Importance for CP Rehabilitation of Transfer of Motor Improvement to Everyday Life

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ABBREVIATION
CIMT—constraint-induced movement therapy

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The comprehensive review of upper-limb therapies for unilateral cerebral palsy by Sakzewski et al[1] is particularly timely because this area has recently experienced a large increase in publications. The article by Sakzewski et al cites previous work indicating that the traditional approach of neurodevelopmental treatment is not efficacious. The authors found that 2 more recent approaches to physical rehabilitation (constraint-induced movement therapy [CIMT] and bimanual therapy) are superior to conventional care.

Two components are common to all forms of CIMT: (1) intensive training of the more-affected arm for multiple sessions; and (2) restraint of the less-affected arm for varying periods of time in different experiments/clinics, thereby forcing use of the more-affected arm. In the protocol referred to as classic CIMT in Sakzewski et al,[1] there are 2 additional components: (3) training by the behavioral technique termed "shaping"[2–5] and (4) use of a "transfer package" of techniques to facilitate transfer of treatment gains from the clinic to everyday life.[2,3,6] In bimanual therapy, training tasks involve use of both upper extremities: the less-affected as well as the more-affected arm. There are no standard procedures in conventional upper-extremity rehabilitation; the range of procedures includes unilateral or bilateral task practice that is usually not as intensive or extended as in the first 2 treatments; stretching to reduce spasticity; practice of compensatory strategies for accomplishing performance objectives rather than focus on use of the more-affected arm; passive and active range of motion exercises for isolated movements; and little or no involvement of caregivers in treatment. Sakzewski et al also found that botulinum toxin A in combination with occupational therapy is superior to occupational therapy alone.

When considering whether to refer children with upper-extremity hemiparesis for physical rehabilitation, pediatricians might take into account that a larger benefit has been demonstrated with these modern approaches than with traditional ones. In this regard, previous reviews have found CIMT to be efficacious[7,8] and recommended that it be adopted into clinical practice.[9] Bimanual therapy has also been recommended for adoption into clinical practice.[9]

Sakzewski et al[1] importantly identify several procedural elements that the efficacy-proven approaches have in common. These elements include that therapy be goal directed, with measurable goals identified by children and their caregivers; that motor training be focused on activities rather than on the individual movements required to complete activities; and that the amount of training scheduled be substantial. However, Sakzewski et al omit an element unique to CIMT; that is, the transfer package, which has been shown to greatly enhance gains in

spontaneous use of a more-affected upper extremity in adults with stroke[6,10] and that has been emphasized as important for the conduct of CIMT in children with cerebral palsy.[2,3] Moreover, implementation of the transfer package as a part of CIMT, and the consequent increased use of a more-affected arm in the everyday environment, has been shown to markedly increase the amount of gray matter in motor areas of the brain of adults, whereas the same treatment in the clinic without use of the transfer package results in no change in brain structure.[10] A similar increase in gray matter in motor areas occurs after CIMT when using transfer package techniques in children.[11]

In Table 4 in the review by Sakzewski et al,[1] 2 sets of CIMT studies appear to have unusually large real-world effect sizes.[2,12–14] However, the disparity in the effect sizes between these studies and the other CIMT studies reviewed is left unremarked and without explanation. Attention to differences in the stated methods make clear that these 2 sets of studies originated in laboratories that either used techniques specifically characterized as constituting a transfer package[2,6,12] or explicitly emphasized using this type of procedure.[13,14] There are several studies reviewed by Sakzewski et al in which CIMT was delivered in the home.[15,16] Training was implemented in these studies adhering to the guidelines of Novak et al,[17] but no use of the transfer package was reported. Thus, even though training was done in the home, systematic steps were not reported to have been taken to integrate use of the more-affected arm into daily life activities, which the transfer package accomplishes by a variety of means.[2,3,6] Moreover, treatment was delivered by parents with highly attenuated input from a therapist.

The criterion in Sakzewski et al[1] for identifying a study as involving CIMT appears to be whether the study authors call what they did CIMT and whether it involved "restraint of the unimpaired limb… accompanied by repetitive unimanual task practice." This labeling may be a starting point for a definition of a complex therapeutic intervention, but it is an uncertain basis for a systematic analysis. In addition to lack of attention to whether the transfer package was used, there is no attempt to discriminate CIMT studies into subgroups based on other variations in the treatment protocol: whether therapy was conducted in a group setting or 1-on-1 with a therapist; whether therapy was set in a clinic, home, or day camp; and whether the training technique termed shaping was used.

The lack of attention to transfer of therapeutic gains from the treatment setting to the real-world setting in pediatric rehabilitation, as well as in adult rehabilitation, results in smaller improvements than are possible in upper-extremity function in the most salient environment for children and their parents (ie, their everyday lives). We suggest that procedures which are successful in producing this type of translation are a fruitful avenue for future research.

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