International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

A Study On Cardiovascular Fitness of Sedentary College Students

Richa Rai[1], Priyanka Chugh[2], M.P.S.Negi[3]

[1, 2]Assistant Professor, Banarsidas Chandiwala Institute of Physiotherapy, New Delhi, India

[3]Statistician; Institute for Data Computing and Training (I.D.C.T.), Lucknow

Abstract: ***Introduction: A step test provides a submaximal measure of cardio-respiratory or endurance fitness. Aim and Objective: This research study aims to study the Cardiovascular fitness of sedentary college students. Methodology: 60 normal healthy subjects having normal BMI were subjected to YMCA 3 minute step test, and their pre and post readings were noted. Results: On Comparing YMCA scores between the genders, t test revealed significantly (p<0.01) different and better (36.2%) scores in females as compared to males (2.54 ± 1.02 vs. 1.62 ± 0.86, t=3.50, p=0.001). The overall Cardiovascular rating scoring remained in the category of Poor and Below Average for most of the students. Conclusion: The average score of both the groups indicates that Physiotherapists and Clinicians should consider the importance of preserving functional capacity/ fitness by recommending regular physical activity for individuals, with normal BMI as well as altered BMI , alike.***

Keywords: Normal BMI, 3-Min Step Test, Fitness, Heart Rate Recovery(HRR).

1. Introduction

Sedentary life style is a seriously growing health problem. Epidemiological study has shown that sedentary life style will contribute to the early onset and progression of life style disease such as cardiovascular disease, hypertension, diabetes and obesity.[1]It is thus necessary to study the lifestyle of our acquaintances and document it on regular basis to bring about the necessary change in society.A step test provides a submaximal measure of cardiovascular respiratory or endurance fitness.

2. Literature Reviewed

Healthy body is necessary for increasing the working capacity and maintaining physical fitness of any individual to perform his daily tasks vigorously and alertly, with left over energy to enjoy leisure time activities. It also helps to withstand stress and carry on, in circumstances where a physically unfit person could not continue.[2]Cardiovascular fitness reduces the risk of cardiovascular diseases and other diseases like hypertension, Diabetes, obesity, and may cure respiratory problems like asthma.[3]Cardiovascular fitness of citizens of a country, is a vital prerequisite to a country's realization of its full potentials.[4]Attributable risk estimates for all-cause mortality indicated that low physical fitness was an important risk factor in both men and women.[5] It was believed that the low cardiovascular fitness level of an individual is associated with higher mortality rate.[6]

There are several modalities available for the objective evaluation of functional exercise capacity. The most popular clinical exercise tests in order of increasing complexity are stair climbing, 3 minute step up test, 6 minute walk test, shuttle walk test, cardiac stress test (Treadmill protocol).

Determining the recovery heart rate (RHR) index after various submaximal exercises is a popular and practical way for a population's cardiovascular fitness evaluation. 30 cm step test was the best reliable and sensitive method among the three tests (30 cm step test, 40 cm step test and squat-up-down test) selected[7]. Furthermore the 3-minute step test is a relatively quick and easy test for measuring cardiopulmonary fitness and can be easily used in the clinical setting[8].

Therefore among the available modalities for assessment of cardiovascular exercise capacity we are using YMCA-3 minute step up test[9].It is cost and time effective too.

3. Methodology

Research design- Cross sectional study design.

Number and Source of subjects- 60 college going subjects were recruited, who voluntary agreed to participate in the health related physical fitness programmes.

Inclusion Criteria- Subjects of the Age- 18-25 years, BMI- Normal, sedentary as per ACSM guidelines, non smoker, individuals who understand written and verbal English language and consented to participate were included.

Exclusion Criteria- Subjects with any history of / diagnosed case of- Diabetes, acute or chronic respiratory disorder, cardio-vascular disorder, neurophysiological disorder, musculoskeletal disorder, any other known medical/systemic condition, pregnancy or on any regular medication as well as subjects who answered "YES to one or more questions" on PAR-Q were excluded.

Outcome measures- Peak Heart Rate and YMCA Score according to Heart Rate after 1 mint.

Procedure- 60 normal healthy subjects were subjected to YMCA 3 minute step test, and their pre and post readings for heart rate and Heart rate recovery in 1 minute (HRR1) after step test was noted. After recording the pulse for 60 seconds just after sitting on chair, then score of the subject was calculated according to the 'three minute step test

scoring' age adjusted standard based on guidelines published by YMCA.

Ratings for Men, based on Age

	18-25	26-35	36-45	46-55	56-65	65+
Excellent (Level 5)	50-76	51-76	49-76	56-82	60-77	59-81
Good (Level 4)	79-93	79-94	80-88	87-101	86-100	87-102
Average (Level 3)	95-100	96-102	100-105	103-111	103-109	104-110
Below Average (Level 2)	102-107	104-110	108-113	113-119	111-117	114-118
Poor (Level 1)	111-157	114-161	116-163	121-159	119-154	121-151

Ratings for Women, based on Age

	18-25	26-35	36-45	46-55	56-65	65+
Excellent (Level 5)	52-81	58-80	51-84	63-91	60-92	70-92
Good (Level 4)	85-102	85-101	89-104	95-110	97-111	96-111
Average (Level 3)	104-110	104-110	107-112	113-118	113-118	116-121
Below Average (Level 2)	113-120	113-119	115-120	120-124	119-127	123-126
Poor (Level 1)	122-169	122-171	124-169	126-171	129-174	128-155

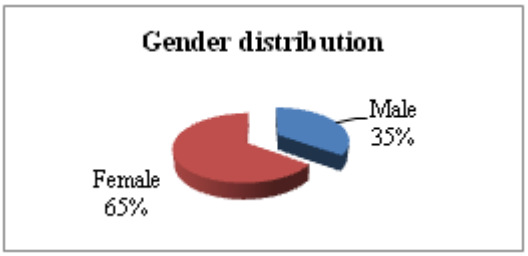
Later these parameters were thus compared by dividing data into two groups statistically.

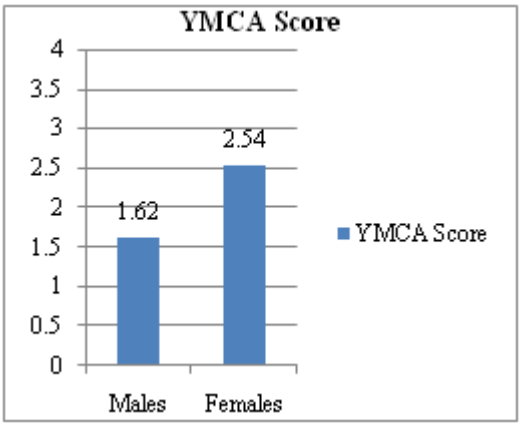
4. Results

The age, height, weight and BMI of two groups were compared by independent Student's t test. The subjects of two groups were demographically matched and thus, comparable (table-1).

Table 1: Mean and SD of Demographic & vital variables and YMCA Score

Variable	Males	Females	P Value
Age (yrs)	20.24 ± 1.26	20.46 ± 1.94	0.59
BMI (kg/m^2)	22.25 ± 1.71	21.71 ± 2.18	0.3
RHR (bpm)	74.38 ± 6.8	77.54 ± 7.95	0.11
PHR (bpm)	112.95 ± 8.94	117.03 ± 9.39	0.105
YMCA Score	1.62 ± 0.86	2.54 ± 1.02	0.001





Also comparing the heart rate for each groupie male and female , comparing the mean RHR between the groups, the mean RHR did not differ statistically ($p>0.05$). Similarly, for each period, comparing the mean HR between the groups, at all post periods, it was significantly different and higher ($p<0.001$) showing the post-test level of exertion for both the groups: male and female.(Table 2)

Table 2: Pre and post exercise heart rate (Mean ± SD) of two groups

Periods	*Heart rate (beats/min)*	*Male (n=30)*	*Female (n=30)*	*p value*
Pre exercise	RHR	74.38 ± 6.80	77.33 ± 8.57	0.11
Post exercise	Peak HR	112.95 ± 8.94	119.87 ± 8.88	0.105
p value		<0.001	<0.001	

5. Discussion

Physical fitness is associated with academic performance in young people, according to a report presented at the American Heart Association's 2010 Conference on Nutrition, Physical Activity and Metabolism. Youth who are regularly active also have a better chance of a healthy adulthood. The American HeartAssociation recommends that children and adolescents should do 60 minutes or more of physical activity daily and they should participate in physical activities that are appropriate for their age and enjoyable. Focusing more on physical fitness and physical education in school would result in healthier, happier and smarter children, Cottrell said.[10]

As seen in the present study, though it is presumed that college going crowd are considered to be physically active and fit, on taking their history of daily activity, it was noticed that they fall into the category of sedentary lifestyle according to the ACSM guidelines. Also on matching their scores with their performance on the YMCA step test protocol, it was seen that they have scored a score between 1 and 2 which falls in the category of "Poor" or " BelowAverage" Cardiovascular status as seen in Table 1.

Frequent researches may provide early information to help the students understand their physical fitness. It will motivate them to be involved in sports. It is also a source to assist physical education teachers, sports directors, physical therapists and sports trainer to be proactive and change their perspective in order to improve the cardiovascular fitness.

This is definitely a grave issue as several studies have considered this fact that low fitness is a strong and an independent predictor of mortality in all body mass index groups after adjustment for other mortality predictors. It is also considered to be of comparable importance with that of diabetes mellitus and other CVD risk factors.In the same study it has also been quoted that a cardiorespiratory fitness has a genetic component, which explains 25%-40% of variation in fitness. It also says that it is clear that habitual physical activity is the other major determinant of fitness and fitness improved in most individuals with appropriate exercise participation.The author of the study also emphasizes on the assessment of physical fitnessby all clinicians, and if practically that is not possible atleast to

evaluate their patient's physical activity habits and recommend a Physician Assisted Counselling for Exercise Program[11].

On physical assessment of all the participants in our study, only those with normal BMI were included for the protocol. The participants may bargain or be defensive on the issue by trying to prove their fitness on the grounds of normal BMI.

However, studies though have shown a genetic component, but have not ignored the effect of environmental or habitual influences. CRF (Cardiorespiratory Fitness) is primarily a function of the heart's maximal abilityto pump blood (maximal cardiac output) and the ability ofskeletal muscle to extract and use oxygen (maximal arteriovenousO2 difference). These two variables have both geneticand environmental influences. For example, the contributionof genetics to heart size, structure, and cardiacfunction variance in the population is estimated to be between30% to 70%. [12]Thus it is clear that there aregenetic factors that limit the extent to which CRF can bedeveloped. However, environment (the frequency, intensity,and duration of aerobic training) has a significant effect onCRF as well and appears to account for more of the variationin CRF than do genetic factors. Insummary of this study Blair et al.[13] emphasized that a low level of CRF as measured by amaximal treadmill exercise test was a more important predictorof all-cause mortality in women than wasbaseline BMI. A previous work by their group hadshown that unfit men who become fit enjoy a substantialreduction in mortality also[14], it seems reasonable to suggestthat a much stronger emphasis should be placed on increasingthe CRF level of all unfit women as well.[13] From anall-cause mortality perspective, all researches strongly suggest thatclinicians and other health professionals spend at least asmuch time encouraging sedentary women to become morephysically active as encouraging overweight and obesewomen to lose weight.

Other studies have also said that the health benefits of normal weight in men are limited to those who have moderate or high levels of CRF. [15]

Low CRF in women was an important predictor of all-cause mortality. BMI, as a predictor of all-cause mortality risk in women, may be misleading unless CRF is also considered.[13]

Also one knows that the levels of physicalactivity and functional aerobic capacityeach decline steadily with age [16, 17]while the prevalence of obesity tendsto increase with age. Total medical expendituresassociated with inactivityand obesity are greatest in the olderpopulation, a fact that underscores thesignificant economic burden to societyposed by an aging population of inactiveobese individuals.[18]

Clinicians should considerthe importance of preserving functional capacity by recommending regular physicalactivity for older individuals, normal-weight and overweight alike. Fit individuals had greaterlongevity than unfit individuals, regardlessof their body composition orfat distribution. In the study by Pate et al. it is also suggested that it may be possibleto reduce all-cause death ratesamong older adults, including thosewho are obese, by promoting regularphysical activity, such as brisk walkingfor 30 minutes or more on mostdays of the week (about 8 kcal/kg perweek), which will keep most individualsout of the low-fitness category.[19] Enhancingfunctional capacity also shouldallow older adults to achieve a healthylifestyle and to enjoy longer life in betterhealth.[20]

According to the results of our study, it may be suggested that the Physical Fitness education must be a compulsory subject for all college students or the student is needed to at least take up a course on physical fitness education for each year so that their cardiovascular fitness is maintained. This has also been urged by many other authors who have found that urban students have lower levels of cardiovascular fitness as compared with rural students. Cardiovascular fitness is recognized as an important component of health and it may be important for the performance of functional activities and quality of life.[21]

Limitation of the study- Limited sample size due to limited time and scope.

6. Future Scope of the Study

a) Include larger sample size and inclusion and segregation of data done on basis of type of lifestyle: sedentary or active.
b) To study the same parameters after a training protocol.

7. Conclusion

The average score of both the groups indicates that Physiotherapists and Clinicians should consider the importance of preserving functional capacity/ fitness by recommending regular physical activity for individuals, with normal BMI as well as altered BMI , alike.

References

[1] Hulens, M, Vansant, G, Claessens, A.L., 2002. Health-related quality of life in physically active and sedentary obese women. Am. J. Hum. Biol., 14(6): 777-85.
[2] Patil, R.B. 2012. A Comparative Study of Physical Fitness among Rural Farmers and Urban Sedentary Group of Gulbarga District. Al. Ameen J. Med. Sci. 5(1): 39 -44.
[3] Amusa, L. O., Goon, D. T. 2011. Health-related physical fitness among rural primary school children in Tshannda, South Africa Scientific Research and Essays 6(22): 4665-4680.
[4] Lamb, K.L., Brodie, D.A., Roberts, K. 1988. Physical fitness and health-related fitness as indicators of a positive health state. Health Promoting 3: 171–182.
[5] Steven N. Blair, PED; Harold W. Kohl III, MSPH; Ralph S. Paffenbarger Jr, MD, Drph; Debra G. Clark, MS; Kenneth H. Cooper, MD, MPH; Larry W. Gibbons, MD, MPH Physical Fitness And All-Cause Mortality a Prospective Study Of Healthy Men And Women..JAMA. 1989;262(17):2395-2401. Doi:10.1001/Jama.1989.03430170057028.
[6] Jourkesh, M., Iraj Sadri, I., Ojagi, A. and Sharanavard, A. 2011. Comparison of Physical fitness level among

the students of IAU, Shabestar Branch. Annals of Biological Research, 2(2): 460-467.
[7] Jinzhou Yuan, Yibing Fu, Ruipeng Zhang, Xi Li andGongbing Shan. The reliability and sensitivity of indices related to cardiovascular fitness evaluation. Kinesiology 40(2008) 2:138-145.
[8] Eun-Hye Jun, Bo-Yoon Choi, Duk-Chul Lee, Ji-Won Lee, Jee-Yon Lee. Cardiopulmonary Fitness Is Independently Associated with Insulin Resistance in Non-Diabetes Mellitus Patients of a University Hospital in Korea. Korean J Fam Med. 2013;34:139-144.
[9] YMCA three minute step test protocol.http://pennshape.upenn.edu/files/pennshape/YMCA-Bench-Step-Test-for-Cardiovascular-Fitness.pdf
[10] (http://www.sciencedaily.com/releases/2010/03/100302185522.htmStudents' physical fitness associated with academic achievement; organized physical activity.
[11] Ming Wei, MDm MPH, James B. Kampert, PhD, et al. Relationship between low Cardiovascular Fitness and Mortality in Normal-Weight, Overweight and Obese Men. JAMA. 1999; 282:1547 -1553
[12] Bouchard, C, Malina R, Perusse, L. Genetics of Cardiorespiratory Fitness Phenotypes. In: Genetics of Fitness and Physical Performance. Champaign, IL: Human Kinetics; 1997, pp. 243–66.
[13] Farrell, Stephen W., Leeann Braun, Carolyn E. Barlow, Yiling J. Cheng, And Steven N. Blair. The relation of body mass index, cardiorespiratory fitness, and all-cause mortality in women. Obes Res. 2002;10:417–423.
[14] Blair SN, Kohl HK, Barlow CE, Paffenbarger RS, Gibbons, LW, Macera CA. Changes in physical fitness and all-cause mortality. A prospective study of healthy and unhealthy men. JAMA. 1995;273:1093–8
[15] Lee CD, Jackson AS, Blair SN. US weight guidelines: is it also important to consider cardiorespiratory fitness? Int J Obes. 1998;22(Suppl 2):S2–7
[16] Schoenborn CA, Adams PF, Peregoy JA. Health behaviors of adults: United States, 2008–2010. National Center for Health Statistics. Vital Health. Stat 10(257).
[17] Fleg JL, Morrell CH, Bos AG. et al. Accelerated longitudinal decline of aerobic capacity in healthy older adults. Circulation. 2005;112:674-682
[18] Anderson LH, Martinson BC, Crain AL. et al. Health care charges associated with physical inactivity, overweight, and obesity. Prev Chronic Dis. 2005;2(4):A09
[19] Pate RR, Pratt M, Blair SN. et al. Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. JAMA. 1995;273(5):402-407)
[20] Xuemei Sui, MD, Michael J. LaMonte, PhD. Cardiorespiratory Fitness and Adiposity as Mortality Predictors in Older Adults JAMA. 2007;298(21):2507-2516.
[21] Sinku,S. Cardiovascular Fitness among Sedenatry Students. Journal of Exercise Science and Physiotherapy, Vol. 8, No. 2: 109-112, 2012 112.