eAddendum

de Jong LD, Dijkstra PU, Gerritsen J, Geurts ACH, Postema K (2013)

Combined arm stretch positioning and neuromuscular electrical stimulation during rehabilitation does not improve range of motion, shoulder pain or function in patients after stroke: a randomised trial

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Appendix 2: Tardieu Scale terminology and measurement procedure
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This document outlines the terminology (Morris 2002) and measurement procedure used during the application of the Tardieu Scale (Held and Pierrot-Deseilligny 1969).

Terminology

Velocity to stretch (V):

V1: As slow as possible.

V2: Speed of the limb segment falling under gravity.

V3: As fast as possible (faster than the rate of the natural drop of the limb under gravity).

Only V2 and V3 are used to rate spasticity.

For each muscle group, reaction to stretch was rated at the specified stretch velocity with two parameters X and R.

Quality of muscle reaction (X):

0: No resistance throughout the course of the passive movement.

1: Slight resistance throughout the course of the passive movement, with no clear catch at a precise angle.

2: Clear catch at a precise angle, interrupting the passive movement, followed by release.

3: Fatigable clonus (< 10 seconds when maintaining pressure) occurring at a precise angle.

4: Infatigable clonus (> 10 seconds when maintaining pressure) occurring at a precise angle.

Angle of muscle reaction (R):

R1: angle of ‘catch’, resulting from overactive stretch reflex.

R2: angle of the muscle length at rest.

The difference between R2 and R1 is the spasticity angle.

Measurement procedure

First, moving ‘as slow as possible’ (V1) the total passive range of motion (PROM$_{max}$) of the actual joint was determined, including the muscle length at rest (R2). The standardized mean angular velocity ($\omega$) of the fast movement (V3) was 300/s (Mackey et al 2004) using a metronome to convert this velocity into an audible signal for the assessors. Because each subject has a different PROM$_{max}$, the individual movement frequency (in beats per minute)
had to be calculated (movement frequency = (ω / PROM\text{max}) \times 60). Participants with < 70º total shoulder joint rotation range (≥ 249 bpm on the metronome) were not assessed because of the imminent risk of injury at higher movements speeds. Joint ranges were clustered in groups of five degrees and corresponding beats per minute were rounded to their middle value (e.g. 70º-75º at 257-240 bpm = 249 bpm). If applicable, one observer moved the joint through range (starting the movement on one click and ending it on the next) and rated the quality of the muscle reaction to stretch (X). The other observer assessed the ‘angle of catch’ (R1) if it occurred. Grading was performed in a constant position of the body for the given joint. Other joints were kept in the same position throughout the test and between tests.

References

