International Journal of Physical Education
Volume 6 | Issue 1 | April, 2013 | 40-42

Research Article

Study of motor performance in relation to anthropometry on pre-adolescent school going rural boys

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Received : 17.12.2012; **Revised :** 01.03.2013; **Accepted :** 01.04.2013

■ **ABSTRACT**

An increasing volume of research is trying to focus on establishment of relationship between different anthropometric parameters with effective participation in various motor activities. The study was aimed to evaluate motor performance in relation to selected anthropometric parameters of pre-adolescent rural boys. Total of 500 boys were selected randomly from different rural schools of CoochBehar district and their anthropometry and motor performance were measured through standard procedure and tests. Mean ... SD were used as descriptive statistics and Spearman correlation co-efficient was used to evaluate the correlation between anthropometric parameters and motor performance. The level of significance was considered only at 0.05 level for this study. Results revealed that anthropometric parameter height, weight and BMI have positive correlation with flexibility, strength endurance, muscular strength, static balance and explosive strength but have negative correlation with reaction time and speed performance whereas BMI have negative correlation with CVE. PBF has negative correlation with flexibility, strength endurance, cardio-vascular endurance, static balance and explosive strength but positive correlation with muscular strength, reaction time and speed. Findings indicated that most of the motor performance involved with strength and power have improved as the height and weight increased and per cent body fat was negatively correlated with most of the motor performance which indicated that excess fat is not helpful to increase motor performance.

■ **Key Words :** Motor performance, Anthropometry, Pre-adolescent, School going rural boys

■ **How to cite this paper :** Sil, Pintu (2013). Study of motor performance in relation to anthropometry on pre-adolescent school going rural boys. *Internat. J. Phy. Edu.,* 6 (1) : 40-42.

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Anthropometry refers to the measurement of the human individual. It is the study of human body measurements to assist in understanding human physical variations. It has also been used for the identification and to correlate physical with racial and psychological traits. Motor performance is an expression used to describe a person's ability to perform efficiently basic skills involving such functional components like flexibility, speed, agility, power, strength, endurance, balance etc. An increasing volume of research is trying to focus on establishment of relationship between different anthropometric parameters with effective participation in various motor activities. Present study analyses the performance of eight different motor abilities, in respect to selected anthropometric parameters *viz.*, height, weight, BMI and body fat percentage (PBF) of pre-adolescent rural school going boys. The purpose of the study was to analyze the relationship between these anthropometric parameters with motor performance in pre-adolescent school going rural boys.

■ METHODOLOGY

Total of 500 school going boys of pre-adolescent were selected randomly as subjects for the present study. The age of the subjects were considered 10 to 14 years for the study. All the subjects were from rural background and most of them were from poor socio-economic status.

Height, weight, BMI and per cent body fat (PBF) were measured as anthropometric parameters. Flexibility, strength endurance, muscular strength, cardio-vascular endurance (CVE), reaction time, balance, explosive strength and speed were selected to measure motor performance for this study.

The following tools and tests were used for collecting data for the study:

- Height was measured by Sediometer and weighting was measured by standard weighing machine.
- PBF was assessed by the formula developed by Lohman *et al.* (1982) using skin fold measurements.
- Flexibility was measured by Sit and Reach test (AAHPERD, 1984).
- Strength endurance was measured by 1 min bent knee sit up (AAHPERD, 1984).
- Muscular strength (grip strength) was measured by hand grip dynamometer.
- Cardio-Vascular Endurance (CVE) was measured by 9 min. run and walk test (AAHPERD, 1984).
- Reaction time was measured by Nelson hand reaction timer test (Johnson and Nelson, 2007).
- Static balance was measured by stork stand test (Johnson and Nelson, 2007).
- Explosive strength was measured by standing broad jump (SBJ) (AAHPER, 1976).
- Speed was measured by 50 yard dash (AAHPER, 1976).

Single group design was used for the present study. Anthropometric variable was used as independent variable and motor performance was considered as dependent variables. Spearman correlation co-efficient was used to evaluate the correlation between anthropometric parameters and motor performance. Significance was measured only at 0.05 level in this study.

■ OBSERVATIONS AND DISCUSSION

The descriptive statistics of different anthropometric parameter (height, weight, BMI and per cent body fat) and motor performance (flexibility, strength endurance, muscular strength, cardio-vascular endurance, reaction time, static balance, explosive strength and speed) have been presented in Table 1. In Table 2, the correlation co-efficient between anthropometric parameters and motor performance have been presented and Table 2 shows that PBF was negatively correlated with flexibility, strength endurance (sit ups score), CVE, static balance and explosive strength but positively correlated with muscular strength (grip strength), reaction time and running speed. All these relation were statistically significant except for reaction time and static balance. Height and weight have positive correlation with flexibility, strength endurance (sit ups score), CVE, static balance and explosive strength but have negative correlation with reaction time and speed. All these correlations were statistically significant except between weight and CVE. Positive correlations between BMI with flexibility, strength endurance, muscular strength, static balance and explosive strength performance have been found in this study and all these correlations were significant except for strength endurance. BMI has negative correlation with CVE, reaction time and speed but this relation was statistically significant for reaction time and speed but not significant for CVE.

Anthropometric parameters, height, weight and BMI have positive correlation with flexibility, strength endurance, muscular strength, static balance and explosive strength. Increase in height and weight, mean increase in bone mass, muscle mass etc. and more muscles and bone mass help to achieve more strength and power. As the height and weight increases, the boy enters into adolescent phase and different physiological changes take place in their body. Specially muscular development and its associated structures like tendons, ligaments etc. lead to more gain in the flexibility; bigger size of muscle, larger size of the heart, more amount of blood etc. lead to achieve more muscular endurance and cardio-vascular endurance during the latter part of adolescents growth. With this, maturation of neuron also plays an important role for the increase of these motor performances in growth process. Positive correlation between height and weight with CVE might also be due to the fact that increase in leg and arm length of the boys occurrs in this age which in other way are more helpful to increase stride length of the boys. This increase in stride length was main thing to cover more distance in less time. A negative correlation between height, weight and BMI with reaction time and speed have been found in this study which might be due to proportionately lack of neuromuscular co-ordination in this particular age of the boys than letter part of life.

Negative correlation was found between PBF with different motor performance – flexibility, strength endurance, CVE, static balance and explosive strength in this study. In Barbara *et al.* (2002) reported that fat mass negatively influenced some domains of physical performance and overall functioning. Excess body fat is related to injury, non-adherence to training and overall reduced athletic performance. González-Gross *et al.* (2003) conducted a study on Spanish adolescents and reported a negative association between body fat and physical fitness. Another research reported that fat has negative relation with physical performance and work capacity (Tyagi, 2001). Hayward and Stolarczyk (1996) reviewed a low body fat while a large muscle mass was important for strength, endurance and power activities. Present subjects have lower level of PBF which in other way was helpful to execute better performance in motor performance like flexibility, strength endurance, CVE, static balance and explosive strength.

A positive correlation between muscular strength and PBF found in this study might be due to the fact that muscular

Table 1: Descriptive statistics of anthropometric parameters and motor performance

Anthropometric parameters	Height (cm)	Weight (kg)	BMI	PBF
Mean S.D.	140.67±10.92	31.57±8.52	15.68±2.15	10.14±5.36
Motor performance	Flexibility (cm)	Strength endurance (sit up/min)	Muscular strength (kg)	CVE (yard)
Mean S.D.	29.55±10.55	19.70±7.12	30.40±13.10	1631.88±268.65
Motor performance	Reaction time (sec)	Static balance (sec)	Explosive strength (cm)	Running speed (sec)
Mean S.D.	0.19±0.02	20.10±19.14	156.04±26.13	8.21±0.82

Table 2: Co-efficient of correlation between anthropometric parameters with motor fitness

	Flexibility	Strength endurance	Muscular strength	CVE	Reaction time	Static balance	Explosive strength	Speed
Height	0.21**	0.17**	0.84**	0.11*	-0.39**	0.34**	0.59**	-0.41**
Weight	0.19**	0.14**	0.82*	0.04	-0.32**	0.298**	0.52**	-0.32**
BMI	0.10*	0.07	0.60**	- 0.06	-0.18**	0.17**	0.31**	-0.16**
PBF	- 0.14**	- 0.14**	0.16**	- 0.30**	0.02	-0.05	-0.15**	0.23**

* and ** indicate significance of values at P=0.05 and P=0.01, respectively.

strength was measured only by grip strength test and grip strength was related to the muscle of hands and arms, specially different small muscle of hand, flexor carpi ulnaris, flexor carpi radialis, biceps, brachialis etc. In the hand and arm region, usually fat present with very low percentage and on other hand PBF was estimated including the fat amount of whole body. Less existence of fat in hand and arm means the existence of greater muscular and skeletal mass in this body part which provide better mechanical efficiency as well as greater strength in performing this motor ability. Same explanation might be considered for the positive correlation between PBF with reaction time because reaction was measured by Nelson reaction timer test which used only the finger movements. Body fat might not have influence on this motor activity. Possible explanation of positive correlation between speed and PBF is unknown and more study is required to get exact explanation of these facts. It might be due to the reason that the pre-adolescents of present study have lesser mean value of body fat (10.14±5.36) which is not enough to effect negatively on speed performance for the present rural boys.

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