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The Role Of Individualized Instructions - Effect Of Ladder Training Vs Plyometric Training Among Coastal Volleyball Players- A Randomized Trial

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Key Words:
coastal life, Volleyball, plyometric training, ladder training, explosive power.

Abstract:

BACKGROUND: Coastal life, because of the abundance of outdoor courts and beach volleyball opportunities, can be a great environment for volleyball players. Millions of people play volleyball in the world. It is considered one of the most competitive sports in many nations. It needs highest level of physical power as well as technical and tactical skills are required. Volleyball is one of the first sports to call on the ability to jump. The jumping force is one of volleyball's most important characteristics. So using the ladder and plyometric training as a structured individualized instruction technique improves the explosive power of the players was the concept behind

AIM: The purpose of this study was to compare the effects of ladder training with plyometric training on volleyball athletes.

METHOD: Forty-five male volleyball players between the ages of 19 and 25 were chosen from the coastal area surrounding the Mahatma Gandhi Medical College and Research Institute in Pondicherry. They were designed to participate with inclusion and exclusion criteria. They were divided into three groups at random: Group A (n = 15) received ladder training, Group B (n = 15) received plyometric training, and Group C (n=15) received control training four days a week for six weeks. After 6 weeks of training, the vertical jump test and 3-hop test were evaluated.

RESULT: The subjects completed all exams for three groups before and after six weeks of training. Paired t test was used to determine the difference between measurements. One-way ANOVA was performed to determine the difference between groups. Statistically significant difference was found after the 6 weeks of training. There was significantly improvement in both groups (<0.05).

CONCLUSION: This study concluded that there was significant improvement in ladder and plyometric training but plyometric training as an individualized instruction technique has better improvement in jump performance.

Introduction:

Coastal life, because of the abundance of outdoor courts and beach volleyball opportunities, can be a great environment for volleyball players. The soft sand offers a difficult lower-body workout while reducing the danger of impact injuries. However, proper warm-up, water intake, and protection from the sun, in addition to physiotherapy, are critical for injury prevention and overall well-being. Volleyball was

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founded in 1895 by an American named William Morgan. Initially, it was believed to be a recreational or training sport for athletes. [1]. A volleyball match can be described as an integrative sport that necessitates six crucial skills. Some of these skills include service, bump, overhand pass, spike, and dive-dive-and-roll. To acquire these skills, every segment must move in the most appropriate position, and the Kinetic pattern of motion is formed by the kinetic energy provided by numerous muscles working together. [2]. Today, it is widely regarded as the world's largest sport in terms of active players, with an estimated 200 million participants. Volleyball requires agility, quickness, strength, vertical jump, and decision-making abilities [3]. Volleyball is a popular sport with thousands of supporters and practitioners worldwide, as well as a competitive activity played on various surfaces such as indoor or outdoor courts [4]. It is a high-intensity anaerobic sport that involves explosive vertical and horizontal motions. As a result, explosive strength, defined as an individual's neuromuscular system's ability to show strain in the shortest amount of time, is regarded as a critical component of effective athletic performance [5]. Volleyball is a difficult sport that needs technical, tactical, and physical abilities.It is a type of multidirectional exercise that enhances flexibility, power, balance, agility, coordination, proprioception, core and joint stability, and foot speed. The training start with general expansion up to advanced skill development, from a full range of motion to smaller, quicker movements. [7]. Plyometric exercise training is a sort of exercise training that is aimed to produce rapid, strong motions and increase nervous system functioning, with the goal of boosting athletic performance. In layman's words, the goal of plyometric training is to develop muscle explosiveness, allowing an athlete to run faster, jump higher, or create force at a faster rate[8]. This type of training is utilised to assist develop and improve explosive power, which is essential in a variety of sports performances. Lower limb plyometric exercises combine speed and strength to produce a reactive, explosive action. Plyometric drills typically entail pausing, beginning, and repeating. as well as abruptly changing directions.[9]. The ability of an athlete to jump is another important indicator of their overall skill. A volleyball player must leap several times during a game. According to statistics, a volleyball player jumps between 80 and 100 times during a game. According to statistics, a volleyball player must leap 4 to 5 times in order to score a point for his or her team. It goes without saying that having a high vertical jump is essential for both attackers and defenders in volleyball. Having a good vertical jump is essential for both volleyball attackers and defensive players. [10].

Methodology:

The purpose of the study to determine the effect of ladder training vs plyometric training among volleyball players. It was a true experimental study. The study involves 45 male volleyball players in the coastal area near our Institute, Pondicherry. Who participated in an intercollegiate competition. All the volleyball players who fulfil the selection criteria has included in the study and then asked to sign the consent form. Inclusion criteria Aged between 19- 25, only male volleyball players and at least 6 months of regular practice. Exclusion criteria any recent injury or lower limb Fracture and Cardiopulmonary problem. They were assigned randomly into three groups, Group A ladder training (n= 15), Group B plyometric training (n= 15) and Group C control group (n=15) .The jump performance was assessed by vertical jump test and 3-hop test. For a total of six weeks, the experimental groups participated in their assigned training and the control group participated in their general route training. Post-tests were taken after six weeks of training.

Procedure:

6weeks of Training, 4 days a week for 40 minutes duration and 10 minutes of warm up and cool down.

Ladder training:

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Ladder training:

Week 1-2	Week3-4	Week 5-6
Foot in each	Shuffle	Double step ickey shuffle
In lateral run	Hop scotch	Scissor skips
In in out out	Ickey Backward hop scotch	Backward straddle hops
Backward run	Straddle hops	Dead leg skips
Bunny hops	Jumps cut	180° straddle hops
Lateral hops	X country skier	V pattern
High knee run	Zig zag pattern	

FIG 1: STRADDLE HOPS

FIG 2: JUMP CUT

Plyometric training:

Week	Plyometric drills	Sets & Reps
1	Side to side ankle hops	2×15
	Standing jump and reach	2× 15
	Front cone hops	6× 5
2	Side to side ankle hops	2× 15
	Standing long jump	2× 15
	Lateral jump over barrier	6× 5
	Double leg hops	10× 3

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3	Side to side ankle hope Standing long jump Lateral jump over barrier Double leg hope Lateral cone hops	2× 12 2× 12 6× 4 8× 3 2× 12
4	Single leg bounding Standing long jump Lateral jump over barrier Lateral cone hops Tuck jump with knee up	2× 12 3× 10 8×4 3× 10 4×6
5	Single leg bounding Jump to box Double leg hop Lateral cone hops Tucks jump with knees up Lateral jump over barrier	2×10 2× 10 6×3 2×11 6×5 3×10
6	Jump to box Depth jump to prescribed height Double leg hops Lateral cone hops Tuck jump with knees up Lateral jump single leg	2×11 4×5 6×3 2×10 4×5 2×10

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FIG 1: LATERAL JUMP SINGLE LEG

FIG 2: TUCK JUMP WITH KNEE UP

Statistical Analysis:

The data analysis shows the outcomes of Kolmogorov-Smirnov and Shapiro-Wilk normality tests for three groups (VJT-pre, VJT-post, 3hT-pre, and 3hT-post). Moreover, paired sample t-tests were performed on the data, which compare three groups and two dependent variables. All groups had p-values larger than the significance level of 0.05, hence it is safe to conclude that their data follow a normal distribution. The Table 1 demonstrates the vertical jump Test mean difference and standard deviation Between the pre test and post test of group A. The pre test mean and SD was 41.2± 5.51whereas the post test mean and SD was 45.4± 5.39, the obtained t-value was 13.4 ,there were significant difference between the group A pre and post test p value (0.001)The Table 2 demonstrates the 3- hop Test mean difference and standard deviation Between the pre test and post test of group A. The pre test mean and SD was 526.4 ± 91.5 whereas the post test mean and SD was 610.3 ± 75.7 , the obtained t-value was 11.9 ,there were significant difference between the group A pre and post test p value (0.001),The Table 3 demonstrates the vertical jump Test mean difference and standard deviation Between the pre test and post test of group B. The pre test mean and SD was 41.4 ± 4.98 whereas the post test mean and SD was 46.5 ± 5.52, the obtained t-value was 14.6 ,there were significant difference between the group B pre and post test p value (0.001),The Table 4 demonstrates the 3-hop Test mean difference and standard deviation Between the pre test and post test of group B. The pre test mean and SD was 567.5± 100.6 whereas the post test mean and SD was 632.9 ± 95.1, the obtained t-value was 3.78,there were significant difference between the group B pre and post test p value (0.002)The Table 5 demonstrates the vertical jump Test mean difference and standard deviation Between the pre test and post test of group C. The pre test mean and SD was 40.9 ± 3.29 whereas the post test mean and SD was 42.2 ± 3.32 , the obtained t-value was 6.4 ,there were significant difference between the group c pre and post test p value (0.001)The Table 6 demonstrates the 3- hop Test mean difference and standard deviation Between the pre test and post test of group C. The pre test mean and SD was 540.2± 87.2 whereas the post test mean and SD was 552.6 ± 87.8 , the obtained t-value was 9.00 ,there were significant difference between the group C pre and post test p value (0.001),The table 7 shows The analysis of covariance (ANOVA) revealed a significant difference between the three groups VJT post test (F= 3.225, p = 0.05), The analysis of covariance (ANOVA) revealed a significant difference between the three groups 3hT post test (F= 3.426, p = 0.04). Based on the post hoc test score (table 5)the dependent variable Post test VJT compare with the Group B and C there was significant difference (0.03) and post test 3hT compare with the group B and C there was significant difference (0.02).

Results:

When the mean values of Groups A, B, and C were compared, there was an increase in jump performance in post-test mean values and a significant improvement in both tests (vertical jump test and 3-hop test). ANOVA was used to compare the post-test mean values of three groups. The p value in VJT (0.05) and 3HT (0.04). This data demonstrates that plyometric exercise results in significantly more improvement than other groups.

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Ladder training:

Table 1: statistical analysis of Group A vertical jump test

Vertical jump Test	Mean	S. D	No. Of samples	T – value	P – value
Pre-test	41.2	5.51	15	-13.4	0.001
Post test	45.4	5.39	15		

Table 2: statistical analysis of Group A 3- hop test

3- hop Test	Mean	S. D	No.Of samples	T – value	P – value
Pre test	526.4	91.5	15	-11.9	0.001
Post test	610.3	75.7	15		

Plyometric training:

Table 3: Statistical analysis of Group B vertical jump test

Vertical jump Test	Mean	S. D	No.Of samples	T – value	P – value
Pre test	41.4	4.98	15	-14.6	0.001
Post test	46.5	5.52	15		

Table 4: Statistical analysis of group B 3- hop test

3- hop Test	Mean	S. D	No.Of samples	T – value	P – value
Pre test	567.5	100.6	15	-3.78	0.002
Post test	632.9	95.1	15		

Control group:

Table 5: Statistical analysis of Group C vertical jump test

Vertical jump Test	Mean	S. D	No.Of samples	T – value	P – value
Pre test	40.9	3.29	15	-6.4	0.001
Post test	42.2	3.32	15		

Table 6: Statistical analysis of Group C 3- hop test

3- hop Test	Mean	S. D	No.Of samples	T – value	P – value
Pre test	540.2	87.2	15	-9.00	0.001
Post test	552.6	87.8	15		

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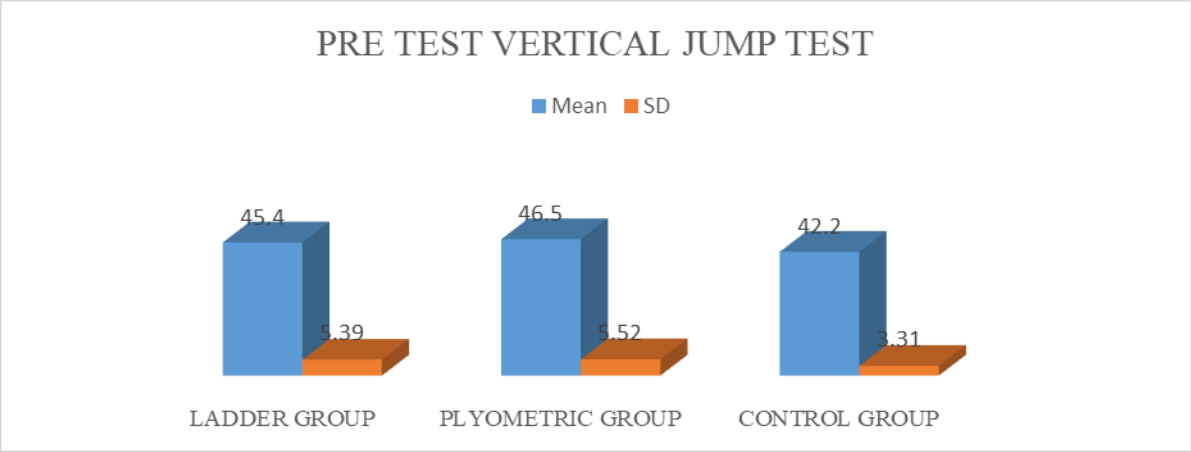
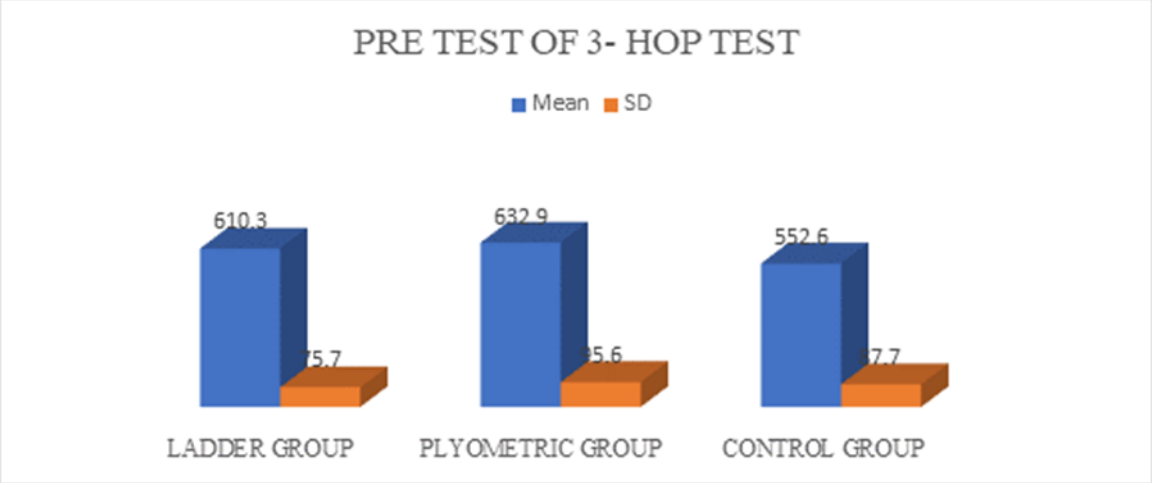
Table 9: Statistical analysis of post-test ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
VJT- POST	Between Groups	151.9	2	75.9	3.225	0.05
	Within Groups	989.1	42	23.5		
	Total	1140.96	44			
3hT_post	Between Groups	51369.3	2	25684.6	3.426	0.04
	Within Groups	314879.3	42	7497.1		
	Total	366248.6	44			

Graph 1: Graphical Analysis of three groups pre test vertical jump Test



Graph 2: Graphical Analysis of three groups pre-test 3- hop test



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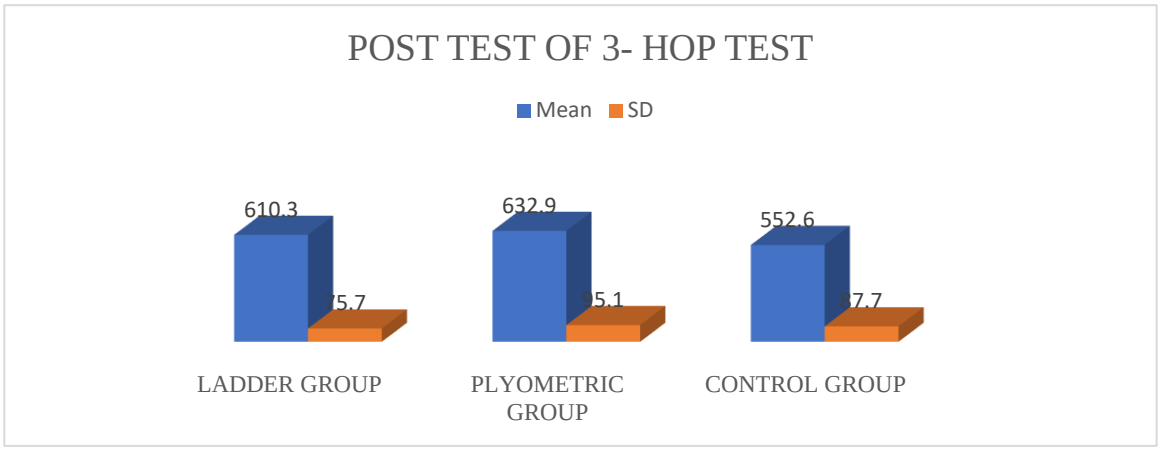
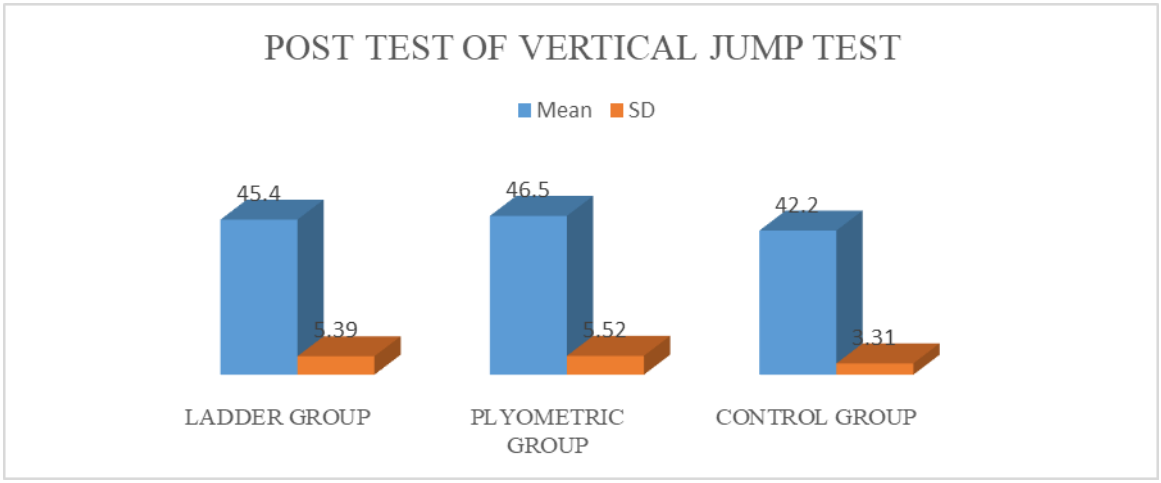
Graph 3: Graphical Analysis of three groups ANOVA post-test vertical jump Test



Graph 4 : Graphical Analysis of three groups ANOVA post-test 3- hop Test



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The purpose of this study was to compare the effect of ladder training versus plyometric training on volleyball players' jumping performance. The mean and standard deviation of the vertical jump test and the 3-hop test for groups A, B, and C are shown in the descriptive analysis. Each group has a 95% confidence interval mean time. ANOVA is used to assess the value differences between groups and the results of the vertical leap test mean difference at 0.05 and the 3-hop test mean difference at 0.04. Which indicates that the mean difference was significantly fulfilled. Dunnett t-tests compare all other groups to one group that serves as a control. The variable that is reliant ,VJT post-test comparison with Group A and C there was not significant level(0.13) and Group B and C there is significant (0.03) and In the post test 3hT compare with the group A and C there was not significant (0.13) group B and C there was significant (0.02).

The results imply that there was an improvement in the Vertical jump test and 3- hop test scores after some ladder and plyometric training. The results also suggest that positive impact on the participants, as the changes in the variables were observed across all three groups. In the plyometric group did the pre-and -post jumping differential correlations between variables become statistically significant. This leads us to the conclusion that a fundamental underlying mechanism was responsible for the plyometric training-induced alterations in jumping performance. Thus, taking into account the suggested adaptations for plyometric training, increased maximal Achilles tendon elongation (and increased amount of stored elastic energy) and better joint proprioception due to the increased sensitivity of the muscle spindle are probably the most crucial mechanisms for the improvement of jumping capacities of players involved in plyometric training [11]. The capacity to use elastic and active muscular lengthening followed by active muscle shortening determines jump performance ability. It improves eccentric muscle control, knee flexion, and hamstring activity, as well as optimal and landing skills. Lower limb power, leaping performance, strength, agility, flexibility, and balance are all improved by plyometric exercise. Previous research suggests that the effectiveness of plyometric training is determined by the training plan and duration. [12]. Jump performance ability is determined by the ability to use elastic and active muscular lengthening followed by active

muscular shortening. It enhances eccentric muscle control, knee flexion, hamstring activity, and optimum and landing skills. Plyometric training improves lower limb power, leaping performance, strength, agility, flexibility, and balance. Previous study reveals that the training strategy and length impact the effectiveness of plyometric training. [13]. A 6-week plyometric training programme for volleyball players to improve vertical leap performance had a positive effect on jump performance due to improved neural adaptation. It alters the muscle structure or size, as well as the single-fibre mechanism. To obtain the highest possible vertical jump height [14].

The triple-hop distance is a solid indication of lower limb strength and power. Over the course of three trials in each category, the THD, vertical jump height, overall BESS error scores, and quadriceps and hamstrings were all examined. The triple-hop distance highly predicted both the vertical jump height and the hamstring and quadriceps strength growth during the THD. The triple-hop distance is a clinical test that can be used to predict an athlete's lower extremity strength and power. [15]. In addition to explosive power impact ladder training and plyometric training among hockey players. It was discovered that the Ladder training group had a greater impact on the group concerned than the Plyometric training and Control groups in terms of explosive power performance [16 In ladder training, research on sports explosive strength is lacking. The present study's volleyball players LTG showed a remarkable improvement. There were better changes in performance given the small sample size and short period. Recommend for a large sample size and length of time. The main outcomes of this study showed that all three groups improved significantly in the vertical leap test and three-hop test, however the plyometric group was more effective for jumping.

performance.

Conclusion:

Based on the results and discussion that have been described the analysis of the provided data indicates that the normality assumption was met for all the groups, and both training had a significant positive effect on the VJT and 3hT scores for all groups.

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Comparing with ladder training, plyometric training has greater effect on volleyball players These findings suggest that the plyometric training as a special individualized training technique was effective in improving the performance of the coastal volleyball players.

Conflict Of Interest: none

Source Of Funding: There is no source

IHEC approval – Yes

Contribution:

Guidance and concept by Venkatesh. K

Data collection and text preparation by Priyadharshini. R

Overall supervision by Shanmugananth. E

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