

Association of Hamstring Flexibility and Skills Performance among Collegiate Recreational Futsal Players in Subang Jaya, Malaysia

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Abstract

Background: Muscle flexibility is one of the most vital aspects of fitness and health that plays an important role in the human body functions. In sports such as futsal, lower limb musculature has its principle function that the properties of these muscles influence performance and skills within the sport. The specific performance traits such as speed, power, and endurance were widely studied however, the specific skills and attributes of futsal sports pass accuracy, ball control, trapping, reflex, consistency, and agility in association with hamstring flexibility were not much reported.

Objective: This study aims to find the association between hamstring flexibility and skills performance of collegiate recreational futsal players.

Methodology: This study includes 100 volunteered male collegiate recreational futsal players with ages range 18-25 years. The participants' hamstring flexibility was tested by using V-sit and reach test and the futsal skills performance with the McDonald soccer skill test. The data were analyzed statistically to find the association using Pearson's Correlation and Linear regression.

Results: The participants showed a strong association between hamstring flexibility and futsal skill performance with $r = 0.701$, $p = <0.001$. Linear regression analysis showed a strong association and predictor value for hamstring flexibility as a factor for futsal skills performance scores with $r^2 = 0.492$.

Conclusion: The study concludes hamstring flexibility is an integral part and plays a major role in the betterment of futsal skills performances unique to the specific game, besides it pivotal in maintaining performance and reducing the risk of injuries among players.

Keywords

Hamstring Muscle, Flexibility, Sports performance, Recreational athlete

Introduction

Muscle flexibility plays an important role in the overall function of the human body, further the decline in muscle flexibility that affects the functional performance and joint range of motion (Lim, Nam, & Jung, 2014). The hamstring muscle is a two-jointed muscle, which connects the trunk with



the lower limb and functions primarily as the flexors of the knee joint (KILINÇ, 2018). The property of hamstring muscle flexibility can return to its original and resting length once an external force is removed (Marshall & Siegler, 2014). Generally, an increase in aging reduces muscle flexibility and extensibility (Mistry, Vyas, & Sheth, 2014). Further, the study by Witvrouw et al. (2003) stated the lack of flexibility had caused hampering performance among professional football players in a Belgian football competition. A prospective study reported 70% of lower limb injuries happen among futsal players while playing for international tournaments (Junge & Dvorak, 2010).

Futsal is an indoor football game that has constant changes in direction of movements that result to cause perpetual stresses and loading in the dimensions of the lower limb muscles. Hamstring injuries were reported as one of the leading injuries in the football sport (van der Horst, Priesterbach, Backx, & Smits, 2017), and the inflexibility of this muscle than perceived. This may have direct adverse effects on the skill performance of futsal players are hampered due to muscle restrictions. Previous studies reported hamstring flexibility influence the athletic performance of vertical jumpers, and sprinters to increase their speed and agility in athletics (García-Pinillos, Ruiz-Ariza, Moreno del Castillo, & Latorre-Román, 2015; Skaggs, Joiner, Pace, Atc, & Skaggs, 2015). Besides, hamstring flexibility has an association with physical fitness, maximum O₂ uptake, and jumping ability in football players (Arnason et al., 2004). Further, the study by Sayers et al. (2008) proved that static hamstring stretching contributed to an increase in the sprinting speed performance in elite football players. Furthermore, a randomized controlled trial on hamstring stretching programs in football players reported an overall improvement in 30m sprint tests significantly as compared with other protocols (Figueira, Gonçalves, Masiulis, & Sampaio, 2018). A study by Ramos-Campo et al. (2016) showed that elite Spanish futsal players classified from their sub-elite counterparts based on the isokinetic strength testing, countermovement jumps, sprint speed, agility, and ball speed/control. This futsal sport requires skills such as burst sprints, accelerations, turnings, jumping, kicking, tackling, and ball control at a high tempo and velocity, requiring optimum conditioning of the muscles and especially the lower limb. These skills are principle to the ever-growing game of futsal, especially locally in Malaysia, where it is one of the most played sports among the collegiate population.

Therefore, there is a need for this study to fill that research gap to find the association between hamstring flexibility and skill performance among collegiate recreational futsal players. Besides, it shows the scope of physiotherapy evaluation and skills performance assistance towards sports performance in the multi-disciplinary team.

Methodology

This cross-sectional study was conducted among collegiate recreational futsal players. The participants were recruited based from futsal centers and courts on convenience sampling within Subang Jaya, Malaysia. The risks and benefits of the study were explained individually to the participants and informed consent obtained before participation. Withdrawal at any time was allowed and the participation was voluntary. Male collegiate recreational futsal players between the ages of 18 and 25 years who play on a regular basis at least 2 hours a week were included as study participants. Participants with acute or chronic lower limb injuries that may hinder

participation in flexibility tests, and players who demonstrate neurological deficits that would limit movement and/or compliance to instructions were excluded.

Outcome measures

V Sit and Reach Test for Hamstring Flexibility

V-Sit and reach test was reported as a validated measuring tool for hamstring flexibility and had been applied in sports fitness testing and physiotherapy assessments. This test has high intra-rater reliability of ($r=0.98$) and has shown minimal discrepancies between test-retest procedures (Cuberek, Machová, & Lipenská, 2013; López-Miñarro, Sáinz de Baranda, Rodríguez-García, & Yuste, 2008).

McDonald Soccer Test for Skills Performance

This test has shown tremendous validity when measuring soccer and futsal skills when applied to players for measuring agility, passing skills, reaction time shot power, movement speed as well as kicking accuracy, pass consistency, and ball control (trapping).

Studies reported McDonald Soccer Test had a high validity coefficient ($r= 0.85$) and reliability coefficient ($r=0.92$)(McMorris, Gibbs, Palmer, Payne, & Torpey, 1994; Miller, 2013). Additionally, Russell & Kingsley(2011) showed excellent results in measuring the skills and performance of a specific sport of football by using the McDonald's Soccer Skills Test.

Assessment procedure

V Sit and Reach Test

The masking tape was taped along the floor in a straight line about 3 feet long and used as baseline (Measuring Line). Next, another tape is placed perpendicularly from the first tape and the point of intersection serves as a zero point. This perpendicular tape intersects at 0 and extends 2 feet to each side. Then, the participant sits on the floor with shoes off, and the measuring line was placed between their legs. The participant's feet were placed immediately behind the zero points in long sitting as starting position, follow that heels were placed about 8 to 12 inches apart. They were asked to clasp their hands together with palms facing down with knees flat by maintain the knees in extension and prevent flexion. The participant instructed to slowly bend or flex their trunk forward with their hands and fingers leading along the measuring line keeping their fingers touching the tape on the floor. The participants were given 3 trials before proceeding with the testing. Finally, the test was carried out with 3 seconds hold time while reaching the maximum point over the measuring line. The distance was measured by using the measuring tape and recorded. If the participant fails to reach the past zero lines (baseline), a negative distance is given starting from zero points. In total three measurements were taken with appropriate time intervals and averaged.

McDonald Soccer Test for Skill Performance

The masking tape marked 9 feet away from the wall (Measuring more than 30 feet wide and 11.5 feet high) and the 3 futsal balls and the stopwatch was prepared. The ball was placed on a line, marked 9 feet away from the wall. Then the other 2 balls were left 9 feet behind the line in the center of the test area. On the signal “Go”, the participant must kick the ball against the wall as many times as possible in 30 seconds. The participant may kick in any way or technique but not be allowed to cross the marker line. Multiple touches to control or trap the ball were allowed. In the event of a wild or misdirected kick, the participant can retrieve the original ball or the other 2 spare balls (Using hands is acceptable). The number of kicks against the wall with successful trapping or control of the ball in 30 seconds was counted using a clicker counter and recorded. The test is repeated 3 times and the average score was calculated.

Statistical Analysis

Data obtained from the study were tabulated and analyzed using the Statistical Package for Social Sciences (SPSS, v 24.0 for Windows). The Shapiro-Wilk was used to test the normality distribution. Pearson’s Correlation was used to test the association between hamstring flexibility and skills performance scores. Also, the linear regression analysis was used to test the absolute statistical value on the strength of the association between the variables.

Results

The average score among the 100 participants (n=100) for the V- sit and reach test was 0.133cm and 19.377 kicks against the wall with reciprocal trapping and control of the ball indicate a slightly above average hamstring flexibility and skills performance respectively. Pearson’s Correlation showed a strong association between the hamstring flexibility scores and skills performance scores with $r = 0.701$, $p < 0.001$. **Fig.1** shows the linearity and relationship between hamstring flexibility and skills performance scores. The regression line with $r^2 = 0.492$ ($r = 0.701$) shows a positive relationship between the two sets of data as proven with Pearson’s Correlation. The linear regression line $y = 19.32 + 0.42x$ shows that there is a linear relationship between the two sets of data, proving that hamstring flexibility affects futsal skills performance with a strong association and linear regression.

From this, we can predict a relatively strong linear relationship between hamstring flexibility and how well a collegiate recreational futsal player will perform in terms of specific skills based on the linear regression. This supports the fact and provides evidence that hamstring flexibility is a significant factor that plays a role in determining the player's skill performance in terms of specific skills unique to the futsal game.

Moreover, the scatter plot (**Fig. 1**) and linear regression line also give us a predictor that overall performance in a game can be improved by performing stretching exercises and range of motion protocols which contribute to the increase in hamstring flexibility and the lower limb musculature. This can be an integral part of not only improving the overall gameplay performance

but also be a core principle in promoting overall general fitness and optimized lower limb biomechanics and muscle properties.

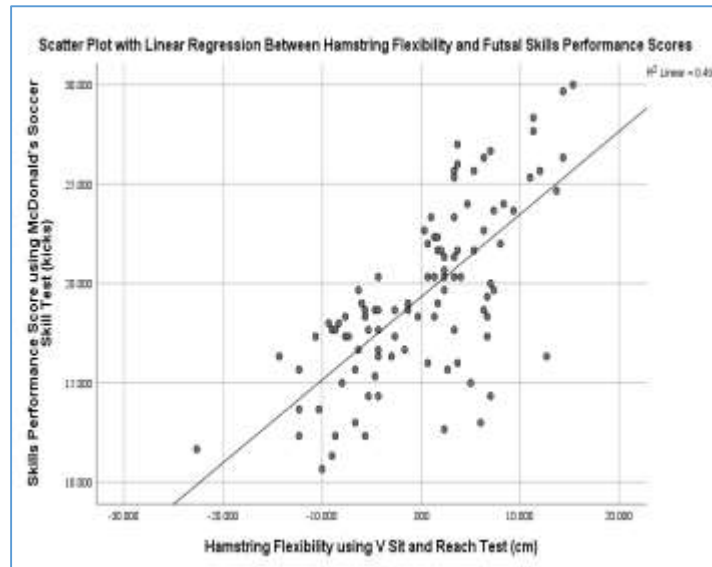


Figure 1. Scatter Plot with Regression Line for Correlation between Hamstring Flexibility using V Sit and Reach Test and Skills Performance using McDonald's Soccer Skill Test

Discussion

Based on the findings, the participant's V-sit and reach test scores were average 0.133cm, which above the average score for V Sit and Reach Test as reported among the 18-25 years old population (Wood, R., 2012). In young adults studies reported with dictate higher extensibilities of hamstring muscle (Youdas, Krause, Hollman, Harmsen, & Laskowski, 2005) that perhaps decline with aging (McCormick & Vasilaki, 2018). A study by Nasiri & Salehian (2011) reported futsal players generally have better flexibility on their piriformis and tensor fascia lata, which are associated with the characteristics and mechanics of the sport. Further, the study by van der Horst et al. (2017) pointed futsal sporting techniques, which comprises of lower limb twists, turns, change of directions, bursts of speed, and accelerations that utilize the lower limb muscles the maximum capacity by balancing the quadriceps and hamstring muscle functions. As the participants required stretching daily before participation in their games may influence the hamstring flexibility. O'Sullivan, Murray, & Sainsbury (2009) proved that warming up showed an increase in passive knee extension range of motion. On the other hand, numerous studies evidenced that stretching regularly or before a sport can increase hamstring flexibility (Medeiros, Cini, Sbruzzi, & Lima, 2016; Nelson & Bandy, 2004).

The participant's average kick score was 19.377, which was higher than the mean average scores of 17.9 to 18.4 kicks reported among football players in the United Kingdom (McMorris et al., 1994). In general, the collegiate players build with a 'sporting brain', attributes such as reaction time, decision making, quick-thinking, and gameplay judgment which may propel the player to perform better. Similarly, a study by Hicheur et al. (2017) reported players aging around 21 years to have perceptual-cognitive expertise by performing better on-pitch and in-game.

Furthermore, good flexibility programs like Nordic hamstring protocol showed a better sprint and jump performance among elite male soccer players (Krommes et al., 2017). Besides the flexibility of hamstrings and the athletic performance had interrelated with improving performance capabilities as well as in the prevention of injuries by reducing musculotendinous stiffness which acts as a foundation for high-level conditioning in sports (Andersen, 2006). A study by Ayala et al. (2017) proved that warm-up and stretching strategies pre-game and on a consistent regime improved performances of amateur football players in terms of sprint speed and joint ROM. The study provides a foundation for the claim that stretching and maintaining the flexibility of muscle stands as the principle to performance enhancement in sports.

Since flexibility maintains the joint range of motion, activation, and recruitment of muscles, physiologically these characteristics contribute enormously to perform better in-game and skill traits. Thus, proper flexibility training maintains the performance peaks of futsal players and reduce the time for age-related degenerative changes. Flexibility is one of the central aspects of overall fitness as learned in any health-science field and thus should be a core aspect to be improved on for any sportsperson as well.

The study further progress in terms of delving deeper into future research by involving the confounding variables such as BMI, measuring muscle strength, female participants, and participants in a different age range. As reported, the BMI had mild positive correlations with the flexibility (Van Der Horst, Backx, Goedhart, & Huisstede, 2017). Gabbe et al. (2006) mention that as the athlete gets older, the hamstring flexibility becomes diminished and a lead risk for hamstring strains and injuries. This shows that aside from the mechanics of the game and regular stretching exercise, other factors can influence muscle properties as well. Orchard et al. (1997) proved that hamstring muscle weakness is a strong indicator of muscle injuries and reduced sports performance in footballers. Thus, this is another area to explore in the futsal sport and room for research to grow in this sport.

The study contains potential limitations, which are constrained only to the region of Subang Jaya. The study results cannot be generalized to female players, professional collegiate, and elite futsal players. The futsal players' specific roles such as striker, midfielder, defender, or goalkeeper in their team were not categorized in this trail. Moreover, the time of day was not specified and the amount of warm-up given before testing was also not defined.

Conclusions

This research clearly illustrates and proves that hamstring flexibility plays important support in the skills performance of collegiate recreational futsal players. As recommended, the study provides implications to players, researchers, physiotherapists, and all healthcare providers to address issues that hamper performance in sports and allows future research in futsal players.

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Conflict of Interest

The author(s) declare(s) that there is no conflict of interest.

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