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EFFECTS OF PLYOMETRIC TRAINING AND HIGH INTENSITY INTERVAL TRAINING ON SPEED AND AGILITY IN MALE FOOTBALL PLAYERS

Mudassar Ali
University institute of physical therapy (University of Lahore)

Dr.Muhammad Danial Baig Chughtai (PT).
Ph.D*, M.Phil, DPT**.** Assistant Professor, United College of Physical Therapy, Karachi.

Dr. Suneeta Tariq PT
CECOS University of IT and Emerging Sciences Peshawar as Lecturer

Dr. Zain Ali Bal; PT
The University of Faisalabad Lecturer

Dr. Neha Yaqoob
Allied Hospital Faisalabad, Doctor of Physical Therapy

Dr. Muqadas Majeed
University of Faisalabad (TUF)

Ahsan Taqweem
Riphah International University, Lahore Campus

ABSTRACT

Football, being an intense sport, requires features such as speed, strength, agility and endurance to boost in these physical characteristics, athletes undergo through some specific exercise regimens. Of all the training techniques, Plyometric Training (PT) and High-Intensity Interval Training (HIIT) are used most commonly and each works in a different way. **Objective :** To determine the effect of plyometric training and high intensity interval training on speed and agility in male football players **Method** :A randomized clinical trial was conducted .Data was gathered from fame club and model town football club Lahore .30 Participants was randomly allocated by probability simple sampling techniques in two groups. Group A participants undergone plyometric training and group B received High-Intensity Interval Training for 4 session per week up to 8 week. 50 meters' linear sprint test for speed and T test for agility assessment were utilized as assessment tool. Study ran March 2023 September 2023. Version 25 of SPSS was employed for statistical analysis. **Results** : Revealed Agility T Test after Intervention show mean ±SD of group A 35.009±276 and group B 34.001±2.68 with mean difference (-2.601), and p value (.021) shown significant differences between groups after Intervention. 50 meters' linear sprint test after Intervention show mean ±SD of group A 32.001±2.810 and group B 31.00±2.79 with mean difference (-2.601) and p value (.023) shown significant differences between groups after Intervention. **Conclusion :** Study's findings suggest that plyometric training and high intensity interval training both can enhance speed and agility in male football players but comparatively plyometric training showed more improvement

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Keywords: *FOOTBALL PLAYERS, SPEED, AGILITY, PLYOMETRIC TRAINING, HIGH INTENSITY INTERVAL TRAINING*

INTRODUCTION

Football is a high-speed sport that involves fast changes in ball direction, high power projections, and runs at maximum or sub-normal speed. A variety of physiological and mechanical needs are covered in the training regimens that sports coaches frequently create for both performance research and sports coaching. As a result, coaches and players can apply the training plan for their regular sports activities. Intermittent, dynamic, and ballistic movement are features of several team sports, including baseball, football, netball, martial arts, and netball. Advanced conditions are necessary for this, as well as a high capacity for both intermittent and aerobic sprinting, robust muscles and strength, flexibility, speed, and adaptability.(1)
Football coaches and sports agents throughout the world have depended on evaluating players' physical characteristics in order to identify and pick talent. (2) Lower-body explosive strength has frequently received special attention because of its strong correlation with game performance, primarily through capacity for speed and agility.(3, 4) One of the most crucial things that team sports players should regularly work on developing in their strength and conditioning regimens is agility. Agility is generally understood to be a quick, whole-body movement that changes direction or velocity in response to a stimuli. (4) According to Mirkov et al., one of the most important components of an athlete's future success is their agility and coordination.(5)

Exercises called plyometrics are designed to improve muscular performance. Athletes in various sports utilise plyometric training methods to build strength and explosiveness. Plyometrics involves quickly extending a muscle (eccentric movement) and then shortening the same muscle and connective tissue (concentric action). It's been proposed that plyometric exercises' gains in efficiency and strength might boost agility. (6) Jumping, hopping, and skipping are exercises that are practiced in most sports.(7) These exercises also help with strong muscular contractions during vigorous activity, when the contraction results in an instantaneous muscle stretch followed by an explosive muscle modification.(8, 9)

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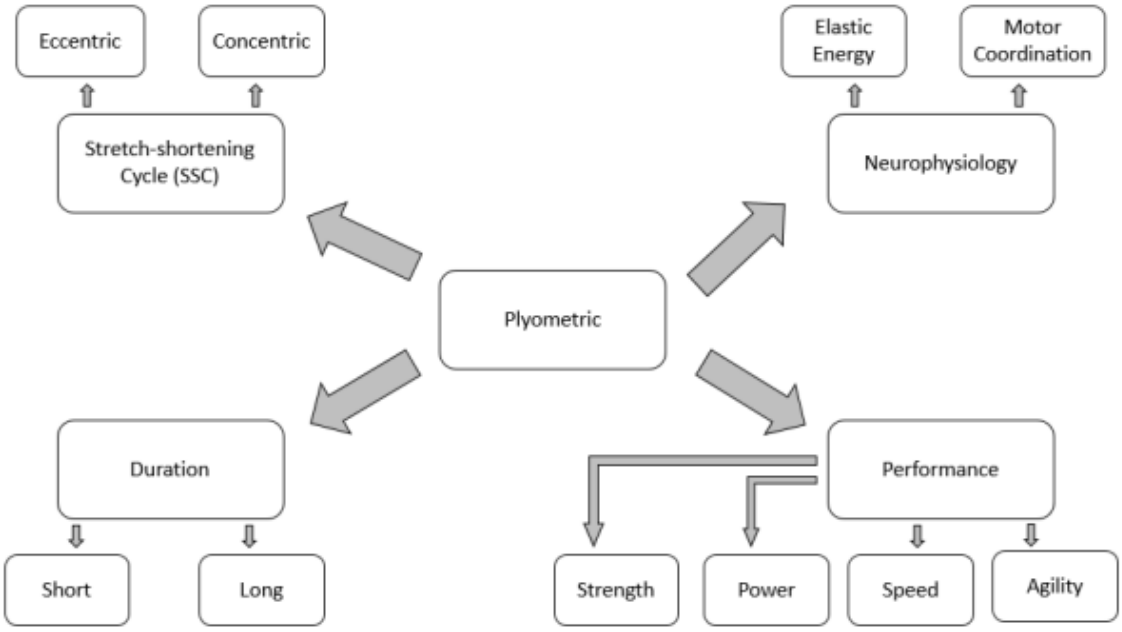

Figure 1. Theoretical Framework of Plyometric Training(1)

The development of the aerobic energy system is necessary for players to recover between games, where they must do high-intensity movements that primarily employ the anaerobic energy system. (10) To succeed, the anaerobic and aerobic energy systems must be improved. These systems are crucial for both action and recuperation. Given the intermittent nature of team sports like football, volleyball, and handball, interval training enhances maximum sprint and explosive strength performances including acceleration, deceleration, swiftness, and agility. In team sports, the elements influencing the outcome of the match are closely correlated with growing and decreasing training frequency as well as agility and high-intensity interval training.(11) According to Moreira et al., athletes' agility performances declined the longer they played in a competition, and this drop may get considerably worse the longer the match and the higher intensity performance it demanded. (12) Both the anaerobic and aerobic systems produce adenosine triphosphate (ATP) during high-intensity exercise. Enhancing energy release from both aerobic and anaerobic energy systems is predicted to be the training objective for sports involving high intensity activity, as the resynthesis of ATP influences sports performance. HIIT's high-speed runs, acceleration, and deceleration positively impact agility. Interval sprints and HIIT training have also been shown to enhance agility performance.(13)

METHOD

A randomized clinical trial was conducted .Data was gathered from fame club and model town football club Lahore . Participants was randomly allocated by probability simple sampling techniques in two groups. 30 sample size was calculated using open Epi Tool software.

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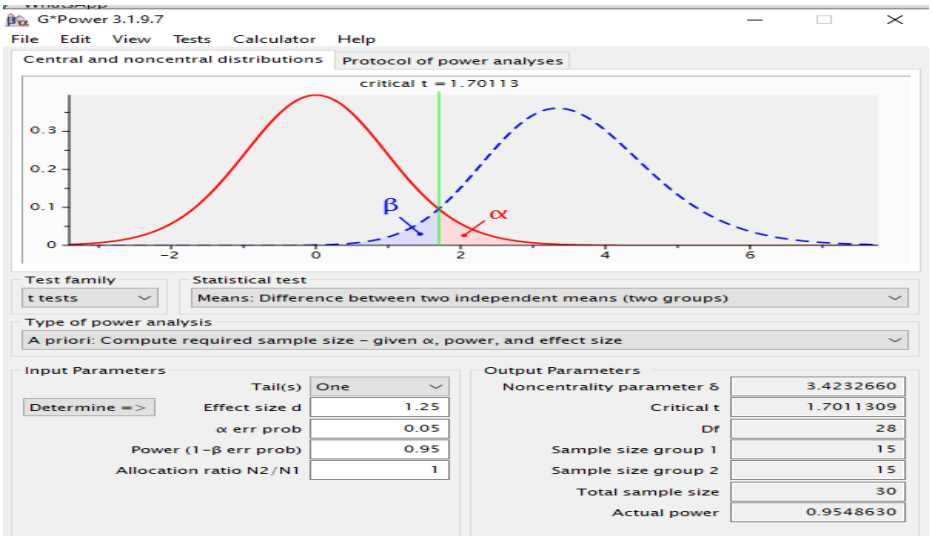

Figure 2:Sample size

20-35 male football players , have at least two years of football training were included .Participants with medical history of severe musculoskeletal injuries such as lower limb injuries within 6 months , who have other pre-existing cardiovascular diseases or other conditions that prevent them from engaging in high-intensity physical activities including uncontrolled hypertension or arrhythmias, using steroids were excluded.2 intervention groups were made .Group A participants undergone plyometric training and group B received High-Intensity Interval Training for 4 session per week up to 8 week. 50 meters' linear sprint test for speed and T test for agility assessment were utilized as assessment tool. Study ran March 2023 September 2023 . Version 25 of SPSS was employed for statistical analysis. Independent Sample T Test between group comparison and Paired Sample T test used for within group difference .

RESULTS

Table 1:Demographics and clinical characteristics of the study subjects (N=30)

Variables	**Group A (Plyometric training)**	**Group B (High intensity interval training)**	P Value
	N=15	N=15	
	Mean ±SD	Mean ±SD	

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Age (years)	26.800±2.0	26.400±2.29	.681
Height (cm.)	160.100±3.814	161.400±2.8	.279
Weight (kg)	59.102±5.1	60. 123±3.961	.561
BMI	24.100±2.403	23.721±2.152	.643

The population under study had baseline characteristics that revealed the mean age in group A was 26.800±2.0 and in group B it was 26.400±2.29.Group A had a mean height of 160.100±3.814 cm, whereas group B had a mean height of 161.400±2.8 cm.Regarding weight (kg), the average weight in group A was 59.102±5.1, whereas group B's weight was 60.123±3.961. The mean BMI values for groups A and B were 24.100±2.403 and 23.721±2.152, respectively.

Figure 3: Age of the Participants

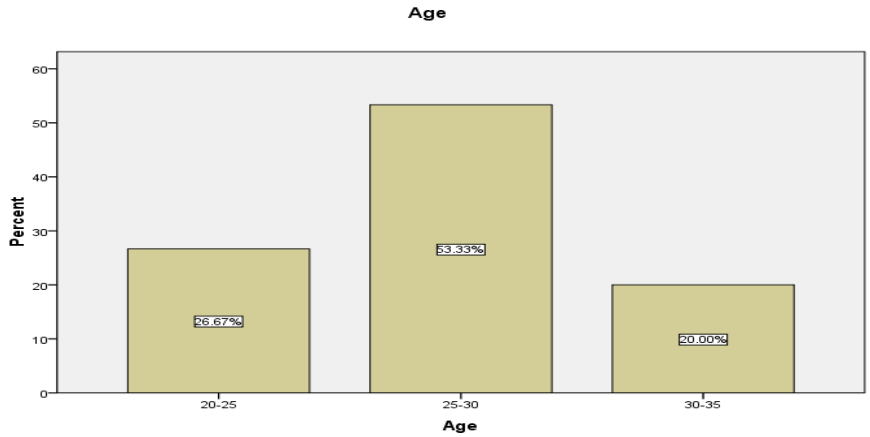

Table 2:Paired Sample T test used within group difference of 50 meters' linear sprint test before and after Intervention

Assessment		**Intervention Groups**	
		Group A (Plyometric training)	**Group B (High intensity interval training)**
	N	**Mean ±SD**	**Mean ±SD**

50 meters' linear sprint test – Before Intervention		15	33.44±2.84	34.000±2.000
50 meters' linear sprint test – After Intervention		15	26.333±2.90	28.902±2.811
Paired Sample T test	**Paired Differences**		7.107 ±1.018	5.10±2.631
	P value		<.001	<.001

Within group difference Paired Sample T test was applied. Group A show paired difference of 50 meters linear sprint test is 26.333±2.90 with significant p value (<.001) and paired difference of group B 28.902±2.811 with significant p value (<.001). Improvement in 50 meters linear sprint test was seen more in group A then group B.

Table 3:Independent Sample T Test between group comparison of 50 meters' linear sprint test before and after Intervention.

		Intervention Groups			**Independent Sample T-test**	
			Group A (Plyometric training)	**Group B (High intensity interval training)**		
Outcome Measure	**Assessment**	**N**	**Mean ±SD**	**Mean ±SD**	**Mean Difference**	**P value**
50 meters' linear sprint test	**Before Intervention**	15	33.4111±2.91	34.001±289	-.269	.766
	After Intervention	15	32.001±2.810	31.00±2.79	-2.601	.023

Between groups comparison Independent sample t test was applied. Before Intervention 50 meters' linear sprint test show mean ±SD of group A 33.4111±2.91and group B 34.001±289with mean difference (-.269), and p value (.766) shown non-significant differences between groups before Intervention. 50 meters' linear sprint test after Intervention show mean ±SD of group A 32.001±2.810 and group B 31.00±2.79 with mean difference (-2.601), and p value (.023) shown significant differences between groups after Intervention. Group A show more improvement in 50 meters' linear sprint test then group B.

Table 4:Paired Sample T test used within group difference of Agility T Test before and after Intervention

Assessment			Intervention Groups	
			Group A (Plyometric training)	Group B (High intensity interval training)
		N	Mean ±SD	Mean ±SD
Agility T Test – Before Intervention		15	32.001±2.90	34.906±2.01
Agility T Test – After Intervention		15	31.204 2.900	28.201 ±2.865
Paired Sample T test	Paired Differences		8.001±3.001	6.901±2.630
	P value		<.001	<.001

The paired sample t-test was conducted to assess the within-group difference in the Agility T Test before and after the intervention for both Group A and Group B. For Group A, the mean agility test time significantly decreased from 32.001seconds 2.90 before the intervention to 31.204 2.900 s after the intervention, yielding a paired difference of 8.001 seconds (±3.001). Similarly, for Group B, the mean agility test time decreased from 34.906±2.01 before the intervention to 28.201 ±2.865) after the intervention, resulting in a paired difference of 6.901 seconds (±2.630). Both groups exhibited statistically significant improvements in sprint time, with p-values less than .001. These findings suggest that the intervention had a positive impact on the agility test of participants in both Group A and Group B, leading to faster times after the intervention compared to before.

Table 5:Independent Sample T Test between group comparison of of Agility T Test before and after Intervention

	Intervention Groups			Independent Sample T-test
		Group A (Plyometric training)	Group B (High intensity interval training)	

Outcome Measure	Assessment	N	Mean ±SD	Mean ±SD	Mean Difference	P value
Agility T Test	**Before Intervention**	15	32.856±2.87	35.009±276	-.268	.650
	After Intervention	15	31.00±2.80	34.001±2.68	-2.601	.021

Between groups comparison Independent sample t test was applied. Before Intervention Agility T Test show mean ±SD of group A 32.856±2.87and group B 31.00±2.80 with mean difference (-.268), and p value (.650) shown non-significant differences between groups before Intervention. Agility T Test after Intervention show mean ±SD of group A 35.009±276 and group B 34.001±2.68 with mean difference (-2.601), and p value (.021) shown significant differences between groups after Intervention. Group A show more improvement in Agility T Test then group B.

DISCUSSION

Current study conducted on 30 football male players 2 intervention groups were made .Group A participants undergone plyometric training and group B received High-Intensity Interval Training .2 assessment test utilized for assessing speed and agility agilty T test and for speed 50 meters' linear sprint test.Both intervention had significant improvement but plyometric training showed more promnent results these results were compatable to (14, 15) The study conducted by Bin Shamshuddin et al. examined the impact of plyometric training on speed and agility in recreational football players. The results indicated a significant difference ($t = 2.53$, $p = 0.01$) when compared to the control group. These findings aligned with the current study, which found that after intervention, the agility test improved from 32.001±2.90 to 31.204 2.900 with a p value <.001, indicating that polymetirc training improves agility performance. (1)

High Intensity Interval Training (HIIT) was found to have effects on increasing explosive power, speed, and agility in a study by Fajrin F. Kusnanik et al. These results were consistent with those of the current study, which found that after intervention, HIIT improved 28.201 ±2.865 from 34.906 ±2.01 with a p value of <.001. (16)
Plyometric training has been shown to increase foot players' speed, according to a recent study. Beato M. et al.(17) research, but the current study on speed additionally included the agility variable, and Beato M. et al. examined jump performance. According to the results of the current study, plyometric training can increase football players' speed and agility. The MH H et al. study indicated that plyometric exercise had improved outcomes on sprint, agility, and jump performance in university football players. (18)

According to a study by Gökkurt, KADİR, et al., 8 weeks of high-intensity interval training is statistically significant for soccer players' speed and acceleration ($p<0.05$). These results aligned with a recent study that found 8 weeks of high-intensity interval training was statistically significant for football players' speed ($p<.001$).(19)

High-intensity interval training has been shown to improve football players' agility and speed; these findings are consistent with the present study by Iaia et al. (20) also same result showed by Hammami M et al.study (21)

Conclusion : Study's findings suggest that plyometric training and high intensity interval training both can enhance speed and agility in male football players but comparatively plyometric training showed more improvement

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