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# Optimizing Adult Health: Impact of Aerobic Exercise on Selected Physical Fitness Components in Young Male Adults

Kuldeep Kumar[a] and Dr. Aarif Majeed[b]

[a] Research Scholar Department of Physical Education Panjab University, Chandigarh, India
[b] Assistant Professor Department of Physical Education Guru Kashi University Talwandi Sabo Bathinda India

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**Abstract**

The present study investigates the impact of a structured aerobic exercise program on cardiovascular endurance, flexibility and body mass index (BMI) among young male adults aged 18–25 years. A total of forty participants were selected through simple random sampling and equally divided into an experimental group (n = 20) and a control group (n = 20). The experimental group underwent a six-week aerobic exercise intervention, consisting of walking, slow running, running, cycling and dancing performed six days per week with progressive duration and intensity. Cardiovascular endurance was assessed using a standard step test, flexibility was measured via the Sit & Reach test and BMI was calculated using height and weight measurements. Pre and post-tests were conducted for both groups and data were analyzed using paired and independent sample t-tests at a 0.05 level of significance. The results revealed significant improvements in cardiovascular endurance and flexibility among participants in the experimental group, whereas BMI remained statistically unchanged. The control group showed no significant changes in any variable, confirming the effectiveness of structured aerobic exercise in enhancing specific physical fitness components. These findings suggest that aerobic exercise is an effective intervention for improving cardiovascular health and flexibility among young adults. However, short-term aerobic training alone may not significantly affect BMI, highlighting the need for longer duration interventions combined with dietary and lifestyle modifications. The study provides valuable insights for physical education instructors, coaches and adults seeking evidence-based methods to enhance health and functional fitness through aerobic training.

## Introduction

Physical fitness is an essential determinant of overall health and well-being, particularly in young adults who are at a critical stage for establishing lifelong healthy habits [3]. Among the key components of physical fitness, cardiovascular endurance, flexibility and body composition play significant roles in determining functional capacity, athletic performance and the prevention of chronic diseases [13]. Regular participation in structured physical activity has been consistently shown to improve cardiovascular function, muscle performance, joint mobility and metabolic health, thereby enhancing quality of life [1, 14].

Aerobic exercise, defined as prolonged, rhythmic physical activity performed at moderate intensity, relies primarily on the aerobic energy system and oxygen metabolism to generate energy for sustained activity [8]. Common forms of aerobic activity include walking, jogging, running, swimming, cycling and dance-based routines. These exercises enhance oxygen uptake, stroke volume, cardiac output and muscular endurance, contributing to improved cardiovascular fitness [7, 12]. Aerobic exercise also stimulates metabolic adaptations, such as increased mitochondrial density, enhanced oxidative enzyme activity and improved lipid metabolism, which are critical for long-term health maintenance [19].

Flexibility, another key component of fitness, refers to the ability of a joint or series of joints to move through an unrestricted range of motion. Flexibility is crucial for daily functioning, reducing the risk of musculoskeletal injuries and optimizing movement efficiency [2]. While stretching protocols are commonly used to enhance flexibility, evidence suggests that aerobic exercises involving continuous dynamic movements can also positively affect joint mobility, muscle elasticity and overall flexibility [11].

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Body mass index (BMI), a proxy for body composition, is often used to assess weight status and health risks associated with overweight or obesity. While aerobic exercise has been associated with caloric expenditure and weight control, short-term aerobic interventions may not significantly influence BMI without accompanying dietary regulation or longer intervention periods [16].

The transition from adolescence to young adulthood is marked by changes in lifestyle, including reduced physical activity, increased sedentary behaviors and dietary shifts, which may negatively impact physical fitness and health outcomes [18]. Therefore, identifying effective strategies to improve cardiovascular endurance, flexibility and body composition in young adults is crucial for both health promotion and disease prevention.

Despite abundant research on aerobic exercise, limited controlled experimental studies have examined the combined effects of aerobic exercise on cardiovascular endurance, flexibility and BMI in young male adults, particularly within Indian university settings. The present study aims to address this gap by evaluating the effectiveness of a six-week aerobic exercise program on these selected physical fitness components.

**Methodology**

An experimental pre-test and post-test control group design was employed to determine the causal effects of aerobic exercise on selected physical fitness components. This design allows for direct comparison of changes in the experimental group against a non-intervention control group, thereby controlling for extraneous variables that may influence physical fitness outcomes.

Forty male adults aged 18–25 years were selected from the university campus using simple random sampling. Inclusion criteria required participants to be free from cardiovascular, musculoskeletal, or metabolic disorders and able to participate in moderate intensity physical activity. To determine the effect of a six-week aerobic exercise program on cardiovascular endurance among young male adults. To assess the impact of aerobic exercise on flexibility. To evaluate changes in body mass index following a structured aerobic training intervention. Aerobic exercise will result in significant improvements in cardiovascular endurance. Aerobic exercise will lead to significant enhancements in flexibility. Aerobic exercise will produce significant changes in BMI.

Participants were divided into two homogeneous groups based on pre-test scores:

- **Experimental Group (n = 20):** Underwent structured aerobic exercise intervention
- **Control Group (n = 20):** Maintained regular daily activity without structured exercise.

Homogeneity was ensured by comparing the mean pre-test scores for cardiovascular endurance and flexibility, thereby minimizing initial group differences.

**Aerobic Training Program**

The experimental group participated in a progressive six-week aerobic exercise program designed to enhance cardiovascular endurance, flexibility and body mass index. Sessions were conducted six days per week, with Sunday designated as a rest day. Each session included:

- **Warm-up:** 15 minutes of dynamic stretching and light jogging
- **Main aerobic activity**: Walking, slow running, running, cycling, and dance-based movement
- **Cool-down**: 10 minutes of stretching and breathing exercises

The training program increased in duration and intensity over time as follows:

| Week | Exercise Type | Duration per Activity | Recovery | Total Volume |
|---|---|---|---|---|
| I–II | Walking, Slow Running, Running, Cycling, Dancing | 5–10 min each | 1 min between exercises | 40 min |
| III–IV | Walking, Slow Running, Running, Cycling, Dancing | 8–15 min each | 3 min between exercises | 60 min |
| V–VI | Walking, Slow Running, Running, Cycling, Dancing | 10–20 min each | 5 min between exercises | 80 min |

**Assessment Measures**

- **Cardiovascular Endurance:** Measured using the step test protocol, recording heart rate recovery post-exercise.
- **Flexibility:** Assessed using the Sit & Reach test, which measures hamstring and lower back flexibility.
- **Body Mass Index (BMI):** Calculated using height (meters) and weight (kilograms) to evaluate changes in body composition.

Pre-tests were conducted one week prior to the start of the aerobic intervention to assess baseline performance. Following the six-week program, post-tests were conducted using identical protocols. Paired t-tests evaluated within-group changes, and independent t-tests assessed differences between the experimental and control groups at $p < 0.05$.

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## Results

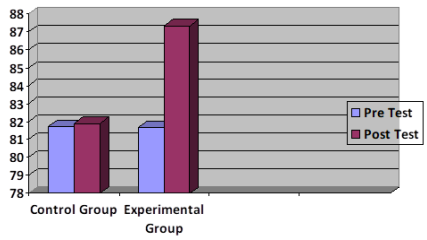
### Cardiovascular Endurance

| Group | Test | Mean | SD | Mean Difference | t-value | Significance |
|---|---|---|---|---|---|---|
| Control | Pre | 81.71 | 4.19 | 0.17 | 0.89 | NS |
| Control | Post | 81.88 | 3.07 | | | |
| Experimental | Pre | 81.66 | 2.86 | 5.68 | 4.58 | S |
| Experimental | Post | 87.34 | 4.57 | | | |
| Control vs Experimental | Post | 81.88 / 87.34 | 3.07 / 4.57 | 5.46 | 7.50 | S |

NS: Not significant ($p > 0.05$), S: Significant ($p < 0.05$)

The experimental group showed a significant increase in cardiovascular endurance ($t = 4.58$, $p < 0.05$) from pre-test ($M = 81.66$, $SD = 2.86$) to post-test ($M = 87.34$, $SD = 4.57$). The control group demonstrated no significant changes ($t = 0.89$, $p > 0.05$). Post-test comparisons between groups revealed a significant difference ($t = 7.50$, $p < 0.05$), confirming the effectiveness of aerobic training.

**Graph 1** Graphically representation of Cardiovascular Endurance of control and Experimental group



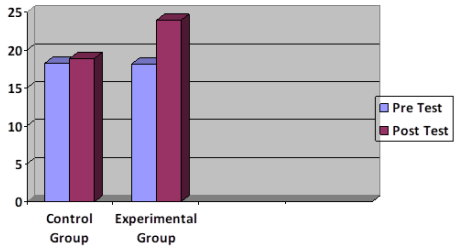

### Flexibility (Sit & Reach Test)

| Group | Test | Mean | SD | Mean Difference | t-value | Significance |
|---|---|---|---|---|---|---|
| Control | Pre | 18.25 | 1.89 | 0.6 | 0.30 | NS |
| Control | Post | 18.85 | 1.76 | | | |
| Experimental | Pre | 18.15 | 3.08 | 5.7 | 5.11 | S |
| Experimental | Post | 23.85 | 2.89 | | | |
| Control vs Experimental | Post | 18.85 / 23.85 | 1.76 / 2.89 | 5.0 | 8.19 | S |

NS: Not significant ($p > 0.05$), S: Significant ($p < 0.05$)

Flexibility improved significantly in the experimental group ($t = 5.11$, $p < 0.05$), increasing from $M = 18.15$, $SD = 3.08$ to $M = 23.85$, $SD = 2.89$. The control group remained statistically unchanged ($t = 0.30$, $p > 0.05$). Post-test comparisons between groups were also significant ($t = 8.19$, $p < 0.05$).

**Graph 2** Graphically representation of Flexibility of control and Experimental group.



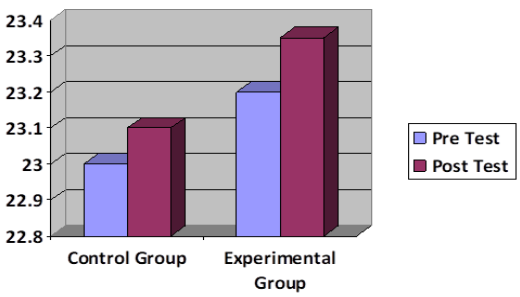

### Body Mass Index

| Group | Test | Mean | SD | Mean Difference | t-value | Significance |
|---|---|---|---|---|---|---|
| Control | Pre | 23.0 | 1.5 | 0.1 | 0.45 | NS |
| Control | Post | 23.1 | 1.4 | | | |
| Experimental | Pre | 23.2 | 1.6 | 0.15 | 0.65 | NS |
| Experimental | Post | 23.35 | 1.5 | | | |
| Control vs Experimental | Post | 23.1 / 23.35 | 1.4 / 1.5 | 0.25 | 0.78 | NS |

NS: Not significant ($p > 0.05$), S: Significant ($p < 0.05$)

No significant changes in BMI were observed in either the experimental group ($t = 0.65$, $p > 0.05$) or the control group ($t = 0.45$, $p > 0.05$). The post-test comparison between groups also showed no significant differences ($t = 0.78$, $p > 0.05$), indicating that BMI was unaffected by six weeks of aerobic training alone.

Graph 3 Graphically representation of Body Mass Index of control and Experimental group.



## Discussion

The findings demonstrate that structured aerobic exercise significantly improves cardiovascular endurance and flexibility among young male adults, corroborating previous research [1, 14]. The increase in cardiovascular endurance can be attributed to adaptations in the cardiovascular and respiratory systems, including increased stroke volume, cardiac output, and $VO_2$ max [12]. These adaptations enhance the ability to sustain moderate-intensity activity, thereby improving overall fitness and reducing risk factors for cardiovascular disease [19].

Flexibility improvements observed in this study are likely due to the dynamic stretching and rhythmic joint movements inherent in aerobic exercise. Continuous movement facilitates elongation of muscles and tendons, resulting in greater joint range of motion [2]. These findings are consistent with prior studies showing that aerobic-based programs can enhance flexibility without dedicated static stretching routines [11].

The lack of significant change in BMI aligns with existing literature indicating that short-term aerobic interventions without dietary control or higher caloric expenditure may be insufficient to induce substantial changes in body composition [16]. Longer-term interventions, coupled with nutritional guidance, may be necessary to achieve meaningful BMI reductions.

Overall, this study highlights the practical application of aerobic exercise in university settings, demonstrating that even short-term, structured aerobic programs can significantly enhance key components of physical fitness.

## Conclusion

- Aerobic exercise significantly improves cardiovascular endurance among young male adults.
- Aerobic exercise significantly enhances flexibility.
- Short-term aerobic exercise does not significantly affect BMI.
- Structured aerobic training programs provide a practical, safe, and effective approach to improving physical fitness in young adults.
- For body composition changes, longer-duration interventions with dietary control are recommended.

**Conflict of Interest**: NIL

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**Declarations:**

**Authors' Contribution**:

- [a-b]Conceptualization, data collection, interpretation, drafting of the manuscript and intellectual revisions
- The authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed

**Correspondence:**

Dr. Aarif Majeed

bhatarif989@gmail.com