

# The Role of Stretching in Exercise Performance and Injury Risk

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I confess: I dislike stretching. I'm always anxious to get started with my run, bike ride or basketball game and never want to spend precious time lying on my living room floor. But we've all been told from our very first P.E. class that stretching before exercise helps prevent injury and improves performance. Or does it?

Many of us use the same stretches that we were taught in those very first experiences in exercise and athletics. Coaches, fitness professionals, and athletic trainers have long believed and taught that stretching before exercise is vital; hence, many injured athletes are filled with guilt and regret, believing that more frequent stretching would have kept them out of the athletic training room or doctor's office. But are they right? Researchers recently began to examine how muscles and tendons respond to stretching and how this relates to exercise performance and injury risk. Their findings suggest it may be time to update the old rules about stretching.

Why do we stretch? The most fundamental principle of stretching seems to hold true, that is, consistent stretching improves flexibility. However, the important question to ask is: does the improvement in muscle and tendon flexibility actually protect athletes from injury? Researchers from the President's Council for Physical Fitness concluded that "only normal levels of flexibility are needed for a low risk of injury." The council further reported that there seemed little basis to conclude that stretching before exercise lowered the risk of injury in individuals with normal levels of flexibility. Additionally, a study that examined injury rates among Australian army recruits found no useful difference between recruits who underwent pre-exercise stretching programs and those who did not stretch. However, there is evidence that either extreme inflexibility or hyperflexibility can increase the chance of injury.

While increases in short-term flexibility do not lower injury rates, many recent studies have also reported that stretching immediately before exercise may actually hinder athletic performance. Researchers attribute the decrease in performance to changes in the muscle-tendon unit as well as a decreased signal from nerves to working muscles. One study, performed by scientists from the University of Newfoundland, found that reaction time, movement time and balance were all reduced after 20 minutes of standard stretching before exercise. At the Olympic or elite levels, even the smallest reductions in these important variables could have a significant effect on athletic performance, especially given the slim margin of difference between competitors. Interestingly, it was also found that the control group's pre-exercise routine that consisted of only a warm-up significantly increased their balance, reaction and movement time scores, suggesting that a warm-up of general and sport-specific activity can have a positive effect on performance.

Stretching also seems to have a negative effect on muscular force manifested in jumping and sprint performance. In a group of experienced sprinters, stretching resulted in significantly slower 50-meter sprint times. Similarly, several studies found reductions in vertical jump height after pre-exercise stretching. In a critical review of the literature, Dr. Ian Shrier found that 20 out of 21 stretching studies

reported a negative effect of stretching on a variety of jumping performance variables. There were no studies that found a positive effect. However, while pre-exercise stretching seemed to have negative effects on jumping performance, a pre-exercise running warm-up increased performance when compared with no warm-up.

It seems that gym teachers may not have had it wrong after all: those warm-up laps around the gym before P.E. may have had a positive effect on the ensuing game of dodge ball. In a study by U.S. Army researchers, McMillian also found that, compared with a stretching warm-up, an active warm-up before exercise improved performance on power and agility tests. While the study did not directly investigate the cause for these changes, they hypothesized that stretching may reduce the amount of muscle available for contraction because of a diminished nerve signal. Another proposed theory was that while contracting, the stretched muscle-tendon unit had to take up the increased “slack” of the stretched muscle before general movement could occur.

It is important to distinguish between stretching immediately before exercise and a general program of flexibility training. The decreases in muscular force, reaction time and balance after acute stretching may not apply to a regular program of stretching performed at other times. In a critical review of the literature by Shrier, seven studies suggested that regular stretching improved performance in many of the same areas mentioned in previous paragraphs. One of those studies found that regular hamstring stretching resulted in increased hamstring muscle performance.

There’s more: athletes whose sports demand high levels of flexibility like gymnasts, dancers and figure skaters may actually improve performance with stretching before exercise because performance in those sports rely on the limits of motion. While those individuals would also suffer a decrease in muscular force, balance, and reaction time, it would presumably be outweighed by an increased ability to achieve the necessary range of motion extremes for those activities.

What does this mean for coaches, athletic trainers, and athletes? The evidence suggests that athletes can benefit from a regular stretching program, if it is properly timed so that athletes are not stretching immediately prior to competition. Following this advice would seem to be important for almost every athlete as most sports encompass facets of power, reaction time, and balance. Another valuable piece of the pre-exercise routine should be both a general warm-up, such as light jogging, and one that is sport-specific.

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