

# Can constraint therapy be developmentally appropriate and child-friendly?

Constraint-induced movement therapy (CIMT) is becoming increasingly recognized as a potentially useful means of treating children with hemiplegia but meanwhile attracts vigorous criticism and controversy. It has been suggested that constraint therapy is physically and developmentally intrusive in a number of ways: preventing use of the normal hand leaves a child with a poorly functioning hand which could cause distress and frustration; restraining the uninvolved limb at a critically sensitive stage of development may theoretically compromise function; there is a possible danger from lack of protection in case of falls; and the activities a child may be asked to perform may be inappropriate for his capability, resulting in resentment and lack of motivation.

The key issues in this fascinating debate embrace aspects of neuroplasticity, early intervention and developmental theory as well as current views on child rearing.

One of the theoretical principles underlying CIMT is the mobilization of the phenomenon of brain plasticity to recruit areas of the brain to perform functions which have been lost due to focal injury. There is increasing evidence that interventions using targeted sensory system input coupled with structured motor activity can bring about subtle changes in brain synapse configuration, resulting in improved motor performance. The potentially greater neuroplasticity in young children suggests that treatment would be more effective in the younger child. But evidence for the existence of critical periods of heightened plasticity in early development when neuron circuits can be shaped by experience point to extreme caution in restraining children at too young an age. In the light of these concerns Naylor and Bower<sup>1</sup> and Eliasson et al<sup>2</sup> in their studies of children from 18 months to five years modified the therapy to reduce the period of restraint to one hour twice weekly for 4 weeks and 2 hours a day for 2 months respectively.

Therapy intended to mediate the effects of 'developmental non-use' needs to be developmentally appropriate. There is evidence that greater cortical reorganisation occurs with more complex tasks and that simple unskilled activities are less effective in this respect. However, younger children do not have the attention skills necessary for repetitive practice. Nor are these activities appropriate for very young children. A child who has never picked up an object needs first to learn the 'primary' skill of grasping. According to the neuronal group selection theory<sup>3</sup> intervention up to the age of about 2 years aims at enlarging primary neural networks through experience and interventions in older children aim at promoting development of a variable movement repertoire through increasing practice. Both Naylor and Bower<sup>1</sup> and Eliasson et al<sup>2</sup> used structured activities which were tuned to the child's developmental level. In

the latter study older children achieved a better functional outcome than younger children.

Measures to make this form of therapy child-friendly have been adopted in several studies. Naylor and Bower<sup>1</sup> used gentle restraint with the therapist holding the hand together with verbal encouragement. In a study<sup>4</sup> of children aged between 4 and 14, the two major elements of adult CIMT were retained (repetitive practice and shaping – approaching a motor behaviour in small steps) and the children wore a sling for 6 hours a day for 10 days. In each of these studies great emphasis was placed on making the therapy sessions fun with social interaction, interesting activities, encouragement, rhymes, and songs.

Although many studies show at least short-term benefit from CIMT there is a dearth of level 1 trials. However, many questions need answering, for example, what is the lowest level of hand function which could improve with therapy? Unlike in other studies, Eliasson et al<sup>2</sup> included children with very reduced function and intriguingly the more impaired children fared best.

Active practice is the important treatment variable but how much does restraint matter? Although one study has shown that the use of restraint was associated with improved results compared with the same therapy without restraint (probably because of increased practice), the environment used to solicit intense practice is all important for change.<sup>5</sup> Perhaps the most important question for future work is whether similar intense practice can be elicited without the restraint and whether this might result in even better outcome.<sup>5</sup>

Hilary Hart

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## References

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