



E-ISSN: 2707-7020  
P-ISSN: 2707-7012  
JSSN 2023; 4(1): 175-178  
Received: 25-04-2023  
Accepted: 21-05-2023

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## Effect of plyometrics exercises on cardio-vascular efficiency and playing ability of badminton players

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**DOI:** <https://doi.org/10.33545/27077012.2023.v4.i1c.168>

### Abstract

Plyometric training is a series of explosive body weight resistance exercise using the Stretch-shortening cycle of the muscle fibre to enhance physical capacity such as increasing musculotendinous stiffness and power. The main purpose of the present study was to determine the effect of Plyometrics Exercises on cardio-vascular Efficiency and playing ability of Inter University Badminton players. There was no significant difference found in vascular Efficiency and cricket playing ability control group. The significant effect observed in Experimental group on cardio-vascular Efficiency and Badminton playing ability, because of training schedule of players. In the post test of control and experimental group significant difference found in cardio-vascular Efficiency, High Serve Ability, Low Serve Ability, Fore Hand Smash Ability, Back Hand Smash Ability and Overall playing Ability. But insignificant in Clear or Lob Ability.

**Keywords:** Plyometric, cardio-vascular, efficiency, ability etc.

### Introduction

Plyometric exercise involves and uses practicing plyometric movements to enhance tissues abilities and train nerve cells to stimulate a specific pattern of [muscle contraction] so the muscle generates as strong a contraction as possible in the shortest amount of time. A plyometric contraction involves first a rapid muscle lengthening movement (eccentric phase), followed by a short resting phase (amortization phase), then an explosive muscle shortening movement (concentric phase), which enables muscles to work together in doing the particular motion. Plyometric exercise engages the myotatic reflex, which is the automatic contraction of muscles when their stretch sensory receptors are stimulated.

Plyometrics are not inherently dangerous, but the highly focused, intense movements used in repetition increase the potential level of stress on joints and musculo-tendonous units. Therefore safety precautions are a strong prerequisite to this particular method of exercise. Low-intensity variations of plyometrics are frequently utilized in various stages of injury rehabilitation, indicating that the application of proper technique and appropriate safety precautions can make plyometrics safe and effective for most people.

### Purpose of the study

The main purpose of the present study was to determine the effect of Plyometrics Exercises on cardio-vascular Efficiency and playing ability of Inter University Badminton players.

### Design of the study

For the present study the data was collected from Inter University Badminton Players of Gondwana University, Gadchiroli Amravati. The study was delimited to 30 male Inter University Badminton players. Age of the Badminton players was ranging from 18 to 28 years. The researcher divided the Badminton players into two equal groups on the basis of the mean performance of pre-test score. The groups were equated and distributed into two homogeneous groups namely.

- 1) Experimental Group
- 2) Control Group

### Selection of Tests

- 1) Cardio-Vascular Efficiency : Coopers 12 minute run and walk
- 2) Three Judges Playing Ability Test

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**Analysis and Interpretation of Data**

To determine the significant difference in the means of Cardio-vascular Efficiency and playing ability of Badminton players between the two groups as well as between the pre-test and posttest means of experimental and control group t-test was employed.

**Level of Significance**

To find out the significance difference, level of significance was set at 0.05 level of confidence. Findings of the statistical analysis have been shown in the following tables.

**Table 1:** Mean, Standard Deviation and t-ratio for the Data on Cardio-vascular Efficiency between the Means of Pre and Post-tests of Control Group

Test	Mean	S.D.	M.D.	S.E.	t-ratio
Pre-test	2188	78.098	3.000	24.878	0.120@
Post-test	2191	57.140			

@ Not significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 1 show that, Cardio-vascular Efficiency mean difference between the pre test and post test of control group is not significant, because the calculated t-value of 0.120 is less than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 2:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability in Service of Badminton Between the Means of Pre and Post-tests of Control Group

Service	Test	Mean	S.D.	M.D.	S.E.	t-ratio
High Serve	Pre-test	4.000	1.069	0.267	0.330	0.807@
	Post-test	4.267	0.704			
Low Serve	Pre-test	3.467	0.990	0.266	0.356	0.748@
	Post-test	3.733	0.961			

@ Not significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 2 reveal that, mean difference of High Serve Ability calculated t-value of 0.807 and Low Serve Ability calculated t-value of 0.748 between the Pre-test and Post-test of Control group is not significant, because the calculated t-value was less than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 3:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability in Smash of Badminton Between the Means of Pre and Post-tests of Control Group

Smash	Test	Mean	S.D.	M.D.	S.E.	t-ratio
Fore Hand Smash	Pre-test	4.533	1.407	0.200	0.431	0.464@
	Post-test	4.333	0.900			
Back Hand Smash	Pre-test	3.933	1.033	0.134	0.377	0.354@
	Post-test	4.067	1.033			

@ Not significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 3 reveal that, mean difference of Fore Hand Smash Ability calculated t-value of 0.464 and Back Hand Smash Ability calculated t-value of 0.354 between the Pre-test and Post-test of Control group is not significant, because the calculated t-value was less than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 4:** Mean, Standard Deviation and t-ratio for the Data on Clear or Lob Ability Between the Means of Pre and Post-tests of Control Group

Test	Mean	S.D.	M.D.	S.E.	t-ratio
Pre-test	4.533	0.834	0.067	0.319	0.209@
Post-test	4.600	0.910			

@ Not significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 4 show that, Clear or Lob Ability mean difference between the Pre-test and Post-test of Control group is not significant, because the calculated t-value of 0.209 is less than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 5:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability of Badminton Between the Means of Pre and Post-tests of Control Group

Test	Mean	S.D.	M.D.	S.E.	t-ratio
Pre-test	20.467	1.807	0.533	0.723	0.738@
Post-test	21.000	2.138			

@ Not significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 5 show that, Playing Ability mean difference between the Pre-test and Post-test of Control group is not significant, because the calculated t-value of 0.738 is less than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 6:** Mean, Standard Deviation and t-ratio for the Data on Cardio-vascular Efficiency Between the Means of Pre and Post-tests of Experimental Group

Test	Mean	S.D.	M.D.	S.E.	t-ratio
Pre-test	2178	89.878	70.000	32.538	2.172*
Post-test	2248	88.331			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 6 show that, Cardio-vascular Efficiency mean difference between the Pre-test and Post-test of Experimental group is significant, because the calculated t-value of 2.172 is greater than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 7:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability in Service of Badminton Between the Means of Pre and Post-tests of Experimental Group

Service	Test	Mean	S.D.	M.D.	S.E.	t-ratio
High Serve	Pre-test	3.667	0.976	1.400	0.326	4.299*
	Post-test	5.067	0.799			
Low Serve	Pre-test	4.467	0.743	1.066	0.271	3.930*
	Post-test	5.533	0.743			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 7 reveal that, mean difference of High Serve Ability calculated t-value of 4.299 and Low Serve Ability calculated t-value of 3.930 between the Pre-test and Post-test of Experimental group is significant, because the calculated t-value are greater than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 8:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability in Smash of Badminton Between the Means of Pre and Post-tests of Experimental Group

Smash	Test	Mean	S.D.	M.D.	S.E.	t-ratio
Fore Hand Smash	Pre-test	4.200	1.014	1.133	0.336	3.371*
	Post-test	5.333	0.816			
Back Hand Smash	Pre-test	4.067	1.100	1.000	0.390	2.567*
	Post-test	5.067	1.033			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 8 reveal that, mean difference of Fore Hand Smash Ability calculated t-value of 3.371 and Back Hand Smash Ability calculated t-value of 2.567 between the Pre-test and Post-test of Experimental group is significant, because the calculated t-values are greater than the tabulated

t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 9:** Mean, Standard Deviation and t-ratio for the Data on Clear or Lob Ability Between the Means of Pre and Post-tests of Experimental Group

Test	Mean	S.D.	M.D.	S.E.	t-ratio
Pre-test	4.200	1.014	0.800	0.341	2.347*
Post-test	5.000	0.845			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 9 show that, Clear or Lob Ability mean difference between the Pre-test and Post-test of Experimental group is significant, because the calculated t-value of 2.347 is greater than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 10:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability of Cricketer Between the Means of Pre and Post-tests of Experimental Group

Test	Mean	S.D.	M.D.	S.E.	t-ratio
Pre-test	20.600	1.682	5.400	0.729	7.407*
Post-test	26.000	2.268			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(14)} = 2.144$

The above Table 10 show that, Playing Ability mean difference between the Pre-test and Post-test of Experimental group is significant, because the calculated t-

value of 7.407 is much greater than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

**Table 11:** Mean, Standard Deviation and t-ratio for the Data on Cardio-vascular Efficiency Between the Means of Post-tests of Control and Experimental Groups

Group	Mean	S.D.	M.D.	S.E.	t-ratio
Control	2191	57.140	57.000	27.163	2.111*
Experimental	2248	88.331			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(28)} = 2.048$

The above Table 11 show that, Cardio-vascular Efficiency mean difference between the Post-test of Control and Experimental groups is significant, because the calculated t-

value of 2.111 is greater than the tabulated t-value of 2.048 at 0.05 level of confidence of 28 degree of freedom.

**Table 12:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability in Service of Badminton Between the Means of Pre and Post-tests of Experimental Group

Service	Group	Mean	S.D.	M.D.	S.E.	t-ratio
High Serve	Control	4.267	0.704	0.800	0.275	2.910*
	Experimental	5.067	0.799			
Low Serve	Control	3.733	0.961	1.800	0.314	5.738*
	Experimental	5.533	0.743			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(28)} = 2.048$

The above Table 12 reveal that, mean difference of High Serve Ability calculated t-value of 2.910 and Low Serve Ability calculated t-value of 5.738 between the Post-test of Control and Experimental groups are significant, because

the calculated t-value are greater than the tabulated t-value of 2.048 at 0.05 level of confidence of 28 degree of freedom.

**Table 13:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability in Smash of Badminton Between the Means of Post-tests of Control and Experimental Groups

Smash	Test	Mean	S.D.	M.D.	S.E.	t-ratio
Fore Hand Smash	Control	4.333	0.900	1.000	0.314	3.188*
	Experimental	5.333	0.816			
Back Hand Smash	Control	4.067	1.033	1.000	0.377	2.652*
	Experimental	5.067	1.033			

\* Significant at 0.05 level  
Tabulated  $t_{0.05(28)} = 2.048$

The above Table 13 reveal that, mean difference of Fore Hand Smash Ability calculated t-value of 3.188 and Back Hand Smash Ability calculated t-value of 2.652 between the Post-test of Control and Experimental groups are significant, because the calculated t-values are greater than the tabulated t-value of 2.048 at 0.05 level of confidence of 28 degree of freedom.

**Table 14:** Mean, Standard Deviation and t-ratio for the Data on Clear or Lob Ability Between the Means of Post-tests of Control and Experimental Groups

Group	Mean	S.D.	M.D.	S.E.	t-ratio
Control	4.600	0.910	0.400	0.321	1.247@
Experimental	5.000	0.845			

@ Not Significant at 0.05 level  
 Tabulated  $t_{0.05(28)} = 2.048$

The above Table 14 show that, Clear or Lob Ability mean difference between the Post-test of Control and Experimental groups was not significant, because the calculated t-value of 1.247 is less than the tabulated t-value of 2.048 at 0.05 level of confidence of 28 degree of freedom.

**Table 15:** Mean, Standard Deviation and t-ratio for the Data on Playing Ability of Badminton Between the Means of Post-tests of Control and Experimental Groups

Group	Mean	S.D.	M.D.	S.E.	t-ratio
Control	21.000	2.138	5.000	0.805	6.213*
Experimental	26.000	2.268			

\* Significant at 0.05 level  
 Tabulated  $t_{0.05(28)} = 2.048$

The above Table 15 show that, Playing Ability mean difference between the Post-test of Control and Experimental group is significant, because the calculated t-value of 6.213 is much greater than the tabulated t-value of 2.048 at 0.05 level of confidence of 28 degree of freedom.

**Discussion of Findings**

After the statistical Analysis Pre-test and Post-test of control group was not significant, in Cardio-vascular Efficiency ( $t = 0.120$ ), High Serve Ability ( $t = 0.807$ ), Low Serve Ability ( $t = 0.784$ ) and Fore Hand Smash Ability ( $t = 0.464$ ), Back Hand Smash Ability ( $t = 0.354$ ), Clear or Lob Ability ( $t = 0.209$ ) and Overall playing Ability ( $t = 0.738$ ), because these t-values are less than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

After the statistical Analysis Pre-test and Post-test of Experimental group was not significant, in Cardio-vascular Efficiency ( $t = 2.172$ ), High Serve Ability ( $t = 4.299$ ), Low Serve Ability ( $t = 3.930$ ) and Fore Hand Smash Ability ( $t = 3.371$ ), Back Hand Smash Ability ( $t = 2.567$ ), Clear or Lob Ability ( $t = 2.347$ ) and Overall playing Ability ( $t = 7.407$ ), because these t-values are less than the tabulated t-value of 2.144 at 0.05 level of confidence of 14 degree of freedom.

Also significant difference found between Post test of Control and Experimental groups in Cardio-vascular Efficiency ( $t = 2.111$ ), High Serve Ability ( $t = 2.910$ ), Low Serve Ability ( $t = 5.738$ ) and Fore Hand Smash Ability ( $t = 3.188$ ), Back Hand Smash Ability ( $t = 2.652$ ), and Overall playing Ability ( $t = 6.213$ ), because these t-values are less than the tabulated t-value of 2.048 at 0.05 level of confidence of 28 degree of freedom.

It is also observed that insignificant difference in Clear or Lob Ability ( $t = 1.247$ ) which was less than tabulated t-value of 2.048 at 0.05 level of confidence of 28 degree of freedom.

**Conclusion**

From the above findings following are the conclusion the drawn

- There was no significant difference found in vascular Efficiency and cricket playing ability control group.
- The significant effect observed in Experimental group on cardio-vascular Efficiency and cricket playing ability, because of training schedule of players.
- In the post test of control and experimental group significant difference found in cardio-vascular Efficiency, High Serve Ability, Low Serve Ability, Fore Hand Smash Ability, Back Hand Smash Ability and Overall playing Ability. But insignificant in Clear or Lob Ability.

**Recommendation**

Researcher given some recommendation are as-

- Similar study may be conducted on girls players.
- If the training schedule increase may given the positive result on fielding ability.
- Similar study may be conducted on different level of players i.e. district, state, national etc.
- For the better and reliable result number of subjects may be increase.
- Similar study may be conducted on different age groups of players
- Similar study may be conducted on the other games players.

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