LIITE S67. Toimintaterapian katsauksen alkuperäistutkimusten interventioiden kuvaukset / alle 18-vuotiaat CP-kuntoutujat.

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<th>First author</th>
<th>Type of intervention</th>
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<td>Bumin et al. 2001</td>
<td>Group and individual sensory-perceptual-motor training was applied according to the treatment protocol below: 1) Sensory systems input activities (wheel-barrow hand walk, swimming); 2) Activities for body awareness (window game, body pushing); 3) Vestibular system activities (swing, jumping on a trampoline, climbing the wall bar); 4) Tactile system activities (stereognosis training, textured road); 5) Motor planning activities (statue spinning, mystery writing); 6) Balance and postural responses activities (balance activities used were: two knees and two hands, two hands and one foot, two elbows and one knee, two knees and kneel hand push); 7) Postural responses and ocular control activities (ball catch, two person ball catch, ball foot toss, throwing a ball into a basket and a target); 8) Bilateral motor co-ordination and motor planning (Inchworm art, stick ball); 9) Visual spatial perception (matching the geometric shapes, puzzle activities); 10) Fine motor skills and motor planning (beads stringing, pegboard activities, writing at different positions, tear art on knee position, button up, knotting, design copying); 11) Right-left discrimination training; 12) Standing and walking training. Setting and provider: in the clinic, a therapist carried out the activities individually (group 1) or in subgroups of 4 children (group 2).</td>
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| Carlsen 1975      | The facilitation approach: activities are generated toward sequential normalization of postural tone and gross coordination and enhancing sensorimotor interaction with the environment as described by Bobaths, Rood and Ayres. The assumption is that interaction on a gross sensorimotor level facilitates a maturational improvement in the fine adaptive components of development. The majorities of activities were directed toward developing sensory organization, postural stability, and controlled movement. The beachball, rocking and scooterboards, vestibular stimulation equipment, and carpeted barrels were most frequently used. Home program activities utilized the same movements on available equipment. Whenever possible, activities were chosen from a published source available to other therapists. The functional approach: the method is directed toward improving the child’s ability in specific developmental tasks, particularly in fine-motor-adaptive and self-care skills. This practice occupational therapist assumes that gross motor activities are the province of physical therapy and occupational therapist should enable the child to care for himself in daily life tasks within the limits of his disability. The program emphasized positioning, adaptive hand, and self-care skills. Toys were selected in accordance with Franzen’s interest levels, age-appropriate items suggested by authors of evaluation.
instruments, and those cited by Gesell and Amatruda. Instructions in feeding and dressing followed programs outlined by Finnie and Müller.

**Setting and provider:** In both groups parents carried out the group sessions in the clinic under supervision of an occupational therapist, who planned the treatment activities, described and demonstrated them to parents.

**Upper extremity treatment**

**Jannink et al. 2008** The virtual reality video game training: The EyeToy: Play (Sony Computer Entertainment Group Europe Ltd) was used. The EyeToy: Play consists of a game-disc and a USB camera that is plugged into a Play Station 2. Based on prior interviews with occupational therapists and physiotherapists, different EyeToy minigames were selected for the training sessions. Within these games, patients had to make gross elbow and shoulder movements to “touch” and manipulate the virtual objects on the television screen. The following minigames were selected for the virtual reality sessions: Kung Foo (participants were challenged to hit virtual characters jumping from a Chinese tower), Wishi Washi (participants were challenged to wash virtual windows by making gross arm movements), and Keep Ups (participants were challenged to keep up a virtual ball with their arms).

**Crompton et al. 2007** Upper limb dexterity training program: group-based task-related training: repeated practice of meaningful, functional activities or components of such activities, to learn more efficient and effective motor skills. Each session began with 5–10 minutes of upper limb warm-up tasks including stretching, of upper limbs, using large arm movements. The warm-ups were followed by 3 activities of 10–20 min. each, which involved games and tasks requiring manipulation and dexterity. Activities varied across the weeks and included pen, paper, and scissor tasks, fine-object construction, in-hand manipulation activities and combining stabilization and manipulation of objects in bimanual tasks. To develop speed “mad minutes” were incorporated where children worked as fast as possible at particular task. 11.5% of the time was spent on warm-ups, 79.8% on general dexterity/manipulation activities and 8.9% on pre-writing or handwriting tasks.

Wallen et al. 2007 Occupational therapy was not standardised, but determined by the treating clinicians to ensure that intervention was appropriate for participants to meet their individual goals. Intervention techniques included those aimed at improving impairment (e.g. stretching, casting, splinting), and enhancing activities (e.g. motor training, environmental modification, practice of specific goal activities). 1 x 60 min./week for 12 weeks (Amount of therapy that is generally feasible for families to attend and therapists to provide.)
Virtual reality assisted upper limb training: Mandala * Gesture Xtreme IREX Virtual Reality (VR) system was used. The system uses a video camera as a capturing and tracking device to put the user inside VR experiences. The user sees him/herself on a TV screen and the virtual environment responds to his/her movements. The user does not have to wear, touch or hold anything. Participants sat on a bench or in their wheelchair in a lab environment viewing a large TV screen with a video camera mounted on a top. A random number of VR applications were given to the participants. Each VR application required them to reach with their arms to the targets. Participants could choose the application to be played. There were sports applications, music programs and game-like programs. In all the programs participants could see themselves as part of the application.

Intensive and regular neurodevelopmental treatment (NDT): therapists used facilitation and handling using principles of NDT to focus on changing impairments and improving upper-extremity quality of movement.

Casting: In addition of NDT therapy children received a bivalved upper extremity cast, which covered the wrist and was extended from below the elbow to the palm of the hand. The wrist was held to position of neutral to 10 degree extension and the thumb and the fingers were free, so that their movement was not affected.

Home programs were given for the casting period only and consisted NDT therapy activities to be carried out at home.

Intensive and regular neurodevelopmental treatment (NDT): the therapist uses movement and handling to alter tone and to facilitate normal movement patterns and postural reactions, while abnormal tone and reflex activity is inhibited. As voluntary control increases the therapist decreases the amount of handling and challenges child to attain more functional postures and activities against gravity. The principals of NDT intervention were similar for all children; each child’s programme was dictated by their unique clinical needs. Goals set most frequently included weight-bearing, reaching and grasping, rotation, bilateral co-ordination, and upper-extremity dissociation.

Home programmes consisted of specific NDT therapy activities.

Bivalved upper extremity cast covered the wrist and was extended from below the elbow to the palm of the hand. The wrist was held to position of neutral to 10 degree extension and the thumb and the fingers were free.

Intensive upper extremity treatment

The pediatric constraint induced therapy (CI): use of the more affected arm was trained intensively by a behavioral procedure termed “shaping”. Shaping is a procedure whereby the subject is required to improve performance, usually in small steps, at each iteration of a movement in order to obtain reward. There was no training on weekends.
was carried out in the context of play to maintain the child’s interest and attention and also during numerous activities of daily living (e.g., feeding, dressing). The less affected arm was restrained in a long arm cast for the entire period of treatment in order to counteract the usually overwhelmingly strong tendency to use the less affected arm; it thereby promoted increased use of the more affected arm. The cast extended from axilla to just beyond the finger-tips. The cast was bivalved. “The transfer package,” were used to induce transfer of therapeutic gains from the treatment period to usual life activities. 1) The treatment was carried out in the child’s home to maximize the similarity between the conditions of training and the normal life situation. In addition, training was carried out on trips outside of the home; e.g., a petting zoo, a botanical garden, a fast food restaurant, preschool. 2) The caregiver was trained to carry out the shaping of movements. 3) A written list of training tasks was drawn up for the caregiver to carry out over the weekends; the caregiver kept a diary of what was actually done. 4) The PMAL was administered to the caregiver daily to determine the amount and quality of use of the more-affected upper extremity during the treatment period. 5) Problem solving was carried out with the caregiver to try to deal with and circumvent perceived barriers to the child’s use of the arm in specific activities. 6) At the beginning of the fourteenth day of treatment the cast was removed and the child received training in using the more affected arm in bilateral activities for the final 2 days of treatment. 7) Written training instructions were given to the caregivers so that they could continue training after the end of formal treatment to maintain the therapy gains. 8) Teachers in preschool and other significant individuals were enlisted by caregiver or therapist to keep reminding the child to use the more affected arm in activities of daily living. 9) Monitoring of compliance by the caregivers with the instructed post-treatment protocol by a weekly phone call for the first month after treatment in which the PMAL was administered and problem solving carried out. Restraint of the less affected arm for the entire 3 week period. Weekly phone call for the first month after treatment: monitoring of compliance by the caregivers. Written training instructions were given to the caregivers so that they could continue training after the end of formal treatment to maintain the therapy gains. Setting and provider: Treatment by a therapist on the weekdays. Caregiver was trained to carry out the shaping of movements and carry out training on weekends. The treatment was carried out in the child’s home and on trips outside of the home, in context of play and activities of daily living (e.g. feeding, dressing).

Gordon et al. 2007 Hand-arm bimanual intensive training (HABIT): the practice begun a regular routine of involved-hand use in the child’s environment so that parents or caregivers could solve problems with staff members, with hope that this interface would continue beyond intervention. Lists of age-appropriate fine motor and manipulative cross-motor activities were established. Specific activities were selected by considering the role of the involved limb in the activity (e.g. stabilizer, manipulator, active/passive assist). Task demands were graded to allow for success, and difficulty was progressed with specific
rules associated with success. Task performance was recorded, and both positive reinforcement and knowledge of performance were used to motivate performance and to reinforce target movements. Bimanual activities were selected that improved each child’s personal movement deficits and engaged the child in activities of increasingly complex bimanual coordination. Directions were given to the child before the start of each task in order to specify how each hand would be used during the activity and to avoid use of compensatory strategies. Interventionists were instructed to avoid urging the child to use his/her involved hand and avoid physically inhibiting use of the non-involved hand during an activity. Children were engaged in two types of structured practice: a) Whole task practice: activities were performed continuously for at least 15 to 20 minutes but no longer than 1 hour. Targeted movements and spatial and temporal movement coordination were practiced within the context of completing a task (e.g. playing a board game). b) Part task practice involved practicing a targeted movement exclusive of other movements. It is analogous to shaping in psychology and CIMT literature. Specifically, symmetrical bimanual movements were often used to elicit a targeted movement (e.g. putting game pieces away simultaneously with each hand) because of the simplicity of control. The frequency of successful task completion (the number of times the child succeeded in 30s) was recorded, and the task was repeated five times. Task difficulty was graded as the child’s performance improved by requiring greater speed or accuracy, or by providing tasks that required more skilled use of the involved hand and arm (e.g. moving from activities in which the involved limb acted as a stabilizer to activities that required manipulative skills). Interventionists altered constraints to grade tasks according to desired target movements (e.g. they built up the grasp surface of an object by adding tape and removed it as grasp improved) (i.e. as a stabilizer or manipulator). Practice was structured to promote increased intensity: the involved hand was not merely used to assist in every activity. Setting and provider: At clinic with groups of four children.

DeLuca et al. 2006 Pediatric constraint induced movement therapy (CIMT). On the first day, the child’s less involved upper extremity was casted from the upper arm to the fingertips using a lightweight fiberglass cast. The cast was bivalved to provide for easy weekly removal to check skin integrity, clean the arm, and allow range of motion. The therapist presented interesting and useful activities to the child in ways that provided immediate, frequent, and repetitive rewards, and supportive gestures, with occasional food and toy incentives for each of the child’s observed efforts. Treatment included tasks such as bearing weight on the arm, reaching, grasping, holding, manipulating an object, fine motor hand skills, and activities of daily living that were age appropriate (e.g. dressing or undressing, eating, and grooming). The child’s behavior was “shaped” to promote increasingly more advanced or sophisticated levels of performance with the impaired upper extremity. Tasks usually were divided into small component skills and then chained together as the child’s ability increased. When the child demonstrated a new skill or movement, the therapist proceeded to “shape” this by increasing the demands for more precision,
strength, fluency, automaticity, and/or functional versatility, as well as self-initiation of the new skill or movement. The therapist used precise verbal directions about the best way to enact the movement to help the child learn how to achieve a higher level of performance. For many activities, the therapist also helped the child by demonstrating the “next” stage of behavior and sometimes directly prompted or physically guided some of the early attempts so that the child had a working model of the target behavior and was ensured of many successes. To keep the child interested and motivated, with many opportunities to return to favorite activities for review and continued upper extremity skill progression throughout the day and over the course of treatment. Therapists encouraged the parents to join in the therapy-related activities and to learn how to use the combination of facilitation techniques and frequent, immediate praise or rewards to practice and extend their child’s emerging new behaviors. One of the most important and challenging aspects of this intensive form of therapy is the near-constant provision of treatment. Rather than provide the child with extended “breaks” or rest periods, the therapists learned to use natural transitions to change the pace, to hold children’s engagement at high levels, and to motivate the child to be aware of and to use his or her upper extremity in all activities throughout the day.

Setting and provider: Trained pediatric constraint-induced therapist with a degree in occupational or physical therapy plus specialized training. Treatment was all one on one, carried out in natural settings while engaging in a wide range of everyday activities.

Charles et al. 2006

Constraint induced therapy (CI) children wore a sling on the non-involved upper extremity for the entire time during an intervention session (6h) and the sling was removed at the end of each session. The sling was strapped to the child’s trunk and the distal end was sewn shut to prevent use of the non-involved hand. Time out of the sling during the 6-hour period was allowed for designated activities (e.g. toileting) and could not exceed 30 minutes per day. At the end of each day, each child in the CI-group went home with an exercise program that involved practice with the involved extremity (without any restraint). During each 6-hour session each child received individualized instruction from a trained interventionist involving specific practice of designated target movements. Children were engaged in play and functional activities that provided two types of structured practice (shaping and repetitive task practice) using the involved upper extremity, especially the hand. Shaping involved practicing a target movement in isolation of other movements under a time constraint of 30 seconds. As soon as the target movement was performed successfully, the difficulty of the task was increased by changing either temporal or spatial/accuracy task constraints. Success was defined as achieving either the same or increasing frequency in three out of five consecutive trials. The choice of changing either spatial/accuracy or temporal constraints was dependent on the constraints of a particular task and the target movements that were elicited by the task. Repetitive task practice involved performing a target movement in a functional context or in relation to other movements. Children were given positive verbal reinforcement throughout a task for performance of target movements.
**provider:** A trained interventionist provided the therapy at clinic with groups of 2–4 children.

**Eliasson et al. 2005**  
*Adapted model of Constraint induced therapy (mCI):* the children wore a restraining but fairly comfortable fabric glove with a built in volar stiff plastic splint on the dominant hand, which prevented them from flexing their fingers, and, thereby, prevented the ability to grasp. The thumb was kept in a fixed position tight against the index finger. The children could, use the hand for support or for breaking a fall. The treatment sessions with the constraining glove were guided by key words: motivation, activities of an appropriate level of difficulty, and repetition. Motivation to use the hemiplegic hand was achieved through the child’s individual inner drive and motivation for play. The chosen tasks for training had to be at the right level of difficulty. The focus for the child was always to complete a game or play with a specific toy, the focus of the therapist /parent/ preschool teacher was to create an enjoyable situation that would involve sufficient challenge and numerous opportunities for repetition. Focus was not on facilitating specific movement patterns. The children were encouraged to perform the tasks in any or differing manners, either finding their own strategies or being helped to find solutions. It was considered to be important that the children experienced how their hemiplegic hand was functioning and to learn to overcome their limitations, such as pronated forearm or flexed wrist. **Setting and provider:** in the children’s usual environment, at home or/and in their preschool setting. It was assumed that a rich natural environment in which a wide variety of different situations would be encountered was important to facilitate the learning process. The parents and/or preschool teachers were responsible for accomplishing the intervention on a daily basis. This was done with supervision from a therapist once a week. Before the onset of the intervention period, an introductory seminar was arranged for parents and the daycare centre personnel involved.

**Sung et al. 2005**  
*Forced Use Therapy (FUT):* a short-arm Scotchcast that extended from just below the elbow to the fingertips was applied to the unaffected upper extremity. Children received occupational therapy twice a week for 6 weeks. Each treatment session, which lasted 30 minutes, consisted of individualized functional occupational therapy for the affected hand after the patient did stretching exercises for 5 to 10 minutes. Functional occupational therapy started with concrete therapeutic goal setting. Tasks such as reaching, grasping, holding, manipulating an object, bearing weight on the arm, and making hand gestures were divided into small component skills, which were worked on individually and later chained together to complete a target activity. The occupational therapist also incorporated activities of daily living (ADLs), including eating, grooming, dressing, and using the toilet, into the therapy sessions. The patients were not enrolled in a daily intensive training program at the hospital after the cast was applied. Rather, they received conventional occupational therapy and parents were instructed to
encourage their children to use the affected hand in daily routine activities. **Setting and provider:** Conventional occupational therapy was provided outside the hospital.

**Taub et al. 2004**

The pediatric Constraint induced therapy (CI): the less-impaired upper extremity was casted from upper arm to fingertips by using a lightweight bivalved fibreglass cast. The day after casting, the CI therapy training procedures (shaping) began. Shaping involved presenting interesting and useful activities to the child in ways that provided immediate, frequent, and repetitive rewards (primarily verbal praise, smiles, and supportive gestures, with some food and toys) for the child’s efforts and increasingly functional use of the more-impaired extremity. 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. When the child demonstrated a new movement skill, the therapist proceeded to shape this by increasing the demands for more precision, strength, fluency, automaticity, and/or functional versatility. The pediatric CI therapist also incorporated everyday tasks (e.g. dressing/undressing, eating, bathing, and grooming) in the therapy sessions. Shaping tasks were selected by considering: 1) the family and child’s goals, 2) the intrinsic motivation, 3) promotion of independence by acquisition of age-appropriate self-help skills, and 4) the movements that therapists believed had the greatest potential for improvement. Parents were encouraged to join in therapy-related activities and encourage their child to use newly acquired skills. When a child showed signs of fatigue, frustration, or reduced interest, the therapist adapted the activities but did not cease the therapy. Rest intervals were given as needed. **Setting and provider:** the intervention was carried out in natural settings. Occupational therapists, physical therapists, or a physiotherapy assistant provided the therapy. Parents were encouraged to join in therapy-related activities and encourage their child to use newly acquired skills when the therapist was not present.

**Occupational therapy consultation**

Okimoto et al. 2000

Consultation to improve mother-child interaction: mothers received consisted: a) decreasing a constant physical contact, maternal verbal and nonverbal directiveness and noncontingent communication and b) increasing maternal use of face-to-face contact and the use of a variety of communication strategies such as statements, questions, praises. One of the basic premises of the instruction was that mothers and infants should “take turns” during the verbal and nonverbal interactions. A number of techniques were given to the mothers that would make turn-taking easier for them. Mothers also learned a variety of therapeutic positions to use with their infants during play with and without adaptive seating equipment. The hope was, that the mothers would modify the amount, and the quality of their holding patterns, while becoming more aware of value of both proper therapeutic holding positions as well as the use of adaptive seating equipment.
Following their instruction and practice, mothers were given a handout reviewing the information presented. **Setting and provider:** occupational therapist at child’s home. **Consultation to improve motor function:** NDT-based occupational therapy focused on such areas as sitting balance and normalizing muscle tone through facilitation of normal developmental movement patterns. Mothers were taught one of the treatment techniques used during the treatment period. They first received a verbal explanation and a nonverbal demonstration of the treatment technique they could use with their child. Then mothers practiced the technique with their child with feedback from the therapist. Following their instruction and practice, mothers were given a handout reviewing the information presented. **Setting and provider:** occupational therapist certified in NDT.