Dynamic Chiropractic

SOFT TISSUE / TRIGGER POINTS

PNF Stretch Techniques -- Causation Unknown

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At present, "the mechanism behind the effectiveness of PNF techniques remains unclear."[1] Proprioceptive neuromuscular facilitation is the technique commonly associated with contract relax stretching (hold-relax), and contract relax-agonist contraction methods. PNF stretching techniques "use volitional contractions in an attempt to achieve increased ROM by minimizing the active component of resistance attributed to spinal reflex pathways."[2] The rationale for the hold-relax method was that successive maximal excitations of motoneurons reflexly promote their subsequent inhibition.[3]

In the hold relax-agonist contraction method, the contraction and relaxation of the muscle to be stretched (antagonist) is followed by a concentric contraction of the muscle opposing the muscle to be stretched (agonist) to inhibit further the antagonist through alpha-gamma coactivation and reciprocal innervation.[2] A decreased reflex activity is supposed to result in a reduced resistance to stretch and therefore increased range of joint motion.

PNF techniques have been based on neurophysiological factors resulting in a neural inhibition of the muscle undergoing stretch (e.g., Sherrington's law of reciprocal innervation, where contraction of muscles is accompanied by simultaneous inhibition of their antagonists). Others[4] stress mechanical factors rather than reflex factors responsible for the increased length after stretching. The mechanical causation is based on the muscle-tendon unit responding to its viscoelastic properties allowing the length increases that occur without stretching. The elastic component relating to stretch is directly related to the applied force or load while the viscous properties are characterized as time-dependent and rate change-dependent, where the rate of deformation is directly proportional to the applied forces.

Viscoelastic tissue has certain properties (e.g., the property of stress relaxation where if the viscoelastic tissue is stretched and then held at a constant length, the stress or force at that length gradually declines. The viscous factor refers to the decrease of tension with time while the elastic factor represents the maintenance of some tension.[5] Another property is creep, which is characterized by continued deformation at a fixed load.

There are other characteristics such as hysteresis and strain rate dependence. The experiments of Taylor, et al.[4] proved that the behavior of muscle in response to stretch could be explained by viscoelastic properties alone, exclusive of reflex effects. While they admit the existence of a stretch reflex they felt that there was no significant force contribution from the stretch reflex. In their study, denervated muscles responded similarly to the innervated muscles. They felt that PNF techniques induced stress relaxation (a viscoelastic property) due to the tension applied to the viscoelastic elements during passive stretch and active isometric contraction.

Magnusson, et al.[1] showed that the PNF techniques were associated with greater EMG activity in the muscle undergoing the stretch compared with static stretch. They concluded that "the role of

the neurophysiological and biomechanical component in stretching of human skeletal muscle in vivo remains unclear" (as of 1996). They felt that the viscoelastic and EMG response was unaffected by the type of stretch maneuver; that the PNF stretching worked by altering the stretch perception. In other words, the discomfort with stretching is reduced by the preisometric muscle contraction simply allowing the individual to increase with less pain.

References

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