
Age-Associated Changes of Hand Grip Strength and Abdominal Strength Endurance in 10 To 14 Years Old Rural Boys

Pintu Sil Asstt. Prof.,

Govt. College of Physical Education for Women, Dinhata, CoochBehar, West Bengal, India

Abstract: The purpose of the study investigated the rate and magnitude of age-associated changes of hand grip strength and abdominal strength endurance in 10 to 14 years old rural boys. For this purpose a total of 500 boys were selected randomly from different rural areas of CoochBehar district. The age of the boys was from 10 years to 14 years. Multiple group design with five independent groups (G1, G2, G3, G4 and G5) was formed for the present study and each age group had 100 boys within it. Hand grip strength was measured by grip dynamometer and abdominal strength endurance was assessed by one minute bent knee sit ups. Maximum and minimum value, mean value and standard deviation were computed for each parameter as descriptive statistics. To find out the inter group difference in hand grip strength and abdominal strength endurance analysis of variance (ANOVA) was used in this study. Significance level set for the study was only 0.05 level of confidence. Results revealed that hand grip strength and abdominal strength endurance increased linearly across all of the age groups from 10 to 14 years ($p < .001$). Peak velocity of improvement for both the hand grip strength and the abdominal strength endurance were found for G3-G4 age group.

Keywords: Age-associated changes, Hand grip strength, Abdominal strength endurance and rural boys.

Introduction:

The study of the age trend development of different strength and abilities in childhood and adolescence are one of the important areas in physical education. Physical education teachers and professionals must be aware with the nature of the development of different physical abilities, like strength, endurance, running speed, flexibility, agility, balance etc. Several studies have been conducted to understand the status and the developmental pattern of these physical abilities among children and adolescence worldwide (Powel et al. 2009; Gantiraga et al. 2006; Chow et al. 2005; Sinaki et al. 1996; Gabbard and Patterson, 1980). Present study is concerned with the findings of age associated changes of two such physical abilities, i.e. hand grip strength and abdominal strength endurance in 10 to 14 years old rural boys. Findings will be helpful for the physical education teachers and coaches to plan educational curriculum as well as sports training schedule for the school aged boys. Present study was

conducted with following purposes:

- To understand the influence of the age in development of the hand grip strength and abdominal strength endurance in 10 to 14 years old rural boys.
- To find out the magnitude of the development of hand grip strength and abdominal strength endurance for different age groups among the 10 to 14 years old rural boys in respect of the adult values.

Materials and Methods:

A total of 500 rural boys for five age groups have been selected randomly from different rural schools of CoochBehar district for the present study. The range of age of the school boys were from 10 years to 14 years. Most of the students were from lower income group.

Hand grip strength was measured by hand grip dynamometer and abdominal strength endurance was measured by 1 minute bent knee sit up test (AAHPERD, 1984).

Multiple group design was adopted for this study. Five independent groups- G1, G2, G3, G4 and G5 were formed on the basis of the age of the subjects and each age group had equal 100 subjects. Mean and SD of the hand grip strength and abdominal strength endurance were computed for each age group and to find out the age trend development, ANOVA was done to find out statistical significance of the differences among means. To find out the exact differences between means LSD were used as post hoc test. All statistical calculations were done using standard statistical procedure (SPSS). Significance was set both 0.05 and 0.01 level of confidence in this study.

Results and Discussion:

Mean values and SD of hand grip strength and abdominal strength-endurance for different age group have been measured as descriptive statistics and presented in Table-1. Table-1 indicated that the mean values for both variables were different for different age groups. So, in order to test the significance of differences among different mean values, ANOVA was administered and details results for hand grip strength and abdominal strength-endurance are presented in Table-2 and Table-3 respectively. From Table-2 and Table-3 it has found that the F-value was statistically significant for both the variables. Now, in order to identify the exact location of the difference between means, method of Least Significance Difference (LSD) was used as a post hoc test. Results are presented in Table-4.

Table-1: Mean Values of Hand Grip Strength (Kg) and Abdominal Strength-Endurance (No Of Sit Ups/Min) and Sd For Different Age Groups In 10 To 14 Years Boys

Selected variable	Different age groups					Statistical Parameters
	G1 (10years)	G2 (11years)	G3 (12years)	G4 (13years)	G5 (14years)	
Hand	19.65	24.28	29.67	36.68	41.72	Mn
grip strength	±7.81	±8.36	±9.76	±10.01	±14.65	SD
Abdominal	17.64	18.41	19.38	21.38	21.67	Mn
Strength-endurance	±6.67	±7.78	±7.33	±7.13	±5.78	SD

Table-2: ANOVA of Hand Grip Strength for Different Age Groups of Rural Boys

Source of variation	Sum of Squares	df	Mean Square	F-value	P-value
Between groups	1271.332	4	317.833	6.541**	.000
Within groups	24052.460	495	48.591		
Total	25323.792	499			

** Significant at both 0.05 and 0.01 level

Table-3: ANOVA of Abdominal Strength-Endurance for Different Age Groups of Rural Boys

Source of variation	Sum of Squares	df	Mean Square	F-value	P-value
Between groups	32106.682	4	8026.670	74.166	.000
Within groups	53572.016	495	108.226		
Total	85678.698	499			

** Significant at both 0.05 and 0.01 level

Table-4: Lsd for Different Age Group of Hand Grip Strength and Abdominal Strength-Endurance in 10 To 14 Years Rural Boys

Measured Components	G1-G2	G2-G3	G3-G4	G4-G5
Hand grip strength	4.63**	5.38**	7.02**	5.04**
Strength-endurance	0.77	0.97	2.00*	0.29

* Significant only at 0.05 level

** Significant at both 0.05 and 0.01 level

Table-4 shows that these all mean differences for different age group of hand grip strength were not statistically significant but mean difference between 12 – 13 years age group (G3-G4=2.00) was found statistically significant at 0.05 level.

From the findings it is clear that hand grip strength increased continuously as the age of the present boys grew from 10 to 14 years. Different mean scores for hand grip strength of different age group have presented graphically in the Figure-1. Figure-1 shows that hand grip strength increased continually but with different rate. Peak velocity of increase was observed in this parameter for G3 – G4 age group (12 – 13 years) for present subjects. Burke et al. (1953) reviewed in their study that grip strength increased rapidly up to the age of 20 years and reaches its maximum value about the age of 30 years. Link (1995) found in their study that grip strength increased linearly across all of the age groups ($p < .001$). Improvement of grip strength with age was also reported by Backman and Deniels (1996).

Mean values of abdominal strength-endurance found for different age group have presented graphically in Figure-2. Trend indicates that abdominal strength-endurance also increases as the age increased. Improvement in this ability is all most linear with the increasing age. Findings are almost same with the several other findings. Dutt (2005) reported a general trend of increase in sit up score, though at varying rates from age 8 to 14 years. After the age of 14 years, a gradual decrease in sit-up score was seen with increase in age. Gakhar and Malik (1999) also reported a similar trend of increase in sit up score with increase in age in Jat school children of Delhi. Singh (2010) reported a slow but continues inclination trend of sit up score in respect of age in Meitei community boys of Manipur. Eiben, Barabas and Nemeth (2005) also found that after early childhood performance in muscular endurance increased gradually with age. Continues increasing trend of strength endurance with growing age was also reported for the school boys of Kerala in a survey study

conducted by Kerala State Sports Council (2009).

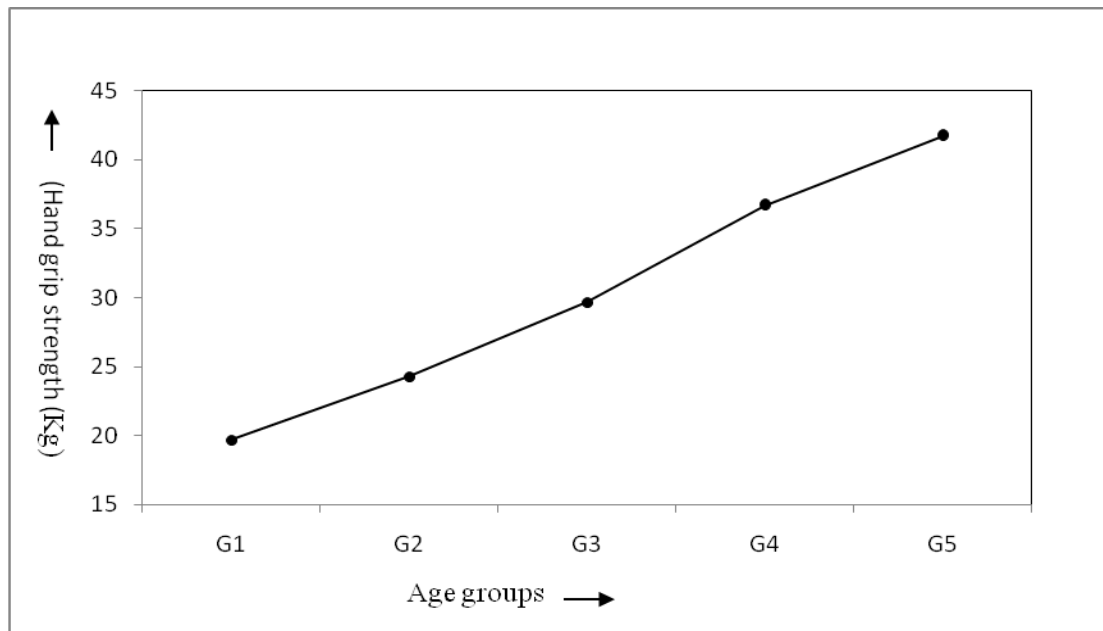


Figure-1: Hand grip strength of different age groups for the 10 to 14 years boys

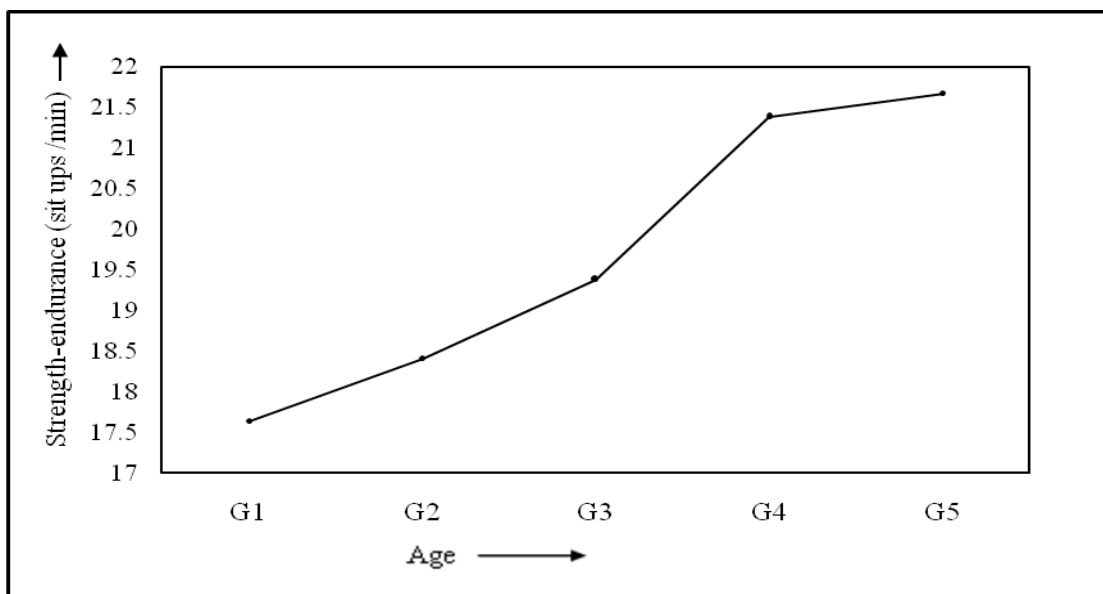


Figure-2: Strength-endurance for different age groups of the present boys

Hand grip strength includes the muscles of lower and upper limb and sit ups measured the strength-endurance of abdominal group of muscles. As the boys grow from 10 to 14 years their bone and muscle mass increased. With the increase in age the strength and aerobic capacity of these muscles increases with greater rate. This might be the main reason of development of hand grip strength and abdominal strength endurance of the boys as their age increased from 10 to 14 years.

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