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THE EFFECT OF 6 WEEKS STATIC STRETCHING AND KINESIOTAPING ON HAMSTRING SHORTNESS IN SOCCER PLAYERS

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Abstract:
Hamstring shortness injuries are common in sports activities and occur frequently in activities which involve running, sprinting, jumping or kicking. Restricted flexibility makes the person susceptible to musculoskeletal overuse that significantly affects the individual's performance level. The present study aimed to compare the effect of 6 weeks' static stretching and Kinesiotaping on hamstring shortness in the dominant leg of soccer players. Twenty soccer players with hamstring muscle shortness, were randomly selected and divided into two groups. First group of 10 individuals used static stretching training (ST) the average age of (Mean±Std.Dev.) 25.78±2.52, body height 180±5.12cm, body weight 79.65±3.42kg, and BMI 24.52±2.36kg/m^2 and second group use Kinesiotape (KT) the average age 23.55±2.30, body height 178±4.91cm, body weight 73.56±3.36kg and BMI 23.21±2.26 kg/m^2. The results showed that six weeks of static stretching training and

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Kinesiotaping had a positive and significant effect on hamstring muscle shortness ($p \leq 0.05$). Therefore, it can be concluded that six week static stretching and Kinesiotaping have a positive and almost equal effects on hamstring shortness and knee joint's range of motion of soccer players and can be used as a corrective therapeutic method for such injuries.

Keywords: hamstring shortness, Kinesiotaping, static stretching, soccer player

1. Introduction

Flexibility is one of the essential components of physical fitness and a key indicator for preventing injuries as well as development and improvement of function and performance. Increasing the joints' flexibility and range of motion, in addition to importance for athletes and sport championships, are important for non-athletes in general body health, including reducing general tension in the nerves and muscles, as well as reducing lower back pain (Shadmehr et al., 2009; Arabmokhtari et al., 2018). There are various tension techniques, most of which include ballistic tension, static tension, dynamic tension, and neuromuscular acceleration via proprioceptive neuromuscular facilitation (PNF) (Marek et al., 2005). Various researches, studying flexibility and extent of its changes, using a variety of tension techniques, have obtained diverse results. Some researchers have reported that PNF tension exercises are more effective than other tension types (Bandy, Iron & Briggler, 1997; Bandy, & Iron, 1994). A number of studies have also recommended non-throwing dynamic tension method (Yamaguchi, & Ishii, 2005; Nelson, & Bandy, 2004; Bonnar, Deivert, & Gould, 2004). The aim of any effective program on flexibility should be to improve the range of motion in a particular joint by modifying the tension strength of the tendon-muscle units that cause movement in that joint. The exercises that stretch these tendon-muscle units will increase the joint's range of motion in the long run (Bandy, & Iron, 1994). Kinesiotaping has been widely used in athletes to prevent sports injuries. Kinesiotape was applied from the origin to the end of hamstrings muscle, which was believed to provide support for the muscle and to increase muscle tone (Chen et al., 2013; Chen et al., 2015).

Hamstring injuries are one of the most common musculoskeletal injuries in the lower extremity. These injuries are primarily caused by high-speed trainings and exercises with high risk of recurrence of injury in these people. Clinical evidence has shown a high prevalence of hamstring shortness in the general population and athletes. In sports fields, the cause of hamstring shortness is hamstring muscle strains. Hamstring injuries are reported to account for about 12% of injuries in professional soccer players. In general, studies have shown that 75% of men and 35% of women older than 10 year old have hamstring shortness. Hamstring muscle injury affects about 12% of injuries in football players and is one of the most common musculoskeletal injuries in the lower extremity. It has been said that the recurrence of this injury is very high among athletes (Van de Hoef et al., 2017; Espejo-Antunez et al., 2018). Several factors increase the likelihood of hamstring muscle injury. One of the most important factors is lack of flexibility. Most medical professionals and instructors consider strengthening and flexibility exercises as a major component of improving the individual's performance. If athletes develop hamstring muscle injury, the treatment process of these injuries is slow, considering the severity of the injury, imposing great costs on government, health-medical care organizations, and sports clubs, and take the athlete away from the tournament. Clinical evidence has shown that hamstring muscle shortness is prevalent in the community and among athletes and many factors, such as nerve dysfunction, muscle injuries, and inappropriate exercises cause hamstring shortness (Shadmehr et al., 2009; Williams et al., 2012). Accordingly, the present study aimed to compare the effect of 6 weeks' static stretching and Kinesiotaping on hamstring shortness in soccer players.

2. Material and Methods

Twenty soccer players with hamstring muscle shortness, were randomly selected and divided into two groups. First group of 10 individuals used static stretching training (ST) the average age of (Mean±Std.Dev.) 25.78±2.52, body height 180±5.12cm, body weight 79.65±3.42kg, and BMI 24.52±2.36kg/m^2 and second group use Kinesiotape (KT) the average age 23.55±2.30, body height 178±4.91cm, body weight 73.56±3.36kg and BMI 23.21±2.26 kg/m^2. The inclusion criteria consisted of being active soccer players (at least 3 times a week) with an age range of 18-30 years, with hamstring shortness, without any neurologic and pathologic disorders, any history of lower extremity surgery, hamstring muscle acute injury more than 3 months, pain in the spine and hip, surgery, or damage to the lower extremities and lumbar spine, and muscle abnormalities (Shadmehr et al., 2009).

The athlete's dominant leg was determined by throwing and kicking the ball. To measure the hamstring shortness, the person was placed in supine position on the dominant leg; the great femoral trochanter, external epicondyle, and external ankle were marked at the end of the test with the marker and connected with a line. The person laid in supine position and flexed the tested hip to 90 degrees with the knee flexed to 90 degrees, while the angle between the hip and the femur was measured at 90 degrees by a metal conveyor to prevent folding of the right angle. The examiner supported the knee and the assistant straightened the knee from a 90 degree flexion. Goniometric axis was located on the external epicondyle of femur and one arm of the goniometer was placed along the large femoral trochanter and the other arm along the external ankle, fastened to the limb by a strap. The head was kept along and parallel to the trunk, while the hands were held near the body. The knee angle was recorded at the first unpleasant stretch, reported by the examinee. If the angle between two arms of the goniometer was greater than 20 degrees, it indicated hamstring shortness. Measurement was repeated 3 times and the mean value was recorded as hamstring shortness (Ravichandran et al., 2017; Khalili, & Bakhtiary, 2014).

After cleaning and preparing the skin and the desired area, elastic tape (width, 5 cm) was used with an X technique for taping. The subject was placed in neutral position, and the edges of the tape were attached without any pull to achieve the effect of releasing the muscle. Then, a tape with the functional effect on the abdominal muscle was attached. For this purpose, we applied 10% stretch and then, in the normal body position, we attached the tape without stretch from the lower part to the beginning of the muscle. At the first stage: in neutral position, we attached a short tape from the internal and external sides of the upper popliteal fossa. At the second stage: in flexion of the femur and extension of the knee, the middle tape was attached to the semimembranosus and semitendinosus muscles and the external (lateral) tape on the biceps femoris (Morris et al., 2013). Finally, at the third stage: the anchors were attached in neutral position to hip condyle. Kinesiotape was replaced every 3 days for 6 weeks. Because of the quadriceps weakness in hamstring shortness and in order to eliminate the effect of this weakness on the research results, the participants were asked to perform quadriceps isometric exercises personally. In the group of ST, the person was placed in supine position and the femur and knee joints of the tension side were kept in 90 degree position. Pelvic fixation is necessary during stretch prevent posterior hip tilt and high back flexion. Therefore, it is essential that the waist is kept flat and without arches on the bed with the help of the examiner, who did this by pressing the other leg downward. The examiner held the upper and lower parts of the knee joint and gently pushed the person's legs upward in order to straighten the knee to reach the end point of the movement and feel stretch under his/her hands. Traction was given for 30 seconds and very slowly, gently, and gradually, so that it does not stimulate the tension reflex and increase muscle tone. After each traction, 5 seconds rest was given, and stretch was repeated four times to reach a total of 2 minutes of stretch. This stretch method was performed 3 days a week for 6 weeks (Bandy, Iron & Briggler, 1997; Rowlands, Marginson, & Lee, 2003). The research stages included a briefing session, pre-test, ST, KT, and post-test and lasted 9 weeks in total. Trainings took place during 18 sessions in 6 weeks and 3 times a week. For stretch trainings, the first 6 sessions had one repetition, the second 6 sessions 2 repetitions, and the third 6 sessions 3 repetitions. Before stretch training, subjects performed warm-up for 10 minutes. It should be noted that the pre-test phase was performed one day before the stretch training and post-test phase, one day after stretch training. To describe the data and determine the central tendencies and distribution, descriptive statistics were used. To ensure normal distribution of data, Shapiro-Wilk test was used. Due to the normal distribution of data, the between-group and inter-group difference after 6 weeks of training was evaluated using independent t-test and paired t-test, respectively. For the statistical calculations, SPSS software was used. The minimum level of significance for all statistical calculations in this study was considered as 0.05.

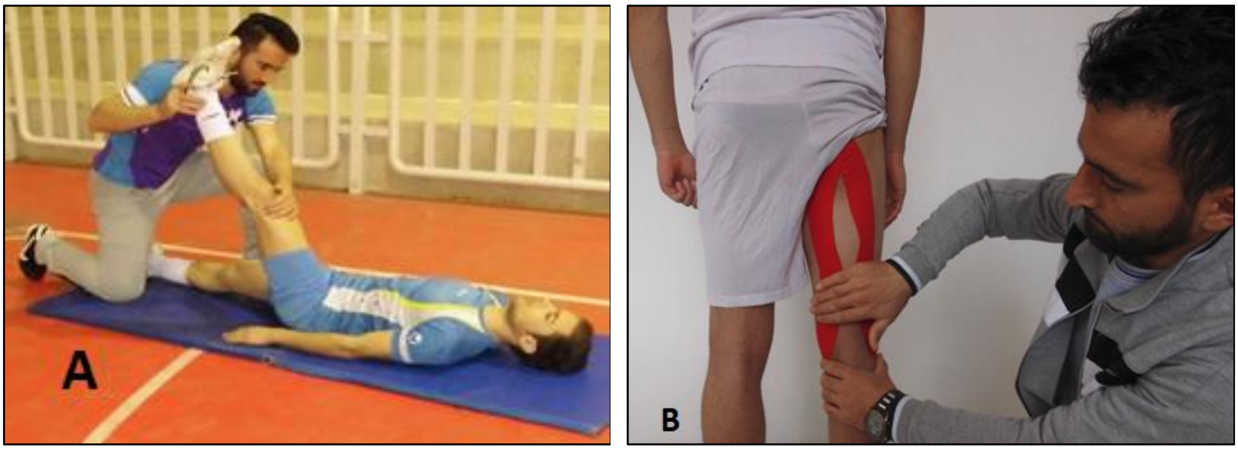


Figure 1: Static stretching training (A),
The kinesiotaping application on the hamstring muscles (B)

3. Results

Table 1 presents descriptive parameters Mean and Std.Dev. and range of minimal and maximal results for both groups pre and post testing. Also, in Graph 1 we present average value between pre and post testing.

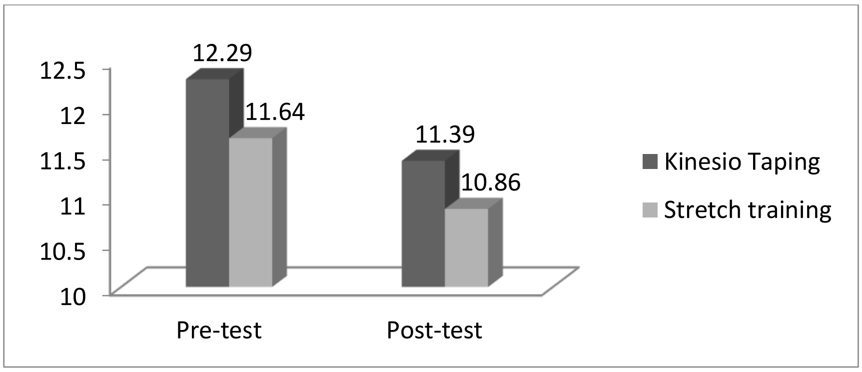
Table 1: Descriptive statistics pre and post testing

	Variables	N	Mean±Std.Dev.	Range	CI 95%	
					Lower	Upper
Pre-test	Kinesio-Taping	10	12.29±5.02	3.66-20.00	8.70	15.89
	Stretch-Training	10	11.64±5.48	3.33±20.33	7.33	15.59
Post-test	Kinesio-Taping	10	11.39±5.42	2.66-19.66	7.51	15.28
	Stretch-Training	10	10.86±5.34	3.00-20.00	7.04	14.08

The findings of the research indicated a significant inter-group decrease in hamstring muscle shortness after six-week static stretching training and Kinesiotaping ($p \leq 0.000$ and $p \leq 0.003$, respectively) Table 2.

Table 2: Difference between pre and post test in the two groups

Variables		N	Mean±Std.Dev.	t	Sig.
Kinesio-Taping	Pre-test	10	12.29±5.02	4.060	0.003
	Post-test		11.39±5.42		
Stretch-Training	Pre-test	10	11.64±5.48	5.000	0.000
	Post-test		10.86±5.34		



Graph 1: Average value of Pre and post test

4. Discussion

The main findings of current research were a significant decrease in hamstring muscle shortness using both static stretching training and Kinesio taping. Six week Kinesio taping was associated with reduced hamstring muscle shortness. Merino-Marban et al., (2015) investigated the immediate effect of kinesiotape on healthy students by X technique, and observed no increase in the hip's range of motion. In this regard, Krohn, & Castro, (2011) examined the effect of kinesiotape on the flexibility of hamstring muscle in healthy individuals. The results of their research also indicated no significant effect on the flexibility of hamstring muscles and a significant reduction in the flexibility of these muscles after walking a distance of 1.2 miles. In a research study, Meiro-Marban et al., (2013) studied the effect of Kinesio taping on the students' flexibility of hamstring without shortness on both legs of the subjects under three conditions of Kinesio taping, tape, and the control group by testing passive direct lifting of the leg in the same conditions. In this assessment, all subjects performed the test in three sets and each set with two repetitions for both legs to determine the hamstring flexibility. The results of this research showed no significant changes in the hip flexion range of motion by Kinesiotape. Any injury, including shortness and loss of muscle length balance, causes inflammation for various reasons, such as blood clots, hematoma, and central nervous system reflections, resulting in pressure on the tissue. This process naturally starts to stimulate pain receptors and will be perceived by the increased pressure on soft tissues. Swelling causes pressure and pressure causes pain; the pressure should be reduced to relieve pain and this is where special kinesiotape techniques can be used to help lower the pressure created in soft tissues. When Kinesiotape is used on the skin. This allows more blood to flow into damaged areas, thus accelerates recovery and repair, allowing lymph fluid to easily discharge from the area; thus, inflammation decreases and as a result, the muscle tone reduces (Morris et al., 2013).

The static stretching had a positive and significant effect on hamstring muscle shortness. Yamaguchi, & Ishie, (2005) studied the effect of static and dynamic stretching on the strength of leg extension. The subjects performed each of the dynamic and static stretching on 5 muscle groups of lower extremity. The results showed no significant difference between the two methods of stretching and the control group, while the extension power of the leg showed significant increase after dynamic training. The present study is consistent with the results of Chan, Hong, & Robinson (2001), comparing the efficacy of static stretching on 40 volunteers in 2 periods of 4 and 8 weeks (3 days a week) on hamstring muscles' flexibility. They concluded that there was no significant difference between these two periods. Pachpute, Patel, & Saini, (2016) examined the role of static stretching on hamstring muscle strength on 40 healthy subjects aged 18 to 30 with hamstring shortness (less than 30 degrees in 90 degree hip and pelvic flexion). Subjects performed stretching protocols 5 times a week for 6 weeks without taping or rotating the pelvis. The results showed a statistically significant effect of static stretching on increasing the maximal hamstring and leg muscles strength and also improving the flexibility of hamstring muscles. In a new study, Cini, Vasconcelos, & Lima, (2016) investigated the acute effect of static inactive stretching exercises on flexibility of hamstring on 46 female students of physiotherapy with an exercise duration of 30 and 60 seconds. According to the results, it can be said that 30 seconds stretching was better for young girls to increase the flexibility. All the above studies are consistent and parallel to the results of the present study and show the significant effect of simple static stretching on stiffness and shortness of hamstring muscles and increased range of motion in knee joint.

The results indicated no between-group difference in using static stretching or kinesiotaping. Comparing two methods of static and dynamic stretching, it was observed that both static and dynamic groups had a higher flexibility of hamstring muscles than the control group (Nelson, & Bandy, 2014; Bonnar, Deivert, and Gould, 2004; Williams et al., 2012). Lim, Nam, & Jung, (2014) examined the effect of different stretching techniques on flexibility, activity, and balance of the hamstring muscles. Subjects were divided into control, PNF, and static groups. Immediately after each technique, the active knee extension, maximum isometric contraction, and balance were measured. Both stretching techniques increased the knee's range of motion, but there was no difference in muscle activity or balance between the groups. The static stretching and PNF did not significantly affect the balance. The effect of Kinesiotaping on hamstring and gastrocnemius muscles was investigated on 39 healthy young people in two groups of hamstring and gastrocnemius; the results indicated a significant increase in maximum power in the taping gastrocnemius immediately and after two days, although there was no immediate change in maximum power of hamstring group. However, the maximum power increased significantly 48 hours after taping. In the gastrocnemius taping, the direct leg lifting and ankle dorsiflexion increased immediately after taping. The active knee extension significantly improved after two days (Lumbroso et al., 2014). Due to different techniques of taping, different durations, and the specific muscles studied, different results may be obtained. It is possible that the muscles evaluated react differently during the kinesiotape and their effects will be delayed (Lumbroso et al., 2014; Lee et al., 2015). For this therapeutic technique that has become more popular in the last two decades, more researches are required to validate Kinesiotaping.

5. Conclusion

Therefore, it can be concluded that six week static stretching training and Kinesiotaping have a positive and almost equal effect on hamstring shortness and knee joint's range of motion of soccer players and can be used as a corrective therapeutic method for such injuries.

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Conflicts of Interest
The authors declare no conflict of interest.

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