

## Effects of Different Surface of Plyometric Training on Speed of Junior Volley Ball Players

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### ABSTRACT

The purpose of study was to find out the effects of different surface of plyometric training on speed of junior volley ball players. To achieve the purpose of the study, thirty school girls' from Jai Gopal Garodia Government higher secondary school, Madhavaram, Chennai, Tamilnadu were selected as subjects at random and their age group range between 12 to 14 years. The study was formulated as pre and post test random group design, in which thirty subject were divided into three equal groups. The experimental group-1 (n=10, SS-PT) underwent sand surface plyometric training. The experimental group-2 (n=10, NS-PT) underwent normal surface plyometric training and group 3 served as control group (n=10, CG) did not undergo any specific training. In this study, two training programme were adopted as independent variable, i.e., sand surface plyometric training, normal surface plyometric training. The speed was chosen as a dependent variable, it was tested by 30 meters run and scores recorded in seconds. The selected two treatment group's namely sand surface plyometric training and normal surface plyometric training was performed three days in a week for the period of six weeks, as per the stipulated training program. The selected performance parameters were collected before and after the training period. The collected pre and post data was critically analyzed with apt statistical tool of analysis of co-variance, for observed the significant adjusted post-test mean difference of three groups with respect to each parameter. The Scheffe's post hoc test was used to find out pair-wise comparisons between groups with respect to each parameter. To test the hypothesis 0.05 level of significant was fixed.

**Keywords:** Plyometric Training; Sand Surface; Normal Surface; Speed; ANCOVA.

### 1. Introduction

Now a day's fitness is considered as most important health indicators in childhood. The concept of physical fitness has since evolved to include morphological and metabolic components (Sudha, Maniazhagu, 2019). Different training methods have been commonly used to improve physical fitness and related standards of performance of athletes (Maniazhagu, 2010). Strength training is a long-term proposition. Athletes do not reach their highest level after four to six weeks from the beginning of the strength training program, but rather during the competitive phase, which is months away from the anatomical adaptation phase (Sridhar, Maniazhagu, 2018).

Plyometric training (PT) is one of popular methods of physical conditioning among individuals playing dynamic sports (Vaczi, J. Tollar, B. Meszler, I. Juhasz, and I. Karsai, 2013). It consists of an eccentric contraction of the musculotendinous muscle followed by an immediate concentric contraction of the same connective tissues and muscles, which often referred as stretch-shortening cycle (SSC) (G. Aloui et al., 2021, Y.C. Wang and N. Zhang, 2016, P. Komi, 2003). There are many factors contributed to the popularity of PT, one of them is that plyometric training can be performed at any intensity levels, ranging from low-intensity exercise such as double-leg hops to high intensity unilateral drills (Villareal, B. Requena, and R.U. Newton, 2010). Several plyometric jump variables can be manipulated to increase plyometric jump effectiveness, such as volume, intensity, and the type of jump (Moran et al., 2020). However, environment-related variables, such as the type of surface (e.g., sand, natural and artificial grass), should also be considered during plyometric jump programming (Sanchez et al., 2020 & Campillo et al., 2020). The speed at which specific movements are performed within specific sporting activities will also need to be considered. If movement needs to be performed quickly, then some attention should be paid to performing them at the speed required when training (Hope and Lawrence, 2014).

## 2. Methodology

To achieve the purpose of the study, thirty school girls' from Jai Gopal Garodia Government higher secondary school, Madhavaram, Chennai, Tamilnadu were selected as subject at random and their age group range between 12 to 14 years. The study was formulated as pre and posttest random group design, in which thirty subject were divided into three equal groups. The experimental group-1 (n=10, SS-PT) underwent sand surface plyometric Training. The experimental group-2 (n=10, NS-PT) underwent normal surface plyometric training and group 3 served as control group (n=10, CG) did not undergo any specific training. In this study, two training programme were adopted as independent variable, i.e., sand surface plyometric training, normal surface plyometric training. The speed was chosen as a dependent variable, it was tested by 30 meters run test and scores recorded in seconds. The selected two treatment group's namely sand surface plyometric training, normal surface plyometric training was performed three days in a week for the period of six weeks, as per the stipulated training program.

### 2.1. Training approaches for experimental groups

Subjects were performed following plyometric exercises on sand surface for SS-PT group and performed on normal surface for NS-PT group.

**Table 1.** The Results of Analysis of Covariance on Speed of Different Groups (Scores in seconds)

Plyometric exercises	Weeks	Repetition	Set	Recovery in between exercise	Recovery in between sets
1. Squad jump 2. Vertical jump 3. Standing broad jump 4. Standing triple jump 5. Bike jump	1-2 Weeks	Each 6	2	1 minute	3 minutes
	3-4 Weeks	Each 8	2	1 minute	3 minutes
	5-6 Weeks	Each 10	2	1 minute	3 minutes

Test Conditions		Group 1 SSPT	Group 2 NSPT	Group 3 CG	SV	SS	Df	MS	'F' Ratio
Pre test	Mean	6.69	6.7	6.7	B	0.1	2	0.01	0.001
	S.D.	0.44	0.51	0.41	W	5.7	27	0.212	
Post test	Mean	5.77	5.81	6.71	B	5.7	2	2.8	23.81*
	S.D.	0.31	0.31	0.41	W	3.2	27	0.11	
Adjusted post test	Mean	5.77	5.81	6.71	B	5.6	2	2.82	43.74*
					W	1.7	26	0.06	

\* Significant at .05 level of confidence. The required table values for test the significance was 3.35 and 3.37 with the df of 2 and 27, 2 and 26.

## 2.2. Results on Speed

The pre test mean and standard deviation on speed scores G1, G2 and G3 were  $6.69 \pm 0.44$ ,  $6.7 \pm 0.51$  and  $6.7 \pm 0.41$  respectively. The obtained pre test F value of 0.001 was lesser than the required table F value 3.35. Hence the pre test means value of sand surface plyometric training, normal surface plyometric training and control group on speed before start of the respective treatments were found to be insignificant at 0.05 level of confidence for the degrees of freedom 2 and 27. Thus this analysis confirmed that the random assignment of subjects into three groups were successful.

The post test mean and standard deviation on speed of G1, G2 and G3 were  $5.77 \pm 0.31$ ,  $5.81 \pm 0.31$  and  $6.71 \pm 0.41$  respectively. The obtained post test F value of 23.81 was higher than the required table F value of 3.35. Hence the post test means value of sand surface plyometric training and normal surface plyometric training on speed were found to be significant at 0.05 level of confidence for the degrees of freedom 2 and 27. The results proved that the selected two training interventions namely sand surface plyometric training and normal surface plyometric training were produced significant improvement rather than the control group of the sample populations.

The adjusted post test means on speed scores of G1, G2 and G3 were 5.77, 5.81 and 6.71 respectively. The obtained adjusted posttest F value of 43.74 was higher than the required table F value of 3.37. Hence the adjusted posttest means value of sand surface plyometric training and normal surface plyometric training on speed were found to be significant at 0.05 level of confidence for the degrees of freedom 2 and 26. The results confirm that the selected two training interventions namely sand surface plyometric training and normal surface plyometric training on speed were produced significant difference among the groups.

In order to find out the superiority effects among the treatment and control groups the Scheffe's post hoc test were administered. The outcomes of the same are presented in the Table 1(a).

**Table 1(a).** The Results of Scheffe's Post hoc Test Mean Differences on Speed among Three Groups (Scores in seconds)

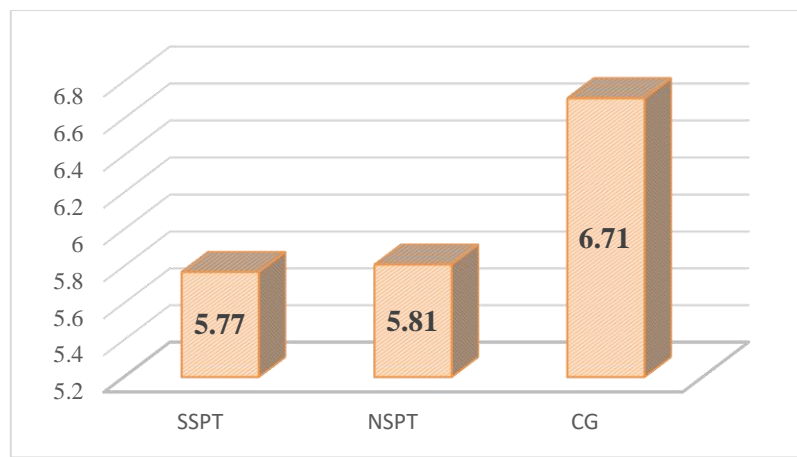
Group 1 SSPT	Group 2 NSPT	Group 3 CG	Mean Differences	Confidence Interval Value
5.77	5.81		0.035	0.348
5.77		6.71	0.94*	0.348
	5.81	6.71	0.901*	0.348

\* Significant at .05 level of confidence.

## 2.3. Result of Scheffe's post hoc test on speed

Table 1(a) shows the paired mean differences of sand surface plyometric training, normal surface plyometric training and control group on speed. The pair wise comparisons result as follows. **First comparison: Group 1 and Group 2:** The pair wise mean difference of group 1 and group 2 values 0.035 was lesser than the confidential value of 0.348. Hence the first comparison was insignificant. The results of this comparison clearly proved that both

training have produced similar effects on speed. **Second comparison: Group 1 and Group 3:** The pair wise mean difference of group 1 and group 3 values 0.94 was higher than the confidential value of 0.348. Hence, the second comparison was significant. The results of this comparison clearly proved that sand surface plyometric training have produced greater improvements on speed, than the control group. **Third comparison: Group 2 and Group 3:** The pair wise mean difference of group 2 and group 3 values 0.901 was higher than the confidential value of 0.348. Hence the third comparison was significant. The results of this comparison clearly proved that normal surface plyometric training have produced greater improvements on speed, than the control group. The adjusted post test mean difference of experimental and control group value graphically represented in the Figure 1.



**Figure 1.** The Adjusted Post Test Mean Values of Experimental and Control Groups on Speed (Scores in Seconds)

### 3. Discussion on Findings

The aim of the study was to compare the effects of different surface of plyometric training on speed of junior volley ball players. The findings of the study showed that the sand surface and normal surface plyometric training have produced similar effects on speed. The following earlier studies are in line with the present study findings. Maniazhagu & Malathi (2016) found that the speed is better improved in circuit training combined with SAQ drills than the circuit training combined with jump rope drills. Ahmadi et al. (2021) found that the type of surface used during PJT induced specific adaptations in terms of jump-related biomechanical variables and physical fitness in female indoor volleyball players. Kurian Abraham and Maniazhagu (2015) established that twelve weeks of circuit resistance training and super circuit resistance training produced significant improvement on speed. Hammami, M., et al. (2020) found that the sand surface plyometric training has produced improvement on physical performance responses. The results clearly show that the low intensity of aquatic and land plyometric training have produced a significant difference among the selected groups on speed (Hemambara, Maniazhagu, 2015). Gokmen Ozen, Ozdemir Atar & Hurmuz Koc (2019) found that the while the plyometric training performed on a wooden or sand surface does not cause a different effect on the improvement of jumping performance, plyometric training on the sand surface may be a more effective training surface to improve the agility and sprint performance of young players. Maniazhagu, Kannadasan, Malar (2017) revealed that the explosive strength and strength endurance-based circuit training have produced significant gain on speed performance.

#### 4. Conclusions

After the 6 weeks of sand surface and normal surface plyometric training, the nature of speed was improved. However, the speed was similar in both the groups. Control group did not show any significant improvement on speed.

#### Declarations

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##### Competing Interests Statement

The authors declare that there are no competing interests.

##### Consent for Publication

The authors declare that they consented to the publication of their original research work.

##### Authors' Contributions

Both the authors took part in data collection, literature review, analysis, and manuscript writing equally.

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