International Journal for Multidisciplinary Research (IJFMR)
E-ISSN : 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Resting Heart Rate and Exercise Heart Rate of Adult Men Smokers and Non-Smokers: A Comparative Study

Nitai Biswas[1], Samaresh Jana[2], Raj Kumar Maity[3], Shivlal Yadav[4]

[1,4]Research Scholar, Department of Physical Education, Banaras Hindu University, Uttar Pradesh, Varanasi, India
[2]State Aided College Teacher (West Bengal), Department of Physical Education, Silda C.S College, West Bengal, India
[3]M.P.Ed, Students, Department of Physical Education, Jadavpur University, West Bengal, India

Abstract:
The purpose of the present study was to compare the resting heart rate and exercise heart rate efficiency of smokers and non-smokers. In the conducted study the researcher was taken Fifty (n=50) subjects, each twenty five (25) smokers and twenty five (25) non-smokers from Jadavpur University, Kolkata, between the age group of 18–25 years. To know the difference between Resting Heart Rate and Exercise Heart Rate between smokers and non-smokers, the researcher was selected the following two cardio respiratory parameters Resting Heart Rate (RHR) and Exercise Heart Rate (EHR). Mean, Standard Deviation, and 't'-test were employed for statistical analysis. The level of significance was set at 0.05 ($p \leq 0.05$). There was a significant difference in Resting Heart Rate (RHR) and Exercise Heart Rate (EHR), between smokers and non-smokers. Thus, we concluded that in non-smokers, Resting Heart Rate and Exercise Heart Rate are good compared to the smokers group.

Keywords: Smokers, Non-Smokers, Resting Heart Rate (RHR) and Exercise Heart Rate (EHR)

INTRODUCTION

Smoking is a major risk factor for cardiovascular morbidity and mortality. According to World Health Organization estimates, all types of tobacco smokers are the maximum chance of heart disease, lung cancer, and other illnesses. And tobacco kills nearly 6 million people are every year. If current trends continue, annual deaths are expected to exceed 8 million by 2030 [1, 2]. Tobacco use increases the risk of all types of cardiovascular disease, including coronary heart disease, peripheral artery disease, and abdominal aortic aneurysm [3]. The American Heart Association's Council on Cardiopulmonary and Critical Care issued a position statement in August 1992 [4], on the environmental Tobacco smoking and cardiovascular disease, and concluded that (environmental tobacco smoke) is a major preventable cause of cardiovascular disease and death. Active smoking is a well known risk factor for heart disease [5]. Carbon monoxide and nicotine etc, are the chemicals in mainstream smoke that are thought to be the most important in causing heart disease [6], The other acute effect of environmental tobacco smoke on the heart is a complex of effects caused primarily by carbon monoxide in the smoking process [7]. Smoking is a

major cause of all types of cardiovascular disease. In addition to vascular effects, smoking directly affects the myocardium via increased oxidative stress and inflammation, leading to systolic and diastolic dysfunction. It also promotes other risk factors for heart failure, such as high blood pressure, an increased heart rate, diabetes, and atherosclerosis [8]. Attenuated heart rate response to exercise, increases the risk of all causes of mortality and coronary heart disease, even after adjusting for age, physical fitness, resting heart rate, and standard cardiovascular risk factors [9]. Previous reports concluded that cigarette smoking is associated with higher resting heart rate and exercise heart rate [11].

Objectives of the study

To measure and compare the resting heart rate and exercise heart rate between smokers and non-smokers group.

Hypothesis

It was hypothesized that:

H0- There would be no significant difference in resting heart rate and exercise heart rate between smokers and non- smokers group.

III. RESEARCH METHODOLOGY

Selection of the subject, Sampling technique, Selection of the variable, Collection of data, Administrating of the test, Design of the study, Statistical procedure are described.

3.1 Population and Sampling technique

For this study the subjects was selected from the Jadavpur University students, a total of Fifty (50) subjects was randomly selected out of which twenty five (25) were smokers and other twenty five (25) were non-smokers. The age ranged of subject is 18-25 years. For the collection of data fifty students were selected randomly, from all departments of Jadavpur University, Kolkata-32, India, was taken as samples. Generally 5 to 7 year habituated smoking people are selected, those who used to smoke 5 to 8 cigarettes or bidis per day were selected.

3.1 Design of the study

To conduct the study, the researcher was selected fifty subjects randomly, twenty-five smokers and twenty-five non-smokers between the ages of 18 and 25 (years). At first it has been taken all the Resting Heart Rate (RHR), Exercise Heart Rate (EHR), and then also recorded parameter of both smokers and non-smokers those are adult male university students.

3.2 Selection of variables & Criterion measuring tools

Table 1

Variables	Name of Test	Instruments	Unit
Resting Heart Rate	McArdle- Katch	Stopwatch	“Beat/minute”
Exercise Heart Rate	McArdle-Katch	Metronome, Stopwatch	“Beat/minute”

3.3 Collection of data

Procedure for Administering of the test, the following tests were administered-

3.3.1 Measurement of Resting Heart Rate

Before exercise, resting heart rate measure by McArdle-Katch test procedure. Counted in 10 second three times, Converted the number of beats counted in 10 second to Beats per Minute (BPM). The standard units for measuring heart rate are obtained by multiplying this number by 6 using the formula below.

Formula:

Heart beat (10 sec) × 6 = Beats per Minute

For Example:

Resting Heart Rate#1 = 10 (Beats/10 sec), Resting Heart Rate#2 = 11 (Beats/10 sec), Resting Heart Rate#3 = 10 (Beats/10 sec). Take the resting pulse three times and converted to heart rate. The mean Resting Heart Rate by dividing the sum of 3 Resting Heart Rate by 3. Such as, Resting Heart Rate#1 = (10×6) Beats/Minute, Resting Heart Rate#2 = (11×6) Beats/Minute, Resting Heart Rate#3 = (10×6) Beats/Minute, Average Resting Heart Rate = [(60+66+60) ÷ 3] (Beats/Minute).

3.3.2 Measure the Exercise Heart Rate

This test was followed the procedure of McArdle-Katch Bench stepping test. Their 10 seconds heart beats counted after the 3 minute exercise.

Procedure:

180 sec Exercise ⟹ 5 sec Rest ⟹ 10 sec pulse rate

3.4 Statistical analysis

The data analyzed and compared with the help of statistical procedure in which Mean, Standard deviation and‘t’-test was used for compare the groups.

IV. RESULT AND DISCUSSION

4.1 Mean & SD of the resting heart rate between the smokers and non-smokers were presented Table 2.

Table 2

Mean & SD of the resting heart rate between the smokers and non-smokers

Category	Mean	SD	‘t’- value
Non- Smoker	63.05	± 5.72	2.43*
Smoker	68.32	± 9.17	

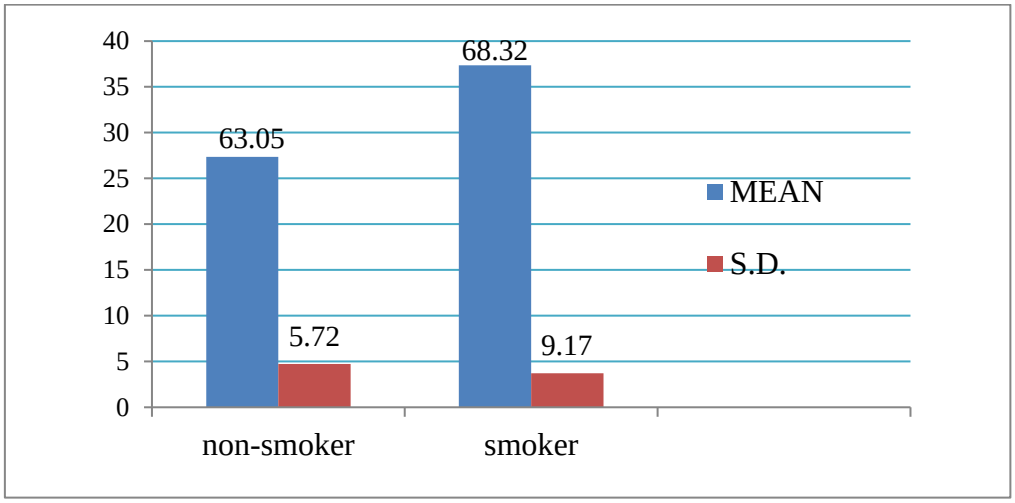
N= 50

***at 0.05 level of significance (2, 48) =2.01**

Table no-II shows that the mean and SD of smokers and non-smokers group. The mean and SD of the non-smokers group was 63.05, ±5.72 and smokers group was 68.32, ±9.17. It was found that the‘t’-value higher than the table value. So it indicates that significant differences exist between two groups. It also found that non-smokers group was better resting heart rate than smokers group.

So can say that mean of smokers was greater than the non-smokers group. Here clearly seen 50 values were significant at 0.05 level of significance, were considered.

Fig 1: Bar diagram of Mean and S.D. for RHR of Smokers and Non- Smokers



From the following graphical representation, it was clearly revealed that the mean of smokers greater than the non-smokers group. It was evident that smokers are higher than non-smokers group. So can say that the calculated value is greater than 2.43 ≥ 2.011 the table value. So Ho will be rejected. That means there is significant difference between the two mean. Lastly, I may conclude that non-smokers are better resting heart rate then the smokers group.

4.2 Mean & SD of the exercise heart rate between the smokers and non-smokers were presented Table 3.

Table 3

Mean & SD of the exercise heart rate between the smokers and non-smokers

Category	Mean	SD	't'- value
Non- Smoker	117.68	± 20.72	2.25*
Smoker	128.88	± 13.86	

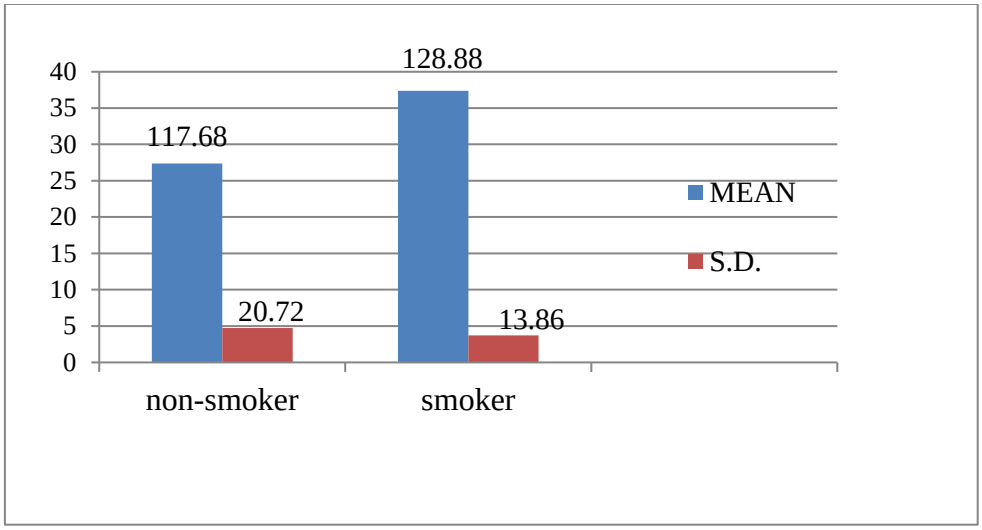
N= 50

***at 0.05 level of significance (2, 48) =2.01**

Table no-III shows that the mean and SD of smokers and non-smokers group. The mean and SD of the non-smokers group was 117.68, ±20.72, and smokers group was 128.88, ±13.86. It was also found that the't' value of both groups was 2.25 respectively.

So we can say that mean of smokers were greater than the non-smokers group. Here 0.05 levels of significance were considered.

Fig 2: Bar diagram of Mean and S.D. for EHR of Smokers and Non- Smokers



From the following graphical representation, it was clearly revealed that the mean of smokers greater than the non-smokers group. It was evident that smokers are higher than non-smokers group. So can say that the calculated value is greater than $2.25 \geq 2.011$ the table value. So Ho will be rejected. That means there is significant difference between the two mean. Lastly, I may conclude that non-smokers are better exercise heart rate than smokers group.

Discussion of the Findings

The purpose of the present study was to compare the resting heart rate and exercise heart rate efficiency of smokers and non-smokers people. The study was conducted on total of fifty (N=50) subjects (25 smokers and 25 non-smokers) from Jadavpur University, Kolkata. In the comparison of smokers and non-smokers in selected resting heart rate and exercise heart rate efficiency, significant differences were found in both parameters resting heart rate (RHR) and exercise heart rate (EHR). Non-smokers subjects resting heart rate (RHR) and exercise heart rate (EHR) is better than the smokers group.

Testing of Hypothesis

According to the hypothesis of the study, the observed result was confirming that there was significant difference in resting heart rate and exercise heart rate, so, as per the assessment of Significance, the null hypothesis was rejected.

CONCLUSIONS

The following conclusions have been drawn based on the findings of the present study.

Comparison of Resting Heart Rate (RHR) and Exercise Heart Rate (EHR) between adult men smokers and non-smokers group proved that there was significant difference. The non-smokers were Resting Heart Rate (RHR) and Exercise Heart Rate (EHR) significantly better than smokers group.

REFERENCES

1. World Health Organization. (2011). WHO report on the global tobacco epidemic, 2011: warning about the dangers of tobacco. World Health Organization.
2. Papathanasiou, G., Georgakopoulos, D., Papageorgiou, E., Zerva, E., Michalis, L., Kalfakakou, V., & Evangelou, A. (2013). Effects of smoking on heart rate at rest and during exercise, and on heart rate recovery, in young adults. Hellenic J Cardiol, 54(3), 168-77.
3. European Society of Cardiology. Position paper on the 'Tobacco Products Directive'. Sophia Antipolis Cedex-France, 2013; available at https://www.escardio.org/about/Documents/ tobacco-products-directive- position- paper. Pd.
4. Taylor, A. E., Johnson, D. C., & Kazemi, H. (1992). Environmental tobacco smoke and cardiovascular disease. A position paper from the Council on Cardiopulmonary and Critical Care, American Heart Association. Circulation, 86(2), 699-702.
5. Wells, A. J. (1994). Passive smoking as a cause of heart disease. Journal of the American College of Cardiology, 24(2), 546-554.
6. Albert, R. E., Vanderlaan, M., Burns, F. J., & Nishizumi, M. (1977). Effect of carcinogens on chicken atherosclerosis. Cancer Research, 37(7_Part_1), 2232-2235.
7. Glantz, S. A., & Parmley, W. W. (1991). Passive smoking and heart disease. Epidemiology, physiology, and biochemistry. Circulation, 83(1), 1-12.
8. Gopal, D. M., Kalogeropoulos, A. P., Georgiopoulou, V. V., Smith, A. L., Bauer, D. C., Newman, A. B., ... & Butler, J. (2012). Cigarette smoking exposure and heart failure risk in older adults: the Health, Aging, and Body Composition Study. American heart journal, 164(2), 236-242.
9. Lauer, M. S., Okin, P. M., Larson, M. G., Evans, J. C., & Levy, D. (1996). Impaired heart rate response to graded exercise: prognostic implications of chronotropic incompetence in the Framingham Heart Study. Circulation, 93(8), 1520-1526.
10. Ellestad, M. H. (1996). Chronotropic incompetence: the implications of heart rate response to exercise (compensatory parasympathetic hyperactivity?). Circulation, 93(8), 1485-1487.
11. Bernaards, C. M., Twisk, J. W., Van Mechelen, W., Snel, J., & Kemper, H. C. (2003). A longitudinal study on smoking in relationship to fitness and heart rate response. Medicine & Science in Sports & Exercise.