Peninsula Cerebra Research Unit
PenCRU Childhood Disability Research

What's the Evidence?
Constraint Induced Movement Therapy for children with hemiplegia

Key messages

- The best available evidence for CIMT found positive treatment effects on functional ability in children with hemiplegia.
- However, it has been suggested that these improvements are only due to the high intensity of the training exercises.
- One study which found no positive treatment effect for CIMT involved only 3 hours of therapy per day.
- There are concerns about the impact of restraint on the unaffected arm.
- Bimanual training is another therapy for hemiplegia which has been compared to CIMT. It involves exercises using both arms; no restraint is used.
- This therapy has been found to be equally effective as CIMT, and it may have a greater positive impact on the child's everyday life as both arms are involved in the therapy.

PLEASE NOTE: This summary was produced more than 4 years ago. Information provided may be out of date. If you think it would be helpful to update this summary please contact us at pencru@exeter.ac.uk

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What were we asked?

A parent wanted to know if there was any evidence that constraint induced movement therapy (CIMT) was effective at improving manual ability in children with hemiplegia.

What did we do?

In 2012 we searched a range of academic databases including NHS Evidence, the Cochrane Library, TRIP database, NICE guidelines and Pubmed for evidence and articles on this topic. This search was updated in April 2013.

What did we find?

What is CIMT?

- CIMT is a therapy for children with hemiplegia which involves encouraging use of the affected arm while restricting use of the unaffected arm. The initial version of CIMT involved a strict regimen. Modified versions of CIMT vary in the therapy regimen, the frequency and duration, and type of constraint. In this summary, we use CIMT as an umbrella term to include modified versions of the therapy.

- Different types of constraint include gloves, mitts, casts, slings or splints. Mitts and gloves are commonly used as they restrict the unaffected arm whilst

still allowing for the arm to be used in the event of a trip or fall.

- CIMT has been carried out at home, preschool, hospital or at a designated camps, and in some cases parents and carers have been trained to deliver the therapy.

- There are some concerns about whether constraint has a detrimental or harmful effect in the long term, and whether the 'non-impaired' arm is wholly unaffected.[1]

- The number of randomised controlled trials (RCTs) investigating this treatment has increased in recent years, which suggests a growing interest in the therapy.

What studies were found?

Our search found three systematic review articles which summarised evidence from several studies; the most recent of these was published in 2009.[2-4] Two of the reviews included all types of study design,[2,3] and one review included only the three RCTs judged to have used high quality methods.[4] Nine additional RCTs have been published since the most recent review.[5-13] There were many differences between these studies:

- The age range of children was from 12 months to 17 years, although most studies included children aged three to seven years.

- The intervention type and schedule varied widely; the most common treatment schedule was six hours of training per day, for a period of 10-15 days. The longest intervention was two months, consisting of two hours training per day. The lowest intensity intervention was 3.5-4 hours of training for two days per week, over four weeks.[13]

- The largest RCT involved a group of 63 children.

- The types of outcome measured in the studies varied. There were some laboratory controlled tests, some methods that assess play activities, and a range of questionnaires that were completed by parents and carers. Some of these methods measured unilateral function (how much and how well the affected limb is used) and others measured bimanual ability (how much and how well both arms are used together).

Did CIMT have a positive effect?

- All of the RCTs included in the three review papers, plus six of the nine more recent RCTs, compared CIMT to usual care.[5,7,8,10,12,13] Usual care varies between countries and centres, and is often not well specified or defined.

- The majority of studies found positive treatment effects for CIMT on bimanual and unilateral functioning.

- It was difficult to compare the results of these studies because they used different scales to measure either unilateral or bimanual improvements.

- Usual care is of much lower intensity than CIMT, and it has been argued that improvements in functional ability following CIMT are only due to the high intensity nature of the therapy, rather than the use of constraint.

- One RCT found no significant treatment effect for CIMT compared to usual care.[8] The authors suggested that this result

could be because their CIMT protocol included only 3 hours of therapy per day; studies that have found a significant improvement typically involved higher intensity therapy.

- Another recent RCT compared a modified CIMT programme delivered by parents to an intensive occupational therapy programme.[11] This study reported no beneficial effect for the CIMT over similarly intensive therapy. However, methodological concerns have been raised with regards to this study particularly in terms of families' adherence to the CIMT regimen,[14] which are refuted by the authors as integral to the pragmatic design of their trial.[15]

- A recent RCT found that children younger than five years of age were more likely to reach the maximum treatment effect of CIMT within a six week period than children older than 5.[16]

Is CIMT effective because of restraint or intensity?

CIMT typically involves up to six hours of manual training exercises per day, whereas usual care involves only a couple of hours of therapy per week. It has been suggested that CIMT has a positive effect on ability of the affected arm only because it involves much higher intensity training for more hours per week, rather than because the less affected limb is restrained.

Bimanual training

Recently, another type of therapy for hemiplegia has been compared to CIMT. Bimanual training involves hand and arm exercises to improve bimanual coordination. Both arms are used in the therapy, no restraint is used, and it is of equal intensity to CIMT. An advantage of this method is that, as both arms are involved, there are no concerns about the treatment having a detrimental effect on the restrained arm, and children may find the therapy less frustrating.

A recent systematic review found seven RCTs that compared CIMT with bimanual training.[17]

- Children aged 2-16 with hemiplegic CP were included.
- Treatment programmes ranged from 10-60h per week, over 10 consecutive week days to 10 weeks.
- All studies included in this review found significant improvements in arm function and overall functional performance in both the CIMT and the bimanual training groups, although different tools were used to measure these improvements.
- One study found greater improvements in grasp in the affected arm in the CIMT group. The same study also found that the bimanual training group showed greater improvements in bilateral spontaneous use of the affected arm.
- Another study also found greater improvements in bimanual coordination in the bimanual training group.

The systematic review concludes that, although both CIMT and BIT improve arm function, bimanual training may have a greater positive impact on the child's daily life.

What do we think?

- The evidence suggests that CIMT can have a positive effect on frequency and quality of use of the affected limb in children with hemiplegia, although it has been suggested that the success of

this therapy is due to the high intensity training programme rather than use of a restraint.

- Further research is needed into the long term effects of the treatment on the development of the restricted arm.

- There is not enough evidence to say which type of restraint is best, how long it should be worn to be most effective, or at what age children would benefit most from the therapy.

- Bimanual training is an alternative therapy which so far has been shown to be equally as effective as CIMT at improving unilateral and bimanual ability in the affected arm.

- The NICE guidelines for spasticity in children and young people suggest that CIMT is followed by bimanual therapy, and intensive programmes over short periods (4-8 weeks) are recommended.[18]

- More long term studies into both treatments are needed, including large numbers of children and measuring improvements in the same way.

- It is important that outcome measures used in these studies have clinical relevance to the child i.e. they measure aspects of functional ability that are important to the child in everyday life.

We would like to hear your feedback on this summary – please email us at pencru@exeter.ac.uk if you have any comments or questions.

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