%):** Level I: 33 (67%) Level II: 15 (31%) Level III: 1 (2%) **MACS (%):** Level I: 2 (4%) Level II: 37 (77%) Level III: 8 (17%) Level IV: 1 (2%)	Modified constraint-induced therapy (n=25) vs. Intensive occupational therapy (n=25) **Intervention details:** *Modified constraint-induced therapy:* • 8 weeks • 2 hours per day of wearing mitt on unaffected-hand (in sessions of minimum 30 minutes), 7 days/week • Weekly session with occupational therapist to demonstrate therapy with the child and provide support/education to the family. • Mitt: fabric with a solid thermoplastic volar insert preventing grasp and release • Mitt could be worn at home, preschool, other environments where adjunct therapy could be provided • Adjunct therapy: based on motor learning principles, involved self generated voluntary repetitions of specific movements of the affected upper limb, incorporated into play activities • Movements targeted were those required for ADL selected by parents as priorities for interventions.	**Post-treatment (10 weeks from baseline):** *Occupational performance:* (-) Canadian Occupational Performance Measure (COPM) - Performance (-) COPM - Satisfaction (-) Goal Attainment Scale (GAS) *Motor function:* (-) Assisting Hand Assessment (AHA) (-) Revised Pediatric Motor Activity Log (Frequency & quality) (-) Modified Tardieu Scale (Elbow flexors, pronators, wrist flexors) **Follow-up (6 months from baseline):** *Occupational performance:* (-) COPM - Performance (-) COPM - Satisfaction (-) GAS *Motor function:* (-) AHA

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		Intensive occupational therapy: • 8 weeks • Daily home program of approximately 20 minutes (parents could increase or decrease based on preferences and other commitments) • Weekly session with occupational therapist to demonstrate therapy with the child and provide support/education to the family. • Included techniques aimed at minimizing impairments (ex: stretching, casting, splinting) and enhancing activities (Ex: motor training, environmental modification, practice of specific goal activities) • Considered different from "customary care" as it was Goal-directed, intensive, supervised and involved a formal home program.	(-) Revised Pediatric Motor Activity Log (-) Modified Tardieu Scale
Xu et al., 2015 China RCT 8/10	**N = 68 children with hemiplegic CP** **Age at enrollment:** 2-14 years **CP diagnosis:** 100%	Constraint-induced movement therapy (CIMT) (n=22) vs. Constraint-induced movement therapy plus electrical stimulation (CIMT-ES) (n=23)	***CIMT-ES vs. CIMT:*** **At post-treatment (2 weeks from baseline):** *Muscle recruitment and coordination:* Surface EMG (-) Root mean square (RMS) of involved wrist extensor (-) RMS of involved wrist flexors (-) RMS of uninvolved wrist extensor

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
High quality	**CP Type:** Unilateral (Hemiplegic) 100% **CP Level (GMFCS) (%):** Level I: 60/68 (88%) Level II: 8/68 (12%) **CP Level (MACS) (%):** Level I: 10/68 (15%) Level II: 49/68 (72%) Level III: 9/68 (13%)	vs. Traditional occupational therapy (OT) (n=23) **Intervention details:** • 3 certified OTs provided treatments for all children • OTs completed follow-up phone calls once every 2 weeks to monitor home based exercise programs *Traditional occupational therapy:* • 3 hours a session, 5 days/week for 2 weeks • With 1 hour home-based exercises program to be done daily • After above intervention, home-based exercise program was increased to 2 hours daily for 6 months • Parents completed activity log to monitor compliance • Functional unimanual and bimanual training • Advice and treatment aimed at reducing spasticity, improving hand function and ADLs • The provision of appropriate orthotics	(-) RMS of uninvolved wrist flexors (-) Integrated EMG (iEMG) of involved wrist extensors (-) iEMG of involved wrist flexors (-) iEMG of uninvolved wrist extensors (-) iEMG of uninvolved wrist flexors (-) Cocontraction ratio *Grip strength:* (-) Sphygmomanometry *Motor function:* (-) Upper extremity functional test (-) Global rating scale **Follow-up (3 months from baseline):** *Muscle recruitment and coordination:* Surface EMG (-) RMS of involved wrist extensor (-) RMS of involved wrist flexors (-) RMS of uninvolved wrist extensor (-) RMS of uninvolved wrist flexors (+) iEMG of involved wrist extensors (-) iEMG of involved wrist flexors (-) iEMG of uninvolved wrist extensors (-) iEMG of uninvolved wrist flexors (+) Co-contraction ratio

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		Constraint-induced movement therapy (with orthosis of the uninvolved hand): • 3 hours a session, 5 days/week for 2 weeks • With 1 hour home-based exercises program to be done daily • After above intervention, home-based exercise program was increased to 2 hours daily for 6 months • Parents completed activity log to monitor compliance • Personal instruction from professionals involving the specific practice of Designated target movements • Children completed therapeutic functional activities using the involved hand • The difficulty of the activity was increased by changing either temporal or spatial/accuracy tasks constraints *Constraint-induced movement therapy (detailed above) plus electrical stimulation:* • Electrical stimulation was applied 20 minutes/day, 5 days/week, for 2 weeks • Extensor carpi radialis (of involved UE) • Extensor digitorum (of involved UE) • MyoTrac Infiniti dual-channel neuromuscular electrical stimulation unit and reusable carbonized-rubber electrodes	*Grip strength:* (-) Sphygmomanometry *Motor function:* (-) Upper extremity functional test (-) Global rating scale **Follow-up (6 months from baseline)** *Muscle recruitment and coordination:* Surface EMG (-) RMS of involved wrist extensor (-) RMS of involved wrist flexors (-) RMS of uninvolved wrist extensor (-) RMS of uninvolved wrist flexors (+) iEMG of involved wrist extensors (-) iEMG of involved wrist flexors (-) iEMG of uninvolved wrist extensors (-) iEMG of uninvolved wrist flexors (+) Cocontraction ratio *Grip strength:* (-) Sphygmomanometry *Motor function:* (-) Upper extremity functional test (-) Global rating scale

Constraint-Induced Movement Therapy Results Table

Author, Year, Country, Design, PEDro score, Rating	Sample Size	Intervention	Outcomes and significance: (+) significant (-) not significant
		• Frequencies set at 50Hz, pulse rate 30 pulses per second with 300us of amplitude (max amplitude of 100mA). • ON time was set to 12 seconds with 1 second of rise and decay and an OFF time for 12 seconds. • Amplitude was increased slowly to the child's tolerance without causing discomfort, and adjusted to induce muscle contraction for all children.	***CIMT-ES vs. OT:*** **Post treatment (2 weeks from baseline):** *Muscle recruitment and coordination:* Surface EMG (-) RMS of involved wrist extensor (-) RMS of involved wrist flexors (-) RMS of uninvolved wrist extensor (-) RMS of uninvolved wrist flexors (-) iEMG of involved wrist extensors (-) iEMG of involved wrist flexors (-) iEMG of uninvolved wrist extensors (-) iEMG of uninvolved wrist flexors (-) Cocontraction ratio *Grip strength:* (-) Sphygmomanometry *Motor function:* (-) Upper extremity functional test (-) Global rating scale **Follow-up (3 months from baseline):** *Muscle recruitment and coordination:* Surface EMG (+) RMS of involved wrist extensor

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			(-) RMS of involved wrist flexors (-) RMS of uninvolved wrist extensor (-) RMS of uninvolved wrist flexors (+) iEMG of involved wrist extensors (-) iEMG of involved wrist flexors (-) iEMG of uninvolved wrist extensors (-) iEMG of uninvolved wrist flexors (+) Co-contraction ratio *Grip strength:* (-) Sphygmomanometry *Motor function:* (-) Upper extremity functional test (-) Global rating scale **Follow-up (6 months from baseline):** *Muscle recruitment and coordination:* Surface EMG (+) RMS of involved wrist extensor (-) RMS of involved wrist flexors (-) RMS of uninvolved wrist extensor (-) RMS of uninvolved wrist flexors (+) iEMG of involved wrist extensors (-) iEMG of involved wrist flexors (-) iEMG of uninvolved wrist extensors (-) iEMG of uninvolved wrist flexors (+) Cocontraction ratio

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