Sports Science & Health Advances ® (SSHA), Vol. 1 (issue 1), Art 10, pp. 39 – 42, June – 2023, Peer-reviewed, Refereed, Indexed
Online ISSN: 2583-8296 © SSHA, doi:10.60081/SSHA.1.1.2023.39-42

Original Article

Impact of physical training on aerobic capacity on under-graduate students

Bhartendu Singh Chauhan[1], Sandeep Kumar[2]

Abstract: Young people in this group bring a wide variety of skills, talents and levels of motivation to their learning in physical education. They are represented at all points of the physical activity. Students' learning in physical education supports the overall vision of senior cycle education which is to develop students as resourceful, confident, engaged and active learners. Students grow in confidence and competence as they acquire the knowledge, skills and attitudes necessary to enjoy and succeed in a variety of physical activities while in senior cycle and in their future lives. Physical activity, in its many forms, provides the medium through which students learn in, through and about physical education. The purpose of the study was to find out the significant difference in among under-graduate students. 60 students between the ages of 18-23 years were selected for the study from Swami Vivekanand Subharti University, Meerut, Uttar-Pradesh. 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. The assessment includes the dietary habits and daily schedule of the students. All the subjects were assessed for Aerobic capacity. To analyze the data, the dependent t-test was applied and it was found that the Aerobic capacity was found better after the treatment (training) was given to the under-graduate students.

Key Words: Physical Training and Aerobic Capacity

INTRODUCTION

The aerobic capacity is the ability of the heart and lungs to provide the body with oxygen for exercise. This is important in many sports in order for the cardiovascular system to continuously provide the muscle with adequate levels of oxygen. The maximal aerobic tests, in which the participants are required to push their body to the limit, usually provide more accurate measures of aerobic capacity. The sub-maximal tests usually involve heart rate measurements which are then extrapolated to estimate performance at maximum effort.

The activity degree of the practices of various physical exercises as well as the capacity of efficiency for an individual or an athlete's as they are undertaking a physical activity such as exercise, is to be evaluated as the maximum performance of that individual (Joyner and Coyle, 2008).

Aerobic capacity is the capacity of large skeletal muscle groups to adapt to work by using energy obtained as a result of aerobic metabolism. Aerobic capacity is used as a physiological criterion to determine the exercise capacity of the athletes. Physiologically, maximum endurance is articulated as the maximum aerobic capacity of the individual. In other words, it is the total oxygen amount used by an individual during an exercise of maximal stress (Tamer, 1996).

The increase in aerobic capacity also increases the capacity of oxygen-carrying which then helps recovery of muscle pH and glycogen consumption during overloads through anaerobic energy (Balsom et al., 1994; Bangsbo, 1994; Tomlin and Wenger, 2001; Impellizzeri et al., 2006). Aerobic capacity is a known determinant of normal walking and has been suggested as a factor that may influence walking ability in individuals with neurological diseases or disorders (e.g. stroke, multiple sclerosis) (Barbeau H,et.all. 2006).

It is the highest amount of oxygen consumed during maximal exercise in activities that use the large muscle groups in the legs or arms and legs combined. Aerobic capacity, aerobic power, functional capacity, functional aerobic capacity, maximal functional capacity, cardio-respiratory fitness, cardiovascular fitness, maximal oxygen intake, and maximal oxygen uptake are terms that are often used interchangeably and the ability of an organism to exert itself and remain active for a long period of time, as well as its ability to resist, withstand, recover from, and have immunity to trauma, wounds, or fatigue. There is ample evidence supporting the beneficial effects of AET on both aerobic capacity and walking outcomes after stroke (Severinsen K, et.al. 2011), (Stoller O et.al. 2012) & (Saunders DH et.al. 2013) and multiple sclerosis (Snook EM et.al. 2009), (Pearson M et.al. 2015) & (Latimer-Cheung AE et.al. 2013). It is usually used in aerobic or anaerobic exercise. The definition of 'long' varies according to the type of exertion – minutes for high intensity anaerobic exercise, hours or days for low intensity aerobic exercise. There are several marked adaptations associated with the regular performance of endurance training.

Recumbent stepping is a non-task-specific total-body aerobic exercise that produces reciprocal movements similar to, but simpler than walking, and relies on similar neural control (Stoloff RH et.al. 2007). This exercise modality may target ambulatory deficits via multiple mechanisms, including increased aerobic capacity and muscle strength (Hass CJ et.al. 2001) & (Pilutti LA et.al. 2013).

Effects of Aerobic Training

Aerobic capacity: Maximum aerobic capacity increases with aerobic training. The resting Vo2 is stable, as is the Vo2 at a given workload. The changes are specific to the trained muscles. Cardiac output: Maximum CO increases, whereas resting CO is stable. Resting SV increases, with a corresponding decrease in the resting HR. Heart rate: Resting HR decreases with aerobic training and is lower at any given workload. The maximum HR is unchanged. Stroke volume: SV increases at rest and is maintained at a lower HR, resulting in a lower RPP for a given level of exertion. Myocardial oxygen capacity: Maximum Mvo2 usually does not change, but at a given workload, Mvo2 decreases with training. This reduces episodes of angina. Peripheral vascular resistance (PVR): Aerobic training reduces arterial and arteriolar tone, thereby decreasing cardiac "after load" and PVR. The reduction in PVR results in a lower RPP and a lower Mvo2 at a given workload and at rest.

Numerous studies have demonstrated that cardio-respiratory fitness declines markedly with age. In cross-sectional studies, the decline is approximately 50% from the third to ninth decade. In longitudinal studies, a more pronounced age-associated VO2max decline is evident, regardless of habitual physical activity levels. The decline is only partially explained by changes in maximal heart rate and other CV parameters. Sarcopenia, the age-related atrophy and weakening of skeletal muscle, contributes significantly to the age-associated decrease in VO2max. Age-related sarcopenia involves a reduced number, size, and function of muscle fibers. By age 75 years, muscle mass typically represents approximately 15% of body weight compared with 30% in young adults. Fast-twitch fibers atrophy to a greater extent than slow-twitch fibers, which likely contributes to decrements in strength that are proportionally greater than the loss of muscle mass. Increased intramuscular fat and decreased mitochondrial bioenergetics contribute to reduced muscle function.16 Effects of CVD (most notably HF) on skeletal muscle compound the effects of sarcopenia.

The accelerated decline of aerobic capacity with age has important implications regarding functional independence and quality of life (QOL). Because many of the activities of daily living require fixed aerobic expenditures, they require a significantly larger percent of VO2max in older than younger adults. When the energy required for an activity approach or exceeds the aerobic capacity of an elderly individual, he or she will be less likely to perform it.

Growth in maximal aerobic power is influenced by growth in body size, so controlling for changes in body size during growth is essential. Although absolute (liters per minute) aerobic power increases into adolescence relative to body weight, there is a slight decline in both boys and girls, suggesting that body weight increases at a faster rate than maximal oxygen consumption, particularly during and after the adolescent growth spurt (Malina et al., 2004). Changes in maximal oxygen consumption during growth tend to be related more closely to fat-free mass than to body mass. Nevertheless, sex differences in maximal oxygen consumption per unit fat-free mass persist, and maximal oxygen consumption per unit fat-free mass declines with age.

METHODOLOGY

For the purpose of the study and before selecting the final subjects of the research, cooper's 12-minute run/walk test was 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.

Administration of test

Cooper's 12-minute test: The Cooper 12-minute run is a popular maximal running test of aerobic fitness, in which participants try and cover as much distance as they can in 12 minutes.

Purpose

to test aerobic fitness (the ability of the body to use oxygen to power it while running)

Equipment required

flat oval or running track, marker cones, recording sheets, stop watch.

Procedure

Place markers at set intervals around the track to aid in measuring the completed distance. Participants run for 12 minutes, and the total distance covered is recorded. Walking is allowed, though the participants must be encouraged to push themselves as hard as they can to maximize the distance covered.

Scoring

There are Cooper test norm tables for general guidelines for interpreting the results of this test for adults. There are also several equations that can be used to estimate VO2max (in ml/kg/min) from the distance score (a formula for either kms or miles):

- VO2max = (35.97 x miles) – 11.29
- VO2max = (22.35 x kilometers) – 11.29

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 between the Pre and Post Aerobic capacity of the students at 0.05 level of significance.

RESULTS

Table 1 Impact of physical training on the aerobic capacity of undergraduate students

Variable	Group	Data	N	Mean	S.D.	T-RATIO
Aerobic Capacity	Ex	Pre	30	1810	307.95	5.14*
		POST	30	1939	285.61	
	CON	PRE	30	1712	293.36	1.30**
		POST	30	1731	280.45	

* Significant at 0.05, df- 29, t-value 1.669 **Insignificant at 0.05, df- 29, t-value 1.669

Table no. -1 show the average scores of Aerobic capacity pre and post data of experimental and control group of under-graduate students that are 1810 & 1939 and 1712 & 1731 respectively. Table shows significant difference in Aerobic Capacity after intervention of the training program to the experimental group in comparison to control group as the acquired t-score 5.14 was discovered higher than the necessary table worth 1.669 in experimental group whereas the acquired t-score 1.30 was discovered lower than the necessary table worth 1.669 at 0.05 level of confidence.

DISCUSSION

The increase in aerobic capacity also increases the capacity of oxygen carrying which then helps recovery of muscle pH and glycogen consumption during overloads through anaerobic energy (Balsom et al., 1994; Bangsbo, 1994; Tomlin and Wenger, 2001; Impellizzeri et al., 2006). Aerobic capacity is a known determinant of normal walking and has been suggested as a factor that may influence walking ability in individuals with neurological diseases or disorders (Barbeau H,et.all. 2006).

Recommendations

- The same study may be conducted on different group of people.
- The similar study may be conducted on female athletes.
- Similar study may be conducted on State, National and also International athletes.
- 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.
- It can be done for the analysis of other Physical, Physiological and Psychological variables.

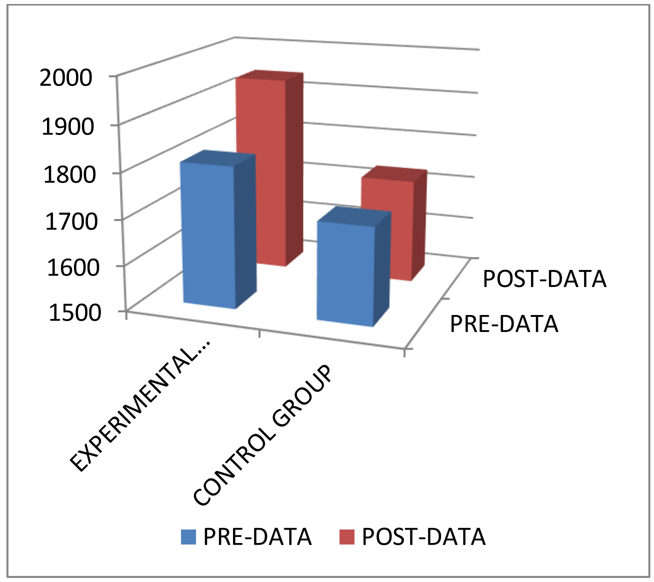

Figure 1 represents the Mean scores of Aerobic Capacity

CONCLUSION

The result shows increase in the Aerobic Capacity of the under-graduate students due to the intervention of the training program. It concludes that the training program given to the students was good and helped to enhance their performance. It also helped them to improve their physical fitness to a higher level. It also provided opportunity for the other researchers that help them to modify the program and even use the same for other physical and health related variables.

Conflict of Interest: No conflict of interest among authors.

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Author Information

[1]**Bhartendu Singh Chauhan**; Ph.D Scholar, Department of Physical Education, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India, Email: bhartenduchauhan00468@gmail.com

[2]**Sandeep Kumar**; Professor, Department of Physical Education, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India, Email: sandeepchaudhary317@gmail.com

Corresponding Author: Bhartendu Singh Chauhan: **bhartenduchauhan00468@gmail.com**

Citation

C*hauhan, S B, M., & Kumar, S.* (2023). Impact of Physical Training on Aerobic Capacity on Under-Graduate Students. Sports Science & Health Advances 1(1), 39-42. https://doi.org/ 10.60081/SSHA.1.1.2023.39-42

Received: 05.03.2023
Accepted: 25.05.2023; Published: 30.06.2023