Possible Implications of Excessive Stretching on Sport Performance

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Since the birth of modern athletics, it seems like stretching and flexibility training have been as common to athletes' programs as the strength training or conditioning portions. Recently, however, it appears that some are questioning the value of vigorous stretching protocols and even suggesting that intense stretching may predispose certain athletes to musculoskeletal injury and cause others to perform at sub-optimal levels (7). This article does not discuss specific types of stretching, but rather seeks to briefly examine the topic of flexibility and the role excessive stretching may play in physical performance.

While many are undoubtedly aware of the definition of flexibility, a brief review is nevertheless warranted. A simplified explanation of the musculoskeletal system is that bones are connected to other bones by ligaments and where two bones meet is called a joint. Further, the actual movement of bones occurs as a result of transmitted force (via tendons, which connect muscle to bone) produced by contracting skeletal muscles. The range of motion (ROM) of a joint describes how "flexible" a joint is. The extent of a joint's ROM depends, to a large degree, on the connective tissue associated with the particular joint. Technically, flexibility is defined as the range of motion about a body joint (2) and describes the elastic properties and stretching capabilities of tendon, ligament, muscle, and fascia.

Prior to any type of flexibility training, each individual person has some degree of flexibility in each joint of their body. For the sake of this article, we will say that each person's degree of flexibility lies somewhere within a continuum ranging from poor to excellent. While each specific joint has its own unique ROM, it is common to find an "inflexible" person having poor ranges of motion across many major joints and vice versa. No matter what the starting point on the flexibility continuum, there is always the potential to increase joint ROM with flexibility training.

Various degrees of flexibility in specific joints are required for particular sports. For example, an Olympic weightlifter must have a certain degree of flexibility in the knees for the catch positions of the clean and the snatch, and the shoulders must have a certain ROM for the overhead portions of the jerk and snatch.

Most athletic movements have somewhat predictable ranges of motion that are not likely to be exceeded in the course of normal execution. For example, it is safe to say that the ranges of motion of the ankles, knees, and hips during long distance running on a flat surface are not particularly great. The question then becomes, why do distance runners who are not particularly inflexible spend so much time stretching their legs to extreme degrees (in terms of joint ranges of motion)? Let us hypothetically say that long distance running never involves knee flexion greater than ninety degrees. Why then would a runner perform vigorous stretching exercises like a standing quadriceps stretch that involves grabbing the foot/ankle behind the back and pulling towards the buttocks thus forcing the knee into extreme flexion, the likes of which are nowhere near the degree of flexion experienced while running? This is not the same thing as light stretching to "loosen up" which certainly has a place in warming up for activity or sport, nor should it be confused with a person who is "tight" and has poor flexibility and therefore requires a more thorough stretching program.

Decreased flexibility has been associated with increased in-line running and walking economy and increased stiffness may be associated with increased isometric and concentric force generation (6). Powers and Howley (8) also contend that a high degree of flexibility in all joints may not be desirable in all sports from an injury prevention standpoint. The specific example used by Powers and Howley in their discussion of flexibility focuses on the shoulder joint which is described as a structurally weak joint relative to other joints like the hip. The authors note that an increase in shoulder muscle mass might reduce shoulder flexibility but would lower the chance of shoulder injury in contact sports by increasing shoulder stability.

Regarding the power production aspect, if the muscle-tendon unit becomes more easily lengthened or stretched, it will take a longer period of time and will require increased muscle shortening to achieve the same degree of skeletal movement than it would if the muscle-tendon unit was "stiffer" or had less "give." Every muscle fiber has an optimal range at which the greatest potential exists for force production and when that specific length is exceeded (>10 – 15%), force production potential drops off appreciably (4). Therefore, it stands to reason that one would not want to force the muscle to contract in that less-than-optimal range. Additionally, since power is the amount of work per unit time, time is a crucial parameter. Increasing the force transmission time (from muscle to bone) will decrease power for any given amount of work. Obviously, if rate of force development (speed) is increased then power could be maintained, but this would be less efficient. Wallmann et al.(9) demonstrated that vertical jump height was negatively affected by static stretching of the gastrocnemius prior to the jumping event, despite the fact that muscle activity (measured by EMG) was greater during the pre-stretch condition when compared to condition involving no pre-stretching.

As far as mechanical efficiency is concerned, excessive stretching also may increase the laxity or "looseness" of ligaments (the connective tissue that holds bones together and aids in joint stability). If joint stiffness (which is affected by muscle and tendon properties, in addition to ligament) is reduced, more time and energy are required to stabilize the joint. Imagine a pair of twins who are identical in every single way (training history, strength, size, aerobic capacity, etc.). One twin runs a mile on a flat track at nine miles per hour and the other runs a mile on a flat sandy beach at the same nine miles per hour pace. Who expends more energy running the mile? Obviously, the twin that ran on the beach had a much harder time because he or she had to expend more energy every step to stabilize the ankles, knees, and hips due to the very unstable sandy ground. Now let us say both of these twins were running on the track and the only difference between the two was that one was an intense, chronic stretcher and the other did very little structured flexibility training and, as a result, the twin that performed a lot of stretching had a much greater degree of joint laxity in the lower body. If they both ran a mile at the same pace and everything other than joint laxity was equal, chances are the twin with more laxity would be less mechanically efficient because of the increased energy expenditure required to stabilize the looser joints.

Cal Dietz, Head Olympic Strength Coach at the University of Minnesota, tells a story relevant to this discussion about a basketball player he recently worked with (5). The freshman forward came in very well-trained and had incredible flexibility (he was able to do the splits) as a result of the very intense and thorough stretching program he had always used. Coaches commented that this player lacked a "first step" and his explosiveness and ability to change direction was not as good as it should be as evidenced by his Pro Agility test score. Three months of an intense plyometric and strength program had no effect. Coach Dietz instructed this player to stop his intense stretching routine. The basketball coaches were unaware of this change to the player's routine and after three to four months commented on the marked improvement in his first step and explosiveness. His Pro Agility test score also improved. Obviously, this is only an anecdotal report and there could be multiple reasons for this player's dramatic improvement, but it certainly raises questions about the possible effects that excessive stretching has on sport performance.

It is important to note that this article is directed at athletic performance and excessive stretching. Athletics and performance is a very different topic than the general population and health and fitness. It is a widely held belief that flexibility training and stretching should be performed by everybody in order to maintain (or increase) the flexibility of the major joints to the point that flexibility is equivalent to the ROM required in activities of daily living (1). While the evidence for a relationship between poor flexibility and low back health is limited, some contend that major health concerns like low back injury do have an association with poor trunk (mainly low back and hamstrings) flexibility(3) so an effort to increase the flexibility of the related joints should not be ignored. ▲

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About the Author

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