COMMENTARY: FACTS, MYTHS AND FALLACIES OF STRETCHING

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Paper submitted September 6, 2002.

INTRODUCTION

Stretching is an athletic ritual that many people are taught as children. It has been handed down from one generation to the next without a full understanding of why, or if, we need to stretch. There has been little understanding on the intensity, frequency, physiological advantage and the best stretching techniques. This commentary challenges some traditional thinking regarding stretching by looking at causes of tight muscles, the physiology of stretching, and some selected literature pertaining to the effectiveness of stretching.

DISCUSSION

Critical Thoughts on Stretching

Some authors, such as Bob Anderson, who wrote the book *Stretching* in 1980 (1), propose that stretching has a variety of benefits. Stretching is thought to relax muscles, reduce muscle tension, and coordinate the body for freer, easier movement. It is also believed to increase range of motion, prevent injuries, prepare the body for activity, develop body awareness, and promote circulation (1). These ideas sound logical, but some literature does not support them.

Critical questions about stretching include:

- Should one stretch before or after exercise?
- With what intensity and frequency should one stretch? Is it possible to over stretch?
- Will stretching reduce injuries?
- Does research show any benefits from stretching?
- What is the optimal method of stretching?
- When is stretching contraindicated?

Causes of Hypertonic Muscles

Knowing what causes tight muscles may help to dictate why and when one should stretch. According to Murphy there are 7 types of hypertonic muscles that can be separated into structural and functional groupings (2).

Treatment for each of these disorders varies according to the cause and may include mental relaxation, trigger point therapy, dietary changes, weight training and stretching.

The structural group includes spasticity and rigidity. Spasticity is caused by upper motor neuron lesions, as seen in strokes, spinal injuries and brain disorders. Rigidity is caused by disorders such as Parkinson's disease.

The functional group includes the following causes of hypertonic muscles: limbic system dysfunction; interneuron dysfunction; reflex spasm; myofascial trigger points; muscle tightness. Limbic system dysfunction is caused by psychological stress, typically seen in neck, shoulder and low back pain. Interneuron dysfunction is caused by compressed nerves and probably responds to chiropractic spinal manipulative therapy. Reflex spasm is a response to pain and the muscles splint to protect the area from further injury.

Hyperirritable spots within tight bands of muscle or fascia are myofascial trigger points, another component of the functional group. When compressed they cause pain to travel to distant locations. According to Travell and Simon, myofascial pain syndromes can be caused by vitamin inadequacy, which can impair energy metabolism needed for contraction of muscles and increase irritability of the nervous system. Other causes of myofascial pain syndromes are metabolic disorders such as thyroid inadequacy, hypoglycemia, gout, psychological factors, allergies, impaired sleep, nerve impingement and chronic infections of viral, bacterial and parasitic origin (3).

Muscle tightness is the last cause of functional muscle hypertonicity. This disorder is caused by hyperactive and shortened muscles, which may be caused by overuse and poor posture. It can also cause joint dysfunction putting pressure on the joints (2).

To address popular notions of stretching and the critical questions posed earlier, we should understand the physiology of stretching. There are nerve endings in the belly of the muscle, the muscle spindle fibers. When the muscle is lengthened, the stretch reflex stops or inhibits the muscle from over stretching and relaxes the antago-

nistic muscle. Other sensory organs, the Golgi tendon organs located in the tendons, are inhibitory in nature. When the tendon is stretched they relax the muscle. Therefore, stretching can be beneficial for muscle tightness but over stretching will be detrimental (4).

Literature Regarding Stretching

There are interesting studies in the literature pertaining to the effectiveness and efficacy of stretching. Some research demonstrates that stretching does increase joint range of motion and increases the speed of reaction of muscles (5). It is also seen to be superior to warming up and massage for increasing joint flexibility (6).

One stretching technique studied in the literature is contract-relax stretching. Contract-relax stretching involves a passive stretch immediately following an isometric contraction of the same muscle. This has demonstrated to significantly increase strength and flexibility (7). This is different than static stretching, where in 1 study static stretching of the calf did not reduce resistance of the ankle joint (8). Contract-relax has also demonstrated to be significantly more effective than ballistic stretching (9,10).

In another interesting study, stretching of the neck muscles increased range of motion of the lower limbs (11). In my opinion, this is caused by decreased tension of the spinal cord and interconnecting muscles and fascia and may be an explanation for why we treat the whole body and not just an isolated area of injury.

Insight into how much someone should stretch may also be provided in the literature. One study demonstrated that there is equal effectiveness for stretching once a day when compared to stretching 3 times a day and that holding a stretch for 30 seconds is as effective holding 1 for 60 seconds (12). It has also been revealed that stretching muscles of the lower extremity had a resulting increase in flexibility for 90 minutes (13).

Some evidence does not support the idea that stretching can help prevent injury. Pope and colleagues conducted a study involving 1538 male army recruits to investigate the effects of stretching. Recruits were allocated to a stretching or control group and both groups first performed an active warm up. The stretching group then utilized 20 second static stretching for 12 weeks. The subjects performed stretches to the gastrocnemius, soleus, hamstring, quadriceps, hip adductor and hip flexor muscles. The control group did not stretch. Within the

12-week period, both groups participated in 40 sessions totaling 50 hours of physical training. The activities included marching, running, obstacle courses, circuit training, swimming and battle training. All injuries were reported to medical personnel and all lower extremity injuries were assessed. The study indicated that pre-exercise stretching did not reduce the rate of injury. They did, however, find that the level of fitness did reduce the rate of injury (14).

Common stretching techniques

Research should provide evidence to help us determine optimal stretching techniques, but this still needs to occur. A variety of popular stretching techniques have evolved over time. Some of the better-known techniques are listed below and comments are made.

One technique that has been abandoned because it caused injuries is ballistic stretching; this is bouncing. The standard technique that has been used for the past several years is static stretching. This method is performed by holding a stretch without bouncing for 15–30 seconds. Auto stretching is also popular and was developed by a Scandinavian manual therapist and a physician. This is a self-stretch technique that uses slow and gentle stretching through a range of motion (15).

Recently, body-mind exercises have also become popular. Yoga and Tai Chi are choreographed movements that include breathing and meditation. The Feldenkrais method and Alexander techniques are other types of body-mind procedures. These are posture and movement reeducation techniques that are claimed to promote decreased stress levels, elevate mood states and kinesthetic feelings of lightness or perception of movement. Pilates is a technique that uses specially designed resistance training devices. Those who use Pilates focus on concentration, control, movement flow, precision, body centering and breathing. Pilates has been shown to increase strength and flexibility (16).

Another type of stretching is active isolated stretching. This is a contract-relax type of technique and sometimes uses a rope to assist the participant. The technique is performed by contracting the muscle group opposite the area that is being stretched and bringing the stretch to a point of light irritation. The stretch is held for 2 seconds. Then, the person stretching returns the muscle to its starting position and relaxes for 2 seconds. The procedure is then repeated (17).

Manual resistance techniques are another popular approach to stretching. These various techniques take ad-

vantage of post contraction inhibition and reciprocal inhibition. A doctor or therapist performs these methods and the goals are to relax muscles, stretch muscles and to mobilize the joints (18).

Dynamic range of motion is also advocated as a stretching procedure. According to Dominguez and Gajda, flexibility will not aid in athletic prowess. They claim that maximal flexibility is only present in pathology such as polio, Ehlers-Danlos syndrome and hypotonia. The authors state that performance will be enhanced by stability throughout a full range of motion, not flexibility. According to the authors, there are more injuries sustained from stretching than from stiffness. They state, "If you bend a joint beyond your ability to control it with muscle strength, you risk either tearing the muscle, tendon or ligaments that support the joint, or damage the joint surface itself through abnormal pressure on it" (19). These authors recommend that stretching should be replaced with dynamic range of motion exercises. For example, they would put the hip joint through a series of motions that would include: flexion, extension, adduction, abduction, internal and external rotation (19).

CONCLUSION

It seems that current literature dispels some of the myths of stretching that have been propagated through the years and provides some of conclusions:

- Pre activity stretching does not decrease the risk of injuries.
- A light activity warm up period before strenuous activity decreases the risk of injuries.
- Warming up or cooling a muscle group will increase the effectiveness of stretching.
- Stretching will cause muscle hypertrophy through eccentric contraction.
- Stretching has an analgesic effect on muscles.
- Stretching will improve range of motion, mobility and speed of contraction (20).
- Adequate nutrition, absence of certain pathologies and psychological stress will decrease muscle flexibility.
- Stretching is contraindicated when the muscle is injured, weak, cold or when there is pain caused by overstretching.

Participants, coaches, researchers of human performance, doctors, therapists and trainers need to find the stretching techniques that will optimize performance and decrease injuries for various activities, ages and body types.

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