Effectiveness and feasibility of intensive short-term graded exercise programmes, using either treadmills or static exercise bicycles, for non-ambulant children and young people with cerebral palsy.

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Children with cerebral palsy who are unable to walk independently are particularly prone to muscle weakness, which contributes to pain, deformity and functional loss. Studies have demonstrated that strength and exercise interventions for children with mild to moderate cerebral palsy can result in an increase in muscle volume, muscle strength or can improve gross motor function.

There are very few studies that have investigated the effect of exercise interventions in non-ambulant children with cerebral palsy, as routine strength and exercise training protocols (such as weight training or circuit training) are not feasible for this group. Although treadmill training and static bikes are not routinely used in rehabilitation for children who have limited motor ability, (at Gross Motor Function Classification System [GMFCS] levels IV and V); some children with severe motor functional disability may be able to pedal independently when given additional support on a static bike or may be able to walk on a treadmill with a support harness.

The impetus for this study was the need to identify effective interventions, where none currently exist, with a view to offering a choice of activity for this population. The study was designed with support from the NIHR Research Design Service-South East and conducted by a team of academic physiotherapists, exercise scientist and research methodologist based at Chailey Heritage Clinical Services and the University of Brighton. The aim of this study was to determine the effect of a six-week exercise intervention, using a static bicycle or treadmill, on gross motor function ability in non-ambulant children with cerebral palsy.

Thirty-five children aged 8–17 with bilateral cerebral palsy; Gross Motor Function Classification System levels IV–V were recruited from four special schools and randomally allocated to a static bike group, a treadmill group or a control group. Participants in the bike and treadmill groups received exercise training sessions, three times weekly for six weeks. The control group received their usual care. Assessments were performed at baseline, and at 6, 12 and 18 weeks by an assessor 'blinded' to which arm each participant was allocated to. Gross Motor Function Measures GMFM-66, GMFM-88D and GMFM-88E were used to measure the effectiveness of the intervention.

At six weeks significant differences were found in GMFM-88D (standing) scores between the bike group and the control group, and the treadmill group and the control group ($P < 0.05$). No significant differences were found for GMFM-66 (overall gross motor function) or GMFM-88E (walking, running, jumping) scores between the bike group and control group, or the treadmill group and control group, although trends of improvement were observed for both exercise groups. The improvements observed declined during the follow-up period- a 'detraining' effect. Participating children reported enjoyment of both treadmill and exercise bike.

This study provides preliminary evidence that exercising on an adapted static bike or treadmill is feasible and enjoyable for non-ambulant children with cerebral palsy and may provide short-term improvements in gross motor function. Further research is warranted to investigate exercise programmes of longer duration, or less intensive but ongoing 'maintenance' exercise programmes. A large-scale randomized trial of such interventions would also enable smaller effect sizes on the outcome variables to be investigated.

Publications associated with this study

Bryant E, Pountney T, Williams H, Edelman N. Can a six-week exercise intervention improve gross motor function for non-ambulant children with cerebral palsy? A pilot randomized controlled trial *Clinical Rehabilitation* 2013; 27(2): 150-9