

Evaluating the effects of UMN lesions on hand grasp and release

Hannah Barden^{1,2}, Christine Chapparo¹, Ian Baguley^{2,3}, Melissa Nott²

¹The University of Sydney, Faculty of Health Sciences, Sydney, Australia, ²Brain Injury Rehabilitation Service, Westmead Hospital, Sydney, Australia, ³The University of Sydney, Department of Rehabilitation Medicine, Sydney, Australia

Introduction:

Upper Motor Neuron (UMN) lesions that occur following acquired brain injury (ABI) impact on upper limb (UL) function. UMN lesions have both positive and negative components, however, measures such as the Modified Ashworth and Tardieu Scales solely focus on the positive features and measure performance at the 'body structure and function' level of the WHO classification of function. In order to evaluate functional change at the 'activity and/or participation' level of function, both positive and negative features need to be assessed.

Objective

1. Investigate a novel method of evaluating 'grasp and release' computerised dynamometry data
2. Determine the relationship between dynamometry measures and standardised functional measures.

Methods:

Adults with post-ABI focal spasticity and healthy controls underwent sequential UL assessments 4 weeks apart involving computerised dynamometry and standardised measures. Computerised dynamometry data was processed to determine the force, duration, force velocity and 'grip work' exerted by each participant during repeated hand grasp and release.

Results:

Preliminary analysis suggested computerised dynamometry assessed both positive and negative features of UMN lesions. Adults with UMN lesions generated less grip force over longer cycle times with their affected limb, consistent with negative UMN features. The ABI group generated high levels of involuntary, non-task grip work (39%), a feature consistent with positive UMN features (contrasting with a value of 3% in controls). Ongoing investigation will provide further understanding of the relationship between dynamometry and functional measures of upper limb performance.

Conclusion: Computerised dynamometry enabled measurement of the grasp and release components of hand function, quantitating aspects of both positive and negative features of UMN lesions in adults with ABI. The relationship between dynamometry and functional upper-limb performance measures may prove to be better than current measures including the Modified Ashworth and Tardieu Scales.

Contribution to OT practice/evidence base

This preliminary data provides evidence to support the use of computerised hand dynamometry in post-ABI UL functional assessment, particularly having greater ecological validity by quantifying an individual's function at the 'activity and participation' level.