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STUDY OF AEROBIC AND ANAEROBIC POWER IN MEDICAL STUDENTS INVOLVED IN VARIOUS SPORTS OF EASTERN REGION OF GUJARAT

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ABSTRACT

Introduction:-To balance a healthy way in life, sports are one of the most important social activity instruments to maintain our daily life. Physical activities of the individuals such as physical, social, mental and spiritual aspects that change certain rules are described in sports and sometimes performed individually or in teams. Maximum oxygen intake is a fundamental measure of the physiology of exercise. VO2 max and anaerobic power are known as the functional limitation of the cardiopulmonary system as well as the degree of aerobic fitness. VO2 max and anaerobic power is the maximum capacity of a person's body to transport and use oxygen during exercise, which indicates a person's physical fitness. Individuals with high cardiovascular function can generate more energy and perform better, such as athletes.

Aim and objective: To compare VO2 max and aerobic power in sportsmen and control groups.

Material and methods: Vo2 max (aerobic power) was calculated using the Astrands-Rhyming nomogram and Harward's step technique. The present study was a cross-sectional study. 50 sportsmen were selected from a medical college. 50 sedentary medical students as a control in the age group of 18-25 years, who were playing that particular game for 3-5 years, were selected from the medical institute.

Result: VO2 max in sportsmen (4.48±0.31) lit/min was significantly higher than in the control group (3.29±0.29) lit/min and anaerobic power in sportsmen (1146.91±33.07) watts was higher than in the control group (994.41±27.43) watts.

Conclusion: Regular physical exercise like sporting activity improves cardio-respiratory fitness (Vo2 max and anaerobic power).

Key word:-Sportsmen, Aerobic Power, VO2 max.

INTRODUCTION

To balance a healthy wayof life, sports are one of the most important social activity instruments to maintain our daily lives.Physical activities of the individuals such as physical, social, mental and spiritual aspectsthat change certain rules are described in sports and sometimes performed individually or in teams. [(1)]A negative lifestyle and physical inactivity have shown that and has seriously threatened the health and hastened the deterioration rate of the human body in a few research findings in the last some decades. Effective instruction on the benefits of maintaining

good health habits should be given to the general population by medical professionals should provide stimulating and unfortunately, there is some evidence that a heavy academic workload in medical education makes it difficult for medical students to maintain regular exercise. (2)
Medical students with academic, psychological, existential stressors confront significant outcomes throughout their professional course training. (3) Today's younger generation are subjected to physical and mental stress and living in a very competitive, challenging world. Cardiorespiratory fitness is aerobic power and anaerobic power. (4) Cardio-respiratory fitness is a major component of health-related fitness and depend on a large scale number of phenotypes associated primarily with cardiac, vascular and respiratory functions.
Physical fitness is the human's ability to maintain homeostasis as long as possible in a state of rest during exercise and competition, and to restore it quickly during and after exercise and competition requires a great deal of effort. (5). There are several studies examining the relationship between physical fitness factors, including maximal oxygen absorption and sprint speed, anaerobic power, and anthropomorphic characteristics. (6-9). The function of a large number of phenotypes depends on cardio-respiratory fitness, which is a major component of health-related fitness. To access cardio-respiratory fitness, sub maximum exercise capacity and maximum aerobic strength are measured. (10)
The assessment of cardiopulmonary function is significantly increasing. Maximum oxygen intake is an important part of the physiology of exercise. VO2 max is known as a measure of functional limitations of the cardiopulmonary system as well as aerobic fitness. Aerobic power is the maximum capacity of a person's body to transport and use oxygen during exercise, which indicates a person's physical fitness. Individuals with high cardiovascular function can generate more energy and perform better, such as athletes.(11) VO2 Max means maximum oxygen uptake reflects the intensity of the aerobic process and increases the maximum capacity to transport and utilize oxygen during the exercise done with increasing intensity. (12) Over the years, exercise had a beneficial effect on fitness and sports performance. When muscle activity is fast and violent, the source of energy is through the anaerobic system, whereas in the case of long-term muscle activity, the source of energy is initially through the anaerobic process and then through the aerobic process. (13)Short-term muscle strength depends on the degradation of ATP and its replenishment from phosphocreatine. The rate of both processes is relatively high, but since phosphocreatine stores are limited and need to be replenished by slow, oxidative metabolism, high phosphate-based potency can only be maintained for a limited time, with the result being at least five. Elements:- Energetic potential, including anaerobic and aerobic components, tactics, techniques and motivation for athletes to make the most of their potential. (14)Anaerobic exercise is a physical exercise that is intense enough to produce high levels of lactate. It is used by athletes to increase strength, speed and power in non-endurance sports and to build muscle for bodybuilders. Anaerobic exercise is a physical exercise intense enough to cause excess lactate to form.
This study aimed to investigate the values of aerobic and anaerobic power in medical students involved in sports disciplines and to compare these values with the sedentary medical student control group.

MATERIAL AND METHOD

Study design: This study was a cross-sectional study. The synopsis of the study protocol was submitted to the Institutional Ethics Committee and approval was obtained. The study was conducted in the department of Physiology Zydus Medical College, Dahod, Gujarat. Sedentary medical students as a control group were selected from the medical college. The sportsmen are selected from medical colleges who were involved in various sports such as badminton, volleyball, cricket, football, hockey and runners.

Selection criteria:

Inclusion criteria

1. Sportsmen medical students in the age group of 18-25years,
2. Sportsmen medical students playingsports for 3-5years;
3. Healthy sportsmen, without a history of major illness in past
4. Sportsmen medical students who are non-smokers, non-alcoholics and non-tobacco chewers in.
5. Only males are included

Exclusion criteria

1. Subjects with any cardiopulmonary disease;
2. Smokers, alcoholics, tobacco chewers an
3. Females were excluded from the present study.

Thus 50 medical student sportsmen and 50 sedentary medical students fulfilling the inclusion criteria were included in the study as a control group. Each of the participants was subjected to Sergeants jump reach test. In this test, the difference between a people's standing reach and the height to which he could jump and touch was measured. Tocarry out this test we required an assistant,measuring tape, chalk, and wall (for marking). The participant warmed up for 10 minutes.Then participants held the tip of the chalk with the tip of their fingers. The participant stood close to the wall with feetapart from each other and reached up as high as possible with one hand and marks the wall with the chalk (M1). Then the participant jumped up as high as possible from a static position and marked the wall with the chalk on his fingers (M2). The assistant measured the distance between M1 and M2. Each participant repeated the test three times. Three readings were used and amongst maximum value used to calculate the anaerobic power by using the Lewisformula.

The Lewis formula (Fox and Mathews, 1974) estimates average power [15]

Average Anaerobic Power (Watts) = $\sqrt{}$ 4.9 x body mass (kg) x $\sqrt{}$ jump-reach score (m) x 9.81

VJ – It is the distance between M1and M2 in cm.

Maximal oxygen consumption (VO_2 max) –

Vo2 max (aerobic power) was calculated using Astrands-Rhyming nomogram and Harward's step technique. The subject was asked to step up and down on a 16-inch bench, 30 times per minute for 5 minutes. The rate was adjusted with the help of a metronome. The pulse rate for one full minute was noted immediately after the exercise. This was matched with the weight of the subject on the Astrand's-Rhyming nomogram to obtain Vo_2max [16].

STATISTICAL ANALYSIS:

The detailed data were collected and entered into the Microsoft Excel sheet and analyzed by using SPSS (Statistical package for social science) software. Values were reported as Mean ± SD. Sportsmen and control group comparison was analyzed by applying an unpaired "t" test. P-value was statically significant, less than 0.05 ($P < 0.05$).

OBSERVATION & RESULTS

Table I: Anthropometric mean valuesof sportsmen and control Group

Sr. no.	Parameters	Sportsmen (*n*=50)	Control (*n*=50)	P-value
		Mean±SD	Mean±SD	

1	**Age (years)**	20.95±0.61	20.97±0.59	0.61
2	**Height (cm)**	173.88±1.74	173.76±1.76	0.62
3	**Weight (kg)**	64.96±8.55	63.82±8.72	0.19

Table II - Comparison of VO_2 max between sportsmen and control

	VO_2 max (litres/min)	
	Sportsman (*n*=50)	**Control (*n*=50)**
Mean	4.690	3.517
SD	0.55	0.27
P	P<0.002 (Statistically highly significant)	

Graph comparison of VO2 max between sportsmen and control

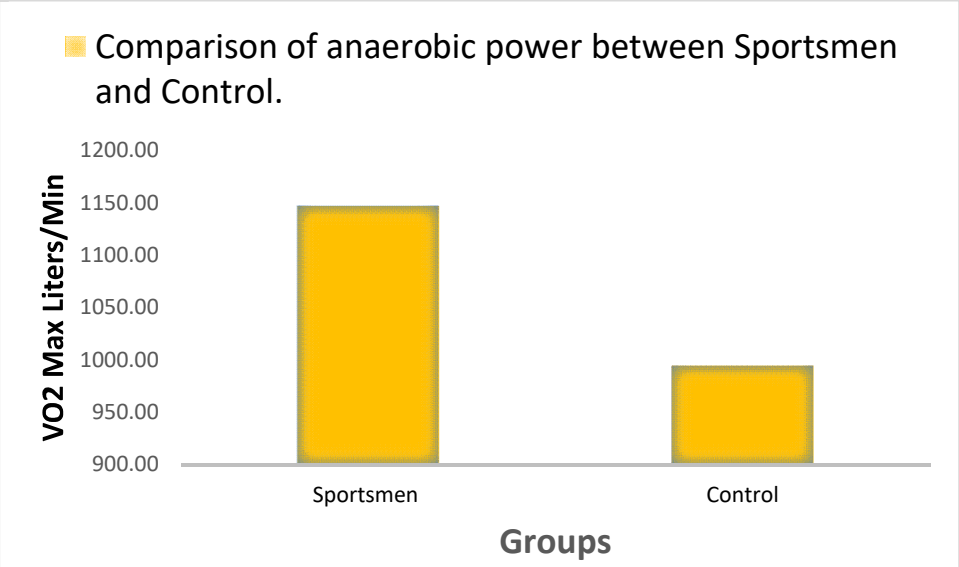
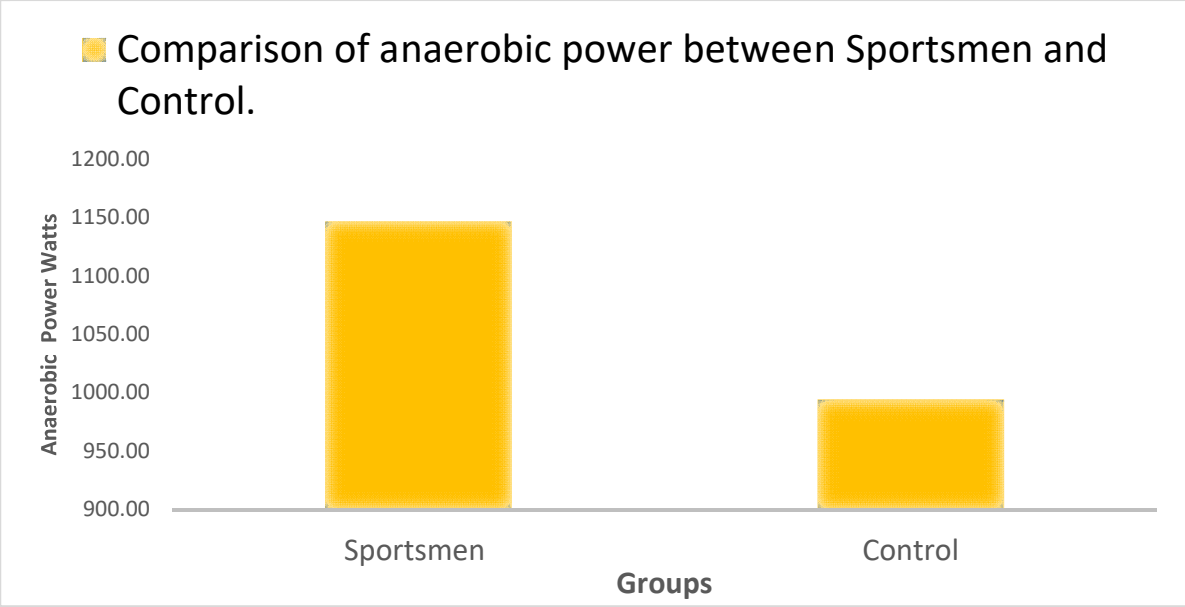


Table III - Comparison of anaerobic power between Sportsmen and Control.

	Anaerobic power(watts)	
	Sportsmen(*n*=50)	**Controls(*n*=50)**
Mean	1146.91	994.41
SD	33.07	27.43
P Value	P<0.001 (Statistically highly significant)	

Graph II Comparison of anaerobic power between Sportsmen and Control.



RESULT

Table I shows mean values of physical characteristics in sportsmen which were age in years (20.95±0.61), height in cm (173.88±1.74), weight in kg (64.96±8.55). The mean values of physical characteristics in the control group were age in years (20.97±0.59), height in cm (173.76±1.76), weight in kg (63.82 ± 8.72). There was no significant difference in age, height and weight between the two groups. This implies that all the groups were comparable concerning these parameters.

Table no. II and Graph I shows a comparison of VO2 max in the control group and sportsmen. VO2max in sportsmen (4.690±0.55) lit/min was significantly higher than in control (3.517±0.27) lit/min. The difference between the mean value of VO2 max in sportsmen and the control group was statistically highly significant ($p<0.002$)

Table III and Graph II show anaerobic power in sportsmen (1146.91±33.07) watts was higher than in the control group (994.41±27.43) watts. The difference between the anaerobic power values of sportsmen and the control was statistically highly significant ($p<0.001$).

DISCUSSION

The present study was approached to compare aerobic and anaerobic power of medical students involved in various sports disciplines and sedentary medical students. Indian medical graduates are the doctors of the future and a good physician should be mentally alert and physically appropriate. [17]When students exercise less often and mainly because of the huge academic workload they have to deal with different types of stress. It is important to measure and analyze their physical fitness for their benefit and improvement to maintain a healthy lifestyle. VO2 max provides a quantitative assessment of an individual's ability to perform aerobic transfusions. Maximum Oxygen Absorption [VO2 max], an internationally accepted parameter for evaluating cardiorespiratory fitness, reflects the amount of oxygen used by the working muscles during maximum exercise. This is the best index of aerobic capacity and the gold standard for cardiorespiratory fitness. Some studies have shown a linear increase in VO2 max and training has shown that prolonged training can increase VO2 max more than 40% in normal

sitting individuals. [18-21]Astrands I and Hermansen L was found in young sedentary men's body weight and height that associated with VO2 max was strong. [22, 23]The anaerobic capacity of football players was also increased significantly. This was due to frequent sprints in sports like football, basketball, hockey cricket. Sprint requires a phosphagen system and creatinine phosphate to generate instant energy. Recovery of the deleted store of creatinine phosphate depends on the distance between sprints. Decreased duration of sprint reduces the reabsorption of creatine phosphate stores which increases fatigue time. Research by Koser and Hazar et al showed that the anaerobic power value of sitting male students is lower than the anaerobic power value of students studying in sports departments. [25]

Several recent studies have found that physical activity has a positive effect on students' academic outcomes. [26-28]The study was conducted on primary, secondary school and college students. In each study, it was determined that students who participated in physical activity had higher grades and test scores than those who did not. Excess VO2 max and a decrease in anaerobic strength are indicators of exercise ability or endurance. VO2 max is the product of maximum cardiac output and maximum arteriovenous oxygen difference.[29] The reason for the decrease in VO2max in our subjects is reduced physical activity, unhealthy lifestyle behaviours, such as those established over the years of education, which can affect adult behaviour and health status. As measured by BMI, cardiorespiratory fitness has also shown a strong correlation with total adiposity. [30]

Conclusion:

Aerobic and anaerobic strength is significantly higher in sportsmen than in controls. This showed that physical activity mostly affects cardio-respiratory function. Aerobic power and anaerobic power can be taken as an indicator of cardio-respiratory fitness. Strength and regular exercise training increase aerobic and anaerobic strength. Anaerobic strength can be improved with the help of specific training and physical factors play an important role in the performance of athletes in a variety of physical activities. The results of this study strongly recommend regular physical exercise for medical students. Medical students are always under tremendous stress which affects their work productivity and this is also due to a sedentary lifestyle. Regular physical exercise will improve their cardiovascular fitness and help them lead a better quality of life. We hope that this information will help medical educators to address this problem, promoting exercise and corporate physical fitness among medical students.

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