



Comparative Study of Blood Pressure Levels Among Athletes and Non-Athletes

Rakesh Kumar Dwivedi

Assistant professor, Department of Physical Education,

Sri jai Narain Misra P.G. College Lucknow

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ABSTRACT

This study aims to analyse and compare the blood pressure levels between athletes and non-athletes, providing insight into the cardiovascular health of physically active versus sedentary populations. Blood pressure is a critical indicator of cardiovascular health, and regular physical activity is known to have profound effects on cardiovascular function. The research examines a sample of 200 individuals, divided into two groups: 100 athletes from various sports and 100 non-athletes with a sedentary lifestyle. Blood pressure measurements, including systolic and diastolic readings, were taken under controlled conditions. The data were analysed to identify significant differences between the two groups and to explore the impact of factors such as age, gender, and type of sport on blood pressure levels. The results show that athletes generally have lower average systolic and diastolic blood pressure compared to non-athletes. This difference is particularly notable in endurance athletes, whose cardiovascular systems exhibit superior efficiency. Non-athletes, particularly those with sedentary habits, are more prone to elevated blood pressure, which may increase their risk for hypertension and related cardiovascular diseases. The study concludes that regular physical activity, especially in the form of sports, contributes to healthier blood pressure levels and can be a

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preventative measure against hypertension. These findings highlight the importance of promoting physical fitness as a public health strategy to combat cardiovascular diseases.

Introduction:

Blood pressure is one of the most critical indicators of cardiovascular health and is closely linked to various lifestyle factors, including physical activity levels. Elevated blood pressure, or hypertension, is a major risk factor for cardiovascular diseases such as heart attack, stroke, and kidney disease, and is a leading cause of mortality worldwide. Regular physical activity has long been recognized as a key factor in maintaining cardiovascular health, improving heart function, and reducing blood pressure. Conversely, a sedentary lifestyle is associated with increased risks of hypertension and other cardiovascular conditions. Athletes, due to their regular training and high levels of physical activity, often exhibit improved cardiovascular efficiency and lower blood pressure compared to the general population. Endurance sports, in particular, have been shown to enhance heart function, reduce resting heart rate, and contribute to lower systolic and diastolic blood pressure levels. On the other hand, individuals who lead sedentary lifestyles may experience poorer cardiovascular health, including higher blood pressure levels, due to the lack of physical conditioning. Despite the well-established link between exercise and blood pressure, there is a need for a deeper understanding of the differences in blood pressure between athletes and non-athletes, especially when controlling for variables such as age, gender, and lifestyle factors. The primary aim of this study is to investigate these differences by comparing the blood pressure levels of athletes from various sports with those of non-athletes. By doing so, this study seeks to provide valuable insights into how physical activity influences cardiovascular health and contributes to the prevention of hypertension.

This research is particularly important given the growing prevalence of sedentary behaviour in modern society, coupled with the increasing rates of hypertension. Understanding the extent to which regular physical activity can mitigate these risks will provide a stronger foundation for public health recommendations that promote active lifestyles as a preventive measure against cardiovascular diseases.

In this context, the study addresses the following research questions:

1. What are the differences in systolic and diastolic blood pressure levels between athletes and non-athletes?
2. How do age, gender, and the type of sport influence blood pressure variations among athletes?



3. Can regular physical activity significantly reduce the risk of hypertension in non-athletes?

The findings of this study will contribute to the broader understanding of the role of physical activity in maintaining cardiovascular health and may support policies aimed at reducing hypertension through active lifestyles.

PROCEDURE AND METHODOLOGY:

Study Design

This comparative study employs a cross-sectional design to analyze and compare blood pressure levels among athletes and non-athletes. The study focuses on identifying variations in systolic and diastolic blood pressure between these two groups, along with exploring the influence of factors such as age, gender, and the type of sport practiced by athletes.

Sample Selection

The study involved a total sample size of 200 individuals, divided into two groups:

- **Group A (Athletes):** 100 individuals who regularly participate in organized sports activities, including both endurance sports (e.g., running, cycling, swimming) and strength-based sports (e.g., weightlifting, wrestling).
- **Group B (Non-Athletes):** 100 individuals leading a predominantly sedentary lifestyle, with minimal or no involvement in regular physical activities.

Participants were recruited through local sports clubs, fitness centres and community outreach programs. The non-athlete group was selected from workplaces and academic institutions. All participants were screened to ensure they had no pre-existing cardiovascular diseases or were not on any medication that could influence blood pressure levels.

Inclusion and Exclusion Criteria

- **Inclusion Criteria:**
 - Ages 18–40 years.
 - No history of cardiovascular diseases or chronic health conditions.
 - No use of medications affecting blood pressure.



- **Exclusion Criteria:**

- Pregnant women.
- Individuals with a history of smoking or substance abuse.
- Participants with medical conditions or medications influencing blood pressure.

Data Collection

Blood pressure readings were collected under standardized conditions using digital sphygmomanometers. Measurements were taken in a quiet environment after participants had rested for at least 10 minutes to ensure accurate baseline values. The following steps were taken to ensure consistency in data collection:

1. **Measurement Procedure:**

- Each participant's blood pressure was measured on three occasions, at intervals of two minutes.
- The average of the three readings was recorded for both systolic and diastolic blood pressure.
- Measurements were taken from the left arm with the participant seated in a comfortable chair, feet flat on the floor, and arm supported at heart level.

2. **Additional Data Collection:**

- Height, weight, and body mass index (BMI) were recorded.
- A brief questionnaire was administered to gather information on lifestyle factors, including diet, sleep patterns, and stress levels.

Grouping of Athletes

The athletes were categorized based on the type of sport they participated in, specifically:

- **Endurance Athletes:** Those engaged in sports such as long-distance running, cycling, swimming, or triathlons.
- **Strength-Based Athletes:** Those involved in sports emphasizing strength, such as weightlifting, wrestling, and bodybuilding.



This categorization was done to analysed whether the type of physical activity had a differential impact on blood pressure levels.

Data Analysis

The collected data were statistically analysed using the following methods:

1. **Descriptive Statistics:** The mean, standard deviation, and range of systolic and diastolic blood pressure levels were calculated for both groups (athletes and non-athletes).
2. **Comparative Analysis:** An independent t-test was used to determine whether there were significant differences in blood pressure between athletes and non-athletes. A significance level of $p < 0.05$ was used.
3. **Subgroup Analysis:** ANOVA was employed to assess the impact of age, gender, and the type of sport on blood pressure within the athlete group.
4. **Correlation Analysis:** Pearson's correlation coefficient was used to evaluate the relationship between BMI and blood pressure levels across both groups.

Ethical Considerations

This study was conducted in compliance with ethical standards, ensuring the safety and well-being of participants. Informed consent was obtained from all participants before data collection. The study was approved by an institutional review board (IRB), and confidentiality of personal data was maintained throughout the research process.

Conclusion of Methodology

This procedure and methodology ensured that data collection was consistent, unbiased, and reliable, allowing for meaningful comparisons between the blood pressure levels of athletes and non-athletes. The analysis provided insights into the influence of regular physical activity on cardiovascular health.

Descriptive Statistics

The study involved 200 participants, with 100 in the athlete group (Group A) and 100 in the non-athlete group (Group B). The mean systolic and diastolic blood pressure levels, along with standard deviations, were calculated for both groups.



- **Athletes (Group A):**
 - **Mean Systolic Blood Pressure (SBP):** 116 mmHg ($\pm$ 8 mmHg)
 - **Mean Diastolic Blood Pressure (DBP):** 72 mmHg ($\pm$ 5 mmHg)
- **Non-Athletes (Group B):**
 - **Mean Systolic Blood Pressure (SBP):** 128 mmHg ($\pm$ 10 mmHg)
 - **Mean Diastolic Blood Pressure (DBP):** 80 mmHg ($\pm$ 7 mmHg)

These values indicate that athletes, on average, have lower blood pressure compared to non-athletes. The difference was observed in both systolic and diastolic pressure, suggesting improved cardiovascular health among athletes.

Comparative Analysis

An independent t-test was conducted to compare the blood pressure levels between athletes and non-athletes. The results showed significant differences between the two groups:

- **Systolic Blood Pressure ($p < 0.001$):** Athletes had significantly lower systolic blood pressure compared to non-athletes.
- **Diastolic Blood Pressure ($p < 0.001$):** Athletes also had significantly lower diastolic blood pressure compared to non-athletes.

This suggests that regular physical activity, such as participation in sports, is associated with lower blood pressure levels, supporting the hypothesis that athletes generally have better cardiovascular health than non-athletes.

Subgroup Analysis: Impact of Sport Type

To further explore the differences within the athlete group, the athletes were divided into two subgroups: endurance athletes and strength-based athletes.

- **Endurance Athletes:**
 - **Mean SBP:** 112 mmHg ($\pm$ 7 mmHg)
 - **Mean DBP:** 70 mmHg ($\pm$ 4 mmHg)



- **Strength-Based Athletes:**
 - **Mean SBP:** 120 mmHg ($\pm$ 9 mmHg)
 - **Mean DBP:** 74 mmHg ($\pm$ 6 mmHg)

Endurance athletes had the lowest blood pressure levels, significantly lower than strength-based athletes. The difference was most pronounced in systolic blood pressure. This finding suggests that endurance sports, which involve sustained aerobic activity, have a greater impact on reducing blood pressure levels compared to strength-based sports.

Influence of Age and Gender

An ANOVA test was used to determine the impact of age and gender on blood pressure within the athlete and non-athlete groups.

- **Age:** Blood pressure increased slightly with age in both groups, but the rate of increase was more significant in non-athletes. Older non-athletes (age 30-40) had a higher risk of elevated blood pressure, while athletes in the same age group maintained relatively stable, lower readings.
- **Gender:**
 - In both groups, men had slightly higher systolic and diastolic blood pressure compared to women, but the differences were not statistically significant ($p > 0.05$).
 - Among athletes, female endurance athletes had the lowest blood pressure readings, reinforcing the cardiovascular benefits of endurance activities.

Correlation with BMI

Pearson's correlation coefficient was calculated to assess the relationship between body mass index (BMI) and blood pressure. In non-athletes, there was a positive correlation between BMI and blood pressure ($r = 0.45$, $p < 0.01$), indicating that higher BMI was associated with elevated blood pressure. In athletes, the correlation was weak ($r = 0.18$, $p > 0.05$), suggesting that regular physical activity mitigated the impact of BMI on blood pressure.



Summary of Key Findings

1. **Athletes had significantly lower systolic and diastolic blood pressure levels** compared to non-athletes.
2. **Endurance athletes exhibited the lowest blood pressure readings**, particularly in systolic pressure, indicating a strong cardiovascular benefit from aerobic sports.
3. **Non-athletes, particularly those with higher BMI, had elevated blood pressure**, placing them at greater risk for hypertension.
4. **Age had a more significant impact on non-athletes' blood pressure**, while athletes maintained more stable readings as they aged.
5. **Gender differences in blood pressure were minor**, with no statistically significant variations between men and women in both groups.

Conclusion:

The findings confirm that regular physical activity, especially in the form of endurance sports, contributes to lower blood pressure levels and enhanced cardiovascular health. Non-athletes, particularly those with higher BMI or older age, are more susceptible to elevated blood pressure, increasing their risk of hypertension and related diseases. These results underscore the importance of promoting physical fitness and active lifestyles as a preventive measure against cardiovascular diseases.

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