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# Effect of Plyometric and Aerobic Exercises on Selected Physical Fitness Components of Basketball Players

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## ABSTRACT

The main purpose of this study was to compare "The Effect of Plyometric and Aerobic Exercises on Selected Physical Fitness Components of Basketball Players". For this purpose sixty male basketball players were selected from Degree College of Physical Education, Amravati by adopting simple random sampling method and age of the subjects was ranging from 18 to 25 years. The subjects were divided into three groups, each group consisted of 20 players, in which group-A and group B were experimental groups and group C was control group. Plyometric Exercises were assigned to Group A, Aerobic Exercises were assigned to group B and no specific exercises was given to control group C. The training period was consisted of six weeks. During the training, principle of overload training was adopted for the optimum development of the desired objective of the study. The training were performed for five days in week, two times a day, in morning 6:00 am to 8:00 am and in afternoon 4:00 pm to 6:00 pm and a complete rest was given on Saturday and Sunday. The subject of group C were not given any specific training but they used to take part in daily basketball practice and participated to their regular program as well.

It was hypothesized that Plyometric and Aerobic Exercises will affect the Physical Fitness components of Basketball players.

Strength, Muscular Endurance, Cardiovascular Endurance and Agility of Basketball players was measured by applying Vertical Jump, Sit-ups, 1.5 mile run and Shuttle Run respectively, and the scores were recorded. Data pertaining to the study were collected before the start of training programs and immediately after the completion of six weeks training programs. The collected data were arranged systematically in a table for further statistical treatments.

Independent and Dependent t-test was employed to find out effect of Plyometric and Aerobic Exercises between different groups as well as One Way Analysis of Variance (ANOVA) was employed to compare the effect of selected Plyometric and Aerobic Exercises on selected Physical Fitness Components of Basketball Players. The level of significance was set at 0.05 for testing the hypothesis. The findings of the statistical analysis revealed that there was significant difference on the Physical

Fitness Components viz. Strength, Muscular Endurance, Cardiovascular Endurance and Agility in both experimental and control group.

**Keywords**: Plyometric, Aerobic, Strength, Muscular Endurance, Cardiovascular Endurance and Agility.

## Findings

To determine the significant difference between the two groups's for and among the different selected Physical Fitness Components, the Independent t-test, Dependent t-test (between pre and post) and ANOVA statistical technique was employed independently for each variable. The level of significance to test the hypothesis was set at 0.05. The findings pertaining to the study have been shown in Table 1, 2, 3 and 4.

**Table-1**
**Summary of Mean, Standard deviation and't'- ratio for the Data on Post-Test of Physical Fitness Component between the Experimental And Control Group of Basketball Players**

| Group | Mean | Standard Deviation | Mean Difference | Standard Error of Mean Difference | t-ratio |
|---|---|---|---|---|---|
| **Experimental A (Plyometric)** | 210.5392 | 16.564 | 45.5636 | 5.830 | 7.815* |
| **Control** | 164.975 | 20.138 | | | |
| **Experimental B (Aerobic)** | 215.817 | 14.600 | 50.842 | 5.562 | 9.141* |
| **Control** | 164.975 | 20.138 | | | |

*Significant at 0.05 level Tabulated $t_{0.05(18)} = 2.228$

It is evident from Table-1 that significance of difference are found in the variables of Physical Fitness Component viz. Strength, Muscular Endurance, Cardiovascular Endurance and Agility between Experimental Group-A (Plyometric Exercise) and Control Group and in between Experimental Group-B (Aerobic Exercise) and Control Group as the obtained t-valve of 7.815 and 9.141 respectively are quite higher than the tabulated t-value of 2.228 at 0.05 level of significance at 18 degree of freedom.

**Table-2**
**Comparison of Mean of Pre and Post Test of Experimental and Control Group for the Data on Physical Fitness Components of Basketball Players**

| Group | Test | Mean | Difference between Post and Pre test Scores | Standard Error | t-ratio |
|---|---|---|---|---|---|
| Experimental (Plyometric) | Pre | 199.9922 | 210.9416 | 75.687 | 2.787* |
| | Post | 210.5392 | | | |
| Experimental (Aerobic) | Pre | 199.9844 | 316.658 | 74.1586 | 4.270* |
| | Post | 215.8173 | | | |
| Control | Pre | 200.0224 | 700.9348 | 120.144 | 6.323* |
| | Post | 164.9757 | | | |

*Significant at 0.05 level Tabulated $t_{0.05(19)} = 2.093$

Statistical Analysis of Pre Tests and Post Tests of Experimental Group-A (Plyometric Exercise), Experimental Group-B (Aerobic Exercise) and Control Group has shown significant difference as the Calculated t-value of 2.787, 4.270 and 6.323 respectively are more than the tabulated t-value of 2.093 when compared independently at 0.05 level of significance at 19 degree of freedom.

**Table – 3**

**Summary of One-way Analysis of Variance (ANOVA) for the Data on Selected Physical Fitness Components between Experimental and Control Group of Basketball Players**

| Physical Fitness Components | Source of Variance | Degree of Freedom | Sum of square | Mean of Sum of Square | F - ratio |
|---|---|---|---|---|---|
| Strength (Vertical Jump) | Between group | 2 | 1363.533 | 681.7665 | 8.5661* |
| | Within group | 57 | 4536.558 | 79.5887 | |
| Endurance (Sit-ups) | Between group | 2 | 3004.654 | 1502.327 | 29.5718* |
| | Within group | 57 | 2895.749 | 50.8026 | |
| Endurance (1.5 mile) | Between group | 2 | 2341.784 | 1170.892 | 18.726* |
| | Within group | 57 | 3563.993 | 62.526 | |
| Agility (Shuttle Run) | Between group | 2 | 1871.839 | 935.9193 | 13.2068* |
| | Within group | 57 | 4039.371 | 70.8662 | |

*Significant at 0.05 level Tabulated $F_{0.05(2,57)} = 3.158$

**Table – 4**

**Paired Mean Difference for the Data on Selected Physical Fitness Components between Experimental and Control Group of Basketball Players**

| Physical Fitness Components | Mean of | | | Mean Difference | Critical Difference |
|---|---|---|---|---|---|
| ---------- | Experimental A (Plyometric) | Experimental B (Aerobic) | Control | ---------- | ---------- |
| Strength (Vertical Jump) | 55.449 | 50.711 | --- | 4.738@ | 5.6479 |
| | 55.449 | --- | 43.837 | 11.612* | 5.6479 |
| | --- | 50.711 | 43.837 | 6.874* | 5.6479 |
| Endurance (Sit-ups) | 53.616 | 58.871 | --- | 5.255* | 4.5124 |
| | 53.616 | --- | 41.938 | 11.678* | 4.5124 |
| | --- | 58.871 | 41.938 | 16.933* | 4.5124 |
| Endurance (1.5 mile) | 49.901 | 53.716 | --- | 3.815@ | 5.006 |
| | 49.901 | --- | 38.974 | 10.927* | 5.006 |
| | --- | 53.716 | 38.974 | 14.742* | 5.006 |
| Agility (Shuttle Run) | 51.573 | 52.518 | --- | 0.945@ | 5.392 |
| | 51.573 | --- | 40.225 | 11.348* | 5.392 |
| | --- | 52.518 | 40.225 | 12.293* | 5.392 |

*Significant at 0.05 level
@ Not Significant at 0.05 level

To determine the significance of difference of selected Physical Fitness Components among three groups i.e. of Experimental Group-A (Plyometric Exercise), Experimental Group-B (Aerobic Exercise) and Control Group, One way Analysis of Variance (ANOVA) statistical technique was employed independently for each variables, where F – ratio was found to be significant, *post-hoc* test was applied to find out the paired mean difference. To test the hypothesis confidence level was set at 0.05. The findings pertaining to the study have been shown in Table 3 and 4.

It is evident from Table-3, that the significance of difference were found in the variable of Strength (F = 8.5661), Muscular Endurance (F = 29.5718), Cardiovascular Endurance (F = 18.726) and Agility (F = 13.2068) among the Groups of Basketball Players, as the obtained F–value are quite higher than that of tabulated F–value of 3.158 needed to be significant at 0.05 level for 2, 57 degrees of freedom.

Findings of *post-hoc* test reveals that there is significance of difference in between Experimental Group-A and Control Group (MD=11.612 > CD=5.6479) and Experimental Group-B and Control Group (MD=6.874 > CD=5.6479) whereas insignificant difference was found in between Experimental Group-A and Experimental Group-B (MD=4.738<5.6479) in the component of Strength. The table also reveals that there is significance difference in between Experimental Group-A and Experimental Group-B (MD=5.25>4.5124), Experimental Group-A and Control Group (MD=11.678>4.5124) and Experimental Group-B and Control Group (MD=16.933>4.5124) in the component of Muscular Endurance.

It is also observed from the table that there is significance difference in between Experimental Group-A and Control Group (MD=10.927 > CD=5.006) and Experimental Group-B and Control Group (MD=14.724 > CD=5.006) whereas insignificant difference was found in between Experimental Group-A and Experimental Group-B (MD=3.815<5.006) in the component of Cardiovascular Endurance.

The table also states that there is significance difference in between Experimental Group-A and Control Group (MD=11.348 > CD=5.392) and Experimental Group-B and Control Group (MD=12.293 > CD=5.392) whereas insignificant difference was found in between Experimental Group-A and Experimental Group-B (MD=0.945<5.392) in the component of Agility.

**Discussion of Finding**

The obtained Significant Difference in initial Experimental Group-A (Plyometric Exercises) and Experimental Group-B (Aerobic Exercises) with final post test of Experimental Group-A (Plyometric Exercises) and Experimental Group-B (Aerobic Exercises) may be attributed to fact that Plyometric and Aerobic Exercises are the best scientific means to develop desired Physical Fitness Components for Basketball Players.

The study also acknowledged that Plyometric Exercises leads to the development of Strength whereas Aerobic Exercises leads to the development of Muscular and Cardiovascular Endurance, because nature of activity shows higher relation with this type of development, which was tested by Vertical Jump, Sit-ups and 1.5 mile run.

Bobo M. and Frost Reuber B. researched independently for the Effect of Plyometric and Aerobic Exercises on development of fitness components and have found similar result as of the present study.

**Conclusion**

Recognizing the limitations of the study and on the basis of statistical findings it may be fairly concluded that

i. Plyometric and Aerobic Exercises lead to the developments of Physical Fitness components of Basketball Players.
ii. Significant difference was observed between Experimental Group A and Control Group and Experimental Group B and Control Group in the selected Physical Fitness Components.
iii. Significant difference was observed between Pre Test and Post Test of Experimental Group A, Experimental Group B and Control Group in the selected Physical Fitness Components.
iv. Significant mean difference was observed Experimental Group A, Experimental Group B and Control Group in the selected Physical Fitness Components of Strength, Muscular Endurance, Cardiovascular Endurance and Agility

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