

Stretching Perspectives

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Introduction

Whether stretching is beneficial for performance or injury prevention remains an on-going debate. For those who believe in stretching, there is some good news. Theory, basic science, and clinical science all agree that regular stretching over weeks not immediately prior to exercise increases force and power by about 2% to 5%, and in one study, improved 50-yard dash time by approximately 0.05 seconds (nonsignificant) [1]. With respect to injury, there are only three clinical studies and all showed clinically relevant improvements, although two studies lacked statistical power (RR [95%CI] 0.82 [0.57, 1.14], 0.57 [0.37, 0.88], 0.77 [0.54, 1.08]) [2–4]. Although regular stretching not immediately prior to exercise appears beneficial, the acute effect of stretching when performed immediately before exercise consistently reduces force and power by approximately 2% to 5% [1]. Results with respect to running speed are inconsistent, which may be due to different methodologies or because stretch-induced viscoelastic changes may decrease resistance to motion in some subjects and allow for increased speed despite decreased force.

Most of the controversy on stretching is focused on whether stretching immediately before exercise prevents injury; several recent reviews suggest it does not [5–7]. This article briefly discusses ideas where current evidence suggests recommendations are unlikely to change with future studies, and where future research should be prioritized.

Recommendations Unlikely to Change Stretching was inappropriate in previous studies

The only clinical method to determine if stretching is done correctly (including force, duration, and timing) is to determine if range of motion (ROM) is increased. Although impractical in an epidemiologic study on injuries where one must follow hundreds or thousands of individuals, this has been done for tests of performance. There was a decrease in force and power in every study but one [8], and a weaker muscle is more likely to become injured.

Studies did not include warm-up

Stretching after a warm-up is more effective at increasing ROM than stretching without a warm-up [9,10]. However, injury rates in those who warm up and stretch are similar to those who warm up without stretching [11,12].

Prevention of tendon and nonmuscle injuries

In the Australian military, tendon injuries occurred in 20 of 735 (2.7%) subjects who stretched and 16 of 803 (2.0%) subjects who did not stretch [5]. Others have suggested that stretching one area reduces the risk of a different area (eg, stretch the hamstrings to reduce stress on the back), but have not put forth any supportive data. It is certainly possible that stretching decreases the risk for one specific type of injury. However, if true, stretching must be harmful for other types of injuries because overall injury rates among stretchers and nonstretchers are similar.

Elite athletes

Although there are no studies on internationally recognized elite athletes, stretching immediately prior to activity results in decreased force and power during tests of performance in University varsity athletes [1]. In addition, research from the basic sciences suggests that weaker muscles cannot absorb as much energy and are more likely to become injured. Because an acute bout of stretching weakens muscles in highly trained University varsity athletes, it is unlikely that findings in other elite athletes would yield different results.

Future Research Priorities

High-intensity sports

One clinical study suggested that stretching does prevent ankle injuries in basketball players [13] (please note that there was a coding error in Tables 3 and 4 of this article and the “yes” should be coded as “0”) [McKay G; personal communication]. There are two reasons why one should be cautious in making conclusions. First, the potential confounders of ankle taping and position played were not adjusted for in the multiple regression analysis. Second, in animals, the energy absorbed after a decrease in stiffness due to fatigue was decreased at both low strain rates (ie, low-intensity sports) and high strain rates (ie, high-intensity sports) [14]. We do not know if stretching-induced decrease in stiffness would have the same effect. Given the conflict between basic and clinical evidence, and study limitations, we simply need more research in this area.

Injured athletes and injury

Healthy subjects increase ROM with stretching partly due to an analgesic effect and not just due to viscoelastic change [15–17]. Is this good or bad for an injured athlete? Stretch-induced analgesia would theoretically increase the risk of injury because it would lead to continued activity of an injured muscle/tendon and a more severe injury. However, stretching regularly might improve healing through stretch-induced hypertrophy. Of course, if the objective is to strengthen, why not use strength training? In the two studies comparing a stretch rehabilitation program to a strength rehabilitation program, the strength group was between 1.8 and six times more likely to achieve excellent results (crude RR of benefit [95% CI] = 5.8 [2.2, 14.8], 1.8 [0.94, 3.5]) [18,19]. Whether stretching with strengthening is superior to strengthening alone has never been studied.

Injured athletes and performance

All studies on performance were done using healthy subjects. Because pain can cause inhibition of muscle activity, the balance of stretching benefits (analgesia minimizing pain-induced muscular inhibition) must be weighed against the disadvantages (direct decrease in force and power).

Timing of stretching

Although regular stretching over weeks is beneficial, we do not know the best time to stretch. This might be immediately after exercise, or at times unrelated to exercise. Because most people would likely prefer to incorporate stretching into their regular exercise routine, a study showing that postexercise stretching is as (or more) effective than stretching at nonexercise times is extremely important.

Evidence in Perspective

Every clinical situation is unique and it will never be possible to study every permutation or combination of type of stretch, athlete level, competition type, specific injury, and test of performance. Current research suggests stretching regularly improves performance and prevents injury. However, stretching immediately prior to exercise is not recommended at this time, with the understanding that more research is needed in the areas of high-intensity sports and injured subjects.

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