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Assesment of maximal oxygen uptake in the students of Degree College in Deoria, Uttar Pradesh

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Abstract
Objective: To assess the Maximal Oxygen Uptake in the students of Degree college in Deoria of Uttar Pradesh.
Methods: Harvard Step test was used on 100 boys from rural and urban area studying in aided college of Deoria. Further, Maximum oxygen consumption (Vo_2 max) was measured in $ml.kg.^{-1}.min^{-1}$ using Astrand and Astrand Nomogram.
Results: The mean of both rural boys is more than urban boys with same standard deviation. Significant difference was found between the means of Rural and Urban boys on the scores of VO2 max.
Conclusions: Rural boys are having better maximal oxygen competition in relation to urban boys.

Keywords: Maximal oxygen uptake, rural, urban etc.

1. Introduction
Physical fitness if the ability to carry out daily tasks with vigour and alertness without undue fatigue and ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies. This implies that fitness has necessary qualities for doing any work or physical activity. These qualities will vary in individuals and at the same time they vary from time to time in the same person. The continuously changing life process creates different needs and emphases for different individuals as they grow older (Leonard, 1951) [16].
Cardiovascular endurance probably is the most important component from the point of view of health over a life time. However, cardiovascular endurance is ill defined and ill understood. What is known about training effects indicates specificity.
Cardio-respiratory endurance is an extremely complex concept and could be readily understood when the various element of cardio respiratory system affected by exercise are recognized. These elements involve heart, the blood vessels supplying blood to all parts of the body, oxygen carrying capacity of the blood, the capillary system receiving the blood and the lungs. Measurement of these elements include blood pressure, heart rate, stroke volume of the heart, lung volume, vital capacity, maximum breath hiding capacity and maximum oxygen uptake(H Harison, 1973) [10].
Cardio respiratory development has been directly related to body growth. As body size increases so does cardio respiratory capacity with an increase in body size there is an accompanying increase in cardiac dimensions which in turn leads to a greater stroke volume and VO2 max. This basic mechanical principle establishes the strong relationship between body size and cardio respiratory capacity. For each centimetre of height increase between 100 and 180 cm there is a 1 beat per minute decrease in sub maximal heart rate at a given power output. The most commonly accepted measure of cardio respiratory capacity is Vow max. or the highest attainable oxygen uptake rate in exhaustive exercise and is usually described in terms of millilitres of oxygen per kilogram of body weight per minute.VO2 max has been measured to increase at the same rate for both sexes, with boys having lightly higher values. Although vow max continues to increase for boys through their adolescent years, there is little development beyond early to adolescent in girls. It has been found a decrease in VO2 max with age for girls. This was most evident beyond early adolescence. These sex related difference may explained by the relatively larger amount of body fat in females compared to males after puberty. These difference almost disappear once maximal o2 uptake is related to the muscle mass that perform the activity.

Boys also experience a peak vo2 max velocity that is closely related to peak height velocity. Vo2 max velocity is delayed approximately 4 months behind peak height velocity and occurs simultaneously with an increase in testosterone. This relationship is a proven factor in the development of muscle strength, increased haemoglobin and red blood cells. Children also show a lower stroke volume, higher heart rate, and lower cardiac output at each metabolic rate, and lower cardiac output at each metabolic level when compared to adults (Barbara, 1990) [2].

Aerobic capacity is the ability to mobilize energy for continuous performance of specific movement for prolonged time i.e., capacity for prolonged physiological functioning under continuous supply or required oxygen under conditions of required oxygen completely available the glucose molecules is completely broken down to co2 and h2p, and energy is made available as needed. (Donald, 1976) [15].

Cardio respiratory fitness can be ascertained/assessed by direct measurement of maximal oxygen uptake (VO2 max) during a graded exercise test. Direct measurement of vo2 max is typically reserved for laboratory setting due to the need for costly equipment and trained technicians, an inability to test large numbers of people at one time, and the requirement that participants exercise to extrusion. As a result numerous sub maximal exercise tests have been developed. Valid and reliable estimates of vo2 max have been made from track walking and jogging; bench stepping, cycle ergometry and treadmill walking and jogging protocols.

The bench mark of aerobic capacity is accepted as maximal oxygen uptake which is used as a measure of aerobic power. Although laboratory testing using indirect calorimetry is the most accurate method to determine maximal aerobic capacity, the procedure is expensive time consuming and requires a highly motivated subjects exercising to voluntary exhaustion. Not all the individuals have the motivation to perform a maximal test and certain contra indications may prohibit maximal testing of some individuals. Consequently, test to estimate aerobic capacity were devised based on the heart rate response at a submaximal workload. These methods, which commonly use bench slipping, cycle ergometry, and walking/running protocols, can be used to quickly test large groups of individuals. Some of the more will known prediction tests include the Harvard Step Test, the Cooper 12 minute Run, 1.5 mile run, and the Astrand Rhyming Nomogram.

Since many youths and adults do not fully understand and appreciate the importance of health and fitness, a heavy responsibility rests on the shoulders of educators or coaches. To develop a health related physical fitness program or training schedule, one must know especially the strong and weak point of a particular population. It has already been discussed above that cardiovascular efficiency has greater importance for the physical fitness of an individual. Considering this the scholar wanted to assess the maximum oxygen uptake of Deoria (U.P) Degree College. This study will help us to have a true picture of cardiovascular endurance in general and vo2max in particular in adolescent boys. It will help the trainers to know the physical standard of the children and accordingly they will be trained. However, no study seems to have been done on the assessment of maximum oxygen uptake in Deoria (U.P.)

2. Methods

2.1 Selection of the subjects: 100 Boys were randomly selected for this study. Fifty from Rural Area and fifty from urban area. For the true representation of the subjects the scholar selected the students only from the Aided college only since in those colleges, maximum students of original native of that particular area and spanning the entire strata in terms of economic consideration. The age of the subjects was in the rage of 16 to 23 years.

2.2 Selection of variables: Based on literary evidence, correspondence with the expert and the scholar's own understanding maximal oxygen consumption was selected for this study.

2.3 Criterion Measures: Soon after the cessation of 5 min. exercise on the bench, heart rate was recorded from 0 to 10 seconds which was further converted to 60 seconds in terms of number of beats/min. Maximum oxygen consumption (Vo_2 max) was measured in $ml.kg.^{-1}.min^{-1}$ using Astrand and Astrand Nomogram.

2.4 Procedure for administration of Test& collection of Data

For the collection of data the scholar first seek the permission from the Principal of college. The subjects were informed about the component and purpose of the study. The height of the benches were fixed as for boys 16 inches. For the step up test each time the subject should step all the way up on the bench with the body erect. The stepping process was performed in four counts as

1. The stronger foot was placed on bench;
2. Other foot was placed on the bench;
3. Stronger foot was placed on floor;
4. other foot was placed on floor

After assessing the load, each subject was asked for step ups in the given work load for 5 minutes. Before he started some time was given to them for warm up and once they finished their warm up they were asked to perform the exercise at that assessed load for five minutes. Immediately after the exercise "0" minute heart rate was taken for 10 seconds which was further converted into 1 minute. It was found that in the case of boys, target heart rate was 36 steps per minute. Heart rate was taken to determine Vo_2 max by Astrand and Astrand nomogram (Indirect Method). The weight of all the individual subjects were taken in kilogram so that the Vo_2 max could be calculated in the form of $ml.kg.^{-1}.min^{-1}$

To compare the performance of boys belonging from rural and urban area 't' test was used. The test was applied at.05 level of significance.

3. Results

Table 1: Descriptive Statistics of Maximal Oxygen Uptake in Rural and Urban Boys of Deoria (U.P.)

Locality	Mean VO2 max (ml/kg/min)	S.D
Rural	36.13	3.51
Urban	33.19	3.18

Table-1 clearly indicates the mean and standard deviations of maximal oxygen uptake of both rural and urban boys. The result shows that the mean of both rural boys is more than urban boys with same standard deviation. Secondly, it was also found that the data was normally distributed.

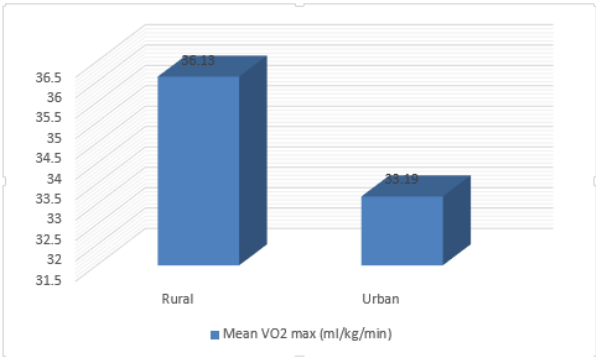

Fig: Graphical Representation of mean Vo2 max in Rural and Urban Boys

Table 2: Comparison of Mean Vo2 Max Between the boys of Rural and Urban areas

Variable	Group Mean		Mean Diff.	σ Dm	t-Ratio
	Rural	Urban			
VO2 max	36.13	33.19	2.94	.15202	5.218*

*Significant at.05 level of confidence $t_{.05}$ (98) =2.00

It is evident from Table-2 that there was a significant difference was found between the means of Rural and Urban boys on the scores of VO2 max since the obtained value of 't' (5.218) was higher than the tabulated value of 't' (2) which was required to be significant at (98) degree of freedom with 0.05 level of confidence.

4. Discussion of Findings

Janssen I, Katzmarzyk PT, Boyce WF, Vereecken C, Mulvihill C, Roberts C, Currie C, Pickett W; Health behaviour in School-Aged Children Obesity Working Group (2005) reported that the adolescent obesity epidemic is a global issue. Increasing physical activity participation and decreasing television viewing should be the focus of strategies aimed at preventing and treating overweight and obesity in youth. Koezuka N, Koo M, Allison KR, Adlaf EM, Dwyer JJ, Faulkner G, Goodman J. (2006) [14] reported that there is a complex inter-relationship between sedentary behaviors and physical inactivity, highlighting the need for targeted interventions addressing patterns of sedentary behavior engagement. Reducing time spent on television viewing may be one plausible strategy within such interventions in reducing physical inactivity among youth. Sanders LF, Duncan GE. (2006) [1] reported that Non-Hispanic black adults have the highest percentage of low cardiovascular fitness among major race groups in the United States. Lee CD, Jackson AS, Blair SN. (1998) [15] reported that Unfit men had higher all-cause and CVD mortality than fit men. The health benefits of normal weights appear to be limited to men who have moderate or high levels of cardiorespiratory fitness. Teh KC, Aziz AR (2000) [20]. A stair-climb test using HDB stairs was developed which was able to estimate cardiorespiratory fitness with reasonable accuracy. Dvorak RV, Tchernof A, Starling RD, Ades PA, DiPietro L, Poehlman ET.(2000) [7] The results suggest that higher levels of cardiorespiratory fitness have greater cardioprotective effects than higher levels of free living physical activity in older individuals. Jurca R, Jackson AS, LaMonte MJ, Morrow JR Jr, Blair N, Wareham NJ, Haskell WL, van Mechelen W, Church TS, Jakicic JM, Laukkanen R.(2005) [12] suggestted that CRF may be accurately estimated in adults from a non-exercise test model including gender, age, body mass index, resting heart rate, and self-reported physical activity. Cheng YJ, Macera CA, Addy CL, Sy FS, Wieland D, Blair SN (2003) [4]. Physical activity and non-smoking or smoking cessation is associated with maintenance of cardiorespiratory fitness. Change in physical activity habits is associated with change in cardiorespiratory fitness, but respiratory function contributed little to this association during a five year follow up. Butterworth DE, Nieman DC, Underwood BC, Lindsted KD. (1994) [3] Neither physical activity nor cardiorespiratory fitness was significantly correlated with nutrient density (nutrient/1,000 kcal). Intake of energy (kcal/kg body weight) was higher for the more physically active and fit women, leading to a significant increase in most nutrients consumed per kilogram of body weight. Drinkard B, McDuffie J, McCann S, Uwaifo GI, Nicholson J, Yanovski JA (2001) [6] suggested that an easily obtained measurement of physical performance (distance traveled during a 12-minute walk/run test) is related to cardiorespiratory fitness and to body composition in adolescents who are overweight. The 12-minute walk/run distance is more predictive of cycle ergometry test results than the 9-minute distance. Guerra S, Ribeiro JC, Costa R, Duarte J, Mota J (2002) [9, 17] showed that boys were more fit and had less fat than girls. The level of cardiorespiratory fitness does not seem to be an important correlate of blood pressure variation across age groups and gender.

Oja P, Laukkanen R, Pasanen M, Tyry T, Vuori I.(1991) [18] suggested that a fast 2-km walk supplemented with simple measurements is a feasible and accurate alternative for determining the cardiorespiratory fitness of healthy adults. Mota J, Guerra S, Leandro C, Pinto A, Ribeiro JC, Duarte JA. (2002) [9, 17] showed that Height, %F and the S/T ratio were also significantly associated with VO (2)/kg body mass and 20SRT-time. Klasson-Heggebo L, Andersen LB, Wennlof AH, Sardinha LB, Harro M, Froberg K, Anderssen SA.(2006) [13] A curvilinear graded relation was found between cardiorespiratory fitness and waist circumference, sum of skinfolds, and systolic blood pressure. The greatest difference in these health variables was observed between low and moderate fitness levels. Eiberg S, Hasselstrom H, Gronfeldt V, Froberg K, Svensson, Andersen LB.(2005) [8] Vo(2)max is higher in boys than girls (+11%), even when related to body mass (+8%) and LBM (+2%). Most of the difference in Vo(2)max relative to body mass was explained by the larger percentage body fat in girls. When boys and girls with the same Vo(2)max were compared, boys engaged in more minutes of exercise of at least moderate intensity.

The above results showed the different aspect of maximal oxygen uptake. The present study showed that the boys of rural and urban areas were having a mean difference of only 3ml/kg/min. The study is justified and relevant. However, more study is required to assess the maximal oxygen uptake in female because it was found that female are mostly anaemic and they restrain themselves from physical activity either in college competition or any other completions.

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