



# Strength Performance in School Going Children Using Bruininks-Oseretsky Test-2

Rathi M\*, Gazbare P, Joshi R, Desai R, Khandare S and Joseph A

Professor, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pune, India

\*Corresponding author: Manisha Rathi, Professor, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pune, India, Tel: +91-9850418712; Email: manisha.rathi@dpu.edu.in

## Research Article

Volume 4 Issue 2

Received Date: April 01, 2021

Published Date: April 22, 2021

DOI: 10.23880/aphot-16000197

## Abstract

**Background-**Strength is essential in children as it involves overall activities of our life, thus lack of strength can affect muscle tone, muscle power, activities of daily living. It is believed that muscle strength gradually increases from early infancy. In developing children alterations related to continuing growth increases the tendency to vary in strength performances. The Purpose Of this study was to find out the total motor point score in children, to find descriptive category according to gender, and to find the descriptive category according to age group.

**Material and Methods:** It was a cross sectional analytical study conducted in schools of Pimpri Chinchwad area. This study included 248 males and 268 females which were assessed for strength by Push up Test and wall squats.

**Result:** The total mean point score of female was 25.18 and in male were 27. The performance of males was better than females. In all the age groups, majority fall in average category, followed by above average except youngest age group which shows more in above average category.

**Conclusion:** The study concludes that, male children showed better performance than female children and as age increases, the strength score increases.

**Keywords:** Strength; Bruininks Oseretsky; Test of Motor Proficiency

## Introduction

Muscle strength is defined as a maximum amount of force a muscle can produce with a single maximal effort. It is measured during muscular contraction. Strength training includes both the size of muscle fibers and also improves the ability of nerves to communicate with the muscles. It is believed that muscle strength gradually increases from early infancy.<sup>1</sup> Strength is a component which comes under gross motor development. Gross motor development is a gradual process by which a child gains and uses coordination of the muscles of the legs, arm & trunks & the smaller muscles of hand [1]. Ganapathy Sankar, et al. [2] found in his study

done on children of 5-10 years of age that prevalence rate was 3.22%. This rate of prevalence was diverse according to gender and geographical areas. A study done by Komal, et al. [3] where they found 21.33 % prevalence rate and in males it was 19.31 % and in females it was 23.23%. Two types of strength can be evaluated, dynamic strength and static strength. Dynamic strength is measured with the subtest of BOTMP. The subtest consists of 3 tasks which includes standing, Long jump, Pushups for 30 sec, sit ups for 30 sec. It helps in assessing arm strength, Leg strength, shoulder strength and abdominal strength [1]. Other scales used to measure strength is the Peabody Developmental Motor scales-2<sup>nd</sup> (PDMS-2), Movement assessment battery

for children (Movement ABC-2), Masstrichtsce Motoriek Test (MMT) [4-7]. In the above scales strength component is not accurately specified there are locomotor components involving Jumping, Hopping, crawling, grasping which do not define strength as a whole. Bruininks-Oseretsky Test of Motor proficiency, Second edition (BOT-2) BOT-2 can be used to assess strength because in other scales strength as a whole component is not being specified whereas BOT-2 scale gives an objective, Descriptive & analytical assessment [5]. BOT-2 is a test which includes engaging, goal-directed activities to measure the motor skills in children ages four through 21. The Bruininks-Oseretsky Test of motor proficiency-BOTMP (Bruininks 1978) contains 46 items grouped under eight different subtests of motor proficiency mainly for children between 4.5 and 14.5 years of age [5].

Strength component of BOTMP is the eight sub test under gross motor composite. Activities in this subtest include push up test, standing long jump, V-up test, wall sits, sit up test. Performance of the standing long jump is measured in distance and rest of the subtests is measured in seconds. According to Descriptive Category of BOT -2 test in prevalence of Developmental disorders in overweight and obese children aged 7-12 years showed motor deficit in Body coordination 33% and in Strength and agility 74% [8].

Therefore, the purpose of this study was (a) To find total point score in school children (b) To find descriptive category according to gender (c) To find descriptive category according to age groups.

## Materials and Methods

This cross sectional analytical study was conducted on children from Pimpri-Chinchwad area of age group 5-15 years. The subjects were divided according to gender and age groups. Age group one included 5.0 to 7.11, age group two includes 8.0 to 9.11, age group three includes 10.0 to 11.11, age group four includes 12.0 to 13.11 and age group five includes 14.0-15.11. All the samples were taken in as they were school going children.

## Procedure

This study was conducted after the approval from Institutional Ethical Committee. It was done to assess the strength in 5-15 years school going children, total 516 subjects from age group 5-15 years were selected in the study who fulfilled the inclusion criteria.

After explaining the purpose of the study to the subject, written consent was taken from parents prior to the assessment. Subjects were selected on the basis of multistage sampling method. In the first stage, three English schools and

three Marathi medium schools were selected randomly out of the total schools in Pimpri Chinchwad area. In the second stage, from each standard, one division was selected. In third stage, from every division, Boys and girls of same age were selected by multistage stratified random sampling method.

A pre-assessment was taken to record their socio demographic data and other parameters. Every child was asked to perform five tasks given in Strength subtest of BOT 2 scale which were as follows:

- **Long jump:** In this task the examinee stood behind the end line, then the examinee was asked to bent his knees and lean forward, the examinee swung his arms back and then jumped forward, swinging arms forward and landed on both feet, the scoring was done by recording the no. of inches covered by the examinee rounding down to the nearest inch that the examinee jumped forward. Distance was measured by using inch tape for the measurement from the end line to the finish line. If the examinee falls or stumbles then the second trial was conducted.
- **Push Ups:** The examinee was in prone position, hands were shoulder width apart, face downwards. A timer was set for 30 seconds. The examinee was explained the procedure for pushups and told to perform for 30 sec. Number of repetitions were recorded to the nearest tenth of a second; the trial was stopped if the form is incorrect or the examinee is unable to do so.
- **Sit Ups:** The examinee was in supine position, face upwards both hands were kept in air, knees was flexed, the examinee was then asked to do trunk flexion, procedure was explained to the examinee, the recording was done to the nearest tenth of a second that the examinee performs proper sit ups in 30 seconds time. The trial was stopped if the form is incorrect or the examinee is unable to do so.
- **Wall sit:** The examinee was supposed to do squat down in midair and will take support with the help of a wall, it appears like that the examinee is sitting, examinee's hands will be fold and legs will be in 90° hip-knee flexion, procedure for the scoring was explained to the examinee the seconds were recorded to the nearest tenth of a second that the examinee performs proper wall sit in 60 seconds time, the trial will be stopped if the form is in correct or unable to do so.

## V-up for 60 Sec

In V up the examinee will lie down on the floor with the face down on the floor arms extended, legs extended backwards and feet touching the floor for the scoring the number of seconds were recorded to the nearest tenth of a second, the examinee maintains proper form of v-up to the 60 seconds of the trial, the timer will be stopped if the

examinee is not able to maintain the proper position.

A trial was given to children before starting the tasks. Precaution was taken to avoid the children from falling. Subjects were assessed for these tasks and a raw score was recorded in the unit measured (e.g. number of pushups, sit ups etc) and then converted to a numerical point score. Further analysis was done with the help of BOT-2 manual. The data collected were analyzed using suitable analysis.

## Result

Total 516 children were selected of age 5-15 years, Out of which 248 were males and 268 were females.

Table 1 shows the mean of strength motor point score of females was 25.8 + 5.21 and males was 27+ 4.8. The statistical results for score wise comparison of gender indicated a significant difference between males & females ( $p < 0.001$ ). This indicates that male performance was higher than females in strength component.

The data summary of strength total point score according to gender is shown below:

	Mean	Std dev
Female	25.28	5.21
Male	27	4.8
Total	26.18	5.07

Using Mann whitney test  $p < 0.001$

**Table 1:** Mean of Strength Motor Point Score according to Gender.

Table 2 shows that the percentage of the descriptive category according to gender. It is shown that participants in average category were more as compare to other groups amongst males and females ( $p = 0.03$ ) which indicates that both males and females come under more in average category followed by above average, below average, well above average & well below average respectively.

GENDER	DESCRIPTIVE CATEGORY					Total
	WAA	AA	A	BA	WBA	
Female	2.02%	16.94%	70.56%	8.87%	1.61%	100.00%
Male	1.87%	17.54%	76.87%	3.36%	0.37%	100.00%
TOTAL	1.94%	17.25%	73.84%	6.01%	0.97%	100.00%

Using chi square test,  $p = 0.03$

**Table 2:** Descriptive Category of Strength according to Gender.

Table 3 shows that in all the age groups, majority fall in Average category, followed by Above Average except age group 1 which shows more in Above Average category.

(51.35%). However this difference was not statistically significant as  $p = 0.88$ .

AGE GROUP	DESCRIPTIVE CATEGORY					Total
	WAA	AA	A	BA	WBA	
Age Group 1	7.21%	51.35%	38.74%	0.90%	1.80%	100.00%
Age Group 2	0.00%	11.58%	82.11%	5.26%	1.05%	100.00%
Age Group 3	0.00%	11.11%	78.70%	10.19%	0.00%	100.00%
Age Group 4	2.00%	6.00%	86.00%	4.00%	2.00%	100.00%
Age Group 5	0.00%	2.94%	87.25%	9.80%	0.00%	100.00%
TOTAL	1.94%	17.25%	73.84%	6.01%	0.97%	100.00%

Using chi square test,  $p = 0.88$

**Table 3:** Descriptive Category according to Age Group.

## Discussion

The Primary aim of this study was to assess strength using Bruininks Oseretsky Test of Motor Proficiency 2<sup>nd</sup> Edition among children. Motor development is a gradual process

in which the child learns to use coordination of the large muscles of the legs and trunks and small muscles of hands.

The Sub-test was designed to assess the upper, lower body and trunk strength. Samples score was consistent with

the individuals who all completed these tests. The total no. of subjects was 516 of age groups 5-15 (mean age -10.67 and SD + 3.03).

According to the descriptive category, mean of strength point score in our study was more in males than females; more males fall in average and above average category, while more no. of females came in well below average and well above average category. Our result were consistent with the study done by Freedson PS showed that boys tend to participate more in physical activities such as sports, gymnastics, swimming etc [9]. Participating in such activities improves strength, so these differences were observed. It is seen that the difference was at its peak during adolescent period. The reason of these differences can also be hormones as male hormones are testosterone, which aids in stimulating muscle mass, whereas female primary hormone is estrogen which aids fat accumulation. Testosterone also increases the concentration of Red blood cells and haemoglobin. Antara, et al. [10] also suggested that male performance was better in terms of running speed and agility than females in the age of 5-15 years using BOT 2. We have not considered nutritional status of these children. but it was observed that nutritional status and socioeconomic status of children is the significant predictor for their fine and gross motor development [4,11].

This study showed that majority of the children falls under the category of average category followed by above average category, except in age group 1 which shows more in above average category. So it interprets that more children had good strength score in this study. Results of this study go in accordance with a study done by T Balakrishna, et al. [12], which stated significant difference in their performance when compared by age with USA children. In this study, Indian children performed well in the strength subtest across all age groups, except age group 4 which underperformed as compared to the USA normative sample.

A study done by Brenda Wilson, et al. [13] stated that these standard scores are age adjusted, progress will not be reflected in the test scores unless or until the progress is rapid than typical maturation (which is not likely to occur with children who have motor problems). Therapist should consider using the subtest point scores as a more accurate measure of change.

The factors included in the study differs age wise as well as gender wise because of the factors have shown good results in male children. Factors included in our study were good in children and children are also involved in a number of physical activities like sports, gymnastics etc therefore more number of children has got good strength score. It was further showed that as age group increases, strength score increases both in male and females. Further research can be

performed considering socio economic status of the children

## Conclusion

The study concludes that male children showed better performance than female children, maximum children fall in average category and as age increases, strength score also increases.

## References

1. Wang WY, Chen SM (199) Balance and muscular strength in normal children aged 9-12 years. *Kaohsiung Journal of Medical Sciences* 15(4): 226-233.
2. Ganapathy Sankar DU (2018) The Prevalence of Developmental Coordination Disorder at Kattupakkam, Tamilnadu. *IOSR Journal of Pharmacy* 8(2): 49-52.
3. Komal KB, Sanjay P (2014) Indication or suspect of developmental coordination disorder in 5-15 years of school-going children in India (Dharwad, Karnataka). *International Journal of Health Sciences & Research* 4(6): 117-122.
4. Ghosh S, Chowdhury SD, Chandra AM, Ghosh T (2013) A study on the influence of occupation on development of motor activities in children. *International Journal of Adolescence and Youth* 18(1): 23-31.
5. Bruininks RH (1978) Bruininks-Oseretsky test of motor proficiency. Circle Pines, MN: American Guidance Service.
6. Venetsanou F, Kambas A, Aggeloussis N, Serbezis V, Taxildaris K (2007) Use of the Bruininks-Oseretsky Test of Motor Proficiency for identifying children with motor impairment. *Developmental Medicine & Child Neurology* 49(11): 846-848.
7. Deitz JC, Kartin D, Kopp K (2007) Review of the Bruininks-Oseretsky test of motor proficiency, (BOT-2). *Physical & occupational therapy in pediatrics* 27(4): 87-102.
8. Gazbare P, Deshmukh S, Palekar TJ, Varghese N, Abraham B, et al. (2020) Assessment of Body Coordination, Strength and Agility Using Bruininks-Oseretsky Test of Motor Proficiency (BOT-2) in Overweight and Obese Children Aged 7-12 Years. *Indian Journal of Physiotherapy & Occupational Therapy* 14(1): 186-189.
9. Freedson PS (1992) Physical activity among children and youth. *Canadian Journal of Sport Sciences* 17(4): 280-283.
10. Antara P, Manisha R, Sanjivani D, Tushar P, Apoorva

- D, et al. (2017) Running speed and agility according to Bruininks Oseretsky Test of Motor Proficiency. *International Journal of Medical and Health Sciences* 6(2): 90-93.
11. Chowdhury SD, Wrotniak BH, Ghosh T (2010) Nutritional and socioeconomic factors in motor development of Santal children of the Purulia district, India. *Early human development* 86(12): 779-784.
  12. Balakrishnan T, Rao CS (2007) Interrater reliability of bilateral coordination of Bruininks Oseretsky Test of Motor Proficiency (BOTMP) & Performance of Indian Children compared with USA norms. *The Indian Journal of Occupational Therapy* 38(3): 55-60.
  13. Wilson BN, Polatajko HJ, Kaplan BJ, Faris P (1995) Use of the Bruininks-Oseretsky test of motor proficiency in occupational therapy. *American Journal of Occupational Therapy* 49(1): 8-17.

