

A Prospective Study on Effect of Exercise on Pulse Rate and Respiratory Rate among Normal Individuals in a Tertiary Healthcare Setup

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Abstract

Introduction: Regular exercise as well as physical activity throughout the life can improve life expectancy. Data related to pulse rate (PR) and its effect on exercise is limited in this area. Hence a study was conducted to find the effect of exercise on Pulse Rate among the active adults.

Methods: It was a prospective study. Study protocol was approved by the institutional Ethics committee. Informed written consent was taken from all the participants. Individuals of both gender, aged > 18 years, regularly attend gym were included. After recruiting the PR and respiratory rate were measured as per the protocol. Under resting condition radial arterial pulse was recorded. First the participant was allowed to laydown comfortably in supine position. At post exercise, PR was recorded 10 min, 30 min and 60 minutes. The difference between the post exercise value and resting value were used to evaluate the PR changes with exercise. Simultaneously, respiratory rate (RR) was also recorded. Chi-square test was used to find the statistical analysis and $P > 0.05$ was statistically significant.

Results: Statistically there was significant difference in the mean PR values 10 and 30 minutes after the exercise. After cycling for 5 minutes, statistically there was significant difference in PR 10 and 30 minutes after the exercise. Similar results were detected 15 minutes after cycling also.

Conclusion: As per the study findings, during exercise, the PR and RR are increased. But cycling was only considered in this research. Long term studies with different exercises are recommended.

Keywords: Exercise, Rate, Life.

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Introduction

Rise in life expectancy is the major goal in the health care sector because the insufficient physical activity leads to short lifespan. [1] From the last decade there is a

drastic change in this scenario throughout the world. [2] Regular exercise as well as physical activity throughout the life can improve life expectancy. [3, 4] As per the

reports, resting heart rate (RHR) inversely related to the life expectancy. [5] Regular exercise and physical activity can reduce the RHR so that the life expectancy may increase.

Relationship between the RHR and life expectancy was studied in mammals, semi-logarithmic relationship was reported. [6] At this juncture, cardiorespiratory fitness is an important as well as key aspect in health and fitness because it reflects the body capacity to deliver oxygen in human system. [7]

Data related to pulse rate (PR) and its effect on exercise is limited in this area. Hence a study was conducted to find the effect of exercise on Pulse Rate among the active adults.

Methods

It was a prospective study. Study protocol was approved by the institutional Ethics committee. Study was conducted from October 2022 to January 2023. An informed written consent was taken from all the participants.

Individuals of both gender, aged > 18 years, regularly attend gym were included. Non cooperative individuals, those were not physically fit and those who don't habituated gym were not considered in this study. After recruiting the PR and respiratory rate were measured as per the protocol. [8]

The PR was mentioned in minutes. Under resting condition radial arterial pulse was recorded. First the participant was allowed to laydown comfortably in supine position. The forearm pronated and wrist slightly flexed. Count was made for one minute. PR was recorded at rest and they were allowed to regular workouts. At post exercise, PR was recorded 10 min, 30 min and 60 minutes. The difference between the post exercise value and resting value were used to evaluate the PR changes with exercise.

Simultaneously, the RR was also recorded under the resting condition. First the

participant was allowed to laydown comfortably in supine position. RR count was taken for 1 minute. RR was recorded at rest and they were allowed to regular workouts. At post exercise, PR was recorded 10 min, 30 min and 60 minutes. The difference between the post exercise value and resting value were used to evaluate the RR changes with exercise.

Statistical analysis:

The data were analysed using SPSS version 21 and presented in the form of mean, SD and SEM. Chisquare test was used to find the statistical analysis and $P > 0.05$ was statistically significant.

Results

Total 223 members were recruited in this research. The means PR and RR at rest were 71.3 ± 5.63 and 14 ± 1.43 per min respectively; 10 minutes after cycling for 2 minutes, the values were 125.5 ± 3.39 and 18 ± 0.87 per min respectively; 30 minutes later was 96.38 and 14 per min respectively; 60 minutes after exercise were 71.2 and 13.7 per min respectively. Statistically there was significant difference in the mean PR values 10 and 30 minutes after the exercise. After cycling for 5 minutes, statistically there was significant difference in PR 10 and 30 minutes after the exercise. Similar results were detected 15 minutes after cycling also.

Discussion

In the present study there was increase in PR with increasing intensity of exercise, and it was statistically significant. Similar findings were reported. [9, 10] Literature revealed that there was rise in heart rate (HR) linearly with the increase in workloads. Dalia Biswas and Kher Jeyant reported that linear increase in HR occurred during graded exercise in bicycle ergograph. [11] During the graded exercise the HR progressively increase owing to an increase in the intensity of sympathetic nervous system, increased venous return and withdrawal of parasympathetic

inhibition. These changes in autonomic activity are reversed and the HR decreases during recovery. The rate at which HR decreases after exercise is a reflection of a person's physical fitness, as in case of active endurance athletes; the more rapid decline, the higher is the level of fitness. [11, 12]

In this research, there was persistent increase in the HR even after rest for 10 minutes and later. A report by Lopes S et al. [13] effect of exercise on cardiovascular function also showed that the HR exceeded 15% above the resting value after 10 minutes of post exercise and later returned to the pre-exercise levels.

The RR increased in all the sessions of exercise and subsequently returned to pre-exercise levels by the end of 30 min in the recovery period during the study. This could be due to rapid neurogenic component and slower humoral component according to the neurohumoral theory of exercise hyperpnoea. Similar findings are reported by various investigators. [14 – 15] As the person begins exercise, the respiration increases in rate and depth in proportion to the concentration of CO₂ in blood. Depth of inspiration depends on number of motor units of inspiratory neurons firing and their frequency of discharge, whereas respiratory rate depends on the length of time elapsing between firings. The afferent receptors which influence the medullary respiratory centre to match the rate and depth of breathing to the increasing metabolic demands of the body are centrally located medullary receptors and peripherally located receptors in respiratory muscles, arteries near the heart and skeletal joints. Stimuli which activate the receptors are chemical, CO₂, O₂ and H⁺ and mechanical, pressure in contracting muscles and moving joints. Thus at higher workloads the metabolism increases many fold and ventilation increases proportionately. [16,17]

Conclusion:

As per the study findings, during exercise, the PR and RR are increased. But cycling was only considered in this research. Long term studies with different exercises are recommended.

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