

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.⁴ 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.⁵

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.⁶ Determination of cardiorespiratory fitness in terms of VO₂max is restricted to laboratory due to its exhausting and difficult protocol.⁷ Queen's college test is simplest procedure to evaluate VO₂ max in large number of population specially in absence of well-equipped laboratory.^{4,8,9}

Both PFI and VO₂ max are dependent on anthropometric parameters like height, weight and body mass index (BMI).¹ 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.¹ 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

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m)}^2$$

Test procedure:

Subjects are instructed to restrain from eating, drinking, doing physical activities atleast 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)³

Subjects were instructed to perform Modified Harvard step test (step up and step down at a constant pace) on a 16.25 inch stool¹⁰ 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

$$\text{PFI} = \text{Duration of exercise (180 sec)} \times 100 / 5.5 \times \text{pulse count (1-1.5 min of recovery pulse)}$$

Queen college step test for measurement of VO2max⁴:

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

Parameters	Rural	Urban	p value
Age (yrs.)	19.04 ± 0.61	18.72±0.73	0.1
Body weight	54.92±8.04	56.99±8.66	0.38
Height	159.44±8.879	158.2±6.12	0.57
BMI	21.59±2.61	22.72±2.76	0.14

Table 2 comparison of mean PFI & VO₂max scores in Urban and Rural female students

Category	Rural	Urban	p value
PFI	62.4±15.97	59.95±1.19	0.48
VO ₂ max	59.3±15.4	59.96±1.48	0.99

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

Group	Parameter	r value	p value
Rural	PFI & Wt	0.025	0.90
	PFI & Ht	0.226	0.82
	PFI & BMI	0.053	0.80
	PFI & VO ₂	0.522	0.007*
Urban	PFI & Wt	0.36	0.07
	PFI & Ht	0.136	0.51
	PFI & BMI	0.357	0.079
	PFI & VO ₂	0.502	0.01*

*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.

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