



## Study of comparative effects of circuit training and plyometric training on selected fitness variables of secondary school boys

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### Abstract

The purpose of the study was to find out the effects of circuit training and fartlek training on selected physical fitness variables (speed, flexibility, muscular strength and muscular endurance) of the male schoolchildren's. For the present study, sixty school boys' students studying from Mahatma Gandhi intercollegiate, Gorakhpur (U.P) were selected randomly as subjects. Their age ranged from 13 to 17. Twenty subjects were distributed into three equally groups. Control group (N=20), Group – I circuit training (N=20), group–II plyometric training (N=20). The experimental groups with varied load and velocity (intensity) under went their respective training programme for three days in a week for eight weeks. Analysis of co-variance (ANCOVA) and scheffe's post hoc tests were used to examine the significance between the variables for testing groups. The analysis was carried out using SPSS version in 17.0 and statistical significance was set to a priority at  $p < 0.05$ . All physical fitness variables showed improvement of circuit training, plyometric training and control group. The speed and flexibility were not significantly proved of between experimental groups and to be improved muscular strength and muscular endurance.

**Keywords:** Speed, Flexibility, Muscular Strength and Muscular Endurance

### Introduction

There are many different training methods that help to improve the physical fitness of athletes or students. Circuit training to improve the general fitness of students. There is a strong relationship between health and physical fitness. Research shows that there is a relationship between physical fitness, changes in fitness and the mortality in healthy middle-aged men in which the increase in physical fitness may lower the risk of death and decrease the mortality of people state that the optimal level of physical fitness is conducive to the lifelong health. The improvement of physical fitness in sport participation helps to minimize the risk factors of health and leads to good health. Physical fitness is very important to sport participation. Not only can it help to develop the skill of different physical activities physiologically but also psychologically. As physical fitness involves the performance of different body parts such as heart, lungs or muscles, it affects what we can do with our minds and so it influences to some degree qualities like mental alertness and emotional stability. There are many physiological benefits of physical training on health. Suggest that physical training can improve the central nervous system and the endocrine systems, increase energy potential, increase metabolic and functional economy, improve oxidation process, improve the capacity of oxygen transport system, increase functional stability. The Traditional Circuit Training exercises include push-up, sit-up, bench lifting, squat thrusts, stepping and dumbbell raising. These exercises are performed with or without apparatus. Circuit training aims at the development of the basic components of physical fitness including muscular. The plyometric training has been suggested to improve the muscular power of athletes. Originally, plyometric training is used to improve the

explosive power of athletes (Blattner & Noble, 1979 [4]. The traditional circuits training as the plyometric exercises are specific for explosive power development (Bobbert *et al.* 1987) [5]. As circuit training may include a number of different training Scientific Culture in Physical Education & Sports exercises, some elementary plyometric exercises may be implemented in the stations of circuit training in this study to create a new plyometric circuit.

### Hypotheses

The improvement of speed, flexibility, muscular strength and muscular endurance of the male students after the traditional circuit training is superior to that after the plyometric training and control group.

### Objectives of the Study

To find out the effects of circuit training and plyometric training on selected physical fitness variables (speed, flexibility, muscular strength and muscular endurance) of the male school children's.

### Methodology

#### Selection of Subjects

For the present study, sixty school students studying from Mahatma Gandhi Inter College, Gorakhpur (U.P), were selected randomly as subjects. Their age ranged from 13 to 17. Twenty subjects were distributed into three equally groups. Control group (N=20), Group – I circuit training (N=20), group– II plyometric training (N=20), The experimental groups with varied load and velocity (intensity) underwent their respective training programme for three days in a week for eight weeks.

**Selection of Variables**

Independent variable: circuit training and plyometric training and control group  
 Dependent variables: Physical fitness components (Speed, Flexibility, Muscular Strength and Muscular Endurance)

**Physical Fitness Components**

| Criterion Variables | Instrument         |
|---------------------|--------------------|
| Speed               | 50 m Dash          |
| Flexibility         | Sit and reach test |
| Muscular strength   | Push up test       |
| Muscular endurance  | Sit up test        |

**Training Programme**

Twenty subjects participated in the traditional circuit training which included a series of traditional exercises. The selected traditional exercises in this study were shuttle run, squat thrust, and bench press, bent-knee sit-up, alternating dumbbell press, back hyperextension, weight lifting, dipping, bench stepping and squat. There were about nine to twelve different traditional exercises in each circuit of training. The number of repetitions in each exercise was gradually increased from eight

to twelve. The training intensity was required to be about 65% of the maximum capacity as indicated by the heart rate. the plyometric circuit training which consisted of a series of plyometric exercises. The plyometric exercises selected in this study included squat jump, barrier jump, lateral barrier jump, front tuck jump with knees up, incline push-up depth jump, jump from bench, plyometric sit-up, incline chest pass with medicine ball and alternate leg bound. There were also about nine to twelve different plyometric exercises in each circuit. The subjects were required to complete three circuits in each training session and there were three sessions per week. The workload, intensity, duration and frequency were similar to that of the traditional circuit training for eight weeks.

**Statistical Analysis**

Analysis of co-variance (ANCOVA) and scheffe’s post hoc tests were used to examine the significance between the variables for testing groups. The analysis was carried out using SPSS version in 21.0 and statistical significance was set to a priority at  $p < 0.05$ .

**Results**

**Table 1:** Analysis of Covariance on Criterion Variables of Experimental Groups (ANCOVA)

| Criterion variables | Adjusted post-test means (plyometric training) | Adjusted post-test means (circuit training) | Adjusted post-test means (control group) | Source of variables | Sum of square      | df      | F value  |
|---------------------|--|---|--|---------------------|--------------------|---------|----------|
| Speed               | 7.00   | 6.900                                       | 7.382                                    | B<br>W              | 1.520<br>7.700     | 2<br>54 | 5.530*   |
| Flexibility         | 18.660   | 20.400                                      | 15.178                                   | B<br>W              | 310.772<br>515.836 | 2<br>55 | 16.869*  |
| Muscular strength   | 21.862   | 18.472                                      | 14.481                                   | B<br>W              | 548.158<br>74.756  | 2<br>56 | 205.309* |
| Muscular endurance  | 30.412   | 28.701                                      | 26.321                                   | B<br>W              | 164.590<br>102.402 | 2<br>55 | 45.003*  |

\*Significant at 0.05 level of confidence.

(The table value required for significance at 0.05 levels with df 2 and 56 is 3.16).

The table –I The significant difference Where shown Between Plyometric circuit training, Traditional circuit training and control group the obtained F- ratio of speed, flexibility, muscular strength and muscular endurance for adjusted post test means were 5.530\*, 16.869\*, 205.309\* and 45.003\* respectively which are more than the table value of 3.16 for df

2 and 56 required for significant at .05 level of confidence. So the results indicate that there was a significant improvement between pre and post-test means of experimental groups. There was no change found on control group. This study indicates that Plyometric circuit training, Traditional circuit training for school children’s would support for the development of the physical fitness variables.

**Table 2:** Scheffe’s Paired Mean Difference of Experimental and Control Groups.

| Criterion variables | Plyometric circuit training group | Circuit training group | Control group | Paired mean difference | C.I  |
|---------------------|-----------------------------------|------------------------|---------------|------------------------|------|
| Speed               | 7.006                             | 6.900                  | 7.396         | 0.38                   | 0.28 |
|                     | 7.006                             | 6.900                  | 7.396         | 0.39                   |      |
| Flexibility         | 18.660                            | 20.701                 | 15.185        | 1.51                   | 2.38 |
|                     | 18.660                            | 20.701                 | 15.185        | 3.47                   |      |
| Muscular strength   | 21.884                            | 18.480                 | 14.480        | 3.40                   | 0.91 |
|                     | 21.884                            | 18.480                 | 14.480        | 3.40                   |      |
| Muscular endurance  | 30.416                            | 28.700                 | 26.320        | 1.70                   | 1.04 |
|                     | 30.416                            | 28.700                 | 26.320        | 2.38                   |      |

\* Significant at .05 level

The table -II shows the paired mean differences on speed of Plyometric circuit training and control group, Traditional

circuit training and control group are 0.38 and 0.39.the flexibility of 3.47 and 5.51 respectively. These values are

greater than the confidence interval values of for speed 0.29, and flexibility 2.38. which are no paired mean differences between speed and flexibility of Plyometric circuit training and Traditional circuit training 0.10 and 1.52. there is less than confidence interval values. The mean differences of muscular strength 3.40, 7.39 and 3.99 muscular endurance are 1.70, 4.09 and 2.38 respectively. These values are greater than the confidence interval values of 0.91 and 1.05. The result of the study shows that there were significant differences between of Plyometric circuit training and Traditional circuit training the mean differences were greater than the confidence interval values of muscular strength and muscular endurance. The speed, flexibility, muscular strength and muscular endurance are better than control groups.

### Discussion and Finding

The results of this study suggest that eight weeks of Plyometric circuit training and Traditional circuit training have a beneficial effect on speed, flexibility, muscular strength and muscular endurance on school children's. There was a control group that received no training apart from the physical fitness tests. There were significant differences found in the physical fitness test results of the traditional circuit training group and Plyometric circuit training as compared with the control group. According to the results of the Table 2 there were significant improvements of the Speed, Flexibility, Muscular Strength and Muscular Endurance where traditional circuit training group and control groups.

Muscular Strength and Muscular Endurance where significant improvements of the plyometric circuit training and control groups. It showed that different components of physical fitness were not equally affected by the traditional circuit training, the improvement in flexibility helps to decrease the chance of hamstring injuries. But there is no significance of speed and flexibility for between experimental groups.

### Conclusion

Eight weeks of training of both the plyometric circuit training group, traditional circuit training group and control group showed significant increase in speed, flexibility, Muscular Strength and Muscular Endurance. Between the experimental groups plyometric circuit training group and traditional circuit training group showed significant improvement of Muscular Strength and Muscular Endurance. There is no significance of speed and flexibility for between experimental groups.

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