To Stretch or Not to Stretch?

Law and Order 2009

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"3-David-2 respond to the Fifth Quarter on South Fifth Avenue for a bar fight involving 20-30 people. One person has reportedly been hit in the head with a bottle and is bleeding profusely; medical and fire are staging." Woop, woop… code 4 to the scene, screech in sideways, open the door before the patrol car comes to a complete stop, jump out and… start stretching. "3-David-2 on scene" you say as you and your partner stand outside the patrol car, loosen up, stretch your triceps, hamstrings, and quads. You ask "Ready, partner?" She replies "Wait just a sec, my left calf is a little tight, let me use the curb here for a minute and loosen it up… OK, I'm ready now. Let's go!"

We are not afforded the opportunity to step out of the patrol car and stretch before getting into the mix of a barroom brawl, or prior to initiating a ped stop on someone you know is going to run. But, does it really matter anyway? Does stretching prior to working out help or hinder physical performance?

Why do we stretch before working out? For the same reason your mother cut the butt of the ham off before putting it into the oven. You asked her when you were a little boy "Mom, why do you cut the butt of the ham off before you put it into the oven?" She answers, "Because that's the way we've always done it." In reality, your mother cut the butt of the ham off because her mother did it, and her mother did it, and her mother did it, and so forth, until you get to the real reason: Because the ovens used to be too small for the entire ham to fit it the oven. It was out of necessity. Now that oven space is plentiful, why do we still cut the butt off the ham before we put it into the oven? Why do we stretch before a game or before working out?

It might be useful to look not at what we've always done, what our high school coaches told us, or what our middle school gym teachers had us do. Rather, what does the scientific research say?

There are many different types of stretching, and for purposes of this article we should really separate "stretching" from "warming up." Oftentimes they are considered one in the same, and in years past we have used stretching as our warm up. However, recently the research has pointed us in a different direction for improved performance.

Static Stretching

Static stretching is almost motionless and the muscle being stretched is not contracted or engaged in any way. The muscle is slowly lengthened to inhibit firing of the stretch reflex (a neurological protective mechanism to prevent the muscle from stretching too far), and held in a comfortable (not painful) range for about 15 seconds.[1] This is the traditional style of stretching: hurdler stretch (with no bounce), standing quad stretch, arm straight across the body or bent over the head tricep stretch. Static stretching can be active or passive, depending on whether the athlete does the work himself or someone else stretches the relaxed muscle.

[1] Costa, Pablo B, Graves, Barbara S, Whitehurst, Michael, and Jacobs, Patrick L. The acute effects of different durations of static stretching on dynamic balance performance. *The Journal of Strength and Conditioning Research* Vol. 23 Number 1 January 2009. 141-147.

Ballistic Stretching

Ballistic stretching is performed using rapid bouncing movements. Ballistic stretching is considered contraindicated and is not recommended due to risk of pulling and/or tearing the muscle. The risk of injury exists from the muscle's stretch reflex. If the muscle is rapidly stretched these receptors quickly engage and the muscle will "snap" back to prevent tearing. Repeated and rapid bouncing does not allow time for the muscle to relax once the stretch reflex is engaged and can therefore leave the muscle shorter than its original length, thus defeating the purpose of improving flexibility through stretching.

Facilitated Stretching

Proprioceptive neuromuscular facilitated stretching, or PNF stretching, incorporates both contracting and stretching the muscle to achieve greater range of motion (ROM) than stretching alone. PNF stretching is passive, or requires a partner to assist as resistance against the contraction and as the one who pushes the limb during the stretching phase. An example would be your partner stretching your tricep, then providing resistance while you isometrically (with no movement) contract your tricep against the resistance of your partner, then allowing another passive stretch of the tricep (stretch-contract-stretch). A variation of PNF stretching is "facilitated stretching" and is considered active because the athlete does all of the work himself. Facilitated stretching can result in remarkable improvement in flexibility in a very short time because neurological mechanisms which maximize a muscle's ability to lengthen.[2]

Stretch or Don't Stretch Pre-Workout?

There is good news for street cops not afforded the opportunity to stretch before fighting an EDP. Research is showing that static stretching can decrease force production and power,[3],[4] such as in activities which involve maximal effort, or explosive and powerful muscular contractions like the vertical jump.[5] Stretching has also been shown to impair response time and balance.[6] Maximal strength has been shown to decrease after static stretching, so it is "not recommended to perform static stretching before athletic events or physical activities that require high levels of force."[7] The reasons behind the results relate to the elasticity of muscle fiber. Using a vertical jump as an example, within the quadriceps muscles there is stored elastic energy. This energy is released and converted to mechanical energy in the form of explosive upward movement when the preparatory downward motion decelerates and changes direction from downward to upwards. Additionally, within a muscle is a bundle of nerves with the purpose of preventing the muscle from being stretched to far. If the muscle spindles detect

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[2] McAtee, Robert and Charland, Jeff, Facilitated Stretching 2nd Ed, "Understanding PNF Stretching," Part I, p. 1. 1999

[3] Behm, DG, Bambury, A. Cahill, and Power, K. Effect of acute static stretching on force, balance, reaction time, and movement time. *Med Sci Sports Exerc* 36: 1397-1402, 2004.

[4] Fowles, JR, Sale, DG, and MacDougall, JD. Reduced strength after passive stretch of the human plantarflexors. J *Appl Physiol* 89: 1179-1188, 2000.

[5] Bruyere, O, Wiedart, MA, Di Palma, E, Gourlay, M, Ethgen, O, Richy, F, and Reginster, JY. Controlled whole body vibration to decrease fall risk and improve health-related quality of life of nursing home residents. *Arch Phys Med Rehabil* 86: 303-307, 2005.

[6] Behm

[7] Bacurau, Reury Frank Pereira, Monteiro, Gizele de Assis, Ugrinowitsch, Carlos, Tricoli, Valmor, Cabral, Leonardo Ferreira, and Aoki, Marcelo Saldanha. Acute effect of a ballistic and a static stretching exercise bout on flexibility and maximal strength. *The Journal of Strength and Conditioning Research* Vol. 23 Number 1 January 2009. 304-308.

that the muscle is being rapidly stretched, it will activate to forcefully snap the muscle back before it lengthens too far and tears. Together, these two properties equate to a powerful snap in the opposite direction of the preparatory movement prior to the desired movement of the muscle.

By statically stretching the muscle prior to initiating a vertical jump, some of this elastic energy dissipates because the muscle is "stretched out." This can be likened to an old, stretched out rubber band which doesn't have the "snap" it used to.

Despite the research that shows static stretching will diminish power, it does however improve flexibility which can prevent injury through increased range of motion. In order to reap the benefits of stretching, it may better serve us at the end of our workout or day and should be included in an officer's fitness program.

So now that our traditional beliefs have been shattered with scientific research, what should we do prior to working out or competing?

Dynamic Warm Up: Asking a question from Michael Boyle's Functional Training for Sports[8], if you tried to prepare frozen rubber bands by stretching them, what do you think would happen? This is the reason cited for athletes pulling muscles; by stretching them before they are warm. This brings us to the last and recommended type of warm up we'll address, the dynamic warm up.

A "dynamic" warm up incorporates using already warm muscles (from a few minutes of low intensity cardio activity) in dynamic movements which prepare the muscles and joints for use by performing similar movements to the workout or competition that will follow, and by performing activities that will maximize performance such as sprinting, jumping, striking, or fighting. The dynamic warm up will also prevent injury by thoroughly warming the muscles and joints by appropriate ROM movement.

It will be impossible to provide all possible activities that could be included in a dynamic warm up, and other numerous resources exist outside of this article. One such resource is the Dynamic Warm Up designed by the United States Tennis Association.[9] It can be printed off complete with photos and instructions, and includes 12 excellent pre-competition or practice exercises. This includes jogging while swinging circles with the arms, side steps while swinging the arms across the body and back, carioca, knee hug lunges, inverted hamstring exercise, backwards lunge with a twist, leg cradle, straight leg march, lateral lunge, trunk rotation with elevation change and arm swing, backwards step-overs, and arm hugs.

Another which was designed for the Washtenaw Community College Police Academy in Ann Arbor Michigan and includes numerous short activities which not only improve cadet performance on physical fitness exit standards, increase speed and jumping performance, but shin splints have also been completely eliminated barring preexisting conditions.

The "Structured Intro" could be used as an entire workout for most people, since it usually takes about 45 minutes to complete, but incorporates required testing activities as well. The Structured Intro takes up the first half of the academy fitness session which was immediately followed by specialized routines such as speed/agility/quickness, reactionary and competition drills, plyometrics, circuits and supercircuits, resistance training, kickboxing circuit (not competitive kickboxing), obstacle courses and foot pursuits, metabolic demands, aerobics classes, cardiovascular room sessions and individual and

[8] Boyle, Michael, Functional Training for Sports, "Linear and Lateral Warm Up," Ch. 5, p. 29. 2004
[9] United States Tennis Association. Player Development Division. 2005

team runs. The runs gradually progress from slow and steady to a variety of training methods such as tempo runs, interval runs, timed runs and longer distance runs usually not exceeding four miles.

The "Structured Intro" includes jogging, walking while rolling shoulders and arms in circles, knee hugs to lunges, inchworms, heel walks, push ups and sit ups (cadets personal 60 second max score, increasing to two minutes), toe tappers, calf raises, back extensions, stationary lunges in all three planes of motion (frontal, sagittal and transverse), vertical jumps, stationary squats, short sprints, high knee running, butt kickers, side shuffles, carioca, skipping for maximal vertical height, skipping for maximal horizontal distance, reverse running, reverse skipping, quick feet skipping, short double leg hops with directional changes, and perfect walking lunges. All activities are performed in very short durations/distances with adequate recovery time in between each activity. Copies will be e-mailed upon request.

What is the bottom line? To improve performance and decrease chance of injury, incorporate a dynamic warm up prior to your workout, then statically or PNF stretch at the end of the workout. Are they worth it? The answer is a resounding "Yes!" No worries that you can't jump out of the patrol car and stretch before you jump into the mix.

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