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An Analysis Upon Anthropometric and Associations with Cardiorespiratory Measurements of School Going Students: A Case Study of Bangalore City

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Abstract – The present study was undertaken to investigate the anthropometric, physical and cardiorespiratiory fitness of 10-16 yrs children. Talent identification in sports is importance because they represent the achievement level of a particular group in future. There are very limited studies available in Indian context on talent identification in sports. A total of 150 male children of 10-16 yrs age volunteered for this study; were divided equally into 3 groups (i) Prepubertal (age-11.0 ± 0.8yrs, n=50); (ii) Pubertal (age 13.5 ± 0.5 yrs, n=50); (iii) Postpubertal (age 15.5 ± 0.5 yrs, n=50). Selected anthropometric, physical and cardiorespiratiory fitness variables were measured for each group. A significantly (P<0.05) greater height, body mass, BSA, LBM, mid upper arm circumference, hip and trunk flexibility, grip strengths, abdominal strength, elastic leg strength, maximum speed, peak power, VO2max, peak expiratory flow rate and blood pressure were observed in Postpubertal children when compared to Prepubertal and Pubertal children.

However, a significantly (P<0.05) lower percent body fat, reaction time, maximal heart rate and recovery heart rates were noted in Postpubertal children when compared to Prepubertal and Pubertal children. The waist- hip ratio of pubertal children was noted significantly higher (P<0.05) when compared to prepubertal and postpurbertal children. No significant change was reported in BMI and resting heart rate among the groups. Identification of children at early stage of their growth and development may produce elite athletes in the future. Talent identification also can be used as a counseling technique that helps to discover and explore areas of talent for particular athletes.

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INTRODUCTION

Sports talent may be identified from the school children 10-16 yrs age group when they show interest in different sports. Anthropometric, physical and cardiorespiratory fitness profiles contribute to selection procedures in different sports events. Besides success 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. Cardiorespiratory fitness variables such as maximal aerobic capacity (VO2max), 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, Cardiorespiratory fitness has been considered as a direct measure of the physiological status of the individual. The gold standard for the measurement of cardiorespiratory fitness is the maximal oxygen uptake (VO2max). The level of cardiorespiratory fitness is highly associated with the performance of other health-related fitness parameters such as strength and power output in young people and in adults. Lipids have important beneficial biological functions. These include usage of triglycerides for energy production, fat storage in adipose tissues, and usage of cholesterol as a component in phospholipids of cellular membranes or in the synthesis of steroid hormones. Elevated plasma cholesterol concentrations have been implicated in the development of coronary artery disease (CAD). Regular monitoring of these health variables of sports children can provide valuable information about their health, metabolic and cardiovascular status.

To identify athletic potentiality, norms of the anthropometric, physical, cardiorespiratory fitness

and lipids profiles have an importance because they represent the health, metabolic and cardiovascular status of the athletes, which relates with the achievement level of a particular group. Various factors like socio-economic condition, diet, physical activity may reflect on these variables. Thus there is a wide range of normalcy and the need to develop local norms has been emphasized. Several studies have been carried out on the physical and cardiorespiratory fitness status of the children of school-age populations. In India, limited studies on the anthropometric, physical, cardiorespiratory fitness and lipids and lipoproteins profiles of children have been reported.

Health-related physical fitness is a series of measures of physical and physiological characteristics that define the risk of premature development of diseases or morbidity and which are associated with a sedentary lifestyle, or are those components of physical fitness that are affected by routine activity and are related to health status.

The importance of having healthy levels of the components of health-related physical fitness (cardiorespiratory fitness, muscle strength/resistance, body composition and flexibility) lies in their relationship with reducing the incidence of chronic diseases and with improving performance, which is why the physical fitness that comes from regular physical activity is beneficial for children.

Growing concern about the harmful effects of childhood unfitness and its results in adulthood has meant that the number of studies investigating the physical fitness of children is increasing.4 Additionally, diagnosing poor physical fitness levels is one possible strategy for detecting metabolic disorders.

Despite consensus about its epidemiological importance, the physical fitness of Brazilian children has been investigated rarely and those studies that have been conducted are limited to regional samples. One of the findings of these studies is a high percentage of unfitness in both sexes in certain health-related fitness levels. Both boys and girls were found to be unfit, especially so for abdominal strength/resistance and aerobic resistance, and when these results are broken down by sex, the boys are fitter in terms of these components.

With relation to flexibility, girls normally score better than boys; in other words sex is once more one of the variables associated with this component. Both sexes exhibited significant variations in abdominal and aerobic resistance, beginning from 10 to 14 years of age in boys and from 12 to 14 in girls. These data suggest that age group can also be considered to be predictive of physical fitness.

METHODOLOGY

Subjects:

A total of 150 male children of 10-16 yrs age volunteered for this study. The children were selected after proper medical checkups from Banglaore city of Karnataka, India. The subjects were equally divided into 3 groups (i) Prepubertal (age-11.0 ± 0.8yrs, n=50); (ii) Pubertal (age 13.5 ± 0.5 yrs, n=0); (iii) Postpubertal (age 15.5 ± 0.5 yrs, n=50). The subjects were informed about the possible complications of the study and gave their consent. Parental consent was also taken from the participants of this study. The institutional review board and ethical board approval was also obtained for the present study.

Measurement of Anthropometric Variables:

Height and body mass were measured using standard methodology. Body mass index (BMI) and Body surface area (BSA) were derived from the height and body mass using standard equations. Measurements of hips and waist of the subject was taken by a steel tape using standard procedure, and the waist- hip ratio (WHR) was determined by standard equation. Mid upper arm circumference (MUAC) of the subject was taken by a steel tape using standard procedure. A skin fold caliper (Mitutoyo, Japan) was used to assess the body fat percentage, from biceps, triceps, sub scapular and suprailiac sites. Body density was calculated according to the formulae of Durnin and Womersley. Body fat was derived using the standard equation of Siri. Subsequently, lean body mass (LBM) was derived by subtracting fat mass from total body mass using the standard equation.

Assessment of Physical Fitness:

Reaction time of the subject was assessed by ruler drop test using standard procedure. Modified sit and reach test (MSRT) was applied using standard procedure in order to assess subject's hip and trunk flexibility. Sit ups test (SUT) was performed using standard procedure to monitor the development of the subject's abdominal strength. Standing long jump test (SLJT) was performed to monitor the development of the subject's elastic leg strength. A grip strength dynamometer (T.K.K.5001 Grip-A, Japan) was used to record the strength of grip muscles of both hands following a standard methodology. To monitor the development of the subject's ability to effectively and efficiently build up acceleration from a standing start to maximum speed, 30 meter acceleration test (30MAT) was performed using standard procedure. Margaria Kalamen Power Test was used to monitor subject's peak power using the standard procedure.

Assessment of Cardiorespiratory fitness:

Subject was asked to take rest for 15 min and the heart rate and blood pressure were recorded. Maximal heart rate (HRmax) and recovery heart rates were recorded following a maximal exhaustive

exercise. Maximal aerobic capacity (VO2max) was measured indirectly using Queen's College step test following standard procedure. Peak expiratory flow rate (PEFR) was recorded using a vitalograph (Montari, India) following standard procedure.

Statistical Analysis:

All the values of anthropometric, physical and cardirespiratiory fitness variables were expressed as mean and standard deviation (SD). Analysis of Variance (ANOVA) followed by multiple comparison tests was performed to find out the significant difference in selected anthropometric, physical and cardirespiratiory fitness variables among the groups. In each case the significant level will be chosen at 0.05 levels. Accordingly, a statistical software package (SPSS) was used.

RESULTS

Anthropometric parameters showed variations among the Prepubertal, Pubertal and Postpubertal children. A significantly ($P<0.05$) higher height, body mass, body surface area (BSA), lean body mass (LBM) and mid upper arm circumference (MUAC) were observed in Postpubertal children when compared to Prepubertal and Pubertal children. On the other hand, a significantly ($P<0.05$) lower percent body fat was noted in Postpubertal children when compared to Prepubertal and Pubertal children. The waisthip ratio (WHR) of pubertal children was noted significantly higher ($P<0.05$) when compared to prepubertal and postpurbertal children. However, no significant change was reported in body mass index (BMI) and total body fat among the groups.

Physical fitness variables showed remarkable differences among the Prepubertal, Pubertal and Postpubertal children. A significantly ($P<0.05$) higher hip and trunk flexibility as measured by modified sit and reach test (MSRT) score, abdominal strength as measured by sit ups test (SUT) score, elastic leg strength as measured by standing long jump test (SLJT) score, grip strengths of both hands, maximum speed as measured by lower 30 meter acceleration test (30MAT) score, and peak power output were observed in Postpubertal children when compared to Prepubertal and Pubertal children. On the other hand, a significantly ($P<0.05$) lower reaction time as measured by ruler drop test (RDT) was noted in Postpubertal children when compared to Prepubertal and Pubertal children.

DISCUSSION

Childhood and adolescence are crucial periods of life, since dramatic physiological and psychological changes take place at these ages. Physical growth in children is measured by changes in body size and/or composition as well as physical profile. During childhood and adolescence, body size and composition markedly change. These changes are strongly associated with the development of various physical performance characteristics. At the same time, anthropometry and body composition during adolescence are predictors of risk factors for cardiovascular disease, diabetes, and many types of chronic diseases which occur in adults. Hence, determining anthropometry and body composition during childhood and adolescence would be of interest to those working in both sports sciences and medicine.

CONCLUSION

Identification of children at early stage of their growth and development may produce elite athletes in the future. Talent identification also can be used as a counseling technique that helps to discover and explore areas of talent for particular athletes. In order to reach their goals, young children should be subject to a series of tests reflecting anthropometric, physical and cardiorespiratory fitness which will indicate their present over all strengths and weaknesses. Improvement in these parameters depends on level of maturation factors and / or motivation, and exposure to long term and higher intensity of training.

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