Comparative Study Of Physical Fitness Index And Predicted VO2max among Rural And Urban Female Students

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Abstract

Background: Physical fitness index (PFI) measures fitness for muscular work and ability to recover from work. It assess cardiopulmonary efficiency. VO2 max refers to maximum amount of oxygen that an individual can utilize during intense exercise and is best indicator of cardiovascular fitness and aerobic endurance. PFI and VO2 max are dependent on height, weight, BMI. Differences in anthropometry among urban and rural subjects due to different environmental, social, nutritional and life style habits can affect PFI and VO2 max. Thus present study is intended to compare PFI and predicted VO2 max among rural and urban female students.

Materials and Methods: 50 participants of age group 18-20 years, 25 sedentary female subjects from each of rural and urban sectors of 1st year MBBS were taken by random sampling. PFI was determined by modified Harvard step test and VO2 max was determined by Indirect Queens college step test. Mean PFI was higher in rural group compared to urban group (p= 0.48). Mean VO2 max was similar in both the groups (p=0.99). PFI was positively correlated with VO2 max in both the groups (p<0.05).

Conclusion: Rural female students do not have a statistically significant higher value of PFI and VO2 max than urban female students.

Keyword: Female subjects, Harvard step test PFI, Queen’s College Test, VO2 max

Introduction

Physical fitness is a key factor for day to day activities and to lead a healthy life.¹ It is defined as ability to carry out daily tasks with vigour and alertness without undue fatigue and with ample energy to enjoy leisure pursuits, to meet unusual situations and unforeseen emergencies.² It is influenced by age, gender, environmental and lifestyle factors like eating habits, physical activity and they might determine cardiovascular health.³ Physical fitness has many advantages like increase in level of activity, tolerance and social behavior. Physically fit individuals can easily adapt to stressful conditions. Physical fitness has three components – static fitness (absence of disease),

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dynamic fitness (ability to perform strenuous work) and motor skills fitness. Of these dynamic fitness is very important and is measured by Harvard step test, which is widely used fitness tool to assess physical performance capacity of an individual.

VO2 max refers to maximum amount of O2 that an individual can utilize during strenuous exercise and is an internationally accepted parameter to evaluate cardiorespiratory fitness and aerobic endurance. Determination of cardiorespiratory fitness in terms of VO2max is restricted to laboratory due to its exhausting and difficult protocol. Queen’s college test is simplest procedure to evaluate VO2 max in large number of population specially in absence of well-equipped laboratory.

Both PFI and VO2 max are dependent on anthropometric parameters like height, weight and body mass index (BMI). Studies mentioned that there is differences in anthropometric values among urban and rural female students due to differences in their environmental, social, life style habits (dietary, physical activity) which can in turn effect PFI and VO2 max. Thus our current study is aimed at comparing and correlating physical fitness levels with Vo2max in rural and urban female students in different social, nutritional, environmental and cultural conditions.

**Objective**

1) To assess physical fitness index using Harvard step test among rural and urban female students.

2) To assess VO2max by indirect Queen’s college step test among rural and urban female students.

3) To compare and correlate physical fitness index and VO2max among rural and urban female students.

**Materials and Methods**

The study was done on 50 sedentary female students of age group 18-20 years, 25 subjects from each of rural and urban sectors of 1st year MBBS were taken by simple random sampling, after obtaining approval from ethical committee of the institute. The detailed procedure was explained and demonstrated to the students. Study was conducted in May- June 2021, Department of Physiology, BMCRI, Bangalore.

**Study Design:** Cross sectional study

**Study setting:** Department of Physiology, BMCRI, Bangalore.

**Inclusion Criteria:**

1) Healthy sedentary female students of 1st yr MBBS

2) Age group: 18 – 20yrs

**Exclusion criteria:**

1) H/o any disorders like Diabetes mellitus, Hypertension, Bronchial asthma, Cardiovascular diseases.

2) H/o alcohol, smoking, any recent major surgery.

3) H/o of anaemia, musculoskeletal abnormalities.

**Measurement of physical parameters:**

Height and weight of the subjects were measured
by stadiometer and standard weighing scale. BMI of all subjects were computed by following equation

\[ \text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2} \]

**Test procedure:**

Subjects are instructed to restrain from eating, drinking, doing physical activities at least for 2hrs before performing experiment. Each subject was allowed to take rest in a recumbent position, 10 minutes before and in between the procedures (Harvard step test and Queen’s college test)

**Determination of Physical Fitness Index (PFI)**

Subjects were instructed to perform Modified Harvard step test (step up and step down at a constant pace) on a 16.25 inch stool at a rate of 22 steps/min (rate detected by metronome) and exercise was continued up to 3 min.

Recovery pulse rate was counted at 1 to 1.5 min post exercise.

PFI score was calculated using formula

\[ \text{PFI} = \frac{\text{Duration of exercise (180 sec) x 100}}{5.5 \times \text{pulse count (1-1.5 min of recovery pulse)}} \]

**Queen college step test for measurement of VO2max:**

VO2max was measured by indirect queen’s college step test. Subjects were instructed to step up and down on a 16.25 inch stool for 3 min at rate of 24 beats/min (rate dictated by metronome). After 3 min of exercise recovery pulse was recorded for 5-20 sec (15 sec duration).

VO2max is calculated using formula

\[ \text{VO2max (ml/kg/min)} = 65.81 - [0.1847 \times \text{Heart rate (5- 20 sec)}] \]

**Statistical Analysis**

Data is presented as mean ± SD. Independent t test is used to determine significant difference between two groups. Pearson’s coefficient is used to correlate different parameters with VO2max and PFI in both groups. P value of < 0.05 as statistically significant.

**Results**

Table 1 shows comparison of physical parameters of Urban and Rural female students

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Rural</th>
<th>Urban</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs.)</td>
<td>19.04 ± 0.61</td>
<td>18.72±0.73</td>
<td>0.1</td>
</tr>
<tr>
<td>Body weight</td>
<td>54.92±8.04</td>
<td>56.99±8.66</td>
<td>0.38</td>
</tr>
<tr>
<td>Height</td>
<td>159.44±8.879</td>
<td>158.2±6.12</td>
<td>0.57</td>
</tr>
<tr>
<td>BMI</td>
<td>21.59±2.61</td>
<td>22.72±2.76</td>
<td>0.14</td>
</tr>
</tbody>
</table>
Table 2 comparison of mean PFI & VO2max scores in Urban and Rural female students

<table>
<thead>
<tr>
<th>Category</th>
<th>Rural</th>
<th>Urban</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFI</td>
<td>62.4±15.97</td>
<td>59.95±1.19</td>
<td>0.48</td>
</tr>
<tr>
<td>VO2max</td>
<td>59.3±15.4</td>
<td>59.96±1.48</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Table 3 correlation of anthropometric parameters and VO2 max with PFI in urban and rural female students

<table>
<thead>
<tr>
<th>Group</th>
<th>Parameter</th>
<th>r value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>PFI &amp; Wt</td>
<td>0.025</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>PFI &amp; Ht</td>
<td>0.226</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>PFI &amp; BMI</td>
<td>0.053</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>PFI &amp; VO2</td>
<td>0.522</td>
<td>0.007*</td>
</tr>
<tr>
<td>Urban</td>
<td>PFI &amp; Wt</td>
<td>0.36</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>PFI &amp; Ht</td>
<td>0.136</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>PFI &amp; BMI</td>
<td>0.357</td>
<td>0.079</td>
</tr>
<tr>
<td></td>
<td>PFI &amp; VO2</td>
<td>0.502</td>
<td>0.01*</td>
</tr>
</tbody>
</table>

*Indicates statistically significant values (p<0.05)

**Discussion**

In our study we intended to compare physical fitness index and predicted VO2 max among rural and urban female students.

Physical parameters (Age, Ht, Wt, BMI) did not show significant differences between urban and rural female students (Table 1)

In our study on comparing PFI and VO2 max among two groups, we did not find any statistically significant differences (Table 2)

Our findings are consistent with study done by Banibrata Das et al., who also found no statistical higher values of physical fitness index and VO2 values in rural students when compared with urban students. This could be attributed due to differences in their different lifestyles and daily life schedules. There may be changes in their nutrition as well. Among urban females there is greater awareness of fitness levels and health consciousness compared to rural females. All above facts may result in differences in their anthropometry and in turn on PFI and also VO2 max, but in our study, we did not find statistically significant difference in PFI when compared between two groups.
Also from table 3 we found out that PFI was positively and significantly correlated with VO2 max in both urban and rural groups (p<0.05).

**Limitation**

Our study involved small sample size of age group limited to 18-20 years. Study in other age groups and involving large sample size may show difference in PFI.

**Conclusion**

Rural female students do not have a statistical higher significant value of PFI and Vo2 max score than urban female students.

**Acknowledgment:** I am grateful to all the participants of the study for their kind cooperation. and also to my Guide Dr Girija B for her support and encouragement. I am also thankful to Department of Physiology BMCRI for the support and encouragement for the study

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Taken from Institutional Ethical Committee

**References**


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4) Das B, Gangopadhyay S, Ghoshb T. A comparative study of physical fitness index (PFI) and predicted maximum aerobic capacity (VO2max) among the different groups of Female Students in west Bengal, India. 2010;22(1):13–23.


