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Physical activity and Physical fitness parameter in undergraduate College going students' age group between 18 to 23 years

[1]Sanskruti Trivedi, BPT; [2]Dr. Arvind Kumar, PhD

[1]Bachelor of Physiotherapy; [2]Principal and Professor (PhD Physiotherapy)

[1]Venus Institute of Physiotherapy – Swarrnim Startup & Innovation University, Gandhinagar, Gujarat
[2]Venus Institute of Physiotherapy – Swarrnim Startup & Innovation University, Gandhinagar, Gujarat

Abstract

Introduction: Maximum Oxygen Uptake (VO2max) reflects Physical Fitness of individual. Decreased Cardiorespiratory Fitness due to lack of regular Physical Activity in young adults have forced them to become the victims of Cardiovascular co morbidities in their later stage.

Method: A Total 40 young adult male and female undergraduate College going student age group between 18 to 23 years were recruited by convenient sampling. Data was collected by assessment and International Physical Activity Questionnaire and QCST.

Result: Mean value of VO2max for males was 46.45 $\pm$ 15.9790711 ml/kg/min and for females was 40.780 $\pm$ 4.107005078 ml/kg/min. The Mean and SD values were found to be significantly higher in the males than in females. The VO2max values obtained in males were found to be closer to the normal predicted values than the values obtained in females.

Conclusion: After analyzing the results it is concluded from this study that overall Physical performance of males was higher than the female students.

Keywords: Physical Fitness, Queen's College Step Test, VO2Max, International Physical Activity Questionnaire.

INTRODUCTION

Transition to College is characterized by change, ambiguity, and adjustment compared to the previous lifestyle before entering college. Time spent in university represents a period of transition and may be an appropriate time to promote physical activity among young adults. Transitioning to College life could be stressful due to an increased pressure to focus on academic performance and having a new social life, as well as in some instances moving away from home for the first time. College students are vulnerable to experiencing tension, stress, and anxiety, and exercise could be used as an excellent method to manage these conditions. Moreover, university students are at risk for weight gain 5.5 times more than the general population. They are also at risk of developing high blood pressure and high serum cholesterol. Therefore, exercise is not only helpful in managing psychological stress reactions that students can experience, but it also has a positive effect on mood and self-esteem, physical and mental health, and the student's quality of life.[1]

However, now a day's increasing dependence on mechanical devices in daily life and reduction in work-related and leisure-time physical activities is rendering life style of both males and females sedentary.[2]

PHYSICAL ACTIVITY

Regular physical activity and health related physical fitness are key indicators of health outcomes. Bodies are recognizing that physical activity and exercise are integral to professional practice and core contributors to health along with reducing the risk of developing diabetes, hypertension, osteoporosis and cardiovascular disease, primary and secondary prevention of cancer. Physical activity also improves emotion and stress control. Promoting physical activity in undergraduate college group students is a sensible strategy likely to help reduce physical activity levels. An associated disease in the future generation a decline physical activity levels among young adults so there was a need to evaluate the physical activity level of the students and to determine their physical fitness level.[3]

Physical activity Maintain healthy bone and muscle, reduce obesity, reduce stress and anxiety, depression, enhanced cognitive function, positive mental health and promote Well Being and healthy lifestyle[4]. Young adults are exposed to a number of academic, physical, emotional and social changes which coupled with changes in independence and living situation among some students may influence key health behaviour such as Smoking, alcohol use, poor nutrition and physical activity.[5]

The International Physical Activity Questioner Measure all physical activity for use with individual adult patients aged 15 to 69 years old. The International Physical Activity Questioner can be used clinically and in population research that compare physical activity level between populations internationally[6]. The measure Assess the type of intensity of physical activity and sitting time that people do as part of their daily lives are considered to estimate total physical activity in MET minute per week and time spent sitting.[7]

FACTORS AFFECTING PHYSICAL ACTIVITY

Several Social and Environmental Factors have systematically emerged as determinants of physical activity in adults. In ethnic minorities, the removal of barriers such as unaffordable facilities and unavailable childcare, high crime rates, fear for personal safety and culturally inappropriate activities are of primary importance. Social support from family, peers, communities and healthcare providers has resulted in modest improvements across cultures, ages and genders in selected settings, but the definition of specific interventions and their outcomes deserve additional attention.[8]

PHYSICAL FITNESS

Being physically fit has been defined as the ability to carry out daily tasks with vigour and alertness without undue fatigue and with ample energy to enjoy leisure time pursuit and to meet unforeseen emergencies[9].The health-related components of physical fitness are cardio respiratory endurance, muscular endurance, muscular strength, body composition and flexibility.[10] Physical fitness is a measure of body's ability to function effectively and efficiently or can be defined as state of health and wellbeing of a person fitness can be achieved through proper nutrition, exercise, rest and moderate to vigorous physical activity.[11] Physical fitness is a multidimensional concept that evolves with age and involves muscles, skeleton, heart and mind related activities that enhance physical, intellectual, psychological, emotional and social development. The lifestyle change diminishes level of physical activity as well as increasing various sickness caused by the lack of movement.[12]

PHYSICAL ACTIVITY AND PHYSICAL FITNESS

The Objectives of the Study are to find the level of the physical activity and compare physical fitness parameters in undergraduate college going student's age group between 18-23 years by evaluating Aerobic Capacity and Endurance and body composition in different level of physical activity.[13] There is consensus that regular physical activity (PA) can improve physical fitness (PF) and health and assist in the prevention of disease. Physically active adults are healthier and have a higher PF than inactive adults. Physical activity is therefore promoted as part of a healthy lifestyle. PA can influence fitness and health and that the relationships are also reciprocal.

BMI

Body Mass Index (BMI) is a value derived from the mass (weight) and height of a person. The BMI is defined as the body mass divided by the square of the body height, and is expressed in units of kg/m2, resulting from mass in kilograms and height in meters.

BMI AND PHYSICAL ACTIVITY

Obesity is an excessive fat accumulation in adipose tissues and is defined by a Body Mass Index (BMI) of 30 kg/m2 and above. Individuals in the BMI range of 25 to 30 kg/m2 are categorized as overweight while a BMI of 40 kg/m2 and above is regarded as morbid obesity. Obesity correlates with an individual's increased risk of cancers, stroke, metabolic disease, heart failure, and other cardiovascular conditions, highlighting the need to reduce the incidence and prevalence of obesity[14]. Inactivity or low level of physical activity combined with changes in eating habits are believed to be the main reasons for the increased prevalence of overweight/obesity among adolescents and adult. The genetic differences in weight gain among them also make them vulnerable to overweight. As physical activity is an important component in weight control and also associated with other major health benefits its role in youth health is fundamental. Physical activity measured as number of steps per day was inversely correlated to percentage body fat as well as to Body Mass Index (BMI) in adults. It is therefore difficult to know whether inactivity causes obesity or obesity leads to inactivity. Guidelines for physical activity levels in adolescents and adult recommend at least 60 minutes of accumulated moderate to vigorous physical activity per day. Many other factors besides individual level of daily physical

activity for a healthy lifestyle are cultural, social, and personal. Data on the inter-relationship between BMI and physical activity are limited.[15]

VO2max

VO2max is the maximum amount of oxygen can take in and utilize. Not all air taken in is used by the body. The more cardiovascular conditioned are, the higher VO2max will be, thus the more oxygen will be able to utilize with each breath. Finding VO2max is among the best measures of cardiorespiratory fitness. Each litre of oxygen utilized burns about 5 Kcals so the higher the VO2max, the more energy will require to exercise meaning can burn more calories and get better more intense workouts. Striving for a higher VO2max is one of the best ways to improve all cardiovascular functions in the body which will improve your overall fitness level.[16]

FACTOR AFFECTING VO2MAX

VO2max level depends on body build and composition and is affected by the following factors:

- Sex - Comparatively, the typical female will have a lower VO2max than the typical male.
- Age - Maximal Oxygen Uptake (VO2max) decreases by 10% per decade in men and women regardless of age and exercise activity.
- Size – Maximal Oxygen Uptake is directly proportional to height and body surface area.
- Weight - Maximal Oxygen Uptake is proportional to a weight.
- Lean body mass - VO2max correlates 0.63 with body mass, 0.85 with fat-free body mass, and 0.91 with active muscle tissue.
- Bed rest - Enforced bed rest of 3 weeks reduces maximal oxygen uptake by approximately 17%.[17]

MET

Meta Equivalent represent the amount of energy expended carrying out physical activity. A Meta Equivalent is a multiple of estimated resting energy expenditure. To get a continuous variable score from the International Physical Activity Questioner we will consider walking to be 3.3 METs, moderate physical activity to be 4 METs and vigorous physical activity to be 8 METs.[18] Increasing energy expenditure can help reduce excess adipose tissue and obesity. The current guidelines put out by the American College of Sports Medicine (ACSM) include either aerobic or anaerobic exercise. Aerobic exercise (i.e., running, cycling, rowing, etc.) is an exercise that exhausts the oxygen in the muscles, but oxygen consumption is sufficient to supply the energy demands placed on the muscles and does not need to derive energy from another source. On the other hand, anaerobic exercise (or resistance exercise, i.e., weight lifting) is oxygen consumption that is not sufficient to supply the energy demands placed on the muscles, and muscles must break down other energy supplies, such as sugars, to produce energy and lactic acid.[19]

VO2max and METs

Metabolic Equivalents (METs) refers to the ratio between the energy expended during physical activity and the energy expended while at rest. Finding a person's MET involves measuring how much oxygen their body uses at rest[20]. At rest, oxygen utilization is about 3.5mL · kg-1 · min-1 and is known as a ―Metabolic Equivalent of Tasks‖ or MET. 1 MET is also known as VO2rest. Normal healthy individuals typically have as VO2max of 25-80 or 7.1 to 22.9 METs.

FACTORS AFFECTING HEART RATE DURING EXERCISE

These factors play a role in directly affecting heart rate while running or walking:

- Emotions and anxiety can raise heart rate.
- Body Temperature: If become too hot or too cold body senses a thermal stress load. Blood is sent to skin to enhance heat dissipation to cool or increases blood flow to warm.
- Apparent temperatures (which account for humidity or wind chill) above 70 degrees (F) and below 35 degrees (F) will increase heart rate at least 2-4 beats per minute. Over 90% humidity can equal as much as a10 beats increase in heart rate. 1.0 Walk or run uphill and HR increases - Walk or run downhill and HR decreases.
- Wind - Walking or running with the wind at back is easy, therefore HR decreases. Walking or running into the wind is more difficult: HR increases.
- Dehydration - As become increasingly dehydrated during a long walk, hike, or run blood becomes thicker and waste products build up in bloodstream heart will work harder to maintain constant cardiac output. A fluid loss of 3% of body weight increases pulse rate because of decrease in circulating blood volume.
- Insufficient nutrition - HR increases.
- Insufficient sleep - HR increases.

METHODOLOGY

Study design: Observational study

Source of data: Civil hospital gandhinagar.

Sampling method: convenient sampling method.

Duration: 4 months

Sample size: 40, group a male – 21, group b female - 19

Inclusion criteria

- Age: 18 to 23 years
- Healthy Male and female college going students

Exclusion criteria

- Age: below 18 years
- Above 23 years neurological disorders cardiorespiratory disorders musculoskeletal disorders
- Students who have recently undergone any surgical procedure students making any history of acute or chronic medical illness**.**

Materials and tools required:

- Google form
- Consent form
- Pen , pencil , paper

Data collection tool:

- Borg Rating of Perceived Exertion (RPE)
- Queen's college step test

DATA ANALYSIS

- Descriptive analysis was done for demographic details.
- Correlation between VO2Max values obtained of male and female.
- Correlation between VO2Max values obtained of the students and their HR.

RESULT:

- 40 young Male (n = 21) and Female (n =19) undergraduate college going students aged between 18 to 23 years participated in the study.
- The mean age obtained of the total participants was 19.95 + 1.72388946 years. The mean values obtained for the height and weight of the participants was 164.13 + 8.63486044 cm and 57.1325 + 13.36431121 kg respectively. The max and min values obtained for height and weight were 182.88 cm, 148 cm and 96 kg, 40 kg respectively.
- The mean BMI recorded was 21.115 + 4.511668632 kg/m2 also the max values found was 34.8 kg/m2 and min value found was 13.5 kg/m2. Out of 40 students that had participated for the test 13 students were underweight, 19 were into the normal category, 6 were found to be overweight and 2 were found to be obese class 1 category.
- Mean value of VO2max for males was 46.45 + 15.9790711 ml/kg/min and that for the females was 40.780 + 4.107005078 ml/kg/min. The mean and SD values were found to be significantly higher in males than in females. The VO2max values obtained in males were found to be closer to the normal predicted value than the values obtained in females.

Variables	Mean	SD	Max	Min
Age(years)	19.95	±1.72	23	18
Height(cm)	164.13	±8.63	182.88	148
Weight(kg)	57.1325	±13.36	96	40
BMI (kg/m^2)	21.115	±4.51	34.8	13.5
HR (bpm) (After Ex.)	143.9	±32.41	220	96
RPE	6.05	±1.036	8	4
VO2max(ml/kg/min)	43.755	±12.12	71	18.93
MET (min/week)	1122.9	±957.81	5439	0.0

Table 1. Mean, SD, max and min values of the anthropometrics values as well as the post participation variables of the total participants

Variables	Mean	SD	Max	Min
Male	46.45	15.9790711	71.00	18.93
Female	40.780	4,107006078	48.080	33.300

Table 2. Gender specific mean, SD, max and min values ofVO2max of total participants

Classification	VO2max values obtained
<30	2
30 -36	5
37-41	1
42-46	2
47-51	4
52-60	1
>60	6

Table 3. The given table shows the categorization of the obtained VO2max values for males according to standard VO2max classification

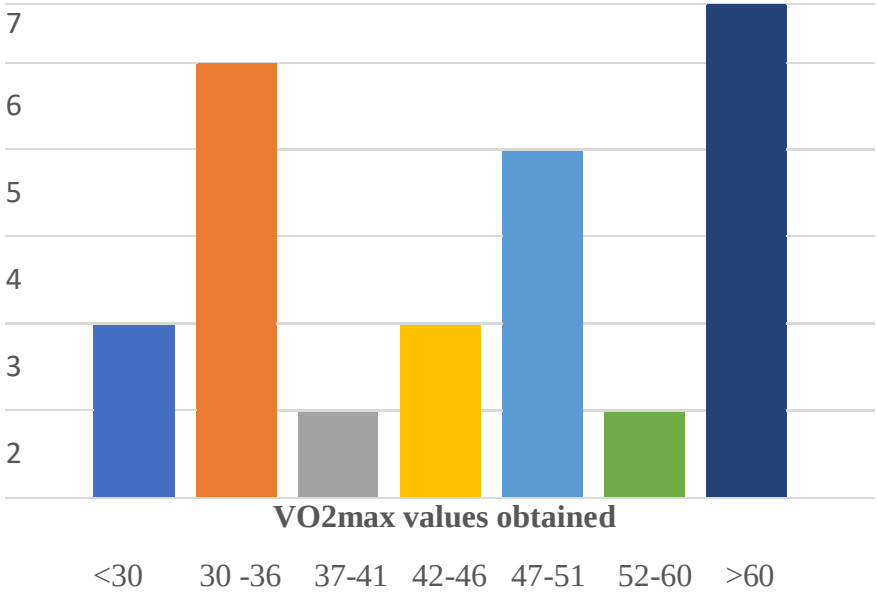


Figure 1. VO2max values for males according to standard VO2max classification

Classification	VO2max values obtained
<28	0
28-32	0
33-37	5
38-41	6
42-46	6
47-56	2
>56	0

Table 4. Categorization of the obtained VO2max values for females according to standard VO2max classification

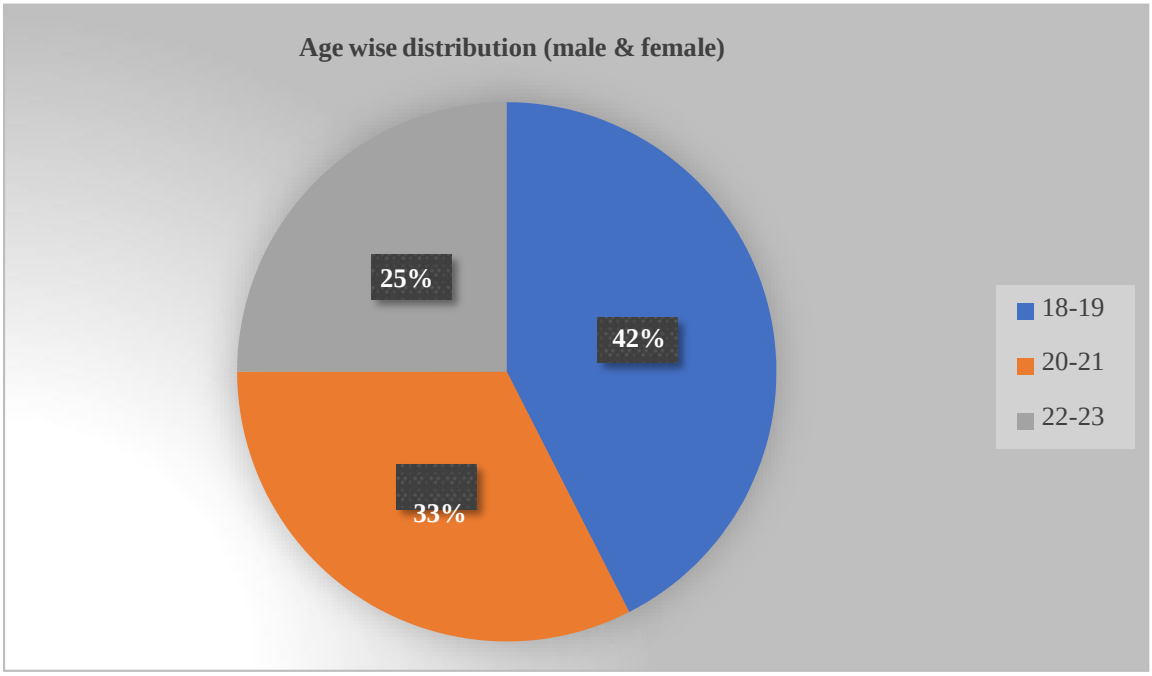
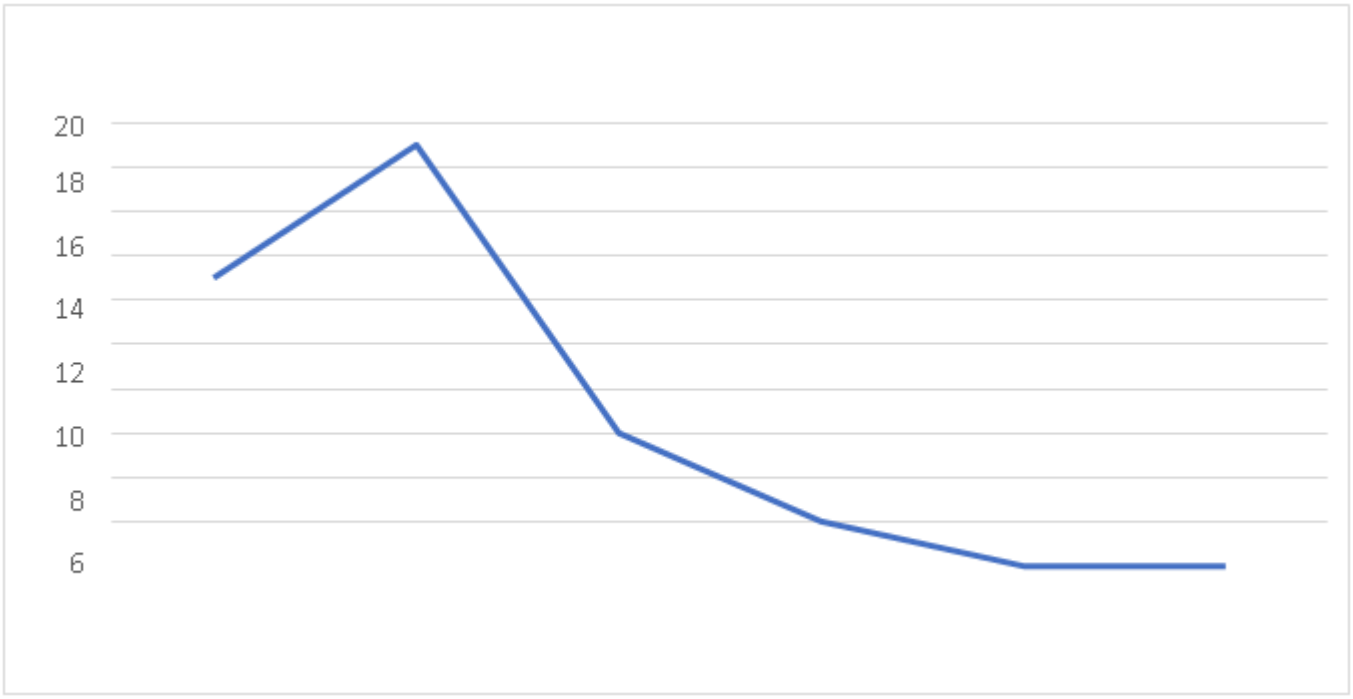


Figure 3. Shows the percentage distribution of participants according to age criteria of 18 to23 years.



Underweight	Normal	Overweight	Obesity class 1	Obesity class 2	Obesity class 3
Below 18.5	18.5 to 24.9	25.0 to 29.9	30.0 to 34.9	35 to 39.9	Above 40

Figure 4. BMI distribution of participants according to the standard classification of BMI

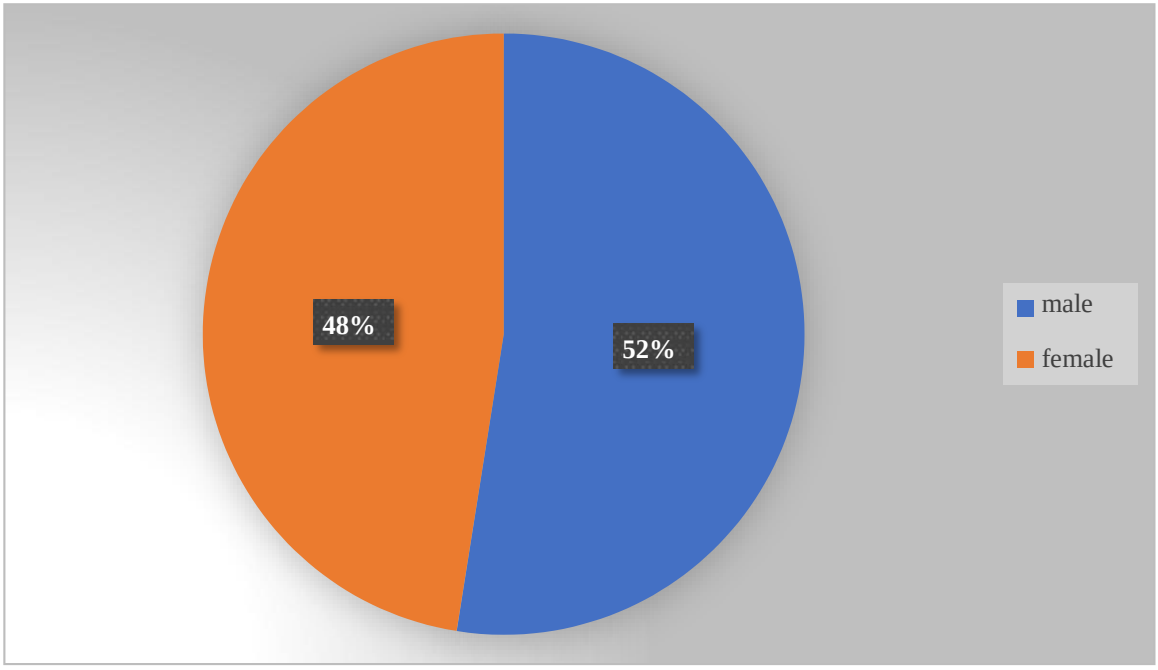


Figure 5. According to gender distribution

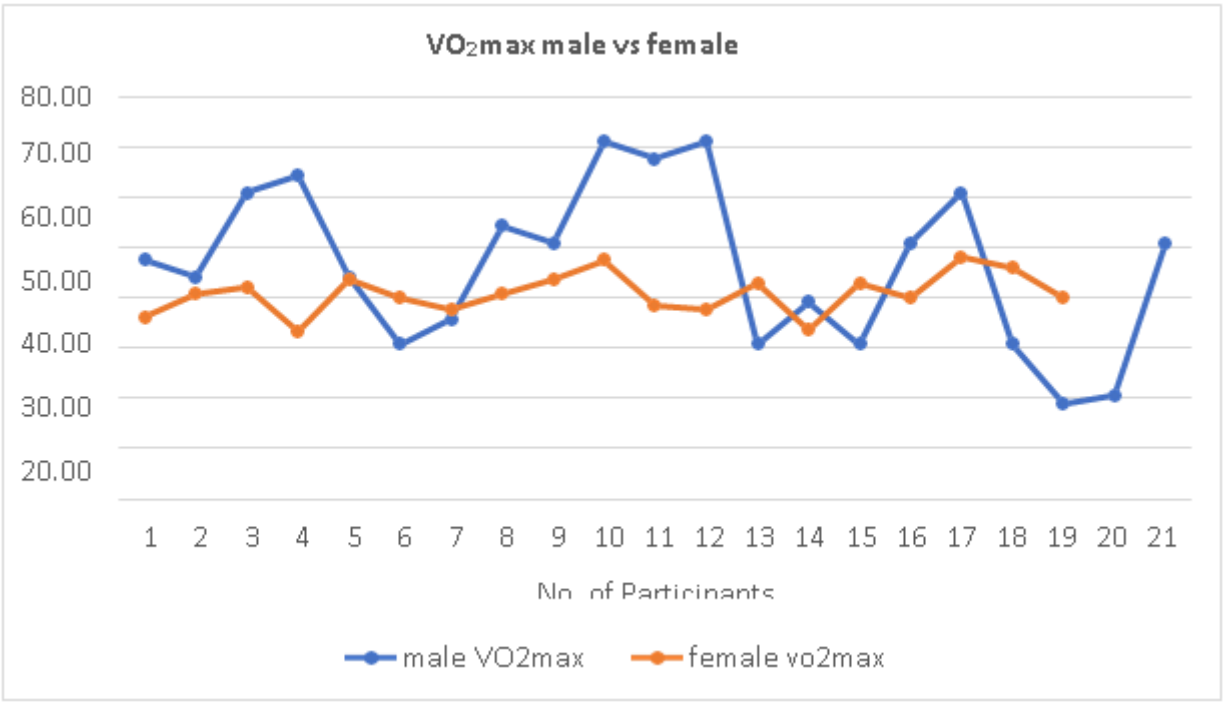


Figure 6. The Correlation between VO2Max values obtained of male and female.

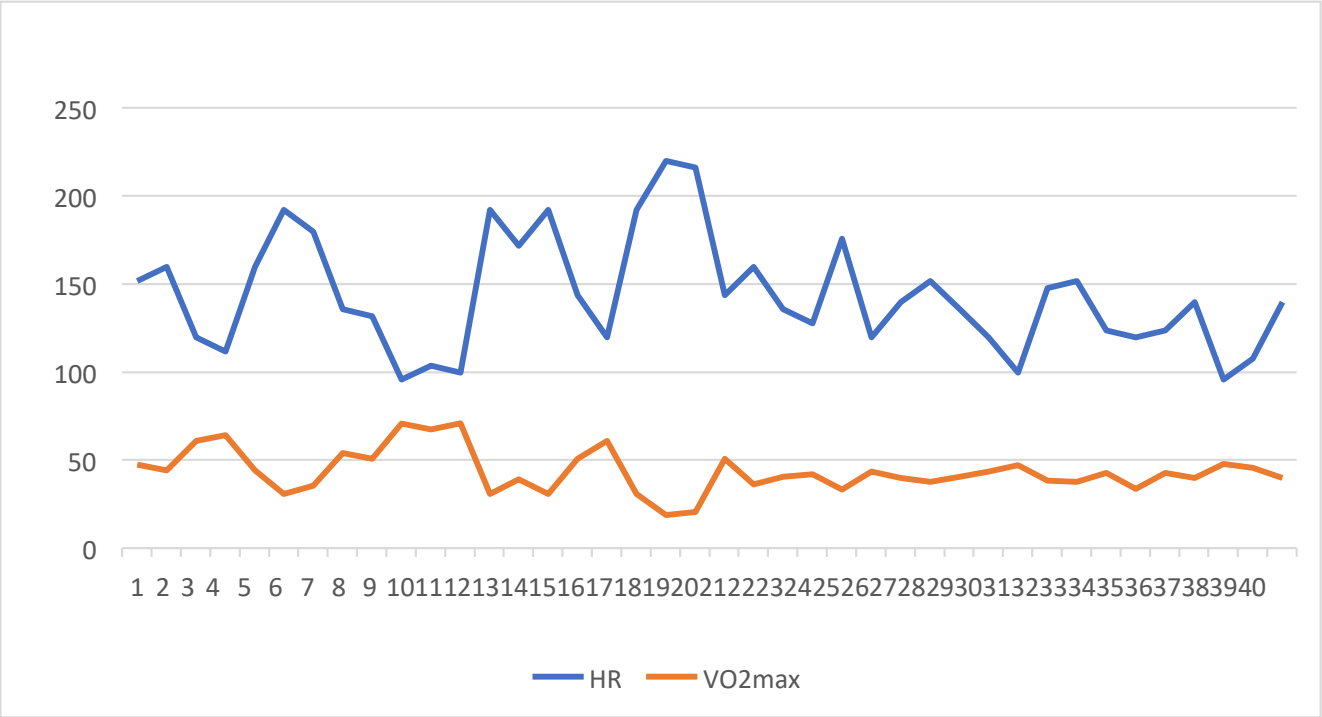


Figure 7. Correlation between VO2Max values of the students and their HR.

DISCUSSION

At present, physical exercise is promoted as an important aspect of general health, and the transition from high school to college will pronounce lifestyle changes that can severely challenge a student's health status[1]. Queen's college step test used to assess the VO2Max of young male and female using heart rate after the participants stepped on a 41.3cm stool at the rate of [female=22 steps/min] and [male=24 steps/min]. Test re-test reliability for recovery heart rate has been measured as r = 0.92. Correlation between recovery heart rate and VO2max has been measured as r = -0.75[21]. 40 young male [n=21] and female [n=19] college going students aged between 18-23 years participated in our study. The result of the present study showed that the mean value of Vo2Max for males was 46.45+15.97 ml/kg/min and that for the females was 40.78+4.1ml/kg/min. On comparing both the mean values it is clearly seen that the aerobic capacity of male students is significantly higher than the female students. It also gives an idea about the level of physical fitness of both the gender. Comparison between the heart rate after exercise and VO2Max values, we found that the students with a high VO2max values were able to gain a lower heart rate and inverse scenario was seen with those who showcased low VO2max. We also found that when compared the BMI and heart rate values of the participants classified according to the standard BMI classification, the students coming under OBESE category had a higher HR and the students coming under the UNDERWEIGHT category also showed and average HR values while some of the students coming under the NORMAL category showed a relatively lower HR somewhere up to the mark. Obesity and Overweight in our participants could also be the reason for a decreased in aerobic capacity. The results of our study also suggested that the female students were into a level of low physical activity when compared with male students. On comparison of the VO2max values of our subjects according to the standard VO2max classifications, the majority numbers of female students n= 6 fitted in the category of AVERAGE and ABOVE AVERAGE, whereas the BELOW AVERAGE and GOOD categories had 5 & 2 females respectively. On the other side maximum numbers of male students n= 6 were found to be falling into the EXCELLENT category. The male students falling into VERY POOR, POOR, BELOW AVERAGE, AVERAGE, ABOVE AVERAGE & GOOD category were 2, 5,1,2,4 & 1 respectively. We also found that out of the total 40 participants who were asked to fill out the physical activity questionnaire, majority students n= 25 were found to be minimally active as they spent 20 to 30 minutes of regular exercise sessions and n= 12 students were found to be inactive and did not spare any time for routine exercise. Lastly 3 students were found to be highly active.

CONCLUSION

This research provides a baseline marker for physical activity levels and sedentary behaviour among college going students, which will be useful for future monitoring and evaluation of interventions. Low to moderate level of physical activity was found among college going students, and there is a difference in aerobic capacity in students who were physically active in their routine life and thus better physical fitness.

FUTURE RECOMMENDATION

- Sample size was small to generalize the result of study.
- IPAQ difficult to provide exact hours and minutes for sitting and walking time.

FUTURE RESEARCHES:

- Further this study can be used to find out the physical fitness index of the individual subjects.
- This study can be extended further by including a detailed measurement of the cardiac function in order to assess whether any cardiac impairment persists or not.

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