Effect Of Explosive Resistance and Speed Training on Sprint and Power in Handball Players

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***Abstract*—The purpose of the present study was to examine the effect of explosive resistance training combined with speed training on sprint performance and leg explosive power among handball players. Thirty (N = 30) Inter Collegiate level handball players from Tamil Nadu Physical Education and Sports University, Chennai, Tamil Nadu, India, aged between 18 and 25 years, were selected as subjects for the study. The participants were randomly assigned into two groups of fifteen each: the experimental group underwent explosive resistance training combined with speed training, while the control group did not participate in any specific training programme. The training intervention was carried out for eight weeks, three alternate days per week. Sprint performance and leg explosive power were assessed before and after the training period. The collected data were statistically analyzed using Analysis of Covariance (ANCOVA), and the level of significance was set at 0.05. The results of the study revealed that the experimental group showed significant improvements in sprint performance and leg explosive power compared to the control group. It was concluded that explosive resistance training combined with speed training is an effective training method for enhancing sprint speed and explosive power among handball players.**

***Index Terms*—Explosive Resistance Training, Speed Training, Sprint Performance, Leg Explosive Power, Handball Players**

I. INTRODUCTION

Resistance training plays a vital role in enhancing muscular strength, power, and neuromuscular coordination, which are essential components of sports performance. High-intensity resistance training has been widely recognized for its ability to improve maximal strength, preserve lean muscle mass, and enhance skeletal health. In addition to physical benefits, recent studies indicate that resistance training contributes positively to cognitive function and motor control, particularly through improved neuromuscular efficiency. Explosive resistance training, often associated with plyometric exercises, focuses on producing maximal force in minimal time by utilizing the stretch–shortening cycle of muscles. This rapid transition from eccentric to concentric muscle action enhances power output, sprint ability, and jumping performance. Such training methods are particularly relevant for team sports like handball, which demand repeated bouts of sprinting, jumping, and rapid changes of direction. Speed is a crucial performance determinant in handball, influencing offensive breakthroughs, defensive recovery, and fast-break situations. Sprint performance over short distances reflects an athlete's ability to generate force quickly and efficiently. Therefore, integrating explosive resistance training with speed training may lead to significant improvements in sprint speed and leg explosive power. However, limited research has examined the combined effects of these training methods among university-level handball players. Hence, the present study aims to analyze the effect of explosive resistance and speed training on sprint performance and leg explosive power among handball players.

II. METHODOLOGY

The purpose of the present study was to examine the effect of explosive resistance training combined with speed training on sprint performance and leg explosive power among handball players. Thirty (N = 30) university-level handball players studying at Tamil Nadu Physical Education and Sports University, Chennai, Tamil Nadu, India, aged between 18 and 25 years, were selected as subjects for the study. The

subjects were randomly assigned into two equal groups of fifteen each. The experimental group underwent explosive resistance training combined with speed training, while the control group continued with their regular physical activity without any specialized training intervention.The training programme was conducted for a period of eight weeks, three alternate days per week. Each training session included a structured warm-up, explosive resistance exercises, speed drills, and a cool-down period.

III. SELECTION OF VARIABLES

Based on the relevance of the study, availability of testing instruments, and feasibility of measurement, the following dependent variables were selected:

- Sprint Performance was measured using the 50-meter sprint test, recorded in seconds.
- Leg Explosive Power was measured using the vertical jump test, recorded in centimeters.

IV. ANALYSIS OF THE DATA

All subjects were tested on the selected variables before and after the training period. The collected data were statistically analyzed using the dependent t-test to determine significant differences between pre-test and post-test means within each group. Analysis of Covariance (ANCOVA) was employed to examine the significance of differences between the experimental and control groups by adjusting pre-test scores. When the obtained F ratio was found to be significant, Scheffe's post-hoc test was applied to identify paired mean differences. The level of significance was fixed at 0.05 for all statistical analyses.

Table – I, Mean Standard Deviation and Dependent 't'- Test Values on Linear Sprint and Leg Explosive Power of Experimental and Control Groups

S. No.	Variables	Group	Pre-Test Mean	SD	Post –Test Mean	SD	't' -Test
1.	Linear Sprint	HIRWST	9.02	0.42	8.48	0.38	10.86*
		EXRWST	8.99	0.39	8.51	0.34	14.72*
		CG	8.96	0.45	8.95	0.44	0.89
2.	Leg Explosive Power	HIWSTG	31.45	0.28	35.82	0.51	26.43*
		ERWSTG	31.48	0.33	34.48	1.62	7.43*
		CG	31.32	0.32	31.34	1.41	1.21

Significant at 0.05 level. (Table value required for significance at 0.05 level for 't'-test with df 14 is 2.14)

The paired sample t-test was employed to analyze the selected dependent variables, and the results are presented in Table I. The obtained t-test values between the pre-test and post-test means of the high-intensity resistance with speed training group, explosive resistance with speed training group, and the control group were 10.86, 14.72, and 0.89 respectively for linear sprint performance, and 26.43, 7.24, and 1.21 respectively for leg explosive power. The t-values obtained for both experimental groups were significantly higher than the required table value of 2.14 at 0.05 level of significance with 14 degrees of freedom, indicating significant improvements due to the training interventions. In contrast, the t-values obtained for the control group were lower than the table value, suggesting that no significant improvement was observed in linear sprint performance or leg explosive power, as the subjects were not exposed to any specific training programme. The findings of the study clearly indicate that both high-intensity resistance training and explosive resistance training combined with speed training significantly improved linear sprint performance and leg explosive power among the experimental groups.

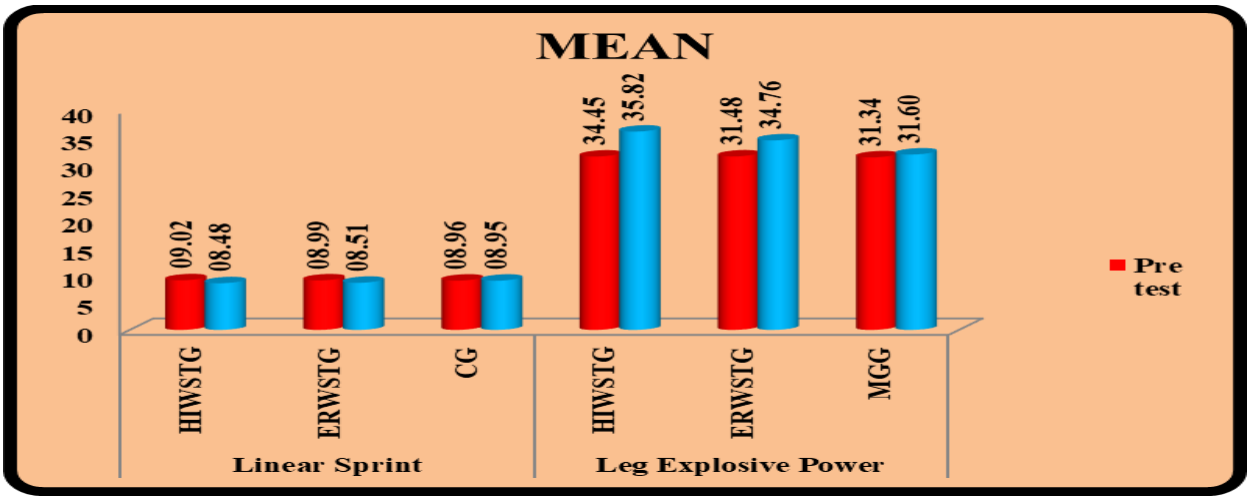

Figure – 1: Pre and Post Test Mean of Experimental Groups and Control Group on Linear Sprint and Leg Explosive Power among Women Handball Players

Table – II, Computation of Analysis of Covariance on Linear Sprint and Leg Explosive Power of High Intensity and Explosive Resistance with Speed Training Group Among Women Handball Players

Adjusted Post Test Means									
S.No	Variables	HIR WSTG	ERWSTG	CG	SOV	SS	Df	MS	F-ratio
1.	Linear Sprint	8.44	8.54	8.95	B.G.	2.19	2	0.73	74.91*
					W.G.	0.53	41	0.01	
2.	Leg Explosive Power	35.99	34.40	31.91	B.G.	122.83	2	40.94	17.51*
					W.G.	128.60	41	2.33	

Significant at. 0.05 level of confidence (The table value required for significance at 0.05 level with df 2 and 41 is 3.23).

From the table - II, the adjusted post test mean values of linear sprint for experimental group are 8.44 and 8.54 leg explosive power for experimental group are 35.99 and 34.40 were as the control group values are 8.95 and 31.91 respectively. The obtained F-ratio of linear sprint 74.91 and leg explosive power 17.51 for adjusted post-test mean is more than the table value of 3.23 for df 2 and 41 required for significance at 0.05 level of confidence. The results of the study indicate that there was significant difference between the adjusted post-test means of experimental and control groups on the development of linear sprint and leg explosive power.

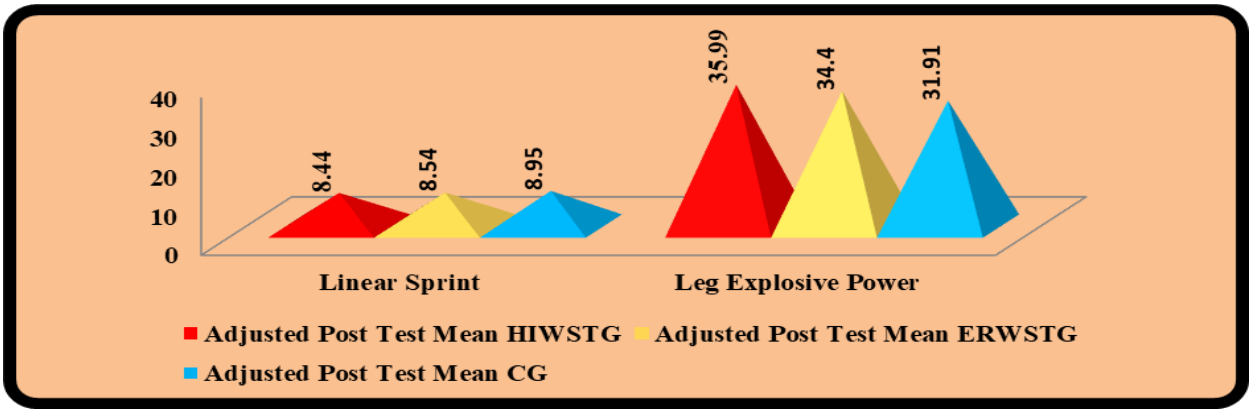

Figure-2: Adjusted Post Test Mean Values of Linear Sprint and Leg Explosive Power among Women Handball Players

V. DISCUSSION ON FINDINGS

The results of the study indicate that the high intensity with speed training and explosive resistance with speed training group showed significant improvement in performance level on linear sprint and leg explosive power variable when compared with control group. These results are in corroboration with the studies of Xavier (2013). Dasarathan M and Saroja M. (2018) Kaukab Azeem, Mohammed Hamdan and Hashem Mohammed (2019)

VI. CONCLUSIONS

From the analysis of the data, the following conclusions were drawn.

1. It was concluded that the six weeks of high intensity with speed training group significantly improved on linear sprint and leg explosive power.
2. It was concluded that the six weeks of explosive resistance with speed training group significantly improved on linear sprint and leg explosive power.
3. When compare to the entire experimental group, high intensity with speed training group shows much better improvement on linear sprint and leg explosive power.

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