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Effects of Plyometric Training on Speed, Explosive Strength, and Strength Endurance among All India Inter-University Men Football Players

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Abstract

The study aimed to determine the effects of four weeks of Plyometric Training on Speed, Explosive strength, and Strength Endurance among All India Inter-University Men's Football Players. For the study, 20 male football players who were going to participate in the *South Zone of AIU were selected. The subjects were divided into the Control Group (CG) and the Plyometric Group (PG).*

All subjects were tested on criterion variables, i.e., Speed, Explosive Strength, and Strength Endurance. The data on the respective performance variable was collected at the pre and post-stage. The descriptive analysis and independent t-test were applied to determine the difference in each criterion variable. It was found that four weeks of Plyometric training had improved the performance of the experimental group. It was concluded that four weeks of Plyometrics could improve the performance of football players if practiced at high intensity with trained football players.

Keywords: Plyometric, Speed, Explosive strength, Strength Endurance, Football.

Introduction

Football requires players to perform numerous skills requiring strength, power, speed, agility, balance, stability, flexibility, and endurance (Bloomfield et al., 2007; Gorostiaga et al., 2004; Helgerud et al., 2001) state that the physical conditioning of players is a complex process. During a football match, players cover almost 10 km in total, which includes an average sprint every 90 seconds (11% of overall activity), with each action lasting an average of 2 to 4 seconds and covering a distance of up to 15 meters (Stolen et al., 2005). Although speed signifies an essential fitness component for a football player, quickness (acceleration speed during the first steps) is additionally essential. This is because sprints in football are mainly performed over short distances at maximal intensity, although the most extended distances tend to be about 40 m and usually involve several direction changes (Jovanovic et al., 2011; Rienzi et al., 2000).

High-speed actions in football have been categorized as requiring agility skills, acceleration, and maximal speed (Gambetta, 1996). Chapman et al., 2008 described speed in football as consisting of running speed, reaction speed, and acceleration speed during the first steps (referred to as quickness). These categorizations imply that the Plyometric (speed, agility, and quickness) training method should be a valuable component of fitness training in football (Pearson, 2001). Plyometric training (PT) is a technique used to increase strength and explosiveness. It consists of physical exercises in which muscles exert maximum force at short intervals to increase dynamic performance. In such training, muscles undergo a rapid elongation followed by an immediate shortening (stretch-shortening contraction), utilizing the elastic energy stored during the stretching phase. There is consensus that Plyometric training improves vertical jump performance, acceleration,

leg strength, muscular power, increased collective awareness, and overall sport-specific skills. Consequently, Plyometric training, primarily used by martial artists, sprinters, and high jumpers to improve performances, has gained popularity and has been used by athletes in all sports. However, although PT has been shown to increase performance variables in many sports, little scientific information is currently available to determine whether Plyometric training enhances skill performance in soccer players, considering that soccer is highly demanding. Soccer players require dynamic muscular performance for fighting at all levels of training status, including rapid movements such as acceleration and deceleration of the body, change of direction, vertical and horizontal jumps, endurance, speed as well as power for kicking and tackling (Ying-Chun Wang and Na Zhang., 2016)

Despite the research above, at this point, there is scientific evidence to support the effectiveness of Plyometric training for conditioning football players, such that football-specific improvements are produced. In addition, short-term (6 weeks) PT intervention induced higher maximal-intensity exercise and endurance performance improvements than soccer training alone. The improvements induced by PT were not affected by gender. Thus, male and female soccer players with similar competitive backgrounds and training loads can undergo similar PT programs (Ramirez-Campillo R. et al., 2016). Accordingly, Plyometric training-induced significantly greater kicking distance in a group of adolescent females (~13 years) after 14 weeks of training. No significant difference was seen in vertical jump height between the groups at the pretest (Rubley MD et al., 2011). PT improved depth vertical jump performance, agility, and isometric knee extensor strength (Váczi M et al., 2013) in young soccer players. Therefore, this study aimed to determine the effects of a Plyometric training method on Speed, Explosive Strength, and Strength Endurance among All India Inter-University Men Football Players.

Method and Procedure

Twenty male soccer players from the South Zone of All India Inter University were selected as subjects for the present study. The investigator met the football players during camps for during all-India Inter-university football camp. All the male soccer players were aged between 18 and 26. The selected football players were divided into two groups. Ten players were grouped as the Plyometric training (n=10) group and ten as the control group (n=10). All the selected subjects underwent medical checkups before the training. It was ensured that no subjects had any ailments. The Plyometric group underwent four weeks of intense plyometric training, and the control group practiced their regular training session. Data were collected at pre and post-stages, and for the statical analysis, an independent t-test was applied.

Discussion and Findings

For the analysis, the Independent 't-test will be implemented to calculate the significant difference, if any, with the significance criteria of $\alpha =$ or $p < 0.05$.

Table 1 Mean scores, Standard Deviation, Std. Error Mean and Resultant 't' Values for Speed Test at Post Control and Post Plyometric

Groups	N	Mean	Std. Deviation	Std. Error Mean	df	t
Post Control Group	10	4.36	.127	.040	18	**2.344***

Post Plyometric Group	10	4.25	.078	.024		

Significant at p>=0.05 level

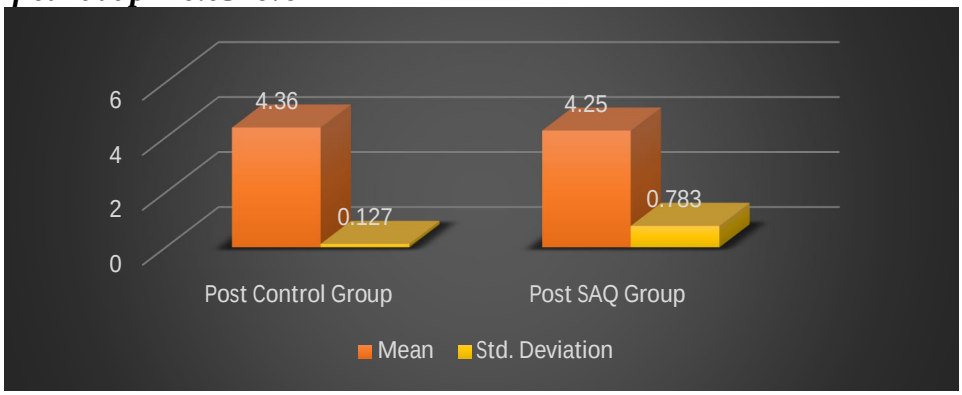

Figure 1.1: Present the Mean and the Std. Deviation in Speed at Post-control and Post Plyometric

Table 1.1 reveals that there was significant difference exists between the mean scores of post control to post plyometric group as the obtained 't' value was ***2.967*** for the speed test, which was found to be higher than the required table value of 2.101 for significance at 0.05 level of confidence with df 18. The mean and the standard deviation of the post-control to the post-plyometric group were 4.36 ± 0.127 and 4.25 ± 0.783, respectively.

Table 2 Mean scores, Standard Deviation, Std. Error Mean and Resultant 't' Values for 1 Explosive Strength test at Post Control and Post Plyometric

Groups	N	Mean	Std. Deviation	Std. Error Mean	df	t
Post Control Group	10	54.00	1.885	.596	18	**3.832**
Post Plyometric Group	10	57.10	1.728	.546		

Significant at p>=0.05 level

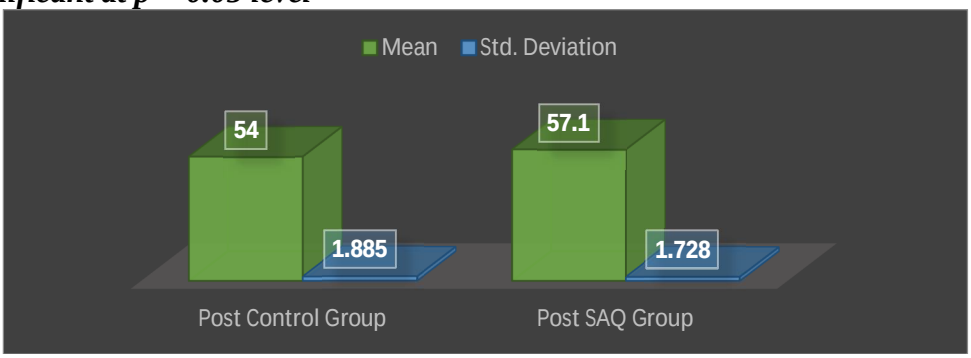

Figure 1.2: Present the Mean and the Std. Deviation in Explosive Strength at Post-Control and Post Plyometric

Table 1.2 reveals that there was a significant difference exists between the mean scores of post control to post plyometric group as the obtained 't' value was ***3.832*** for the Explosive Strength test, which was found to higher than the required table value of 2.101for significance at 0.05 level of confidence with df 18. The mean and the standard

deviation of the post-control to the post-plyometric group were 54.00 ± 1.885 and 57.10 ± 1.728, respectively.

Table 3 Mean scores, Standard Deviation, Std. Error Mean and resultant 't' values for 1 Speed Endurance test at Post Control and Post Plyometric (N=10 for each group)

Groups	N	Mean	Std. Deviation	Std. Error Mean	df	t
Post Control Group	10	52.80	3.521	1.113	18	**2.491***
Post Plyometric Group	10	56.30	2.710	.857		

Significant at p>=0.05 level

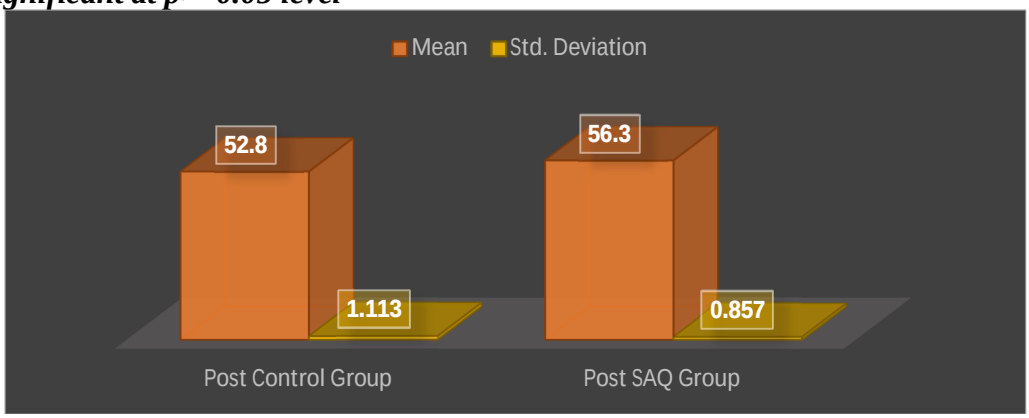

Figure 1.3: Present the Mean and the Std. Deviation in Speed Endurance at Post-Control and Post Plyometric

Table 1.3 reveals that there was significant difference exists between the mean scores of post control to post Plyometric group, as the obtained 't' value was 2.491 for the Speed Endurance test, which was found to be higher than the required table value of 2.101 for the significance at 0.05 level of confidence with df 18. The mean and the standard deviation of the post-control to the post-plyometric group were 52.80 ± 3.521 and 56.30 ± 2.711, respectively.

Based on the finding, it was analyzed that the Plyometric training group had the upper hand in terms of performance capacity when compared to the Control group. After four weeks of intense plyometric training, speed, explosive strength, and strength endurance improved compared to the control group.

Conclusion

Due to the complex physical requirements in soccer, including endurance, strength, power, and agility, soccer training must fulfill the improvement needs. Taken altogether, the data demonstrated a strong ability of Plyometric training to transfer and improve specific cardiovascular and neuromuscular fitness. PT induces an increase in VO2 max, maximal strength, sprinting speed, solid kick, endurance, agility, particular soccer player skills, and vertical jump ability (Helgerud J, Rodas G, Kemi OJ, Hoff J., 2011) in male and female individuals at any age, whether in recreational or professional athletes. In addition, improvements include muscular and tendon strengthening and avoiding injuries (Asadi A, de Saez Villarreal E, Arazi H., 2015).

Thus, plyometric training must be a part of soccer player training programs, as in many sports. Safety considerations must be considered, including evaluating the athlete, ensuring facilities and equipment are safe, establishing sport-specific goals, determining program design variables, teaching the proper athlete technique, and adequately promoting the program.

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