

Muscle Overactivity in the Upper Motor Neuron Syndrome

Assessment and Problem Solving for Complex Cases: the Role of Physical and Occupational Therapy

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KEYWORDS

• Spasticity • Upper motor neuron syndrome • Physical • Occupational • Therapy

KEY POINTS

- Assessment of abnormal tone includes evaluation of neural and nonneural features of musculature, with emphasis on functional implications.
- Treatment interventions should consider severity and chronicity of impairments, in addition to the client's goals, resources, and support.
- Often, optimal outcomes are achieved via a multidisciplinary approach using a blend of compensation and remediation techniques.

INTRODUCTION

The presence of muscle overactivity may have undesirable implications for an individual that includes decreased range of motion, abnormal posture, abnormal movement patterns, and limited movement capabilities.¹ The functional impact of such deficits may lead to pain, skin breakdown, decreased movement repertoire, inefficiency of movements (leading to fatigue), and limited ability to interact in meaningful ways in a variety of environments.² The role of the physical or occupational therapist is to determine the implication of muscle overactivity, via an evaluation that includes a comprehensive assessment of active and passive movements, neural and nonneural

Disclosure Statement: The authors have nothing to disclose.

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Phys Med Rehabil Clin N Am ■ (2018) ■–■

<https://doi.org/10.1016/j.pmr.2018.03.006>

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pmr.theclinics.com

structures, cognition, social support system, and patient goals. Collectively, this information assists the clinician in determining the optimal plan of care for the individual. This article discusses examination and intervention techniques that the physical or occupational therapist may use as a framework for managing muscle overactivity in the presence of upper motor neuron syndrome (UMNS) in complex cases.

The initial examination of an individual with muscle overactivity in the presence of UMNS should include assessment of³

- Passive range of motion (PROM)
- Active motion, including
 - Force production: grading of force, timing, presence of cocontraction
 - Ability to isolate movements in single joints (segments) and with multiple joints
 - Movement analysis (initial conditions, initiation, execution, termination)
- Standardized assessment tools, including but not limited to
 - Modified Ashworth Scale, Tardieu scale
 - Outcome tools, such as Barthel Index, Rivermead Mobility Index, Gait Speed

When performing the evaluation and treatment of individuals who have hemiparesis following lesions to the corticospinal system it is important for the clinician to be able to have a working understanding of the terminology of UMNS and how the terminology is applied during the rehabilitation process of the affected body parts. For example, when working with individuals who have hemiparesis following a stroke, it is not appropriate for therapists to describe the abnormal volitional movement patterns of the upper limb as spastic movement. Spasticity only describes one sign of UMNS.⁴ When using the term spasticity in conjunction with a volitional movement, it is not being used correctly and does not provide a clear clinical picture of either the movements available to the patient or the anomalies of the intended motion that need to be more completely analyzed for effective therapeutic interventions. For therapeutic analysis, a clinician needs to understand the positive and negative signs of UMNS.⁴ Combinations of positive and negative signs produce imbalances of muscle force across a joint of a limb creating maladaptive postural influences of the limb and abnormalities in movement patterns.⁴ Negative signs include a lack of muscle activity. For example, weakness, lack of volitional recruitment of muscle groups, and a lack of reflexive activity are considered negative signs of UMNS.⁴ Positive signs include spasticity, associated reactions, clonus, cocontraction, and spastic dystonia.⁴ Included with the impaired movement patterns associated with the positive and negative signs of UMNS are also the consequences of the UMNS in regards to shortening of soft tissues of the muscles, joints, structures, and osteoporotic considerations of the bones and the skin.

Spasticity is defined as resistance of the antagonistic muscle group in reaction to a passive stretch. The strength of the resistance is velocity driven. When using this definition in the clinical picture of therapy, the effects of spasticity is seen during PROM of the joint (not active volitional movements).⁴

PASSIVE RANGE OF MOTION ASSESSMENT

Because the effects of spasticity are velocity driven, the faster the joint is stretched the greater the antagonistic muscle groups of the joint resist the stretch. The effects of spasticity may also be a contributing factor to shortening of the muscle and soft tissues of the joints and weakness of the bones because of osteoporosis related to muscular imbalances and long periods of immobilization caused by lack of ability of the limb to change positions.⁴ Therapists need to take these effects of spasticity

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