

COMPARISON OF RESTING HEART RATE OF BOXING PLAYERS AND SEDANTARY INDIVIDUALS.

¹AMAN SHARMA

(Student), Department of Physical Education and sports, University of Jammu, India

²VARUN ATRI

(Student), Department of physical education and sports, University of Jammu, India

Abstract

The purpose of the present study was to compare the resting heart rate of boxing players and sedentary individuals. Since interest has been aroused by the awareness that lower resting heart rate reflects better cardiovascular fitness whereas an elevated resting heart rate is a potent precursor of several cardiovascular and metabolic diseases like hypertension, atherosclerosis etc. For this study, a total of 30 subjects were selected through random sampling comprising 15 boxing players (MAM Stadium boxing academy, Jammu) and 15 sedentary individuals (Jammu University regular students) are selected. The boxing players are those who had been undergoing a systematic training for the past 1-2 years while the sedentary individuals had not engaged in regular physical activity for at least 1 year. The age of the subjects ranged from 18-24 years. The resting heart rate was measured using Fingertip Pulse Oximeter. To analyze the data, an independent sample T test was applied. The results revealed a statistically significant difference in the resting heart rate of boxing players and sedentary individuals indicating superior cardiovascular fitness of boxing players.

Keywords: RESTING HEART RATE, BOXING PLAYERS, SEDENTARY INDIVIDUALS, CARDIOVASCULAR FITNESS, PHYSICAL ACTIVITY.

Introduction

Physical activity plays an important role in maintaining a healthy lifestyle, with sports emerging as a keystone in promoting cardiovascular well-being. Among sports, boxing stands out as a discipline that not only demands skill and agility but also make our bodies work really hard by placing a significant physiological demand on its participants. Boxing is a combat sport where two participants of same weight battle each other with their fist in series of 3 min rounds (Aiba 2010). In boxing ultimate goal is to land punches on your opponent while avoiding their punches. The sport demands strength, endurance, and agility. Energy from aerobic and anaerobic metabolism relies on the intensity and length of the activity. High intensity activity cause a deficit in oxygen uptake and delivery, leading to muscle anaerobiosis (Brooks 1986). Boxing is characterized by High intensity movements during rounds with short breaks are not enough for full recovery. Consequently, this results in the production of lactic acid, and elevated blood lactate (Khanna and Manna, 2006). A small number of studies have been done on the physiological demands of the boxers. (Khanna and Manna, 2006).

As we delve into the world of boxing, our focus shifts to the exploration of physiological impacts this sport imposes on its practitioner. And particularly we turn our attention towards the resting heart rate of boxing players and sedentary individuals. Heart rate is the number of times our heart

beats in a minute and is directly related to the workload being placed on the heart. When the body is in a resting state (i.e. lying down in a quiet area for at least five minutes), resting heart rate is measured. A normal resting heart rate ranges from 60-100 beats per minute (bpm).

Higher resting heart rates than 100 bpm indicate that the heart is working too hard to pump blood, which could be a significant issue that needs to be checked by a doctor.

Athletes with endurance training are more likely to have resting heart rates below 60 bpm because their bodies are more adept at using blood oxygen.

The cardiovascular system is significantly impacted by the physiological demands of sports, particularly high-intensity exercises like boxing.

Investigating the function of the Autonomic Nervous System (ANS) in heart rate control is essential to understanding the complex link between physical effort and cardiovascular response. The sympathetic nervous system (SNS) and parasympathetic nervous system (PNS) are the two branches of the autonomic nervous system (ANS).

Together, these branches constantly adjust heart rate to satisfy the body's changing demands. The SNS is responsible for fight / flight response and it is on alert in response to stress, extreme happiness or during physical activity. It signals our heart to beat faster by releasing nor epinephrine. The SNS increases the force of each heart contraction. The PNS on the other hand is linked with the rest and digest response. It is active during relaxation and recovery. It signals the heart to beat slowly by releasing acetylcholine which binds to muscarinic receptors in the heart. The PNS reduces the force of each heart contraction.

The balance between SNS and PNS determines the overall heart rate at any given moment. The SA node located in the heart's right atrium, acts as the natural pacemaker, receiving signals from both branches of ANS. The SNS continuously send signals to the SA node, modulating its activity to maintain an optimal heart rate based on the body's needs. Resting Heart Rate: After periods of rest, the PNS dominates, leading to a lower resting heart rate. This is often referred to as vagal tone, reflecting the level of parasympathetic activity. Athletes and individuals with good cardiovascular fitness often have higher vagal tone, resulting in lower resting heart rates.

Since boxing is high intensity and short duration activity. It is a combination of anaerobic and aerobic activity. Boxing training leads to changes in heart over time. It leads to reduction in resting heart rate, increases stroke volume, reduces heart variability. Means at rest, heart pumps more blood with one beat than in sedentary individuals. Boxing training is a combination of both cardiovascular endurance and muscular strength.

HYPOTHESIS:

H₀: There is no significant difference between resting heart rate of boxing players and sedentary individuals

H₁: There is a significant difference between resting heart rate of boxing players and sedentary individuals.

OBJECTIVES

The study had the following objectives

- To compare resting heart rate of boxing players and sedentary individuals.
- To determine the resting heart rate of boxing players aged 18-24 years.
- To determine the resting heart rate of sedentary individuals aged 18-24 years.
- To access the impact of regular boxing training on resting heart rate.

Delimitations

- The study was delimited to male individuals only
- The subjects selected ranged from 18 to 24 years only.
- To test the hypothesis, 30 subjects were chosen.

Limitations

- The factors like personal habits, life style, daily routine, diet, climate conditions and environment sources which might have an effect on the results of the study could not be taken into consideration.
- Hereditary, social and physiological factors could not be controlled.
- No special motivational technique was used during the test.
- The subject's schedule regarding daily routine could not be controlled and was not considered in the study.

Method and Procedure

The present study employed a **comparative cross-sectional research design** to examine differences in resting heart rate between boxing players and sedentary individuals.

A total of **30 male subjects**, aged **18–24 years**, were selected through random sampling. Participants were free from any known cardiovascular or metabolic disorders. The sample was divided into two groups:

- **Group A: Boxing Players** - 15 Active individuals engaged in boxing training from the past 1-2 years were considered. These boxing players were taken from MAM stadium Jammu.
- **Group B: Sedentary individuals** –15 Individuals with no history of boxing engagement or had not engaged in regular physical activity for at least 1 year. These were taken from University of Jammu, Jammu and Kashmir.

A standardized fingertip pulse oximeter was used to collect the samples of resting heart rate from the subjects. Firstly, all the subjects were asked to sit quietly for 15 minutes in a well-ventilated room to minimize external disturbances. Then 3 readings were recorded at 1 minute interval and then average of 3 readings were taken to get the final resting heart rate value.

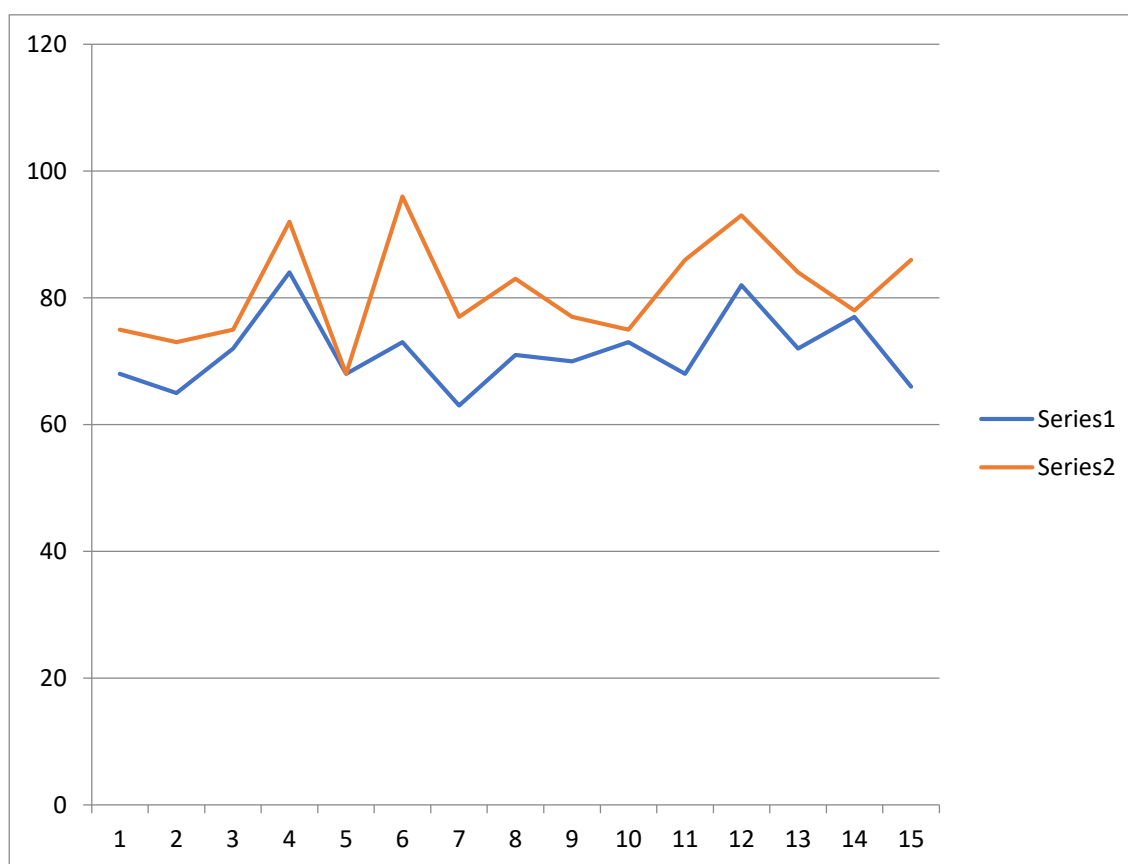
Participants were instructed to avoid caffeine intake, strenuous physical activity, or stimulants prior to data collection to ensure measurement accuracy.

A **BPL Fingertip Pulse Oximeter (Model 02)** was used to measure resting heart rate. The instrument measures pulse rate with a minimum error margin of **±2 beats per minute** and was procured from a standardized and reliable manufacturer. The device was calibrated before data collection and was considered accurate for the purpose of the study.

.Statistical Technique Used

The collected data were analyzed using descriptive statistics (mean and standard deviation). An independent samples *t*-test was employed to determine the significance of differences in resting heart rate between boxing players and sedentary individuals. The level of significance was set at **0.05**.

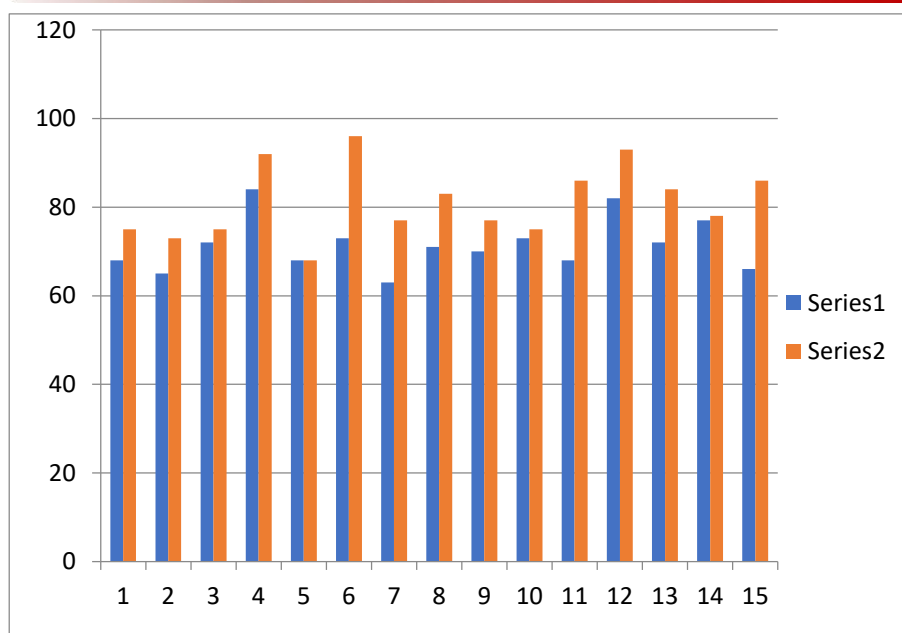
Before calculating the *t* value, the data was plotted on the graph to analyze the difference in the means of the two groups boxing players and sedentary individuals.



Here

Series 1 represents the resting heart rate of boxing players and Series 2 represents the resting heart rate of sedentary individuals.

We can also analyze the data on another graph to see the difference.



From the graph it is clear that there is difference in the means of the two groups. Now to scientifically prove this, we have used the Independent two sample t- test.

TABLE 1

Descriptive Analysis of resting heart rate of boxing players and sedentary individuals.

S.NO	Variable	N	Group	Mean	Standard Deviation
1	Resting heart rate	15	Boxing players	71.4666667	5.89026639
		15	Sedentary individuals	81.2	8.169630172

TABLE 1 shows the means of two groups of boxing players and sedentary individuals. This table also shows the values of standard deviation of both groups.

TABLE 2

Significant difference between the means of resting heart rate of boxing players and sedentary individuals.

	Group	Mean	Mean Difference	SD	Standard Error mean	T Value	df	
Resting heart rate	Boxing players	71.467	-9.733	5.89026639	6.7479	-3.743	28	
	Sedentary individuals	81.2		8.169630172	2.1085			

The table 2 represents the mean, Standard deviation, t-value and Significance level between the boxing players and sedentary individuals.

Calculated $T = 3.743$ $Df = 28$

at 0.05% level of significance.

- tabulated $T = 2.048$
- Thus, $Cal\ T > Tab\ T$

Since the calculated t-value (3.743) is greater than the tabulated t-value (2.048) at 0.05 level of significance with 28 degrees of freedom, the null hypothesis is rejected.

This indicates that there is a statistically significant difference in the resting heart rate between boxing players and sedentary individuals.

Based on the results of the present investigation, it can be concluded that boxing players possess a significantly lower resting heart rate than non-players. This finding reflects enhanced cardiovascular efficiency among individuals engaged in regular boxing training. The demanding nature of boxing, which involves repeated bouts of high-intensity activity interspersed with short recovery periods, appears to promote physiological adaptations such as increased stroke volume and improved autonomic regulation of the heart.

The study highlights the positive influence of structured boxing training on cardiovascular health and emphasizes the importance of regular high-intensity physical activity in improving resting heart rate. These findings are valuable for coaches, physical education professionals, and sports scientists in designing effective training and fitness programs aimed at cardiovascular enhancement.

Recommendation

Based on the research findings, several recommendations can be made:

Expand Sample Demographics: Consider including participants from a wider age range, including children, adolescents, and adults, to better understand how resting heart rate differs across different age groups and developmental stages.

Incorporate Female Participants: Ensure the inclusion of female participants in your study to investigate potential gender differences in resting heart rate among boxing players and non-players. This would provide a more comprehensive understanding of the impact of boxing on cardiovascular health across genders.

Include Other Athletic Groups: Compare resting heart rates of boxing players not only with non-athletes but also with athletes from different sports backgrounds. This would allow for a broader comparison and insight into how specific athletic training regimes influence resting heart rate.

Longitudinal Study Design: Conduct a longitudinal study to track changes in resting heart rate over time among both boxing players and non-players. This could provide valuable information on the long-term effects of boxing training on cardiovascular health compared to non-athletic individuals.

Consider Fitness Levels: Assess the fitness levels of participants using additional measures such as VO2 max or cardiovascular endurance tests. This would help in understanding how resting heart rate correlates with overall fitness levels and how it may be influenced by boxing training specifically.

Explore Training Intensity and Duration: Investigate the relationship between resting heart rate and the intensity and duration of boxing training sessions. This could provide insights into optimal training strategies for cardiovascular health improvement in boxing athletes.

REFERENCES :

- Aladin, et.al(2014). "Relation of resting heart rate to risk for all-cause mortality by gender after considering exercise capacity (the Henry Ford exercise testing project)". *The American Journal of Cardiology*. 114 (11): 1701–06. doi:10.1016/j.amjcard.2014.08.042. PMID 25439450.
- Billman GE, Schwartz PJ, Stone HL (1984) The effects of daily exercise on susceptibility to sudden cardiac death. *Circulation* 69:1182-1189
- Blair SN, Kohl HW, Barlow CE, Paffenbarger RS, Gibbons LW, Marcera CA. Changes in physical fitness and all-cause mortality. A perspective study of healthy and unhealthy men. *J Am Med Assoc* 1995; 273:1093-8.
- Blomqvist CG, Saltin B. Cardiovascular adaptations to physical training. *Annu Rev Physiol*. 1983;45:169-89. doi: 10.1146/annurev.ph.45.030183.001125. PMID: 6221687.
- Blomqvist CG, Saltin B. Cardiovascular adaptations to physical training. *Ann Rev Physiol* 1983; 45:169-189.
- Brinkworth GD, Noakes M, Buckley JD, Clifton PM. Weight loss improves heart rate recovery in overweight and obese men with features of the metabolic syndrome. *Am Heart J* 2006; 152(4):693 e1-693 e6.
- Centers for Disease Control. (1990, September 19). Coronary heart disease attributable to sedentary lifestyle--selected states, 1988. *JAMA*, 264(11), 1390, 1392. PMID: 2391732.
- Dantas E.M., Sant'Anna M.L., Andreao R.V., Goncalves C.P., Morra E.A., Baldo M.P., Rodrigues S.L., Mill J.G. Spectral analysis of heart rate variability with the autoregressive method: What model order to choose? *Comput. Biol. Med.* 2012;42:164–170. doi: 10.1016/j.combiomed.2011.11.004. [PubMed] [CrossRef] [Google Scholar]
- Dimkpa, U. (2009). Post-exercise heart rate recovery: An index of cardiovascular fitness. *Journal of Exercise Physiology Online*, 12(1), 10-22.
- Dixon EM, Kamath MV, McCartney N, Fallen EL. Neural regulation of heart rate variability in endurance athletes and sedentary controls. *Cardiovasc Res* 1992; 26:713-719.
- Du N, Bai S, Oguri K, Kato Y, Matsumoto I, Kawase H, et al. Heart rate recovery after exercise and neural regulation of heart rate variability in 30-40 year old female marathon runners. *J Sports Sci Med* 2005; 4:9-17.

- El-Ashker, S., & Nasr, M. (2012). Effect of boxing exercises on physiological and biochemical responses of Egyptian elite boxers. *Journal of Physical Education and Sport*, 12(1), 111.
- Fletcher GF, Balady GJ, Amsterdam AE, Chaitman B, Robert E, Jerome F, et al. Exercise standards for testing and training. A statement for health care professionals from the American heart association. *Circulation* 2001; 104:1694-1740.
- Furlan R, Piazza S, Dell'Orto S, Gentile E, Cerutti S, Pagani M et al. Early and late effects of exercise and athletic training on neural mechanisms controlling heart rate. *Cardiovasc Res* 1993; 27:482-488.
- Ghosh, A. K. (2010). Heart rate, oxygen consumption and blood lactate responses during specific training in amateur boxing. *International Journal of Applied Sports Sciences*, 22(1), 1-12.
- Goldsmith RL, Bigger JT, Bloomfield DM, Steinman RC. Physical fitness as a determinant of vagal modulation. *Med Sci Sports Exerc* 1997; 29(6):812-817.
- Gould, W. B. IV. & Greely, H. T. (Symposium Contributors). (2004). Symposium: Sports and the Law. In Stanford University. School of Law Symposium Proceedings (p. 9).
- Huang P, Leu H, Chen J, Chen C, Huang C, Tuan T, et al. usefulness of attenuated heart rate recovery immediately after exercise to predict endothelial dysfunction in patients with suspected coronary artery disease. *Am J Cardiol* 2004; 93(1):10-13.
- Jolly MA, Brennan DM, Cho L. Impact of exercise on heart rate recovery. *Circulation*. 2011 Oct 4;124(14):1520-6. doi: 10.1161/CIRCULATIONAHA.110.005009. Epub 2011 Sep 26. PMID: 21947293.
- Khanna, Gulshan & Manna, Indranil. (2006). Study of Physiological Profile of Indian Boxers. *Journal of sports science & medicine*. 5. 90-8
- Li K, Cardoso C, Moctezuma-Ramirez A, Elgalad A, Perin E. Heart Rate Variability Measurement through a Smart Wearable Device: Another Breakthrough for Personal Health Monitoring? *Int J Environ Res Public Health*. 2023 Dec 6;20(24):7146. doi: 10.3390/ijerph20247146. PMID: 38131698; PMCID: PMC10742885.