Indian J Physiol Pharmacol 2001; 45 (4) : 457–462

PHYSICAL FITNESS: A LONGITUDINAL STUDY AMONG MUSLIM CHILDREN OF BIJAPUR (KARNATAKA)

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(Received on September 11, 2000)

Abstract : Aerobic capacity or maximum oxygen uptake capacity (VO_2max) has been widely considered to be reliable and valid measure of cardio respiratory fitness. Persons possessing higher values and have the capacity to yield larger amounts of energy, are capable of performing better in athletic and other field activities. Seventy school going children from the Muslim community of Bijapur (Karnataka) aged 12-16 years (means ± SEM = 14.33±0.94), volunteered for this study. Their height (cm) and weight (kg) were measured as physical anthropometry and Body mass index (BMI) was calculated (kg/m^2). VO_2max (ml.kg^{-1}. min^{-1}) was determined by applying the step test study of *Margaria et al.* The Physical fitness index (PFI) of the subjects were assessed by Harvard Step Test. The physiological endurance measured as VO_2max (ml.kg^{-1}. min^{-1}) was found to be 34.31±2.44 S.E.M, which is lower in comparison to their Caucasian counterparts but nearly similar when compared with their Indian counterparts. The present study reveals that VO_2max significantly correlates with BMI and PFI score. The present study also reveals that 27.2%, 20.07%, 15.77%, 14.37% and 22.87% of the subjects are in excellent, very good, good, average and poor classifications of fitness level respectively.

Key words : muslim children aerobic capacity physical fitness

INTRODUCTION

Physical fitness acquired in youth and maintained throughout life by means of an appropriate pattern of a healthy lifestyle, including habitual physical activity, is thought to have beneficial effects on the cardiovascular, respiratory and locomotor systems as well as cell metabolism and body functions in general (1). It is well known that the capacity to perform work influenced by many factors such as physical fitness, socio economic status, cultural habits and proper scientific training (2, 3). Exercise stress testing is a valuable tool for evaluating physical fitness and cardio-respiratory status of children (4). Aerobic capacity or maximum oxygen uptake capacity (VO_2max) has been widely considered to be reliable and valid indicator of cardio-respiratory fitness (5). VO_2max is a test for assessing the running endurance.

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The distance runners who acquire a high VO_2 max will obviously be at an advantage. The VO_2 max improves with training though reaches a plateau at a certain time (6). A higher correlation between the anaerobic threshold and distance running performances indicates that a runner who is able to run with a high percentage of VO_2max without building up a significant amount of anaerobic metabolite will certainly perform better (5).

With the development of sports and exercise physiology and ergonomics the Harvard step test has been given much attention to select highly physically active persons who will be capable of doing hard work so that they may be recruited in various sports and games, defense services or appropriate industrial occupations. American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) recommends this test to study health related physical fitness programme in youth (7). Several investigators have obtained cardio-respiratory fitness data on male and female children from different parts of the world including India. To our knowledge, there is no data available on normal exercise measurements in school going children from Indian Muslim community particularly from north Karnataka. Hence the purpose of this study was to find out the physical fitness index along with aerobic capacity (VO_2max) of above said children.

METHODS

Seventy (70) school going children from the Muslim community of Bijapur (Karnataka) aged 12–16 years (means ± SEM = 14.33 ± 0.94) were volunteered for this study. Their height (cm) and weight (kg) were measured as physical anthropometry. Body Mass Index (BMI) was calculated (kg/m^2) (Table I). VO_2 max ($ml.kg^{-1}.min^{-1}$) was determined by applying the step test study of *Margaria et al* (8). The experiment consists of two-step test studies each for 5 min work, separated by 5 min rest. Using Margaria's equation VO_2max was determined with indirect exercise heart rates.

$$VO_2max\left(ml.kg^{-1}.min^{-1}\right)=\frac{f\,max\left(V''O_2-V'O_2\right)+f''V'O_2-f'V''O_2}{(f''-f')}$$

Where f max = maximum exercise heart rate

f' and f" are two exercise heart rates at two work loads $V'O_2$ and $V''O_2$ respectively.

The indirect maximum exercise heart rate (f max) was obtained with time taken for five beats using electronic stop watch (accuracy was 0.01 sec.) immediately at the end of step test work, which was later converted to beats/min. A comparison of VO_2 max of Margaria's step test with treadmill study for measuring maximum exercise heart rate (f max) was found to be almost equal (9). Cardiovascular endurance was measured using Harvard step test (10). Each subject completed 'up' and 'down' task (24 steps / min) on an 18 inches bench for 3 mins duration.

The physical fitness index (PFI) score was calculated as follows:

$$PFI = \frac{\text{Duration of exercise in seconds} \times 100}{5.5 \times \text{pulse count (1–1.30 min. after exercise)}}$$

Pre and post exercise (1 min after exercise) blood pressure was measured by the auscultatory method with a mercury Sphygmomanometer. The pre and post exercise heart rate (1 min after exercise) were recorded too (Table II)

The mean, standard errors of mean (S.E.M.) and the correlation co-efficient (r) among various characteristics were calculated and their test of significance was also applied(11).

RESULTS

Table I shows the anthropometrical characteristics of the school going children from the Muslim community. The mean score of heart rate and blood pressure at pre and post exercise level are presented in the Table II. Post exercise % age change of heart rate and blood pressure in comparison to pre exercise conditions is depicted in Fig. 1. The Physiological endurance measured as VO_2max (ml.kg-1. min-1) was found 34.31 ± 2.44. The present study reveals that VO_2 max (ml.kg1.min-1) positively correlate with BMI (r = 0.27, P < 0.05,y = 0.6063X + 26.093., S.D. reg = ± 5.02) (Fig.2) and P.F.I. score (r = 0.26, P < 0.05, y = 0.1274X +22.617, S.D. reg = ± 4.93) (Fig. 3)

TABLE I: Subject characteristics (Anthropometrical).

Characteristics	*Value (Mean ± S.E.M.)*
Age (yr)	14.33±0.94
Age range, (yr)	12–16
Height (cm)	153.91±2.62
Weight (kg)	38.46±2.48
B.S.A. (m^2)	1.30±0.04
B.M.I. (kg/m^2)	16.14±0.51

Values are means ± S.E.M. except for ranges, n = 70, B.S.A., Body surface area; B.M.I., Body mass index.

TABLE II: Subject characteristics (Physiological).

Characteristics	*Pre exercise*	*Post exercise*
HR (bpm)	73.02±3.55	110.53±6.71
SBP (mm Hg)	108.44±7.13	119.60±8.76
DBP (mm Hg)	69.98±3.06	72.84±4.27
VO_2 max ($ml.kg^{-1}.min^{-1}$.)		34.31±1.17
VO_2 max (l/min)		1.32±0.07
P.F.I. Score		94.40±2.44

Values are means ± S.E.M., n = 70, HR, Heart rate; bpm beat per minute; SBP, Systolic blood pressure; DBP, Diastolic blood pressure; VO_2 max, maximal aerobic capacity.

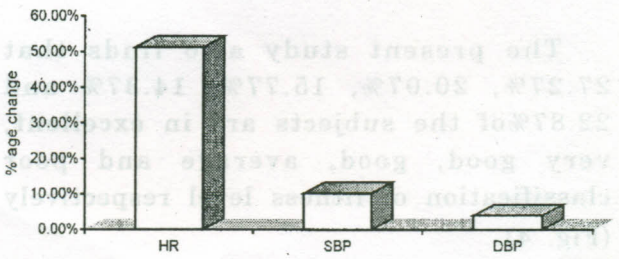

Fig. 1: Post exercise percentage change of heart rate and blood pressure.

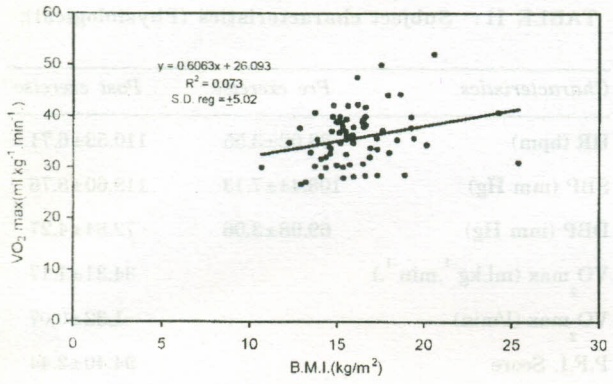

Fig. 2: Relationship between B.M.I. (kg./m^2) and VO max (ml.kg^{-1}.min^{-1}.) n = 70; the correlation co-efficient (r) is 0.27, P<0.05; y = 0.6063X + 26.093; S.D. reg. = ± 5.02.

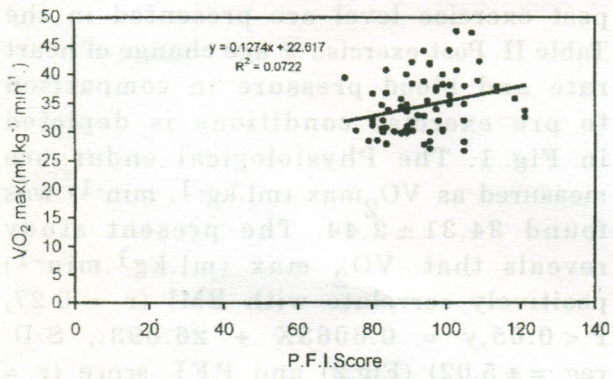

Fig. 3: Relationship between P.F.I. Score and VO max (ml.kg^{-1}.min^{-1}.) n = 70; Correlation Coefficient (r) is 0.26, P<0.05; y = 0.1274 X + 22.617; S.D. reg. = ± 4.93.

The present study also finds that 27.27%, 20.07%, 15.77%, 14.37% and 22.87%of the subjects are in excellent, very good, good, average and poor classification of fitness level respectively (Fig. 4).

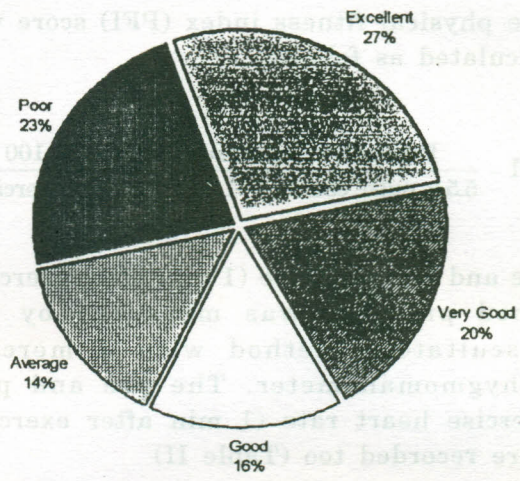

Fig. 4: Pie chart showing the percentage of various classification of physical fitness index (P.F.I.) score. n = 70; Poor < 84, Average = 84–90, Good = 91–95, Very Good = 96–100 and Excellent>100 of P.F.I. score.

DISCUSSION

The results of the anthropometrics measurements of the school going Muslim children of Bijapur (Karnataka) from this study showed that BMI of these children (16.14 ± 0.51) is lower in comparison to average Asian (20.1 ± 3.) and Caucasian (20.8 ± 3.6) in the same age groups (12). The predicted aerobic capacity (VO_2max) (ml.$kg^{-1}min^{-1}$) of these children (34.31 ± 1.17) is also lower in comparison to American school going children (49.0 ± 2.41) (13) but it is found nearly similar when compared with their Indian counterparts (35.0 to 40.0 ml)(14). Another study of Verma et al on Indian adolescent male found a mean VO_2max as 36.8 ml. kg^{-1}. min^{-1} .(15). The

lower aerobic capacity of these children may be due to either lower BMI or less physical activities because of their sedentary life style (16). It was observed that the children who engage in regular endurance training could improve their VO_2max than children who are more sedentary (17). The physical fitness index of the school going Muslim children from this study reveals two extreme groups of classification (i.e.27.2% of excellent Vs 22.8% of poor) The poor physical fitness of these children may be due to poor body composition or inadequate supplementation of diet or lack of physical exercise. For the proper growth of an individual, exercise is necessary as it increases the plasma somatotropin level (18), which is eventually responsible for human growth (19). In order to improve the physical efficiency of these school going children from Muslim community of Bijapur (Karnataka) their training schedule to be formulated in such a way, so that, their muscle strength, as well as, their endurance capacity increases. These parameters can be improved by proper training, which involve exercise of the muscles and some endurance training, including breathing exercise and exercise like running of long duration, etc. However this schedule is to be formulated carefully so that it doesn't exceed the tolerance limit, as over exercise is detrimental for human body.

ACKNOWLEDGEMENTS

We deeply acknowledge the kind co-operation from Dr. B.S. Patil, Principal, Dr. S.R. Choudhury, Vice Principal and Dr. D.C. Patil, Hospital Supdt. of Al Ameen Medical College and Prof. N.S. Bhusnur, Principal, Sri. S.R. Byakad and Sri S.M. Jain of SECAB P.U (Composite) college for Boy's, Bijapur. Dr. Parvez Khan, Sri Charit Bhograj and Sri Altamash Shaikh and Sri Anil Kadechud provided assistances in field study. Smt. Shabana. S. Inamdar assisted in preparation of manuscript.

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