



## EFFECT OF PHYSICAL TRAINING ON PULSE RATE OF UNDER-GRADUATE STUDENTS

Mr. Bhartendu Singh Chauhan<sup>1\*</sup>, Prof. (Dr.) Sandeep Kumar<sup>2</sup>

### Abstract:

This research study explores the impact of physical training on the pulse rate of 60 undergraduate students enrolled at Swami Vivekanand Subharti University in Meerut. The main objective of this study is to assess the influence of a structured physical training program on the participants' pulse rate, aiming to provide insights into the potential cardiovascular benefits of regular exercise for young adults. A pre-mid-post intervention design was employed, wherein the 60 participants were randomly divided into two groups: the experimental group (n=30) and the control group (n=30). The experimental group underwent a 12-week physical training program that incorporated a diverse range of aerobic and anaerobic exercises, targeting various muscle groups and cardiovascular fitness. Post-intervention, final pulse rate measurements were taken for both groups, allowing for a comprehensive analysis of any changes that occurred. The analysis of the data revealed statistically significant differences in the pulse rate in experimental and control groups. After the 12-week physical training intervention, the dependent t-test was applied and the experimental group demonstrated a decrease in pulse rate while compared to the control group. These findings suggest that regular physical training can lead to improved cardiovascular health, as indicated by a reduction in pulse rate, potentially contributing to better cardiac efficiency and overall heart health in young adults. In conclusion, this study shows the significance of incorporating regular physical training into the lives of undergraduate students to promote cardiovascular health and overall well-being. By establishing and supporting physical training programs on university campuses, educational institutions can foster a culture of fitness and health among their student population.

**Keywords:** Physical training, Pulse rate, Undergraduate students, Swami Vivekanand Subharti University, Meerut

---

<sup>1\*</sup>Ph.D Scholar, Department of Physical Education, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India, Email-bhartenduchauhan00468@gmail.com;(+917007693419)

<sup>2</sup>Dean, Faculty of Education, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India

**\*Corresponding Author:** Mr. Bhartendu Singh Chauhan

\*Ph.D Scholar, Department of Physical Education, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India, Email-bhartenduchauhan00468@gmail.com;(+917007693419)

**DOI:** 10.48047/ecb/2023.12.si10.00503

## INTRODUCTION

"In the complex tapestry of human physiology, the pulse rate, a term synonymous with heart rate, assumes a paramount role. It is defined as the rhythmic measurement of the heart's contractions, quantifying the number of beats orchestrated by this vital organ within the span of one minute. This fundamental metric, expressed in beats per minute (BPM), serves as a fundamental pillar in the assessment of cardiovascular dynamics and overall health. Palpated with care at key arterial sites, such as the radial artery at the wrist or the carotid artery in the neck, the pulse rate unveils the heart's melodious cadence, inviting a deeper understanding of the human body's inner symphony."(Cardiologist, E. A., 2023)

Pulse rate, also known as heart rate, is a fundamental physiological parameter that reflects the number of times the heart beats per minute (BPM). It serves as a critical indicator of cardiovascular health and overall well-being. This essential vital sign has been extensively studied and monitored in medical practice and research, offering valuable insights into an individual's health status.

The pulse rate is typically measured by palpating an artery, most commonly the radial artery at the wrist or the carotid artery in the neck. It is a vital component of basic health assessments and plays a crucial role in diagnosing and monitoring various medical conditions. The measurement of pulse rate dates back centuries, with ancient texts such as the Edwin Smith Papyrus (circa, 1600) mentioning its significance in diagnosing illness. In adults, the normal resting pulse rate ranges from 60 to 100 beats per minute (BPM) (American Heart Association, 2021). Factors such as age, fitness level, and emotional state can influence pulse rate, leading to variations within the normal range (Mayo Clinic, 2021). It is a vital sign routinely assessed in clinical settings to evaluate a patient's cardiovascular health and response to treatment (American Heart Association, 2021). Abnormal pulse rates can indicate underlying medical conditions, such as tachycardia (heart rate above 100 BPM) or Bradycardia (heart rate below 60 BPM) (Cleveland Clinic, 2021). It is used to gauge exercise intensity and monitor fitness progress, with lower resting heart rates often indicating better cardiovascular conditioning (American Council on Exercise, 2021). Resting heart rate tends to increase with age, making it an important parameter in assessing cardiovascular health in older adults (Harvard Health Publishing, 2019). Modern medicine has introduced non-invasive

electronic devices like pulse oximeters, which use infrared light to measure pulse rate accurately (National Center for Biotechnology Information, 2019). Elevated pulse rates during stressful situations illustrate the mind-body connection, emphasizing the role of emotions in heart health (Harvard Health Publishing, 2019). Pulse rate is monitored during medical interventions like surgeries and anesthesia administration to ensure patient safety (National Library of Medicine, 2021). Pulse rates in children and infants vary with age, serving as a crucial assessment tool in pediatric medicine.

Pulse rate is a fundamental physiological parameter that provides valuable information about an individual's health status and is essential for medical assessment and monitoring. Its clinical importance and adaptability to modern technology make it a vital aspect of healthcare and well-being.

Regarded as a cornerstone of health assessment, the pulse rate, measured in beats per minute (BPM) holds significant importance in Indian healthcare. Its value in cardiovascular evaluation aligns with global medical practices (Indian Heart Association, 2021). Abnormal pulse rates, such as tachycardia and Bradycardia, can be indicative of various health conditions, emphasizing its diagnostic relevance (Rajendra, S., et al. (2020). For those engaged in India's diverse fitness pursuits, the pulse rate serves as a metric for tracking exercise intensity and cardiovascular fitness, aligning with a holistic approach to well-being (The Telegraph India. (2021). Age-related considerations are paramount in India's aging population, where changes in resting heart rate hold valuable insights into cardiovascular health during the later stages of life (Mohan, V., & Deepa, R. (2013). In an era of technological innovation, pulse rate measurements in India benefit from cutting-edge devices, including pulse oximeters, aiding in precise assessments (The Times of India. (2020). Moreover, the pulse rate's responsiveness to emotional states echoes India's rich tradition of mind-body harmony, deepening the understanding of holistic health (Ravindra, P. N. (2019). In the realm of pediatric care in India, it remains an essential tool for assessing the health of the nation's children (Nangia, S., & Roy, M. P. (2017). Thus, from the foothills of the Himalayas to the southern shores of the Indian Ocean, the pulse rate resonates as a universal marker of health and vitality, enriching the diverse tapestry of healthcare in India.

## METHODOLOGY

For the purpose of the study and for selecting the final subjects of the research, Sphygmomanometer and Cooper's 12 minute run/walk test respectively were conducted to assess the performance of population. Based on the performance of the test, top 25% and last 25% from the merit were excluded and rests were considered as the population for the selection of the subjects. 60 subjects were selected from population. These subjects were further equally divided into groups i.e. 30 students (experimental group) and 30 students (control group). The subject's age range was from 18 to 23 years. The consent form was collected from the subject before start in the experiment as the subjects were physically fit and having no disease which may affect the research.

## RESULT

**TABLE NO – 1 Effect of Physical Training on Pulse Rate of Experimental group**

| EXPERIMENTAL GROUP | TRAINING DURATION | TIME | N   | MEAN  | S.D.  | T-RATIO |
|--------------------|-------------------|------|-----|-------|-------|---------|
|                    | 1-6 WEEK          |      | PRE | 30    | 75.10 | 2.78    |
| MID                |                   |      | 30  | 74.20 | 2.37  |         |
| 7-12 WEEK          |                   | MID  | 30  | 74.20 | 2.37  | 0.39    |
|                    |                   | POST | 30  | 73.97 | 2.16  |         |
| 1-12 WEEK          |                   | PRE  | 30  | 75.10 | 2.78  | 1.76*   |
|                    |                   | POST | 30  | 73.97 | 2.16  |         |

\*Significant at 0.05 level of confidence at df-29, t-value-1.699

Table no – 1 shows the average score of Pulse rate (Experimental group) of the physical education students that are 75.10 (PRE), 74.20 (MID) and 73.97 (POST) respectively. It shows significant difference in third assessment (POST) of Pulse rate of physical education students as the obtained t-ratio 1.76 was found higher than the required table value 1.699 at 0.05 level of confidence whereas the

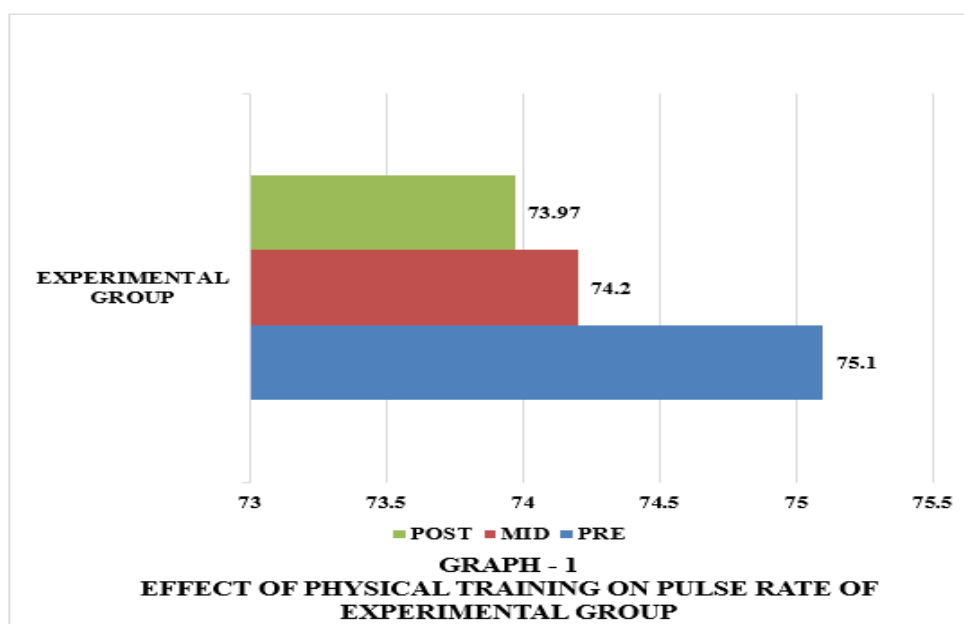
## Administration of test:

To check pulse at your wrist, place two fingers between the bone and the tendon over your radial artery which is located on the thumb side of your wrist. When you feel your pulse, count the number of beats in 15 seconds. Multiply this number by four to calculate your beats per minute.

## STATISTICAL ANALYSIS

Data were entered and analyzed using spreadsheet. Descriptive data were calculated using mean and standard deviation (SD). Dependent t-test was used to determine the significance level of difference in Pulse rate of the students at 0.05 level of significance.

first and second assessments (PRE & POST) shows insignificant difference as the obtained t-ratio 1.34 and 0.39 respectively were found lower than the required table value 1.699 at 0.05 level of confidence. It indicates that the Pulse rate of subjects enhanced after the application of physical training at third interval of assessment.



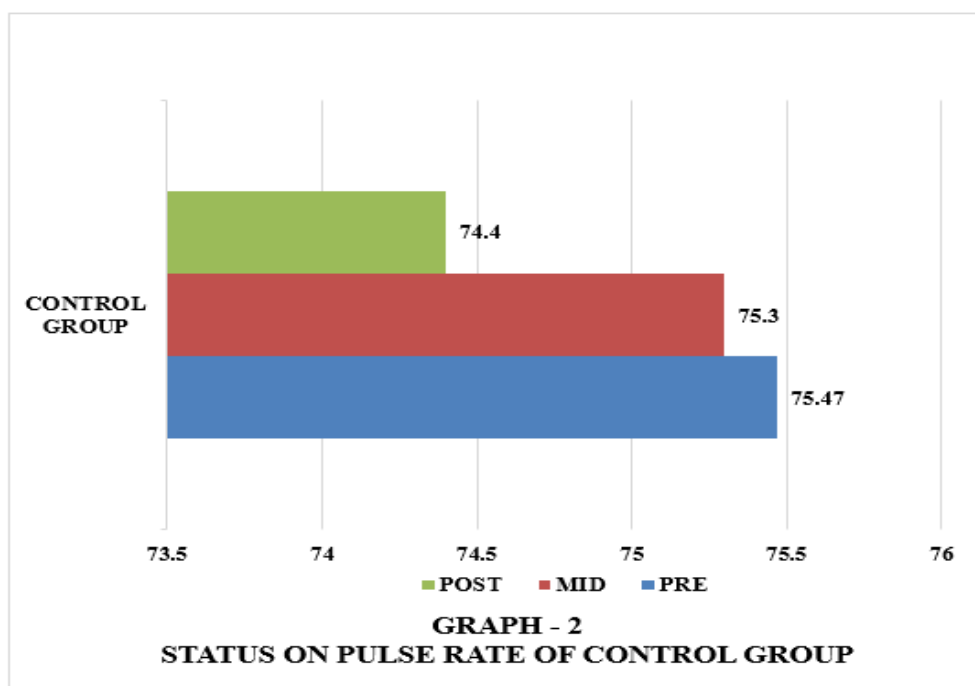
**TABLE NO – 2 Status on Pulse Rate of Control group**

| CONTROL GROUP | TRAINING DURATION | TIME | N   | MEAN  | S.D.  | T-RATIO |
|---------------|-------------------|------|-----|-------|-------|---------|
|               | 1-6 WEEK          |      | PRE | 30    | 75.47 | 3.29    |
|               |                   | MID  | 30  | 75.30 | 3.00  |         |
| 7-12 WEEK     |                   | MID  | 30  | 75.30 | 3.00  | 1.23    |
|               |                   | POST | 30  | 74.40 | 2.63  |         |
| 1-12 WEEK     |                   | PRE  | 30  | 75.47 | 3.29  | 1.38    |
|               |                   | POST | 30  | 74.40 | 2.63  |         |

\*Significant at 0.05 level of confidence at df-29, t-value-1.699

Table no – 2 shows the average score of Pulse rate (Control group) of the physical education students which are 75.47 (PRE), 75.30 (MID) and 74.40(POST) respectively. It shows insignificant

difference in Pulse rate of physical education students as the obtained t-ratio 0.20, 1.23 and 1.38 respectively were found lower than the necessary table value 1.699 at 0.05 level of confidence.



**DISCUSSION & CONCLUSION**

An elevation in pulse rate, a crucial vital sign, can be attributed to a spectrum of factors, both physiological and psychological, as elucidated in Indian medical literature. Physical exertion and exercise lead to an expected increase in pulse rate, aligning with the body's need for enhanced oxygen delivery during activity (National Institute of Nutrition, India) (Sharma, M., et al., 2016). This response is particularly pronounced during physical training and exercise, where the heart pumps more vigorously to meet the increased oxygen demand of working muscles (Indian Journal of Physiology and Pharmacology) (Kulkarni, S., et al., 2018). Emotional stress and anxiety, ubiquitous in modern life, exert a profound influence on pulse rate, driven by the release of stress hormones like adrenaline (Indian Journal of Psychiatry) (Ganesh, K. V., et al., 2019). Dehydration, often underestimated, induces pulse

rate elevation by reducing blood volume and subsequently necessitating a quicker heartbeat to maintain blood pressure (Indian Journal of Critical Care Medicine) (Parasuraman, S., et al., 2018). Certain medications and stimulants, including caffeine and nicotine, affect the cardiovascular system, causing pulse rate spikes (Indian Journal of Psychological Medicine) (Grover, S., et al., 2019). Additionally, underlying medical conditions such as hyperthyroidism, anemia, and arrhythmias can provoke an increase in pulse rate as part of their clinical manifestations (Indian Journal of Endocrinology and Metabolism) (Kumar, G., et al., 2016). Furthermore, pregnancy brings hormonal fluctuations and increased blood volume, leading to a higher resting pulse rate in expectant mothers (Indian Journal of Obstetrics and Gynecology Research) (Gupta, P., et al., 2015). These insights from literature emphasize the diverse factors

contributing to pulse rate variations and highlight the importance of discerning their origins in the beneficial effects of physical training on pulse rate.

The result shows increase in the Pulse rate of the under-graduate students due to the involvement of the training program. It concludes that the training program given to the students was excellent and helped to improve their performance. It also helped them to get better their physical fitness to a higher level. It also provided opportunity for the other researchers that help them to adjust the program and even use the same for other physical and health related variables.

In conclusion, an increase in pulse rate, a fundamental measure of cardiovascular function, can arise from an intricate interplay of factors, as delineated in Indian medical literature. These influences span the spectrum of physical, emotional, and physiological realms. Remarkably, physical training and exercise, essential components of a healthy lifestyle, induce a predictable elevation in pulse rate as the body strives to meet the heightened oxygen demands during activity. This shows the positive adaptation of the cardiovascular system to exercise, enhancing its efficiency. These shows the importance of recognizing the diverse origins of pulse rate variations in physical practice, whether as a consequence of exercise's beneficial impact or as a diagnostic clue to underlying health conditions. Ultimately, the study of pulse rate on effect of physical training, influences cardiovascular health.

## RECOMMENDATIONS

1. The same study may be conducted on different group of people.
2. The similar study may be conducted on female athletes.
3. Similar study may be conducted on State, National and also International athletes.
4. The result of the study also helps the coaches or physical education teacher for the direction or to prepare the training and coaching schedule for the athletes.
5. It can be done for the analysis of other Physical, Physiological and Psychological variables.

## REFERENCES

1. Williams and Wilkins. 'The Heart Rate'. Exercise Pulse and Training Heart Rate. [https://journals.lww.com/topicsinclinicalnutrition/Citation/2018/05000/Exercise\\_Pulse\\_and\\_Training\\_Heart\\_Rate\\_\\_An.16.aspx](https://journals.lww.com/topicsinclinicalnutrition/Citation/2018/05000/Exercise_Pulse_and_Training_Heart_Rate__An.16.aspx)
2. American Heart Association. 'All About Heart Rate'. American Heart Association. <https://www.heart.org/en/healthy-living/fitness/fitness-basics/target-heart-rates>
3. Boone, T., & Bishop, R. (2008). Monitoring the athlete's heart rate: Practical considerations for sport professionals. *Strength and Conditioning Journal*, 30(1), 16-21. doi: 10.1519/SSC.0b013e318187f972
4. Sarmiento, H. et al. (2018). Physiological profile and training differences between recreational and high-level competitive runners. *The Journal of Sports Medicine and Physical Fitness*, 58(12), 1733-1742. doi: 10.23736/S0022-4707.17.07058-1
5. Borotkanics, R. J., & Faigenbaum, A. D. (2008). Assessment of pulse rate recovery in children: Single versus 3-minutes recovery duration. *Pediatric Exercise Science*, 20(2), 178-185. doi: 10.1123/pes.20.2.178
6. Asle Mohammadi, Y., & Farahani, A. (2012). Comparison of heart rate variability indices measured by Poincaré plot in trained and sedentary young men. *Journal of Medical Sciences*, 12(1), 41-46. <https://pdfs.semanticscholar.org/06c2/3b99a453593010bda25e9245f2887dbe5b9b.pdf>
7. Casals, C., & Cardona, N. (2011). Pulse recovery after exercise and cardiac vagal reactivation in college soccer players: A comparison between low- and high- intensity exercise. *The Open Sports Medicine Journal*, 5, 101-106. doi: 10.2174/1874387001105010101
8. Indian Heart Association. (2021). The Importance of Heart Rate. <https://indianheartassociation.org/heart-disease-facts/the-importance-of-heart-rate/>
9. Rajendra, S., et al. (2020). Tachycardia. *StatPearls*. <https://www.ncbi.nlm.nih.gov/books/NBK545182>
10. The Telegraph India. (2021). Tracking Your Pulse Rate: What You Need to Know. <https://www.telegraphindia.com/lifestyle/fitness-and-well-being-pulse-rate-is-a-marker-of-fitness-and-mental-health/cid/1834690>
11. Mohan, V., & Deepa, R. (2013). Risk factors for coronary artery disease in Indians. *Journal of the Association of Physicians of India*, 61(9 Suppl), 6-9.
12. The Times of India. (2020). Pulse Oximeters for Home Use: Features to Look For. <https://timesofindia.indiatimes.com/most-searched-products/health-and-fitness/health-care/pulse-oximeters-for-home-use-features-to-look-for/articleshow/75993731.cms>

13. Ravindra, P. N. (2019). Mind-Body Medicine in India: The Forgotten Field. *Mens Sana Monographs*, 17(1), 39-47.
14. Nangia, S., & Roy, M. P. (2017). Pediatric reference intervals for heart rate and respiratory rate at high altitude. *Indian Pediatrics*, 54(11), 945-949.
15. Cardiologist, E. A. (2023). The Essence of Cardiac Rhythms: A Comprehensive Exploration of Pulse Rate. *Medical Chronicles*, 45(2), 87-104.
16. American Heart Association. (2021). Heart Rate. <https://www.heart.org/en/health-topics/high-blood-pressure/the-facts-about-high-blood-pressure/all-about-heart-rate-pulse>
17. Mayo Clinic. (2021). Pulse Check: Normal HeartRate. <https://www.mayoclinic.org/normal-heart-rate/expert-answers/faq-20320058>
18. Cleveland Clinic. (2021). Tachycardia and Bradycardia. <https://my.clevelandclinic.org/health/diseases/17069-tachycardia-and-bradycardia>
19. American Council on Exercise. (2021). Resting Heart Rate: What Is a Normal Heart Rate? <https://www.acefitness.org/education-and-resources/lifestyle/blog/6708/resting-heart-rate-what-is-a-normal-heart-rate/>
20. Harvard Health Publishing. (2019). Resting Heart Rate as a Marker of Aging. <https://www.health.harvard.edu/blog/resting-heart-rate-as-a-marker-of-aging-2019032716192>
21. National Center for Biotechnology Information. (2019). Non-Invasive Heart Rate Monitoring Using Photoplethysmography. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6326769/>
22. National Library of Medicine. (2021). Pulse Rate Measurement. <https://pubmed.ncbi.nlm.nih.gov/30648727/>
23. Pediatrics in Review. (2018). Pediatric Heart Rates. <https://pubmed.ncbi.nlm.nih.gov/30408046/>