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ORIGINAL RESEARCH

ASSESSMENT OF BODY MASS INDEX AND HEALTH RELATED FITNESS AMONG SCHOOL CHILDREN

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ABSTRACT
The present study on body mass index and health related physical fitness of school children was undertaken with the view of portraying the health related fitness profile of school children in Kannur district of Kerala. Data on body mass index and health related fitness according to ICHPER.SD Asia Youth Health Related Fitness test was collected from 1000 school children from different schools of Kannur district, Kerala. The study had sub samples of 250 boys and 250 girls from schools belonging to urban areas; and 250 boys and 250 girls belonging to rural areas. The data on BMI and health related fitness variables of the study were comparable to the data of Indian counterparts shown in previous studies. The analysis of data revealed that girls had significantly greater BMI as compared to boys. However, boys scored significantly better than girls on one mile run, sit ups and modified pull ups. Girls were significantly better than boys in case of flexibility performance in the sit and reach test. In case of sum of skinfolds, girls had significantly greater skinfold measurements as compared to boys. Rural sample of school children scored significantly better than urban school children in modified pull ups. In case of sum of skinfolds, urban school children had greater skinfold measurements as compared to their rural counterparts. The study warrants the need for further investigations covering a wider segment of population and taking other vital parameters such as nutritional status, physical activity patterns, and socio-economic conditions so as to obtain meaningful relationships.

KEYWORDS: BMI, Health Related Fitness, School Children.

INTRODUCTION
The world's health is undergoing an unprecedented transition on several fronts, including epidemiological, nutritional and demographic. The result is a broad shift in disease burden. A report from the World Health Organization (WHO, 2003) predicts that the majority of deaths by broad cause (59%) are from non-communicable diseases.
The World Health Organization in 2005 estimates that physical inactivity causes almost 2 million deaths worldwide annually. Over the past 50 years, a variety of populations have been studied for possible relations among physical activity, body composition, physiological fitness, and cardiovascular health. The unique and fundamental contributions of epidemiology have been recognized as a means to understand the causes of cardiovascular diseases, and as procedures to prevent and control them (Berlin and Colditz, 1990; Powell, Thompson, Caspersen and Kendrick, 1987). This lead to the realisation that physical activity protects

against the development of CHD, stroke, hypertension and obesity (Lee, Sesso and Paffenbarger, 2001; Bouchard, Shephard and Stephens, 1994).

Assessment of health related fitness of school children have been carried out in different countries (Lenhard et al, 1992; Hua et al, 1984; and Fu et al, 1994, Volbekiene and Griciute, 2007). Studies have also investigated on the association of physical activity to childhood obesity (Shephard and Buchard, 1995; Morena et al, 2004; Joens-Matre, 2008), metabolic risk factors (Ekelund, 2007; Evans et al, 2008) and motor performance(Bayer et al, 2008).

Population based estimates of comprehensive fitness testing are scarce in India. An assessment of body mass index and health related fitness among school children will be first step in realizing of the unhealthy upbringing of the younger generation. The study has special relevance to the over pussy academic parenting style of Kerala parents, neglecting the vital aspects of development and health of children.

METHODS

For the purpose of the study 1000 school children, comprising of 500 boys and 500 girls from different schools of Kannur district, Kerala was selected. The selection of subjects included a strata of 250 boys and 250 girls each belonging to urban and rural areas. The subjects were selected from class VIII of the respective schools with an average age of 13.45 years.

For the purpose of the present investigation, the following variables were selected:
1. Body Mass Index calculated from height and weight measurement.
2. ICHPER. SD. ASIA. Health related Physical Fitness Test comprising
   a. Endurance run (One mile run)
   b. Muscular Endurance (Flexed knee sit ups in 60 seconds)
   c. Muscular Strength (Modified Pull ups)
   d. Flexibility (Sit and reach)
   e. Body composition - Skin fold measurements (triceps and calf measurements)

The profile of BMI and health related physical fitness of the sample is presented with the descriptive statistics. The comparison of BMI and health related physical fitness among the sub samples based on gender and locale is done by employing the student t – test.

RESULTS AND DISCUSSIONS

The descriptive analysis of body mass index, and health related fitness of total sample is presented in table 1.

Table 1

Descriptive analysis of data on body mass index and health related fitness components of the total sample (N = 1000)

Variables	Mean	S D	Minimum	Maximum	Skewness	Kurtosis
BMI	15.41	1.36	11.60	21.00	0.319	0.244
1 mile run (secs)	534.59	112.24	345.00	986.00	1.021	1.09
Sit ups (nos)	25.04	5.65	5.00	37.00	- 0.219	- 0.37
Modified pull ups (nos)	14.71	6.06	1.00	30.00	0.076	- 0.77
Sit and reach (cm)	27.73	5.21	14.00	41.00	0.187	- 0.82
Sum of skinfolds (mm) (triceps and calf)	17.79	2.24	11.20	26.90	0.619	1.29

Table 1 indicates that for the total sample, the mean and standard deviation for BMI was 15.41 and 1.36, the mean and standard deviation values for the health related fitness variables were; 534.59 and 112.24 seconds respectively in case of one mile run performance; 25.04 and 5.65 respectively in case of sit ups; 14.71 and 6.06 respectively in case of modified pull ups; 27.73 and 5.21 respectively in case of sit and reach; and 17.79 and 2.24 millimeters respectively for the sum of triceps and calf skin folds.

The comparison of body mass index and health related fitness based on gender is shown in table 2.

Table 2.

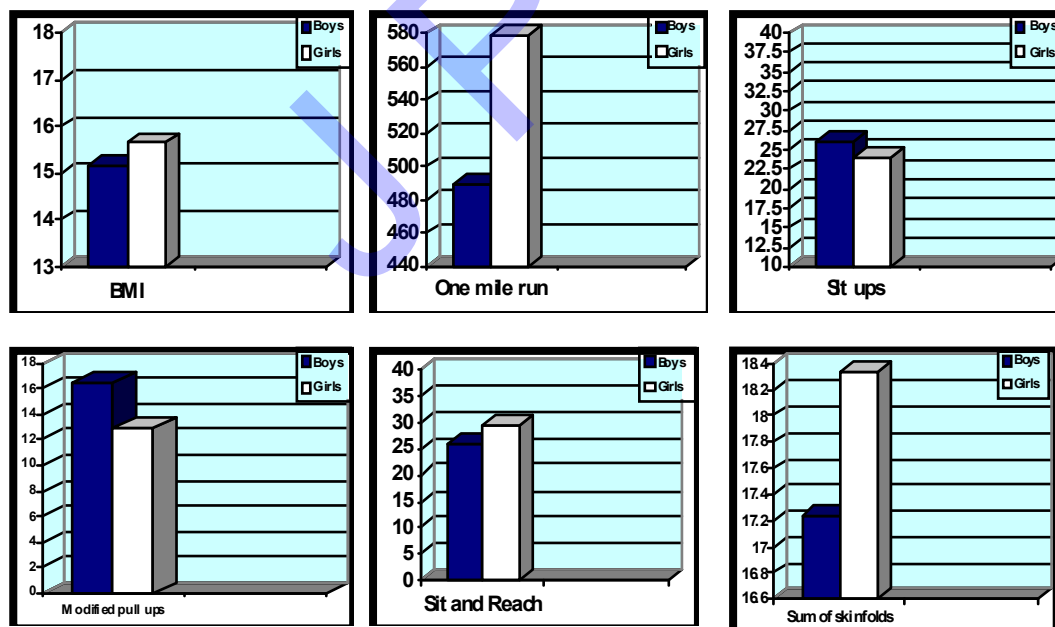**Comparison of body mass index and health related fitness based on gender**

Variables	Mean		Mean difference	't' ratio
	Boys	**Girls**		
BMI	15.16	15.66	0.50	5.85*
1 mile run	490.05	579.12	89.06	13.66*
Sit ups	26.11	23.98	2.13	6.10*
Modified pull ups	16.43	12.99	3.44	9.36*
Sit and reach	26.02	29.44	3.42	10.89*
Sum of skinfolds (triceps and calf)	17.24	18.34	1.11	8.09*

* indicates significant difference at 0.05 level

$t_{0.05}(998) = 1.96$

Table 2 of the comparison of body mass index and health related fitness between boys and girls indicate that there were significant difference between boys and girls on BMI and all the health related fitness variables since all the obtained t – values were significant at 0.05 level. The results indicate that girls had significantly greater BMI as compared to boys. The results also indicate that boys scored significantly better than girls in one mile run, sit ups and modified pull up performances. However, in case of sit and reach, girls scored significantly better than boys. Girls possessed significantly more skin fold measurements as compared to boys.

Fig. 1. Means of boys and girls in BMI and health related fitness variables

The comparison between urban and rural school children on body mass index and health related fitness variables is shown in table 3.

Table 3.
Comparison of body mass index and health related fitness based on locale

Variables	Groups Means		Mean difference	't' ratio
	Urban	Rural		
BMI	15.30	15.51	0.205	0.086
1 mile run	535.68	533.50	2.18	0.307
Sit ups	24.74	25.33	0.60	1.67
Modified pull ups	13.48	15.94	2.47	6.57*
Sit and reach	27.53	27.94	0.40	1.22
Sum of skinfolds (triceps and calf)	18.18	17.40	0.78	5.63*

* indicates significant difference at 0.05 level

$t_{0.05}(998) = 1.96$

Table 3 of the comparison of body mass index and health related fitness between urban and rural school children indicates that except for t - ratios of 6.57 and 5.63 obtained for modified pull ups and sum of skin folds which were significant; for all other comparisons the obtained t- values were not significant.   In the case of modified pull ups, rural children scored significantly better than urban children. In case of sum of skin folds, urban children possessed significantly more skin fold measurements as compared to rural children.

Fig. 2. Means of urban and rural children in BMI and health related fitness variables
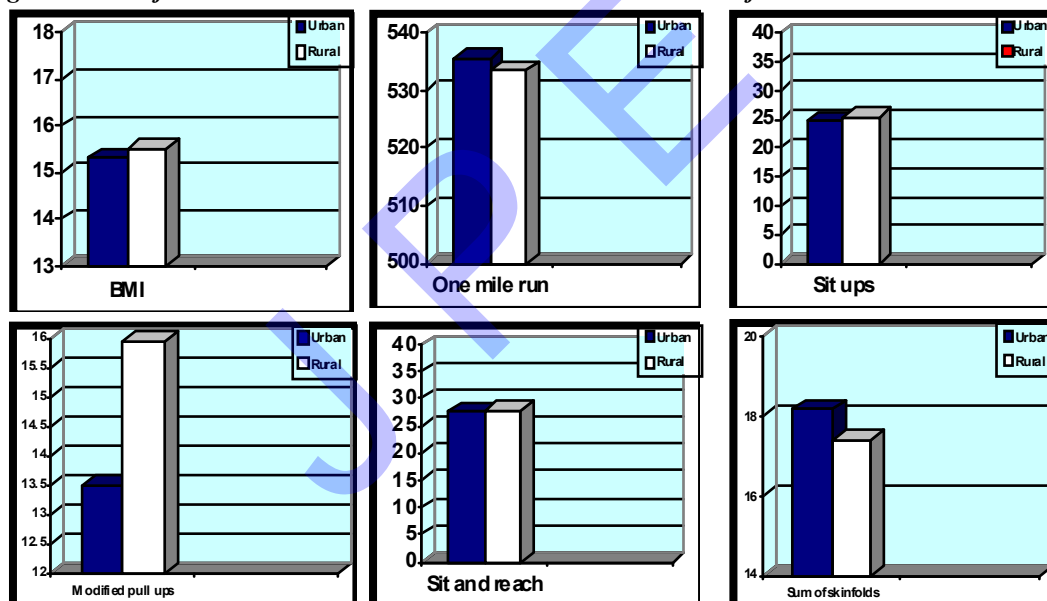
Adolescence is period of rapid growth and development, and the adolescent anthropometry varies significantly world wide. There is scanty information regarding the anthropometric parameters and health related fitness of Kerala adolescents. The mean height, weight and BMI of the boys and girls of the present study were comparable to the data of Indian counterparts in different studies (Venkaiah, 2002; Bandyopadhyay, 2005). The scores on health related fitness parameters of the boys and girls of the present study was also comparable to the findings on the study conducted by Manoj and Manoj (1995) on a Kerala sample of adolescents.

The comparison of body mass index and health related parameters with respect to gender indicated that in case of BMI, girls had significantly greater values as compared to boys. The findings of the present study in terms of significant difference in health related fitness variables between boys and girls are in consonance with the general trend of fitness and motor variables where boys dominate over girls in   cardio-respiratory and strength variables. Girls at any age are generally better than boys in flexibility measures due the suppleness of the body and relatively better range of motion around joints.

In case of comparison with respect to locale, no significant difference was observed between rural and urban children in body mass index. Except in case of modified pulls ups where rural children were found to be significantly better than urban counterparts; and sum of skinfolds where urban children showed greater values as

compared to rural children, no significant difference was observed between the urban and rural children on other health related fitness variables. The urban and rural children of the present study were comparatively similar in terms of most of the selected health related fitness variables, which indicates that place of residence may not be a dependable factor for health related fitness parameters of the present sample. The findings suggest that further probing into socio-economic and nutritional status, and physical activity involvement of the subjects to provide valid explanations for such results.

CONCLUSIONS
On the basis of the findings of the study, the following conclusions are drawn:
1. Girls showed significantly greater body mass index as compared to boys.
2. Boys scored significantly better than girls on one mile run, sit ups and modified pull ups.
3. Girls were significantly better than boys in case of flexibility performance in the sit and reach test.
4. In case of sum of skinfolds, girls had significantly greater skinfold measurements as compared to boys.
5. Rural sample of school children scored significantly better than urban school children in modified pull ups.
6. In case of sum of skinfolds, urban school children had greater skinfold measurements as compared to their rural counterparts.

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