Establishing the impact of a controlled testing speed on spasticity outcomes: assessment tool implications

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Introduction

Returning to walking is the most common goal following neurological injury, such as stroke or traumatic brain injury. Spasticity is an abnormal muscle tightness in response to a fast movement, which is common in this population and has a profound impact on function and quality of life. The impact that spasticity has on walking outcomes remains unclear. One explanation for this is incorrect treatment decision making secondary to false-positive assessment findings. This may be because the current standardised testing protocol, using the Modified Tardieu Scale (MTS), is much faster than the speed that the leg moves during walking.

Aims

This study aimed to determine whether completing the MTS at a speed matched to an individual patient's walking speed alters the assessment findings, when compared to its standardised form.

Methodology

Ninety participants with spasticity of one or more of the gastrocnemius, soleus, hamstrings or quadriceps attended a 1-hour assessment session. These muscle groups were selected as they are paramount for walking and often the focus of spasticity intervention. The MTS was completed as fast as possible (V3), as per the standardised protocol, as well as at a controlled speed, matched to the individuals leg movement during walking. The speed was measured using two validated sensors (Figure 1), secured to the participants limb.

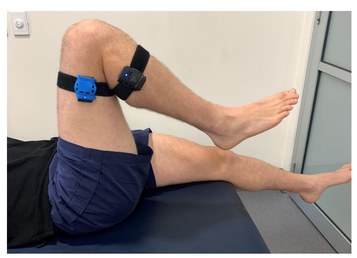

Figure 1: An example of sensor placement, used for the assessment of hamstring spasticity

Methodology (continued)

The prevalence and severity of spastic trials were compared for the standardised V3 assessment and the controlled assessment. Severity was rated using the Tardieu Score (TS), Table 1.

Tardieu Score (TS)
0 = No resistance throughout the movement
1 = Slight resistance through movement, with no clear catch
2 = Clear catch at a precise angle, followed by a release
3 = Fatigable clonus (<10 sec), at a precise angle
4 = Infatigable clonus (>10 sec), at a precise angle
5 = Joint immovable

Table 1: Tardieu Score

Results

The prevalence of spasticity when using the standardised V3 assessment was highest in the soleus (88.9%) and gastrocnemius (85.6%) and lowest in the hamstrings at 40° hip flexion (4.4%). For all muscle groups the V3 assessment was faster than the controlled velocity (Figure 2). The proportion of spastic trials was decreased when using the matched velocity (Figure 3). These results were of greatest significance in the gastrocnemius and soleus muscle groups.

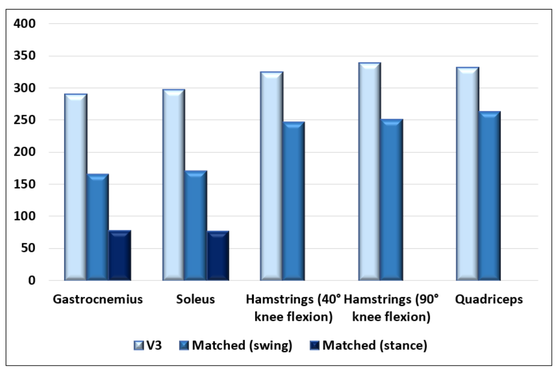

Figure 2: Average peak testing speed for each muscle group (°/sec)

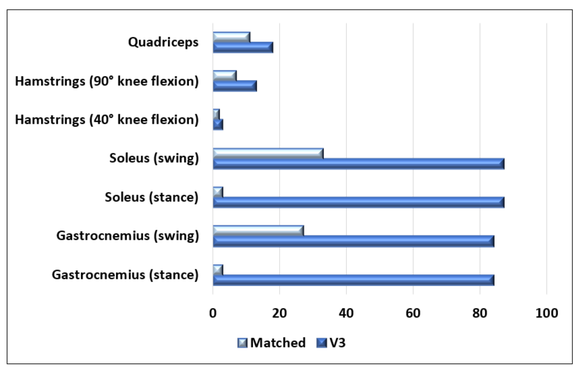

Figure 3: Proportion of spastic trials, TS ≥ 2 (%)

Conclusions

A large difference in testing speeds when comparing the V3 assessment to a controlled assessment was demonstrated. At V3, the prevalence and severity of spasticity was greater, potentially leading to false-positive findings. Treatment of spasticity that is not impacting walking may lead to sub-optimal outcomes and healthcare wastage. The implementation of a controlled testing speed, using innovative sensors, could enhance the selection of patients requiring treatment to improve walking outcomes in individuals with spasticity.

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