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Potency of plyometric training on body mass index among state-level thrower: An experimental study

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Abstract

Introduction: Plyometric is the type of jump training planned to enhance muscular power and explosiveness, resulting in improved athletic performance. Body Mass Index, or BMI, is the method of determining body fat derived from the height and weight of adult individuals.

Objective: The objective of the current research was to recognize the effect of plyometric training on BMI among state-level throwers.

Methods: Twenty state-represented throwers (Age-15±2.37years, Height-160±6.9cm, Weight-50±7.4 Kg) from the Barasat Athletic Club, North 24 Parganas, and West Bengal, India were purposefully chosen as the study's subjects. The total of twenty subjects were distributed to one experimental group and one control group, each with 10 subjects. Pretest scores on BMI were obtained for both groups. The experimental group was then given a 12-week plyometric training (hurdles hops, squat jumps, box jumps, and depth jumps), just when the control group received only their regular everyday activities of their training schedule. All twenty individuals (the experimental and control group) underwent a body mass index test following the experimental treatment. These results of the test served as the post-test score on BMI for both groups. The t-test was employed for statistical analysis of the pre-test and post-test results. 0.05 level of significance was set for judging significance.

Result and Discussion: Mean ±SD values of the body mass index of the pretest and post-test of the experimental group are 24.45±2.41kg/m² & 23.13±2.48 kg/m² and for the control group 21.12±3.30 kg/m² & 21.04±3.32 kg/m² respectively. For the experimental group Cal. t value is 2.61 whereas the control group it is 0.74. At the 0.05 level of significance, a value of 2.14 is required to be significant at 9df. Based on the outcome, for the experimental group, the 't' value is 2.61, that is greater than the Tab. value of 2.14, while the control group's "t" value is 0.74, which is lower than the table value of 2.14. The statistical analysis indicates a significant difference between pretest and post-test scores on body mass index for the experimental group, who participated in the plyometric training, whereas there is no significant change in the body mass index for the control group between pre-test and post-test results.

Conclusion: Twelve weeks of plyometric training considerably improve (reduce score) the BMI of the state-level thrower.

Keywords: BMI, plyometric, state-level, throwers, experimental

Introduction

Plyometric training, additionally referred to as "ploys," is a method of physical training designed to advance nervous system performance and produce quick, strong movements. It is usually employed to enhance athletic performance. (Anitha J, 2017) ^[1]. Plyometric is the type of jump training planned to enhance muscular power and explosiveness, resulting in improved athletic performance. Plyometric training improves the explosive strength of both the upper body and lower body by doing upper-body plyometric (kneeling overhead throw, underhand throws, static chest pas etc.) and lower-body plyometric (different forms of the jump-tuck jump, squat jump, box jump etc.)

Body Mass Index, or BMI, is the method of determining body fat derived from the height (m) and weight (kg) of adult individuals. Body Mass Index or BMI is a simple, popular and vastly used method devised by Adolphe Quetelet the Belgian statistician in between 1830 to 1850. For the vast majority of adults, BMI is a dependable indicator of body fat percentage. (Jebraj FA and Alexander RC, 2016) ^[3]. The BMI is measured in kilogrammes per square metre (kg/m²) and is calculated by dividing the body mass by the square of the body height.

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Underweight (less than 18.5 kg/m²), normal weight (18.5 kg/m² -24.9 kg/m²), overweight (25 kg/m² - 29.9 kg/m²), and obese (30 kg/m² or more) are the four BMI categories. (https://en.m.wikipedia.org/wiki/Body_mass_index)

Different scientific studies showed that plyometric training influenced the body mass index. Plyometric training helps in the sharp reduction of unnecessary fat accumulation in the body, improves overall fitness, and ultimately increases sports performance by specifying the measurement of body mass index. Research suggests that the higher the body mass index, the lower the fitness level. Higher levels of physical exercise are related to higher physical fitness, and inadequate physical exercise is not only linked with an increased body fat mass percentage but also causes a decrease in muscle mass. Because there is a paucity of research on the impact of plyometric exercise on BMI among state-level throwers, this study was carried out.

Objectives

- To measure the BMI for state-level throwers.
- To recognize the effect of plyometric training on BMI among state-level throwers.

Materials and Methods

Twenty state-represented throwers (Age 15±2.37 years, Height 160±6.9 cm, and Weight 50±7.4 kg) from the Barasat Athletic Club, North 24 Parganas, and West Bengal, India were purposefully chosen as the study's subjects. Chronic medical disorders like asthma or any other illness that would put the subject in danger while undergoing experimental testing were included as exclusion criteria. Throughout the programmes, the subjects abstained from using narcotics, coffee, alcohol, smoking, and other intoxicants. They signed a form providing their informed consent in order to participate as the subjects in the study voluntarily. The total twenty subjects were randomly allocated to equal two groups with ten subjects each: One experimental group and one control group. Pre-test-post-test control group research design was employed for the present study. Pre-test scores on BMI were obtained for both groups by using the BMI metric formula devised by Belgian mathematician Adolphe Quetelet in 1930, which is expressed in kg/m². The Stadiometer was used to measure height (in metres) and the weighing machine to measure weight (in kilogrammes) in order to calculate BMI. The control group did not receive the plyometric training in addition to their regular activities as per their practise routine, while the experimental group had a plyometric training treatment for twelve weeks with other daily activities. After experimental treatment, the BMI measurement was taken on all twenty subjects in the character of one experimental and one control group. These BMI scores form the Post-test scores for the present study.

Training Programme

The 12-week Plyometric exercise routine was scheduled for three days a week, 60 minutes per day, with a ten-minute warming-up and ten-minute cooling-down. The following Plyometric training protocol was taken for state-level throwers.

Exercise Name	Sets and Reps	Recovery Time
A. Box-jumps	2x4	Two minutes
B. Squat -jumps	2x4	Two minutes
C. Depth-jumps	3x4	Four minutes
D. Hurdles-hops	3x4	Four minutes

Total duration of training program: 12 weeks.

Frequency of training program: Three days/week.

Duration of a single training program: 1 hour/day.

Statistical Analysis

Mean and Standard Deviations as descriptive statistics were used to calculate the average and deviations. The significant changes in BMI between the pretest and post-test results of each group i.e. experimental group and control group were determined using a paired sample t-test. In every instance, a 0.05 level of significance was set to evaluate the significance.

Results and Discussion

Table 1: Mean, SD and t-value of body mass index (kg/m²) for experimental group between pre-test and post-test

Variable	Test	Mn	SD	DF	Calculated 't' value
Experimental Group	Pre-test	24.45	2.41	9	2.61
	Post-test	23.13	2.48	9	

* Tab 't' is 2.14 at 0.05level of significance and at 9 DF

Table-1 showed that the BMI of the experimental group in the pretest and post-test was 24.45 kg/m² and 23.13 kg/m² respectively. The experimental group's Cal. 't' value is 2.61, while the Tab. value is 2.14. Based on the outcome, for the experimental group, the 't' value is (2.61) which is greater than the Tab. value (2.14). Therefore, it can be said that a 12-week plyometric training significantly reduced the body mass index for state-level throwers.

Table 2: Mean, SD and t-value of Body Mass Index (kg/m²) for the control group between pre-test and post-test

Variable	Test	Mn	SD	DF	Calculated 't' value
Control Group	Pre-test	21.12	3.30	9	0.74
	Post-test	21.04	3.32	9	

* Tab 't' is 2.14 at 0.05level of significance and at 9df

Table-2 showed that the BMI of the control group in the pretest and post-test was 21.12kg/m² and 21.04 kg/m² respectively. The control group's calculated 't' value is 0.74, while the Tab. value is 2.14. Based on the findings, for the control group, the 't' value is 0.74 which is much lesser than the Tab. value (2.14). Therefore, it can be said that the BMI for the control group has not changed significantly.

Sinikumar, *et al.* (2017) ^[4] conducted a study to ascertain the impact of plyometric and progressive resistance training on teen males' explosive strength, cardiovascular endurance, and body composition. They showed that the plyometric exercise plan significantly increased cardiovascular endurance, increased explosive strength decreased body weight and BMI. Wankhede NA, (2022) ^[6] conducted a study to determine the effect of plyometric exercise on BMI in female volleyball players. For the study, the researcher formed one experimental and one control group consisting of 25 volleyball players each. 12 weeks of plyometric exercise were given to the experimental group. The findings of the pre-and post-test comparison of the test score for BMI show a considerable improvement in body composition (BMI). The result of the current study bears the same trends, as the study also revealed a significant improvement (reduction) in the BMI for the state-level throwers.

The present study's findings clearly demonstrate that the experimental group's BMI post-test scores, which were much lower than their pre-test scores, were improved by their 12-week plyometric exercise. In this context, a decreased body

mass index indicates improved physical fitness and reduces body fat for state-level throwers. In the post-test, a decrease in body mass index means an improvement in the physical fitness of the state-level throwers, except in the control group. It is obvious that plyometric training is the only element contributing to the state-level throwers' considerable improvement (reduction) in body mass index since the control

group did not receive any plyometric training beyond their daily routine activity. The current study exhibited that the body mass index for the experimental group was further improved (reduced) in the post-test as compared to pretest scores than the improvement of the control group. It may be specified that the body mass index decreased due to the plyometric training for state-level throwers.

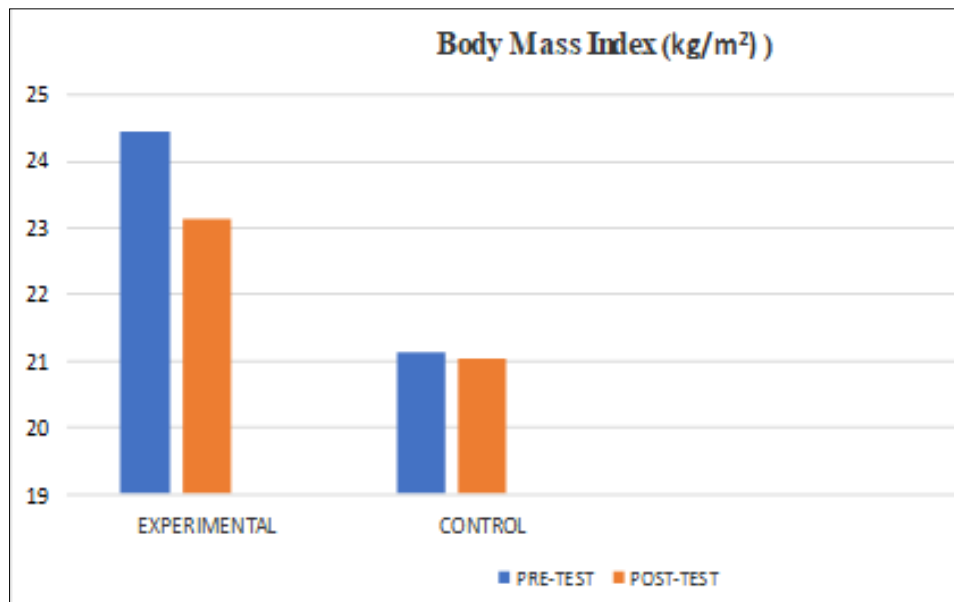


Fig 1: Graphical representation of mean on body mass index at pre-test and post-test for experimental and control group

Conclusions

According to the results of the current study, the subsequent conclusions could be drawn

1. The BMI of the state-level thrower ranged between 21.04 kg/m² and 24.45 kg/m².
2. 12 weeks of plyometric training lead to a reduction of 5.39% in BMI.
3. State-level throwers' body mass index significantly changes as a result of twelve weeks of plyometric training.
4. The coaches and trainers may incorporate plyometric training into their training programme to bring about desirable changes in BMI and improve overall fitness and performance.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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