

## Comparative study of physical fitness among rural and urban school students of Bankura, West Bengal

Prithviraj Karak\*, Abhinaba Gupta, Pranay Karmakar and Rajkumar Maiti

Department of Physiology, Bankura Christian College, Bankura-722101, West Bengal, India

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**Abstract:** *Background:* Physical fitness has been associated with the state of physical well-being of a person, which ultimately influences the physical, mental and social qualities. The importance of physical fitness depends on activities that focus not only of improving the physical health but also the daily life style of an individual. *Objectives:* The main purpose of this study was to compare selected physiological variables among rural and urban school students in Bankura district. The allied objectives of the study are as follows: 1) To compare the cardiovascular parameters among rural and urban school students of Bankura, 2) To compare BMI, Waist-hip ratio (WHR) and life style parameters; 3) To compare the physical fitness index (PFI) among rural and urban areas of Bankura, and 4) To compare the muscle strength of rural and urban areas of Bankura school students. *Methods:* For the present study, subjects were selected from male students of Bankura district. 25-rural students (Group-1) and 25-urban students (Group-2) with the age group of 12-14 years were selected in the present study at Bankura District. Different anthropological, cardiovascular, respiratory and physical fitness index parameters were measured. The level of significance was kept at 0.05, to testing the hypothesis. *Results and Conclusion:* Rural students had performed significantly better in almost all the physical fitness variables as compared to urban students. This study proves that the potential differences in physical fitness of among the rural and urban school going students of Bankura.

**Keywords:** Physical fitness, School students, Life style, Blood pressure, Respiratory capacity.

### Introduction

Physical fitness of an individual is concerned with his physical and mental well-being. Physical fitness is an essential indicator for a healthy lifestyle. Two major components of physical fitness are the health related and performance related physical activity. The health related physical fitness is the aerobic capacity which includes the cardio-respiratory endurance, flexibility of body parts, upper body strength and endurance, abdominal muscle strength and endurance and body composition. The benefits of good health related physical fitness in day-to-day life style which is very much crucial for us.

Physical fitness is defined as body's ability for efficient function, enjoying the time spent, confining diseases that related to health and coping with emergencies [1]. Physical fitness is generally considered to be "the ability to perform daily tasks without fatigue". It includes several components: cardio-respiratory fitness, muscular

endurance, muscular strength, flexibility, coordination and speed. The main objective of physical education concerned with building up physical power through the growth and development of various organ systems. Differences in mean height, weight and physical fitness levels of children belonging to different socio-economic strata and towns or villages is a common occurrence.

Walking for long time or running for daily is the cardio-respiratory fitness; lifting something is the application of strength for an individual. Having maximum angular movements with economic use of force on different body parts through the joints is the flexibility. Good stature with proper muscle mass without extra fat is requiring for a certain level of health related physical fitness. It is a very crucial public health related issue for the rural population of India who are having a very poor socio-economic condition and traditional culture. Hence, the present

study is designed in such a way to procure some information about health related physical fitness of rural school going boys and comparison with that of urban school students.

Due to globalization and growing economic growth, many countries are rapidly undergoing important demographic, epidemiological and nutrition transitions. Urbanization and increasing income have a great impact on physical status and wellbeing of an individual [2-4]. Change in physiological status of an individual is due to change in food habit, physical activity and life style [5-6]. The transition from rural agricultural societies to urban societies, which come with major changes, have forced to a large extent the social and biological transformation of populations throughout the world [7]. The differences in growth, body dimensions, body composition and fitness levels of children due to urban and rural environmental disparities have come into center of attention during the last few decades [8-9].

The environmental factors lead to changes in the physical fitness level among children. The impact of socioeconomic status, ethnicity and area of residence (urban or rural) has been reported on the level of physical fitness among children, with no consistent patterns emerging [10-11]. It was observed that greater physical fitness of children had a significant relationship with larger living space and residing in rural areas.

### Material and Methods

The present study was a cross-sectional study, conducted in the Department of Physiology, Bankura Christian College, Bankura, West Bengal. The subjects were purposively selected from the various schools in rural and urban area of Bankura.

#### Methods of collection of data

*Sample size:* Statistically adequate samples of 25-rural students (Group-1) and 25-urban students (Group-2) with the age group of 12-14 years were selected in the present study. Informed consent was taken from all the subjects. Subjects of age above 14-years, any chronic illness, any medication procedure and smokers were excluded from this study.

*Questionnaire includes demographic information* (gender & age), food habits, medical history (hypertension, diabetes, coronary heart disease, chronic renal disease, chronic respiratory diseases, etc.) behaviour and personal habits (e.g., smoking) and family history.

*Anthropological parameters:* For each subject following parameters was measured like height, weight and circumferences at waist and hip. Anthropometric measurements were taken by using standard protocols given by Weiner and Lourie [12-13]. Stature was taken with the help of anthropometry in the standard arm hanging position; body weight was measured by using spring balance with minimum clothing. The BMI was calculated as the weight in kilograms divided by the square of the height in meters [weight (kg) /height (m<sup>2</sup>)]. Subjects were divided into 2 groups as per WHO classification on BMI.

#### Measurement of Pulse rate and Blood pressure

*Measurement of pulse rate:* Pulse rate was measured according to the standard protocol. All participants had rested for at least 10 mins before exercise. Pulse rate was measured for a complete minute in supine, in sitting and standing positions. The results were recorded as pulse rate per minute and then analyzed.

*Measurement of Blood pressure before and after exercise:* Blood pressure was measured by the auscultatory method, in supine, sitting and standing position by using a mercury sphygmomanometer with a cuff of 12 cm. widths. All the subjects were made to rest for at least 10 mins before taking the readings. The manometer cuff was snugly tied around the arm with tubing on the medial and the lower side. Systolic and diastolic blood pressure were recorded first in the supine position and then standing position, with cuff tied to the arm. Reading was taken in all 3 positions and was analysed accordingly [14]. After 3 minutes exercise blood pressure was also recorded till the recovery period.

*Determination of Physical Fitness Index (PFI) by Modified Harvard step test* [15-17]: The resting pulse rate of the subject was recorded

before the experiment. The subject should wear shorts and rubber-soled shoes. He should stand before or stool and as soon as a friend or a teacher shouts start, he or she should place one foot on the bench or stool step up placing both feet on the platform, straighten the legs and back, and immediately step down again, bringing down first the same foot he or placed up first. Sequence of stepping down and up with the rhythms of the metronome, or with the shout of an observer as 1,2,3,4-1,2,3,4-or “up-down”, should be continued at the rate of 20 steps per minute for a period of the exactly 3 minutes (180 sec). Immediately after the exercise the subject should sit quietly on a chair and the recovery pulse rate was measured after exactly 1 minute for 30 sec period at the following recovery interval: (1

to  $1\frac{1}{2}$  min, (2 to  $2\frac{1}{2}$  min and (3 to  $3\frac{1}{2}$  min. Recovery time period was also measured.

The physical fitness was calculated by using the following formula and graded the level of fitness according the score sheet (Table 1).

**Table-1: Rating of physical fitness index scores**

Fitness level	PFI scores
Very poor fitness	<40
Poor fitness	41-50
Average fitness	51-60
Good fitness	61-70
Very good fitness	71-80
Excellent fitness	81-90

$$\text{Physical Fitness Index (PFI)} = \frac{\text{Duration of exercise in seconds} \times 100}{2 \times \text{sum of three recovery pulse rate for 30sec period} (1-1\frac{1}{2} + 2-2\frac{1}{2} + 3-3\frac{1}{2})}$$

*Determination of PEFR* [18]: Peak expiratory flow rate (PEFR) measurement is a quick test to measure air flowing in and out from the lungs. The instrument is graduated with a scale on the surface and a mouth piece. The graduation starts from 60 L/min to 800 L/min with accuracy of 10 L/min. The mouthpiece was washed and sterilized for each subject [19].

*Statistical Analysis:* To compute mean difference between urban and rural in relation to selected physical fitness components mean, standard deviation and independent t-test was used. The data was analyzed statistically by using appropriate statistical tools such as mean, standard deviation and percentage and the level of significance was also tested.

*Determination of O<sub>2</sub> saturation* [20-21]: Oxygen saturation is the fraction of oxygen-saturated hemoglobin relative to total hemoglobin in the blood. The human body requires and regulates a very precise and specific balance of oxygen in the blood. Normal blood oxygen levels in humans are considered 95–100 percent. If the level is below 90 percent, it is considered low resulting in hypoxemia.

**Results**

*Assessment of Hand Grip Muscle Strength* [22-23]: The grip strength of the subjects was measured with the help of hand grip dynamometer. While holding the dynamometer in their hand the subjects were asked to squeeze it powerfully. The subjects were required to crush gradually and uninterruptedly for at least two seconds. The grip strength of both right and left hand of the subjects were recorded separately. The subjects were given two attempts for the each hand. The best among the two attempts was the score of the test recorded in kilograms.

The study group consisted of 50 students, out of which equal number of rural and urban school student. The mean age of  $11.84 \pm 0.694$  years for rural subject and for urban subject it is  $12.12 \pm 1.032$  years. Table 2 summarizes the demographic variables and general information in terms of age, height and weight and body mass index and waist-hip ratio also determined. The BMI value of rural student was  $20.02 \pm 2.036$  kg/m<sup>2</sup>, which was far lesser than the BMI of urban student  $24.74 \pm 1.881$  kg/m<sup>2</sup>. The Waist-Hip ratio of urban students  $0.869 \pm 0.042$  was greater than the rural students  $0.83 \pm 0.66$ .

In the life style parameters it was observed that sports/ physical activity hours of rural student was much more than the urban students whereas and television viewing time is more in case of urban students. On the other

hand leisure time of rural student was less than that of urban students.

<b>Table-2: Anthropometric variable &amp; life style parameters among rural and urban school students</b>		
<b>Variables</b>	<b>Group I (Rural)</b>	<b>Group II (Urban)</b>
Age(Yrs)	11.84±0.694	12.12±1.032
Height (mts)	141.16±11.98	137.57±26.58
Weight (kgs)	40.2±8.38	50.24±10.34
BMI (Kg/m <sup>2</sup> )	20.02±2.036	24.74±1.881
Waist circumference (cm)	69.2±8.63	72.69±8.089
Hip circumference (cm)	82.36±6.857	84.04±7.235
Waist-hip ratio (WHR)	0.83±0.66	0.869±0.042
<b>Life style parameters</b>		
Sports / Physical activity (min/day)	125.2±44.64	105.6±41.673
Television viewing hours (min)	100.4±47.03	172.8±45.914
Leisure time (min)	80.2±36.07	130.6±47.03
Smoking	0	0
*Statistically significant (p<0.05)		

<b>Table-3: Comparison of the BMI gender among rural and urban school students</b>		
<b>Variables</b>	<b>Group I (Rural)</b>	<b>Group II (Urban)</b>
Severe thinness	12%	4%
Thin	28%	18%
Normal	60%	50%
Overweight	0	20%
Obese	0	8%

Table 3 shows the comparison of BMI for age as per WHO growth charts by gender among rural and urban school students. The mean BMI value was statistically significant (p<0.05). The percentage of severe thinness was more in case of rural students in comparison with urban students. Comparison of BMI shows that the percentage of thin (28%) of rural student and urban students

(18%). On other hand the percentage of normal BMI (60%) of rural student was greater than the urban students (50%). Comparison of BMI shows that overweight and obese students found more in case of urban areas whereas there were no overweight and obese students in rural areas.

Table 4 summarizes the physical fitness index among rural and urban school students by modified Harvard step test method. It was observed that there was significant difference in percentage of very poor fitness between rural and urban school students. The percentage of poor fitness among rural students was less than that found among the urban students. The percentage of students having average and good fitness of rural student was greater than the urban students group. Recovery time period was far less than that of the urban school students.

<b>Table-4: Comparison of physical fitness index among rural and urban school students</b>		
<b>Parameter</b>	<b>Group I (Rural)</b>	<b>Group II (Urban)</b>
Heart rate (beats/min)	83.14 ± 10.994	89.16 ± 21.549
<b>Physical fitness [PFI score (%)]</b>		
Very poor fitness (<40)	0	0
Poor fitness (41-50)	38%	48%
Average fitness (51-60)	40%	36%
Good fitness (61-70)	20%	16%
Very good fitness (71-80)	0	0
Excellent fitness (81-90)	0	0
Recovery time period (min)	4	8
*Statistically significant (p<0.05)		

Table 5 summarizes the cardio-respiratory status among rural and urban school students. The heart rate of urban student's 89.16±21.549 beats/min was greater than the rural student's 83.14±10.994 beats/min. There was significant difference of BP of rural and urban students. The value of systolic blood pressure and diastolic blood pressure of rural students were less than the urban students. The respiratory rate of urban students is

greater than the rural students. On other hand percentage of O<sub>2</sub> saturation were comparatively more than the urban students. The value of PEFR of rural students was greater than the urban students.

**Table-5: Comparison of cardio-respiratory status among rural and urban school students**

Parameters	Group I (Rural)	Group II (Urban)
Heart Rate (beats/min)	83.14±10.994	89.16±21.549
BP (mm of Hg)	SBP-108.72±12.203 DBP-72.4±7.76	SBP-116.28±15.407 DBP-74.56±11.196
Respiratory Rate (times/min)	14.2±3.167	18.04±2.087
TV (ml)	450.6±20.90	480.2±17.40
VC (L)	3.12±0.178	2.82±0.155
PEFR (L)	280±50.9	250±45.8
% of O <sub>2</sub> saturation	96.12±4.027	95.2±4.974
*Statistically significant (p<0.05)		

Table 6 summarizes the comparison of muscle strength among rural and urban school students. In rural students the hand grip strength of left hand (20.64±5.374) was more than urban students (18.77±6.764). Table 5 shows that in rural students the hand grip strength of right hand (24.3±6.181) was more than urban students (20.2±6.597).

**Table-6: Comparison of muscle strength among rural and urban school students**

Parameters	Group I (Rural)	Group II (Urban)
Muscle strength by Handgrip test		
Grip Strength Left hand (kg)	20.64±5.374	18.77±6.764
Grip Strength Right hand (kg)	24.3±6.181	20.2±6.597

### Discussion

The current study shows potential differences in physical fitness of rural and urban school students. The results of present study showed that the rural children had performed significantly better in almost all the physical fitness variables as compared to the urban school students. The present data agreed with the published reports advocating that the place of residence has an impact on children's fitness.

These findings proves that the rural school going boys students was significantly better in speed, abdominal strength endurance and explosive leg strength compared to that of urban school going boys students. It may be due to the students belonging to rural area engage various activities like walking to school, playing in ground or in sand and regular physical activity at the same time their food habit was also a great impact on their physical performances.

From above results it was clear that there was significant difference of physical fitness parameters between school students of rural and urban areas. There were more statistically significant on selected strength variables of sports performer student than the normal urban student. Flexibility in general rural school students were greater than the urban student [24].

This result reflects that the school students have more speed with which they may change their body position or direction. Improvement of these abilities was only possible through regular and systematic physical training and through participation in multidimensional physical activities of different games and sports.

So, physical training student's agility is better than general students. The physical fitness of rural student is greater than the urban student. From the results it was clear that the students of rural student have far better physical fitness than students of urban. As per curriculum rural students has to participate in the fitness training and various games and sports which may the great factor of improving the stated

fitness variable. Rural student has greater muscle strength than the urban student.

### Conclusion

From the above results and discussion we can interpret that the place of residence has clear impact on physical fitness of students as studied herein. The rural students performed significantly better on the physical fitness tests as compared to the urban students. Life style, food habits and the constituents of food might have played significant role in the differences among students from different settings.

The study was to examine potential differences in physical fitness of school going boy's students in both urban and rural settings. This study gives reference values on height, body weight and some physical performance tests of Bankura School

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going boy's students. Recent study stated that physical activity is correlated with a number of factors including demography, psychology, society and environment.

In conclusion and within the study's limitations, suggested that the place of residence has clear impact on physical fitness level. The lower level of speed, abdominal strength endurance and explosive leg strength of urban student may indicate lower habitual physical activity level in urban students.

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\*All correspondences to: Dr. Prithviraj Karak, Assistant Professor, Department of Physiology, Bankura Christian College, Bankura-722101, West Bengal, India. E-mail: drpkarak@gmail.com