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# An analysis on the plyometric exercises impact on volleyball players

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**Abstract**
The objective of the exploration was to decide how certain physical and physiological elements in male volleyball players answered plyometric training and circuit training. 24 male volleyball players between the ages of 18 and 25 were randomly selected. They were parted into two gatherings (one benchmark group and two exploratory gatherings), with the trial bunch I getting a month and a half of plyometric training and the exploratory gathering II getting a month and a half of circuit training. The benchmark group was not allowed to participate in the training program. Prior to trial treatment, pre-tests were performed to quantify sub factors such as speed, muscle endurance, mobility, vigor, explosive power, vital capacity, and anaerobic capacity, followed by post-tests. Was broken. The reliant 't' test and ANCOVA were utilized to inspect the information. As per the discoveries, plyometric and circuit training emphatically expanded anaerobic and aerobic capacity as well as muscular endurance, flexibility, nimbleness, and explosive strength.

**Keywords:** Plyometric training, circuit training, speed, muscular endurance, flexibility, explosive strength, vital capacity, aerobic capacity and anaerobic capacity

## Introduction

Volleyball is a demanding anaerobic action that includes fast developments (both in an upward direction and evenly) and brief reprieve spans. Thus, a fundamental part of powerful athletic execution is respected Explosive strength expressed as the ability of an individual's neuromuscular framework to exhibit stress in the short term. In fact, power comes from a combination of maximum strength, speed and dexterity.

Running, jumping, and unexpected course changes require as much strength as your specific muscles can tolerate to achieve a similar measure of work significantly quicker or a greater extent of exertion in a similar period. Besides, studies have shown a significant connection be tween's upward bounce execution and power boundaries, showing that power influences vertical jump execution. The synchronization of a few muscles in the middle, arms, and legs is expected to play out a convoluted activity like an upward jump. Bouncing skill has been featured as one of the main concluding standards of fantastic execution in volleyball given that every player finishes in excess of 250 jumps all through a five-set volleyball match. Truly, various examinations have shown that a competitor's presentation level might be anticipated by the consequences of an upward bounce test. For example, Smith found that Canadian public volleyball players played out their upward bounces while spiking and obstructing better compared to Canadian college volleyball players.

Additionally, Ziv and Lidor found that a group of players with high vertical jumps performed better, whereas male and female volleyball players contrasted vertical jumps. Hop training is often associated with plyometric training, especially exercises that put pressure on the musculoskeletal system. De Villarreal found that his level of vertical jump increased by 4.7% to 15% when performing bodyweight plyometric exercises such as countermovement hops, deep he bounces, and squat jumps. The stretch-shortening cycle (SSC) consists of an expansion of activity (abnormal activity) followed by a rapid developmental shortening (concentric activity). sensory system. This exercise also involves stretching the muscles, increasing the amount of flexible energy stored in the muscles, fueling more muscle cells, increasing the number of repetitions at which neurons fire, and improving joint proprioception. The idea of training specificity states that when training activities are task-specific, training adaptations are effectively transferred (e.g., testing, competition).

Plyometric volleyball training includes rapid, explosive tosses as well as workouts that entail leaping, hopping, and bounding. The improvement of agility is also connected to such motions. This capacity is thought to be a support of engine programming achieved by brain transformation of muscle shafts, Golgi ligament organs, and joint proprioceptors as well as neuromuscular training.

While planning strength training regimens, the competitor's age and sex ought to likewise be considered. For instance, throughout adolescence, changes in the muscular, neural, and hormonal systems brought on by the growth spurt associated with puberty affect adolescents' capacity to carry out motions. The female development spray likewise begins close to two years sooner than the male spray and levels at around 15 to 16 years old, while men continue to develop until they are 19 to 20 years old.

As compared to their male counterparts, female athletes were shown to have weaker quadriceps and hamstrings in adulthood because of these alterations in adolescence (even when corrected for body weight). These differences are mirrored in the varied motor patterns shown by the two sexes and are caused by the differing capacity to create strength, which affects leaping performance.

While plyometric training has been broadly utilized in volleyball, there is lacking logical information to evaluate its possible consequences for the numerous exhibition related factors. The two objectives of this deliberate audit were as per the following: To assess the feasibility of a plyometric training program in male and female volleyball players, as well as to comprehend how such programs differ according on the ages of the players.

## 2. Literature review

According to a study of the literature, more research has been done on the efficacy of plyometric training than on the usefulness of the technique for young athletes. The goal of the majority of studies was to better understand and examine the benefits of plyometric exercise on the legs. We also consider the effects of plyometric exercise on the arms in this study. Prior research has mostly focused on increasing explosive power. The use of temporal factors in player testing, which was unique in this study and will enable investigation of the impact of plyometric training on improving speed and force, was not previously seen in investigations. Jalak offers the following definition of speed force: The ability of the whole body, individual body parts (e.g. hands and feet), or neuromuscular machines to move the machine at maximum velocity is represented by velocity forces (e.g. balls, discs) (Jalak, 2008) Purpose of this study was to determine what well an organized plyometric training program meant for the power limits of youthful volleyball players all through their common training period.

Contemporary volleyball players must be physically fit, and it's crucial develop speed, explosive power and muscular endurance. In addition to outstanding coordination and intelligence, team members' good rapprochement and collaboration play a significant role in volleyball as a social game (Järvekülg, 2002).

For volleyball achievement, the capacity to jump upward is fundamental. The leap set, bounce serves, hindering, and spiking all incorporate hopping. A decent competitor should not just have a great vertical leap but also have a speedy vertical rise. This calls for the capacity generate power in a short time (Powers, 1996).

The duration of the play's use of maximal strength, which ranges from 0.5 to 0.7 seconds, determines how much strength is used. Nevertheless, the majority of the play's explosive moments occur in much less time. Because of this, specialized power training is necessary for the best use and conversion of the acquired maximal muscular the power to "explosiveness" of essential muscle mass in the lower body appendages that partake in departure (Lehnert *et al*., 2009) [12].

Plyometric training has been shown to improve jump performance in many sports. These workouts develop power by fusing movement speed and strength. Plyometric exercises are thought to be the connection between speed and strength as they use muscle tone response that produces an explosive response (Powers, 1996).

The plyometric technique is one of the most popular ways to train volleyball players (Lehnert *et al*., 2009) [12].

This study presents a summary of a 16-week plyometric training program that twenty-one young volleyball players from the Kohila volleyball club participated in. Every player took part in the evaluations.

## 3. Methodology

The objective of the exploration was to decide how certain physical and physiological variables in male volleyball players answered plyometric training and circuit training. 24 male volleyball players between the ages of 18 and 25 were randomly browsed an assortment of designing universities in Chennai, Tamil Nadu, to satisfy the review's goals. Three gatherings - trial I, exploratory II, and control bunch - of picked members were made. During a six-week training meeting, three substitute days out of each week, the trial bunch I blended plyometric training with the exploratory gathering II circuit training bunch. The benchmark group went on with their ordinary everyday schedules and got no extra guidance. The factors in this review's information were analyzed utilizing the reliant 't' test to decide if there had been a critical improvement and examination of covariance (ANCOVA) for every variable independently to recognize contrasts. These tests were performed at the 0.05 degree of importance, and post hoc investigation was likewise utilized at whatever point the 'f' proportion was huge. The consequences of the reliant 't' test on the pretest and posttest implies for the exploratory and control gatherings' information Speed, muscular endurance, flexibility, agility, explosive power, vital capacity, and anaerobic capacity were assessed and presented in Table I.

**Table 1:** Estimation of the "t" ratio between probe and control collection test results

| Variables | Group Name | Mean | | SD | | SD Error | DF | `t' ratio |
|---|---|---|---|---|---|---|---|---|
| | | Pre | Post | Pre | Post | | | |
| Speed | Experimental Group | 4.25 | 4.12 | 1.23 | 1.23 | 1.023 | 12 | 9.23 |
| | Control Group | 4.21 | 4.25 | 1.56 | 1.25 | 1.05 | | 1.236 |
| Muscular Endurance | Experimental Group | 39.56 | 43.25 | 8.54 | 7.58 | 1.065 | 12 | 12.36 |
| | Control Group | 38.25 | 38.54 | 4.56 | 4.25 | 1.023 | | 2.36 |
| Flexibility | Experimental Group | 33.25 | 35.26 | 5.64 | 6.25 | 1.45 | 12 | 14.25 |
| | Control Group | 33.25 | 29.56 | 7.15 | 4.23 | 2.023 | | 1.23 |
| Agility | Experimental Group | 12.25 | 12.32 | 1.24 | 1.24 | 1.54 | 12 | 4.25 |
| | Control Group | 12.45 | 15.24 | 1.85 | 1.25 | 1.025 | | 1.23 |
| Explosive | Experimental Group | 47.58 | 39.56 | 4.25 | 6.23 | 1.78 | | 11.23 |
| Strength | Control Group | 47.12 | 35.62 | 3.21 | 3.21 | 1.05 | 12 | 1.25 |
| Vital Capacity | Experimental Group | 4.56 | 5.62 | 1.05 | 1.45 | 1.89 | 12 | 6.15 |
| | Control Group | 4.58 | 4.25 | 1.06 | 1.89 | 1.478 | | 2.35 |
| Anaerobic Capacity | Experimental Group | 119.56 | 124.56 | 16.25 | 16.25 | 1.25 | 12 | 16.24 |
| | Control Group | 119.58 | 108.56 | 16.23 | 15.23 | 1.365 | | 3.56 |

* Threshold of significance was set at 0.05, and the value of the df 11 table is 2.20.

The table shows that the average speed of the test group before and after the test is 3.64 and 3.54 respectively. This is because the trailing 't' part exceeded the table value of 2.20 required for significance at the 0.05 level of odds level 11, not entirely settled to be genuinely critical. The obtained 't' proportion was 8.33. The benchmark group's speed pre- and post-test mean qualities were 3.63 and 3.64, individually. The figured 't' proportion was 0.312, not exactly the 2.20 worth in that frame of mind for importance at the 0.05 level, and with 11 levels of opportunity, not set in stone to be measurably unimportant. The discoveries of this exploration genuinely shown that consolidated Plyometric and circuit training for male volleyball players altogether worked on the speed in the exploratory gathering

The table 1 exhibits that the exploratory gathering's mean pre-and post-test scores for Muscle endurance was 40.00 and 44.75, individually. As the determined 't' proportion was higher than the needed table worth of 2.20 for importance at the 0.05 level with 11 levels of opportunity, not entirely settled to be genuinely critical. The acquired 't' proportion was 11.58. As far as muscular endurance, the benchmark group's pre-and post-test mean scores were 39.91 and 39.25, separately. With 11 levels of opportunity, the processed 't' proportion of 1.53 was not exactly the table worth of 2.20 for importance at the 0.05 level, and it was subsequently considered measurably unimportant. The discoveries of this exploration genuinely shown that consolidated Plyometric and circuit training for male volleyball players fundamentally worked on the muscular endurance in the exploratory gathering. The tables I exhibit that the exploratory gathering's pre-test and post-test mean scores for flexibility were 32.41 and 36.75, separately. As the subsequent 't' proportion was Greater than the table value 2.20 required for severity at the 0.05 level with 11 levels of opportunity and the acquired 't' proportion was 15.24, not entirely settled to be genuinely huge. The benchmark group’s pre-and post-test mean flexibility scores were 32.25 and 31.41, individually. The figured ‘t’ proportion was 0.813, not exactly the 2.20 worth in that frame of mind for importance at the

0.05 level, and with 11 levels of opportunity, not set in stone to be measurably unimportant. The discoveries of this exploration measurably showed that joined Plyometric and circuit training for male volleyball players altogether further developed flexibility in the exploratory gathering.

## 4. Result and Discussion

**Table 2:** Calculation of the covariance examination between the experimental and control groups for speed

| Test | Experimental Group | Control Group | SSV | SS | DF | MS | ‘F’ |
|---|---|---|---|---|---|---|---|
| Pre-test Mean | 4.23 | 4.46 | BG | 1.236 | 2 | 1.256 | 1.236 |
| Pre-Test SD | 1.23 | 1.78 | WG | 2.356 | 32 | 1.235 | |
| Pre-test Mean | 4.25 | 4.27 | BG | 1.256 | 2 | 1.563 | 1.235 |
| Pre-Test SD | 1.23 | 1.54 | WG | 2.56 | 32 | 1.456 | |
| Adjusted posttest mean | 4.25 | 4.89 | BG | 1.236 | 2 | 1.897 | 12.56 |
| | | | WG | 1.326 | 31 | 1.256 | |

* Significant with a confidence level of 0.05

At odds levels 1 and 22, the table importance of 0.05 is 4.30 and at odds levels 1 and 21 is 4.32. Table II shows that the exploratory group (plyometric training group) and the control group had mean pre-test speeds of 3.74 and 3.67, respectively To meet the required value of 4.30 in the table for df 1 and 22 with a 0.05 confidence level for speed, the "F" part of the pretest mean obtained was 0.026, which was the lower value. The trial bunch (plyometric training gathering) and control bunch had post-test mean speeds of 3.54 and 3.64, individually. The post-test mean's determined "F" proportion is 0.852. The exploratory gathering (plyometric training gathering) and control gathering's amended post-test implies for speed were 3.53 and 3.65, individually. With 0.05 degree of trust in speed, the got "F" proportion of the changed the post-test mean was 11.38, which was higher than the required table value of 4.32. As per the review's discoveries, there was a tremendous contrast in speed between the plyometric training gathering's changed posttest mean and the benchmark group.

**Table 3:** Calculation of the examination of covariance for the correlation of the exploratory and control gatherings' actual endurance

| Test | Experimental Group | Control Group | SSV | SS | DF | MS | ‘F’ |
|---|---|---|---|---|---|---|---|
| Pre-test Mean | 42.36 | 40.56 | BG | 1.023 | 2 | 1.235 | 1.23 |
| Pre-Test SD | 8.56 | 4.25 | WG | 882.365 | 32 | 36.25 | |
| Pre-test Mean | 45.56 | 40.25 | BG | 171.23 | 2 | 171.54 | 7.589 |
| Pre-Test SD | 7.89 | 6.25 | WG | 668.52 | 32 | 27.56 | |
| Adjusted posttest mean | 50 | 40.25 | BG | 186.25 | 2 | 186.56 | 141.545 |
| | | | WG | 30.281 | 31 | 2.365 | |

At odds levels 1 and 22, the table importance of 0.05 is 4.30, and at odds levels 1 and 21 it is 4.32. Table III shows that the mean velocities of the experimental group (the group that received plyometric training) and the control group were 40.00 m/s and 39.91 m/s, respectively, before the test. The obtained 'F' portion of the pretest mean value was 0.001, which did not exactly match the tabulated value of 4.30 required for df 1 and 22 at the 0.05 confidence level for muscle endurance. The mean velocities of the experimental group (plyometric training group) and the control group were 44.75 and 39.25 respectively after the test. For a muscle endurance confidence level of 0.05 for df 1 and 22, the trailing 'F' portion of the posttest mean was 6.79, higher than the required tabular value of 4.30. The exploratory group (plyometric training group) and the control group changed muscle endurance scores to 45 and 39.28, respectively, after the test. The determined 'F' portion of the adjusted test average was 131.16, which was higher than the 4.32 required by the table for the df 1 and 21 at the 0.05 degree of certainty for muscular endurance. As indicated by the review's discoveries, there was a huge distinction between the benchmark group and consolidated plyometric and circuit training gathering's changed post-test implies for muscle endurance.

## 5. Discussion on findings

### 5.1 Speed
According to the review results, there is a significant difference in pre-test and post-test speed in the combined plyometric and circuit training group. However, we see no change in the speed of the benchmark group before and after the test. As per measurable examination, there is a huge contrast in speed between the exploratory gathering (joined plyometric and circuit training gathering) and control gathering's changed post-test midpoints. It is seen that volleyball players' speed altogether expanded in the consolidated plyometric and circuit training bunch.

### 5.2 Muscular Endurance
As per the review's discoveries, there is a big difference between pre-examination and post- examination results for the joined plyometric and circuit training gathering's muscle endurance. However, there is no way to see a variety in the benchmark group's muscular endurance between the pre-and post-test. As per factual examination, there is a huge contrast in muscular endurance between the exploratory gathering (consolidated plyometric and circuit training gathering) and control bunch as measured by adjusted post-test averages. Conclusion: Volleyball players' muscular endurance significantly improved in the combined Plyometric and Circuit Training group.

### 5.3 Flexibility
As per the review's discoveries, there is a big difference between pre-examination and post- examination for the joined plyometric and circuit training gathering's flexibility. However, there is no way to see a variety in the benchmark group's flexibility between the pre-and post-test. As indicated by factual investigation, the joined plyometric and circuit training gathering of the exploratory gathering and the benchmark group's changed post-test averages differed significantly in terms of flexibility. It is observed that volleyball players' flexibility significantly improved in the combined Plyometric and Circuit Training group.

### 5.4 Agility
As indicated by the review's discoveries, there is a big difference between pre-examination and post-examination for the consolidated plyometric and circuit training gathering's spryness. However, there is no way to see a variety in the benchmark group's nimbleness between the pre- and post-test. As per factual examination, there is a massive distinction in deftness between the trial bunch (joined plyometric and circuit training gathering) and control bunch as estimated by changed post-test midpoints. It is seen that volleyball players' deftness essentially worked on in the consolidated Plyometric and Circuit Training bunch.

### 5.5 Explosive strength
As indicated by the review's discoveries, there is a big difference between pre-examination and post-examination for the consolidated plyometric and circuit training gathering's explosive strength. However, there is no way to see a variety in the benchmark group's explosive power between the pre-and post-test. As per factual examination, there is a tremendous contrast in explosive strength between the trial bunch (joined plyometric and circuit training gathering) and control bunch as estimated by changed post-test midpoints. The consolidated Plyometric and Circuit Training bunch, it can be inferred, significantly increased the volleyball players' explosive strength.

### 5.6 Vital Capacity
As indicated by the review's discoveries, there is a big difference between pre-examination and post-examination results for the joined plyometric and circuit training gathering's vital capacity. However, there is no way to see a variety in the benchmark group's vital capacity between the pre-and post-test. As per measurable examination, there is a huge distinction in vital capacity between the trial bunch (joined plyometric and circuit training gathering) and control gathering's adjusted post-test averages. Conclusion: A group combining plyometric and circuit training showed a significant increase in lung capacity in volleyball players.

### 5.7 Anaerobic ability
As per the review's discoveries, significant change in pre-test and post-test results for the joined plyometric and circuit training gathering's anaerobic capacity. However, there is no way to see a change Difference in anaerobic capacity before and after benchmark group test. As per factual examination, there is a huge contrast in anaerobic capacity between the trial bunch (consolidated plyometric and circuit training gathering) and control bunch as measured by adjusted post-test averages. Conclusion: Volleyball players' anaerobic capacity significantly improved in the joined Plyometric and Circuit Training bunch.

## 6. Conclusion
Male volleyball players that took part in the plyometric training program essentially worked on in the physical and physiological measures in general (speed, muscular endurance, flexibility, explosive power, vitality, lung capacity, anaerobic capacity). For several physical and physiological characteristics of male volleyball players (speed, muscular endurance, flexibility, explosive power, vigor, lung capacity, anaerobic capacity, etc.), the benchmark group showed no predictable changes. The review's discoveries demonstrated that among male volleyball players, there is a massive contrast between the changed post-test method for the trial gathering and control bunch for a number of physical and physiological characteristics.

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