

# IMPACT OF ADDUCTOR STRENGTHENING ON SPRINT TIME AND AGILITY IN FOOTBALL PLAYERS

\*<sup>1</sup>Khadijeh J. Menai, <sup>2</sup>Ali Irani

<sup>2</sup>HOD Physiotherapy Dean, NMIMS Sunanda Divatia School Of Science, V.L.Mehta Road, Vile Parle (W), Mumbai-400056.

<sup>2</sup>HOD, Department of Physiotherapy and Sports Medicine, Nanavati Super Specialty Hospital, SV Road, Vile Parle (W), Mumbai-400056.

CORRESPONDING AUTHOR

\*<sup>1</sup>Khadijeh J. Menai

Ph.D. Student, NMIMS Sunanda Divatia School Of Science, V.L.Mehta Road, Vile Parle (W), Mumbai-400056.

## ABSTRACT

**Background:** The ability to tackle and dribble the ball swiftly past the rival player forms an important ball based football skill. Agility plays a crucial role for the players to gain good control over the ball. A combination of good agility with good sprint time is undoubtedly a distinguishing characteristic of elite level players. Football as a sport requires a rapid change of directions and speed several times during a match. This particular action requires the player to apply force rapidly into the ground, thereby putting a lot of stress on the adductor muscles. This research paper focuses on the impact of hip adductor exercises and their influence on agility and sprint time in football players.

**Methods:** This interventional study was carried out on 131 male elite level football players playing from clubs and football academies in and around Mumbai city. All the players were assessed for 30 M sprint test, T-Test, and Dribble time test to assess sprint and agility pre and post-intervention. An adductor strengthening intervention consisting of 8 exercises were performed for over four weeks.

**Results:** Paired T-test was used to analyze the data, which showed statically significant improvement with p-value 0.000 (<0.05) in the 30M sprint test, T-Test, and Dribble time post four weeks of intervention.

**Conclusion:** We concluded that the adductor training intervention helped improve the sprint time and agility in football players. As the intervention helped improving performance in football players, it should be introduced in the routine conditioning program of the players.

**Keywords:** Sprint time, Agility, Adductor Strengthening, Football Players.

## INTRODUCTION

Football is a sport with immense global appeal and fan following. The FIFA world cup 2018, held in Russia had set a new viewership record of 3.5 Billion people globally [1] and 110.5 million viewers across India [2]. This would mean that 51.3% of the world population watched the FIFA world cup 2018 at some point making it one of the most popular and globally viewed sports [1]. In India, football was played mainly on a recreational basis. But, lately, the sport has emerged as a promising profession with numerous brands, companies, and super leagues investing in the profession. The Indian Super League and I League are examples that were formed to encourage the sport in India. Football is one of the most complex and high impact team sports, which requires the correct application of motor skills in rapidly changing situations [3]. It is a sport where good motor skills are required to be able to control, dribble, and pass the ball, which forms an important fundamental skill for all football players [4]. The players need to exhibit a high competency in terms of accurately passing and receiving the ball from their co teammates, which in turn is possible only if players display a quick and swift change in speed and direction throughout the game. The ability to tackle and dribble the ball swiftly past the rival player forms an important ball based football skill. Hence agility plays a crucial role for the players to gain good control over the ball. Besides, poor agility may also lead to fatigue, thereby having an impact on athletic performance. The key to good agility is fast foot movements while still keeping the ball under control.

A clear winning criterion of the sport is to shoot more goals than the opponent team, which requires a good sprint time and agility. As per the match analysis, during an average match play, 9-14 km distance is covered by an elite level football player during a match with a sprinting pace varying between 1.4-10 m/sec [5]. Moreover, players perform long sprints on an average of 2-4 seconds every 90-180 seconds during the match.<sup>5</sup> Straight sprint constitutes the fundamental element of sprinting in football. The energy required for such a burst of high-intensity activities comes from the anaerobic process to form ATP. A combination of good agility skills with good sprint time is undoubtedly a distinguishing characteristic of elite level players. Team coaches have formulated a lot of strength conditioning and training programs emphasizing on improving the sprint time and agility. Located on the inner aspect of the thigh adductor group of muscles comprises adductor longus, adductor brevis, adductor magnus, pectineus, and gracilis [6]. The primary function of adductor muscles is to bring the leg towards the midline (adduction of the leg) in an open chain and stabilization of hip and pelvis in a closed chain, thereby improving the efficacy in sprinting. Football as a sport requires a rapid change of directions and speed several times during a match. This particular action requires the player to apply force rapidly into the ground, thereby putting a lot of stress on the adductor muscles.

Strengthening the adductor muscles not only improves

athletic performance and reduces the eccentric stress imposed on them but also reduces the chances of sustaining a groin injury. Groin injuries constitute of 12-16% of the total injuries in football players [7]. Of these, 70% of the groin injuries are adductor-related in football players [7]. Groin injuries often result in prolonged standing pain, improper diagnosis, and a long duration of absence from the game. Moreover, considering the dynamic nature of the sport, there is immense pressure on the player to return to sports. There is a shortage of studies acknowledging the role of adductor muscles when agility or sprint time of a player is monitored. Strength training programs and regimes rarely focus on the adductor muscles in isolation. This research paper focuses on the impact of hip adductor exercises and their influence on agility and sprint time in football players. It also provides a base for incorporating hip-strengthening exercises in the pre-season and season training programs and regimes, leading to improvement in sprint time and agility, thereby improving the sports performance in football players. Hence the study aimed to determine the impact of a 4-week adductor strengthening exercises program on sprint time and agility in football players.

## METHODS

This interventional study was carried out on 131 male elite level football players playing from clubs and football academies in and around Mumbai. By a method of convenient sampling, players were included between the age group of 18-35 years with a minimum of 2 years of playing experience and training at least thrice a week. Players with recent injuries or surgeries and non-consent were excluded from the study. After the ethical approval from the ethical committee of Nanavati Super Speciality Hospital (BNH/3596/2015), subjects were selected as per the inclusion and exclusion criteria. Local clubs and football academies were approached across the city of Mumbai, which included Oil and Natural Gas Corporation (ONGC) Football team, Central Bank of India (CBI) Football team, Air India Football team, Conquers FC (Football club), Andheri Football Academy (AFA) and West Zone United FC (Football club). All the teams were approached between the in-season period from October to March. The study was performed in strict accordance with the ethical guidelines of NMIMS University.

## PROCEDURE

Written informed consent was taken from the individual player meeting the inclusion criteria. Before starting the study, all the players were assessed for the outcome measures, including 30 M sprint tests to assess sprint time, T-Test to assess agility, and Dribble Time Test to assess sprint and agility. A brief warm-up of 15-20 minutes was performed by all the players, which included jogging, running, sprinting, and stretches before they could perform the tests.

## Outcome Measures

30 M sprint test: A 30-meter distance was marked with the

help of measure tape. Cones were placed at the start and finish line. Players were asked to sprint as fast as possible from a stationary position covering the 30 M distance, and the stopwatch was started from the start point and stopped as soon the player crosses the finish line. The sprint time thus obtained was recorded in seconds. The test was performed thrice with one-minute rest in between, and the best of three scores was taken into consideration.

**T-Test:** The T-Test directive protocol was followed, and the finishing time was recorded. Each player performed the T-Test thrice with one-minute rest in between, and the best of three scores was taken into consideration.

**Dribble Time Test:** Players were asked to start dribbling a stationary ball from one goal post to the other, keeping the ball as much under control as possible and near the foot. Time starts as soon as the foot touches the ball and stops the minute the player crosses the finish line. The time thus obtained was recorded in seconds. The test was performed thrice with one-minute rest in between, and the best of three scores was taken into consideration.

**Intervention Program:**

This consisted of 4 exercises that were performed in the first two weeks. The exercises were performed at a frequency of four times a week with ten repetitions of three sets each. Each exercise was held for five counts. They were as follows.

- 1) Adductor 90-90 ball squeeze: Player was asked to lie in the supine position with the hip and knees flexed at 90° angle. Holding this position, a ball was placed between the knees, and the player was asked to squeeze the ball with maximal effort for a count of five.



**Picture 1:** Adductor 90-90 ball squeeze

- 2) Side-lying straight leg raise for adductors: Player was asked to lie on one side. The upper leg was folded at the knees and placed in front of the lower leg. The player lifted the lower leg straight up keeping the knees tight. The position was held for five counts, followed by a return to start position.



**Picture 2:** Side-lying straight leg raise for adductors

- 3) Elastic resistance band strengthening for adductors: In the standing position, a resistance band was wrapped around the lower leg. The player was asked to draw the leg inward towards the midline against the resistance of the band, and the position was held for five counts.



**Picture 3:** Elastic resistance band strengthening for adductors

- 4) Elastic resistance band strengthening sumo squats: In the standing position, a resistance band is wrapped around both lower legs, and the player was asked to squat with the toes pointing 45° outwards. The position was held for five counts.



**Picture 4:** Elastic resistance band strengthening sumo squats

Post two weeks, four exercises were added to be performed in the next two weeks along with the previous ones. They were as follows.

- 5) Side-lying straight leg raise for adductors with a chair: The player is asked to lie on one side with the upper leg resting on the chair. The player raises the lower leg towards the chair keeping the knees tight. The position was held for five counts.



**Picture 5:** Side-lying straight leg raise for adductors with chair

- 6) Long sitting adductor squeeze: The player was asked to sit in a long sitting position with both legs raised off the ground. The ball was placed between both the legs; the player was asked to flex both the knees slightly. The position was held for five counts.



**Picture 6:** Long sitting adductor squeeze

- 7) Lateral lunge: The player was asked to perform a lateral lunge keeping one knee bent and other foot pointing 45° outwards. The position was held for five counts.



**Picture 7:** Lateral lunge

- 8) Static adductors using a footstool: The player was asked to stand with one leg resting on the footstool, and with a ball placed in between the stool and the other leg, the player was asked to squeeze the ball. The position was held for five counts.



**Picture 8:** Static adductors using a footstool

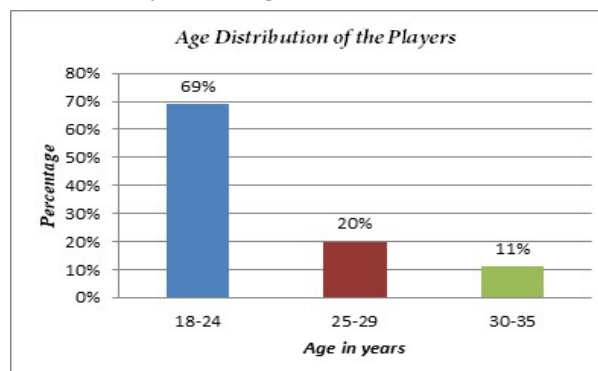
Post four weeks, ten players were eliminated from the study due to the inability to maintain follow up with the exercise protocol; hence 121 players were reassessed for the outcome measures.

### Statistical analysis

Data were analyzed using SPSS 23 software package for statistical analysis. The level of significance was set as  $p < 0.05$ . 30 M sprint tests and T-tests were calculated for their mean and standard deviation. A comparison of the mean was done using Paired-T Test.

### RESULTS

As seen in graph 1, 69% of the players were between the age group of 18-24 years, 20% of the players were between the age group of 25-29 years, and 11% of the players were between 30-35 years of age.

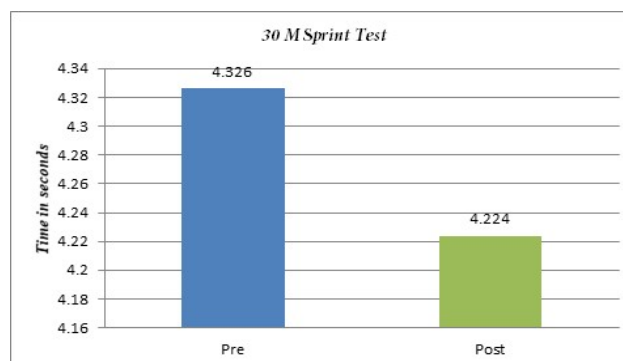


**Graph 1:** Age distribution of the players

As seen in Table 1 and graph 2, when players were analyzed for their 30 M sprint test, their mean pre-intervention sprint time was  $4.32 \pm 0.22$ , and their mean post-intervention sprint time was  $4.22 \pm 0.24$ . When compared this showed a statistically significant difference as  $p < 0.05$ .

	Mean	SD	P-Value
Pre 30 M sprint Test	4.326	0.22	<0.05
Post 30 M sprint Test	4.224	0.24	

**Table 1:** Comparison of 30 M sprint test pre and post-intervention

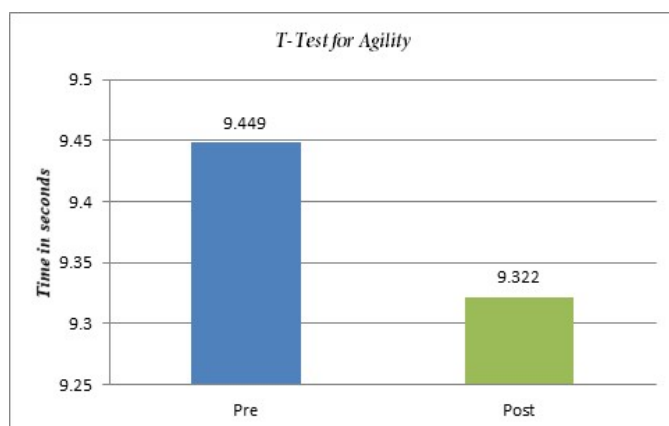


**Graph 2:** Difference in 30 M sprint Test pre and post-intervention.

As seen in table 2 and graph 3, when players were analyzed for their T-Test, their mean pre-intervention score was  $9.44 \pm 0.44$ , and their mean post-intervention score was  $9.32 \pm 0.39$ . When compared this showed a statistically significant difference as  $p < 0.05$

	Mean	SD	P-Value
Pre T-Test	9.449	0.44	<0.05
Post T-Test	9.322	0.39	

**Table 2:** Comparison of T-Test pre and post-intervention

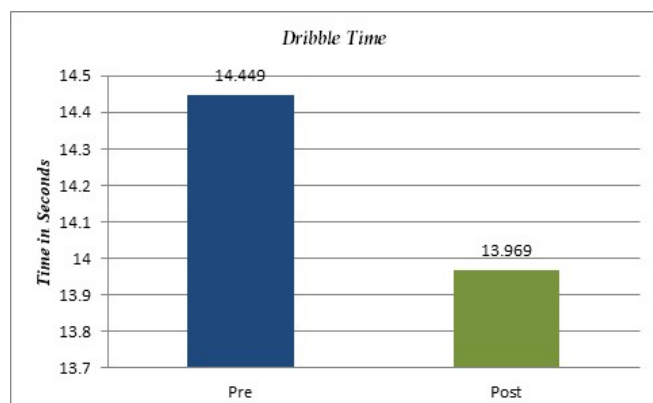


**Graph 3:** Difference in T-Test for agility pre and post-intervention.

As seen in Table 3 and graph 4, when players were analyzed for their Dribble time test, their mean pre-intervention Dribble time was 14.44±1.06, and their mean post-intervention Dribble time was 13.96±1.11. When compared this showed a statistically significant difference as  $p < 0.05$ .

	Mean	SD	P-Value
Pre Dribble Time	14.449	1.06	<0.05
Post-Dribble Time	13.969	1.11	

**Table 3:** Comparison of Dribble time test pre and post-intervention



**Graph 4:** Difference in Dribble time test pre and post-intervention.

## DISCUSSION

This research investigated the role of adductor strengthening intervention on sprint time and agility in elite football players. As seen in graph one majority of the players were between the age group of 18-24 years (69%), 20% were in the age group of 25-29 years, and 11% were in the age group of 30-35 years. Post 4 weeks of adductor strengthening intervention, players showed improvements in 30 M sprint tests, T-Test for agility, and Dribble time. The findings of this study were in contrast to the study done by Nelson et al. [8] on the impact of hip rotator strengthening on agility in male soccer players wherein the study found no difference in terms of agility post nine weeks of hip internal and external rotator strengthening. The possible reason being the players indulging in large volumes of other weekly exercises, which masked the effects of

study focused on the internal and external rotators of the hip rather than a specific large group of muscle. The small hip rotator muscle plays a significant role in stabilizing the hip joint rather than creating an enormous amount of torque, thereby failing to improve agility and speed.

The results of our study show a strong relationship between hip adductor strength with sprint and agility skills in football players. Adductor muscles play an essential role in a quick and sudden change of direction and speed in response to external stimuli, in this case being able to dodge the opponent player to gain better control over the ball [9]. Repeated concentric and eccentric contraction of adductor muscle is required to achieve good agility and speed. Moreover, adductor magnus muscle has been shown to assist in hip extension along with its role in stabilization of the hip and pelvis. Along with adductor magnus the hip extensors play a crucial role in sprinting, thereby propelling the body forwards with force [10]. The adductor muscles absorb the forces during a sudden lateral change of directions, cuts, and sprints, enabling a player to better position themselves for the consequent pass or shoot. The energy thus stored in the adductor muscles gets translated, giving sharpness in a player's agility and speed, thereby giving them an edge above the other players.

Adductor strengthening has been shown to reduce the incidence of adductor-related groin injury and strains as well. Ernest Esteve et al. [11], in the year 2018, reported a 15% reduced adductor strength in players with more than six weeks of pre-season groin pain compared to their healthy counterparts. Players with reduced adductor muscle strength are at an increased risk of sustaining a groin injury. Most of the studies done previously to improve the agility in football players have focussed on plyometrics, strength, and conditioning or a combination of these programs. The literature shows a lack of studies emphasizing the role of adductor muscles in improving athletic skills to achieve peak performances. Most of the studies on the role of therapeutic exercise interventions in improving sprint and agility skills have been inconclusive. In the current study, the adductor strengthening intervention aims at strengthening the hip adductors in all possible aspects, including isometric strengthening, elastic resistance band strengthening, and dynamic strengthening with concentric and eccentric muscle contraction. The intervention requires no equipment and can be easily performed on-field before the routine strength training sessions or matches. The study aims at incorporating the concept of training the hip adductor muscles into routine practice. After the post-performance parameters were completed, the elastic resistance bands were given to the players to ensure continuity in terms of incorporating the intervention into their daily routine.

## CONCLUSION

We concluded that the adductor training intervention helped improve the sprint time and agility in football players. As the intervention helped improving performance

conditioning program of the players.

### Limitations

Lack of a control group was a limitation of the study

The study was restricted to only male football players.

### Acknowledgment

We would like to thank all the players and team coaches for their kind cooperation throughout the study

Conflict of interest

None

### REFERENCES

- [1] <https://the18.com/soccer-news/how-many-people-watch-world-cup-2018-tv-numbers>
- [2] [https://www.business-standard.com/article/sports/fifa-world-cup-2018-watched-by-110-5-mn-viewers-across-india-118072601114\\_1.html](https://www.business-standard.com/article/sports/fifa-world-cup-2018-watched-by-110-5-mn-viewers-across-india-118072601114_1.html)
- [3] Bate. D. Soccer Skills practice, in: Science and soccer. Reilly, T., ed. London: E &FN Spon, 1996:227-241.
- [4] Ali. Ajmol. Measuring Soccer skill performance: A Review. Scandinavian journal of medicine and science in sports. 2011; 21(2):170-83.
- [5] Bangsbo, J, Mohr, M, and Krustrup, P. Physical and Metabolic demands of training and match-play in elite football players. Journal of sports science. 2006; 24(7):665-674.
- [6] Paul E. Hughes, Jim C. Hsu & Matthew J. Matava. Hip Anatomy and Biomechanics in the Athlete. Sports medicine and Arthroscopy Review. 2002 June; 10:103-114.
- [7] P.Holmich, K.Thorborg. Epidemiology of groin injuries in athletes. Sports Hernia and Athletic Pubalgia: Diagnosis and Treatment. 1<sup>st</sup> ed; 2014, p13-21.
- [8] Jesse Obed Nelson, Mark DeBeliso. The impact of hip rotator strength training on agility in male high school soccer players. The Sport Journal. 2014 March; 21: 431-436.
- [9] Andreas. Serner, Andrea Britt Mosler, Johannes L Tol & Roald Bahr. Mechanism of acute adductor longus injury in male football players: A systematic visual video analysis. British journal of sports medicine. 2018;53(3): 099246.
- [10] Harris NK, Cronin JB, Hopkins WG, Hansen KT. Squat jump training at maximal power load vs heavy loads: Effect on sprint ability. Journal of Strength Conditioning Research. 2008;22(6): 1742-1749.
- [11] Esteve E, Rafhlee MS, Kristian Throborg. Pre-season adductor squeeze strength in 303 Spanish male soccer athletes A cross sectional study. The orthopaedic journal of sports medicine. 2018 Jan; 6(1): 232596711774727.