EFFECTS OF SPEED-STRENGTH AND PLYOMETRIC TRAINING ON FOOTBALL AND VOLLEYBALL PERFORMANCE

ABSTRACT

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INTRODUCTION

Sports training are a complex process consisting of various training content element and aspects. For optimum effect of those factors that must be arranged in a definite system in which the volume and temporal relation of each factor to other factors is optimum.

The main point of training, is primarily to develop strength and endurance in the type of work in which an improvement is sought for. It is very usual, within a month, reasonable amount of fitness, speed, strength, flexibility and so on, are seen to be gradually increased. But this disappears during the phase of training.

Sports performance is a product of execution and result of sports action or a complex sequence of sports actions measured or evaluated according to agreed and socially determined norms.

Plyometrics is a type of exercise that utilizes a rapid eccentric movement, followed by a short amortization phase, and then followed by an explosive concentric movement which enables the synergistic muscles to engage in the myotatic-stretch reflex during the stretch-shortening cycle. Plyometric exercises use explosive movements to develop muscular power, the ability to generate a large amount of force quickly. Plyometric training, acts on both the musculotendinous and neurological levels to increase an athlete's power output without necessarily increasing their maximum strength output. Plyometrics are used to increase the speed or force of muscular contractions, often with goals of increasing the height of a jump or speed of a punch or throw (Medical Dictionary for the Professionals and Nursing).

‘Speed-Strength’ is the ability of the neuromuscular system to produce the greatest possible impulse in the shortest possible time. Speed-Strength is defined as work divided by time, where work is defined as Force x Distance. Therefore, speed-strength is defined as Force x Distance, divided by time. Speed strength is characterized by three distinct components:

(i) Starting Strength (ii) Explosive Strength

Modern-day volleyball is dominated by techniques which require two-foot take-off jumps. Nevertheless, the speed of movement and the suddenness of the actions have forced volleyball players to use single foot take-off jumps during serves, lifts, spikes, blocks and other techniques. Exercises involving two-foot take-off jumps mainly dominate modern-day
training techniques. Thus, there is a need to study to which extent exercises involving two-foot take-off jumps affect the efficiency of single foot take-off jumps (Valdan Milic, et. al. 2008).

The subject matter of this study is to determine the effects of plyometric training exercises on the development of explosive leg strength among the volleyball players. The possible relations and differences between the quantitative indicators of jumping height in the case of the two-foot take-off and single foot take-off block and spike jumps stand out as a special point of interest. What would especially be beneficial for volleyball training is the study of whether the use of a plyometric program has the same effect on the effectiveness of explosive strength among volleyball-specific block jumps, spike jumps (in the case of both two-feet and single foot jumps), the depth jump and the triple standing jump.

In the present study a special emphasis has been given to find out the effectiveness of Sped-Strength and Plyometric training on football shooting, volleyball service and take-off height of volleyball performance.

1.3 Objectives of the study:

The objectives of the study are as follows:-

i. To compare the effectiveness of training on selected performance variables between speed-strength and plyometric training in volleyball services.

ii. To compare the two-foot take-off height for spiking between speed-strength group and plyometric group in volleyball.

iii. To compare the shooting ability between the speed-strength training group and plyometric training group of football players.

iv. To find out the relation of motor fitness between speed-strength training group and plyometric training group and plyometric training group of volleyball players.

v. To find out the relation of motor fitness between speed-strength training group and plyometric training group of football players.

vi. To compare the effect of speed-strength training on motor fitness between football players and volleyball players.
vii. To compare the effect of plyometric training on motor fitness between football players and volleyball players.

viii. To compare pre and post plyometric training effect on motor fitness level of football group.

ix. To compare pre and post Speed-strength training effect on motor fitness level volleyball group.

It is hypothesized that:

\( H_1 \) There will be improvement in velocity of ball volleyball service due to Speed-Strength training.

\( H_2 \) There will be improvement in two-foot take-off height due to Speed-Strength training.

\( H_3 \) There will be no difference in performance in soccer following two types of training method.

\( H_4 \) There will be no difference in performance in volleyball following two types of training method.

\( H_5 \) Plyometric training is an effective means in improving leg explosive power.

\( H_6 \) Plyometric training will be more effective in soccer than Volleyball.

\( H_7 \) Speed-Strength training will be improved 30 m sprint, standing long jump and 3-jump ability.

\( H_8 \) There will be significant correlation between Take-off height and all motor fitness components.

\( H_9 \) There will be high relationship between shooting velocity in soccer and leg explosive power test.

The necessary related literature has been reviewed to get a clear direction in the study.

Typical athletic movements are characterized by the occurrence of a special strength variant which is called explosive leg strength. Explosive strength is defined as the individual ability of the neuro-muscular system to manifest strain in the shortest possible time-span (Verhošanski, 1979).
Kollath and Quade (1993) showed that professionals were significantly quicker than amateurs over 10m, 20m and 30m. The acceleration difference to 10m was especially significant. This suggests that better players need superior acceleration and maximum speed to play at a higher level. Interestingly, the 30m speed was similar for the German professionals regardless of position.

Apor (1998) suggests, in making fitness recommendations for footballers; that players need to develop the musculature of a sprinter. I have already mentioned the benefit of maximum leg-strength training with heavy resistances for developing acceleration and speed.

Valdam Milic, et. al(2008) showed in their research work that six week plyometric training model (with an increase in exercise intensity from 70% to 100%) influences the statistically significant increase in explosive strength of the leg muscles, and this increase the jumping skills for the block jump, spike jump, depth jump and triple standing jump.

J M Sheppard(2012) showed that counter movement vertical jump and spike jump of the volleyball player significantly increased due to speed strength training.

Kimerly Nunley(2014) Showed that plyometric are exercises that challenge the athlete’s muscles explosively. With consistently plyometric training, football players can significantly increase their speed and power.

METHODOLOGY

Twenty two male volleyball players and twenty male football players of 16 through 21 years age group were randomly selected as subjects from two organizations of Hooghly district under the state of West Bengal.

A set of standard tests – bent knee, sit-up, pull-up and three mile run were conducted to measure abdominal muscular endurance, arm muscular endurance and cardiovascular endurance respectively.

To measure the volleyball performance, velocity of service and two foot take-off height were taken.

To measure the football performance, shooting velocity was taken.
To improve the performance of soccer and volleyball two different training were applied on the subjects. Two different training methods were plyometric training method and speed-strength training. Plyometric exercise protocol was consists of bounds, hurdle hopping, single leg hopping, box jumps, depth jumps, tuck jumps, two legged hops, chest pass, incline push up depth jump, power drop, inline chest pass and vertical toss. Whereas, speed-strength training exercise protocol was consist of back squat, drop jumps, jumps ups, bench press, squat jumps and box jumps.

To assess the speed-strength training MJQ (Max John Quadrathalon) test battery was applied on the subjects. MJQ test battery comprised of three jumps, 30 m sprint, standing long jump and over head shot throw.

**Treatment:**

There were two different experimental samples: one sample was made for Speed-strength training and the other was marked for treatment was plyometric.

The Speed-strength was given series of exercises apart from warming up and cooling down.

Three days in a week training was given with progressive and adopting changing the loading procedure for 8 weeks.

The other plyometric group has also trained 3day/week for period of 8 weeks after initial test on all the selected variables. No experimental groups which might have some influence over the organism.

The days of the week as selected for the training were conveniently administrated and no interruption develop could affect the training process.

Final data all the variables were collected through the tests all ready conducted during initial reading.

**Design of the Study:**

Forty two male Players and Players with an age of 16 to 21 years volunteered for the study. The entire subjects will be equally divided into two groups, one group will be considered as Plyometric training group and other one will be considered as Speed-Strength training group.
An initial test was taken on both groups in terms of Footballer subjects. The shooting ability was evaluated by video graphic record.

After initial test on shooting ability the subjects of both group will be given plyometric training and Speed-Strength Training for development of leg power.

An initial test was also conducted on both the groups of Volleyball subjects. For volleyball players the test was ball velocity in Tennis Service and take-off height during spiking. The performance of volleyball for both groups were assessed by the video graphic record. Initially the motor fitness was measured for all groups of Volleyball and Football to assess the fitness level of the subjects. Besides it the performance of speed-strength for both volleyball players were and football groups assessed was evaluated.

After completion of eight weeks duration the final tests on all the variable were taken and the date collected through different tests items for analysis.

**RESULTS AND DISCUSSIONS**

![Figure 1. Graphical Presentation of Pre and Post training comparison of Volleyball Service Velocity (m/s) of Plyometric training group](image)

Figure 1 shows the mean and SD of service velocity of pre-training & post training of volleyball players of plyometric training group. They are 17.06±1.127 and 18.52±1.35 respectively. It shows that the ‘t’ value is signified at 0.05 level.
Figure 2 shows the means and SD of service velocity (m/s) of pre-training and post training of volleyball players of Speed-Strength training group were 16.00±0.87 and 17.29±1.05 respectively.

The results show that the significant improvement of service velocity in volleyball due to speed-strength training.

Figure 3 shows the mean and SD of Take off height (spiking) of pre-training & post training of volleyball players of Speed-Strength training group were 40.71±5.70 and 48.71±6.74 respectively (Fig31). It shows that the ‘t’ value is significant.
Figure 4 shows the mean and SD of Take-off height (spiking) of pre-training and post training of volleyball players of Plyometric training group were 41.85±4.03 and 48.46±3.48 respectively. It shows that the ‘t’ value is significant.

Figure 5 indicates the mean and SD of shooting velocity of pre-training and post training of football players of Plyometric training group were 19.13±1.14 and 20.79±1.41 and ‘t’ value was significant 0.05 level.
Figure 6 indicates the mean and SD of shooting velocity of pre-training & post training of football players of Speed-Strength training group were 18.752±1.232 and 20.06±1.499 respectively. The results shows that the performance in terms of shooting velocity (m/s) is increased significantly (P<0.05).

CONCLUSIONS

The following conclusions are drawn from the results of the study:

i. There was a difference in shooting velocity of football players.

ii. Shooting velocity in soccer increased due to Speed-Strength.

iii. Eight weeks Plyometric training significantly improved the arm explosive strength which manifested in the form volleyball velocity during serving towards the opponent’s court.

iv. Speed-Strength training improved service velocity in volleyball.

v. The speed-Strength training method had the successful output in improving take-off height for spiking.

vi. There was improvement in two feet take-off height for spiking of volleyball players due to Plyometric training.