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Acute Effects of Dynamic versus Static Stretching on Explosive Agility of Young Football Players

Kulbir Singh Rana, Anuradha Lehri and Swapnil Ramteke

Abstract

Aim: To determine acute effects of dynamic versus static stretching on explosive agility of young football players. **Material and Method:** The study was conducted on 30 male academy football players between 14-16 years. Thermometer and stop watch was used to determine the body temperature and timings of testing respectively. Agility scores using Illinois agility test were taken between three groups of 10 each i.e. control, dynamic stretching, and Static stretching groups. **Results:** The mean time in control, dynamic and static group is 16.049,13.075 and 14.632 respectively. And p value in control versus dynamic group is 0.0001, in control versus static group is 0.05 and in dynamic versus static group is 0.007. “t” score in control versus dynamic group is 4.783, in control versus static group is 2.108 and inn dynamic versus static group is 3.061.**Conclusion:** There is no significant difference in acute agility scores after static versus dynamic stretching with warm up.

Kulbir Singh Rana
Ph.D. Student
Department of Sports Science
Punjabi University, Patiala(Punjab) India
E mail: kbsrana@gmail.com
Anuradha Lehri
Assistant Professor
Department of Sports Science
Punjabi University, Patiala(Punjab) India
Swapnil Ramteke
Assistant Professor
Institute of Allies health Sciences
Integral University Lucknow
Utter Pradesh, India

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Introduction

Most sports individuals or athletes have some pre-participation routine during warm up prior to physical activity to increase body temperature, which in turn increases the flexibility and extensibility of muscles and other soft tissues. This prevent injuries and enhance sports performance by improving flexibility (Taichi Yamaguchi et al 2005; Hedrick A 2000; BaechleT & EarleR2000). Flexibility exercise can reduce perception of pain ensuring muscular exercise distress based on decreased level of residual muscle activity because of static stretching of the involved muscle. Used prior to exercise static stretching may enhance performance. The latest research has shown that strength developed with exercise on rebound movement can be better enhanced by add - on flexibility training. However, the primary importance of the flexibility is in preventing and reducing the injuries. (Thakur D &Motimath B 2014) Agility training is thought to be a re-enforcement of motor programing through neuromuscular conditioning and neural adaptation of muscle spindle, Golgi-tendon organs, and joint proprioceptors (Singh A, Boyat AV, Sandhu JS). An athlete who displays good agility will most likely possess other qualities such as dynamic balance, spatial awareness, and rhythm as well as visual processing (Behm DG, Chaouachi A 2011). Developing agility in children continues over a long period of time. The basic methodology of agility training implies the learning of a basic walking technique, running technique, change of direction, jumps, and landings (Thakur D, Motimath B 2014). Typical warm-up routine consists of light running and calisthenics followed by stretching. Athletes and Coaches use different types of stretching that are usually based only on their personal preference, but no optimal type or amount of stretching has been identified. Static stretching, the holding of a fixed stretched position for 15 to 30 seconds, has long been used as the standard stretching routine. Literature indicates that dynamic stretching may be more beneficial prior to activities that are explosive in nature (Baechle T & Earle R 2000). There are insufficient evidences endorsing improvement of agility followed by either static or dynamic stretching. The current study attempted to further elucidate the issue of using static versus dynamic stretching prior to an explosive type activity. These results may assist athletes and coaches in determining what type of stretching to use when preparing for explosive type, athletic, activities.

Material and methods

To determine if dynamic stretching after a warm-up run would yield the fastest time versus static stretching after a warm-up run or running alone on the Illinois agility test for 30 academy football men players the following procedures were developed. The instrument used to determine the agility of the subjects was the Illinois agility test, which incorporates quick change of direction, straight ahead sprinting, and awareness of body positioning. The validity, reliability, and reproducibility of the Illinois agility test has been established and it has been used repeatedly in sport testing (Pauole, Madole, &Lacourse, 2000; Roozen, 2004). Time to complete the Illinois agility test was measured with the stop watch apparatus.Body temperature was taken using a handheld Thermometer at axilla. Subjects were briefed on the testing procedure and protocols, volunteers were recruited, and those who volunteered signed the informed consent. Subjects were advised that their participation may benefit the team by determining a more effective warm-up protocol for football players. All treatment protocols were conducted in a random order on three non-consecutive days. Subjects were randomly assigned to one of three treatment order groups, which are as follows;

Group 1: Control group (CG),
Group 2: Dynamic stretching (DS), and
Group 3: Static stretching (SS).

The warm-up run for each treatment group consisted of a 10-minute run. Immediately following each warm-up run, the body temperature was measured for all subjects. Within two minutes of completing the warm-up run, the groups start their respective stretching protocols followed by Illinois test. Control group walks followed by Illinois test was measured.

The SS group completed static stretches;

- Modified Hurdler,
- Sitting Quadriceps Pull,
- Butterfly,

- and Pyramid.

The DS group completed the following dynamic stretches;

- Walking Lunges,
- Butt Kickers,
- Side Lunges,
- Squats
- Heel-Toe

Results

For this study, the effect of dynamic versus static stretching on explosive type agility activity. The following result is obtained.

Mean time in control group is 16.049
Mean time in dynamic group is 13.075
Mean time in static group is 14.632

And p value is

In control versus dynamic group is 0.0001
In control versus static group is 0.05
In dynamic versus static group is 0.007

And t score is

In control versus dynamic group is 4.783
In control versus static group is 2.108
In dynamic versus static group is 3.061

No difference existed for body temperature taken post warm-up run between the CONTROL, DS, or SS groups or post stretching between the DS and SS groups.

The mean body temperatures after running were; CONTROL (M = 98.8 °F), DS (M = 99.3 °F) and SS (M = 97.2 °F), and after stretching were; DS (M = 99.3 °F) and SS (M = 97.2 °F). Based on these results, no effect due to body temperature could be determined.Result shows that there is no significant difference between groups in explosive agility type activity.

Discussion

Most of the sports consists of explosive movements which are typically performed at high speeds against resistance provided by the weight and inertia of the body (Aggeloussis, Mavromatis, Kasimatis, Gourgoulis & Garas, 2003). Properly preparing the body to meet the high demands placed on it by these types of activities may serve to increase performance and reduce the incidence of injuries. An effective pre-participation routine prior to explosive type activities will contribute to the development of balance, body strength, body control, running mechanics, agility, and efficient sport-specific movement (Swanson, 2006). In an attempt to further elucidate on optimal pre-participation protocols for explosive type activities, the current study evaluated the effects of dynamic versus static stretching on explosive agility type activity by comparing the time to complete the Illinois agility test for each group; (1) warm-up run alone (CONTROL), (2) Static Stretching subsequent to a warm-up run (SS), and (3) Dynamic Stretching subsequent to a warm-up run (DS).Dynamic Versus Static Stretchingliterature supports the use of dynamic stretching as part of a pre-participation routine prior to high-speed type activities (Little & Williams, 2004), the current study isin support with the previous studies between dynamic versus static stretching protocol for the Illinois agility test. Fletcher and Jones (2004) and Yamaguchi and Ishii (2005) both concluded that dynamic stretching improved performance demonstrated by a decrease in sprint time and increased leg extension power, respectively. Gourgoulis et al. (2003) incorporated half squat jumps into a dynamic pre-participation routine and demonstrated an increase in vertical jump heights, while Faigenbaum, Bellucci, Bernieri, Bakker, and Hoorens (2005) concluded that static stretching when compared to dynamic stretching decreased vertical jump height. Moss (2002) also concluded that a static stretching routine decrease jumping height in gymnasts by 8.2%. For tasks requiring power and agility, the results suggested that dynamic stretching might offer performance benefits not found with static stretching or with no pre-participation routine (McMillian, Moore, Hatler& Taylor, 2006). To the contrary, Koch, O'Bryant, Stone, Sanborn, Proulx, Hruby, Shannonhouse, Boros, and Stone (2003), determined that no difference existed on broad jump performance between static and dynamic stretching protocols. While Weimann and Klee (2003) stated that the perceived benefits of static stretching before a maximum performance have not been proven, Little and Williams (2006), stated that the use of short-duration static stretching prior to participation did not appear to be detrimental to subsequent high-speed performance. To further elucidate the topic, Gambetta (1997) stated static stretches before warm-up or competition could cause tiredness and decrease coordination. For a pre-participation routine prior to an explosive type activity static stretching may not optimally prepare the athlete for the dynamic demands that would be placed on the body.

Results from the current study did not seem to clarify the picture as to whether stretching prior to an explosive agility type performance is beneficial in improving agility test times. Furthermore, this study was unable to determine the differences between static and dynamic stretching protocols prior to an explosive type activity.

Body Temperature. The results of the current study demonstrated no significant differences for body temperature. Although body temperature did not influence agility test times, all body temperatures measured were below or at normal body temperature (98.6^0 F). The decreased body temperatures from normal may have been due to two reasons; 1) The ambient temperature of the testing facility is regulated not to fall below 62 degrees F, and the temperature on experimental days was near 62 degrees F; 2) Anecdotally the subjects indicated that the warm-up run was "too easy" and subjectively no subjects were sweating after the warm-up run. This lack of sufficient increase in body temperature during warm-up may have been one reason for the lack of differences noted between dynamic and static stretching on explosive agility activity in this study. Pre-participation routine. This study was designed to keep the pre-participation routine realistic to a game time setting. The stretching protocols were designed to focus on the main muscles involved in the overall movements of the test, in a timely fashion. Faigenbaum et al. (2005) used a 10-minute warm-up period when looking at the acute effects of different warm-up protocols on fitness performance in children, while Yamaguchi and Ishii (2005) used a 30-second time of static stretching in their study analyzing leg power and static stretching. Both procedures were adopted for this study, a 10-minute warm-up run and a 30 second stretching period of muscle groups for both static and dynamic stretching protocols. It was hypothesized that dynamic stretching would have resulted in decreased agility test times, as compared to static stretching, due to the mimicking and the rehearsal of the activities' specific movement patterns (Boyle, 2004; McMillian, Moore, Hatler& Taylor, 2006). Physiology of dynamic stretching. Muscles and tendons are stretched during any stretching protocol. Viscoelastic properties of the muscle-tendon unit are responsible for the increased length of the muscle (Taylor, Dalton, Seaber& Garrett, 1990). Within the muscle and tendon, Muscle Spindles and Golgi Tendon Organs protect the muscle from being overstretched. McArdle, Katch and Katch (1996), state both are highly sensitive receptors that provide sensory information about changes in length and tension, protecting the muscle and tendon from injury. Supporting literature revealed muscular changes during warm-up and stretching happen at the cellular level. It is suggested that increased muscular compliance from static stretching might mean that the muscle may go through a greater period of unloaded shortening before taking up slack to transfer the generated force (Nelson, Guillory, Cornwell &Kokkonen, 2001). In addition to the musculotendinous unit theory, a more compliant muscle, due to static stretching, the less able that muscle can store elastic energy in its eccentric phase (Wilson, Wood & Elliot, 1991). However, (Clark, 2000) stated dynamic stretching is an active contractile process, and the performance benefits obtained may stem from facilitated motor control. Shellock and Prentice (1985) state performance benefits come via rehearsal of specific movements, increased muscle blood flow, or elevated body or peripheral temperature, which may increase the sensitivity of nerve receptors and increase the speed of nerve impulses, potentially encouraging muscle contractions to be more rapid and forceful. Literature supports dynamic stretching protocols prior to explosive type activities for their success in achieving better tests body. This fact may be due to the rehearsal of movements involved in the actual activity (McMillian, Moore, Hatler& Taylor, 2006). Dynamic stretching protocols may be successful because they focus on related movements while removing awkward movements from the routine (Hedrick, 2000). Dynamic stretching protocols allow for subjects to actively focus energy and attention into the stretching period because of the demands of the protocol. In addition, dynamic stretching protocols allow for constant movement from warm-up to actively keep body body temperature elevated leading into actual competition or testing. Muscle temperature enhances the rate of ATPase activity (Stein, Gordon & Shriver, 1982), which increases the rate of cross bridge cycling (Bergh &Ekblom, 1979). These effects result in an improved maximal shortening velocity and concomitant changes in the force-velocity relationship, which in turn improves maximal dynamic performance (Bennett, 1984). Even though the current results were not significant, evidence exists to implement dynamic stretching protocols into pre-participation protocols, which may have a positive effect on performance. At this point, it is understood that some type of pre-participation routine should be utilized prior to exercise and that dynamic stretching may seem to be more beneficial for increasing performance, but further research is required to determine volume of warm-up activity (running), intensity of pre-participation routine, and the type of stretching (dynamic versus static).

Conclusion

Although literature supports the idea that dynamic stretching protocols may be beneficial for explosive type of activities, the current study was unable to determine if dynamic stretching would yield the fastest time versus static stretching on the Illinois agility test for academy football players. I believe the major limitation of this study was the lack of adequate warm-up, which should have increased the body temperature by at least one or two degrees. Without adequate warm-up for the subjects, the study was unable to determine if no difference existed between treatments or if a difference could not be identified.

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