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## Nature of Physical Growth for 9-11 Years Boys

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### ABSTRACT

Human life is considered to be the path of journey that starts with the pre-natal stage and thereafter follows intermediate stages of early childhood, late childhood, pre-adolescence, adolescence, adulthood, and finally ends with death. Generally, the growth and development patterns of human beings are studied in different phases. The purpose of the present study was to analyze the status of physical growth for 9-11 years' primary school children. A total number of 90 primary school boys volunteered as subjects for the present study; out of them 30 were from class three (9 years), 30 were from class four (10 years) and rest 30 were from class five (11 years). The selected parameters to measure physical growth status were body weight, standing height, arm length, leg length, and sitting height. Results indicated that there was a linear growth from Class-III to Class-V in each of the selected anthropometric parameters and the growth rate is positive for children in different age level.

### INTRODUCTION

Generally, the growth and development pattern of human beings are studied in different phases. In this regard human life is considered to be the path of journey that starts with pre-natal stage and thereafter follows intermediate stages of early childhood, late childhood, pre-adolescence, adolescence, adulthood and finally ends with death. Each and every stage of growth and development has its unique characteristics. A detailed study of these characteristics has been the essential features for medical practitioners, psychologists, anthropologists and educators. The term growth and development are often used interchangeably, but there is a difference in emphasis implied by each though growth considers to be one aspect of development. In its purest sense, growth refers to an increase in the size of the body caused by the biological process in which child becomes bigger in size, in volume and heavier in weight. Growth is an enlargement of cell. Growth is anatomical in nature to a great extent i.e. the changes in one's structure and forms. Growth is associated with age. After birth, the process of growth becomes faster up to the age of about 3-4 years. Thereafter the growth rate becomes slower up to the age of 8-9 years. The primary school children exhibited linear increase in height and stature comparatively to a lesser degree than the early childhood and pre-adolescence (Jenkins et al., 1966; Rarick & Smoll, 1967; Thomas, 1972; Lindgren 1978). It was also reported that the rate of growth of primary school boys and girls were almost similar (Largo et al., 1978; Beunen et al., 1981; Shaver, 1982; Gallahue, 1982). The process is also influenced by factors like nutrition, living condition, exercise habit etc.

However, since each child is unique and develops at a singular rate, great variations occur within the traditional school levels and for that matter even within a single age level. Therefore, the principle of individual difference becomes an important factor in implementing school processes. In the present study the physical growth was

expressed by the increase of certain parameters.

### MATERIALS AND METHOD

#### Selection of Subject

A total of 90 school boys volunteered from three different primary schools named Singhajhuli Shahid Mashiur Rahman Memorial Madhyomik Bidyalay, Singhajhuli Govt. Primary School and Baruihati Govt. Primary School in Jashore district of Bangladesh as subjects for the present study; out of them 30 were from class four, 30 were from class five, and the rest 30 were from class six. They were from rural areas and mostly from lower to middle-income groups of families. A list of subjects has been provided in Appendix-A.

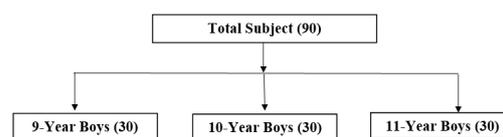


Figure 1: Distribution of the Subjects

#### Criterion Measure

Bodyweight, standing height, arm length, leg length, and sitting height were the measuring criteria of the present study.

#### Equipment and Tools used

In the present research project following instruments and tools were used for collecting data.

1. Digital Weighing machine was used to measure body weight in Kg.

2. Measuring tape was used to measure body height, arm length, leg length, and sitting height in cm.

3. A bench was used to measure the sitting height of the body.

Procedure for Conducting Test for collecting data

Different tests were administered by following standard procedures as follows (Plate 1 A-E):

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### Standing Height

Purpose: To measure standing height.

Facilities and equipment: A measuring tape, a smooth wall, and a plain surface.

Procedure: The subject was directed to stand barefooted against a smooth wall facing back and keeping arm sideways down with feet together. The scale was placed over the head at 90° to the wall. The distance between the floor and the scale was measured and expressed in cm.

Instruction: The subject should stand directly facing the front.

Scoring: The standing height was measured in cm.

### Body Weight

Purpose: To measure body weight.

Facilities and equipment: A digital scale or a weighing machine.

Procedure: The scale was placed on the firm floor. The subject was told to stand on the weighing machine, removing shoes and heavy clothes such as a sweater. The subject was stood with both feet straight on the center of the weighing machine.

Instruction: Initial reading of the pointer should be adjusted at 0(zero) before measuring body weight.

Scoring: The body weight was measured in kg.

### Arm Length

Purpose: To measure the arm length of the subject.

Facilities and equipment: a steel tape was used to measure the arm length of the subject.

Procedure: At first the subject was told to stand on the floor facing front straight. The arm was hanging sideways with the finger opened. The length between the shoulder joint and tips of the middle finger with a completely straightened arm was measured by the tape. The distance was considered as arm length.

Scoring: The arm length was measured in cm.

### Leg Length

Purpose: To measure the leg length.

Facilities and equipment: At first the subject was told to stand on the floor facing front straight keeping the feet together. The distance between the hip joint and the floor measured by the steel tape is considered as leg length.

Scoring: The leg length was measured in cm.

### Sitting Height

Purpose: To measure the sitting height of the subject.

Facilities and equipment: A steel ruler a chair and steel tape.

Procedure: The subject was told to sit on a chair hanging both legs down to the ground. The lower back and shoulder were placed against the back support of the chair looking straight ahead. The ruler was placed on the head parallel to the ground from the highest point on the head to the base sitting surface was measured by the tape. The distance measured between the highest points of the head to the sitting surface was considered as sitting height.

Scoring: The sitting height was measured in cm.

### Procedure for Analyzing Data

The collected data were analyzed using appropriate statistical procedure mean was calculated as the measure of central tendency was

The formula used mean =  $\frac{\sum x}{n}$

Standard deviation was calculated as a measure of variability was Formula used

standard deviation =  $\sqrt{\frac{\sum (x - m)^2}{(n - 1)}}$

The significance of the difference between the two was measured by calculating the 't' value

Formula used: 
$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$



Figure 1 (A-C): Procedure of collecting data of natural physical growth (A= Standing Height, B= Body Weight, C= Arm Length)



**Figure 2 (D-E):** Procedure of collecting data of natural physical growth (D= Leg Length, E= Sitting Height)

**Presentation and Analysis of Data**

**The Data**

The purpose of the present study was to analyze the change in physical growth status for 9 to 11-year boys. The selected growth parameters were standing height, body weight, arm length, leg length, and sitting height. The separate meters were measured in cm and kg for body weight. These measurements were considered as data for the present study.

**Level of Significance**

In the present study, the level of significance for the testing difference between means was set at 0.05 level

**Presentation of Data and Statistical Analysis**

The descriptive statistics of the different parameters for different groups of subjects have been presented in table 1. It is seen from Table-1 that the body height increased from 131.53 cm ± 5.49 cm to 138.77 cm ± 8.076 cm with the

**Table 1:** Descriptive statistics of different parameters for different age group.

Different Parameters	Group	Mean	Std. dev.	Range	Variance	Std. era
Standing Height (cm)	9 Year	131.53	±5.49	120 to 145	30.14	1.002
	10 Year	138.77	± 8.076	128 to 159	70.75	1.54
	11 Year	139.933	± 6.313	132 to 156	39.86	1.153
Bodyweight (kg)	9 Year	25.9	± 3.7	20 to 34	13.69	0.68
	10 Year	32.47	± 6.64	25 to 46	44.09	1.21
	11 Year	33.47	± 7.48	27 to 52	55.95	1.37
Arm length (cm)	9 Year	58.1	±3.16	53 to 65	9.99	0.58
	10 Year	61.3	±5.18	52 to 70	26.83	0.98
	11 Year	63.5	±3.298	57 to 71	10.88	0.602
Leg Length (cm)	9 Year	66.23	±4.77	60 to 78	22.75	0.87
	10 Year	71.77	±5.22	64 to 83	27.25	0.95
	11 Year	84.53	±4.41	78 to 98	19.45	0.81
Sitting height (cm)	9 Year	68.67	±3.97	61 to 75	15.76	0.73
	10 Year	69.83	±3.25	63 to 75	10.56	0.59
	11 Year	71.27	±4.42	64 to 79	19.54	0.81

change from 9 to 10 year; and from 138.77 cm ± 8.076 cm to 139.93 cm ± 6.3133 cm. with the change of age from 10 to 11 year. It is also seen that the body weight increased from 25.9 kg ± 3.7 kg to 32.47 kg ± 6.64 kg with the change from 9 to 10 year; and from 32.47 kg ± 6.64 kg to 33.47 kg ± 7.48 kg with the change of age from 10 to 11 year. It is also seen that the arm length increased from 58.1 cm ± 3.16 cm to 61.3 cm ± 5.18 cm with the change from 9 to 10 year; and from 61.3 cm ± 5.18 cm

to 63.5 cm. ± 3.298 cm with the change of age from 10 to 11 year. The table also exhibited that the leg length increased from 66.23 cm ± 4.77 cm to 71.77 cm ± 5.22 cm with the change from 9 to 10 year; and from 71.77 cm ± 5.22 cm to 84.53 cm ± 4.41 cm with the change of age from 10 to 11 year. It is seen that the sitting height increased from 68.67 cm ± 3.97 cm to 69.83 cm ± 3.25 cm with the change from 9 to 10 year; and from 69.83 cm ± 3.25 cm to 71.27 cm ± 4.42 cm with the change of age

from 10 to 11 year.

The mean values of different parameters for different age groups have been shown in Figure 1. It is seen from Figure 1 that each of the selected parameters viz. Body height, body weight, arm length, leg length and sitting height increased with respect to age from 9-11 years boys.

As the mean values from different selected parameter increased with respect to age, the statistical t test was administered to analyse the significance of the change in mean values. Table-2 shows the results. It is seen from the table values that the increase in body height from 9-10 was significant and 10-11 year was not significant.

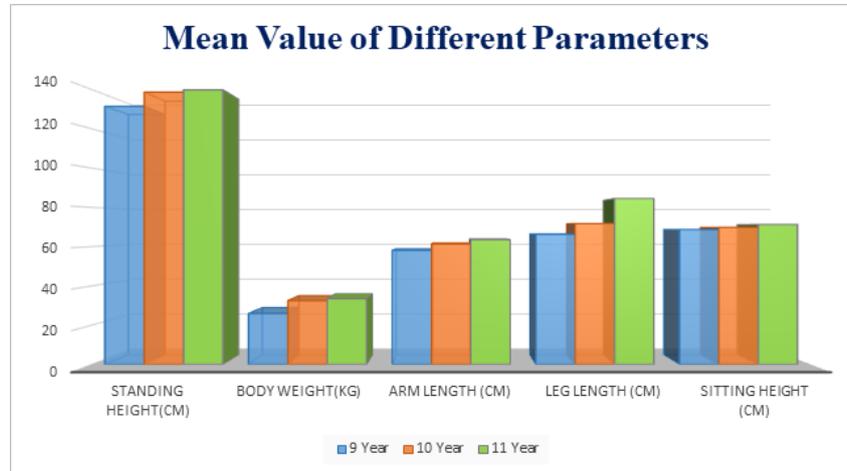


Figure 3 : Mean values of different parameters for different age group

Table 2 : 't' values for testing of significance of difference between two means for body height (cm)

Inter group difference	Means of values			Mean difference (M1-M2) (M2-M3)	Calculate 't' Values	Remarks
	9y	10y	11y			
9y-10y	131.53	138.77		-7.24	4.059427	Significant*
10y-11y		138.77	139.93	-1.16	0.619744	Not significant

\*t' (0.05) with (df) 58 = 1.67

Table 3 : Testing of significance among mean values of different groups of subjects for body weight (kg)

Inter group difference	Means of values			Mean difference (M1-M2) (M2-M3)	Calculate 't' Values	Remarks
	9y	10y	11y			
9y-10y	25.9	32.47		-6.57	4.732863	significant
10y-11y		32.47	33.47	-1	0.54753	Not significant

\*t' (0.05) with different freedom (df) 58 = 1.67

Table 4 : Testing of significance among mean values of different groups of subjects for arm length (cm)

Inter group difference	Means of values			Mean difference (M1-M2) (M2-M3)	Calculate 't' Values	Remarks
	9y	10y	11y			
9y-10y	58.1	61.3		-3.2	2.888554	significant
10y-11y		61.3	63.5	-2.2	1.961931	significant

t' (0.05) with different freedom (df) 58 = 1.67

The mean difference and testing statistical significance for body weight has been presented in table 3. It is seen from the table values that the increase in body weight from 9-10 was significant and 10-11 year was not significant. The mean difference and testing statistical significance for arm length has been presented in table 4. It is seen from the table values that the increase in arm length from 9-10 and 10-11 year were significant.

The mean difference and testing statistical significance for leg length has been presented in table 5. It is seen from the table values that the increase in leg length from 9-10 and 10-11 year were significant of 0.05 level. The mean difference and testing statistical significance for sitting height has been presented in table 6. It is seen from the table values that the increase in sitting height from 9-10 years were not-significant and 10-11 year was significant of 0.05 level

**Table 5 :** Testing of significance among mean values of different groups of subjects for leg length (cm)

Inter group difference	Means of values			Mean difference (M1-M2) (M2-M3)	Calculate 't' Values	Remarks
	9y	10y	11y			
9y-10y	66.23	71.77		-5.54	4.29121	significant
10y-11y		71.77	84.53	-12.76	10.22749	significant

't' (0.05) with different freedom (df) 58 = 1.67

**Table 6 :** Testing of significance among mean values of different groups of subjects for leg length (cm)

Inter group difference	Means of values			Mean difference (M1-M2) (M2-M3)	Calculate 't' Values	Remarks
	9y	10y	11y			
9y-10y	68.67	69.83		-1.16	1.238362	Not significant
10y-11y		69.83	71.27	-1.44	1.437632	Not significant

't' (0.05) with different freedom (df) 58 = 1.67

**RESULT**

On the basis of statistical analysis of data following results were obtained:

- i. In height there was statistically significant difference from 9-10 year and there was not significant difference from 10-11year.
- ii. Increase in body weight,there was statistically significant difference from 9-10 year and there was not significant difference from 10-11year.
- iii. The increase in arm length, from 9-10 and 10-11 year were statistically significant.
- iv. In leg length, there were statistically significant from the age of 9-10 and 10-11 year.
- v. The increase in sitting height, there were statistically not significant from the age of 9-10 and 10-11 year.

**SUMMARY AND CONCLUSION**

In height there was statistically significant difference from 9-10 year and there was no significant difference from 10-11year.Increase in body weight also there was statistically significant difference from 9-10 year and there was no significant difference from 10-11year.Again, the increase in arm length andleg length from 9-10 and 10-11 year were statistically significant.The increase in sitting height, there were statistically not significant from the age of 9-10 and 10-11 year. From the discussion it can be seen that the nature of growth status for 9-11year boys changed bit slower but recognizable.

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