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Effect of Plyometric Training and weight Training on Selected Speed and Stride Length of Basket Ball Players

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Abstract: *The Aim of the study was to find out the effect of Plyometric Training and Varied Intensities of Weight Training on Selected Speed and Stride Length of Basketball Players. The investigator randomly selected 60 Basketball Players, who represented Different Universities in A.P. They were divided into three groups at random again consisting twenty subjects in each group and they were randomly assigned as experimental group I Plyometric Training Experimental group II Weight Training and control group. Variables are Speed and Stride Length, The difference between the pre-test and post-test means were subjected to statistical treatment using ANCOVA, In all cases 0.05 level was fixed to test the hypothesis of the study.*
Key words: *Basketball Players, opponents, officials*

Introduction

Sports are most often played just for fun or for the simple fact that people need exercise to stay in good physical condition. Although they do not always succeed, sports participants are expected to display good sportsmanship, standards of conduct such as being respectful of opponents and officials, and congratulating the winner when losing.

Statement of the Problem : The purpose of the study was to find out effect of plyometric training, and weight training on Speed and Stride Length of basketball players.

Methodology

1. Sixty basketball men players who represented their university in inter university tournaments were selected at random.

2. Their age ranged between 18 and 25 years.

3. The selected 60 subjects were divided into plyometric, weight training and control groups, each group consisted of 20 subjects.

4. The speed and stride length for the purpose of the study.

5. The training was given on alternative days of a week for a period of 12 weeks.

Limitations

1. The diet of the subjects was not restricted with strict observation.

2. The socio-economic background of the subjects was not considered for the purpose of the study.

3. The heredity and the environment of the subjects were not considered in this study.

4. The psychological stresses and other factors, which affect the metabolic functions, were not taken into consideration.

5. The other extraneous factors which would have influenced the results of the study were not controlled.

In this chapter, the selection of subjects, selection of variables, selection of tests, pilot study, reliability of the instruments, reliability of the data, competence of tester, orientation to the subjects, training programme, collection of the data, tests administration, experimental design and statistical procedures have been explained.

The purpose of the study was to find out effect of plyometric training, and weight training on speed and stride length among basketball players.

To achieve the purpose of the study, 60 inter university level men basketball players who represented their university in different competitions were selected at random. The subjects were selected from of Andhra University and Adikarai Nannaya University in Andhra Pradesh. The age of the subjects ranged between 18 and 25 years. The selected subjects were fit to undergo the experimental training and gave their written consent to participate in the study.

The demographic profile of the subjects selected were given in Table I.

Selection of Subjects

Table 1: Demographic profile of the selected subjects

	Age (Years)	Height (Meters)	Weight (Kilograms)
Mean	22.1	1.698	63.7
SD	1.984	0.0279	2.4654
Minimum	18	1.65	58
Maximum	25	1.75	68

Selection of Variables: Based on the available scientific literatures pertaining to plyometric training and weight training and in consultation with experts, the following dependent variables were selected for this study.

Dependent Variables

a) Speed

b) Stride Length

Independent Variables

1. Plyometric training for 12 weeks
2. Weight training for 12 weeks

Research Design

The research design of the study was random group design. 60 inter university level basketball players (N=60) who represented their university in different basketball tournaments were selected at random. The selected subjects were randomly divided into three groups and assigned into plyometric training group (Group-I), weight training group (Group-II) and control group. Each group consisted of 20 subjects. The training period was 12 weeks and three sessions a week on alternative days. Prior to experimental treatments all the subjects were measured of the criterion variables selected for this study. After the completion of the experimental period, the all the subjects were again measured

of the criterion variables selected. The differences between the initial and final means on criterion variables were considered as the effect of respective treatment among the subjects. To test statistical significance of the difference, the obtained data were analysed using ANCOVA. In all cases 0.05 level was fixed to test the hypothesis.

Table II: intra class correlation co-efficient values on selected criterion variables

Variables	'r' Value
Speed	0.94*
Stride Length	0.95*

* Significant at .05 level of confidence.

3.10 Criterion Measures

Speed and endurance parameters were measured through standard physical efficiency tests. The criterion variables selected, test items used and the units of measurements were presented in Table III.

TABLE III: Showing Criterion Measures, Test Items and Units of Measurements

S.No	Criterion Variables	Test Items	Units
1	Speed	50 M Run	Seconds
2	Stride Length	Calculated as suggested by Seagrave, L., (1996)	Meter

Training Programme- Plyometric Training

The plyometric training programme was scheduled for six days (Monday to Saturday) per week in the morning between 6.30 a.m. and 7.45 a.m. for twelve weeks.

The plyometric training programme consisted of warm up and stretching for 10 – 15 minutes, selected plyometric exercises and cool down for 5 – 10 minutes.

The initial intensity was fixed at 60 – 65%. The intensity of the exercise was gradually increased, once in every four weeks. The intensity was fixed between 65% and 70% during 4-8 weeks and 70% and 75% during 8-12 weeks. The subjects were asked to perform 10 repetitions in each exercises and 90 seconds rest was given as the recovery between sets.

The number of sets was gradually increased once in four weeks along with the intensity.

The training was given under the direct supervision of the investigator.

The detailed plyometric training programme and design is given in table – IV and V respectively.

TABLE IV: Showing Plyometric Exercises

S.No	Exercises	Rest Between Sets
1	Squat Jumps	90 Seconds
2	Jump to Box	90 Seconds
3	Lateral Jump to Box	90 Seconds
4	Bounding	90 Seconds
5	Bounding with Rings	90 Seconds
6	Depth Jump	90 Seconds
7	Medicine Ball Chest Pass	90 Seconds
8	Box Drill with rings	90 Seconds
9	Medicine Ball Standing throw	90 Seconds
10	Lateral Hurdle Jump	90 Seconds

Table V: Showing Plyometric Training Programme Design

Design	1-4 Week	5 – 8 Week	8 – 12 Week
Intensity	80 foot contacts	160 foot contacts	240 foot contacts
Repetitions	8	8	8
Set	1	2	3
Rest	90 seconds between set	90 seconds between set	90 seconds between set

The description of the plyometric training imparted are detailed below

Weight Training

This group consisted of twenty subjects. Three training sessions in a week for a period of twelve weeks were given. This group was directed to do 10 repetitions of each exercise and was also asked to do 3 sets in the beginning.

The load was increased by increasing the repetitions or sets after each week according to the ability of an individual. They were asked to do the exercises in pairs when one subject was doing exercises, the other subject was asked to help him. After completing one set, the next person was asked to do the same exercises.

The subjects were given equal amount of time to relax after each exercise. This programme consisted of the following eight exercises.

a. Military press

b. Barbell curls
c. Bench press
d. Lying Triceps Extension
e. Barbell Rows
f. Squats
g. Standing calf Raises
h. Leg Press

Table VI: Work load schedule for Weight Training Group

S. No	Weight Training Exercises	Repetitions and Sets							
		I – III Weeks		IV – V Weeks		VI – VIII Weeks		IX –XII Weeks	
		Reps	Sets	Reps	Sets	Reps	Sets	Reps	Sets
1	Military Press	10	3	10	4	15	4	20	4
2	Barbell Curls	10	3	10	4	15	4	20	4
3	Bench Press	10	3	10	4	15	4	20	4
4	Lying Triceps Extension	10	3	10	4	15	4	20	4
5	Barbell Rows	10	3	10	4	15	4	20	4
6	Squats	10	3	10	4	15	4	20	4
7	Standing Calf Raises	10	3	10	4	15	4	20	4
8	Leg Press	10	3	10	4	15	4	20	4

Administration Of Tests

Speed (50 Meters Run)

Purpose: The 50 meters dash was conducted to determine the speed of the subjects.

Test Administration: The subject took a position behind the starting line. The starter used the command, "ready" and "go" accompanied by a downward sweep of the arm as a signal to the timer. The subject ran across the finishing line. One trial was permitted. (Allen Stall, 1980)

Scoring: The score was the elapsed time to the nearest one tenth of a second between the starting signal and the instant the subject crossed the finishing line.

Stride Length

Purpose: To measure the stride length of the subjects while performing 50 meters run.

Equipment: Stop watch, Clapper, Saw Dust

Procedure: While the subjects were allowed to run fast in 50 metres run to measure speed, the measurement of the length of stride was taken in the test

course, which consists of an acceleration zone of 20 metres and the test zone of 30 metres (between 20th to 50th metre). The athlete uses the acceleration zone to gain maximum speed through the 30 metres test course. A light coating of sawdust was spread over the test zone that highlighted the footprints. Stride length was the distance from the tip of the rear toe to the tip of the front toe was recorded to the nearest centimetre. To avoid the bilateral discrepancies two successive strides are measured to the nearest centimeter.

Scoring: The average of two successive strides of the subject was recorded in meter as the individual score.

Results and Discussions

Computation of analysis of covariance and post

HOC test

Results on speed: The statistical analysis comparing the initial and final means of Speed due to Plyometric Training and Weight Training among inter university basketball players is presented in Table VII

Table VII : Ancova Results on Effect of Plyometric Training And Weight Training Compared With Controls on Speed

	Plyometric training	Weight training	Control group	Source of variance	Sum of squares	df	Mean squares	Obtained f
Pre-test Mean	7.37	7.30	7.47	Between	0.30	2	0.15	1.24
				Within	6.98	57	0.12	
Post-test Mean	6.92	6.97	7.50	Between	4.11	2	2.05	17.16*
				Within	6.82	57	0.12	
Adjusted Post-test Mean	6.93	7.05	7.42	Between	2.55	2	1.28	57.66*
				Within	1.24	56	0.02	
Mean Diff	-0.46	-0.33	0.02					

Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.16, 2 and 56 (df) =3.16. *Significant

As shown in Table VII, the obtained pre-test means on Speed on Plyometric Training group was 7.37, Weight Training group was 7.30 was and control group was 7.47. The obtained pre-test F value was 1.24 and the required table F value was 3.16, which proved that there was no significant difference among initial scores of the subjects. The obtained post-test means on Speed on Plyometric Training group was 6.92, Weight Training group was 6.97 was and control group was 7.50. The obtained post-test F value was 17.16 and the required table F value was 3.16, which proved that there was significant difference among post-test scores of the subjects.

Taking into consideration of the pre-test means and post-test means adjusted post-test means were determined and analysis of covariance was done and the obtained F value 57.66 was greater than the required value of 3.16 and hence it was accepted that there was significant differences among the treated groups. Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table VIII.

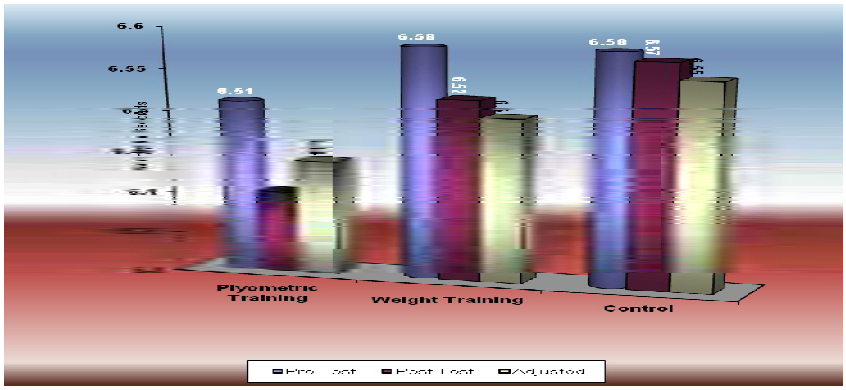
Table VIII: Multiple Comparisons of Paired Adjusted Means and Scheffe's Confidence Interval Test Results on Speed

MEANS				Required . C I
Plyometric Training Group	Weight Training Group	Control Group	Mean Difference	
6.93	7.05		0.12*	0.12
6.93		7.42	0.49*	0.12
	7.05	7.42	0.37*	0.12

* Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between Plyometric Training group and control group (MD: 0.49). There was significant difference between Weight Training group and control group (MD: 0.37). There was significant difference between treatment groups, namely, Plyometric Training group and Weight Training group. (MD: 0.12). The means of pre-test, post-test and ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure I.

Figure I: Bar Diagram Showing Pre Test, Post-Test and Ordered Adjusted Means on Speed



Discussions on Findings on Speed

In order to find out the effect of plyometric training and weight training on speed parameter Speed the obtained pre and post-test means were subjected to ANCOVA and post hoc analysis through Scheffe's confidence interval test.

The effect of Plyometric Training and Weight Training on Speed is presented in Table VII. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 57.66 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table VIII proved that there was significant difference between Plyometric Training group and control group (MD: 0.49) and Weight Training group and control group (MD: 0.37). Comparing between the treatment groups, it was found that there was significant difference between Plyometric Training and Weight Training group among inter university basketball players.

Thus, it was found that Plyometric Training was significantly better than Weight Training and control group in reducing the time and thereby improve Speed of the inter university basketball players.

Results On Stride Length

The statistical analysis comparing the initial and final means of Stride length due to Plyometric Training and Weight Training among inter university basketball players is presented in Table IX

Table IX : ANCOVA results on effect of plyometric training and weight training compared with controls on stride length

	Plyometric training	Weight training	Control group	Source of variance	Sum of squares	df	Mean squares	Obtained f
Pre-test Mean	1.61	1.60	1.60	Between	0.001	2	0.000	0.23
				Within	0.107	57	0.002	
Post-test Mean	1.64	1.62	1.60	Between	0.01	2	0.01	3.82*
				Within	0.11	57	0.002	
Adjusted Post-test Mean	1.63	1.62	1.60	Between	0.01	2	0.004	42.24*
				Within	0.01	56	0.000	
Mean Diff	0.03	0.02	0.001					

Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.16, 2 and 56 (df) =3.16.

*Significant

As shown in Table IX, the obtained pre-test means on Stride length on Plyometric Training group was 1.61, Weight Training group was 1.60 was and control group was 1.60. The obtained pre-test F value was 0.23 and the required table F value was 3.16, which proved that there was no significant difference among initial scores of the subjects.

The obtained post-test means on Stride length on Plyometric Training group was 1.64, Weight Training group was 1.62 was and control group was 1.60. The obtained post-test F value was 3.82 and the required table F value was 3.16, which proved that there was significant difference among post-test scores of the subjects.

Taking into consideration of the pre-test means and post-test means adjusted post-test means were determined and analysis of covariance was done and the obtained F value 42.24 was greater than the required value of 3.16 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table X.

Table X

Multiple Comparisons of Paired Adjusted Means and Scheffe's Confidence Interval Test Results on Stride length

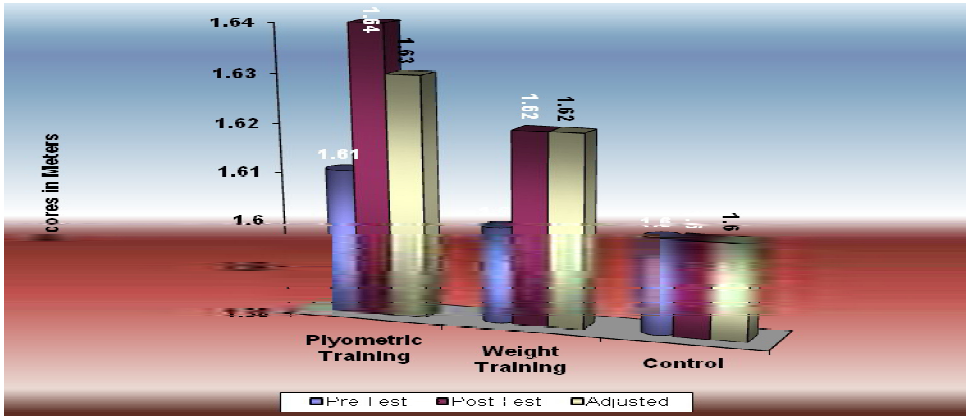
MEANS				Required . C I
Plyometric Training Group	Weight Training Group	Control Group	Mean Difference	
1.63	1.62		0.01*	0.01
1.63		1.60	0.03*	0.01
	1.62	1.60	0.02*	0.01

* Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between Plyometric Training group and control group (MD: 0.03). There was significant difference between Weight Training group and control group (MD: 0.02). There was significant difference between treatment groups, namely, Plyometric Training group and Weight Training group. (MD: 0.01).

The means of pre test, post-test and ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure II.

Figure II: Bar diagram showing pre-test, post-test and ordered adjusted means on stride length



Conclusions: Within the limitations and delimitations of this study, the following conclusions were drawn. It was concluded that experimental protocols plyometric training and weight training were easy to administer and effective in improving speed of basketball players. Plyometric trains and weight training protocols significantly improved sprinting speed of basketball players compared to control group. Comparing between treatment groups, it was found plyometric training was significantly better than weight training group. Plyometric trains and weight training protocols significantly improved stride length of basketball players compared to control group. Comparing between treatment groups, it was found there was no significant difference between plyometric training and weight training groups.

The findings of this study proved that basketball players can improve their speed and stride length through the suggested plyometric training and weight training protocols. In the light of the above findings, the following recommendations are made.

Efforts may be taken to include plyometric training and weight training protocols suggested in this study in the physical education curriculum to improve overall speed and endurance parameters of the players. Efforts may be taken by coaches, sports scientists and educational authorities to include plyometric training and weight training in the training schedules of basketball players. Advantages of plyometric training and weight training may be popularized among basketball players for their all round development of speed and endurance parameters.

During the course of research, the investigator comes across different ideas and suggestions that can be looked into by future researchers. Some of the important ones are detailed hereunder. A separate research to find out the effect of plyometric training and weight training on physiological variables and strength

variables of the basketball players may be under taken. A similar study may be conducted among college sportswomen to find out the effect of plyometric training and weight training on their physical fitness levels and skills of college women. Since this study covered the men basketball players only, a similar research may be undertaken among women basketball players to find out the effect of plyometric and weight training. A comparative effect of plyometric training with weights and other modes of resistance training may be under taken to throw more lights on the usefulness and purposes of plyometric training.

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