

Commentary 8

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Critical questioning by scientists about common stretching assumptions is not new. German research in the mid-1990s showed that most of the common hypotheses about the neurophysiological effects in stretching are wrong. For example, it had been postulated that brief active contraction prior to stretching

would lead to a subsequent tonus decrease in the stretched muscle. Similarly, it had been suggested that a simultaneous antagonist contraction during static stretching would achieve the same. Yet, the German measurements have shown that both procedures actually lead to an increased excitability of the musculature as well as a slightly

increased muscle resistance to stretching (Wiemann & Hahn 1997, Freiwald et al. 1998). It had also been assumed that a slow and long stretch at a moderate force would lead to a tonus decrease, yet EMG measurements have shown that there is generally a slow tonus increase when a joint is moved close to its maximum range of motion. Given the complex properties of biological soft tissues these findings, as well as those of Herbert and Gabriel should not be too surprising. Nevertheless, it is plausible that prolonged static stretching, directly after exercise, might be contraindicated for regeneration, as static stretching is likely to inhibit capillary blood supply in the stretched tissues (similar to the water extrusion in squeezing a sponge).

It is important to remember that stretching is practiced for many different reasons. Herbert and Gabriel only looked at three possible intentions: injury prevention in sports, prevention of muscle soreness, and an increase of sports performance in athletes. But stretching is also used to increase range of motion in the case of chronic myofascial shortness due to muscular imbalance, post-trauma or post-surgery. One recent study found that cyclic stretching stimulates the secretion of growth factors of tendon fibroblasts and may have a positive influence on tendon and ligament healing through stimulation of cell proliferation, differentiation and matrix formation (Skuttek et al. 2001).

Further research is needed to clarify what type of stretching, over which time frame, is advisable for which conditions. There is evidence that active dynamic stretching techniques seem to be more effective for increasing range of motion than static stretching (Wiemann & Hahn 1997). A muscle is strongest at about

its midrange of potential length. In many people, certain muscle groups are dominantly used in shortened positions due to repetitive movement (in sports or at a work station), poor posture, or a sedentary life style. In these cases, the tissue may slowly adapt by reducing its ultimate fiber length so that the habitually used joint position becomes the new 'middle position' where the muscle can work most economically. One approach that may gradually lead to a lengthening process is to give the tissue regular stimulations when it is both actively used and in extended positions.

This has an interesting parallel in the field of myofascial tissue manipulation, where the practitioner may attempt to loosen soft-tissue restrictions by stretching the tissues using the application of manual pressure. It had been assumed by several authors that this type of passive stretching would stimulate the Golgi-tendon organs, which would then induce a tonus decrease of the shortened muscle fibers. Yet, more detailed studies have revealed that these stretch receptors are generally not stimulated by passive stretching. This research supports the use of myofascial release techniques, in which the patient temporarily contracts the same tissues which are being worked on. It seems that in both areas, stretching and soft-tissue manipulation, there is a trend towards more active movement participation, and that this shift is a reflection of recent research findings.

Regarding the benefits of stretching for athletes, it is advisable to differentiate between activities in which a wide range of free joint motion is important (in this case regular stretching may be beneficial) and activities in which explosive contraction power is more essential, for example for free-style, long-distance swimmers, a wide and free

arm swing is necessary. On the other hand, German studies (Hennig & Podzielnny 1994) demonstrated that static stretching, immediately prior to vertical jumping, tends to have a negative effect on the jumping height.

Comparing the differences in joint utilization between humans and other primates, Australian researchers found that humans are less prone to develop osteoarthritis in those joints (such as the elbow) which are used in a similar wide range of motion to that of other primates. Joints which we generally use in a more limited range of motion (like the cervical spine, shoulder, hand, fingers, knee and hip joint) are more likely to develop this degeneration (Alexander 1994). Regular dynamic stretching and other forms of gymnastics might therefore prove to offer prevention from osteoarthritis, and possibly other joint diseases.

Other possible advantages of stretching may include psychological functions. For example before sports, brief static stretching may be good for the overly nervous or hyper-agitated athlete, and active dynamic stretching may be better for individuals who would profit from some general activation. So far, there has been little or no research on the possible effects of stretching on proprioception. Since clinical studies have shown strong correlations between dysfunctions such as chronic low back pain (Radebold et al. 2001) or idiopathic scoliosis (Keesen et al. 1992) where proprioceptive accuracy is reduced this field of research may offer useful information. It seems that there are many interesting interrelations between body image organization, chronic pain, post-traumatic stress disorders, psychological and physical aging, and proprioceptive accuracy. Static stretching, such as is often performed in conventional Hatha yoga, as well as various forms

of dynamic stretching, could indeed prove to have profound effects in this important dimension.

Conclusion

More research is needed to determine which type of stretching has what kind of advantages and side-effects, for what type of condition. Herbert and Gabriel's research for athletes (and the unprecedented international attention given to their publication)

make a valuable contribution in this direction.

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