Effectiveness Of Myofascial Release On Lower Limbs Muscle Balance And Flexibility In Sepak Takraw Players

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Abstract

Introduction: Myofascial release is an inexpensive and accessible method which allows the individual to maintain their flexibility and potentially release the player's fascia tightness anywhere and anytime. This study aims to determine if myofascial release would improve the flexibility and balance among sepak takraw players.

Methods: Twenty-three (n=23) males with mean age of 14.70 ± 2.69 years and BMI of 22.62 ± 2.49 who have tightness of their hamstring, quadriceps and calf muscles were recruited and participated in the study. Participant's flexibility of the three muscle groups and balance were measured with goniometer and balance foam. The intervention was done for three sessions with a two days gap in between the days; and a pre-post measurement within each session.

Results: The finding from analysis with one-way repeated measure ANOVA showed no significant difference in flexibility of the right and left hamstring, quadriceps and calf muscle ($p>0.05$) in each session. In addition, balance result on firm and foam surface also showed no significant difference ($p>0.05$). However, the results showed a significant difference in between each pre-post's day session (i.e., within the same day session). The flexibility of

hamstring, quadriceps and calf muscle showed a highly significant difference ($p<0.001$) during each session and over the right and left leg. Furthermore, the balance on firm surface did not show a significance difference ($p>0.05$). In contrast, the balance on the foam surface showed a significance difference ($p<0.001$).
Conclusion: The study has found that the effect of myofascial release did not last more than two days (48 hours). However, MFR can be performed for a short-term effect on the required players during games rest interval or in between games (before the next game start) within the same day.

Keywords: Myofascial release, muscle flexibility, muscle balance, hamstring, quadriceps, calf muscle.

Introduction

Myofascial release (MFR) is a manual therapy which is widely an applied treatment which involves a guided long duration mechanical forces to manipulate the Myofascial complex which is purposefully done to restore optimal length, decrease the pain and improve function (Barnes, 1990; Ajimsha, Al-Mudhaka and Al-Madzhar, 2014). Myofascial release assorted to be effective and provides immediate relief of pain and tissue tenderness (Hou et al., 2002; Mckenny et al., 2013). In addition, it is also a foreseen as hands on soft tissue technique which requires a gentle stretch to the constrained fascia (Kalichman, 2016). Deep tissue manipulation is a type of massage therapy concentrating on readjusting deeper layers of muscles and connective tissue (Riggs, 2007). Myofascial release has been categorized into two different techniques which is the direct and the indirect technique (Grant and Rigg, 2007). Direct technique works directly over the restricted fascia and in conjunction to this, the practitioner uses knuckles, elbow or other tools to slowly sink into the fascia as well the pressure which is applied to the concern area weights a few kilogram. This process will slowly stretch the fascia and manipulates the Myofascial complex. In contrast to the direct technique, the indirect MFR technique involves a gentle stretch which is guided along the way with minimal amount of resistance until the movement is free from its restriction (GOT 2006). In addition, the force applied while performing the indirect MFR technique is a few grams; whereby the hand tends to pursue in the direction of fascia restriction hold the stretch and therefore allow the fascia to loosen by itself (Ajimsha, Al-Mudhaka and Al-Madzhar, 2014). Fascia is termed

as a "soft tissue component of connective tissue system that permeates the human body" (Huijing and Langevin, 2009). Each muscle is covered superficially by a fascia which gives the muscle a tissue paper appearance superficially. There was a research done on MFR which stated that reduced flexibility in certain muscle and a tightness of one muscle maybe an aetiological cause for a condition. (Grieve et al., 2014) As an example, Ajimsha, Al-Mudhaka and Al-Madzhar (2014), study highlighted that MFR treatment is more effective than a control intervention or plantar heel pain. This study was done with a randomised control trial and double blinded trial. Total amount of 66 patients were recruited for plantar heel pain and was randomized picked into MFR and control group (no treatment). Randomly picked groups were given 12 session of treatment per client over 4 weeks. Sport is an area whereby most of the athletes would have experienced injuries whether during sports matches or either during trainings. Injury prevention on involves identifying and understanding of the factors leading to that injury. Such an approach could allow the development of the most appropriate strategy for reducing the risk (Louis, Croisier, Sebastian Ganteaume, Binet,Genty and Marcel Ferret,2008).The causes of injuries could be derived by many factors, such as the lack of warm up's, flexibility limitations, insufficient balance control, uneven grounds, lack of muscular strength, and improper coordination. In order to prevent these injuries, there are many ways of approaching it, such as proper warm-up and cool-down techniques, stretching and Myofascial release. Myofascial release can be implemented well in cases of limited flexibility (i.e., limited range of motion) athlete's. Studies have been done to improve the assessment of athletes on balance as well as on their flexibility.

Objective of the Study

To determine the effectiveness of Myofascial release on the hamstring, quadriceps and calf muscles flexibility in developmental level sepak takraw players.

To determine balance after Myofascial release is given to developmental level sepak takraw players.

Method

The study involved a Quasi-experimental design (pre-post intervention). This is to investigate the effectiveness of Myofascial release on balance and flexibility of sepak takraw players. The data are collected and done in University Sains Malaysia Kubang Kerian and in

Sekolah Menengah Kebangsaan Putera Kota Bharu Kelantan. This study uses purposive sampling. Participants were selected from a group of sepak takraw players who are: (1) well trained; (2) represents the state level; and (3) that has competitive experience.

Inclusion criteria

State players, Age 13-21 years old, Competitive sepak takraw players, Injury free, medically fit, Tightness of hamstring, quadriceps and calf muscle.

Exclusion criteria

Acute injuries, untrained sepak takraw players, Flexible hamstring, quadriceps and calf muscle, Arthritis, Stiff joint capsule.

Procedure

This study was conducted after receiving the approval from the Human Research Ethics committee of University Sains Malaysia (USM). A letter of requesting permission was sent to the Kelantan State Sports Counsel in order to get their approval to conduct the research. Upon receiving the approval from the State Sports Counsel, the researchers had a meet up session with the coaches to explain about the study. Once the agreement was done, date and venue for the interview were fixed. Participants should completely understand the research that was conducted. Similarly, participants should be aware and alert regarding the risks as well as the benefits that was faced during the research study. The consent form was then be kept by the researchers for verification purposes as well as stating that they had agreed to be a volunteer willingly and with no forces. All the information from the consent form was kept as a confidential document. Before proceeding with the research, the participants were briefed regarding the research and its purposes. The consent forms were then distributed among the entire participant. All things considered, the guardian or the participant was asked to fill and sign the informed consent form for the confirmation of participation in the research. Notably, once the consent form was given, the participant was then be given a demographic data which consists of their name, age, gender, height, weight, BMI, status of activeness, and years of experience in participation and playing position in sepak takraw matches (i.e., tekong, feeder or killer). Once the demographic data was filled a screening assessment was done first, Participants who suit the inclusion criteria were taken in count to participate in the research. A pre-test assessment was done for the participants which

meets the inclusion criteria. The pre-test assessment consists of muscle length (flexibility) and balance test. Flexibility assessment was measured by the length of hamstring, quadriceps and calf muscle. Measurement was taken by using a goniometer which was done three times for each muscles and the mean value were taken. Static and dynamic balance assessment was done using the Balance Error Scoring System (BESS) and the time was recorded. Myofascial release treatment was given to the participant on three different muscles of the lower limb, namely the hamstring, quadriceps and calf muscles. The duration of each muscle treatment was 5 minutes. There was a gap of 2 days before the next assessment was done. Following the two days interval, a mid-test assessment was done and the muscle length as well as the static and dynamic balance was recorded. Therefore, Myofascial release was done again for the same group of muscles (i.e., 5 minutes of duration each muscle). After getting the mid-test assessment and treatment done, there was a gap of two days and the final step was conducted which was the post-test assessment. This included the same procedure as the above mentioned for pre-test assessment and mid-test assessment. Data analysis was done by comparing the results of the pre, mid and post- test assessments on flexibility and balance after MFR treatment.

Flexibility (Goniometer)

This test measured three different muscle groups namely hamstring muscles, the quadriceps muscles and the calf muscles for 3 times. The mean of the reading was recorded. A treatment bed would also be required for the comfort of the participant during the measurement. The test records were measured in degree (º). Detail of each assessment was as the following:

Hamstring Muscle

Active knee extension

This test was known as the active knee extension which serves the purpose of assessing the range of active knee extension in a position of hip flexion, as required in running and kicking. The participant was asked to lie in supine position with the head, back and arms across the chest. The hip was passively flexed until the thigh was vertical (90º). The position was maintained throughout the test with the opposite leg in a fully extended position. Therefore, the foot of the leg being tested was kept relaxed while the tested leg was actively straightened until the point when the thigh begins to move from the vertical

position. In regards to this, the angle of the thigh at this point was recorded. _The axis of the goniometer was placed over the lateral epicondyle of the femur and the stationary arm was aligned with the greater trochanter and the moving arm was parallel to the lateral malleolus. The normal value for active knee extension ranges from 135- 0 degree.

Measurement for Straight leg raise test to check for hamstring flexibility

Quadriceps muscle

Modified Thomas test

The Thomas test was named after British orthopaedic surgeon Dr. Hugh Owen Thomas (1834-1891). Described below is the Modified Thomas test, used to obtain measures of flexibility for the iliopsoas and quadriceps muscles (Harvey, 1998). The participant was asked to sit at the very edge of a bench and then roll back onto the bench while pulling both knees to the chest. This was to ensure that the lumbar spine is flat on the bench and the pelvis is posteriorly rotated. The subject then holds the opposite hip in maximum flexion with the arms, while the limb to be tested was lowered towards the floor. The angle which was measured was the knee flexion angle (reflecting the length of the rectus femoris). For this measure, the stationary arm of the goniometer was aligned with the lateral midline of the thigh, using the greater trochanter as a reference point. The fulcrum was placed over the lateral epicondyle of the femur. The

moving arm was aligned with the lateral midline of the fibula, using the lateral malleolus as a reference point. Full hip extension with knee flexion less than 45 degree was indicative of rectus femoris tightness. This procedure was repeated for the opposite side.

Measurement for modified Thomas test to measure quadriceps flexibility

Calf muscles

Knee to wall test

The purpose of this test was to measure the flexibility of the Achilles and soleus flexibility. The participant was asked to remove his shoes. Therefore, a ruler or a measuring tape was used to measure against the wall. Alternatively, a piece of sports tape was placed on the floor and by using a ruler or measuring tape up to 12 centimetres was marked 0cm starts from the wall. The big toe was placed at 6cm from the wall. In addition, the participant was asked to touch the wall with their knee of the foot that is on the tape. It was important to ensure that the hip and knee area were in line with the second toe and the heel stays down on the ground. Therefore, starting from 6cm onwards, the participant was gradually asked to move from the wall (or forwards in extremely tight cases) until the participant can only just hold down their heel on the ground and the knee to the wall whilst maintaining leg alignment. The normal value was between the range of 10-12cm. Tightness was evaluated if the range was lesser than 6cm and hypermobility was when the value exceeds 12cm

Measurement for knee to wall test to measure calf flexibility

Balance Error Scoring System (Balance)

The participant was asked to remove their shoes first or any ankle taping if necessary. Socks maybe worn if desired. Instructions were read to the participants first before starting the BESS test. BESS has 3 possible surfaces and ways to be done, which includes double leg stance on the firm surface and then on the foam surface. Next, participants were required to stand by a single leg stance on both firm surface and foam surface. Single leg stance requires the participant to stand on the non- dominant leg. Lastly, participants was asked to perform a tandem stance same as others which was on firm surface and then foam surface. In the tandem stance, the heel of the dominant foot should be touching the foot of the non-dominant side. All this three tests were done with the eyes closed.

Balance assessment on the firm surface

Measurement for balance on the foam surface

Myofascial Release Technique

Myofascial release technique is a technique in where the superficial layer of the muscle was released by using a force from a tool such as the forearms, elbows and knuckles. In this test we were using the forearm as the tool for releasing the fascia. Participant was made to lie down in supine position with the application part exposed. The unexposed parts were draped appropriately. The technique used was the direct technique of Myofascial release. In supine lying, the muscle that was covered is the quadriceps. Duration of the application will be for 5 minutes. Similarly, for the hamstring muscle, the patient was made to lie in prone position whereby application area was exposed and the other area was draped appropriately. The technique was applied for duration of 5 minutes. As for the calf muscle, the participant was asked to lie in prone position. The areas of the calf muscle were given support at the lower ankle to provide a comfort nature while the procedure was being carried out. The same amount of duration which is 5 minutes was applied for the Myofascial release of the calf muscle

Myofascial release therapy being done for the hamstring muscle

Results

This purpose of conducting this study was to assess the effectiveness of Myofascial release on balance and flexibility in sepak takraw players in Kelantan state. The players with an age range between 13 to 21 years old will be recruited in the study. The data was analysed by using a descriptive statistics of mean and standard deviation for the age, weight, height and BMI. Therefore, there were two other methods used to analyse the data, namely, one way repeated measure ANOVA and paired t- test. The sample in this study was taken from Sekolah Menengah Kebangsaan Putera Kota Bharu Kelantan. Flexibility and balance assessment was carried out before Myofascial was implemented and also after in order to investigate the improvement of the flexibility of the hamstrings, quadriceps and calf muscle as well as the balance. The test was done for three sessions with a two days gap between each session. Within each session there is a pre and post assessment which will be conducted. A total number of 23 participants consisting of sepak takraw players were taken in order to conduct the study. The mean age of the entire participant was 14.70 ± 2.69 years old. Mean age, body height, body weight and body mass index (BMI) for all 23 participants were taken and tabulated in Table 4.1. The values were analysed by using descriptive statistics and were expressed in mean± SD. As from the table above, it is notified that the mean and standard deviation of the age is between 14.70(2.69), height 142.48(12.40), weight 46.70 (9.60) and the body index is 22.62 (2.49)

Hamstring muscle flexibility

Hamstring muscle was selected as one of the test variable in order to check on the lower limb flexibility in this study. Figure 4.1 shows the

mean of hamstring muscle comparing with all the three sessions. The result of one way repeated measure ANOVA has shown a non-significant interaction on both the right and left hamstring in where the values for the right side (F=1.07; df =1.82; P=0.35) and the left side (F= 5.00; df=1.80; P=0.100).

Quadriceps muscle flexibility

Quadriceps muscle was selected as one of the test variable in order to check on the lower limb flexibility in this study. Table 4.3 shows the result of one way repeated measure ANOVA has shown a non-significant interaction on both the right and left hamstring in where the values for the right side (F=0.20; df =1.45; P=0.75) and the left side (F= 0.97; df=1.89; P=0.39)

Calf muscle flexibility

Calf muscle was also selected as one of the test variable in order to check on the lower limb flexibility in this study. Table 4.4 shows the mean of calf muscle comparing with all the three sessions. The result of one way repeated measure ANOVA has shown a non-significant interaction on both the right and left hamstring in where the values for the right side (F=5.76; df =1.92; P=0.06) and the left side (F= 3.59; df=1.48; P=0.052)

Balance on firm surface

The result of balance with a firm surface has showed a non-significant interaction (F= 0.82; df=1.91; P=0.44) across the 3 different measurement sessions. Figure 4.4 shows the comparison of balance over all the three sessions.

Balance on Foam surface

The result of balance with a foam surface has showed a non-significant interaction (F= 1.38; df=1.90; P=0.26) across the 3 different measurement sessions. Figure 4.5 shows the comparison of balance over all the three sessions. Therefore, another test which was done in order to determine the changes of pre-post value of flexibility and balance is paired t- test. As shown below in Table 4.7, the changes of the hamstring muscle flexibility portrayed a statistically significant value (P <0.001) when paired t test was done within the same day of each three session for the sepak takraw players.

Discussion

In sports such as sepak takraw, the player's physical fitness requirement and ability play an important role for them to perform and compete at their best. The major fitness components for sepak takraw player includes cardiovascular endurance, muscular strength and endurance, flexibility, balance, power, agility and reaction time (Rajesh,2013). Sepak takraw players need to combine different kind of serves, kicks, and spikes in their game. These skills range from basic (i.e., beginner) to the more acrobatic (i.e., advance or elite player) kind that requires years of training and practice to execute it flawlessly. In order for players to perform their task and skill effectively (e.g., serve and spike), wide range of motion as well as proper balance are very important. Besides, flexibility and balance helps in reducing the chances of getting injured while playing the game (Hartig and Henderson, 1999). The Straight Leg Raise, Modified Thomas Test, and Knee to Wall Test is a standard measure of the flexibility of muscle length for hamstring, quadriceps and calf muscle respectively. As mentioned by Hamid (2014), it is important to have flexibility in sepak takraw games i.e. to have a good range of motion of the musculoskeletal joint and improved performance. Flexible or lengthened muscle would improve the sepak takraw player's techniques (i.e bicycle kick, kicking, spiking and few others) and reduces the rate of muscle injuries (Kubo, 2016). Besides flexibility, balance is also considered one of the parameter which is important for a sepak takraw player. Accoring to Razaie (2014), balance is a factor of postural stability and motor abilities. For example, when a sepak takraw player balances on one leg, they need to maintain their balance in order to prevent any injuries while performing the technique (Razaie, 2014).

Effect of MFR on Flexibility (Hamstring, Quadriceps and Calf muscle)

Muscle flexibility is one of the vital components of sepak takraw as it determines the ability of the athlete to perform the skilled movements such as horse kick serve, sun-back spike, roll spike and outside kick (Sports Singapore, 2009). The result of the current study shows non-significant difference in the flexibility of Hamstring, Quadriceps and the calf muscle (i.e., both right and left side of the limb) during all three sessions among the players.

Effect of MFR on Balance

The current study investigated balance on a firm and a foam surface. The result shows that myofascial release does not improve on the balance throughout the sessions of intervention. Possibility why balance did not improve over time can be due to the flexibility of the muscle.

Conclusion

Myofascial release is an inexpensive and accessible method which allows individual to maintain their flexibility and potentially release their fascia tightness. Fascia tightness has been shown to be present among athlete and limiting their movement. The ability to balance and be flexible while performing a skill is very important in sepak takraw. Hence, a time frame quasi-experimental design was conducted to measure the effectiveness of myofascial release on flexibility and balance among sepak takraw players. The present study has found that, the effect of myofascial release does not last more than two days (48 hours). However, MFR provide short term effect on releasing muscle tightness. Thus, the results suggested that the use of myofascial release is efficient and effective to provide a fascia release and increase the player's flexibility. Myofascial release is suitable to be applied for a short-term effect on the required players during games or in between games (i.e., before the next game start) in the same day. Myofascial release increases the joint range of motion with no associated disadvantageous effect on the neuromuscular force of production (Ajimsha, 2003). Myofascial release technique can also be used to increase the flexibility without damaging muscle force and performance. Practitioners would prefer to use a myofascial release technique for a better result of flexibility is due to the immediate improvement in the range of motion of the joint. Moreover, myofascial release focuses more on the fascia rather than the muscle itself. Hereby, this reduces the rate of muscular injuries which may be caused due to excessive stretching of the muscle. Therefore, it varies as different practitioners have different preferred techniques. Efficiency of MFR was varied in both value and effects. With the result obtained from this study, it shows that when there is a gap in between the myofascial treatment, the effect might deteriorate until the following treatment is given. These results will be a good example in order to allow the coach and the sports therapists to plan out their intervention. With this, it will be easier for the coach to plan out an advance plan plan in order to focus on the players' flexibility before

any game. Since flexibility is vital in sepak takraw players, it is important for the players to achieve and optimum range for a better performance. This can be done for the players who are having problems in increasing their flexibility since it is now known that Myofascial release has a significant change after 5 minutes.

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