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Challenges in combining upper limb and lower limb interventions in protocols for children with brain injury

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SIR–I read with interest the recent paper by Sakzewski et al. concerning occupational performance and upper limb outcomes from a randomized trial in children with acquired brain injuries.[1] This publication coincides with another paper recently published in *Clinical Rehabilitation* from the same study but which focusses on the gross motor outcomes following participation in a 20-week home-based intervention using Mitii interactive computer games.[2]

The almost simultaneous publication of these two papers provides an opportunity to open discussion on the challenges of addressing the therapy needs of children with both upper and lower limb movement impairments. It is a shame in this instance that the results of both the upper limb, visual perceptual, and lower limb outcomes were not reported in the same publication in order to consider the interrelationship between gross motor and upper limb function in more depth. There is evidence from other studies that improvements to lower limb function may have benefits to upper limb function.[3] The need to address both hand and gross motor

function has recently been considered by Bleyenheuft et al. who included lower extremity activities into the Hand Arm Bimanual Intensive Therapy Including Lower Extremity (HABIT-ILE) for children with unilateral cerebral palsy (CP) with promising preliminary results.[3]

A further consideration is the interpretation of the results reported in these two studies is the potential impact on the overall dose when combining both upper limb and lower limb protocols in the same regime. The protocol for these studies involved 20 weeks of Mitii training (30 minutes per day, 6 days a week), for an overall potential dose of 60 hours. However, the bias of intervention from the recommended programmes of the Mitii reported in the studies was 60% targeting cognitive, visual perceptual, and upper limb activities, and 40% focused on gross motor activities. Thus, the maximum overall dose would be only 36 hours for upper limb activities and 24 hours, spread over 20 weeks. This has implications for the analyses and interpretation of the effect of training dose (hours) on the primary outcomes in both these papers. An important point to acknowledge here is with respect to the reduced dose by nature of the study design, aimed at addressing both upper limb and lower limb repetitions within the same session. In contrast, recent studies have increased the dosage for children with CP when combining upper limb and lower limb therapies.[3]

The authors have argued that children with acquired brain injury had additional comorbidities that may have impeded capacity to attend and concentrate for the 30-minute sessions. However, children with CP are also recognized to have similar risk of comorbidities influencing learning and behaviour and these factors should also be considered in this group with respect to impact on intervention adherance.[4] Important also is the need to ensure that separately reported studies

which have the same sample source are clearly reported and cross-referenced. This has implications for future systematic reviews and or meta-analyses; in this instance investigating the effects of virtual reality and or interactive computer games for childhood disability, in order to avoid overstating precision due to the narrower confidence interval provided by inflated sample sizes.[5]

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