

PRF endeavours

InMotion asks two recent recipients of Physiotherapy Research Foundation seeding grants to elaborate on their research projects.

Better assessments for better outcomes: determining the ecological validity of the Modified Tardieu scale

Megan Banky, APAM

Project overview

Mobility limitations are common following neurological injury and spasticity is prevalent in this population, making it a major focus of rehabilitation interventions. Historically, spasticity has been shown to have a detrimental impact on long-term mobility outcome. Our research team have recently published a series of four articles which support the body of emerging evidence suggesting that spasticity may not have as large an impact on mobility outcomes as previously thought. Several theories may explain the conflicting evidence surrounding this complex debate; one of these suggests that there may be a disparity between impairment-based assessment findings and how spasticity manifests during walking.

The Modified Tardieu scale is the gold standard clinical outcome measure used to assess spasticity, as it involves moving the joint at different speeds and is therefore able to differentiate the velocity dependent component of spasticity from co-existing impairments. When walking, the lower extremities move through a large range of motion (ROM) at various speeds. As such, a spasticity assessment protocol should provide standardised testing parameters for both of these variables. Currently, scales of spasticity, such as the Modified Tardieu scale, do not provide quantitative standardisation in regards to the speed of assessment, making it difficult to ascertain whether clinical assessment of spasticity is relevant to activities such as walking.

Although there have been many investigations into the reliability of the Modified Tardieu scale, little attention has been paid to the validity or the standardisation of testing speed. 'Ecological validity' refers to the

relevance of a test result to everyday situations and not purely its reflection of a clinical phenomenon. The aim of this research project is to evaluate whether the Modified Tardieu scale accurately reflects muscle function during walking. This may give an indication of the scale's ecological validity and provide a stronger justification for the clinical use of this scale.

Methodology

Thirty-five patients and 25 assessors will be recruited to participate in this cross-sectional observational study. Participants will attend a testing session whereby each assessor will complete the Modified Tardieu scale on a range of patients with lower limb spasticity. The ROM and speed of assessment will be recorded simultaneously using three systems: (1) a criterion reference three-dimensional motion analysis system, (2) a smartphone app and (3) the Microsoft Kinect. This testing protocol has been validated in a group of healthy controls. The data will be analysed to determine whether the ROM and speed of assessment accurately reflect lower limb biomechanics during walking.

Current leading research

There is currently a lack of evidence to substantiate the relationship between spasticity and functional outcomes, and no resolution has been reached to verify the role that spasticity may have during walking. A co-investigator of our study was the lead author of the 2010 International Consensus Statement outlining best practice in the assessment, intervention and aftercare for lower limb focal spasticity treated with botulinum toxin. This publication highlights the importance of a holistic, patient-centred and functionally relevant approach to the assessment of spasticity. It is anticipated that the findings from this current study will add valuable information to the body of evidence investigating the relationship between the assessment of spasticity and mobility performance.



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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



'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.'