International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Body Physique and Motor Ability Status in School Going Adolescent Children

Sayani Ghosh

Roll: SMGC/FNTM-IV No: 0004
Registration No: 3021521400004 of 2015-2016
Department of Food & Nutrition, Sarada Ma Girls' College, Ramakrishna Vivekananda Mission Sarada Ma Girls' College, Kolkata, West Bengal, India

Under the Supervision of **Ayan Chatterjee**, Ramakrishna Vivekananda Mission Sarada Ma Girls' College, Kolkata, West Bengal, India

Abstract: ***Physical fitness is a main key for being healthy in adulthood. And, cardio respiratory fitness is needed for not only success in track and field but also for better academic achievement. Maximal aerobic capacity (VO_2max), heart rate, blood pressure and pulmonary function reflects the overall cardio respiratory fitness. The objective of the present study is to assess the cardiovascular fitness status in school going adolescent and it's relation with nutritional status. Information about age (year) and economic status was collected. Physical parameters- stature and weight was measured and with the help of those measurements Body Mass Index (BMI) was calculated. Systolic and diastolic pressure was also collected. And maximum aerobic capacity (VO_2max) and physical fitness index was measured for understanding fitness level of individual. Motor ability status of the study participants was assessed in terms of Kraus-Weber Tests; lower limb endurance was assessed by sit-and-stand test, the vertical jump height and the standard broad jump height test. The results revealed that the rural children were found to have significantly better endurance in terms of Kraus Weber Test ($P<0.01$), standing broad jump ($P<0.01$), standing vertical jump ($P<0.05$) and Sit and Stand Test ($P<0.01$) than the urban children. In conclusion, from the results that place of residence had impact on the physical fitness components among the children.***

Keywords: Vo2 max, physical fitness, aerobic capacity, school going adolescent, BMI

1. Introduction

Physical fitness is characterized by people's ability to carry out daily activities with vigour and alertness but without undue fatigue and with sufficient reserve to enjoy active leisure pursuits and to meet unforeseen emergencies. Furthermore, physical fitness can be understood as an integrated measurement of all the functions – cardio-respiratory, musculoskeletal, endocrine-metabolic, psychological and structures involved in the performance of daily physical activity as well as sports-related physical exercise. In relation to the intensive research efforts to combat the public health burden of civilization diseases such as obesity, depression and cardiovascular disease, physical fitness of children was recently highlighted as a key factor of individual's lifelong health. More specifically, a large amount of studies underline the crucial role of sufficient levels of cardio-respiratory, musculoskeletal, and motor fitness (e.g., balance, coordination) on children's physical, mental, cognitive, and social capability [1,2]. Additionally, longitudinal analysis from childhood over adolescence into young adulthood revealed both that children's physical fitness tracks into young adulthood and that the physical fitness status predicts health outcomes over this time frame. Beside the positive impact of physical fitness on health, there has been public concern about youth physical fitness status, particularly since the new millennium. A bulk of studies resumed that the physical fitness of children decreased within the last decades and that differences between the fit and the unfit children increased further. While physical fitness testing has always been a proven method in the sports specific process of talent identification, the mentioned evidence of physical fitness' relation to health as well as its unfavourable secular changes has globally led to scientific and political recommendations for a regular screening of physical fitness and treatment of inadequate fitness in childhood on a population level [3-5]. In conjunction to these recommendations, the evaluation of child's physical fitness is becoming more and more an inherent part of physical education curriculum in schools since all children, irrespective of their ethical and socioeconomic background can be reached. Especially in the school setting, the testing of physical fitness – as practical and fundamental part of the evaluation process - is inevitable conducted by the use of field-based tests. Compared to more sophisticated laboratory-based test equipment (e.g., cycle ergometer, force plate), these tests are an operational and recognized alternative since they are time-efficient, low in cost and equipment requirements and can be easily administered to a large number of persons simultaneously. Of note, the evaluation of physical fitness requires the presence of actual and valid norm values (regarding the applied fitness tests), mostly provided by percentile values. Percentile values are of interest to estimate the proportion of children with low or high physical fitness and hence, to identify the target population for primary prevention as well as for talent promotion in a sports club. In recent years, a large number of cross-sectional studies reported physical fitness percentiles for a wide variety of physical fitness tests in children. However, with regard to an evaluation of a child's physical fitness over time (i.e., development) the use of longitudinally-based percentile values is of particular interest due to their underlined dedication of true physical fitness development within subjects (i.e., individual changes in timing and tempo of growth and maturation) [4, 6-8]. Physical fitness is in part genetically determined (e.g., sex, distribution of muscle fibers types), but it can also be immensely influenced by lifestyle factors. These factors can be crucial in enhancing and maintaining physical fitness during childhood. Thus, knowledge about their impact on physical fitness in children ought to be of significant interest for coaches, teachers and politicians that are entrusted with fostering children's physical fitness. With respect to environmental living conditions, literature clearly revealed an association between children's physical fitness and their area of residence. Specifically, most of the studies researching the topic during the last 15 years resumed better physical fitness in children living in rural compared to urban areas. For example, within the scope of a nationwide survey of 8- to 9-year-olds' Greek rural residents outperformed their urban peers in proxies of cardio-respiratory fitness (CRF) (20-m shuttle run [20-m SRT]), muscular power of the upper (1-kg ball push) and lower body (vertical jump), and speed (30-m sprint). Particularly, in tests of CRF (i.e., 1-mile run, 20-m SRT) a performance gain of rural living children aged 9 to 12 from different nations (e.g., Australia, India, Switzerland, Iceland) is highlighted. In contrast, according to recently published research, there are further hints of a better physical fitness of urban residents during the transition from childhood to adolescents (i.e., ≥ 11 years) when compared to their rural counterparts. Adolescence is a key period in life for major physical aptitude development. Moreover, physical fitness is a powerful marker of the health condition in childhood and adolescence. The success not only in academic achievement but also in track and field discipline is based on the synthesis of anthropometric characteristics and motor abilities as well as optimal technique. But overall characteristics are also influenced by genetic inheritance, morphology, personal interest and habitual activity. Therefore, cardio respiratory fitness variables such as maximal aerobic capacity (VO_2 max), heart rate, blood pressure and pulmonary functions reflect the overall capacity of the cardiovascular and respiratory systems of an individual. And aerobic fitness and activity positively support musculoskeletal, cardiovascular, and mental health and may track into adulthood. On the other hand, aerobic capacity (VO_2 max) is the maximal amount of oxygen that human body can utilize per minute of activity or physical work. It is the most frequently used to measure as an indicator of cardio respiratory fitness, which shows cardio respiratory durability of an individual. Cardio respiratory fitness variables such as maximal aerobic capacity (VO_2 max), heart rate, blood pressure and pulmonary functions reflect the overall capacity of the cardiovascular and respiratory systems and the ability to carry out prolonged exercise. Hence, Cardio respiratory fitness has been considered as a direct measure of the physiological status of the individual [9-10]. Various factors like socio-economic condition, diet, physical activity may reflect on these variables. Earlier studies also reports that, the environmental factors lead to changes in the physical fitness level among children. The impact of socioeconomic status, ethnicity has been reported on the level of physical fitness among children. In this backdrop the present study has been undertaken to assess the boy physique status in terms of some anthropometric parameters, and motor ability of 12-18 years age group children in order to identify potentiality and sports talent in them.

2. Review of Literature

Development of physical fitness

Overall, physical fitness in children increases with increasing age. The age-related improvement in physical fitness is mainly influenced by growth and maturation that refer to the biological context of human development. Normal growth and maturation effect changes in components of physical fitness in children independent on a child's physical activity. In recent times, an abundance of cross-sectional studies reported age- and sex-specific percentile-norm values of youth. Findings of studies clearly figured out that performance in tests of cardio-respiratory fitness (CRF), musculoskeletal fitness and motor fitness increased over the age period of 6 to (at least) 12/13 years in boys and girls. Herein, boys achieved better results than girls in nearly all physical fitness components, flexibility and balance, where the opposite is notable. In addition, the magnitude of sex differences frequently increased over time in CRF and musculoskeletal fitness [11-12]. According to the components of physical fitness that were investigated in the underlying studies of the present thesis an overview of performance development by age and sex in CRF, muscular power of the upper and lower body, speed, agility, and flexibility across the age span of 8/9 to 12/13 years will be discussed in turn below.

Cardio-respiratory fitness

In general, boys and girls enhanced their CRF on a linear course over the age period of 6 to 13/14 years. For example, in four different endurance tests (20-m shuttle run [20-m SRT], ¼-mile run, ½-mile run, and 1-mile run) that were conducted in a sub-sample of 8 to 13 year olds, boys and girls from Spain improved their median performance over all age groups (i.e., ages: 8/9, 10/11, 12/13) in all tests. Overall, boys' performance increased to a higher magnitude in all tests as compared to girls. Furthermore, boys significantly outperformed girls in all age groups. Findings are in line with those of a cumulative sample of 9 to 12 year old Australians from 15 different studies published between 1985 and 2009 that were tested in 1.6-mile run and 20-m SRT. Performance in the 1.6-mile run linearly increased with increasing age in both sexes. The same pattern of performance improvements by age was notable in the 20-m SRT for boys, whereas girls only showed a marginal performance progression from ages 9 to 11 and afterwards maintained performance. Recently, another study also observed that, cardio-respiratory fitness data for Portuguese children aged 10, 11 and 12. Both boys and girls increased performance in the 20-m SRT by age but the increase was less pronounced in girls (25% vs. 19%). By testing on an incremental endurance bike (PWC 170), 8 to 12 year old German boys continuously improved their absolute and relative values of mechanical power (i.e., Watt, Watt/kg), whereas annually progression increased over the age of 10 in particular. In girls, performance progression in absolute power values was present as well. But girls' relative mechanical power values did not show such a clear pattern. Performance increased from age 8 to 9 and remained stable at age 10. From age 10 to 11 performance improved again and then decreased at age 12. Results from longitudinal studies confirm performance improvements by age [13].

Muscular power of upper- and lower body

During the school-age years, performance in upper and lower body muscular power increases in boys and girls. Sex differences are relatively small but consistent during this age span and show higher values for boys than for girls. Nevertheless, current cross-sectional studies report that performance differences between boys and girls are statistically meaningful in favour of the former group For instance, an earlier study observed that , inter alia, children aged 8 to 13 for upper- (basketball throw [BT]) and lower- (standing long jump [SLJ], vertical jump [VJ]) muscular power. Children were classified in age groups of two consecutive years (i.e., 8 to 9, 10 to 11, and 12 to 13). In both sexes performance increased with increasing age, whereas males' performance was significantly better in all age groups. With respect to the 50th percentile, increase of performance (i.e., 8/9 to 12/13 years) in upper and lower body muscular power was higher in boys than in girls. Sex-specific increases of performance were rather dominant for SLJ (boys: 32%, girls: 28%) and BT (boys: 70%, girls: 65%) compared to VJ (boys: 52%, girls: 41%). In addition, the magnitude of sex differences increased over time in all three tests. In general, sex differences in physical fitness tests that refer to throwing performance are bigger than for tests that refer to other basic skills like jumping (e.g., SLJ) and running (e.g., 20-m sprint) [14].

Speed

The literature revealed an improvement in running speed performance across the age span of 8 to 12 years in both sexes with negligibly better values in boys. For instance, in a recently published study boys and girls aged 8, 9, and 10 showed a decrease in time needed to run 50-yards with increasing age. Annual improvements were constant in boys (4%). Girls improved their performance from 8 to 9 years to the same magnitude as boys (i.e., 4%) with a slightly higher percentage of increase from ages 9 to 10 (6%). Nevertheless, there was a trend of better performances in boys than girls in all age groups that refer to time differences of 0.3s to 0.5s. Another study reported significantly higher velocity in the 30-m sprint in favour of boys aged 8 to 12. Children were classified in age groups of 8-9 and 10-12. The average velocity of 10-12 years old boys and girls was higher than that of 8-9 year old peers. Girls showed a higher percentage of increase than boys (12% vs. 8%) [15-16].

Physical activity

Physical activity is frequently defined as any "bodily movement that is produced by the contraction of skeletal muscle and that substantially increase energy expenditure. It characterizes a behavior that occurs in a variety of forms and contexts, including free play, house chores, exercise, school physical education, and organized sports. Thus, there is reason to presume that physical activity and physical fitness are positively linked and that the relationship between physical activity and fitness is causal (i.e., higher PF caused higher PA and vice versa). With respect to a narrative review, earlier study stated that relationships between indicators of physical fitness and regular physical activity exist, but they are generally low or moderate. Additionally, physical activity accounts for a relatively small percentage of the variation in some indicators of fitness in children as well as in adolescents [15].

Physical fitness and health

Benefit of physical fitness on health with respect to a public health approach, the necessity of physical fitness testing is highly caused by the assumption of a positive relation between physical fitness and enhanced health. Thus, the linking between physical fitness and various health outcomes (e.g., adiposity, cardiovascular disease, and metabolic disorder) is risen up to a powerful topic in scientific research within the last two decades. In relation to this topic it has to be pointed out that health is a multifactorial construct with a physical, mental and social domain. The World Health Organisation defined health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The definition has not been amended since 1948 and is up to now criticized and discussed concerning its absoluteness of the word complete in relation to well-being. One proposal for a redefining was devised by a consortium of international health experts in 2009, defining health as the ability to adapt and to self-manage. The human body evolved to be physically active. In other words, our bodies require physical activity to remain healthy. Throughout history, survival of the human species depended on hunting or gathering our food supplies, pursuits that demanded prolonged and often strenuous physical activity. The advent of mechanization and modern technology in the last few decades has resulted in the human race becoming less physically active than ever before – and we are paying for it with our health [1-3]. It has been reported that there is a link between the nutritional profile, level of growth, physical aptitude, mental development, cardiovascular risk factors and school performance. Physical fitness is a powerful marker of the health condition in childhood and adolescence. Previous research indicates that boys have better muscular fitness in different age groups and achieve better results in the tests for assessment [17]. Adolescence is a key period in life for major physical aptitude development and this differs between boys and girls. Increase in anaerobic and aerobic functional capacities is higher in boys than girls and there is a higher amount of skeletal muscle mass in boys. Some studies have equally shown that children who participated in physical education maintained or improved grades and scores on standardized tests and had better classroom performance. Physical activity in children therefore remains a preventive and therapeutic measure to reduce the risks of future cardiovascular diseases [18]. Children who meet recommended physical activity guidelines have improved aerobic fitness, muscular strength, cardiovascular and metabolic health and are less likely to be overweight or obese. It has been also reported in the earlier studies that, various factors including socio-economic condition, diet, and physical activity may reflect the aerobic capacity among the adolescent children. Several studies have been carried out on the physical and cardio respiratory fitness status of the children of school-age population. In India, limited studies on the anthropometric, physical, and cardio respiratory fitness of children have been reported. In view of the above, a study was undertaken to investigate the anthropometric, physical and cardio respiratory fitness and motor ability status of 10-16 years age group children in order to identify potentiality and sports talent in them.

3. Aims and Objectives

Physique can be characterized by the individuals' body structure, body size and body composition. On the other hand body composition, anthropometric dimensions, and morphological characteristics play a vital role in maintaining regular activity. Various attributes of physique (body size, shape and composition) are considered to contribute success in various sports. Physical component is primarily oriented towards systematic development of motor abilities and their manifestation through sports skills in a selected sports discipline. And the, motor abilities are inherited, relatively stable traits of athletes that are prerequisites for performing various sports skills. Moreover, physical and motor fitness are generally achieved through proper nutrition, physical exercise and sufficient rest. Proper nutrition is a fundamental component of athletes' training and performance. In adults the balance between energy intake and energy demands is crucial in training, recovery, and performance. In this backdrop, the present study has been undertaken to assess the cardio respiratory status in school going adolescent (age range 12-18 years) children.

The objectives of the study are as follows:

- To find out the cardio respiratory fitness status in school going adolescent with reference to the anthropometric parameters. And also find out the motor ability in terms of physical fitness.

4. Materials and Methods

Initially institutions involved in imparting education to adolescents were approached for getting access to conduct the study on their students. After getting permission from institutional authorities, the study was conducted on mutual convenient dates. In the beginning, the study requirements will be explained to the individuals showing initial interest and on receiving their consent, the names of the participants, from within the age range 12 - 18 years will be enlisted.

Location of the Study: Initially the authorities of the educational institution located in Village- Debpukur, P.O- Sweli Telinipara Dist- North 24 Paragana and the educational institution situated in, Kolkata were approached for getting access to carry out the study on their students. On obtaining the permission the study was conducted among the school students.

Selection of the Participants': The present study was conducted on school going children residing and attending schools in urban area and rural area of the age group of 12-18 years. Total 75 (37 from urban school and 38 from rural school) participants enlisted their names for the present study. Individuals fulfilling the inclusion criteria and residing and also attending the school in urban area constituted the Urban Group (UG) and the individuals residing and attending school in rural area constituted the Rural Group (RG) of same comparable age group and socio economic status.

Inclusion Criteria: Individuals with no known chronic disease history (as reported by their parents/guardians) and attending schools in urban and rural area within the age range was considered for inclusion.

Recording of Basic Information: Information on participants' age (year), daily activities of was noted in a pre-designed schedule.

Assessment of Socioeconomic Status: Socioeconomic status (SES) was recorded using a modified version of the scale of Kuppuswamy [19].

Assessment of Physical and Physiological Parameters: Stature (to the nearest 0.1cm) and body weight (to the nearest 0.1 kg), was measured with the individuals in light clothing and without shoes. Body Mass Index (BMI) was calculated from the measured body height and body weight data. Systolic, diastolic blood pressure (mm Hg) in resting condition and resting heart rate (beats.min^{-1}) was recorded using a sphygmomanometer and a stop watch. Body Temperature (BT) (ºC), was recorded by a clinical thermometer and was noted in ° Fahrenheit (° F) and expressed in ° Celsius (° C).

Assessment of Physiological Fitness Status: Maximal aerobic capacity (VO_{2max}) was estimated following appropriate Queens College step test. To reduce the inter-observer measurement variation coefficients [20], all anthropometric measurements were obtained by the same data collector. The muscular fitness was assessed using Kraus-Weber Tests, lower limb endurance was assessed by sit-and-stand test, the vertical jump height and the standard broad jump height was measured. All measurements were taken in the morning hours with ambient temperature around 27˚- 29˚.

a) **Kraus-Weber Tests**: Dr. Hans Kraus and Dr. Sonja Weber developed the Kraus-Weber Minimum Test in the 1950's. The six-item medical fitness test measures the strength and flexibility of key postural (core) muscles. The test consists of five strength challenges and one general flexibility procedure. The Kraus-Weber Tests do not require sophisticated equipment and are easy to administer. These tests are graded on a pass-fail basis. Being unable to perform even one of the six exercises qualifies as failing the test. A variation of the scoring method enables partial movements on each test scored from 0 to 10 [21].

Test Descriptions

1. Strength of Abdominal and Psoas Muscles

2. Strength of Abdominal Minus Psoas Muscles -
3. Strength of Psoas and Lower Abdominal Muscles -
4. Strength of Upper Back Muscles
5. Strength of Lower Back Muscles
6. Floor Touch Test

b) **Sit-and-Stand Test:** Sit in the middle of the chair. 2. Place your hands on the opposite shoulder crossed at the wrists. 3. Keep feet flat on the floor. 4. Keep back straight and keep your arms against your chest. 5. On "Go," rise to a full standing position and then sit back down again. 6. Repeat this for 30 seconds [22].

c) **Vertical Jump Test:** The subject stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. This is called the standing reach height. The athlete then stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. The jumping technique can or cannot use a countermovement. Attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded [23].

d) **Standing Broad Jump:** To measure the leg extension explosive strength, the jumping performance was analyzed. The subject was asked to jump for maximum distance from a standing position and was instructed to bend his knees, putting his arms in front of him, and jump forward as possible, trying to land on his feet. Two attempts were given for better result of the test and noted in centimeters [24].

Statistical Analysis: Obtained data were statistically analyzed. The data was analyzed with the help of percentage, mean and standard deviation, t- test and correlation. P value lower than 0.05 ($P<0.05$) was considered significant.

5. Results

Basic information in respect of their age (years) and SES has been presented in table 1.0. And as per the SES of all of the participants' were fall into lower middle category as per modified version of the scale of Kuppuswamy's socio economic scale.

Table 1.0: Basic information of the Study Participants

Variables	UG	RG
Age^ (years)	13.6 ± 0.9	13.4 ± 0.83
Gender	Male	Male
SES^	Upper middle class	Upper middle class

AM±SD; ^ NS

Physical and physiological parameters of the study participants in terms of stature (cm), body weight (kg), body mass index (BMI), heart rate $_{\text{pre work}}$ (beats.min $^{-1}$), systolic blood pressure (mm Hg), diastolic blood pressure (mm Hg), body temperature (ºC) has been presented in table 2.0.

Table 2.0: Physical and Physiological Parameters of the Study Participants

Variables	UG	RG
Stature^ (cm)	158.1 ± 5.70	155.2 ± 7.55
Body Weight^ (kg)	54.9 ± 4.90	50.6 ± 14.23
Body Mass Index^ (BMI)	22.0 ± 2.38	20.8 ± 5.00
Resting Heart Rate^ (beats.min^{-1})	76.7 ± 6.14	78.9 ± 1.89
Systolic Blood Pressure^ (mm Hg)	111.5 ± 7.28	111.6 ± 9.82
Diastolic Blood Pressure^ (mm Hg)	73.4 ± 5.31	72.2 ± 10.06
Body Temperature^ (ºC)	36.3 ± 0.9	36.1 ± 1.0

AM±SD, ^ NS

Physical fitness status in terms of Vo2 max (ml.kg^{-1}.min^{-1}) of UG and RG group has been presented in figure 1.0

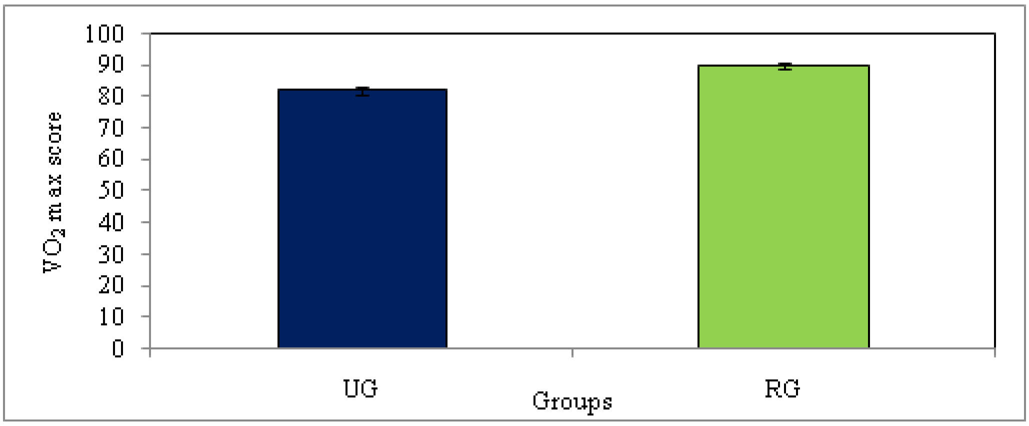
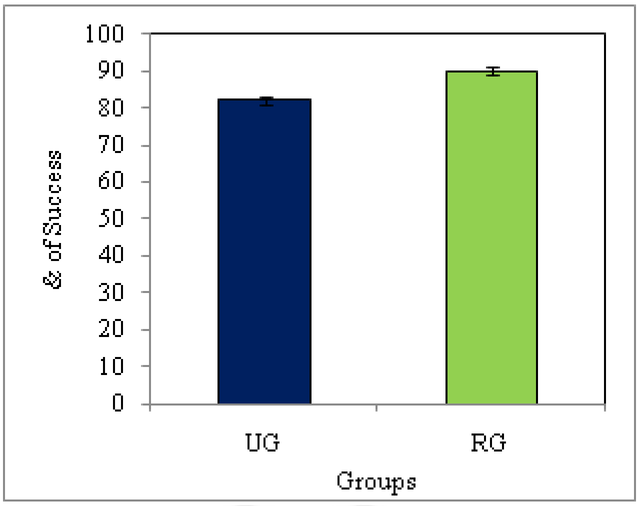
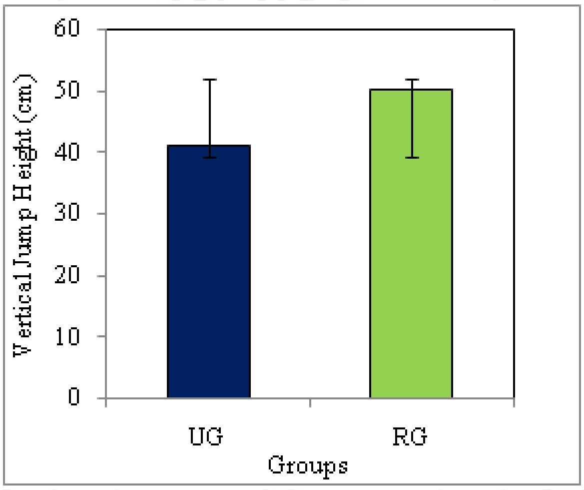


Figure 1.0: VO_2 max value (ml.kg^{-1}.min^{-1}) of the Study Participants

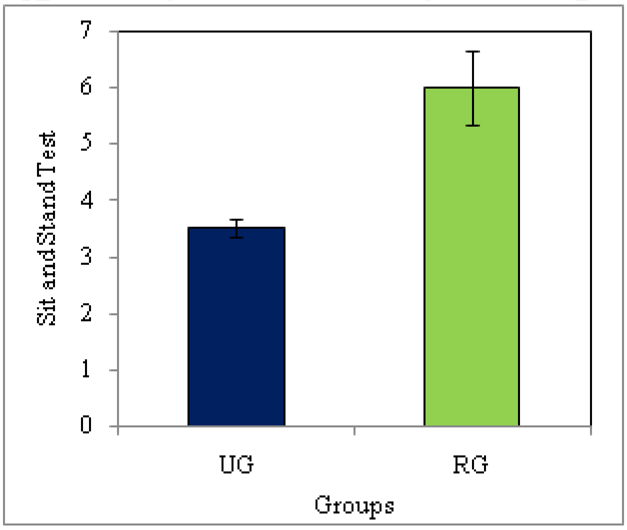
In figure 2, comparison of muscular fitness between UG and RG individuals in terms of Kraus-Weber Tests (a), Vertical Jump Height (cm) (b) Sit and Stand Test for Lower Limb Endurance (c) and Standing Broad Jump test score has been presented.



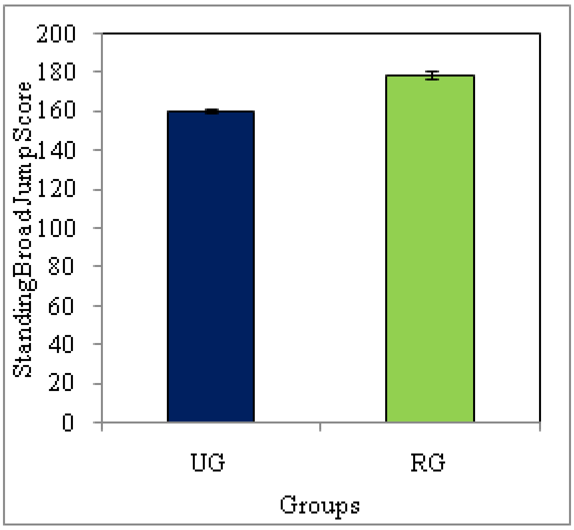
a) % of success in Kraus-Weber Tests



b) Vertical Jump Height (cm)



c) **Sit and Stand Test Score of the Study Participants**



d) Standing Broad Jump Score of the Study Participants

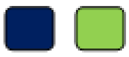


Figure 2.0: Muscular fitness of UG and RG Participants UG RG

6. Discussions

In the present study the muscular fitness is adjudged in terms of Kraus Weber Test; it is a combination of 6 tests and a 'fail' in any of the 6 test items implies a whole test failure. Each test is to assess the strength of different important muscles: Test 1 (A + P) is for Abdominal and Psoas muscles, Test 2 (A - P) is for Psoas, Test 3 (P) is for Psoas and Lower Abdominal muscles, Test 4 (UB) is for Upper Back muscles, Test 5 (LB) is for Lower Back muscles, Test 6 (B +H) is for Back and Hamstring muscles and also the test for flexibility. The success percentage in RG individuals were found to be 90, which was significantly higher ($P < 0.01$) compared to the success percentage of UG individuals [fig 2(a)]. This may indicate that the muscular flexibility and fitness of the RG individuals; and thereby probably reducing the consequent impact of hormonal changes on body weight and flexibility. Lower limb endurance was assessed by sit-and-stand test; RG individuals had significantly higher ($P < 0.01$) values compared to their UG counterparts [Fig 2(c)]. Hence, improvements in functional fitness tests involving dynamic movements of the lower limbs may be expected, such as in lower limb endurance. This may also be due to swift circular turns and the footwork with controlled coordination of hand and body. In the present study the mean Vertical Jump Height (cm) of the RG individuals were found to be 50 cm while that of UG individuals were 41 cm [fig 2(b)]. This may indicate that the jumping movements as well as the vigorous stamping of the feet with heavy ankle bells may have positive influence on developing the lower limb strength; that is required for jumping. Standing broad jump score also higher among RG individuals compared to their age matched UG counterpart. Mean value of VO_2 max of among the RG participants was significantly higher ($P<0.01$) than the age matched UG counterpart [Fig 1 (a)].

The principle aim of the current study was to examine potential differences in physical fitness of school going children residing in either urban or rural settings. The results of present study showed that the rural children had performed significantly better in almost all the physical fitness variables as compared to urban children. The present data agreed with the earlier studies advocating that the place of residence has an impact on children's fitness. Earlier studies from West Bengal also proposed that rural children were fitter than their urban counterparts. McNaughton et al reported [25] that the Tasmanian boys and girls had greater aerobic fitness than their rural counterparts, whereas motor skills were similar among urban and rural children in New South Wales, Australia. The rural children in Turkey were found to have significantly superior flexibility and muscular endurance than their urban counterparts. The height and weight are positively correlated with distance in girls and it advocated that the rural girls having proportionately greater body dimensions had superior physical performance. Chillon et al. found that the rural Spanish children had superior cardio-respiratory fitness and upper and lower-limb muscular fitness but inferior speed and flexibility. Such research reports may be due to the fact that the difference between rural and urban areas are diminishing because of facilities which were available in urban areas are now being provided in rural areas also in terms of gymnasium, transport, connectivity with other towns and cities and better health facilities and other opportunities [26-30]. But as the results of the present study showed that rural children were better in anthropometric characteristics and physical fitness than the urban children, it might be due to more activity oriented routine in rural areas.

7. Conclusions

It is concluded that the place of residence has clear impact on physical fitness of children. The rural children performed significantly better on the physical fitness tests as compared to the urban children. The way of life, activity levels, food habits and the constituents of food might have played significant role in the differences among children from different settings.

Acknowledgement

I express my deep sense of gratitude to Mr. Ayan Chatterjee, for kindly consenting to act as my supervising teacher for the present study and for his guidelines and unwavering support throughout the work. My thanks are also due to different stakeholders of the units, wherein the study has been carried out, in particular to the school authorities and the study participants, for their sincere cooperation and unconditional support. I owe a sense of gratitude to the intelligence and cooperation of those people who had been so easy to understand what I needed for completion of this exclusive project work. I want to express my heartiest gratitude and thanks to the respected teachers Dr. Sauryya Bhattacharya, Assistant Professor and course coordinator of post graduate section, Department of Food and Nutrition, Sarada Ma Girls College, Barasat. I would also like to give my special thank to our respected Teacher in Charge Prof. Mahua Bhattacharjee and Prof. Sripati Bhusan Chakraborty and all the teachers of the department of Food and Nutrition. I am thankful to the library and laboratory faculty of my college. I am also thankful to the other officials and support staffs of our college. Members of my extended family had been a source of inspiration for me; by taking a keen interest all throughout in my work, ungrudgingly sparing me from many household responsibilities, voluntarily helping me in whatever way they could, reposing a faith in me, they have facilitated my, otherwise pedestrian effort, in true sense. My thanks are also due to all those involved in giving the present work its final shape. I would like to forward my gratitude to my friends who always support me during my project work.

Once again, I convey my grateful thanks to all of them and to others whose names I might have inadvertently omitted.

References

[1] Kunješić M, Badrić M, Prskalo I, Differences in Aerobic Capacity among Students with Regard to Their Level of Nutritional Status. *International Journal of Human Science*. 2016; 13: 414-420.
[2] Manna I, Pan SR, Chowdhuri M, Anthropometric, Physical and Cardio respiratory Fitness of 10-16 Years Children.*US National Library of Medicine Enlisted Journal*. 2014; 7: 275-283.
[3] Mahishale A, Kulkarni N. Comparison of Cardiovascular Fitness of Children 13-16 Years of Age from Rural and Urban Areas of Belgaum District: A Cross Sectional Study. *Journal of the Scientific Society*.2014; 41: 79-84.
[4] Dhobanga MND, Kimbi HK, Bopda OSM, Mibo'o P, Nkwelle P, Noumi S et al. Influence of Nutritional Status on the Physical Aptitudes and Cardiovascular Profiles of School Children in Rural and Urban Areas of North Cameroon. *British Journal of Medicine and Medical Research*. 2015: 10; 1-11.
[5] Singh KM, Singh M, Singh S. Study of Physical Fitness among Rural and Urban Children from Punjab. *International Journal of Physical Education, Sports and Health*.2016; 3: 475-478.
[6] Desai IK, Kurpad AV, Chomitz VR, Thomas T. Aerobic Fitness, Micronutrient Status, and Academic Achievement in Indian School-Aged Children. *Journal Pone*. 2015; 0122487: 1-13.
[7] McArdle WD, Reliability and Interrelationships between Maximal Oxygen Uptake, Physical Work Capacity and Step Test Scores in College Women. *Medicine and Science in Sports*, 1972; 4: 51-82.
[8] Brouha L, Graybiel A, Health CW, Step Test: Simple Method of Measuring Physical Fitness for Hard Muscular Work in Adult Man. *Rev Can Biol*. 1943; 2: 86.
[9] Dutt S. Health related physical Fitness of Boys Age 8-18 years. *J Exerc Sci Physiother* 2005;1: 12-22.
[10] Ruiz JR, Ortega FB, Rizzo NS, Villa I, Hurtig-Wennlöf A, Oja L, *et al*. High Cardiovascular Fitness is Associated with Low Metabolic Risk Score in Children: *The European Youth Heart Study. Pediatr Res* 2007; 61:350-355.
[11] Aberg MA, Pedersen NL, Torén K, Svartengren M, Bäckstrand B, Johnsson T, *et al*. Cardiovascular fitness is associated with cognition in young adulthood. *Proc Natl Acad Sci U S A* 2009; 106:20906-11.
[12] Reddy KS. India wakes up to the threat of cardiovascular diseases. *J Am Coll Cardiol* 2007; 50:1370-2.
[13] Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: *Analysis of worldwide data. Lancet* 2005; 365:217-23.
[14] Gupta R, Gupta VP, Sarna M, *et al.* Prevalence of Coronary Heart Disease and Risk Factors in an Urban Indian Population: *Jaipur Heart Watch-2. Indian Heart J* 2002; 54:59-66.
[15] Kriemler S, Manser-Wenger S, Zahner L, Braun-Fahrländer C, Schindler C, Puder JJ. Reduced Cardiorespiratory Fitness, Low Physical Activity and An Urban Environment are Independently Associated with Increased Cardiovascular Risk in Children. Diabetologia 2008; 51: 1408-15.
[16] Wilczewski A, Sklad M, Krawczyk B, Physical Development And Fitness of Children from Urban And Rural Areas as Determined by EUROFIT Test Battery. *Biol Sport Warsaw* 1996; 13: 113-26.
[17] Bathrellou E, Lazarou C, Demosthenes B. Panagiotakos, Labros S. Sidossis: Physical Activity Fitness and Sedentary Behaviours in Children from Rural and Urban Areas of Cyprus. *Cent Eur J Public Health* 2007; 15:66-70.
[18] Castro-Piñero J, Artero EG, España-Romero V, Ortega FB, Sjöström M, Suni J, *et al*. Criterion-Related Validity Of Field-Based Fitness Tests In Youth:. *A systematic review Br J Sports Med* 2010; 44:934-43.
[19] Mahishale A, Kulkarni N. Comparison of Cardiovascular Fitness of Children 13-16 Years of Age from Rural and Urban Areas of Belgaum District: A Cross Sectional Study. *Journal of the Scientific Society*.2014; 41: 79-84.
[20] Ozdirenç M, Ozcan A, Akin F, Gelecek N. Physical Fitness in Rural Children Compared with Urban Children in Turkey. *Pediatr Int* 2005; 47:26-31.
[21] Rutenfranz J, Andersen KL, Seliger V, Masironi R. Health Standards in Terms of Exercise Fitness of School Children in Urban And Rural Areas in Various European Countries. *Ann Clin Res* 1982; 14:33-6.

[22] Peña Reyes ME, Tan SK, Malina RM. Urban-Rural Contrasts in The Physical Fitness of School Children in Oaxaca, Mexico. *Am J Hum Biol* 2003; 15:800-13.
[23] Eiben O, Barabas A, Nemeth A. Comparison Of Growth, Maturation and Physical Fitness of Hungarian Rural and Urban Boys and Girls. *J Hum Ecol* 2005; 17:93-100.
[24] Cooper AR, Wedderkopp N, Wang H, Andersen LB, Froberg K, Page AS. Active Travel to School and Cardiovascular Fitness in Danish Children and Adolescents. *Med Sci Sports Exerc* 2006; 38:1724-31.
[25] Hurtig-Wennlöf A, Ruiz JR, Harro M, Sjöström M. Cardiorespiratory Fitness Relates More Strongly Than Physical Activity to Cardiovascular Disease Risk Factors in Healthy Children and Adolescents: *The European Youth Heart Study*. *Eur J Cardiovasc Prev Rehabil* 2007; 14:575-81.
[26] Sidney S, Sternfeld B, Haskell WL, Jacobs DR Jr, Chesney MA, Hulley SB. Television Viewing and Cardiovascular Risk Factors in Young Adults: *The CARDIA Study*. *Ann Epidemiol* 1996; 6:154-9.
[27] Das B, Tirthankar G, Gangopadhyay S. A Comparative Study of Physical Fitness Index and Predicted Maximum Aerobic Capacity (VO_2 Max) among the Different Groups of Students in West Bengal, India. *Int J Appl Sports Sci* 2000; 22:13-23.
[28] Hofman A, Walter HJ. The Association between Physical Fitness and Cardiovascular Disease Risk Factors in Children in a Five-Year Follow-Up Study. *Int J Epidemiol* 1989;18:830-5.
[29] Rouse IL, Beilin LJ, Armstrong BK, Vandongen R. Vegetarian Diet, Blood Pressure and Cardiovascular Risk. *Aust N Z J Med* 1984; 14:439-43.
[30] Grant R, Bilgin A, Zeuschner C, Guy T, Pearce R, Hokin B, *et al*. The Relative Impact of a Vegetable-Rich Diet on Key Markers of Health in A Cohort of Australian Adolescents. *Asia Pac J Clin Nutr* 2008; 17:107-15