



**ISSN Print:** 2394-7500  
**ISSN Online:** 2394-5869  
**Impact Factor:** 5.2  
IJAR 2018; 4(5): 323-324  
[www.allresearchjournal.com](http://www.allresearchjournal.com)  
Received: 20-03-2018  
Accepted: 21-04-2018

**Dr. Mayuri R Shah**  
Assistant Professor, Dr. D Y  
Patil College of Physiotherapy,  
Pune, Maharashtra, India

## Normative data on grip strength in children aged 4-8 years

**Dr. Mayuri R Shah**

### Abstract

**Background:** Reliable and valid evaluation of hand strength can provide an objective index of general upper body strength. The synergistic action of flexor and extensor muscles and the interplay of muscle group is an important factor in the strength of the resulting grip. The purpose of this testing is diverse, including to diagnose diseases, to evaluate and compare treatments, to document progression of muscle strength, and to provide feedback during the rehabilitation process as a measure indicating level of hand function.

**Aim:** To evaluate normative values of grip strength in 4-8 years old children using aneroid sphygmomanometer.

**Methodology:** 200 subjects were included in the study. Age groups were divided into 4 groups. Both males and females were included. Recent trauma to hand, diagnosed disease like Rheumatoid arthritis, and deformity, nerve injury, and fractures were excluded. Subject was seated in chair with arm adducted and hand outside the armrest. Feet flat on ground. Cuff was inflated to 20mmhg and was placed in hand rolled and tied. Subject was instructed to make a closure of palm. Readings were recorded and data was analyzed.

**Results:** ANOVA was used for comparing 4 groups and unpaired t test was used in each group for males and females comparison. Only age group 5-6 years showed males had higher grip strength than females.

**Conclusion:** The study concluded that grip strength increases with age and males have higher grip strength than females.

**Keywords:** Grip strength, children, 4-8 years

### Introduction

Hand grip strength is a physiological variable that is affected by a number factors including age, gender and body size among others. The hand is a complex organ with several functions. As a grip organ it is both able to exert strength and hold and handle delicate objects. It is used in performing activities of daily living. The power of hand grip is the result of forceful flexion of all finger joints with the maximum voluntary force that the subject is able to exert under normal biokinetic conditions<sup>[1]</sup>. The estimation of hand grip strength is of immense importance in determining the efficacy of different treatment strategies of hand and its rehabilitation.

There are different methods of assessing hand grip. Commonly used is Manual Muscle Testing. In manual muscle testing strength of individual muscles is assessed. For grip strength a coordinated activity is needed. And hence, for evaluating hand grip, the use of manual muscle strength test is poor in accuracy and sensitivity.

There are many instruments to assess grip strength such as hand held dynamometer, Jamar dynamometer, Manual dynamometer<sup>[2]</sup>. Therefore, to assess grip strength one such technique currently used is use of aneroid sphygmomanometer instrument. It is valid and acceptable<sup>[2]</sup>.

Very few studies are done to study grip strength. Many studies are done using hand held dynamometer. It is not easily available and is costly. No studies give normal values of grip strength in children. So, this study is carried out using aneroid sphygmomanometer with paediatric cuff in 4-8 years age group. It is readily available, convenient and is cost-effective. This study is to give reference values of grip strength in children in this age group<sup>[3]</sup>.

**Correspondence**  
**Dr. Mayuri R Shah**  
Assistant Professor, Dr. D Y  
Patil College of Physiotherapy,  
Pune, Maharashtra, India

This study will help to get the normative values which will help in diagnostic and rehabilitation purpose.

The aim of the study is to evaluate normative values of grip strength in 4-8 years old children using aneroid sphygmomanometer.

### Methodology

The materials used were aneroid sphygmomanometer, chair, paper, pen, pencil. This study was a observational study. It was carried out in Pune. Children aged 4-8 years were included and children diagnosed with any systemic disease, recent fractures, or any deformities were excluded. The sample size was 200. The children were positioned in a chair with the arm adducted, elbow flexed to 90 degrees with the hand out of arm rest. Dominant hand was used. Hips and knees approximately 90 degrees angle flexion with feet flat on ground. The cuff was rolled and tied. The instrument was zeroed before each measurement. The cuff was inflated to 20mmhg initially when placed in volunteers' hand. Upon the examiner command, the volunteer would perform a palmer closure. The procedure was repeated 3 times with a rest period of 1min in between each reading. Best of 3 readings was used in the study. After collection the data was analysed.

**Table 3:** Grip strength between males and females:

| Groups              | Grip strength Males (mean ± SD) | Grip strength Females (mean ± SD) | t value | p value |
|---------------------|---------------------------------|-----------------------------------|---------|---------|
| Group A : 4-5 years | 94.41 ± 21.009 mmhg             | 87 ± 17.66 mmhg                   | 1.355   | 0.18    |
| Group B : 5-6 years | 115.6 ± 15.48 mmhg              | 93.69 ± 19.26 mmhg                | 4.420   | <0.001  |
| Group C : 6-7 years | 115.4 ± 20.15 mmhg              | 107 ± 25.5 mmhg                   | 1.291   | 0.20    |
| Group D : 7-8 years | 154.9 ± 31.84 mmhg              | 141.9 ± 19.72 mmhg                | 1.679   | 0.099   |

Unpaired t test was used between males and females in all age groups. It was not significant except for the age group 5-6 years where it is extremely significant.

### Discussion

The objective of the study was to find the normative values of grip strength in children aged 4-8 years.

The study indicates that among the four age groups of children, the grip strength was seemed to increase as the age increased. The rationale for the improved grip strength could be maturation of neuromuscular system, physiologically improvement in mass, force, velocity, work, power and energy contribute to increase in grip strength. The primary biological reaction for strength or any muscle contraction is Adenosine Tri Phosphate. It is reported that contractile properties of human skeletal muscles become mature early in infancy [4]. Study done by Newman DG to find norms of hand grip strength evidenced that by the age of 18years, boys had mean hand grip strength about 60% higher than girls [5].

The study concluded that hand grip increases with increase in age and males had higher grip strength as compared to females. Age limit and nutritional status of subjects were not considered was the limitation of study. Comparison between dominant and non-dominant hand can be done in future studies.

### References

- Shyamal Koley, Arvinder Pal Singh. Effect of hand dominance of grip strength in Collegiate Population of Amritsar, Punjab, India, 2010.

### Results

**Table 1:** Distribution:

| Groups             | Males | Females |
|--------------------|-------|---------|
| Group A: 4-5 years | 24    | 26      |
| Group B: 5-6 years | 24    | 26      |
| Group C: 6-7 years | 28    | 22      |
| Group D: 7-8 years | 28    | 22      |
| Total              | 104   | 96      |

**Table 2:** Age wise grip strength:

| Groups              | Grip strength (mean ± SD) |
|---------------------|---------------------------|
| Group A : 4-5 years | 90.56 ± 19.54 mmhg        |
| Group B : 5-6 years | 104 ± 20.47 mmhg          |
| Group C : 6-7 years | 111.76 ± 22.82 mmhg       |
| Group D : 7-8 years | 149.2 ± 27.71 mmhg        |

One way analysis of Variance was done in between 4 age groups. The p-value was <0.001 which is considered extremely significant suggested that the grip strength increases with age.

- Shipham SJS. Pitout Rheumatoid Arthritis: Hand function, Activities of daily living, grip strength and essential assistive devices, Curatoni, 2003.
- George Hamilton F, Caronyl Mc Donald, Thomas Chenier C. Measurement of grip strength: Validity and reliability of sphygmomanometer and Jamar grip dynamometer, JOSPT, 1992; 16:5.
- Growth, Maturation and physical activity, by Claude Bouchard and Roberta Malina 2<sup>nd</sup> Edition.
- Newman DG, Pearn J, Barnes A, Young CM, Kehoe M. Norms for hand grip strength, Arch Dis Child, 1984.