PEDAL POWER PILOT STUDY: Adapted Dynamic Cycling for Children with Cerebral Palsy

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Introduction

Children with Cerebral Palsy (CP) can have reduced muscle strength, particularly in distal and lower limb musculature (Elder et al, 2003). Reduced muscle strength may be due to low activity levels while poor activity levels could cause decreased muscle strength (Fowler et al, 2007). Paediatric research evidence supports muscle strengthening to improve gross motor function and physical activity levels in children with CP. The World Health Organisation (WHO, 2007) emphasises inclusion of activities and social participation in children's rehabilitation programmes. Frequent and successful participation in community-based physical activities may result in children with CP maintaining these activity levels into adulthood. Numerous barriers exist for children with CP to access physical and leisure activities (Mihaylov et al, 2004).

Pedal Power is a registered UK charity whose mission is to make cycling accessible to all. Pedal Power provides adapted cycles and opportunities to participate in adapted dynamic cycling (ADC). Participation in ADC may increase activity levels and lower limb muscle strength in children with CP. To date however, no research evidence on ADC for children with CP or potential effects of ADC on muscle strength has been identified.

Aim

To determine the effects of 6 ADC sessions on lower limb muscle strength in children with CP.

Method

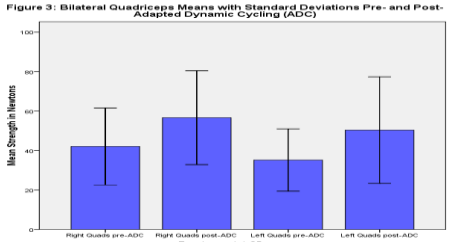
Ethical approval was provided by the School of Healthcare Studies Research Ethics Committee, Cardiff University. Parents and children volunteered to participate following a Pedal Power cycle assessment for a suitable cycle with appropriate adaptations. Children with CP aged 2–18 were included while those who had undergone lower limb surgery or received botulinum toxin injections within 6 months of the study were excluded. In a same subject experimental design, bilateral quadriceps and hamstring strength was measured in sitting at 90° knee flexion, using a hand-held dynamometer (Figure 1). Strength was measured 4 times before and 4 times after participation in 6 ADC sessions. Children participated in 6 ADC sessions over 8 weeks, cycling in a traffic free city park, increasing time and distance cycled as able (Figure 2).

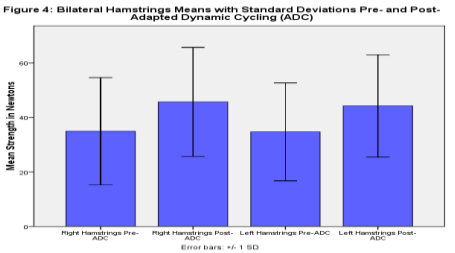
Figure 1: Measuring Right Quadriceps Strength using the Hand-held Dynamometer

Figure 2: Adapted Dynamic Cycling (ADC) Intervention

Results

Participants were nine children with CP: 4 boys and 5 girls, aged 2.6 – 17.8 years (mean: 9.46; SD: 5.56). Gross Motor Function Classification Scale Levels (Palisano et al, 1997) ranged from I – IV. Pre- and Post-intervention mean strength values with standard deviations are presented in figures 3 and 4. Differences in bilateral Quadriceps and Hamstrings mean strength values were analysed using non-parametric Wilcoxon Rank Sign test, significance level set at p≤0.05 .
Quadriceps strength changes were significant **(Right p=0.018; Left p=0.021)**.
Hamstring strength changes were not significant **(Right p=0.065; Left p=0.069)**.





Discussion

This pilot study found significant differences in bilateral quadriceps strength following 6 sessions of ADC. Strength profiles in children with CP demonstrate those with weaker quadriceps being less ambulant while increasing quadriceps strength can improve gross motor function in children with CP (Reid et al, 2010). ADC may therefore provide an opportunity to include body structure and function as well as activity and participation levels of the "International Classification of Functioning, Disability and Health" (WHO, 2007) in a child's rehabilitation programme.

Conclusion

ADC provides an opportunity for increasing strength and activity levels in children with CP while providing opportunity for social participation. This pilot study forms part of a larger study with control group investigating the effects of ADC in children with CP.

References

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