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### Impact of speed training and plyometric exercise on triple jump performance among fewer than 17 boys

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**Abstract:** The present study is an experimental research which was concluded to find out the impact of speed training and plyometric exercise on Triple Jump performance among under 17 age boys athlete of International Indian School, Dammam, Saudi Arabia. To achieve this purpose training method was designed in which the subjects were divided from the group of two hundred and twenty-five triple jumpers which were chosen randomly for this study and they were divided into three equal groups of seventy-five each. The three experimental groups were Group A - Speed, Group B - Plyometric exercise and Group C – Speed Training. In which A & B were experimental group and C being control group. This research was based on pre-test, Treatment and post - test equivalent group design. Before the training program a pre- test for all the three groups. The control group did not get the training but they had participated in other physical activities. After the Six-week training program the post - test was held for all the three groups. To analyze data, descriptive statistics was used. Further to check the effectiveness of each training program ANCOVA was applied with the pre-data as a covariate. Least significant difference was applied for post hoc analysis of variables where F-ratio was significant. The descriptive statistics for the gross scores of Spikers, Set-upper and Libero, which pertain to Mean, Standard Deviation, Minimum, Maximum, Range, Kurtosis, Skewness and Standard Error.

Key Words: Speed, Plyometrics, Triplejump, Technique

### Introduction

The human body comprises of arrangement of weights and levers and as any other system of weights and levers, they are subjected to indistinguishable universal forces. A human being either applies the principles and set guidelines of body mechanics capably, or wastes/dissipates energy or experiences a strain or injury. Human body is controlled by Bodily laws. It is important to study the effects of physical laws on human activities and has been applied in the fields of rehabilitation and treatment. In Body mechanics application of physical laws is important. Athletic coaches have realized that technicalities of human body are essential and important to the improvement and innovation of highly proficient performance.

Triple jump is one of the most complex, intricate, and challenging athletic events in the track and field competition/contest. These three phases are performed in a proper sequential form. Plyometric training consists of powerful and fast movements. It involves relaxing and contracting muscles in fast sequences, making use of elasticity, flexibility and strength. This training raises the speed of the muscle contractions leading to higher power needed in sports activities. Speed is defined as the capacity and capability of moving a body part or the entire body with the supreme and utmost likely speed or velocity.

The investigator Allen researched triple jump is an athletic result about three ground contact phases during which athletes must deal off the protection and persistence of parallel pace in resistance to the generation of erect velocity

Baca A the investigator says Drop jumping is a popular and prevalent mode of plyometric training. Frequent techniques are used to ascertain limitation values quantifying drop jumps, such as the jump height or the extents of the phases of descending and upward activities of the center of accumulation through foot get in touch with the ground after dropping. BING YU in 1999, the aim of the details was to discover the effects of chosen factors on horizontal to vertical speed change in the triple jump. An accepting of this alternation is important not only for studies on the methods of the triple jump, but also for the other jumping events.

### Method

The present study is experimental research which is concluded with the purpose to see the efficiency of selected plyometric exercise and speed training in improving triple jump performance. The populations for this study are the students of under 17 years of International Indian School, Dammam, Saudi Arabia.

### Experimental design

In this experimental study subjects are divided into three groups, two are experimental group and third is control group. The entire 225 subjects will be placed in fisher's table random number. The division of the groups viz. Group - A (Experimental) Group - B (Experimental) and Group - C (control)

The design of the experimental group was in three phase

Phase - I: Pretest

Phase - II: Training (Speed/Plyometric exercise) Phase - III: Post Test

The design of control group was in two phase

Phase - I: Pretest Phase - II: Post test

### **Pre-Test (Phase-I)**

As the purpose of this study was to measure the effect of speed training and plyometric training for under 17 year boys, a standard test was administered for this purpose. The pretest of Triple jump was taken of all the three groups.

### **Treatment training (Phase-II)**

After the pre-testing was over, the total subjects were divided into three groups

Group - A - Experimental

Group - B - Experimental

Group - C - Control

Group A and B participated in regular training program as follows

Group A participated in Speed Training Program and Group B Participated in Plyometric exercise training program. The subjects of experimental Group A and B went under specific training schedule for three days a week. The training was for six weeks which was conducted in the morning session for one hour. The training session was conducted on Sunday, Tuesday and Thursday only. The holiday given was on Monday, Wednesday, Friday and Saturday. The subject of Group C participated in other regular physical activities were not given any training treatment.

### **Posttest: (Phase-III)**

When the treatment training schedule was finished for the period of six weeks the post test on triple jump was conducted for all the three Groups A, B and C. The measurement was taken before and after the six-week training program.

There were around 10 different types of training schedule for Group A and 18 different training schedules for Group B. The list of these practices was send to three different experts in the field of track and field respectively. After taking their consideration the training schedule was prepared and the treatment was conducted on six (n=3) + (n=3)boys triple Jump athletes of International Indian School, Dammam, Saudi Arabia. This ensures that the speed training components and plyometric exercise components were applicable for this study. The training schedule was in reputational manner but every training component was used on the particular group for one time a week, which mean a particular training schedule was executed six time in the given six-week training program.

## Experimental group 1 was applied with the experimental treatment of the speed training:

- Speed Rhythm Run (Sunday) Speed standing start 8 strides, Speed standing start 12 strides, Speed standing start 20 strides & Speed standing start 32 strides
- Acceleration Run (Tuesday) 30-meter Speed-30-meter float - 30-meter Speed, 30 meter Slow -30-meter Speed - 30-meter Float & Downhill Speed run-slope 30 degree
- Strength Run (Thursday) Runs over low hurdles – 3 stride rhythm - 5 hurdles, Wind assisted run-ups in the correct rhythm & Sand Running knee up running

# Experimental group II was applied with the experimental treatment of the plyometric training:

- Bounding Training (low Intensity) (Sunday)
  - 1. Continuous single right leg hop going forward on plain grass ground RRRR......
  - 2. Continuous single left leg hop going forward on plain grass ground LLLL.....
- 3. Continuous Step going forward on plain ground
- 4. Continuous two hop (left) step (Right) two hop (Right) = LLSRRSLL......

- 5. Continuous three hop (left) step (Right) three hop (Right) = LLLSRRRSLLL......
- Box Jump Training (low Intensity) (Tuesday)
  - 1. Cont. box single left leg hop (6 box of 10 inch each, Dist. bet box-2 meter) = Box down box.
  - 2. Cont. box single right leg hop (6 box of 10 inch each, Dist. bet box- 2 meter) = Box-down- box.
  - 3. Cont. box lunge jumps (6 box of 10-inch height each, Dist. bet box- 3 meter) = Box-down- box.
  - Continuous box jump two hop on ground and step on box (four box of 10-inch height each, Distance between box- 4 meter) = LR- RRL-LLR...
- Tuck Jump Training (Low Intensity) (Thursday)
  - 1. Depth jump -30 cm- both leg vertical jump
  - 2. Depth jump 30 cm- left leg vertical jump
  - 3. Depth jump -30 cm- right leg vertical jump
  - 4. Depth jump-30cm-both leg-Horizontal jump
  - 5. Depth jump-15cm-left leg-Horizontal jump
  - 6. Depth jump-15cm-right leg-Horizontal jump
  - 7. Continues low Hurdle jump both leg going forward (5 hurdle of 10-inch height)
  - 8. Continues low Hurdle jump left leg going forward (5 hurdle of 10-inch height)
  - 9. Continues low Hurdle jump Right leg going forward (5 hurdle of 10-inch height)

A Treatment schedule of speed training for the experimental Group A was designed by different modules. The day's schedule should be performed (The following days the schedule was performed)

- The training program given in that particular day
- Distance to be covered for that particular training program.
- Number of Sets to be performed.
- Number of Repetition to be performed per Set.
- Recovery period to be given in between sets.

### **Results and Discussion**

To analyze data, descriptive statistics was used. Further to check the effectiveness of each

training program ANCOVA was applied with the predata as a covariate. Least significant difference was applied for post hoc analysis of variables where Fratio was significant.

### **Descriptive Analysis**

The descriptive statistics for the gross scores of Spikers, Set-upper and Libero, which pertain to Mean, Standard Deviation, Minimum, Maximum, Range, Kurtosis, Skewness and Standard Error, are presented in Table - 1 to Table - 9.

Table-1 describes various statistics of Jumpers in relation to Plyometric Exercise. The mean and Standard deviation of Pre-experimental test of Jumpers were: Pre-Test (9.39± .62) and Post Test  $(10.14 \pm .61)$ , respectively. In the same age categories, the minimum and maximum values of Pre-experimental test of Jumpers were: Pre-Test (8.39 and 10.45 cm.) and Post Test (9.12 and 11.30 cm) respectively. The variables like pretest and posttest of jumpers were negatively skewed. Negatively skewed distribution shows that most of the data is on the higher side. Since the value of Kurtosis were positive in both pretest and posttest. It shows that the data on these variables was more variable than that of normal distribution.



**Figure 1:** Bar chart of pretest and posttest of Plyometric exercise at triple jump in Athlete

**Table- 1:** Descriptive Analysis of Plyometric exercise at pre-and post-test in Jump Performance(N=75)

TEST	Minimum	Maximum	Mean	Std. Deviation	Std. Deviation Skewness		Kurtosis	SE
Pre-Test	8.39	10.45	9.39	.62	.119	.580	666	1.121
Post Test	9.12	11.30	10.14	.61	.300	.580	314	1.121

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TEST	Minimum	Maximum	Mean	Std. Deviation	Skewness	SE	Kurtosis	SE
Pre-Test	7.60	10.20	8.69	.84	.722	.580	673	1.121
Post Test	8.09	10.51	9.16	.82	.723	.580	816	1.121

Table- 2 Descriptive Analysis of Speed exercise at pretest & post-test in Jump Performance (N=75)

Table- 3 Descriptive Analysis of Control Group at pre-test & post-test in Jump Performance (N=75)

TEST	Minimum	Maximum	Mean	Std. Deviation Skewness		SE	Kurtosis	SE
Pre-Test	8.26	10.20	8.97	.66	.891	.580	451	1.121
Post-Test	8.26	10.20	8.97	.66	.891	.580	451	1.121



**Figure 2:** Bar chart of pretest and posttest of Speed exercise at triple jump in Athlete

Table - 2 describes various statistics of Jumpers in relation to Speed Exercise. The mean and Standard deviation of Pre-experimental test of Jumpers were: Pre-Test ( $88.70\pm$  .84) and Post Test ( $9.16\pm$  .82) respectively. In the same age categories, the minimum and maximum values of Pre-experimental test of Jumpers were: Pre-Test (7.60 and 10.20 cm.) and Post Test (8.09 and 10.51 cm) respectively. The variables like pretest and posttest of jumpers were negatively skewed. Negatively skewed distribution shows that most of the data is on the higher side. Since the value of Kurtosis was positive in both preand post-test. It shows that the data on these variables was more variable than that of normal distribution.



**Figure 3:** Bar chart of pretest and posttest of control group at triple jump in Athlete

Table - 3 describes various statistics of Jumpers in relation to Control Group. The mean and Standard deviation of Pre-experimental test of Jumpers were: Pre-Test  $(8.97\pm .66)$  and Post Test  $(8.97\pm .66)$  respectively. In the same age categories, the minimum and maximum values of Preexperimental test of Jumpers were: Pre-Test (8.26 and 10.20 cm.) and Post Test (8.26 and 10.20 cm) respectively. The variables like pretest and posttest of jumpers were negatively skewed. Negatively skewed distribution shows that most of the data is on the higher side. Since the value of Kurtosis was positive in both pretest and posttest. It shows that the data on these variables was more variable than that of normal distribution.

#### Findings

Various descriptive measures of means for different variable were calculated for original post test condition and have need depicted along with the adjusted post mean by ANCOVA separately for each variable.

**Table 4**: Descriptive Statistics of post mean Triple Jump ofExperimental groups

Group	Mean	Std. Deviation	Ν
Plyometric Exercise Group	10.14	.614	75
Speed Activity Group	9.16	.823	75
Control Group	8.97	.657	75

**Table 5** : Descriptive Statistics of adjusted post MeanTriple Jump of Experimental groups

Casar	Маан	Std.	95% Confidence Interval		
Group	mean	Error	Lower Bound	Upper Bound	
Plyometric Exercise Group	9.78	.020	9.737	9.816	
Speed Training Group	9.47	.019	9.436	9.514	
Control Group	9.01	.019	8.980	9.056	

**Table 6** Analysis of Covariance for between subjecteffects among Experimental groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Group	20.609	1	20.609	399.938*	.000
Error	.216	41	.005		
Total	4028.535	45			
Corrected Total	32.759	44			

Table 4 depicts that the original post mean Triple Jump of Plyometric exercise group is 10.14 inch with a standard deviation of .614 inch. The original post mean Triple Jump of Speed training group is 9.16 inch with a standard deviation of .823 cm and the original post mean height of Control group is 8.97 inch with a standard deviation of .657 inch (Figure 4). The Table indicates that Plyometric exercise group as the highest in Triple Jump followed by Speed training group and control group.



Figure 4. Bar chat of post mean Triple Jump group.

Table 5 depicts that the adjusted post mean Triple Jump of Plyometric exercise group is 9.78 inch. The adjusted post mean Triple Jump of Speed training group is 9.47 inch and the original post mean Triple Jump of Control group is 9.01 inch (Figure 5). Thus indicating an increase in mean Triple Jump in the Plyometric exercise group, increase in mean Triple Jump in the Speed training group and decrease in the Control group.



**Figure 5.** Bar chat of adjusted post mean Triple Jump group

<b>Table 7</b> : Pair wise comparison	of Mean	Triple Ju	ump with	Least	Significant	Difference	among
Experimental groups							

(I) Croup	(I) Crown	Mean Difforence (I	Std.	Sig	95% Confidence Interval for Difference		
(I) Group	(J) Group	J)	Error	51g.	Lower Bound	Upper Bound	
Plyometric Exercise Group	Speed Training Group	.302*	.029	.000	.244	.359	
Plyometric Exercise Group	Control Group	$.759^{*}$	.027	.000	.704	.814	
Speed Training Group	Control Group	$.457^{*}$	.027	.000	.403	.512	

Plyometric Exercise Group	Speed Training Group	Control Group	MD	CD at 5% Level
9.78	9.47		.302*	.03
9.78		9.01	.759*	.03
	9.47	9.01	$.457^{*}$	.03

**Table 8**: Least significant difference post hoc test of the mean of triple jump at different methods of training

It is evident from table 6 that, among the experimental groups i.e. Plyometric exercise group, Speed training group and the control group there exists a significant difference as the p-value (0.000) is less than 0.05 (Figure 5) Thus the null hypothesis was rejected at 0.05 level of significance. Since the F-Value is significant, a pair-wise comparison of means has been made in table 6.



**Figure 7-** Mean comparison of Triple Jump at different methods of training

The pair wise comparison of means between Plyometric exercise group and Speed training group, reveals that mean difference is significant at 0.05 level of significance as p-value (0.000) is less than 0.05. The pair wise comparison of means between Speed training group and Control group, reveals that mean difference is significant at 0.05 level of significance as p-value (0.000) is less than 0.05. However the pair wise comparison of means between Plyometric exercise group and Control group reveals that mean difference is significant at 0.05 level of significance as p-value (0.00) is less than 0.05. Table 8 revealed that there is significant difference between the paired mean of Triple Jump at different methods of training at plyometric exercise and Speed training is .302, plyometric exercise and control group is .759, Speed training and control group is .457 respectively. The highest significant paired mean difference was recorded between plyometric exercise and control group (.759), on the other hand the lowest significant paired mean difference was recorded between plyometric exercise and Speed training (.302). The graphical representation of mean of Triple jump at different methods of training has been presented in Figure 7.

### Conclusions

It is concluded that the impact of speed training on the triple jump performance from pretest to posttest had shown significant improvement among the selected participants. It was concluded that the Training Schedule of plyometric training have better and favorable effect and results when compared with the effects of two different types of training. The result also reveals that speed training requires more training periods to improve the triple jump performance.

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