

Spasticity: Mechanisms, Quantification and Treatment
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The definition of spasticity is an increase of muscle tone, a disorder of stretch reflex functioning, and enhanced resistance to clinical assessments. This definition is applicable to static situations alone and does not encompass dynamic situations. Individuals who suffer from this impairment often become weaker with voluntary motion and display impaired motor coordination which is most perplexing. Spasticity often plagues many pathological populations from stroke to spinal cord injuries. We need to make a concerted effort to research this topic due to the impairment it causes, pain to patients, and the potential to deform joints and degrade muscles.

Spasticity is best measured via the key parameters of the stretch reflex threshold, stretch reflex gain, and stretch reflex properties. This impairment can be measured clinically (i.e. Modified Ashworth Scale), mechanically (i.e. joint torque, stiffness), with EMG, or motion damping (i.e. Pendulum Test). The most popular technique is the Modified Ashworth Scale which has a number of shortcomings including the subjectivity of this scale, as well as the discrete and limited scale (0, 1, 1+, 2...).

The origins of spasticity differ due to the level of injury experienced by the patient. Possible mechanisms include abnormal motoneuron excitability, abnormal excitatory drive from brainstem nuclei, damage to white matter pathways, disturbances in spinal interneuronal processing, changes to spinal cord circuitry and plateau potentials.

The treatment of spasticity has future implications on the realm of robotics (i.e. gait trainers, exoskeletons), pharmaceuticals, and physical therapy. Additionally, the area of neurorehabilitation should focus energy on redefining the current definition as well as assessments to include dynamic situations.