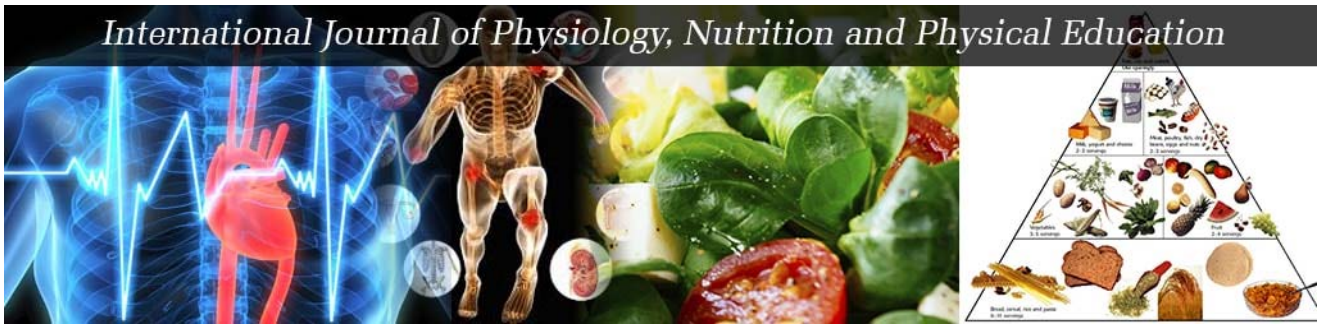

ISSN: 2456-0057
IJPNPE 2017; 2(1): 32-35

www.journalofsports.com
Received: 10-11-2016
Accepted: 11-12-2016

Bewketu Chekol
MSc in Coaching Lecturer in Sport Science Department
Bahirdar University Ethiopia

Correspondence
Bewketu Chekol
MSc in Coaching Lecturer in Sport Science Department
Bahirdar University Ethiopia

Research reviews insight into flexibility the pros and the cons of stretching prior to exercise

Bewketu Chekol

Abstract
Flexibility is an essential fitness component that decreases with age and physical inactivity. Traditionally, including stretching especially static stretching as a warm-up has long been recommended for individuals who engage in exercise for rehabilitation, injury prevention, health improvement and athletic performance enhancement (American College of Sports Medicine [ACSM] 2006, Kovacs 2006, Shrier 2004). The proposed goals of acute stretching prior to physical activity are to enhance performance include improved coordination and proprioception, increased range of motion (ROM), reduced injury potential, improved circulation and decreased muscle viscosity, which leads to smoother muscle contractions (Fredette 2001). However, in recent years there has been growing concern about whether or not stretching should be included in the warm-up phase. Mounting evidence suggests that pre-exercise stretching plays a limited role in injury prevention and performance enhancement. Static stretching impairs performance, Static Stretches Don't Reduce muscle Soreness, Static Stretches Don't Warm-up Your Muscles and Static Stretches Don't Put You in the Right State.

Keywords: Flexibility, stretching

Introduction
Flexibility is an essential fitness component that decreases with age and physical inactivity. Traditionally, stretching as a warm-up has long been recommended for individuals who engage in exercise for rehabilitation, injury prevention, health improvement and athletic performance enhancement Kovacs 2006, Shrier 2004 [15, 27].

Proposed goals of acute stretching prior to physical activity to enhance performance, improved coordination and proprioception, increased range of motion (ROM), reduced injury potential, improved circulation and decreased muscle viscosity, which leads to smoother muscle contractions (Fredette 2001) [9].

However, in recent years there has been growing concern about whether or not stretching should be included in the warm-up phase. Growing evidence suggests that pre-exercise stretching plays a limited role in injury prevention and may unfavorably impact exercise performance. A lot of people warm-up using static stretches.

I've been advocating dynamic stretches for some time, with reasons. But it needs to conduct carefully monitored research. Unfortunately I can't. What I can to do is reviewing and evaluating the literatures. When reviewing I try to evaluate critically the method and material used grouping and results.

By focusing on a broad range of studies relating to post-stretching performance, the study seeks to clarify current understanding of stretching benefits and downsides. While certain performance benefits previously ascribed to stretching have not been born out in the material this study reviews, nevertheless, goal-directed stretching for specific purposes and under particular timing conditions may be beneficial. Areas for further research are also considered.

Stretching-induced force deficits have been observed in a number of studies. The present article suggests both mechanical and neural factors which may be responsible. On the mechanical side, temporary loss of muscular stiffness following stretching is believed to cause decreases in force and power production. Neural factors include decreased neuromuscular activation, (though the precise mechanism leading to decreased force and power production remains poorly understood).

Performance deficits from pre-exercise stretching appear in cited studies relating to muscle strength and power, maximal voluntary contraction (MVC) of the plantar flexors, peak torque and mean power output, jumping performance, running speed and economy, and muscular strength endurance.

Purpose of the study

This study provides an extensive review of literature relating to pre-exercise stretching and its effect on athletic performance. In addition to acute static stretching, the study considers the effects of proprioceptive neuromuscular facilitation (PNF), ballistic and dynamic stretching. While each of these techniques has shown effectiveness in various studies examining ROM, they appear to differ in their impact on exercise performance.

The article begins with a helpful primer on the physiology of acute stretching, outlining the mechanical and neural factors believed to be involved in post-stretching muscular deficit. The review reiterates the evidence of recent research which suggest that pre-exercise stretching may be of limited utility for injury prevention and further, may unfavorably impact athletic performance.

Finally, a holistic assessment is provided to help athletes determine the timing, duration and form of stretching best suited to achieving particular goals. Dynamic rather than static stretching is favored in general for positive results.

Reviews

Static Stretches Impair Performance. Stay away from static stretches right before explosive movements like weight lifting, sprinting, jumping, and endurance events etc. PubMed has plenty of research why, examples:-

Before we review the effects of pre-exercise stretching on muscular-force development, we must first understand the physiology behind this phenomenon. Scientists theorize that stretching-induced force deficits involve mechanical factors and neural factors. Most authors agree that both factors interact and contribute to create a muscular-force deficit following stretching.

The mechanical factor most responsible for decreases in force and power production is the temporary loss of muscular stiffness following stretching (Kokkonen, Nelson & Cornwell 1998, Marek *et al*. 2005, Shrier 2004) [14, 17, 27]. The loss in stiffness increases the length of sarcomeres within individual muscle fibers and decreases the contact between actin and myosin, thereby altering the length-tension relationship and decreasing force (Nelson *et al*. 2001) [18, 19].

In addition, the muscle fibers must shorten over a longer distance to reach maximal contraction. This can pose a problem for explosive-power performance because the muscle can't contract rapidly or generate maximal force. Decreased stiffness also affects eccentric force development and alters the stretch- shortening cycle, thus affecting power development during plyometrics or jumping (Young & Elliott 2001) [32].

Deficits in strength and power measurements following static stretching have ranged from 5% to 30%, according to (Young and Behm 2003) [31]. Other researchers who measured one-repetition maximum (1RM) performances for knee flexion and knee extension found reductions of 7.3% and 8.1%, respectively, following acute static stretching (Kokkonen, Nelson & Cornwell 1998) [14]. A third study showed decrements in 1RM scores for knee extension (-5.7%) and knee flexion (-3.6%) following an acute bout of static stretching in individuals who had also just finished a 10-week flexibility training program (Nelson, Kokkonen & Eldredge 2005) [20, 21, 22].

The neural factor most responsible for reduction in force and power production is decreased neuromuscular activation. The leading thought is that stretching induces a neuroinhibitory mechanism that affects neural input to the muscle (Mark *et al*. 2005) [17]. The decrease in muscle activation is partially responsible for to a decrease in muscle force (Behm, Button 7 Butt 2001) [2].

Reviews in this area were conducted in line with why performance reduces following stretching.

Jumping Performance

Numerous researchers have reported that jumping performance is impaired following an acute bout of static stretching. One study found that drop jump performance decreased by 6.9% in subjects who warmed up with a static-stretching routine compared with a group of controls who warmed up without stretching (Young & Elliot 2001) [32]. These authors concluded that static stretching reduced eccentric muscular-force development and thus decreased the muscles' stretch-shortening cycle, which is crucial to maintaining jumping performance. Similarly, another study reported that vertical-jump performance decreased by 1.5% following an acute bout of pre-exercise static stretching (Church *et al*. 2001) [4].

Shrier (2004) [27] has suggested that the average decrease in vertical-jump performance following static stretching is 2.5%. During each condition, measurements of VJ height and EMG activity during the VJ were recorded analysis of variance and post hoc analysis indicated that VJ height was significantly less (4.19 ± 4.47%) after SS than NS (p<0.05) and significantly greater (9.44 ± 4.25%) in DS than SS (p<0.05). There was significantly greater EMG amplitude in the DS compared with the SS (p<0.05). The results demonstrated that SS has a negative influence on VJ performance, whereas DS has a positive impact. Increased VJ performance after DS may be attributed to post activation potentiation.

Sprint Time and static stretching

Static stretching inhibits the stretch reflex: the ability to store kinetic energy in your muscles during the eccentric. More than enough articles were reviewed. Soccer players, sprinters, college athletes are found researched. RSA, 20m ST,30m ST, 40m ST was seen same result is found there is a significant difference b/n groups of NS and SS in ST. sprinting tine of NS group mean is less than SS group mean at (p<0.05) & (p<0.01).

Dawson, et.al (2009) [5] Thirteen male team sport players completed a repeated sprint ability test consisting of three sets of maximal 6 × 20-m sprints (going every 25 seconds) after performing one of three different warm-up protocols in a within-subjects counterbalanced design. Each warm-up protocol involved an initial 1000-m jog, followed by either dynamic activity only (D), static stretching followed by dynamic activities (S-D), or dynamic activities followed by static stretching (D-S). First (FST), best (BST) and total (TST) 20-m were evaluated. The mean values for TST in all individual sets and overall were generally slowest in the D-S condition (D = 60.264 ± 1.127 seconds; S-D = 60.347 ± 1.774 seconds; D-S = 60.830 ± 1.786 seconds). Overall, these results suggest that 20-m RSA may be compromised when SS is conducted after dynamic activities and immediately prior to performance (D-S).

*SS of both legs or of either the left or right leg prior to sprinting led to a significant increase (0.04 seconds) in 20 m ST. At elite levels of athletic competition, this small increase could be the difference between winning and losing a race. Investigators who studied the effects of different SS protocols (active and passive) on 20 m sprint performance among 97 rugby players reported significant increases in ST following both protocols (Fletcher & Jones 2004) [7]. An increase in 20 m SS in 16 division-1 track athletes was also attributed to passive SS (Nelson *et al*. 2005) [20].

Muscular Strength Endurance and static stretching

Stretching before an endurance event may lower endurance performance and increase the energy cost of running. Articles in this area are in scarce and needs more research. From review of same groups NS & SS were statistically compared. In 60-minute treadmill run NS running covers more distance with little expenditure of energy than SS running in 30-minute 65% $\dot{V}O_2$max preload followed by a 30-minute performance run where participants ran as far as possible without viewing distance or speed.

One study investigated the effects of an acute bout of static stretching on knee-flexion muscle strength endurance in a group of males and females (Nelson *et al*. 2005) [20]. Muscle strength endurance was 28% lower after the stretching bout than it was after no stretching. The authors' recommendation: Avoid heavy static stretching prior to maximal muscle strength endurance exercises.

Collectively, present research findings suggest that there are no ergogenic benefits, and there are potentially detrimental effects, to incorporating static-stretching exercises into the warm-up routine. These findings are consistent among different populations and research designs (Shrier 2004) [27].

Static Stretches Don't Lower Risks of Injury

Since the early 1980s, static stretching has been widely promoted before performing physical activity as a method to prevent injury and improve physical performance. It has become a popular routine included in the warm-up to exercise as it is believed that the slow, controlled movement allows the stretch to be performed easily and safely, with reduced risk of injury compared with other forms of stretching (Smith 1994) [29].

There currently appears to be little sound empirical evidence to substantiate these claims, however, with literature on the subject being scarce and often contradictory. Moreover, some research appears to indicate that static stretching prior to exercise even may increase the risk of injury (Shrier 1999) [26].

Two common factors associated with exercise-related musculoskeletal injury are muscle stiffness and lack of ROM both of which may be addressed by the static stretching technique to help reduce injury risk. The effect of static stretching on muscle stiffness has been well documented and shown to correlate highly to the incidence of muscle injury. Correlation, however, does not infer causation.

The relationship between stretching and injury prevention has been substantially researched, and several systematic reviews have been conducted, with the general census showing stretching to have no positive effect on preventing injury (Herbert, RD and Gabriel, M. 2002) [24].

A computer-aided literature search was performed using MEDLINE, SPORT Discus, Pub Med, and Science Direct databases, selected as they all contain large amounts of relevant literature in the areas of sport and physical activity.

Results seem to indicate that: There is moderate to strong evidence that routine application of static stretching does not reduce overall injury rates. There is preliminary evidence, however, that static stretching may reduce musculotendinous injuries.

Static Stretches Don't Reduce Soreness

Some people stretch post exercise to reduce delayed onset muscle soreness (DOMS). If lifting caused DOMS, you'll be sore the next day, whatever stretching you do. Many people stretch before or after engaging in athletic activity. Usually the purpose is to reduce muscle soreness after exercising (with delayed onset), to reduce risk of injury, and improve athletic performance (Rob D 2002) [24].

Studies on this issue were systematically reviewed. Some studies were done between subjects, others are within subjects. Some group include static stretching in warming up others did not. Muscle soreness was measured 24 hour 48 hour and 72 hour after football training athletics training and other sports

This systematic review finds clear evidence from five studies of nominally moderate quality that stretching before or after exercising has no effect on delayed onset muscle soreness DOMS.

Static Stretches Don't Warm-up Your Muscles.

Warm muscles are harder to injure than cold ones. Static stretches don't raise your body temperature. This method, however, doesn't let you practice movements. So you lost 20 mins doing something that isn't optimal while 10 mins dynamic stretching would have increased flexibility, raised body temperature and grooved motor patterns. SS increased the time needed for warming up. In order to compensate the time needed for stretching, you'll have to add 10 mins stationary cycle or light jogging. For this additional light jogging or stationary cycle you'll have to invest additional energy so that the total energy cost increases.

SS increased the energy cost to warm up the muscles. Findings suggest that stretching before an endurance event may lower endurance performance and increase the energy cost of running.

Static Stretches Don't Put You in the Right State.

To get best results from SS you must relax your whole body, release tension. That's why static stretches, including yoga, are great to de-stress. But they aren't great to prepare yourself for heavy Deadlifts, sprinting, MMA (mixed martial arts) or any other sports where you need to be fast, explosive and aggressive. You want to be fired up, not relaxed.

Summary of Results

With respect to acute static stretching, the study summarizes their results as follows: "Collectively, present research findings suggest that there are no ergogenic benefits, and there are potentially detrimental effects, to incorporating static-stretching exercises into the warm-up routine." That being said, the study does find benefit in dynamic stretching, which involves movements designed to mimic specific actions occurring during athletic performance.

Conclusion

No more static stretching within an hour prior to exercise or competition for activities involving a force or power component. If a client's goal is to improve ROM, & stiffness then static stretching following exercise is best for

maximizing flexibility without affecting performance. Areas that future studies may address include molecular mechanisms behind stretching-induced force and power declines; the effects of regular stretching and performance; and the effects of stretching on performance during an injured state.

References

1. American College of Sports Medicine (ACSM). ACSM's Guidelines for Exercise Testing and Prescription (7th ed.). Baltimore: Lippincott, Williams & Wilkins, 2005.
2. Behm D, Button D, Butt J. Factors affecting force loss with prolonged stretching. Canadian Journal of Applied Physiology, 2001; 26(3):261-72.
3. Burkett L, Phillips W, Ziuraitis J. The best warm-up for the vertical jump in college age athletic men. The Journal of Strength and Conditioning Research, 2005; 19(3):673-76.
4. Church J. Effect of warm-up and flexibility treatments on vertical jump performance. The Journal of Strength and Conditioning Research. 2001; 15(3):332-36.
5. Dawson. Effects of static stretching in warm-up on repeated sprint performance. Journal of science and medicine in sport, 2009; 125:SI-S83.
6. Evetovich T. Effect of static stretching of the biceps brachii on torque, dectromyography, and mechanomyography during concentric isokinetic muscle actions. The Journal of Strength and Conditioning Research, 2003; 17(3):484-88.
7. Fletcher I, Jones B. The effect of different warm-up stretch protocols on 20 meter sprint performance in trained rugby union players. The Journal of Strength and Conditioning Research. 2004; 18(4):885-88.
8. Fowles J, Sale D, MacDougall J. Reduced strength after passive stretch of the human plantarflexors. Journal of Applied Physiology. 2000; 89(3):1179-88.
9. Fredette D. Exercise recommendations for flexibility and range of motion. In J. Roitman (Ed.), ACSM Resource Manual for Guidelines for Exercise Testing and Prescription (4th ed.). Baltimore: Lippincott, Williams & Wilkins, 2001.
10. Godges J. Effects of two stretching procedures on hip range of motion and gait economy. Journal of Orthopaedic and Sports Physical Therapy. 1989; 10(9):350-57.
11. Heyward V. Advanced Fitness Assessment and Exercise Prescription (5th ed.). Champaign, IL: Human Kinetics, 2006.
12. Katie Small, Lars Mc Naughton, Martyn Matthews. A Systematic Review into the Efficacy of Static Stretching as Part of a Warm-Up for the Prevention of Exercise-Related Injury, Research in Sports Medicine, 2008; 16(3):213-231
13. Knudson D. Stretching during warm-up: Do we have enough evidence? Journal of Physical Education, Recreation and Dance. 1999; 70:24-27, 51.
14. Kokkonen J, Nelson A, Cornwell A. Acute muscle stretching inhibits maxi- mal strength performance. Research Quarterly for Exercise and Sport, 1998; 69:411-15.
15. Kovacs M. The argument against static stretching before sport and physical activity. Athletic Therapy Today, 11 2006; (3):6-8.
16. Little T, Williams A. Effects of differential stretching protocols during warm ups on high-speed motor capacities in professional soccer players. The Journal of Strength and Conditioning Research. 2006; 20(1):203-207.
17. Marek S. Acute effects of static and proprioceptive neuromuscular facilitation stretching on muscle strength and power output. Journal of Athletic Training, 2005; 40(2):94-103.
18. Nelson A, Kokkonen J. Acute ballistic muscle stretching inhibits maximal strength performance. Research Quarterly for Exercise and Sport, 200l; 72:415-19.
19. Nelson A. Inhibition of maximal voluntary isokinetic torque production following stretching is velocity-specific. The Journal of Strength and Conditioning Research. 2001; 15(2):241-46.
20. Nelson A. Acute effects of passive muscle stretching on sprint performance. Journal of Sports Science. 2005; 23(5):449-54.
21. Nelson A, Kokkonen J, Arnall D. Acute muscle stretching inhibits muscle strength endurance performance. The Journal of Strength and Conditioning Research. 2005; 19(2):338-43.
22. Nelson A, Kokkonen J, Eldredge C. Strength inhibition following an acute stretch is not limited to novice stretchers. Research Quarterly for Exercise and Sport; 76 2005; (4):500-506.
23. Pope R. A randomized trial of preexercise stretching for prevention of lower limb injury. Medicine & Science in Sports & Exercise, 2000; 32(2):271-77.
24. Rob D Herbert. Michael Gabriel Effects of stretching before and after exercising on muscle soreness and risk of injury: systematic review. BMJ AUGUST 2002 bmj.com 2002; 325(31):335-464
25. Rosenbaum D, Hennig E. The influence of stretching and warm tip exercises on Achilles tendon reflex activity. Journal of Sports Sciences. 1995; 13:481-90.
26. Shrier I. Stretching before exercise does not reduce the risk of local muscle injury: A critical review of the clinical and basic science literature. Clinical Journal of Sports Medicine, 1999; 9(4):221-27.
27. Shrier I. Does stretching improve performance: A systematic and critical review of the literature. Clinical Journal of Sport Medicine. 2004; 14(5):267-73.
28. Siatras T. Static and dynamic acute stretching effect on gymnasts' speed in vaulting. Pediatric Exercise Science, 2003; 15(4):383-91.
29. Smith CA. The warm-up procedure: To stretch or not to stretch. A brief review. *Journal of Orthopaedic and Sports Physical Therapy.* 1994; 19:12-17. [CrossRef], [PubMed], [Web of Science ®], [CSA]).
30. Unick J. The acute effects of static and ballistic stretching on vertical jump performance in trained women. The Journal of Strength and Conditioning Research. 2005; 19(1):206-12.
31. Young W, Behm D. Effects of running, static stretching and practice jumps on explosive force production and jumping performance. Journal of Sports Medicine and Physical Fitness. 2003; 43(1):1-27.
32. Young W, Elliott S. Acute effects of static stretching, proprioceptive neuromuscular facilitation stretching, and maximum voluntary contractions on explosive force production and jumping performance. Research Quarterly for Exercise and Sport. 2001; 72(3):273-79.