

# Stretching -- The truth about what we currently know.

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How many of us stand behind the blocks and swing our arms trying vainly to do "the condor" like Michael Phelps or have our teammate hold our hands and try to press our arms behind our backs efforts to touch our knuckles together, gritting and sweating all the while, thinking "This is helping. I know it is." Well, I am here to tell you that maybe it is not helping as much as we were hoping.



What you have before you is a summary of some of the current findings and proposed hypotheses regarding the state of knowledge on stretching. Use this article as a cure for insomnia or as a spark for further reading...I'll see you in the pool!

Stretching is the movement of the muscles and tendons about a joint to a point of resistance within the available range of movement (ROM) at which point a force is applied, generally past its end range. The tissue is subjected to a pulling force resulting in elongation of the musculotendinous unit. What happens to the tissue is dependent on its viscoelastic properties. Viscoelasticity is a combination of viscosity and elasticity. Viscosity refers to a material's ability to dampen and lubricate. Elasticity refers to a material's ability to return to its original state following deformation after the removal of the deforming load. In addition to affecting the tissue's structural elements, stretching affects different sensory receptors in the muscle and tendon resulting in important neurophysiologic phenomena.

Flexibility is the ability to move muscles and joints through a full ROM. Flexibility is necessary for efficient movement. Flexibility varies from person to person and from joint to joint within an individual. Most consider good flexibility essential for successful athletic performance and injury prevention. This premise has not been proven, however, in clinical studies. What has been shown is that flexibility is maintained through regular and proper stretching regimens and will diminish over time if tissues are not stretched or exercised. Aging affects tissues to the extent that flexibility is decreased. This gradual shift toward increased stiffness can be countered by remaining active and working on flexibility. The goal of any flexibility program is to improve the joint ROM by improving muscle extensibility. In addition, flexibility can be affected by joint laxity (looseness). Each of these elements is separate. Individuals with joint laxity may have poor musculotendinous extensibility (muscle stiffness).

Strength and stretching: Most studies have found acute decreases in strength following stretching. This finding is more prominent the longer the stretching protocol or the higher the number of exercises and sets. Overall performance seems to be minimally reduced in studies compared to strength loss. For instance, jumping ability is a measure of performance while weight moved with a single leg press is a measure of strength. Studies have demonstrated minor reduction in jumping compared to larger loss in weight moved with a single leg press with stretching. Thus, in strength-dependent activity, stretching may actually have a negative acute effect such as in maximum effort endeavors like single repetition maximal lifts. Preservation of performance may be due to the practice of mixing in warm up with stretching. In addition, strength and performance may actually be separate entities with unique features and distinctions.

Reviews of stretching routines have suggested that they do not protect against injury, especially due to overuse, but may help prevent muscular strains.

Chronic stretching on strength performance has been looked at as well. Over time, flexibility improves with chronic stretching routines as has improvements in strength. The key difference between these seemingly contradictory findings is acute vs. chronic stretching programs.

What could be happening?

Electrical activity in the muscle and tendon receptors is affected by stretching. This change in neuromuscular activity may lead to changes in muscular activity and subsequent performance.

Improved tolerance to stretching has been identified as a benefit of stretching. Rather than promoting increased elasticity in the muscle itself, the benefit seems to come from changes in how the neural receptors in the muscle, joint, and tendon operate in the stretched muscle. The stretched muscles have a reduction in sensitivity which allows for smoother functioning.

Stretching may alter the properties of the muscular and tendinous structures making them more elastic and less viscous. Stretching may, therefore, lead to a decrease in viscosity acutely, which can allow the muscle fibers to slide with less resistance to movement. This can lead to increased compliance (stretchiness) that may lead to decreased ability of the muscle to produce force.

Cellular adaptations from stretching may include increased muscle cell formation, a finding seen in animal studies. Whether increased muscle cell formation has a positive effect on strength in this instance is not known.

Finally, certain hormonal changes take place with stretching such as an increase in the production of insulin-like growth factor that can lead to muscle development.

#### Conclusion:

Flexibility and strength are fundamental fitness components in many sports. Strength performance may be diminished by a preceding stretching routine. Studies of acute exercise programs include routines that are often much longer in duration and include a greater number of sets than are traditionally practiced and recommended. Further studies with more realistic designs are needed. In addition, many of the studies include very few subjects calling into question the validity of the results.

Chronic stretching routines seem to offer a benefit to participants with maintenance of flexibility and strength. This may be due in part to actual changes in anatomy allowing for improved ROM or an increased tolerance to pain allowing for a greater ROM closer to the maximal limit of the stretched structures.

#### Summary:

Pre-exercise stretching leads to a decrease in the ability to generate a maximal force. These effects are less apparent when combined with other pre-swimming activities typically used in a warm-up such as drills or low intensity movements.

Stretching may reduce the incidence of muscle strains but will not have an impact on injury risk due to overuse injuries.

Based on the existing literature it seems reasonable to recommend:

1. Target pre-participation stretching to muscle groups known to be at risk for a particular sport.
2. Apply 4-5 x 60 sec stretches to pain tolerance to the target muscle groups and perform bilaterally
3. Perform some dynamic pre-participation drills before actual performance