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Effect of Aerobic Exercises on Chest Wall Expansion, Breath Holding Time and Respiratory Rate in College Level Students

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Abstract: *This study sought to assess the impact of aerobic exercises on chest wall expansion, breath-holding duration, and respiratory rate among college-level students. The research focused on a population of collegiate students aged 20 to 25 years from the academic community of Kuhi, Nagpur (M.S.). Thirty subjects were selected for the study, all of whom were non-sports individuals with no previous active involvement in any sports or physical activities. The selection process employed a simple random sampling technique. To achieve the study's objectives, a pretest was administered to the treatment group, assessing the selected variables. Subsequently, the group engaged in a seven-week aerobic exercise program tailored to their respective fitness levels. Following the training period, a posttest was conducted to evaluate the same variables. Descriptive analysis, mean comparison, and the paired t-test, with a significance level set at 0.05, were employed to analyze the data. The findings revealed a significant increase in chest wall expansion, breath-holding time, and respiratory rate among participants engaged in aerobic exercises. The pivotal outcome of this investigation underscores the notable influence of aerobic exercise on the respiratory system.*

Keywords: Aerobic exercises, Chest wall expansion, Breathing holding time and Respiratory rate

I. INTRODUCTION

During the act of breathing, air is inhaled and exhaled in separate steps in order to facilitate oxygen flow within the body, which is a fundamental physiological process that enhances the flow of oxygen within the body. In addition to the enhancement of oxygenation, this process also boasts several health benefits, such as bolstering the immunity system, minimizing stress, and preventing illness. The respiratory system, which takes its origin from the nasal passages and extends through the air sacs, contains an intricate set of structures that facilitate the exchange of gases within it.When we inhale air, we begin the journey by passing it through the nasal passages before proceeding through the larynx and pharynx, which ultimately lead us to our trachea. In the chest cavity, the respiratory pathway divides into right and left branches, which then eventually divide into a complex network resembling the branching of a tree within the chest cavity. As part of the respiratory tree, or air conductive zone, which consists of fifteen to twenty air sacs, the terminal bronchiole, which is located at the end of the respiratory tree, culminates in the terminal bronchiole, which further divides into fifteen to twenty air sacs that make up the respiratory zone. The respiratory zone, from the terminal bronchiole to the air sacs, assumes a pivotal role in facilitating respiration.

In the respiratory process, the muscular contraction, notably of the chest ribs, instigates an outward motion, expanding the chest volume both vertically and horizontally. Concurrently, the diaphragm, situated between the thoracic and abdominal cavities, undergoes a process of narrowing and contraction, further enhancing the vertical expansion of the chest. This carefully orchestrated sequence facilitates the inhalation of air into the lungs, with the diaphragm contributing approximately 75 percent to the air intake during normal breathing. The subsequent elastic recoil, characterized by a coordinated interplay among muscles, ribs, and lungs, reinstates the components to their initial positions, expelling air through pressure on the lungs—a phenomenon denoted as elastic recoil.

Normal breathing is a highly calibrated physiological mechanism that occurs at a pace of 16 to 20 breaths per minute in a healthy human. Aerobic workouts, such as running, jogging, walking, and stretching, improve respiratory muscle

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endurance. This increased endurance allows the chest wall to expand, increasing total respiratory capacity and improving the breathing process. The combination of enhanced physical and mental fitness observed with aerobic exercise emphasises the good influence on respiratory health, as established in existing studies (Bhandari, M., 2020). The study of the effects of aerobic activities on respiratory parameters in college students is an important undertaking that will shed light on the possible advantages of physical activity on the respiratory system. This study specifically focuses on chest wall expansion, breathing holding time, and respiratory rate, aiming to contribute valuable insights to the field of sports and physical education.

II. METHODOLOGY

The study's cohort consisted of collegiate students within the age range of 20 to 25 years, specifically drawn from the academic community of Kuhi, Nagpur (M.S.). In pursuit of the study's objectives, thirty subjects were selected, all of whom were individuals with no prior engagement in sporting activities or events. The selection process was executed through a simple random sampling technique.For the investigation, a pretest was administered to the treatment group, assessing specific variables. The group adhered to a predetermined aerobic exercise program tailored to their respective capacities for a duration of seven weeks. Subsequently, a posttest was conducted on the aforementioned variables after the culmination of the seven-week training period. The hypothesis testing involved the following criterion measures:
Chest Wall Expansion: Measured using a flexible tape and recorded numerically as the score.
Breathing Holding Time: The higher of the two breath-holding durations was recorded in seconds as the score.
Respiratory Rate: Recorded as the number of breathing cycles in one minute.

2.1 Training Programme:

Everyone the participant performed the aerobic exercises after proper warming up. A ten minutes warm up session consisting of 400 meters jogging.

Week	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	15 min Slow	15 min Fast	15 min Fast	15 min slow	16 min Fast	16 min Fast	Rest
2	16 min Slow	16 min Fast	16 min Fast	18 min slow	18 min Fast	18 min Fast	Rest
3	17 min Slow	17 min Fast	17 min Fast	19 min slow	19 min Fast	20 min Fast	Rest
4	19 min Slow	20 min Fast	20 min Fast	22 min slow	22 min Fast	24 min Fast	Rest
5	20 min Slow	22 min Fast	22 min Fast	24 min slow	24 min Fast	26 min Fast	Rest
6	24 min Slow	24 min Fast	24 min Fast	28 min slow	28 min Fast	30 min Fast	Rest
7	30 min Slow	32 min Fast	34 min Fast	35 min slow	38 min Fast	40 min Fast	Rest

2.2 Aerobic Exercises:

Toe-Touch, Side to Side, Double Side to Side, Grapevine, Cross Over Step, Jump on the Spot, Knee Curl, Front Kick, Knee and Arm Lift, Side Kick

2.3 Statistical Analysis:

For comparing the Mean, standard deviation (SD) of selected variables, descriptive analysis and paired t-test were applied at 0.05 level of significant. The results of the study are presented with the help of the following tables and graphs.

Table 1: Mean, SDand ‘t’ test of chest wall expansion between pretest and posttest of students

Test	N	Mean	SD	SE	MD	Ot	df	Tt
Pretest	30	40.80	1.45	0.40	2.60	13.730	29	2.045
Posttest	30	43.40	1.67					

Table-1 illustrates a noteworthy distinction in chest wall expansion between the pre and post-test treatment groups. The calculated 't' value of 13.730 surpasses the tabulated value of 2.045, considering 29 degrees of freedom.

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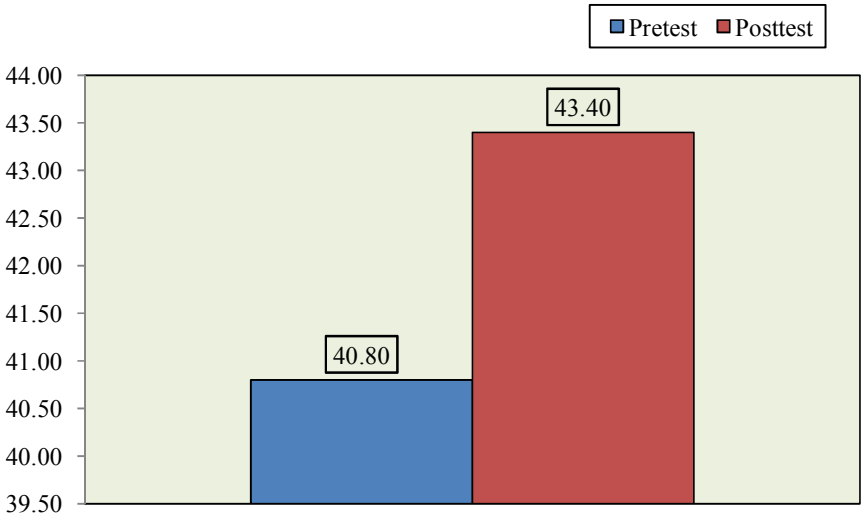

Fig 1: Graphical representation of mean value of chest wall expansion between pretest and posttest of students

Table 2: Mean, SDand 't' test of breathing holding time between pretest and posttest of students

Test	N	Mean	SD	SE	MD	Ot	df	Tt
Pretest	30	54.90	5.06	0.97	4.50	5.033	29	2.045
Posttest	30	59.40	1.67					

Table-2 indicates a substantial disparity in breathing holding time between the pre and post-test treatment groups. The computed 't' value of 5.033 exceeds the critical table value of 2.045, considering 29 degrees of freedom.

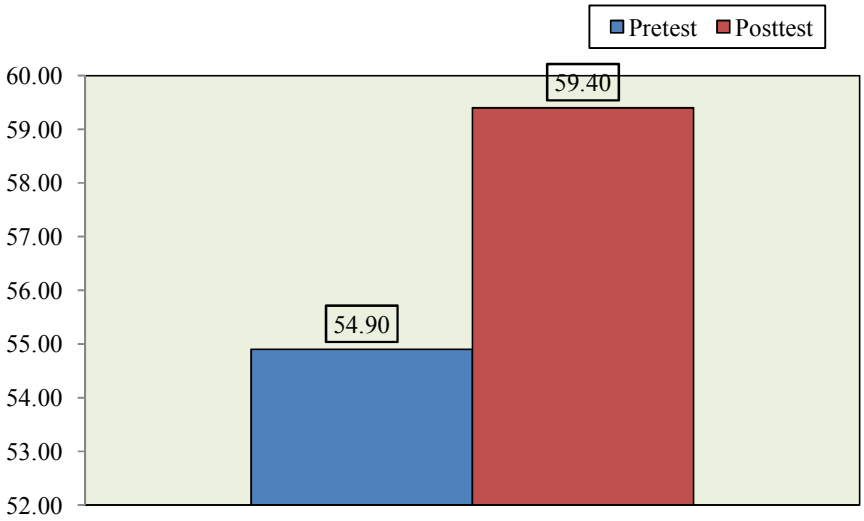

Fig 2: Graphical representation of mean value of breathing holding time between pretest and posttest of students

Table 3: Mean, SDand 't' test of respiratory rate between pretest and posttest of students

Test	N	Mean	SD	SE	MD	Ot	df	Tt
Pretest	30	18.90	1.69	0.44	1.90	11.763	29	2.045
Posttest	30	17.00	1.70					

Table-3 shows that the significant difference in respiratory rate between pre and post test treatment group. The obtained 't' value of 11.763 is more than the table value of 2.045 with 29 degree of freedom.

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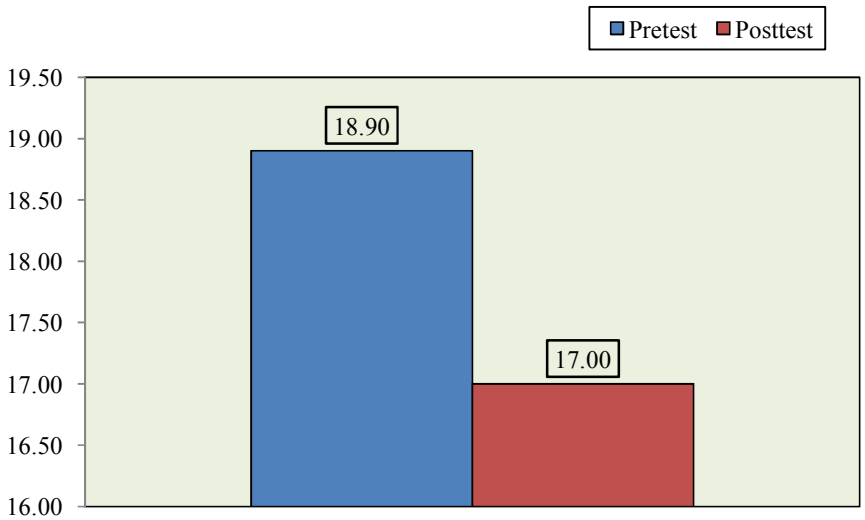

Fig 3: Graphical representation of respiratory rate between pretest and posttest of students

III. CONCLUSION

The findings of this study revealed a demonstrable enhancement in chest wall expansion, breath-holding duration, and respiratory rate following engagement in aerobic exercises. A pivotal observation arising from this investigation is the discernible influence of aerobic exercise on the respiratory system. This preliminary inquiry underscores the potential positive impact of a seven-week regimen of aerobic exercises on parameters such as chest wall expansion, breath-holding duration, and respiratory rate.

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