

Study significance

Traumatic brain injury and stroke represent the major causes of death and disability for younger and older adults. Many of these individuals present with walking problems, and spasticity is a commonly reported impairment following neurological injury. The Modified Tardieu scale is used to guide spasticity treatment and monitor the effectiveness of expensive interventions such as the administration of botulinum toxin-A. This study is the first attempt we are aware of to evaluate the ecological validity of the Modified Tardieu scale. Establishing its ecological validity will enable clinicians to accurately assess spasticity, ensure treatment decisions are cost-effective and monitor patient progress in a more effective manner.

Impact on clinical practice

The results of this study will guide further standardisation of the joint ROM and angular velocities during clinical testing using the Modified Tardieu scale. It is anticipated that this project will lead to the development of innovative and accurate assessment devices including a smartphone app. This will be freely downloadable and widely accessible to all clinicians working in the neurological sector, including those in rural or remote practices. The results of this study will also be used to inform future research further investigating the impact of spasticity on mobility outcomes.

Effectiveness of a novel approach to training bike skills in ambulant children with cerebral palsy: a model for promoting motor learning and participation

Rachel Toovey, APAM

Project overview

Cerebral palsy (CP) affects one in every 500 live births, making it the most common physical disability of childhood. Children with CP have problems with movement to varying degrees—some children can walk independently but have difficulties with sports and high-level mobility, while other children are medically complex and rely on a wheelchair for mobility. Across all levels of function, there is an increasing need for

evidence-based interventions tailored towards the attainment of goals that are meaningful to children with CP and their families. Learning to ride a bike is a common childhood activity. As I have experienced, working as a physiotherapist with children with CP at the Victorian Paediatric Rehabilitation Service (VPRS), it is also often a goal for ambulant children with CP. Training bike skills in ambulant children with CP has resulted in positive clinical outcomes in pilot work conducted by myself in collaboration with the VPRS; however, the evidence base is limited.

This project is part of my PhD at the University of Melbourne and Murdoch Children's Research Institute. It will utilise motor learning and participation frameworks to assess the effectiveness of a novel task-specific approach to training bike skills in ambulant children with CP.

Methodology

A single-blind randomised controlled trial will be undertaken. Up to 60 ambulant children, aged 6–15 years, with CP who have goals related to bike skills will be randomised to an intervention or comparison group. The intervention, framed by motor learning theory, will involve a task-specific, centre-based group bike skills training program, while children in the comparison group will participate in a parent-led home-based program. Both programs will take place for a week in the school holidays. Outcomes measured have been informed by a participation framework to assess not just skill development but also the impacts on the children's daily activities. The primary outcome is goal attainment and will measure the extent to which the participants achieve their bike-riding goals. Secondary outcomes include level of bike skills, physical activity, self-perception, broader functional skills and participation in bike riding over the study period. Outcomes will be measured in the week after and at three months after the programs.

Current leading research

There is currently very limited evidence to guide clinicians (generally physiotherapists and occupational therapists) on best practice bike skills training in children with CP. The studies that



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RESEARCH

do exist on bike riding in children with CP have been conducted on stationary bikes with no evidence to suggest this transfers to improved two-wheel bike skills. More broadly though, a systematic review I conducted in collaboration with my supervisors found promising evidence for task-specific motor learning approaches for acquiring or improving gross motor skills in this population. Additionally, a small number of low-quality studies on training bike skills have been conducted in children with primary intellectual disabilities (Down syndrome, autism spectrum disorder) with promising results, including improved bike skills and levels of physical activity. This seeding grant is providing funds to undertake the first randomised controlled trial exploring training bike skills in this population. If shown to be effective, the rigorous design of the trial will provide strong evidence for training bike skills.

Study significance

Training bike skills is a promising means of improving meaningful and functional outcomes in this population through goal attainment and skill learning. If shown to be effective, clinicians will have much needed guidance on evidence-based methods for enabling children with CP, and their families, to achieve their bike-riding goals. It also has the potential to provide a pathway to improved participation in

physical activity, which research suggests improves quality of life in children with CP. Additionally, physical activity in childhood is important as it leads to improved physical activity and reduced risk of chronic disease in adulthood.

Impact on clinical practice

Through this project, new knowledge regarding the effectiveness of a novel, task-specific approach to training bike skills and the associated outcomes for ambulant children with CP will be generated. Given the clinically driven nature of this research and its promising feasibility, the approach has the potential to be replicated globally. Moreover, it may be a model for promoting motor skill learning and participation in other activity-specific skills and other populations with neurological or developmental conditions. It will also continue to drive the shift in clinical practice towards physiotherapy that is functional and meaningful for children and their families.

Associate investigators/PhD supervisors: Associate Professor Alicia Spittle, APA Paediatric Physiotherapist; Dr Adrienne Harvey, APAM; Associate Professor Jenny McGinley, APAM.

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