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COMPARISON OF VARIOUS DIMENSIONS OF VO_2 MAX BETWEEN OBESE AND NON-OBESE

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Abstract:-Background : Maximal oxygen consumption test perhaps in most valid means of determining a person's maximal aerobic power of VO_2 max. Cardio-respiratory fitness and body composition are associated with the risk of emergence of cardio-vascular diseases.
Purpose: This study was to assess the Comparison of various dimensions of VO_2 max between obese and non-obese.
Methods : Eight male students were selected from Chaudhary Charan Singh P.G. College, (Saifai) Etawah, Uttar Pradesh, India belonging to faculty of Arts, Science and Commerce. Their fat percentages were calculated and they were divided into two groups obese (>20% Body fat) and non-obese (<20% Body fat) randomly selected unrelated normal healthy and sedentary collegiate boys aged 18-25 years. Each group contains 40 subjects.
Result : Table 2 showed that obese subjects had lower VO_2 max in term of total body mass and lean body mass as 't' ratio were 4.31 and 2.65 repectively which were higher than the tabulated 't' value (2.02) at 0.05 level of significance. However, there were insignificant differences observed in case of absolute VO_2 max in l/min as evident from the 't' ratio 1.89 which was lower than the tabulated 't' value (2.02) at 0.05 level of significance.
Conclusion : It was clearly indicated that obese subjects had lower VO_2 max than non-obese subjects. Dolgener (1980) conducted a study on body building and body composition of high ability male dancer. Findings were dances having less fat composition to non-dancers. So, non-dancers had less VO_2 max than dances.

Keywords:VO_2 max, obese, non-obese, body fat

INTRODUCTION

Many factors influence the VO_2 max of these the most important are cardio-vascular efficiency body composition (fatness or obesity), mode of exercise, person heredity, state of training and age. Obesity is generally considered a contributor too many measure health problems, including non-insulin dependent diabetes mellitus and some form of cancer. However, its contribution to the etiology of atherosclerosis CVD (Cardio Vascular Disease) particularly CAD (Cardiac Arterial Disease) is the sourse of considerable controversy and remains an enigima. Although studies clearly show that the excess weight increases the risk of a number of metabolic and physiological risk factors related to atherosclerosis widely divergent result have been reported in observational studies between the association of overweight or measures of body fatness and severity of atherosclerosis and mediocre of cardio arterial disease. (Cancer Barret, 1985)

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Maximal oxygen consumption is related to cardio vascular fitness. We known that body composition or obesity are causes of cardio vascular disease. The capacity of heart and lungs both are related to aerobic and anaerobic condition.

It is considered that VO_2 max are maximal aerobic capacity is only a single measure of the functional capacity of the oxygen system or cardio-respiratory system or the oxygen transport system (Koley 2007).

Peak VO_2 increases with age in both boys and girls, both in absolute terms and with body size and composition accounted for but boy's value are higher than the those of girls even during prepubertal years (Maffulli et. al. 2001).

It is estimated that 69% of the differences in max VO_2 score among individual can be explained simply by difference in body mass 4% by difference in stature and 1% by variations in lean body mass (Wyndham and Hengns 1969).

Thus it is not meaningful to compare exercise performance or the absolute value for oxygen consumption among individuals who differ in body size or body composition (Cureton et. al. 1979). This has led to common practice of expressing VO_2 max in terms of body composition either in relation to body mass, lean body mass or live volume (McArdle and Catch 1991).

Both the high body fatness and low aerobic fitness have been shown to be risk factors for cardio vascular disease. It is still unclear, whether these factors are related to each other or if they are independent risk factors.

2. MATERIALS AND METHODS

2.1. Participants

Eight male students were selected from Chaudhary Charan Singh P.G. College, (Saifai) Etawah, Uttar Pradesh, India belonging to faculty of Arts, Science and Commerce. Their fat percentages were calculated and they were divided into two groups obese (>20% Body fat) and non-obese (<20% Body fat) randomly selected unrelated normal healthy and sedentary collegiate boys aged 18-25 years. Each group contains 40 subjects.

2.2. Data collection

After obtaining approval for the human subject's protocol the consent for voluntary participation was obtained. The work was approved by Ethical Committee of Department of Physical Education of Chaudhary Charan Singh P.G. College, (Saifai) Etawah, Uttar Pradesh, India.

2.3. Measures

2.3.1. Body composition

Percentage of body fat was determined by the skin fold thickness, recoreded at four sites of the body i.e. biceps, triceps, sub scapula and suprailliac and the total corresponding value of skin fold at four sited were referred to the help of converting chat prepared by Durnin and Rahman (Durnin and Rahman 1967). Total body mass (Body weight) was measured with standard weighting machine and recorded in kilogram. Lean body mass was obtained by substracting total body fat (in kg) from total body weight and recorded into kilogram.

2.3.1. Prediction of VO_2 max

Bench stepping test was used to predict maximal aerobic capacity. It is a standard method to measure one's maximal oxygen uptake using bench stepping sub maximal exercise. Prior to the test, subjects did 5-7 minutes warming up consisting of lower limb muscle stretching and brisk walking. A wooden stepping bench of 16 inch was used along with metronome and stop watch. Metronome was

used to monitor the stepping cadence, which was set at 120 beats per minute (30 complete steps per minute). The step test began after a brief demonstration and practice period. The subjects were asked to perform each stepping cycle to a four-step cadence, up-up-down-down continuously for six minute. After completion of test, subjects remained standing while pulse rate was measured for one minute. Obtained scores of pulse rate were referred to Astrand-Astrand nomogram (Fox and Browers, 1989, Schoenfeld et.al., 1978) to predict VO_2 max.

3. STATISTICAL METHOD

Descriptive statistics was applied on all data. After determine normal distribution of the test variables, Independent t-test was to compare mean differences of variables between obese and non-obese groups.

4. FINDINGS

Table 2 showed that obese subjects had lower VO_2 max in term of total body mass and lean body mass as 't' ratio were 4.31 and 2.65 respectively which were higher than the tabulated 't' value (2.02) at 0.05 level of significance. However, there were insignificant differences observed in case of absolute VO_2 max in l/min as evident from the 't' ratio 1.89 which was lower than the tabulated 't' value (2.02) at 0.05 level of significance.

6. DISCUSSION OF FINDINGS

It was clearly indicated by the table 2 that obese subjects had lower VO_2 max than non-obese subjects. However, Dolgener (1980) conducted a study on body building and body composition of high ability male dancer. Findings were dances having less fat composition to non-dancers. So, non-dancers had less VO_2 max than dances. Chatterjee (2005) conducted a study, which aimed to evaluate the cardio-respiratory fitness in term of VO_2 max in obese boys of West Bengal, India. The finding was VO_2 max per kg of body mass was significantly higher among non-obese boys but the VO_2 max per unit of body surface area was significantly higher ($p>0.001$) in obese group. This indicates that reduce oxygen utilization by adipose tissue during exercise reduce the overall VO_2 max. Cardio respiratory fitness represents the functional capacity of heart, blood vessels, lungs and related muscles while individual performing different kinds of physical activities. Body composition is the main component of health related fitness refers to the relative amounts to fatty tissue devoid of fat free mass i.e. muscle, bone and water.

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Table 1
MEAN AND STANDARD DEVIATION OF THE OBESE AND NON-OBESE SUBJECTS IN DIMENSIONS OF VO_2 MAX AND BODY COMPOSITION VARIABLES

Variables	Obese Group (n=40)		Non-obese Group (n=40)	
	Mean	SD	Mean	SD
Fat Percentage	23.76	2.41	11.27	2.23
Total body Mass (in kg)	71.12	5.53	59.73	5.85
Lean Body Mass (in kg)	54.21	5.03	52.06	6.12
VO_2 max in term of ml/kg(BM)/min	50.15	9.68	66.86	12.38
VO_2 max in term of ml/kg(LBM)/min	63.83	11.56	75.57	15.13
Absolute VO_2 max in liter	3.74	1.07	3.89	1.22
Fat Weight (in kg)	15.26	3.02	6.7	1.35

BM: Body Mass, LBM: Lean Body Mass

Table 2
MEAN COMPARISON OF VARIOUS DIMENSIONS OF VO_2 MAX BETWEEN OBESE AND NON-OBESE GROUP

Groups / Variables	Obese Group (n=40)		Non-obese Group (n=40)		't'ratio
	Mean	SD	Mean	SD	
VO_2 max in term of ml/kg(BM)/min	50.15	9.68	66.86	12.38	4.31*
VO_2 max in term of ml/kg(LBM)/min	63.83	11.56	75.57	15.13	2.65*
Absolute VO_2 max in liter per minute	3.74	1.07	3.89	1.22	1.89

*significant at 0.05 level
T0.05 (N=38) =2.02

Figure 1 Graphical representation of Mean and Standard Deviation (SD) of dimensions of

VO_2 max and body composition variables of the obese and non-obese subjects