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INFLUENCE OF SELF-RESISTANCE AND PLYOMETRIC TRAINING ON SPEED AND BREATH-HOLDING ABILITY IN VOLLEYBALL PLAYERS

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ABSTRACT

This study investigates the influence of Self-Resistance Training and Plyometric Training on speed and breath-holding ability among volleyball players. A total of 60 intercollegiate-level volleyball players, aged 19-22, were randomly assigned to three groups: Self-Resistance Training, Plyometric Training, and a Control Group. The study design included pre- and post-testing on two dependent variables: speed (measured via a 30m run) and breath holding time (measured using the nose clip method). The interventions lasted for 12 weeks, with Self-Resistance and Plyometric Training groups undergoing their respective training programs, while the Control Group received no specific intervention.

The results indicated significant improvements in both speed and breath-holding ability for the intervention groups compared to the Control Group. Plyometric Training had a slightly greater effect on speed, while both training modalities led to significant improvements in breath-holding time, with Self-Resistance Training showing slightly better results. However, no significant difference was observed between the two intervention groups in terms of either speed or breath-holding time. In conclusion, both Self-Resistance and Plyometric Training were effective in enhancing speed and breath-holding ability in volleyball players, with minor differences in the magnitude of improvement between the two training methods. These findings suggest the potential for integrating both training strategies to optimize performance in volleyball.

Keywords: Self-Resistance, Plyometric Training, Speed and Breath-Holding

1. INTRODUCTION

The dynamic nature of volleyball requires players to excel in speed, agility, and endurance, alongside effective recovery during intense rallies. Two critical components for performance enhancement in volleyball are speed and breath-holding ability, as they enable athletes to execute explosive movements and sustain high-intensity play. Over recent decades, self-resistance exercises (bodyweight training) and plyometric training have emerged as highly effective training modalities to address these demands [1]

Self-resistance exercises, which rely on the athlete's body weight, are widely regarded for their adaptability and effectiveness in improving muscular endurance, strength, and flexibility without requiring specialized equipment [2]Such exercises have been shown to enhance muscle activation and core stability, which are essential for optimal performance in volleyball [3]Plyometric training, characterized by explosive, high-intensity movements such as jumping

and bounding, has been found to improve neuromuscular coordination, power, and reaction time. This training modality is particularly beneficial for volleyball players, as jumping and sprinting are fundamental to the sport [4]

Breath-holding ability, while often overlooked, plays an integral role in anaerobic performance during high-intensity sports like volleyball. Enhanced breath-hold capacity allows athletes to sustain energy output during prolonged rallies, recover quicker, and maintain focus under physical strain [5]Combining plyometric and self-resistance training has shown synergistic effects in improving these attributes, particularly in team sports requiring bursts of explosive power and endurance [6] [7]

Previous studies have investigated the effects of plyometric training and bodyweight exercises independently; however, the combined impact of these training modalities on speed and breath-hold capacity in volleyball players remains underexplored [8] [9] [10] Recent research highlights the necessity for targeted training programs to address the specific demands of volleyball, emphasizing the importance of speed and endurance during gameplay [11] [12]Understanding the combined influence of self-resistance exercises and plyometric training on these parameters can provide valuable insights for coaches and players aiming to optimize performance [13] [14]

2. SELECTION OF SUBJECTS

The study aims to find out the influence of self-resistance and plyometric training on speed and breath-holding ability in volleyball players. For these purposes, intercollegiate level volleyball players who participated at inter-collegiate level competitions in Adikavi Nannaya University were selected. 60 players in the age group of 19 to 22 were randomly selected as subjects for this study. Subjects were randomly selected into three groups, namely, experimental group I, experimental group II, and control group consisting of 20 in each. The subjects were oriented for the purpose of the study and all the subjects volunteered to undergo the treatments as the research would further enhance their abilities and contribute for the training methods.

3. SELECTION OF THE VARIABLES

Dependent Variables

1) Speed
2) Breath Holding time

Independent Variables

1) 12 weeks self-resistance training
2) 12 Weeks Plyometric training

4. EXPERIMENTAL DESIGN

The study was framed as a true random group design including a pre-test and post test. The subjects (N=60) were randomly assigned to three equal groups of twenty. The selected subjects were divided into three groups randomly. Experimental Group I was regarded as self-resistance training group, experimental group II was regarded as plyometric exercises group and control group was not involved in any special treatment. Pretest was carried out for the experimental groups I and II, as well as the control group on variables chosen for the study namely, speed and breath holding time. Experimental groups underwent the respective training for 12 weeks. All the subjects were measured of their post test scores on the selected criterion variables immediately after the completion of 12 weeks training. Differences of scores between the initial and the final scores were the differences under study. To determine if statistical significance existed in results attained, data were subject to statistical treatment using the procedure for ANCOVA, whose differences fixed levels of 0.05 to test the relevance of the study in each instance.

5. CRITERION MEASURES

TABLE I

TESTS USED TO ASSESS THE BIOMOTOR ABILITIES, AND CARDIORESPIRATORY FITNESS VARIABLES

S.No	Variables	Tests	Units of Measure
1	Speed	30 M Run	Seconds
2	Breath Holding Time	Nose Clip Method	Seconds

COMPUTATION OF ANALYSIS OF COVARIANCE AND POST HOC TEST

RESULTS ON SPEED

The statistical analysis comparing the initial and final means of Speed due to Self-Resistance and Plyometric Training among Volleyball players is presented in Table II

Table II

COMPUTATION OF ANALYSIS OF COVARIANCE OF SPEED

	SELF-RESISTANCE TRAINING	PLYOMETRIC TRAINING	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	6.99	7.01	7.05	Between	0.03	2	0.01	0.40
				Within	1.81	87	0.03	
Post Test Mean	6.98	6.85	7.00	Between	0.34	2	0.17	5.33*
				Within	1.80	8	0.03	
Adjusted Post Test Mean	6.91	6.93	7.04	Between	0.19	2	0.09	24.79*
				Within	0.21	86	0.00	
Mean Diff	-0.08	-0.09	-0.01					

The pre-test means did not differ significantly between the Self-Resistance Training, Plyometric Training, and Control Groups ($F = 0.40$). The post-test results showed a significant difference between the groups ($F = 5.33$, $p < 0.05$), indicating that both training interventions improved speed more than the Control Group. The adjusted post-test means supported this significant effect ($F = 24.79$, $p < 0.05$), indicating that both interventions had enhanced speed compared to the Control Group. Mean differences for Self-Resistance Training (-0.08), Plyometric Training (-0.09), and the Control Group (-0.01) indicated that Plyometric Training had a slightly higher impact. Conclusion: Both interventions significantly improved speed, with Plyometric Training having the highest effect.

Table III

Scheffe's Confidence Interval Test Scores on Speed

MEANS				Required . C I
Self-resistance training Group	Plyometric training Group	Control Group	Mean Difference	
6.92	6.94		0.01	0.05
6.92		7.05	0.13*	0.05
	6.94	7.05	0.11*	0.05

***** Significant

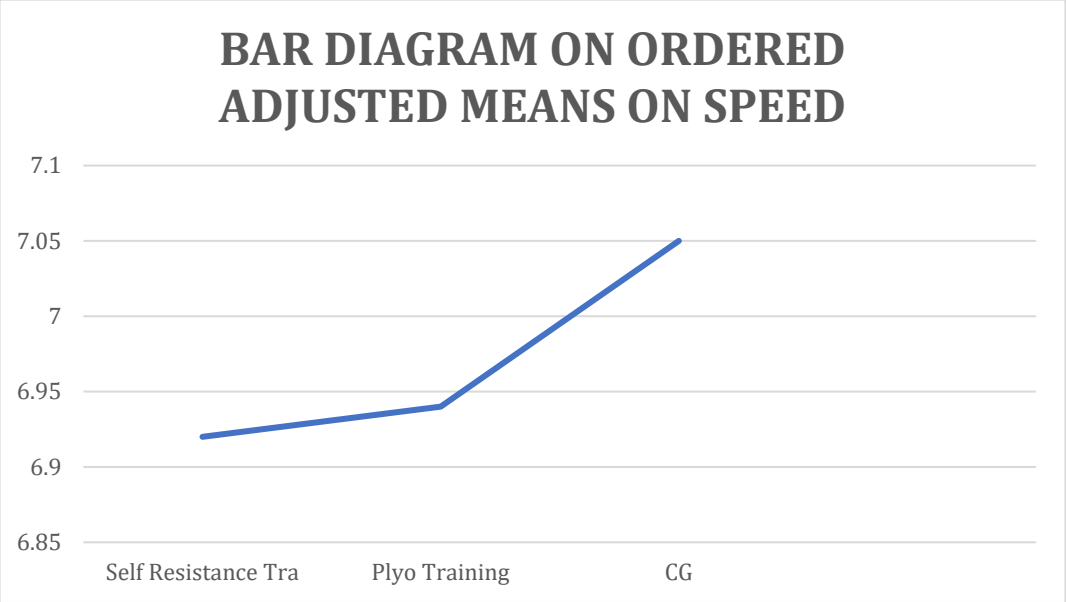
The mean difference between the Self-Resistance Training Group and Plyometric Training Group was 0.01, which was not significant. A significant mean difference of 0.13 ($p < 0.05$) was found between the Self-Resistance Training Group and the Control Group, indicating improved speed in the Self-Resistance Group. Similarly, the Plyometric Training

Group showed a significant mean difference of 0.11 ($p < 0.05$) compared to the Control Group, demonstrating that Plyometric Training was more effective in improving speed.

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure I.

Figure I

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON SPEED



6. DISCUSSIONS ON FINDINGS ON SPEED

The study assessed the impact of Self-Resistance Training and Plyometric Training on speed, with both interventions showing significant improvements compared to the Control Group. Initially, the pre-test means showed no significant difference between the groups ($F = 0.40$), indicating they were comparable. However, the post-test results revealed a significant difference ($F = 5.33$, $p < 0.05$), demonstrating that both interventions effectively improved speed. The adjusted post-test means further supported this finding, with a significant F-value of 24.79 ($p < 0.05$), confirming the positive impact of both training programs.

The mean differences showed that Plyometric Training had a slightly higher impact on speed (mean difference = -0.09) compared to Self-Resistance Training (-0.08), while the Control Group exhibited minimal change (-0.01). Scheffe's Confidence Interval test highlighted significant mean differences between the intervention groups and the Control Group, with Plyometric Training showing a mean difference of 0.11 ($p < 0.05$) and Self-Resistance Training a mean difference of 0.13 ($p < 0.05$).

In conclusion, both training methods significantly enhanced speed, with Plyometric Training proving to be slightly more effective than Self-Resistance Training. These findings suggest that incorporating these interventions can lead to improved athletic performance.

RESULTS ON BREATH HOLDING TIME

The statistical analysis comparing the initial and final means of Breath holding time due to self-resistance training and Plyometric training among Volleyball players is presented in Table IV

Table IV

COMPUTATION OF ANALYSIS OF COVARIANCE OF BREATH HOLDING TIME

	SELF-RESISTANCE TRAINING	PLYOMETRIC TRAINING	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARES	OBTAINED F
Pre Test Mean	39.20	39.15	39.65	Between	3.03	2	1.52	0.05

				Within	1686.30	87	29.58	
Post Test Mean	42.75	42.20	39.00	Between	164.03	2	82.02	3.11*
				Within	1502.95	87	26.37	
Adjusted Post Test Mean	42.87	42.36	38.72	Between	203.86	2	101.93	25.65*
				Within	222.55	86	3.97	
Mean Diff	3.55	3.05	-0.65					

Table F-ratio at 0.05 level of confidence for 2 and 87 (df) =3.10, 2 and 86 (df) =3.10.

*Significant

The ANCOVA results for Breath Holding Time revealed no significant difference in pre-test means between the Self-Resistance Training, Plyometric Training, and Control Groups (F = 0.05). However, post-test analysis showed a significant difference (F = 3.11, p < 0.05), indicating that both interventions improved breath holding time compared to the Control Group. The adjusted post-test means confirmed this effect (F = 25.65, p < 0.05). The mean differences were 3.55 for Self-Resistance Training, 3.05 for Plyometric Training, and -0.65 for the Control Group. Both training interventions significantly improved breath holding time, with Self-Resistance Training showing slightly greater improvement.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in TableV.

Table V

Scheffe's Confidence Interval Test Scores on Breath holding time

MEANS				Required . C I
Self-Resistance Training	Plyometric training Group	Control Group	Mean Difference	
42.87	42.36		0.51	1.58
42.87		38.72	4.14*	1.58
	42.36	38.72	3.64*	1.58

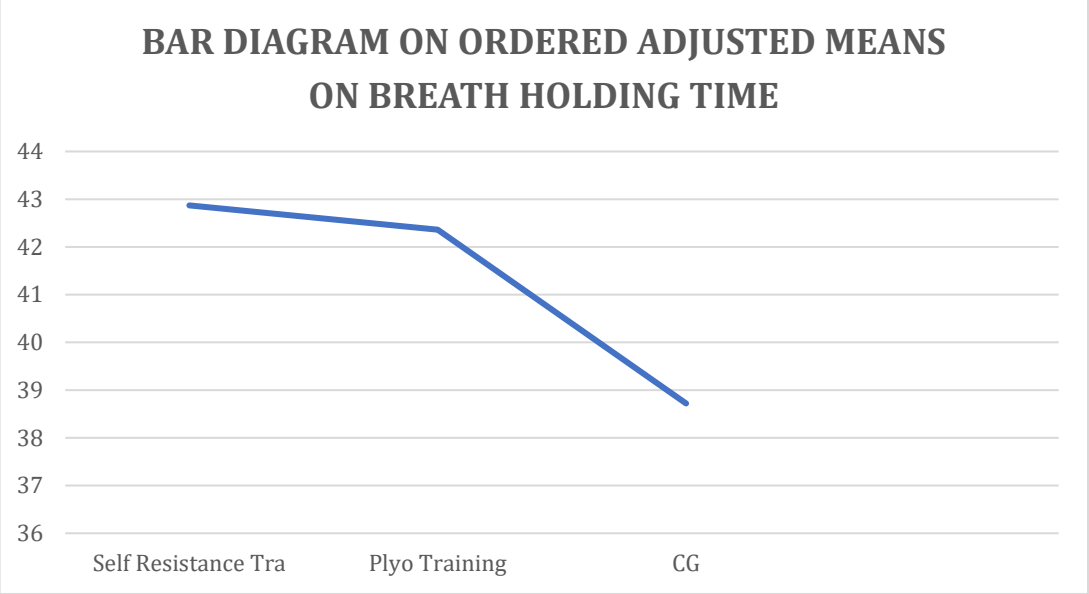
***** Significant

The results of Scheffe's Confidence Interval Test for Breath Holding Time showed significant mean differences between the intervention groups and the Control Group. The Self-Resistance Training Group and Plyometric Training Group had a mean difference of 0.51, which was not significant. However, the Self-Resistance Training Group showed a significant mean difference of 4.14 (p < 0.05) compared to the Control Group, and the Plyometric Training Group also showed a significant mean difference of 3.64 (p < 0.05) compared to the Control Group. These results highlight the effectiveness of both interventions in improving breath holding time over the Control Group.

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure -II

Figure -II

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON BREATH HOLDING TIME



7. CONCLUSIONS

1) It was concluded that **12 weeks of Self-Resistance Training and Plyometric Training** significantly improved speed among **Volleyball players** compared to the Control Group. Comparisons between the treatment groups showed that there was no significant difference in speed improvement between Self-Resistance Training and Plyometric Training.
2) It was concluded that **12 weeks of Self-Resistance Training and Plyometric Training** significantly improved **breath holding time** among **Volleyball players** compared to the Control Group. Comparisons between the treatment groups indicated that there was no significant difference in breath holding time improvement between Self-Resistance Training and Plyometric Training.

CONFLICT OF INTERESTS

None.

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