A Study On Cardiovascular Fitness of Sedentary College Students

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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. 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. Cardiovascular fitness reduces the risk of cardiovascular diseases and other diseases like hypertension, Diabetes, obesity, and may cure respiratory problems like asthma. Cardiovascular fitness of citizens of a country, is a vital prerequisite to a country’s realization of its full potentials. Attributable risk estimates for all-cause mortality indicated that low physical fitness was an important risk factor in both men and women. It was believed that the low cardiovascular fitness level of an individual is associated with higher mortality rate. Therefore among the available modalities for assessment of cardiovascular exercise capacity we are using YMCA-3 minute step up test. 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, neuropsychological 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

<table>
<thead>
<tr>
<th>Excellent (Level 5)</th>
<th>18-25</th>
<th>26-35</th>
<th>36-45</th>
<th>46-55</th>
<th>56-65</th>
<th>65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>50-76</td>
<td>51-76</td>
<td>46-76</td>
<td>58-82</td>
<td>60-77</td>
<td>59-81</td>
</tr>
</tbody>
</table>

| Good (Level 4)      | 76-93 | 79-94 | 80-88 | 87-101 | 88-100 | 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 | 106-110 | 113-119 | 113-117 | 114-118|

| Poor (Level 1)       | 111-157 | 114-161 | 116-163 | 120-167 | 117-118 | 114-119|

Ratings for Women, based on Age

<table>
<thead>
<tr>
<th>Excellent (Level 5)</th>
<th>52-81</th>
<th>58-80</th>
<th>51-84</th>
<th>63-91</th>
<th>60-92</th>
<th>70-92</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>52-81</td>
<td>58-80</td>
<td>51-84</td>
<td>63-91</td>
<td>60-92</td>
<td>70-92</td>
</tr>
</tbody>
</table>

| Good (Level 4)      | 85-102 | 85-101 | 86-104 | 95-110 | 97-111 | 98-111|

| Average (Level 3)   | 104-110 | 104-107 | 107-110 | 113-118 | 113-116 | 113-121|

| Below Average (Level 2) | 113-120 | 113-119 | 113-120 | 120-124 | 120-124 | 120-126|

| Poor (Level 1)       | 122-169 | 122-171 | 126-169 | 128-171 | 127-174 | 126-155|

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 & vitals variables and YMCA Score

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>20.24 ± 1.26</td>
<td>20.46 ± 1.94</td>
<td>0.59</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.25 ± 1.71</td>
<td>21.71 ± 2.18</td>
<td>0.3</td>
</tr>
<tr>
<td>RHR (bpm)</td>
<td>74.38 ± 6.8</td>
<td>77.54 ± 7.95</td>
<td>0.3</td>
</tr>
<tr>
<td>PHR (bpm)</td>
<td>112.95 ± 8.94</td>
<td>117.03 ± 9.39</td>
<td>0.11</td>
</tr>
<tr>
<td>YMCA Score</td>
<td>1.62 ± 0.86</td>
<td>2.54 ± 1.02</td>
<td>0.001</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Periods</th>
<th>Heart rate (beats/min)</th>
<th>Male (n=30)</th>
<th>Female (n=30)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre exercise</td>
<td>RHR</td>
<td>74.38 ± 6.80</td>
<td>77.33 ± 8.57</td>
<td>0.11</td>
</tr>
<tr>
<td>Post exercise</td>
<td>Peak HR</td>
<td>112.95 ± 8.94</td>
<td>119.87 ± 8.88</td>
<td>0.105</td>
</tr>
</tbody>
</table>

p value: <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 Heart Association 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. 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 “Below Average” 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 fitness by 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 ability to pump blood (maximal cardiac output) and the ability of skeletal muscle to extract and use oxygen (maximal arteriovenous O2 difference). These two variables have both genetic and environmental influences. For example, the contribution of genetics to heart size, structure, and cardiac function variance in the population is estimated to be between 30% to 70%.12 Thus it is clear that are genetic factors that limit the extent to which CRF can be developed. However, environment (the frequency, intensity, and duration of aerobic training) has a significant effect on CRF as well and appears to account for more of the variation in CRF than do genetic factors. Insummary of this study Blair et al.13 emphasized that a low level of CRF as measured by an maximal treadmill exercise test was a more important predictor of all-cause mortality in women than was baseline BMI. A previous work by their group had shown that unfit men who become fit enjoy a substantial reduction in mortality also14, it seems reasonable to suggest that a much stronger emphasis should be placed on increasing the CRF level of all unfit women as well.13 From an all-cause mortality perspective, all researches strongly suggest that clinicians and other health professionals spend at least as much time encouraging sedentary women to become more physically active as encouraging overweight and obese women 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 physical activity and functional aerobic capacity decline steadily with age16, 17 while the prevalence of obesity tends to increase with age. Total medical expenditures associated with inactivity and obesity are greatest in the older population, a fact that underscores the significant economic burden to society posed by an aging population of inactive obese individuals.18

Clinicians should consider the importance of preserving functional capacity by recommending regular physical activity for older individuals, normal-weight and overweight alike. Fit individuals had greater longevity than unfit individuals, regardless of their body composition or fat distribution. In the study by Pate et al. it is also suggested that it may be possible to reduce all-cause death rates among older adults, including those who are obese, by promoting regular physical activity, such as brisk walking for 30 minutes or more on most days of the week (about 8 kcal/kg per week), which will keep most individuals out of the low-fitness category.19 Enhancing functional capacity also should allow older adults to achieve a healthy lifestyle and to enjoy longer life in better health.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.

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