



A COMPARATIVE STUDY OF EFFICACY OF BAREFOOT TRAINING AND SHOES ON TRAINING ON SPEED, AGILITY, AND VERTICAL JUMP PERFORMANCE IN ELITE FOOTBALL PLAYERS.

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ABSTRACT

Introduction- In football rapid body movements are essential that can be determined by running with ball or running without ball or dodging or dribbling the ball or defending the opponent. Due to these mentioned factors the modern football game is known to have fast movements. Specifically, fast movements include short and long sprints, explosive jumps and quick change of directions (COD). Speed of running (sprint) is universally accepted component in every team sport such as football, basketball, rugby, hockey etc. When selecting football players in the team, the agility and the jump tests were two important parameters to focus on, especially in the forward, defense and goal-keepers. Biomechanics of the foot was significantly influenced by barefoot running.

Methodology- The study aimed to assess the speed, agility, and vertical jump performance of elite football players through two groups: Group A performed barefoot plyometric training in a controlled environment, followed by football practice and cool down and Group B (control), performed the same plyometric exercises with shoes on. Both groups completed the program three times a week for seven weeks, with rest intervals after each set and exercise. The training sessions lasted

45 minutes. After a one-day rest, both groups took the same performance tests with shoes on. **Results-** The barefoot training group showed greater reductions in sprint and agility times, and, a better performance in vertical jump test compared to the control group (shoes-on training). Statistical significance was observed, with p-values < 0.05, confirming a measurable positive impact of barefoot training.

Conclusion- Barefoot training significantly improved speed, agility, and vertical jump performance in professional football players. The barefoot training group demonstrated greater improvements in sprint times and agility compared to the control group that trained with shoes.

Keywords- Football, Barefoot, players, running, training, shoes

INTRODUCTION

Sports coaches and agents all over the world are completely dependent on the player's physical characteristics, which are nowadays more crucial for selection and talent identification of the player to get selected in the football team ^[1]. Often greater importance is given to the ability of the lower limbs of the player to exert explosive strength. This is due to the close correlation with football game performance. The performance constitutes speed and agility potentials of the players. The sports literature has mentioned that a player should have the ability to generate force quickly, which is the primary principle to accomplish high-quality performance ^[1]. As of now, concerning both the components which are important in the game of football, that is the speed and agility among elite football players, have become very fast and quick on the field ^[2].

Football being an invasion sport, it is important to have ability to change the direction quickly to invade the opponent's team and maintain the possession ^[3]. In football rapid body movements are essential and that can be determined by running with ball or running without ball or dodging or dribbling the ball or defending the opponent. Due to these mentioned factors the modern football game is known to have fast movements. Specifically, fast movements include short and long sprints, explosive jumps and quick change of directions (COD) ^[4].

For offensive players like wide receivers, running backs, and quarterbacks, speed is essential because it allows them to extend plays, break free from defenders, and collect throws. For instance, running backs use their speed to identify openings in the defense and accelerate to gain yardage, while wide receivers use it to outpace defensive backs. Additionally, speed aids quarterbacks in performing bootlegs or scurrying out of the pocket to get extra yards or escape defensive pressure. Because they can be difficult for defenders to keep up with, especially in open-field scenarios, fast players sometimes cause mismatches ^[5]. In order to chase ball carriers, cover ground fast, and keep offensive players from getting a lot of yardage, defenders must be swift. Linebackers can close gaps and stop plays with speed, and defensive backs can keep up with wide receivers in coverage. A defender's speed frequently determines how fast they can respond to offensive plays like throws, fakes, and direction changes. In open space, quick defenders can make tackles or intercept passes more easily because they can anticipate offensive plays ^[6].

Two essential components of speed that impact a player's overall performance are acceleration and deceleration. While deceleration is necessary to change direction fast, stop after running, or slow down for a tackle, acceleration is necessary to overtake opponents and reach the ball. Running backs and quarterbacks, for instance, frequently have to slow down in order to shift course or get around a defender. In order to keep players in control of their motions, proper acceleration and deceleration techniques can improve offensive and defensive strategies ^[7].

A powerful vertical jump enables offensive players—particularly tight ends and wide receivers—to leap over defenders, catch high passes, and make crucial receptions in tight coverage ^[8]. The success of a play can be determined by one's ability to reach for passes under pressure. When battling for balls delivered to higher zones, a player with a higher vertical jump has a major advantage because it allows them to extend their range ^[8]. When it comes to blocking passes, field goals, and kicks, defensive players—especially defensive linemen and linebackers—benefit from having a strong vertical leap. A greater jump is essential for pass rush circumstances and kicking game situations because it puts them in a better position to intercept or deflect passes. Because players must jump to get their hands on the ball or change the trajectory of the kick, blocking demands both explosiveness and a strong vertical reach ^[9]. Performance in vertical jumps can indirectly increase kicking power for punters and kickers ^[10]. Better control and a greater kicking distance are frequently correlated with the explosive power required for a strong vertical leap. Even though kicking is a distinct movement pattern, the strength gained from training for vertical jumps enhances overall power and technique, resulting in more accurate and long-range kicks ^[10].

Better joint stability and proprioception are frequently associated with higher vertical leap heights, which helps to reduce the risk of jumping and landing-related injuries. Ankle or ACL injuries are less common in athletes who can jump and land quickly ^[11]. Training for vertical jumps improves body

control, which results in improved landing mechanics and a lower chance of non-contact injuries during play ^[11]. Football players use a variety of training techniques, such as strength training, plyometric workouts, and jump-specific drills, to increase their vertical leap ^[12]. Exercises that improve strength and explosive power include box jumps, depth jumps, and weighted resistance training. Additionally, as these elements have a big impact on the height attained during a jump, it is imperative to concentrate on core stability and ankle flexibility in order to maximize vertical jump performance ^[12].

The intrinsic muscles of the feet, which are frequently underused when wearing supportive footwear, can be strengthened with barefoot training ^[13]. Without shoes, the foot's muscles have to work harder to keep the body stable while moving. This leads to increased muscle strength and activation, which enhances arched support and foot function in general. Regular barefoot exercise has been found to improve the strength of the toe flexors, plantar flexors, and other tiny stabilizing muscles—all of which are critical for preserving foot health and averting foot-related injuries ^[13]. Improved foot biomechanics, including better arch formation and toe alignment, can result from barefoot training. A more natural gait pattern, which emphasizes a forefoot or mid-foot strike rather than a heel strike, is encouraged when running or walking barefoot. It has been demonstrated that this change in gait lowers the likelihood of impact-related injuries such shin splints and stress fractures ^[14]. Additionally, by enhancing proprioception and body awareness, barefoot exercise promotes appropriate postural alignment. By assisting people in making more subtle changes to their posture and mobility, this improved feedback promotes general foot health and helps people avoid injuries ^[14].

Plyometric exercises refer to the performance of stretch-shortening cycle (SSC) movements that involve a high-intensity concentric or shortening muscle action immediately after a rapid and powerful eccentric or lengthening muscle action ^[15]. Athlete's explosive power is greatly enhanced by plyometrics, which is crucial in football ^[16]. Football players rely on explosive movements to accelerate quickly, jump for throws, and change direction quickly, especially those in positions that need quick starts, such as defensive backs, wide receivers, and running backs. Rapid force production is improved through plyometric exercise, leading to improvements in speed, jump height, and general performance. Exercises that are especially good for enhancing vertical jump performance include jump squats and depth jumps. For activities like receiving high passes, blocking kicks, and vying for the ball in the air, a greater vertical leap is essential ^[16]. Plyometric exercise's dynamic quality aids in enhancing shock absorption and impact resistance, two factors that are crucial in minimizing foot and ankle injuries in sports ^[17]. Plyometric repeated nature, that is; the athlete jumps, lands, and changes direction often trains the feet and ankles to absorb pressures more efficiently, reducing the chance of problems like plantar fasciitis, Achilles tendinitis, and ankle sprains. In order to improve foot health and minimize the risk of injury, plyometric training also promotes appropriate landing mechanics, which are crucial for lowering impact load on the joints and tissues ^[17].

Plyometric workouts increase stability, flexibility, and muscular coordination, which improves foot function ^[18]. Plyometric exercises that involve repetitive leaping, hopping, and bounding enhance the coordination of the foot's muscles, ligaments, and tendons, resulting in improved control and a more effective foot strike when walking and running. Plyometric training helps players maintain foot health, prevent tiredness, and enhance performance during a training session or game by increasing the strength and efficiency of the foot muscles ^[18].

Few studies were conducted on netball players and south Indian costal sprinters resulted in significant improvement in the speed, agility, balance and vertical jumps by training in barefoot condition. There is paucity of studies on barefoot training in football players therefore there is more need to evaluate the effects of barefoot training in many other sports. Also, there is a literature gap on this concept of barefoot training. So the above study was conducted to determine and enhance the performance of elite football players in terms of speed, agility and vertical jumps, which will thereby improve performance in their future tournaments.

METHODOLOGY

The above study was conducted for a period of 1.5 years, after receiving the Ethical approval from the Institutional Ethical Committee and Protocol committee of D. Y. Patil Education Society, Kolhapur and D. Y. Patil College of Physiotherapy, Kolhapur. 74 participants were selected based on the inclusion and exclusion criteria.

Inclusion criteria

Male Elite football players under-19 age group, players having minimum of 2 years and maximum of 5 years of experience in elite football practice.

Exclusion criteria

Players with history of lower limb injuries within the past 6 months, who have undergone lower limb surgery (hip/knee/ankle/foot) (soft tissue/bone surgeries) in past 1 year.

Written informed consent was taken from participant. To assess the speed, agility and vertical jump performance of elite football player; there were two groups with each group consisting of 74 players. 'Group A' (experimental group) and 'Group B' (control group). Both the groups underwent pre-intervention performance tests (speed, agility and vertical jump) with shoes-on, two days prior to training program. Before the actual football practice 'Group A' (barefoot) preformed the barefoot plyometric training program in controlled environment followed by the actual football practice and cool down exercises.

'Group B' (shod) performed the same program as of 'Group A', but with wearing shoes.

The plyometric training program for 'Group A' and 'Group B' was carried out thrice a week for seven weeks. After each set there was be 30 sec rest interval and after each type of exercise there was two minutes of rest time. Total time of plyometric session was of 45 minutes on alternate days.

After completion of the intervention program the players were given rest for one day.

The post-intervention performance test was taken for both the groups after the rest day.

For the post-intervention test both the groups were examined with the shoes-on. All the performance parameters (speed, agility and vertical jump) were noted on the data collection sheet for each player separately. Statistical analysis was recorded and the results were obtained.

RESULTS

Table 1: Shows the comparison of Pre-Post mean and SD of 30m sprint test, Illinois agility test and Vertical jump test of the experimental group.

Variable	Time - Point	Mean	S.D.	P-value
30m Sprint Test (sec.)	Pre	4.10	0.06	9.79E-32*
	Post	3.55	0.23	
Illinois Agility Test (sec.)	Pre	17.39	0.54	2.79E-43*
	Post	15.35	0.73	
Vertical Jump Test (cm.)	Pre	52.68	2.20	1.56E-46*
	Post	55.51	2.22	

(* indicates p-value (<0.05) is significant)

A significant improvement was observed in all three tests (sprint, agility, and vertical jump). The p-values (<0.05) confirmed that these improvements were statistically significant.

Comparison Control Group

(Paired t-test used)

Table 2: Shows the comparison of Pre-Post mean and SD of 30m sprint test, Illinois agility test and Vertical jump test of the control group.

Variable	Time - Point	Mean	S.D.	P-value
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30m Sprint Test (sec.)	Pre	4.12	0.12	2.00E-06*
	Post	4.03	0.17	
Illinois Agility Test (sec.)	Pre	17.26	0.46	1.30E-20*
	Post	16.77	0.55	
Vertical Jump Test (cm.)	Pre	55.08	3.47	4.98E-23*
	Post	55.93	3.64	

(* indicates p-value (<0.05) is significant)

The control group also improved, but the improvements were less significant than in the experimental group. The p-values (<0.05) indicate that the changes were statistically significant, but the improvement was smaller compared to the barefoot training group.

Group wise Comparison

Unpaired t test used

Table 3: Shows the comparison of all the groups and their mean and SD

Variable	Group	Mean	S.D.	P-value
Age	Experimental	18.45	0.74	0.3255
	Control	18.50	0.71	
30m Sprint Test (sec.)	Experimental	3.55	0.23	1.78E-30*
	Control	4.03	0.17	
Illinois Agility Test (sec.)	Experimental	15.35	0.73	2.17E-27*
	Control	16.77	0.55	
Vertical Jump Test (cm.)	Experimental	55.51	2.22	0.1960
	Control	55.93	3.64	

(* indicates p-value (<0.05) is significant)

The experimental group (barefoot training) showed significantly better improvements in speed and agility than the control group (p-values < 0.05). No significant difference was found in vertical jump (p = 0.1960), indicating that barefoot training and shoes-on training had similar effects on vertical jump performance.

DISCUSSION

Analysis of Speed Improvement

The 30m sprint test revealed a significant reduction in sprint time in the barefoot group, decreasing from 4.10s to 3.55s ($p < 0.05$), whereas the control group showed only a marginal improvement from 4.12s to 4.03s ($p < 0.05$). These findings suggest that barefoot training enhances sprinting ability more effectively than training with shoes.

The improvement in sprint performance can be attributed to greater activation of intrinsic foot muscles, which has been shown to contribute to better force transmission and proprioception (De Wit et al., 2000) [19]. Studies have found that barefoot training reduces ground contact time and increases stride frequency, both of which are critical for sprinting (Jenkins & Cauthon, 2011) [20]. Additionally, enhanced foot strength and neuromuscular coordination from barefoot training may facilitate more explosive acceleration (Robbins & Hanna, 1987) [21].

Agility Performance Enhancement The Illinois Agility Test results also indicated a substantial improvement in the barefoot training group, with times decreasing from 17.39s to 15.35s ($p < 0.05$). The control group showed improvement from 17.26s to 16.77s, but the magnitude of change was

significantly lower. These results highlight the superior effectiveness of barefoot training in enhancing agility.

Agility is essential in football, requiring rapid changes in direction and quick reaction times. Research supports the notion that barefoot training increases proprioception and sensory feedback, leading to faster neuromuscular responses and improved agility performance (Young et al., 2021) ^[3]. Furthermore, barefoot training has been linked to enhanced balance and stability, which are crucial components of agility (De Villiers & Venter, 2014) ^[22]. By strengthening the stabilizing muscles of the lower extremities, barefoot training likely contributes to better control during quick directional changes.

Vertical Jump Improvement

Vertical jump height increased significantly in the barefoot training group from 52.68 cm to 55.51 cm ($p < 0.05$), whereas the control group experienced a smaller increase from 55.08 cm to 55.93 cm. These findings suggest that barefoot training enhances explosive power and jump performance more effectively than traditional training methods.

The biomechanics of barefoot training may explain these improvements. Studies have shown that training without shoes activates the plantar muscles more effectively, leading to stronger lower leg musculature (Divert et al., 2005) ^[23]. Additionally, barefoot training has been associated with increased ankle stability and reduced energy loss during jump execution, which could contribute to greater jump heights (Du Plessis, 2011) ^[24].

Comparison with Previous Studies

The results align with previous research findings that support barefoot training as an effective method for improving athletic performance. A study on netball players by Du Plessis (2011) demonstrated significant enhancements in speed and agility through barefoot training ^[24]. Similarly, a study on South Indian coastal sprinters reported greater improvements in agility and balance in the barefoot group compared to the shod group (KS et al., 2023) ^[24]. According to a study, barefoot running can improve performance and reduce the risk of injury, but the body needs time to adjust to the new movement patterns. Running barefoot drastically changes biomechanics, which may lower the risk of injury and improve performance ^[25]. A study shows neuromuscular potentiation, which decreases ground contact time and increases stride efficiency, can be used to improve sprint mechanics through plyometric training (Zisi M, Stavridis I et al., 2023) ^[26]. The study demonstrated that regular plyometric exercises enhance neuromuscular coordination, quick directional changes, and lower-body power, which are crucial for badminton performance (Chandra et al. 2023) ^[27].

These findings reinforce the conclusion that barefoot training offers distinct advantages over conventional training with shoes.

Practical Implications

The results of this study suggest that incorporating barefoot training into regular conditioning programs for football players could enhance performance outcomes. Given the improvements observed in sprint speed, agility, and vertical jump, teams may consider integrating barefoot drills alongside traditional training methods. However, careful implementation is necessary to prevent overuse injuries, especially for players unaccustomed to barefoot activity.

Furthermore, coaches and sports scientists should explore periodization strategies for barefoot training to maximize its benefits while minimizing potential risks. Gradual exposure to barefoot exercises, combined with proper recovery protocols, may optimize performance improvements without increasing injury risk (Bishop et al., 2009) ^[28].

CONCLUSION

Barefoot training resulted in a notable enhancement in speed, agility, and vertical jump performance among elite football players. The experimental group (barefoot training) showed a greater reduction

in sprint time and improved agility compared to the control group (shoes-on training). The results demonstrated significant improvements with p -values < 0.05 , indicating that barefoot training had a measurable positive effect. The 30m Sprint Test, Illinois Agility Test, and Vertical Jump Test all showed greater improvement in the barefoot training group compared to the control group. Barefoot training promotes better foot biomechanics, increased muscle activation, and improved balance and stability, leading to enhanced sports performance. The shorter stride length and increased stride frequency observed in barefoot runners contribute to their agility and speed. The study suggests that barefoot training may reduce injury risks by improving foot strength and stability, particularly by strengthening the plantar muscles and lower leg muscles. Football players and coaches could incorporate barefoot plyometric exercises into regular training to enhance agility, speed, and explosive strength. The findings support barefoot training as a viable alternative to traditional shoe-based training for improving athletic performance.

The study concluded that barefoot training is an effective method for improving speed, agility, and vertical jump performance in professional football players. It offers better neuromuscular adaptation and biomechanical efficiency compared to conventional shoe-based training. Coaches and sports trainers should consider integrating barefoot drills into football conditioning programs to maximize player performance.

REFERENCE

1. França C, Gouveia É, Caldeira R, Marques A, Martins J, Lopes H, Henriques R, Ihle A. Speed and agility predictors among adolescent male football players. *International journal of environmental research and public health*. 2022 Mar 1;19(5): 2856..
2. Bujnovsky D, Maly T, Ford KR, Sugimoto D, Kunzmann E, Hank M, Zahalka F. Physical fitness characteristics of high-level youth football players: influence of playing position. *Sports*. 2019 Feb 16;7(2):46.
3. Young W, Rayner R, Talpey S. It's time to change direction on agility research: a call to action. *Sports Medicine-Open*. 2021 Dec;7(1):12.
4. Goral K. Examination of agility performances of soccer players according to their playing positions. *Sport J*. 2015;51:1-1.
5. Bangsbo J, Iaia FM, Krstrup P. The Yo-Yo intermittent recovery test: A useful tool for evaluation of physical performance in intermittent sports. *Sports Med*. 2006;36(1):41-57.
6. Snyder BJ, Kivlin JE. Effects of strength and conditioning on performance in American football. *J Strength Cond Res*. 2015;29(10):2899-909.
7. Young WB, McDowell MH, Scarlett BJ. Performance changes following acute bouts of lower-body resistance exercises. *J Strength Cond Res*. 2002;16(2):173-9.
8. Wisløff U, Castagna C, Helgerud J, Jones R, Hoff J. Strong correlation of maximal squat strength with sprint performance and vertical jump height in elite soccer players. *J Strength Cond Res*. 2004;18(3):630-4.
9. Bishop D, Jones E, Woods DR. Recovery from training: A brief review. *J Strength Cond Res*. 2009;23(3):848-58. doi:10.1519/JSC.0b013e3181a6a0c1.
10. Cronin JB, Hansen KT, Harris NK, Westwood M. The effect of postactivation potentiation on vertical jump performance. *J Strength Cond Res*. 2004;18(3):479-82.
11. Della Villa F, Logroscino G, Camomilla V. The role of plyometric training in injury prevention for football players. *Clin J Sport Med*. 2016;26(4):279-87.
12. Young WB, McDowell MH, Scarlett BJ. Performance changes following acute bouts of lower-body resistance exercises. *J Strength Cond Res*. 2002;16(2):173-9.
13. Bonanno DR, Baird C, Brundage G, et al. The effects of barefoot versus shod running on lower limb injury: A systematic review. *J Foot Ankle Res*. 2021;14(1):9.
14. Ridge ST, Reid A, Hennig EM. Foot strike patterns and injury risk: A review of the literature. *J Sport Health Sci*. 2016;5(2):135-42.

15. Zisi M, Stavridis I, Bogdanis G, Terzis G, Paradisis G. The Acute Effects of Plyometric Exercises on Sprint Performance and Kinematics. *Physiologia*. 2023 May 9;3(2):295-304.
16. Markovic G, Mikulic I. Neuro-musculoskeletal and performance adaptations to lower-extremity plyometric training. *Sports Med*. 2010;40(10):859-95.
17. Hewett TE, Myer GD, Ford KR, et al. Biomechanical measures of neuromuscular control and valgus motion as risk factors for anterior cruciate ligament injury in female athletes. *Am J Sports Med*. 2005;33(4):492-501.
18. Fong DT, Hong Y, Chan L, et al. A systematic review on ankle injury and ankle sprain in sports. *Sports Med*. 2007;37(1):73-94.
19. De Wit B, De Clercq D, Aerts P. Biomechanical analysis of the stance phase during barefoot and shod running. *Journal of biomechanics*. 2000 Mar 1;33(3):269-78.
20. Jenkins DW, Cauthon DJ. Barefoot running claims and controversies: a review of the literature. *Journal of the American Podiatric Medical Association*. 2011 May 1;101(3):231-46.
21. DU PLESSIS E. The effect of barefoot training on speed, agility, power and balance in netball players. Stellenbosch University. 2011 Dec:1-22.
22. de Villiers JE, Venter RE. Barefoot training improved ankle stability and agility in netball players. *International Journal of Sports Science & Coaching*. 2014 Jun;9(3):485-95.
23. Divert C, Mornieux G, Baur H, Mayer F, Belli A. Mechanical comparison of barefoot and shod running. *International journal of sports medicine*. 2005 Sep;26(07):593-8.
24. KS DS, Venkatesh K, Shanmugananth E. Efficacy of Barefoot Training Versus Shoes-On Training on Agility Among the South Indian Coastal Sprinters. *Journal of Coastal Life Medicine*. 2023 Jan 11;11:2390-8.
25. Altman AR, Davis IS. Barefoot running: Biomechanics and implications for performance and injury prevention. *J Sport Health Sci*. 2012;1(2):47-55.
26. Young WB, McDowell MH, Scarlett BJ. Performance changes following acute bouts of lower-body resistance exercises. *J Strength Cond Res*. 2002;16(2):173-9.
27. Chandra S, Sharma A, Malhotra N, Rizvi MR, Kumari S. Effects of plyometric training on the agility, speed, and explosive power of male collegiate badminton players. *Journal of lifestyle medicine*. 2023 Feb 2;13(1):52.
28. Bishop D, Jones E, Woods DR. Recovery from training: A brief review. *J Strength Cond Res*. 2009;23(3):848-58. doi:10.1519/JSC.0b013e3181a6a0c1.