Modified Constraint-Induced Movement Therapy combined with Bimanual Training (mCIMT–BiT) in children with unilateral spastic cerebral palsy: How are improvements in arm-hand use established?

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1. Introduction

In children with unilateral spastic CP, an increasing number of studies has indicated positive effects of (modified) Constraint-Induced Movement Therapy ((m)CIMT) on the potential of the affected arm to assist the unaffected arm during bimanual activities (Eliasson, Krumlinde-sundholm, Shaw, & Wang, 2005; Wallen, Ziviani, Herbert, Evans, & Novak, 2008) as well as on the quality, speed, and dexterity of upper limb function (Bonnier, Eliasson, & Krumlinde-
The notion of a reduction of learned non-use has probably received the greatest attention in the literature on mCIMT in children with unilateral CP, but it has never been established with good empirical evidence (Brady & Garcia, 2009; Hoare et al., 2007a; Hoare, Wasiak, Imms, & Carey, 2007b; Huang, Petters, Hale, & McBride, 2009). Children with unilateral spastic CP often display a form of learned non-use, as in daily life they experience too little incentive to use their affected upper limb during functional tasks, which often becomes apparent during bilateral activities (Gordon, Charles, & Wolf, 2005). The basic notion behind learned non-use following unilateral brain damage is that certain residual motor capacities of the affected extremity remain hidden due to a learning process favouring the easier movements with the non affected extremity (Taub, Uswatte, & Pidikiti, 1999). As a result, motor performance is often better during forced activities than those receiving mCIMT–BiT improved the amount of use of the upper limb due to a reduction of so-called ‘learned non-use’ or ‘developmental disregard’.

Recently, we conducted a randomized controlled trial (RCT) (Aarts, Jongerius, Geerdink, van Limbeek, & Geurts, 2010) in 52 children with unilateral spastic CP showing that 6 weeks mCIMT followed by 2 weeks of task-specific bimanual training (mCIMT–BiT) improves the spontaneous use of the affected limb during play and self-care activities as assessed with the Assisting Hand Assessment (AHA) (Krumlinde-sundholm, Holmefur, & Eliasson, 2007) and the ABILHAND-Kids (Arnould, Penta, Renders, & Thonnard, 2004), respectively. In addition, significant improvements were obtained in terms of experienced daily life problems and individually tailored functional goals as assessed with the Canadian Occupational Performance Measure (Law et al., 2005) and Goal Attainment Scaling (Steenbeek, Ketelaar, Galama, & Gorter, 2007).

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The goal of this study was to investigate how the above-mentioned improvements in spontaneous use of the affected limb during play and self-care activities were established as a result of 8 weeks mCIMT–BiT. Developmental disregard was assessed with the Video Observations Aarts and Aarts module Determine Developmental Disregard (VOAA-DDD) (Aarts, Jongerius, Geerdink, & Geurts, 2009) as were upper limb capacity and performance as measures at the activity level of the ICF. Indeed, recent research has shown that both unimanual capacity and bimanual performance are important aspects of bimanual activities in children with CP (Szatkewski, Ziviani, & Boyd, 2010). In addition, active and passive range of (extension) motion of the affected wrist and elbow were assessed as measures at the ICF level of bodily functions. The results of a previous study (Sutcliffe et al., 2009) led us to the hypothesis that developmental disregard would be reduced or even resolved after mCIMT–BiT. In addition, it was hypothesized that changes in active or passive range of joint motion would not underline the improvements found at the activity level.
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