

A Deeper Look At Stretching: Assessing Its Impact On Muscle Function Greg Roskopf, MA

- **Stretching: A Global View**
- How many people stretch on a regular basis?
- How many people are in chronic pain?
- How do you feel when you stretch??
- How do you feel after you stretch?? (hours later)
- How many people see long term changes in their flexibility through stretching??
- How many people would like to see greater positive changes??

- **Why Do Muscles Tighten Up?**
 - **Protection**
 - Body recognizing instability
 - “walking on ice”
 - **Overwork**
 - Performing the function of other muscles
 - Tent poles
 - **Compensation**
 - Same as above
 - **Inhibition Response***
 - Antagonist muscle loses the ability to contract
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- **Perceived Benefits Of Stretching**
 1. Increase or maintain flexibility for day to day or performance functionality:
 - “Movement and physical activity in general helps us maintain flexibility into older age”
 2. Prevent injury during sports and exercise activity:
 - “Stretching can be detrimental to performance and may increase risk of injury”
 3. Increase performance in sport:
 - “Reduction in force output: Either stretching causes the muscle to lose energy stored in the elastic component of muscle, or the nervous system is changed so that it does not send signals to the muscles as efficiently”
 4. Offset muscle soreness after exercise:
 - “DOMS: a review of all studies of stretching practices did not find any benefit from stretching for the prevention of muscle soreness”

“Stretching the truth-Does stretching work? What works? What’s best?”
(2008)

- **The Effects Of Stretching**
 - “Stretching before or after exercising does not confer protection from muscle soreness.
 - “Stretching before exercise does not confer a practically useful reduction in the risk of injury
 - Effects of stretching before and after exercise on muscle soreness and risk of injury: a systemic review (2002)
BMJ School of Physiotherapy, Sydney Australia
 - Reduced Strength After Passive Stretch of the Human Plantarflexors
Journal of Applied Physiology 89: 1179-1188, 2000
 - “Motor unit activation and electromyogram were significantly depressed after maximally tolerable passive stretch”
 - “Prolonged stretching of a single muscle decreases voluntary strength for up to one hour after the stretch as a result of impaired activation and contractile force”
 - “Provides valuable insight to important influences on the generation of maximum voluntary force in human skeletal muscle”
- **What Is our Goal When We Are Trying To Stretch?**
THE PHYSIOLOGICAL AFFECT
 - Increase ROM
 - **Superficially:**
 - increase how far you can “move”
 - **Specifically:**
 - Degrees of movement a particular joint
 - » Associated length changes in the tissue
 - » Separation of agonists attachments
 - » Approximation of the antagonists attachments
- **Conventional Means of Enhancing ROM**
1st Option: Increase the length of muscular soft tissues
Directly:
 - Elastic vs. Plastic properties: temperature and deformation
 - Viscoelasticity - speed specific, temperature key
 - Degeneration of tissue when beyond elastic and into plastic stage
 - Temp to 102° - 110°, lengthen-hold-cool for the least amount of degenerative changes.
 - **Practical Means of Enhancing ROM**
- **2nd Option:** Modify the neuromuscular controls over length/tension by resetting the muscle spindle.
Indirectly stretching the tight muscle
 - Inhibit the antagonist vs. activate the agonist
 - Increases ROM the quickest
 - Teach the nervous system to allow ROM.
 - Nervous System must also be comfortable with stability in this ROM

- **JOINT STABILITY & JOINT MOBILITY**
 - ROM IS GOOD: If its stable.
 - Muscles support and control motion around joints.
 - Mobility will be limited if there is no sense of muscular stability (ice)
 - If the antagonist muscles cannot contract efficiently
 - Body will naturally protect the joint when muscles cannot support it
 - Ligaments are 2nd form of protection: Not primary tension regulators!
- **Alpha Gamma Co-activation**
 - Higher centers recognize change in length and send info to activate the gamma motor neuron
 - Gamma motor neuron sends info directly to the intrafusal fibers (contractile portion)
 - Intrafusal fiber tenses:
 - Sensory input directed to alpha MN
 - Combined information!!!
- **ISOLATED WEAKNESS IN EXTREMES**
 - **Neurological advantage**: Lengthened position (spindle feedback)
 - **Biomechanical advantage**: actin and myosin crossbridging
 - **Biomechanical and neurological disadvantage**: Shortened position
 - ***Pain and dysfunction typically show up in the extremes
 - **The lengthened position of one muscle is the shortened position of the opposite muscles
- **Muscle Tightness -vs- Muscle Weakness**
- Consider muscles that shorten in order to move you into the position of limitation
 - **Limitation in Hip Flexion**:
 - Tight Hamstrings OR Weak Hip Flexors:
 - Rectus Femoris
 - TFL
 - Psoas Major/minor
 - Iliacus
 - Sartorius
 - Adductors/abductors that flex the hip
- **ROM Exam Becomes The Indicator**
 - Where ever you see a limitation in ROM
 - Means the muscles that move you there, cannot shorten efficiently
 - The ROM exam tells where the problem originates
 - What is the body protecting from??
 - What muscles cannot shorten?
 - A representation of instability
 - We are only as strong as our weakest link
 - Must improve the ability for the muscles to shorten

- **Muscle Weakness -vs- Muscle Tightness**
 - Hip Flexor weakness/Hip Extensor tightness
 - Hip Extensor weakness/Hip Flexor tightness
 - Internal Rotator weakness/External Rotator tightness
 - Trunk rotator weakness/trunk rotator tightness
 - Dorsiflexor weakness/Plantarflexor tightness
- **Active -vs- Passive Range**
 - Only as good as the motion that you can control
 - Must fill in the gap between active and passive ROM
 - Ex: Quads -vs- Hams
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MUSCLE ACTIVATION TECHNIQUES: Increase Stability In Order To Increase ROM

- **LOW-INTENSITY ISOMETRICS**
- Low-Intensity Isometric contractions:

Create less muscle spindle stretch lag and unloading effects.

Easier to regulate the intensity of the contraction.

Least stressful and most controlled form of exercise when dealing with injury.

Low-intensity **isometrics**, then a continuum of reinforcement exercises.

- **LOW-INTENSITY ISOMETRICS**
 - Place joint in specific position relating to weakness.
 - Maintain extreme of motion.
 - Client activates into plane of weakness.
 - Performs 6 contractions: Hold 6 seconds with each contraction.
 - Start with the minimal amount of effort (10%) and increase appropriately.
 - **30-60-90 PRINCIPLE**
 - 15 degree carry over in isometric strengthening.
 - Reinforce 30 degree increments from neutral
 - Actively moving away from neutral in order to restore active/passive relationship
- **MAT STRENGTHENING**

Must activate “**POSITIONS OF WEAKNESS**”

Must be “**Jump-Started**” prior to prescribing isolated strengthening exercises

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