



## Progressive resistance exercise increases strength but does not improve objective measures of mobility in young people with cerebral palsy

### Synopsis

Summary of: Taylor NF, et al. Progressive resistance training and mobility-related function in young people with cerebral palsy: a randomized controlled trial. *Dev Med Child Neurol.* 2013; doi:10.1111/dmcn.12190 [Prepared by Nora Shields, CAP Editor].

**Question:** Does progressive resistance training (PRT) improve mobility and muscle strength in young people with cerebral palsy (CP)? **Design:** Randomised, controlled trial with concealed allocation and blinded outcome assessment. **Setting:** Recruitment from a large metropolitan children's hospital and a CP register in Australia. **Participants:** Participants had spastic diplegia CP, were aged 14 to 22 years, and classed as level II or III on the Gross Motor Function Classification System. Exclusion criteria were participation in PRT in the previous 6 months, single-event multi-level surgery in the previous 2 years, or contractures more than 20 deg at the hips and knees. Randomisation allocated 24 participants to PRT and 25 to a control group. **Interventions:** The intervention group participated in a twice-weekly, 12-week PRT program performed at community gymnasia. Training was completed alone or in pairs under the supervision of a physiotherapist. Each participant was prescribed 4 to 6 individualised exercises, targeted to address deficits identified by instrumented gait analysis and clinical assessment. Participants completed three sets of 10 to 12

repetitions of each exercise at an intensity of 60% to 80% of one repetition maximum (RM). The control group continued with their usual recreation and physiotherapy provided it did not include PRT. **Outcome measures:** The primary outcome was the 6-minute walk test at weeks 13 and 24. Secondary outcome measures assessed objective mobility-related function (self-selected walking speed, timed stairs test, Gross Motor Function Measure (GMFM-66) dimensions D and E, Gait Profile Score), participant-rated mobility (Functional Mobility Scale, Functional Assessment Questionnaire) and muscle performance (1-RM) of leg press and reverse leg press). **Results:** After 12 weeks of training, there was no difference between the groups for the 6-minute walk, stairs test, GMFM dimension D and E, and reverse leg press. The intervention significantly improved the Functional Mobility Scale at 5 m (0.6 units, 95% CI 0.1 to 1.1), the Functional Assessment Questionnaire (0.8 units, 95% CI 0.1 to 1.6) and leg press 1-RM (14.8 kg, 95% CI 4.3 to 25.3). At week 24, there were no differences between the groups for any outcome. The groups did not significantly differ for the remaining secondary outcomes at either time-point. **Conclusion:** Individualised PRT increases strength in young people with CP. The participants thought their mobility had improved, although objectively it had not.

### Commentary

Is this study another 'death knell' for the use of strengthening to improve mobility in cerebral palsy (CP)<sup>1</sup> or are there alternative explanations that we are missing? This randomised trial in young people with CP improved strength in targeted muscles but failed to improve mobility. The investigators are experts on CP, the study design is exemplary, the outcome measures are well chosen and the compliance is excellent. They concluded that participants gained only what they practised (ie, strength, not gait).

These results are nearly identical to the similar well-conducted trial by Scholtes et al.<sup>2</sup> Strength gains were modest (11 to 27%) in comparison to other studies<sup>3,4</sup> and were likely to have been insufficient to produce measurable functional change. Both used resisted functional exercises involving multiple muscle groups, which may not adequately target the desired muscles, especially if selective control is compromised<sup>5</sup> – single-joint exercises might be a better alternative. It may also inadvertently strengthen non-desired muscles, leading to greater muscle imbalance and contracture in some participants,<sup>2,3,6</sup> which could negate the potential benefits. Muscles that tend to develop contractures in CP were among those strengthened here. Perhaps CP warrants a more precise approach to weakness and muscle imbalance, providing justification that physiotherapists have input into these programs.

Whilst strengthening guidelines (6 to 15 repetitions, 1 to 3 sets, 2 to 3 times/week, for 8 to 20 weeks) were clearly met here, strengthening should be lifelong in people with CP. Irrefutable evidence supports the multiple health benefits of strengthening. People with physical disabilities such as CP are more sedentary, weaker and more likely to experience functional deterioration in adulthood than others, unless they remain physically active,<sup>7</sup> so it could be devastating to insinuate that strengthening is not helpful. Instead, therapists need to ensure that individuals with CP are strengthening the correct muscles in the right way and other impairments do not affect the functional goals of training.

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### References

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