

A Comparative Study of Anthropometric Measurements Related to Bicep Girth and Calf Girth among Normal and Deaf-Dumb Children between 8 to 14 Years

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ANTHROPOMETRY: Anthropometry, measurement of body structure is the oldest type of body measurement known dated back to the beginning of recorded history. Sulpiastri investigated the outline of the body by dividing it into 480 parts. The ancient Egyptians also used a rough sort of Anthropometry during the period from the thirty fifth to twenty second Century B.C. "Anthropometry, measurement of the biological oneness of mankind is far more significant than the relatively superficial differences". Anthropometric measurements have been a part of physical education since its inception in this country. The two Greek words 'Anthropos' and 'Metrien' gives birth to a new term 'Anthropometry'. Anthropos means 'Man' and 'Metrien' means to measure. Therefore when we speak literally Anthropometry is the measurement of the body to discover its exact dimensions and the propositions of its parts. Anthropometric measurement consists of objective measurement of structure and of functions of the body. The measurement of structures includes such items as Weight, total Height, and girth of muscles, the width, the depth and the circumstance of the chest. The measurement of function includes such items as pulse rate, venous and Venus blood pressures muscular strength, basal metabolic rate estimated from cardio vascular variable, posture and breathing capacity. Two of the accepted biological principles are "Function decides structure and structure decides function". Organs and muscles that are well used will develop the proper growth and development. Right from the very beginning the selection of the athletes is based on a complex of physical qualities. "The human performance can be viewed on the expression of a number of components called performance factors, some of which are general factors and some of which are specific factors". Historically some very comprehensive human capabilities have been suggested, such as general intelligence, physical fitness and general athletic ability. For scientific training and special factors like physique and body composition play an important role. Top performance in any sport normally bring with them elements which makes the previous technique appears less economical and less effective, such elements assert an influence only if they are accompanied by physical condition (Rasch and Burke, 1973). Anthropometric variable and body composition are very important factors for achieving high level of performance in standard competition. Body size characteristics may become important in determining success in many sports. Height is an advantage in sports such as Kabaddi players and arm reach is an asset to the reach the touch line and boxer (Reilly, et al. 1990).

Here the researcher wants to consider single aspect and i.e., body composition profiles. The researcher is in pursuit to find out if any specific compensatory qualities are found among the physically challenged children, which will be beneficial for the development of sports performance in certain age group, also the trainability of body composition which is one of the performance factors.

"Sound education is the art of helping human beings of all ages to grow and develop to a fuller stature of mind, body and spirit, and to live well in their world" –L. Arnaud Reid

Physical education has an important part to play in helping children develop in stature of mind and spirit as well as body; children with 'special needs' may be helped to 'live well in their world' even if that world is more limited than that of their more fortunate peers.

Whatever the educational situation, it is to give children the joys and excitement of physical activity and play in some form. This natural childhood activity should be used to give physically challenged children as much opportunity as possible for independence and for acceptance by other children.

Body- mind relationship: The idea that physical well-being and motor skill has impact upon other aspects of life and adds to the quality of life is not new. The Latin tag 'mens sana in corpore sano' has been the watchword of others besides professional physical educationalists. The Greeks emphasized the importance of balance and harmony of mind and body. Socrates stated 'It is a matter of common knowledge that grave mistakes can often be traced to bad health.' But from time to time since the fifth century BC there has been the notion that one can educate the mind of man and ignore his body. This idea persists today in the teaching of educational philosophers such as R.S. Peter and his followers, who appear to think of man as an intellectual being without a body and perhaps without a soul. None the less twentieth-century doctors are very aware of the psychosomatic unity of man and acknowledge not only that the body may influence the mind but that the mind can have tremendous upon the body.

The Deaf child: The deaf child hearing impairment is often a result of sensor neural deficits caused through cochlear damage⁷. Equilibrium deficits with a concomitant loss of balance and coordination may compound the athlete's disability if there has been damage to the semicircular canals or vestibular apparatus. However, the greatest limitation which deaf athletes usually confront is their inability to communicate effectively with other individuals. This inability can be overcome by the use sign language and other methods of visual cueing. Deaf athletes can also compensate for their hearing loss by maximizing their visual abilities through training powers of observation and peripheral vision. Acquisition of these skills enables most deaf persons to participate in almost any athletic or fitness activity.

Objectives of the Study:

1. To find out, assess and analyze the body composition (biceps girth and calf girth) among normal children and that of deaf-dumb at particular age group.
2. To study the body composition (biceps girth and calf girth) in boys and girls (normal and deaf-dumb) between 08 to 14 years.
3. To compare the body composition (biceps girth and calf girth) among boys and girls (normal and deaf-dumb) between 08 to 14 years.

Hypothesis:

H-01: According to the researcher, there may be some compensatory physical and mental abilities with physically challenged children.

H-02: The researcher hypothesize that concrete relationship and differences in the body composition (biceps girth and calf girth) between 08 years to 14 years of normal and that of deaf and dumb children.

H-03: The study of body composition (biceps girth and calf girth) and its comparison of deaf-dumb are at par to that normal.

H-04: The researcher hypothesize that though being deaf-dumb the children do not show considerable differences in the body profiles (biceps girth and calf girth) to that in normal children.

Delimitations:

1. The study is delimited to both boys and girls.
2. The study is further delimited to the age group between 08 to 14 years.
3. The study is delimited to only deaf-dumb (boys) category in physically challenged children.
4. The study is delimited to the standard body composition profiles only biceps girth and calf girth applicable for specific age groups and sex.
5. The study is further delimited to the school going children in both normal and deaf-dumb.

Limitations:

1. Diet and rest of the children was a limitation.
2. Physical, mental, weather, school, house and surrounding conditions were a limitation.
Organization of the tests was adjusted with the concerned school's time tables.

Methodology

Sample:

The samples of this study are randomly selected from different schools with their date of birth lying between 1993 and 1999 in normal (boys and girls) and deaf-dumb subjects (boys and girls). The selected age groups of the subjects were from 08 to 14 years. In each group 25 subjects were selected initially with a margin of ± 5 . All the selected subjects were non-sportsman staying either in school hostels or at their residence to ensure the untrained development in body composition profiles. Every subject was allotted with a code and a separate self contained form for test results. The tests were selected in the aspects of growth. In growth, biceps and calf girths is evaluated. The tests were administered individually under standard conditions applicable for specific tests with required calibration.

Variables:

Independent Variables:

1. Normal boys and girls.
2. Deaf-dumb boys and girls.

Interweaving Variables:

(1) Sex: Boys and girls (2) Age: 08 to 14y years. (3) Criteria: Non sportsman. (4) Times: Initial

Dependent Variables:

Growth:

1. Biceps girth
2. Calf girth

Definition of the Growth and Development Factors:

1. **Biceps Girth:** The circumference or girth of freely hanging upper-arm measured midway between the point acromiale and radial is known as upper-arm circumference/ girth.
2. **Calf Girth:** It is the maximal circumference of the lower leg over the calf muscle.

Tools and Means:

Means Used:

1. **Personal data bank:** It is used to collect the information of an individual. Personal data bank consists of the following aspect: Full name, name and address of the school, date of birth and age, gender, deaf-dumb/ normal, diet (vegetarian/ mix), sportsman / non-sportsman.
2. **Body Composition Profiles:**
 - Biceps Girth
 - Calf Girth

Procedure:

The subjects were selected from different schools in normal category (boys and girls) and deaf-dumb schools (boys and girls). In all 14 testes were selected for evaluating the growth of the subjects between 08 to 14 years. To have the difference of data for assessing the development it was decided to organize the test with gap of one year. The subjects were tested initially for their growth from 02nd to 7th July 2011. The sequence of the tests was so organized as follows:

Biceps Girth, Calf Girth

- **Biceps Girth:** The circumference or girth of freely hanging upper-arm measured midway between the point acromiale and radial is known as upper-arm circumference/ girth.
- **Calf Girth:** It is the maximal circumference of the lower leg over the calf muscle.

Collection of Data:

The subjects were selected from different schools in normal category (boys and girls) and deaf-dumb schools (boys and girls). In all 14 testes were selected for evaluating the growth of the subjects between 08 to 14 years. To have the difference of data for assessing the development it was decided to organize the test after a gap of one year. The scores are then entered individually in the forms provided accordingly. For identification of variables different colours are used: Normal boys- yellow; Deaf-dumb boys- blue; Normal girls- Green and Deaf-dumb girls- Pink. The table containing the most initial and most final results and its difference mean is considered for the statistical findings.

Statistical Methods:

To analyze the collected data the scores are arranged according to the comparison and in sequential order so as to find out the statistical values. The following statistical variables are selected for comparing, analyzing and interpretation of numerical values and basing on which the findings are discussed.

Mean is computed by adding all the scores and then dividing by the number of scores involved. The mean is used in the study to measure the average in growth and development.

Standard Deviation is computed in the study for the measures of variability. Standard deviation reflected the magnitude of the deviations of the scores from their mean.

For testing the null hypothesis for the difference between various sample means the t-Test is used at significance of .05 levels.

Results and Discussions:

Results:

Table No. 1: Mean and Standard Deviation of Biceps Girth, and Calf Girth

CATEGORY	Mean		Standard Deviation	
	Biceps Girth	Biceps Girth	Calf Girth	Calf Girth
COMPLETE	16.48	1.84	2.63	22.96
NORMAL BOYS 8-14	17.08	2.15	3.19	23.75
NORMAL GIRLS 8-14	16.3	1.96	2.33	22.14
DEAF & DUMB BOYS 8-14	16.21	1.70	2.59	22.88
DEAF & DUMB GIRLS 8-14	16.34	1.39	2.05	23.08
NORMAL BOYS 08 YEARS	15.36	0.86	1.3	21.24
NORMAL BOYS 09 YEARS	16.64	1.46	1.7	21
NORMAL BOYS 10 YEARS	15.8	1.58	1.52	22
NORMAL BOYS 11 YEARS	16.64	1.57	1.48	23.72
NORMAL BOYS 12 YEARS	16.92	1.35	1.40	23.32
NORMAL BOYS 13 YEARS	18.12	2.36	2.97	26.44
NORMAL BOYS 14 YEARS	20.12	1.56	2.10	28.56
NORMAL GIRLS 08 YEARS	14.88	1.05	1.75	20.36
NORMAL GIRLS 09 YEARS	15.08	1.46	1.69	20.88
NORMAL GIRLS 10 YEARS	15	1.38	1.42	20.96
NORMAL GIRLS 11 YEARS	16.36	1.28	2.16	23.76
NORMAL GIRLS 12 YEARS	16.8	1.70	2.24	22.96
NORMAL GIRLS 13 YEARS	18	1.91	2.23	22.48
NORMAL GIRLS 14 YEARS	18	1.65	2.14	23.6
DEAF & DUMB BOYS 08 YEARS	15.32	0.98	1.95	20.64
DEAF & DUMB BOYS 09 YEARS	15.2	1.22	1.93	20.8
DEAF & DUMB BOYS 10 YEARS	15.28	0.84	1.68	22.36
DEAF & DUMB BOYS 11 YEARS	16.04	1.69	2.24	22.76
DEAF & DUMB BOYS 12 YEARS	16.04	1.42	2.43	23.56
DEAF & DUMB BOYS 13 YEARS	17	0.81	1.36	24.12
DEAF & DUMB BOYS 14 YEARS	18.64	1.65	1.93	25.92
DEAF & DUMB GIRLS 08 YEARS	15.4	1.15	1.73	21.88
DEAF & DUMB GIRLS 09 YEARS	15.4	0.76	1.21	21.16
DEAF & DUMB GIRLS 10 YEARS	15.4	0.81	1.47	21.56
DEAF & DUMB GIRLS 11 YEARS	16.72	1.06	1.67	23.72
DEAF & DUMB GIRLS 12 YEARS	16.96	0.93	1.34	24.16
DEAF & DUMB GIRLS 13 YEARS	16.88	1.30	1.68	24.4
DEAF & DUMB GIRLS 14 YEARS	17.64	1.07	1.56	24.72

Table no. 2: T- Test Results comparison of body composition between normal and deaf-dumb children between 8 to 14 years

Category	BICEP Muscle Girth	CALF Muscle Girth
NB-DDB-8	0.87	0.2
NB-DDB-9	0.04	0.7
NB-DDB-10	0.15	0.4
NB-DDB-11	0.20	0.08
NB-DDB-12	0.02	0.6
NB-DDB-13	0.03	0.08
NB-DDB-14	0.021	0.29
NG-DDG-8	0.10	0.03
NG-DDG-9	0.33	0.50
NG-DDG-10	0.21	0.15
NG-DDG-11	0.28	0.94
NG-DDG-12	0.68	0.026
NG-DDG-13	0.01	0.001
NG-DDG-14	0.36	0.04

Table No. 3: Showing the comparison of the mean scores and ‘t’ value of the **Normal Girls and Deaf-dumb Girls 08 years** for the BICEPS MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value ‘t’	Df	Table Value of ‘t’	Comments
BICEPS MUSCLE GIRTH	NG-08	25	14.88	1.05	0.52	0.10	48	2.02	<i>Insignificant</i>
	DDG-08	25	15.4	1.15					

* Significance at .05 Levels

The above table shows that the mean value of Biceps Muscle Girth of Normal Girls of 08 years is 14.88 with standard deviation (1.05) and Deaf-dumb Girls is 15.4 with standard deviation (1.15) and the obtained ‘t’ value is 0.10 at 48 degree of freedom with the table ‘t’ value is 2.02 at .05 level of significance found to be insignificant

Table No. 4: Showing the comparison of the mean scores and ‘t’ value of the **Normal Girls and Deaf-dumb Girls 09 years** for the BICEPS MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value ‘t’	Df	Table Value of ‘t’	Comments
BICEPS MUSCLE GIRTH	NG-09	25	15.08	1.46	0.32	0.33	48	2.02	<i>Insignificant</i>
	DDG-09	25	15.4	0.763					

* Significance at .05 Levels

The above table shows that the mean value of Biceps Muscle Girth of Normal Girls of 09 years is 15.08 with standard deviation (1.46) and Deaf-dumb Girls is 15.40 with standard deviation (0.763) and the obtained 't' value is 0.33 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 5: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 10 years** for the BICEPS MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
BICEPS MUSCLE GIRTH	NG-10	25	15	1.38	0.40	0.21	48	2.02	<i>Insignificant</i>
	DDG-10	25	15.4	0.81					

* Significance at .05 Levels

The above table shows that the mean value of Biceps Muscle Girth of Normal Girls of 10 years is 15 with standard deviation (1.38) and Deaf-dumb Girls is 15.40 with standard deviation (0.81) and the obtained 't' value is 0.21 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 6: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 11 years** for the BICEPS MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
BICEPS MUSCLE GIRTH	NG-11	25	16.36	1.28	0.36	0.28	48	2.02	<i>Insignificant</i>
	DDG-11	25	16.72	1.06					

* Significance at .05 Levels

The above table shows that the mean value of Biceps Muscle Girth of Normal Girls of 11 years is 16.36 with standard deviation (1.28) and Deaf-dumb Girls is 16.72 with standard deviation (1.06) and the obtained 't' value is 0.28 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 7: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 12 years** for the BICEPS MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
BICEPS MUSCLE GIRTH	NG-12	25	16.8	1.70	0.16	0.68	48	2.02	<i>Insignificant</i>
	DDG-12	25	16.96	0.93					

* Significance at .05 Levels

The above table shows that the mean value of Biceps Muscle Girth of Normal Girls of 12 years is 16.80 with standard deviation (1.70) and Deaf-dumb Girls is 16.96 with standard deviation (0.93) and the obtained 't' value is 0.68 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 8: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 13 years** for the BICEPS MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
BICEPS MUSCLE GIRTH	NG-13	25	18	1.91	1.12	0.01	48	2.02	<i>Insignificant</i>
	DDG-13	25	16.88	1.30					

* Significance at .05 Levels

The above table shows that the mean value of Biceps Muscle Girth of Normal Girls of 13 years is 18 with standard deviation (1.91) and Deaf-dumb Girls is 16.88 with standard deviation (1.30) and the obtained 't' value is 0.01 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 9: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 14 years** for the BICEPS MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
BICEPS MUSCLE GIRTH	NG-14	25	18	1.65	0.36	0.36	48	2.02	<i>Insignificant</i>
	DDG-14	25	17.64	1.07					

* Significance at .05 Levels

The above table shows that the mean value of Biceps Muscle Girth of Normal Girls of 14 years is 18 with standard deviation (1.65) and Deaf-dumb Girls is 17.64 with standard deviation (1.07) and the obtained 't' value is 0.36 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 10: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 08 years** for the CALF MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
CALF MUSCLE GIRTH	NG-08	25	20.36	1.75	0.52	0.03	48	2.02	<i>Insignificant</i>
	DDG-08	25	21.88	1.73					

* Significance at .05 Levels

The above table shows that the mean value of Calf Muscle Girth of Normal Girls of 08 years is 20.36 with standard deviation (1.75) and Deaf-dumb Girls is 21.88 with standard deviation

(1.73) and the obtained 't' value is 0.03 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 11: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 09 years** for the CALF MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
CALF MUSCLE GIRTH	NG-09	25	20.88	1.69	0.28	0.50	48	2.02	<i>Insignificant</i>
	DDG-09	25	21.16	1.21					

* Significance at .05 Levels

The above table shows that the mean value of Calf Muscle Girth of Normal Girls of 09 years is 20.88 with standard deviation (1.69) and Deaf-dumb Girls is 21.16 with standard deviation (1.21) and the obtained 't' value is 0.28 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 12: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 10 years** for the CALF MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
CALF MUSCLE GIRTH	NG-10	25	20.96	1.42	0.60	0.15	48	2.02	<i>Insignificant</i>
	DDG-10	25	21.56	1.47					

* Significance at .05 Levels

The above table shows that the mean value of Calf Muscle Girth of Normal Girls of 10 years is 20.96 with standard deviation (1.42) and Deaf-dumb Girls is 21.56 with standard deviation (1.47) and the obtained 't' value is 0.15 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 13: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 11 years** for the CALF MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
CALF MUSCLE GIRTH	NG-11	25	23.76	2.16	0.04	0.94	48	2.02	<i>Insignificant</i>
	DDG-11	25	23.72	1.67					

* Significance at .05 Levels

The above table shows that the mean value of Calf Muscle Girth of Normal Girls of 11 years is 23.76 with standard deviation (2.16) and Deaf-dumb Girls is 23.72 with standard deviation

(1.67) and the obtained 't' value is 0.94 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 14: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 12 years** for the CALF MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
CALF MUSCLE GIRTH	NG-12	25	22.96	2.24	1.20	0.026	48	2.02	<i>Insignificant</i>
	DDG-12	25	24.16	1.34					

* Significance at .05 Levels

The above table shows that the mean value of Calf Muscle Girth of Normal Girls of 12 years is 22.96 with standard deviation (2.24) and Deaf-dumb Girls is 24.16 with standard deviation (1.34) and the obtained 't' value is 0.026 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table No. 15: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 13 years** for the CALF MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
CALF MUSCLE GIRTH	NG-13	25	22.48	2.23	1.92	0.001	48	2.02	<i>Insignificant</i>
	DDG-13	25	24.4	1.68					

* Significance at .05 Levels

The above table shows that the mean value of Calf Muscle Girth of Normal Girls of 13 years is 22.48 with standard deviation (2.23) and Deaf-dumb Girls is 24.4 with standard deviation (1.68) and the obtained 't' value is 0.001 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

Table 16: Showing the comparison of the mean scores and 't' value of the **Normal Girls and Deaf-dumb Girls 14 years** for the CALF MUSCLE GIRTH

Variables	Groups	N	Mean	Standard Deviation	Mean Difference	Obtained Value 't'	Df	Table Value of 't'	Comments
CALF MUSCLE GIRTH	NG-14	25	23.6	2.14	1.12	0.04	48	2.02	<i>Insignificant</i>
	DDG-14	25	24.72	1.56					

* Significance at .05 Levels

The above table shows that the mean value of Calf Muscle Girth of Normal Girls of 14 years is 23.6 with standard deviation (2.14) and Deaf-dumb Girls is 24.72 with standard deviation (1.56)

and the obtained 't' value is 0.04 at 48 degree of freedom with the table 't' value is 2.02 at .05 level of significance found to be insignificant

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