

Baby-CIMT Manual



Ann-Christin Eliasson and Lena Sjöstrand

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The baby-CIMT manual

This manual has been developed to help therapists start a baby-CIMT programme. The programme is for infants below one year of age at risk of developing unilateral cerebral palsy (CP). Baby-CIMT is based on experience from a research project conducted at Karolinska Institutet, Stockholm, Sweden.

The first part describes the theoretical perspective and important issues in the organization of baby-CIMT. This is followed by a description of the baby-CIMT programme and the agenda for therapists, including important aspects of preparation and treatment planning. The last part includes several worksheets to be used by therapists and parents.

It is important to recognize that baby-CIMT is a specific method that has to be used to complement other important aspects of development for babies in their everyday environment.

We hope you will find this manual useful in clinical practice. Should you have any questions, feel free to contact us:

Professor Ann-Christin Eliasson, occupational therapist

Lena Sjöstrand, occupational therapist.

Neuropediatric Research Unit, Karolinska Institutet, Stockholm, Sweden

Email; ann-christin.eliasson@ki.se

What is baby-CIMT?

Baby-CIMT is a further modification of modified constraint-induced movement therapy (CIMT), adapted to very young babies at risk of developing unilateral CP. Its main purpose is to increase the use of the involved hand. Baby-CIMT is intended to give the child numerous practice repetitions with the affected hand, so that its development keeps up with that of the other hand. To achieve this, some blocking of the non-involved hand is typically needed during the practice time. Children are stimulated to use the involved hand by a selected battery of commonly available toys. The practice should occur in the infants' everyday environment, provided by the parents under therapist supervision during weekly home visits.

The evidence for early intervention

Early intervention is important because learning-induced brain plasticity at an early age seems to have a unique impact on brain development. Several researchers have demonstrated that activation and stimulation significantly affect neural activity in the sensory and motor cortex [1]. In young children, there are ongoing structural changes in the corticospinal system directed to hand function [2]. These observed changes are activity dependent [3, 4]. In baby-CIMT, we take advantage of the great plasticity of the young brain and recent knowledge of how to provide training with the aim of influencing future development of hand function.

Theoretical assumptions of baby-CIMT

Theoretically, this training is closely connected to Bronfenbrenner and Morris's ecological model of child development [5]. This model highlights the importance of the complex interaction between the active child and other people, objects, and symbols in the immediate environment. The model is child centred, which is important even for babies at a young age. Bronfenbrenner and Morris [5] state that unconditional love and time spent with a child are the two most important agents providing energy for development. This claim has served as an important guideline in discussing training with parents.

Another influence is dynamic systems theory, an ecological model highlighting the importance of children's self-initiated activity [6]. According to this perspective, development is driven by children's unique characteristics and capacity for exploration, through which they discover new and more adaptive forms of activities. This means that children do not use any "right" or "wrong" movements when playing. The importance of a rich natural environment, in which a good selection of toys and other objects facilitates the use of the hand, is emphasized.

The third important theoretical assumption is based on principles of motor learning, focusing on understanding how individuals acquire and perform skilled motor activities [7]. Selecting appropriate tasks at "just the right level" is crucial for everyone – including young babies. Through repetitive practice, babies acquire skilled behaviour. Repetition is the key element along with feedback on performance. Babies are very sensitive to encouragement and the way parents respond to them.

Coaching strategies [8] and the motivational interview [9] together constitute the fourth theoretical approach that therapists can use to help parents become training providers, successfully supporting their children's development. Coaching strategies provide emotional support, information exchange, and a structured process. They include a process of goal setting, exploring options, planning and carry out the plan, performance checking, and generalizing. Furthermore, coaching helps parents identify ways of being successful training providers. The motivational interview is a technique used by therapists to encourage parents to be confident problem solvers and treatment providers. Simply stated, therapists should ask questions rather than simply coming up with answers.

Baby-CIMT, for whom and when

Starting age

It is recommended that baby-CIMT start when asymmetric hand use is first observed, commonly at three to five months of age. As the training focus is the infant's self-initiated actions, training should start when the baby begins to be interested in objects and tries to grasp them. At three months, there is usually some grasping ability; at four months, the baby is increasingly handling and grasping toys, making the training easier to provide. Children can of course begin the training at a later age. At an early age, it can be difficult to know if the asymmetric hand function will lead to unilateral CP or disappear. However, training provided in an appropriate way will not harm any child's development.

Organization of the baby-CIMT programme

The programme includes several components, all of which must be recognized and implemented by the therapist. There is one agenda for the therapist, but there is also an agenda for the parents which must be introduced by the therapist before starting the programme.

Before starting a baby-CIMT programme, it is important to give the families enough information so they can decide whether they want to take part in it. The "Before training starts" mind map for parent information and education (Worksheet 1) is a useful tool, helping the therapist cover the important issues to be discussed with parents.

We expect the training to be:

- provided in the infants' everyday environment and performed by the parents
- supervised by a therapist during weekly home visits
- provided for 30 minutes per day for at least two six-week periods (>42 hours is recommended)
- directed to the involved hand by restraining the non-involved hand
- evaluated before and after the training period

Dosage and intensity

We suggest distributed practice, 30 minutes per day, six to seven days per week, for two six-week periods separated by a six-week break; a third period might be needed later on. Though it is still unclear what the optimal dosage is, the suggested total dosage of practice is >42 hours. The duration of each session (30 minutes per day) is shorter than in most protocols, but the overall programme duration is longer (two six-week periods separated by a six-week break) than most previous protocols. Studies of older children commonly recommend dosages of 60 hours or more for long-term effectiveness [10]. The choice of duration was based mainly on practicality and feasibility. Babies' attention spans are short, and even 30-minute sessions are commonly divided into two segments for younger children. At this age, limited time is available for training because other needs, such as feeding, physical care, and sleeping, must be allowed for. However, it is important to emphasize that the family must keep up the practice dosage.

Two six-week training periods with a break between them allow the developmental process to be monitored, to investigate what happens when there is no structured practice. From a feasibility perspective, we know that parents like this periodic training. They have acknowledged that after six weeks of structured practice, a break was a relief that made it possible to give the next training period their full attention. It should be recognized that it is challenging for parents to be the training providers on a daily basis, initiating appropriate activities and keeping focused during the training.

During the rest of the day, we assume that the child will use both the involved and non-involved hand for grasping, two-hand holding, grasp/re-grasping, and – later on – for coordinated bimanual actions. We assume that what is learned during the training session will be used when the restraint is removed.

Parents as training providers in the home environment

We recommend using the baby's everyday environment with parents as training providers, because it is known that parents can administer the treatment as effectively as therapists can if they receive coaching, supervision, and education [10, 11]. A home programme is also more convenient for families, as they can choose the best time for the play session, when the infant is alert and awake. The home can be a rich environment and it is important to teach families to use their environment in the best way. We assume that parents always attempt to do their best and that we need to trust and support their competence. A condition for the training, however, is that the family should receive support and coaching during weekly home visits.

Therapist agenda for baby-CIMT

The following points will be discussed in greater detail:

1. First visit: before start of training

- Assess the infant's hand use, preferably using the Hand Assessment for Infants (HAI) tool
- Present information on why to use baby-CIMT (Worksheet 1)
- Present information on the organization of the baby-CIMT period, and what is expected of parents as training providers

2. Preparation for therapist: before training

- Ensure good understanding of the attitudes towards family and children especially relevant to this programme (see also Worksheet 9)
- Plan the treatment, using Hand Assessment for Infants (HAI) and the description of functional ability levels (Table 1-3)
- Read the agenda for home visits (Worksheet 2)
- Choose the restraint and position for the infant (suggestions in Worksheets 4 and 5)
- Arrange a folder for diaries and other information (Worksheet 7).

3. During the training: weekly home visits

- Follow the programme for weekly home visits but be open-minded regarding the family's wishes and needs (Worksheets 2 and 3)
- Update the folder with diary, goals, and other information (worksheet 8)
- After each home visit, complete the therapist evaluation questionnaire (Worksheet 9)

4. Follow-up

- After each training period, it is important to follow up the development (i.e., evaluate the effect of training), preferably using HAI, and give feedback to the families
- There will always be questions as to whether or not the programme should be repeated. The only possible current response is to follow up the hand-use development to ensure that there is good progress.

1: First visit, before start of training

Assessment for evaluation and treatment planning

The infant's ability to use his or her hands needs to be carefully assessed before starting any intervention, to clarify whether and to what extent asymmetric hand use is present. The newly developed Hand Assessment for Infants (HAI) tool is preferred for this assessment. HAI is a video-recorded assessment based on goal-directed manual actions in infants and can be used for children aged three to twelve months at risk of developing unilateral CP. HAI is intended to detect and quantify possible asymmetry between hands by providing separate scores for each hand and to provide a measure of two-hand use according to both criterion- and norm-referenced scales. If HAI cannot be used, another video-recording of hand use needs to be made. When recording, ensure that the infant handles several objects requiring both uni- and bimanual involvement; use the same toys in the "before" and "after" video-recording.

In addition to identifying asymmetric behaviour, HAI will provide important information on the infant's ability and level of development. By analysing the video, the difference between hands and the reduced use of the involved hand will become clearer. This will help you decide at what functional level the child is functioning (Table 1-3) and what action(s) require further training.

2: Preparation for therapists, before start of training

Therapist engagement: attitudes towards family and coaching strategies

The therapist attitude is crucial for successful training. It is important that therapists evaluate not only the parents' and children's ability but also their own work. To help therapists focus on their role, the "Therapist home visit engagement and evaluation" worksheet must be read before conducting each home visit and the questionnaire on it completed afterwards (Worksheet 9).

In the therapist's several roles, it is important to:

- help the families organize the training
- coach and encourage parents to use their creativity as training providers
- reinforce the parents in their role as experts concerning their child's abilities and needs

Therapists must be able to listen reflectively and it is crucial that they sum up what has been discussed during the visits, to help parents remember the important points raised. The techniques used in motivational interviews are helpful for this approach. In addition to coaching parents, the therapists are experts and have to educate parents about their children's special needs.

Therapist engagement: attitudes towards the infant

In general, young infants are slower to react than older children, and it takes time before they start to reach out and try to grasp objects. Infants with delayed development or an affected hand are even slower to react – a characteristic that will follow them to varying extents as they age. The family needs to understand the child's response pattern. It is a balancing act between waiting for the child's intention to initiate actions, helping the child focus attention on the training situation, rather than simply doing things for them. Infants are more likely to look at and manipulate novel toys than toys with which they have become familiar, and immediate feedback is important in helping them focus their attention [12]. Some key advice is as follows:

- Wait for the child's intention, then maintain his or her attention
- Tempt and encourage the child to act; do not try to force
- Reinforce and respond positively to the child's action
- Stop training when the child gets tired and stops cooperating

Type of restraint to be used during training sessions

Any kind of simple restraint can be used, for example, a glove, sock, or sleeve with a bag clip (Worksheet 5). We prefer to keep the restraint simple and comfortable, as young babies do not usually attempt to remove the restraint. It is not necessary to make the restraint stiff or to incorporate a splint, as is needed for older children to prevent grasping. It is enough simply to make the restrained hand clumsy.

Significantly, babies are allowed to use the restrained hand. When doing so, they typically recognize that the hand is more difficult to use and therefore switch to the unrestrained, involved hand. Even if they use the restrained hand intermittently during the training session, they still typically obtain more repeated practice using the unrestrained hand than they would if training were not administered.

Position of babies and parents during hand training

A general rule is that the infant should be in as upright and stable a position as possible (Worksheet 4). This position helps the infant direct his or her arm movements towards the presented toys and is known to help the child focus attention on the play situation. When the infant can sit in a baby chair, that is preferable. If the infant is somewhat unstable, we suggest using small pillows to provide stability. We do not want the child to have to practice sitting balance when playing, as postural control is known to influence exploration and manipulation skills and the quality of object manipulation [13]. Upright rather than supine positioning is beneficial for the ability to generate force and lift the arms against gravity. When children can sit without support, they can of course be on the floor. However, unstable floor sitting typically results in less fine motor control and the child tires more easily than when sitting in a chair.

The position of the parents should preferably be in front of the child, or if around the corner of the table. There should always be possibilities to have eye contact with the child.

Parent education

The “To be discussed before training” mind map for parental information and education (Worksheet 1) is a useful tool that can even be used later in the programme to help parents understand the reasons for the training. Some repetition of information are important. The parents’ ability to understand what their child is experiencing is known to directly affect the child’s outcome [14].

In addition, video-recordings of other infants using baby-CIMT are typically of interest. Such educational material is important, because good parental ability to discern and understand infant needs significantly reduces parental stress and enhances cognitive and social function in infants [15, 16]. The information provided to parents must be adapted to their unique capacities and readiness to receive it. The weekly coaching and education sessions provided by the therapist are important for this reason.

Planning intervention for children at different ability level

Preparing and planning the training that occurs during the play session are important for treatment success. To guide the therapists in treatment planning, we have identified three functional ability levels and provided examples to guide the focus of practice (Tables 1–3). These suggestions are based on experience from providing baby-CIMT, developing HAI, and studying the early development literature. Although babies typically use both hands to similar extents, we have focused on aspects of hand use that can be used in one-handed practice. It is most important that the infants focus on object exploration, not on motor action per se, challenging the overall development at the appropriate cognitive level.

Certain aspects must be considered. Grasping and object manipulation do not develop at the same rate or to the same extent in the affected and non-affected hands in children at risk of developing unilateral CP. Meanwhile, the children's interest and cognitive abilities continue to develop. It is therefore important to organize the training at the appropriate motor ability level guided by a cognitive developmental perspective. We have identified three ability levels in order to facilitate treatment planning at the appropriate ability level for baby-CIMT. Using these levels will make it easier to select toys promoting important actions to practice at the appropriate motor and cognitive ability level for the individual child.

In addition to baby toys, many other objects in the environment are interesting to babies. Infants easily become bored and distracted when repeatedly given the same toys. It is therefore important to have a selection of toys used only during training that match both the child's age and ability levels. We suggest assembling a special basket for the training that contains objects chosen to provoke the target actions. In addition to describing each motor ability level, Tables 1–3 suggests examples of toys that can be used.

We recommend that the training should be planned and performed based on the child's defined ability level. We have found it crucial to take account of this ability level, not making the training too difficult. The play session must be challenging but also successful for the child. It is based on the theoretical assumption that training has to be at the appropriate ability level, not too difficult and not too simple.

First ability level: pre-grasping and reaching

Goal-directed reaching is seen at a very early age [17] while grasping takes longer to develop. In young babies aged three to four months and babies with limited hand use functioning at the pre-grasping and reaching level, several hand actions can be promoted. Almost all babies have intentional movements, although they may be reduced in the involved hand. In play sessions at this ability level, we aim to develop several aspects of hand use (Table 1). First, infants should learn to move their hands towards visual stimuli (Figure 1A). To initiate touching/moving/grasping, they need to be attracted by toys located near the hand.



1:A. Toy placement stimulates reaching

Easy grasping should also be stimulated, by presenting easy-to-grasp toys *close to the involved hand* (Figure 1B). The toy position must be adjusted so that it is easy for the child to close his or her fingers around the object, which can be a small rattle or colourful pencil. If the child cannot grasp the toy, it should be *placed in the hand* (Figure 1C). As soon as the object is in the child's hand, one should expect some object exploration, the simplest exploratory action being swiping and waving the object. The goal is that the infant should hold on to the object for a while before dropping it. In more advanced easy grasping, one should also expect *some reaching*. Even in very young children, some exploratory hand action is seen, as children *try grasping/scrabbling or fingering* the object of interest (Figure 1D). It is important that the infant should look at his or her own actions and pay attention to the toys.



1:B. A toy presented close to the hand, promoting easy grasping



1:C. When a toy is held in the hand, some exploration is expected, such as waving within the visual field.



1:D. Exploration action by scrabbling and pre-grasping.

Most of the exploratory actions described above are also seen in infants with one affected hand, though they occur to a lesser extent and are accompanied by delayed initiation and slower performance. Some infants develop well and progress to the next ability level. Other infants will still have problems performing these actions even as they age. If so, the training should still occur at the first ability level, i.e., the same actions should continuously be practiced although the toys must be changed according to the infant's cognitive development. For example, if the infant is older but still has a very limited grasping ability, reaching and pre-grasping can be fun to practice by moving buttons or jar lids around in a box, pushing balloons, knocking over towers of blocks, etc. (Figures 1E–H). It is important to give children opportunities to practice at an appropriate motor and cognitive level.



1:E. Toy placement to stimulate reaching towards toy



1:F. Object exploration by scrabbling and pre-grasping



1:H. When a toy is held in the hand, some exploration is expected

Table 1. Treatment strategies for babies functioning at the first level (aged about 3–4 months).

Pre-grasping and reaching		
<i>What the child does</i>	<i>What the therapist does</i>	<i>Selected toys, ability and age appropriate</i>
Initiates reaching towards objects by touching, moving, and sweeping them from a close position	Shows attractive objects and holds them near the baby's hand within the visual field	Necklaces and strings
Holds objects placed in the hand without dropping them	Puts objects in the child's hand; if necessary, helps the child keep focus and awareness of easy-to-hold objects	Rings, small rattles, plastic spoons, and maracas
Holds objects in the hand while moving the arms in various directions, by waving and flapping the objects around	Gives the child time to explore the objects and their own abilities; attracts the child's attention within his or her visual field and uses objects producing noise	Rings, small rattles, plastic spoons, and maracas
Scrabbling, pre-grasping, and squeezing	Holds the objects in front of the child or places them on the child's tummy	Hair bands, soft flexible material, curly strings, and rustling papers
Initiates easy grasping actions	Positions the objects close to hand, increasing the distance as the child progresses; for more advanced children, expect some reaching before grasping	Strings, pencils, spoons in various colours, positioned and adjusted close to hand to be easy to grasp
Reaching at a distance		Balloons and tower of blocks to knock over

Second ability level: grasping ability

At this level, we aim for improved grasping ability and more frequent use of the affected hand for object exploration (Table 2). Infants aged five to seven months have typically developed grasping and like to explore toys and other objects. They do this by banging, fingering, mouthing, and squeezing objects, and these exploratory actions lead to variation in grasping actions and object exploration. Though motor actions can still be very imprecise and not always successful, development is typically dramatic in this age range. Children with an affected hand may progress to this ability level at a somewhat later age but, independent of age, the various grasping actions need to be practiced before introducing more advanced motor action. Children who can use their affected hand for grasping at a younger age seem to have better future development and a better prognosis.

Grasping and object exploration are also important for the infant's understanding of objects' various properties, creating a link between hand motor function and cognition. *Grasping easy-to-grasp objects* in easy positions is the starting point at this level. More intentional grasping is then expected to develop. The infants should grasp on their own initiative with *increasing frequency and speed*. They should *grasp objects placed in various positions and at various distances* from a table, basket, or the floor. They typically begin to reach farther in front of the body (Figure 2A). Infants *explore toys* using various actions depending on the object's size, shape, and other attributes, such as colour. They grasp objects, turning them around, banging and looking at them, and "tasting" them (Figure 2B). Infants also explore objects by means of frequent grasping/re-grasping and fingering (Figure 2C). Variation in behaviour is increasing at this ability level. Children are usually interested in strings, hair bands, soft paper and packages, and hard toys. The quality of grasping improves, as can be seen from the ability to adjust arm and hand orientation, meaning that the infants can successfully *grasp objects from different locations and objects of different sizes* (Figures 2D and E). To develop smoothness and precision of movement, repetition is important. At the second ability stage, babies like to have many different toys to explore and start to have preferences for certain objects. Though some of these objects are of greater interest, parents should encourage numerous repetitions of grasping actions involving various toys. Toy selection is especially important if the infants are older and have passed the cognitive stage of general object exploration. The requirement for new and interesting toys increases with age, independent of functional level. The infant's attention span typically increases in relation to their interest in the play session.



2A. Reaching to grasp toys



2B. Exploring objects by mouthing



2C. Exploring objects by fingering and re-grasping

Children with an affected hand commonly continue holding the affected arm closer to the body. It is therefore important to stimulate them to reach for objects at various distances, as these infants need to learn that the affected arm is as long as the other one (Figure 2A, E). Likewise, the variety of grasping actions is typically less in the affected than the other hand, meaning that objects must be placed in different positions to promote variation in grasping behaviour and thereby adjusted arm and hand movements. Forearm adjustments, such as supination, might not develop on their own, so the selected toys and their positions must provoke this behaviour. Note that it is always easier for the baby to try to grasp an object another person is holding than an object placed on a table or in a basket. The ability to reach farther ahead is related to the development of independent sitting, but can be stimulated by using a high chair. One might observe that hand opening, for example, by the thumb movement is reduced. Limited hand opening means that it is usually easier to grasp smaller than larger toys and that it is difficult to extend both the fingers and the thumb. Hand opening can be practiced by gradually increasing the size of toys, which should be slightly larger than preferred, to provoke the infant's ability.



2D. More advanced grasping requires hand orientation



2E. Increased distance requires arm and hand adjustment for successful grasping grasping

Table 2. Treatment strategies for babies functioning at the second level (aged about 5–7 months).

Grasping abilities		
<i>What the child does</i>	<i>What the therapist does</i>	<i>Selected toys, ability and age appropriate</i>
Grasps easy-to-grasp objects in easy positions; drops objects	Provides the child with various easy-to-grasp objects, placed in locations where he or she can succeed; expects dropping when new objects are presented	Plastic spoons, things with thin handles, bag-clips, and maracas
Grasps objects in various positions and at various distances (reaching)	Varies the positions of objects to increase reaching distance, just on the edge of success	Any object of interest of appropriate size and shape
Increases the frequency/pace of grasping and releasing actions	Frequently provides toys of the right grasping difficulty; there should be a flow of action and interaction with the child	Use many different objects to obtain many grasping repetitions
Explores objects using various actions, such as waving, banging, pressing, and mouthing behaviours	Provides objects with different shapes, sizes, sounds, and textures	Packages, rubber objects, and cones
Explores objects using various finger movements, such as squeezing, fingering, and re-grasping	Provides objects with different surfaces and object that can change shape	Use things from nature, twigs, packages, and wrapping papers
Increase precision in grasping, by orienting the arm/hand and adjustment of grip size	Provides objects that need to be grasped in a special way and place them in various positions	Bigger toys, sticks objects placed to provoke hand opening and supination

Third ability level: refinement of grasping and object manipulation

Refining the grasping and manipulating of objects, the last step in this programme, typically begins at eight to twelve months of age. When older and more advanced, the infant grasps with increased precision and begins to adjust the hand according to the demands of the object's properties and location [18]. The precise pincer grip is seen more often. The children also start to understand how various objects are actually used, for example, that a spoon is used for eating. They start to perform simple sequences of actions, pretending to eat with a spoon and making purposeful actions such as pointing or pressing a button on a toy to make a sound (Table 3). It is also in this age range that purposeful bimanual task performance develops. In addition to using both hands, infants with an affected hand need to practice the specific hand actions that they perform less well. This is important even for children with only mild impairment. The quality of hand actions needs to improve and that only happens if they practice a lot.

When infants are functioning at this third level, precision in *grasping and releasing objects of various sizes and properties, located in various places* needs to be practiced. Even at this level, the ability to adjust the hand opening is typically limited, and the movement of the thumb and forearm are limited to different extents. Hand opening can be practiced by gradually increasing the size of toys, which should be slightly larger than preferred, to match the infant's ability. Blocks, rods, and balls of various sizes can be used for this purpose (Figure 3A). It is as difficult to release as to grasp, and dropping things on the floor or into a basket is typically of great interest (Figure 3B).

The ability to *orient the hand and arm* toward objects of various forms and in various locations before grasping them improves the quality of object handling. Hand orientation includes supination, a motion typically impaired and needing practice even in children with only mild involvement (Figure 3C). Impaired supination makes it difficult to grasp a pencil vertically or to hold a plate horizontally. Toys that promote supination are important to use – for example, infants may enjoy looking at stickers or drawings held inside the hand.



3A. Increasing the grip size



3B. Releasing on purpose



3C. Handling more fragile objects and orienting the hand

The control and quality of grasping improves at this ability level. This results in more *distal grasping and the use of a pincer grip* (Figure 3F), making it possible to handle even fragile objects. This increased control also makes it possible, for example, to grasp an object standing vertically on a table, such as a roll of paper, without causing it to slide. The complexity of the task can be increased by including *simple sequences of actions*. It can be demanding to pick up small objects from a glass or can or to insert small things into a narrow slit (Figure 3G).

Distal control even includes *poking and pressing* buttons. The index finger is commonly used for these actions but seems not to be the typical choice of children with an involved hand. There are various ways to make a child aware of the index finger, such as the method shown in Figure 3H. The use of finger puppets and nail polish are other ways to stimulate the use of the index finger. At this level, children can grab moving objects and start to coordinate reaching and grasping more efficiently, for example, when grabbing moving objects such as a ball. The speed of a ball can easily be varied to match the infant's ability.



3F. Using a more refined grip



3G. Releasing coins into a narrow slip



3H. Poking at figures in a book

Table 3. Treatment strategies for babies functioning at the third level (aged about 8–12 months).

Refinement of grasping and object manipulation		
<i>What the child does</i>	<i>What the therapist does</i>	<i>Selected toys, ability and age appropriate</i>
Grasps, releases, and drops objects of various sizes and in various positions	Arranges the play situation so the child has to place and release objects at different distances and in different locations on the table and in boxes of different sizes	Small toys, objects with small bases, and fragile things such as biscuits, cakes, and cornflakes. Basket, cans and boxes of different size for above objects, take-and-give games
Orients the hand and form the hand before grasping, independent of the toy's location	Places or holds objects so as to promote supination and other hand adjustments	Sticker or small toys to be hidden in the hand Sticks and blong toys
Grasps with increased precision using more distal finger movements and refined pincer grips, making it possible to handle more fragile objects	Presents small objects placed in various locations, at different stability and difficulty levels	Small toys, pearls, and buttons (linked with cords to increase safety) placed in bowls of adequate size Objects with small bases, such as spools and standing dolls
Pokes at pictures and presses buttons	Supports increased recognition of the index finger	Books with a lot of details, finger dolls, and tubes
Catches moving objects	Varies the speed	Balls of different size
Conducts simple sequences of actions	Increases the complexity of sequences based on cognitive ability	Places a spoon in a cup; removes an object from a bowl. Lifts a cup to grab a cube; presses buttons on toys to make sounds

3: During the training, weekly home visits

A general plan for the home visits is presented in Worksheet 2. When starting the training programme, we have found it useful first to define the ability level, and thereafter to think about how to organize the training and select the toys.

Focus of training

Part of the programme is to help parents know what to do during the training session, to show them what training is at the right ability level, not too difficult and not too easy. The first step is to show parents what their infants can actually do with the affected hand, not their difficulties. It is useful to compile a list of obvious actions that can be seen as strengths. Various toys and actions have to be explored and the successful actions noticed. The families should be helped to find and select toys and objects in their home environment that are useful based on their children's ability level and interest. Goals should be defined to show the parents what to continue to expect from their infant. When these goals are defined, they should be used to guide the following week of training. Two or three areas can be focused on each week, as noted in the diary (Worksheet 8). Using motivational interview techniques, the parents should be highly involved in determining the focus or goals for the following week. These must be adjusted or at least discussed every week during the home visit.

Training diary

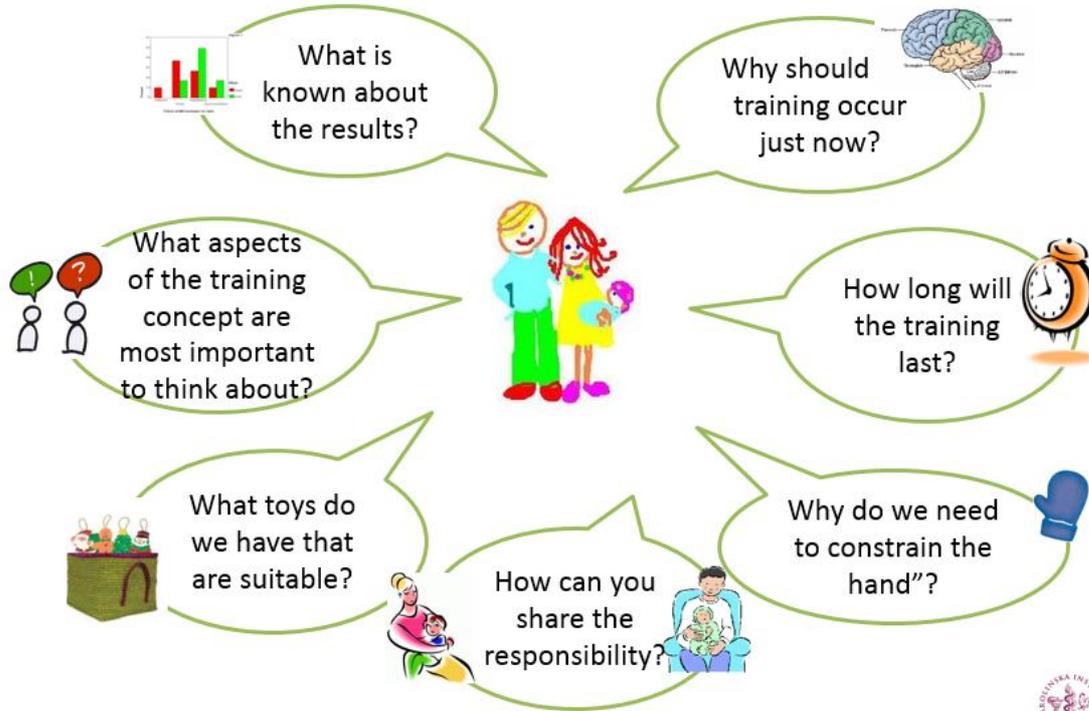
A diary should be used to motivate the families to continue the programme at the agreed-on level of intensity. The family is asked to record the training duration each day, using a diary sheet for each week (see Worksheet 8). We assume that the family will accurately record the actual training duration and the family's recorded training time should not be questioned.

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Worksheet 1: Mind Map for parent information and education.

To be discussed before training



Worksheet 2: Guide for therapists – structuring home visits

Collect information from the last week

- Use the logbook contents to promote discussion. Ask about opportunities to perform the play sessions, based on the times and other comments noted by the family.
- Discuss the focus area from last week, exploring its achievement and relevance.
- Use the mind map “Are you ready to play”

Perform a training session

- Let the parents start the training session by demonstrating what they usually do and what toys they use. Give positive feedback using the motivational interview techniques, ask question, inform and listening.
- The therapist have than to take an active role in the intervention, playing with the child to try to challenge his or her behaviour on its optimal ability level.
- Children commonly need a variety of toys in order to maintain interest and attention. Many materials in the environment, for example, from the kitchen and garden, can be used. It is useful if the therapist can lend the family some toys, but it is also important to encourage them to create their own play material.
- At the end, use the mind map “How did the session go?”. It is developed to foster the reflection after the training.

Plans for next week

- Sum up what were the most important things in the play session, which is the foundation for the goal of next week.
- Ensuring that the parents understand what activities are at the appropriate level of difficulty. This is important in helping the parents pace the training to provide the right level of challenge.
- Two or three focus areas should be selected jointly with the families. An area can be emphasized for more than one week. This depends on the level of detail of the goal or focus area formulation. The selected focus areas should be recorded on the notebook page for the following week.
- Provide the family with relevant educational and information material.

Worksheet 3: Guide for parents - preparing play session

This agenda includes points to be noted before starting the programme; the mind maps (Worksheet 6 and 7) should also be used.

Before starting the play session

- Prepare the play session, look at mind map “Are you ready to play”
- Make sure that the room is quiet and calm; turn off the TV, radio, and other distracting devices and give the infant your full attention.
- Remind yourself about the focus area. The choice of toys is important. You need to find toys that have the right level of difficulty for the child. A large variation of toys is important to change in between.
- The training sessions can be divided into two play sessions a day if your child’s attention span is short.
- If your child is sick, we recommend cancelling the training.

During the play session

- Give the infant all your attention and make sure that the play session is fun. An infant learns best when doing something fun with someone he or she likes. Endeavour to have good communication during the play time.
- It is important for the infant to be successful; at the same time, you need to challenge the infant’s ability to encourage practice. The important thing is that the infant should play actively as long as he or she is interested and is having a good time.
- Give the infant a chance to conduct many repetitions. Change the activity when the child loses interest.

After the play session

- **Use the mind map “After training” for reflection and adjustment for next session**

Worksheet 4: Position of babies and parents during hand training.

A general rule is that the infant should be in a sitting position as upright and stable as possible. This will help the infant direct his or her arm movements.

The second rule is that the parents should be in front of the child or around the corner of the table. There should always be possibilities to have eye contact with the child.

Parents' position

The parents should always be in front of the infant for good eye contact. This position facilitates interaction as the parents can easily see the child's reaction to the toys. Avoid competing attractions, such as TV.



Baby seats

Small infants can be placed in a baby seat. Place the baby sitter on a table to ensure a comfortable position for the parents. If the infant is somewhat unstable, small pillows should be used to provide stability.



Baby chair/high chair

When the infant can sit in a baby chair/high chair, this is preferable. If the infant is somewhat unstable, small pillows should be used to provide stability. We do not want the infant to have to practice sitting balance when trying to use the involved hand.



Use a table in front of the child

When the baby is sitting in a baby chair, it is useful to have a table in front of the child, to stimulate the grasping of toys placed in various positions on it.

When an ordinary table is used, make sure that the table is not too high because it is difficult for infants to lift their arms more than is necessary. Baby chairs with a built-in table can be used instead.



On the floor

We do not recommend the supine position on the floor. This position can be tiring for infants: because they will need to lift their arms against gravity, they will easily lose control of their movements. The prone position is also difficult for object manipulation because infants with asymmetries are commonly unstable for a long time when in this position. We do not want the infant to have to practice weight bearing at the same time as practicing object manipulation.

Independent sitting

When infants can sit independently, they can of course be on the floor. If they are unstable when sitting, sitting in a high chair typically results in more advanced object exploration.



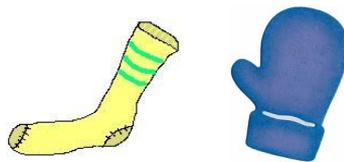
Worksheet 5: Choice of restraints.

Babies typically try to reach out and grasp with the hand closest to the object, independent of the involved hand. With increased age, infants develop a stronger hand preference and choose the best functioning hand as a first choice. Therefore, a restraint of the non-involved hand becomes necessary to increase the frequency of use of the involved hand.

Any kind of restraint can be used. Young babies cannot usually remove the restraints themselves, so we prefer to keep them simple and comfortable. The simplest restraint is simply to put the uninvolved hand under the belt in the baby seat.



A sock or clumsy glove can be used. It is not even necessary to have a splint inside the glove to prevent grasping, as is needed for older children. It is sufficient to make the hand clumsy – this will induce the infant to switch to the affected hand.



The restraint can also be a simple bag clip affixed to the end of the sleeve of a long-sleeved sweater.



The baby are allowed to use the restrained hand during the training sessions, when they feel it is needed.

Worksheet 6: Mind map to be used for preparation of the training session.

Are you ready to play ?



Worksheet 7: Mind map to be used after the training.

How did the session go?



Worksheet 8: Diary.

Weekly Goal

-
-
-



Note:

WEEK

<u>Diary</u>	<u>Time, minutes</u>	<u>Comments</u>
<u>Monday</u>		
<u>Tuesday</u>		
<u>Wednesday</u>		
<u>Thursday</u>		
<u>Friday</u>		
<u>Saturday</u>		
<u>Sunday</u>		
<u>Total time</u>		

Child's name.....

Worksheet 9: Therapist home visit, engagement and evaluation.

The therapist's role is to:

- coach parents, asking questions rather than coming up with answers
- encourage the parents to develop solutions to problems defined by themselves
- be sensitive to the kind of information/education the family requests
- reinforce the parents' self-efficacy and confidence as treatment providers

Reflective questionnaire for therapists, to be completed after a home visit

Questions	Yes	No	Could be better	Examples
Did you reinforce the parents in their role as the ones who know what their child can do?				
Did you encourage them to use their creativity to find suitable toys?				
Did you encourage them to communicate and interact with the child in the play situation?				
Did you listen in a reflective manner?				
Did you sum up what happened during the training?				