

INFORMATION/EDUCATION PAGE

Therapy Choices for Children With Difficulties Using 1 Hand After a Brain Injury



Goal

After a brain injury in a baby or child, 1 side of the body may not work very well (known as hemiparesis). This paper focuses on the upper extremity (arm, forearm, and hand). Over the last 20 years, scientists have learned a lot about treating this problem. They have combined the results of many studies to make conclusions.¹⁻³ They have also written guides to help therapists use this information.^{4,5} This paper tries to help parents easily understand this information. You can use it to understand the different types of therapy that can help your child use their hands and improve independence with daily activities.

Background

When 1 arm/hand does not work well, it can be hard for your child to use their 2 hands together for important things like play. You might hear your doctors and therapists talk about cerebral palsy, hemiparesis, hemiplegia, or stroke. These terms can be confusing and scary. Your child's therapist will focus on the problem, not the cause. Most of our knowledge in this area comes from studies of children who had brain injuries around the time of birth. We can apply this information for children who have an injury later in life.

As we use 2 hands together for most activities, it is important that therapy helps your child learn skills to use their 2 hands together. We call this *skill-based* therapy. This paper talks about 2 types of skill-based therapies that work for babies and young children. One is called constraint-induced movement therapy (CIMT). This involves putting a

glove, mitt, or cast on the preferred hand and doing lots of practice with the hand they don't like to use. Information about CIMT is very common on the internet. The other therapy is called bimanual therapy (BMT). BMT is not as well-known but has been used by therapists for a very long time. It involves lots of practice using toys and activities that need 2 hands. There is lots of research on CIMT and BMT. Both have been found to be very helpful for babies and children with difficulties using 1 hand. CIMT and BMT teach your child skills to use their hands by giving them special ways to practice. They focus on helping your child to think and move. They change the brain by getting your child to do lots of fun and motivating practice.⁶ Science tells us that the best time to do CIMT and BMT is in the first 2 years of life;⁷ however, both are also helpful in older children.

Child-parent-therapist teamwork

After getting to know your child and family, and how your child plays, you and your therapist should write goals together. Your therapist should help you understand what skills are easy for your child and what skills are hard. This helps to pick the right therapy for your child, which includes how much practice your child needs to do in the clinic and at home. Your therapist should teach you how to position and play with your child and how to set up lots of opportunities for play when you are not with your child. This includes tips about the toys that will help your child learn new skills. It is important for your child to practice new skills in their typical daily life—where they

need to use them. At each visit, your therapist should help you update the home program based on progress and your feedback.

Taking a break from therapy is important. It helps you and your child focus on other parts of life. Your child's life should not be all about therapy and if they learn the skills in therapy—they won't forget to use them in their daily life. You should view breaks between rounds of CIMT and BMT as an important part of your child's therapy plan.

There is also a different type of therapy you can choose for your child called goal directed training (GDT). This is different from CIMT and BMT as it helps your child learn important activities such as pulling up their pants. It doesn't just work on skills. Together, your therapist and child figure out how to get an activity done like putting on a *t*-shirt more quickly and easily. It aims to help your child be more independent. Your child may learn a new trick for doing the activity or use a tool to help get the job done. This may be as simple as your child learning that it is easier to sit on a chair when dressing. GDT is not better or worse than skill-based therapy. It is different. Talk to your therapist about what therapy might be best for your child.

these papers showed that CIMT works better than usual care (therapy that is not really described and usually done every few weeks). But, it also showed us that CIMT is not more effective than BMT.¹ For further information, you can read a simple summary of this paper on the website. GDT is also backed by science. A recent review of studies on children who have brain injury shows that GDT can help children reach goals they find important.²

Dosage

Like medication, a recommended amount of therapy should be given if it is to be helpful. This is known as therapy dosage. The dose of practice for CIMT and BMT can be given to a child in a short period of time of 2-3 weeks which is known as "intensive practice". Or the practice can happen over a longer period of time (8-10 weeks) which is known as "distributed practice". Either way, the total amount of practice that is recommended using CIMT or BMT is at least 30-40 hours. This practice can happen during therapy appointments and/or during a home activity program. With dis-

Summary of Therapy

Type of Therapy	Focus	What Does Practice Look Like?	How Many Hours of Practice Does My Child Need?
Constraint-induced movement therapy (CIMT)	Skill-based therapy	Putting a glove, mitt, or cast on the hand that your child prefers to use and doing lots of practice with the hand they don't like to use. Activities must motivate the child.	At least 30-40 hours
Bimanual therapy (BMT)	Skill-based therapy	Practice skills for using both hands together. Activities must motivate your child.	At least 30-40 hours
Goal directed training (GDT)	Important goal-related activity	Practice an important activity such a putting on a <i>t</i> -shirt. Through practice, your child learns how they can do the activity in their own way. This may include using tools to help. The goal must be the child's goal.	At least 14-25 hours
Usual Care	Varies	Therapy is often given every 2 weeks without a structured home practice program. Therapy methods are often mixed and not really described.	Unknown

Evidence

The Cochrane Library is a website with high-quality research papers that look at lots of studies to help us understand if a treatment is helpful or not. This helps therapists and doctors choose the right care for your child and family. Recently, 1 of

tributed practice, visits should be 1 on 1. You watch the therapist work with your child, and they coach you about how to practice at home. At each visit, your therapist should discuss the home program and what is important to practice before the next visit.

For GDT, a lower dosage of practice of 14-25 hours has been found to be enough for a child to learn how to do activities independently.³ This means that if your child wants to learn how to put on their *t*-shirt, they will need to practice for 14-25 hours.

In the past, the term “usual care” has been used to describe therapy given once every 2 weeks without a structured home practice program. It is usually not well described in research papers and the research shows us that this type of therapy is not very helpful.

One hand or 2 hands?

Most activities, and most goals set for children with difficulties using 1 hand involve using 2 hands. CIMT can be used to improve 1-handed skills. BMT can help your child learn skills to use 2 hands together.² After a discussion with you, carefully looking at your child play or do an activity and setting goals, your therapist should help support you in understanding the best therapy option for your child. BMT and CIMT should be given by a licensed therapist with the right skills. The therapist should consider your child and family’s personal, social, and environmental factors before recommending a plan for your child.

Summary

Children with difficulties using 1 hand after a brain injury should practice for at least 30-40 hours to achieve gains from therapy such as CIMT and BMT. CIMT can be used to target 1-handed goals, while BMT gives the opportunity to improve 2-handed goals. You and your therapist can confidently choose between intensive or distributed CIMT or BMT based on what best suits your child and family. If your child wants to focus on an important activity such as putting on a *t*-shirt, use GDT. Your child will need to practice for 14-25 hours to achieve goals like this. Other factors to consider are therapist skills, costs, funding, service models, and resources.¹

Resources

CPToys: www.cptoys.org. Matches toys with therapy goals. Sets up home programs and provides education forums for parents.

Cochrane review (plain language summary): <https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD004149.pub3/full#CD004149-abs-0005>

Link to the manual that has been developed to help support the implementation of a baby CIMT program.

<https://dl-manual.com/doc/baby-cimt-manual-20151125-nopyl7d1kwoq>

International Alliance for Pediatric Stroke (IAPS). Work includes education, awareness, and advocate on behalf of children and their families. They offer help to find providers. Their website includes education materials for caregivers.

<https://iapediatricstroke.org/>

Children’s Hemiplegia and Stroke Association (CHASA) aims to help children with hemiparesis and adults with hemiplegia from childhood brain injury. They organize in-person and online networking opportunities. Their work has included educational scholarships and orthotic grants.

<https://chasa.org/>

International Pediatric Stroke Organization (IPSO) is a non-profit organization of professionals dedicated to pediatric stroke and cerebrovascular disease. The organization includes caregiver advocates and the website includes resources for caregivers.

<https://internationalpediatricstroke.org/>

Authorship

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Disclaimer

This information is not meant to replace the advice of a medical professional and should not be interpreted as a clinical practice guideline.

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References

1. Hoare BJ, Wallen MA, Thorley MN, Jackman ML, Carey LM, Imms C. Constraint-induced movement therapy in children with unilateral cerebral palsy. *Cochrane Database Syst Rev* 2019;4:CD004149.
2. Novak I, Morgan C, Fahey MC, et al. State of the Evidence Traffic Lights 2019: systematic review of interventions for preventing and treating children with cerebral palsy. *Curr Neurol Neurosci Rep* 2020;20:1–22.
3. Jackman M, Lannin NA, Galea C, Sakzewski L, Miller L, Novak I. What is the threshold dose of upper limb training for children with cerebral palsy to improve function? A systematic review. *Aust Occup Ther J* 2020;7. 245-12.
4. Greenham M, Knight S, Rodda PhD J, et al. Australian clinical consensus guideline for the subacute rehabilitation of childhood stroke. *Int J Stroke* 2021;16:311–20.
5. Boulanger JM, Lindsay MP, Gubitz G, et al. Canadian Stroke Best Practice Recommendations for Acute Stroke Management: Prehospital, Emergency Department, and Acute Inpatient Stroke Care, 6th Edition, Update 2018. *Int J Stroke* 2018;13:949–84.
6. Hoare B, Greaves S. Unimanual versus bimanual therapy in children with unilateral cerebral palsy: same, same, but different. *J Pediatr Rehabil Med* 2017;10:47–59.
7. Nordstrand L, Eliasson AC, Holmefur M. Longitudinal development of hand function in children with unilateral spastic cerebral palsy aged 18 months to 12 years. *Dev Med Child Neurol* 2016;58:1042–8.