



#### H4 Interventions to improve balance in children and adolescents with down syndrome: a systematic review

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*Background and Objective(s):* Lack of balance affects the ability of children and adolescents with Down Syndrome (DS) when performing motor skills. Recently, there are available many interventions that aim to improve balance in DS; however, the current state of evidence of the efficacy of these interventions is unknown. Therefore, the purpose of this systematic review is to summarize the effects of interventions available on balance in children and adolescents with DS and their dosage parameters.

*Study Design:* Systematic Review.

*Study Participants and Settings:* This review included randomized controlled trials (RCT) that investigated the effects of interventions to improve balance in DS. Studies that did not provided details of the intervention and studies that included other syndromes were excluded.

*Materials and Methods:* Two examiners independently searched for studies on the databases ERIC, Medline, Scielo and PEDro, using the keywords “Balance”, “Postural Control” or “Posture” combined with “Down Syndrome”. The final selection was made by the consensus between the examiners, with a third one in case of disagreement. The same investigators independently graded risk of bias using the PEDro scale and quality of evidence using the GRADE System. Subgroups random-effects meta-analysis were conducted when data was available and consistence ( $i^2 < 50\%$ ).

*Results:* Eight RCT were included in this review. We identified nine interventions: balance training exercises, treadmill training, suspension training, whole-body vibration, virtual reality, muscle strengthening, vestibular stimulation, sensory integration therapy (SIT), and neuro-development treatment (NDT). Such interventions were performed in 2–3 days per

week, during six to 24 weeks; intensity parameters were heterogeneous in the selected studies. These interventions were offered isolated or in combinations. Isolated balance exercises and isolated SIT were inefficient in improving balance in children in SD. There are positive results when combining balance exercises or vestibular stimulation with the other modalities. Our meta-analyses showed statically significant differences ( $p < 0.05$ ) favoring combined balance trainings [g:  $-1.33$  (CI:  $-1.90, 0.81$ ;  $p = 0.01$ ); and g:  $2.95$  (CI:  $0.17, 5.73$ ;  $p = 0.03$ )]. The level of evidence of these interventions varied from low to moderate. The efficacy of balance exercises combined with whole-body vibration, virtual reality games or strength training and vestibular stimulation combined with strength training have the best level of evidence.

*Conclusions or Significance:* This review provided the appraisal of different balance training options that can be utilized in the rehabilitation of children and adolescents with DS. There is low to moderate evidence that balance exercises and vestibular stimulation are more effective when executed in combinations with other modalities than when performed isolated.

#### H5 Quantifying dose in upper extremity pediatric neurorehabilitation

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*Background and Objective(s):* Therapy dose is a key consideration in pediatric neurorehabilitation. Evidence points to improved motor outcomes after 60 hours of therapy, with additional gains at higher doses. Dose is typically defined by duration, but this may be an incomplete measure. While 300 movement repetitions (reps)/h is standard in basic science and feasible with adults,  $< 50$  reps/h was reported clinically. Accurate quantification of reps is required to optimize the design of pediatric rehabilitation trials and programs. Our objective was to examine factors associated with rep rates in children receiving neurorehabilitation.

*Study Design:* Randomized, controlled clinical trial.

*Study Participants and Settings:* Children with hemiparesis due to perinatal stroke (7–19y) treated at 3 Canadian pediatric rehabilitation hospitals.

*Materials and Methods:* Therapy employed a camp-based model. Constraint-Induced Movement Therapy (CIMT) occurred 5 days in week 1 followed by Bimanual Therapy (BT) 5 days in week 2. CIMT involved 1.5 hours of therapy with individually selected target movements daily. BT involved bimanual therapy of target movements for 0.75 hours and functional goal practice for 0.75 hours. Movement reps were recorded. Given the difficulty of counting reps for whole tasks, only target movement practice for BT was included. The Assisting Hand Assessment (AHA) and the Box & Blocks Test (B&B) were administered before and after camp. Change scores were calculated by subtracting post-camp scores from baseline. Factors associated with rep rates were explored using standard linear regression.