

**Research Article****Assessment of fine motor integration using bruininks oseretsky test of motor proficiency, 2nd edition, in 5 to 15 years of school going children****Diksha Gondkar* , Dhote Sanjivani, Tushar Palekar, Mohammed Zaid Tai***Dr. D.Y. Patil College of Physiotherapy, Dr. D.Y. Patil Vidyapeeth, Pune, India***ARTICLE INFO:****Article history:**

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ABSTRACT

Fine motor integration is the degree to which visual perception and finger hand movements are well coordinated. Through integration of visual input and motor output motor tasks are planned, monitored, adjusted and executed. The Bruininks-Oseretsky Test of Motor Proficiency, 2nd edition, is a pediatric test of fine motor and gross motor skills. It is an individually administered test that uses goal directed activities to measure motor skills in individuals ages 4 through 21. A study was conducted among 516 number of students from English as well as Marathi medium schools. After assessing the fine motor integration in the study population it was found that as the age increases the fine motor integration also increases and it is more in male children than that of female children.

Introduction

Fine motor integration is the degree to which visual perception and finger hand movements are well coordinated. Through integration of visual input and motor output, motor tasks (e.g. writing) are planned, executed, monitored and adjusted [1]. The age from 3 to 6 years is a sensitive period for development of fine movement skills (Gallahue and Donnelly, 2003). Because most preschool children are naturally curious, love to play and explore, these fine motor skills are learned very easily especially when stimulation, opportunities to play and to be physically active or sports are offered. The mastery of certain movement skills is a prerequisite for daily life functioning and participation in later physical or sport-specific activities [2]. At an early age, gross movement skills are necessary to move, stabilize and control body and objects while exploring the environment. Later in life, well developed gross movement skills help individuals to function more smoothly. Fine movement skills are necessary for development of basic self-help skills. During infancy, development is evaluated almost exclusively by motor development. Once a child can reach, grasp and walk, however, interest in further development of more complex movement skills is reduced and more attention is given to the development of cognitive, social and emotional aspects. Motor development is basically only taken into consideration when dysfunctions or efficient movement behavior appears (Davies,

2003). Research in the area of movement skill development mainly focuses on motor impairment and motor deficits. Hence, research on fine movement skill development and performance in developing children is fragmentary. The information which is available is mostly based on the sequences of developmental change in movement patterns and can be found in literature such as Gallahue and Ozmun (2006) and Haywood and Getchell (2005) [2]. Different tools to assess movement performance in early childhood are available. The movement assessment can be norm- or criterion referenced. A norm referenced test compares the child's performance to that of normative group and quantifies the child's movement skills competence. A criterion referenced test compares the child performance to pre determine criteria. A second form of movement skill assessment tool is also used with the scope on movement development and performance in typical preschool children, which includes Motoriktest fur Vier-bis Sechjarige Kinder (MOT4-6), Movement Assessment Battery for children (Movement- ABC), Peabody Development Scales (PDMS) koperkoordinationtest fur Kinder (KTK), Test of Gross Motor Development (TGMD), the Maastrichtse motoriek Test (MMT), the Bruininks-Oseretsky test of Motor proficiency (BOTMP). The second edition of Bruininks Oseretsky test of Motor proficiency is also used to evaluate the motor performance [2]. The Bruininks-Oseretsky Test Of Motor

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Proficiency, second edition (BOT-2) is preferred for this study as it is an individually administered test that uses engaging, goal-directed activities to measure motor skills in individuals aged 4 through 21 (Bruininks and Bruininks, 2005). It assesses four motor-area composites; Fine manual control (FMC), Manual Coordination (MC), Body Coordination (BC) and Strength and Agility (SA). BOT-2 has 4 subtests with 53 items and each motor composite has 2 subtests. As BOT-2 testing involves game-like motor tasks which capture the child's interest and are not verbally complex, it is suitable for children of non-English speaking background. Also the authors report that it can identify motor deficits in individuals with 'mild to moderate' motor impairment and is validated and reliable for assessing subjects with 'mild to moderate' mental retardation. Furthermore, the motor activities incorporated in BOT-2 includes gross motor (GM) tasks that assess hopping, jumping, running, ball skills, balance, strength and coordination and fine motor (FM) tasks that assess precision, integration and manual dexterity through drawing, writing and functional tasks such as threading blocks [3].

The selection of the items is based on the following criteria:

- To provide a broad and general view on movement skill development status of a child;
- To represent significant aspects of motor behavior;
- To emphasize motor activity;
- To provide opportunity to discriminate between a broad range of motor abilities;
- To fall within the possibilities of mild and moderate mentally retarded children;
- To appeal to limited memory capacity and vocabulary of the child;
- Material has to be easily transported.

The scoring system varies according to the individual items; it ranges from a 2-point scale to a 13-point scale. The raw scores can be converted into a standard numerical score. Every child is asked to perform 8 tasks i.e. copying a circle, a square, overlapping circles, a wavy line, a triangle, a diamond, a star & overlapping pencils, given in fine motor integration subtest of BOT-2 scale. Subjects are assessed for these tasks and a raw score is recorded in the unit measured and then converted to a numerical point score. The use of test is recommended for motor impairment diagnosis, screening, placement decisions, development and evaluation of motor training program and supporting research goals [2].

Materials and methods

The study was to assess the fine motor integration in 5-15 years school going children. This study was a Cross sectional-Analytical Study design which was conducted in schools in

Pimpri Chinchwad Municipal corporation 516 subjects of age group 5-15 years were selected in the study fulfilling the inclusion criteria. The inclusion criteria comprised of the students who were healthy and were willing to participate in this study whereas the exclusion criteria comprised of the students who had a neurological deficit or any upper limb fracture within 6 months or any diagnosed medical condition or any audio-visual defect. After explaining the purpose of the study to the parent, they were informed about their right to opt out of the study any time during the course of the study without giving reason for doing so. The parents were assured that their child's participation and non-participation would not affect their child's education. Subjects were selected on the basis of multistage sampling method. In the first stage, 3 English schools and 3 Marathi schools were selected randomly out of the total schools in Pimpri Chinchwad Municipal Corporation randomly. In the second stage, from each standard, 1 division was selected randomly. In third stage, from every division, boys and girls of same age was selected by stratified random sampling method. A written informed consent was obtained from the parents one day prior to the assessment. An assessment was taken to record their demographic details and other parameters. Every child was asked to perform 8 tasks i.e. copying a circle, a square, overlapping circles, a wavy line, a triangle, a diamond, a star & overlapping pencils, given in the fine motor integration subtest of BOT-2 scale. Table & chair for the examinee that was approximate for his or her height was given. Each page was torn from examinee booklet before placing it in front of the examinee. Erasing was not allowed. For each item, basic shape facet was scored, then all remaining facets and the total score for that item was also scored. The examinee used preferred drawing hand for all items in this subtest. Before administering each item, the task was taught to the examinee using verbal and nonverbal directions as necessary to ensure the examiner's understanding of the task. The overall size of the drawing was supposed to be least half the size of the stimulus. Subjects were assessed for those tasks and a raw score was recorded in the unit measured and then converted to a numerical point score. Further analysis was done with the help of BOT-2 manual. The data collected was analyzed using suitable statistical tests. The outcome measure of this study was 'Motor Point Score' of fine motor integration and 'Descriptive Category' of fine motor integration. The subjects were divided into 5 age groups. Age group 1 comprised of children of age 5.0-7.11 years, age group 2 comprised of age 8.0-9.11 years, age group 3 comprised of age 10.0-11.11 years, age group 4 comprised of 12.0-13.11 years and age group 5 comprised of 14.0-15.11 years.

Results

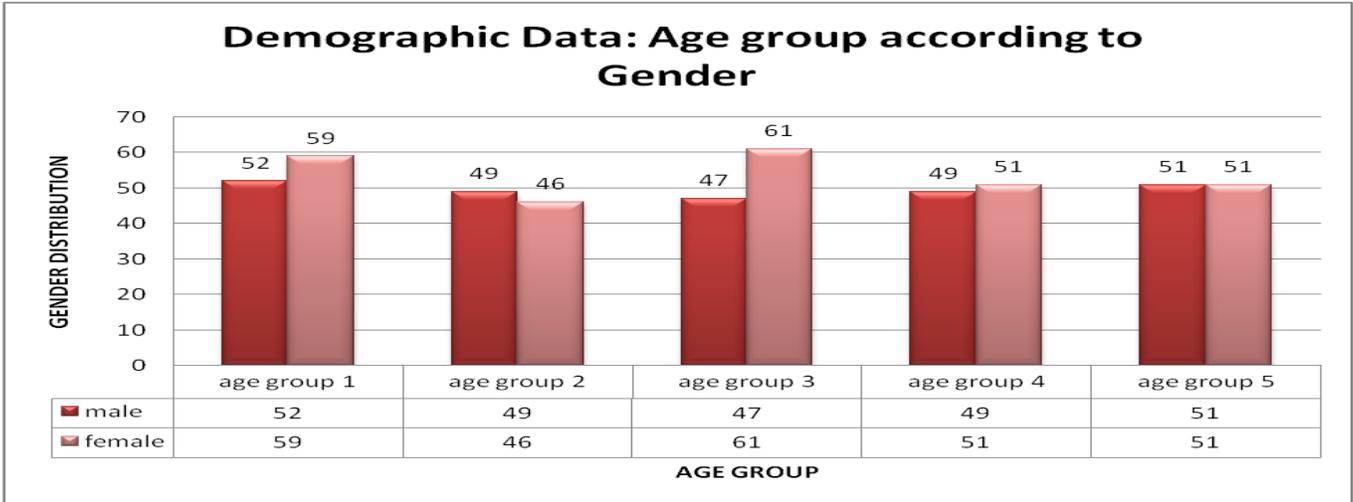


Fig 1: Graph 1 represents that, out of the total study population, 248 were male and 268 were female

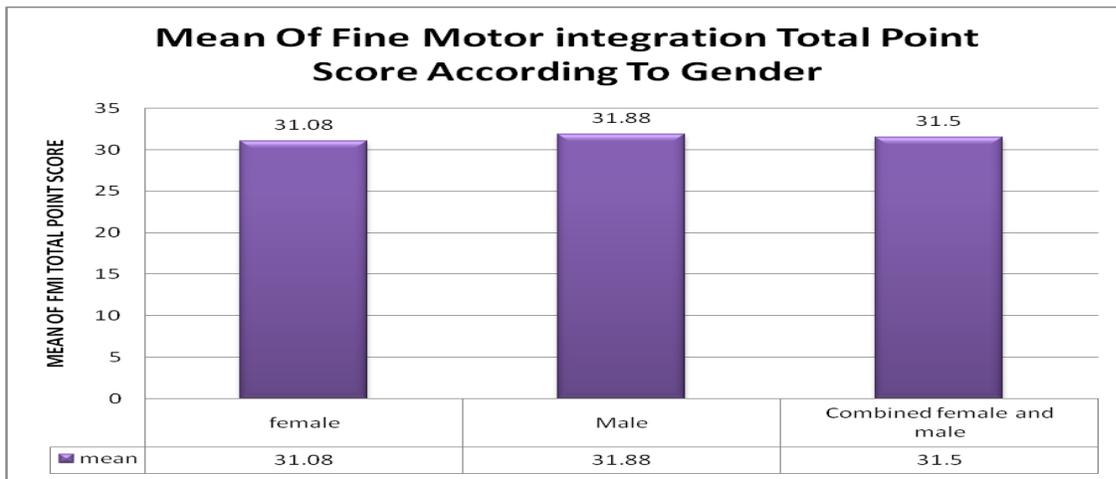


Fig 2: Mean and Standard deviation of FMI total point score among males and females

Interpretation: Graph 2 represents that, mean of fine motor integration point score is more in male i.e. 31.88 than female i.e.31.08.

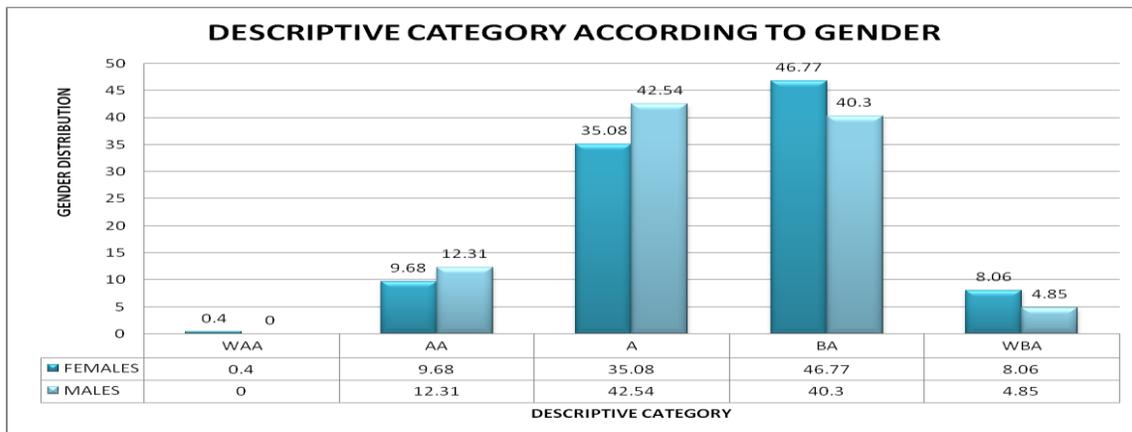


Fig 3: Descriptive category versus gender

Interpretation: Graph 3 represents that, more males fall in average and above average category than females and more females fall in below average and well below average category than males. 0.4% of the females fall in well above average category. Also number of females in well below average category is more than that of males.

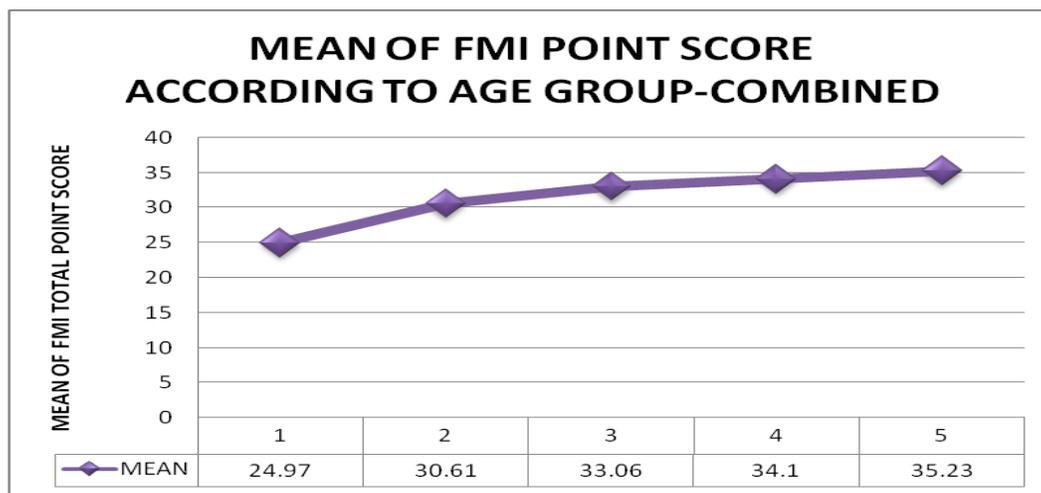


Fig 4: as the age group increases the mean of fine motor integration point score increases

Interpretation: The above graph represents that, as the age group increases the mean of fine motor integration point score increases.

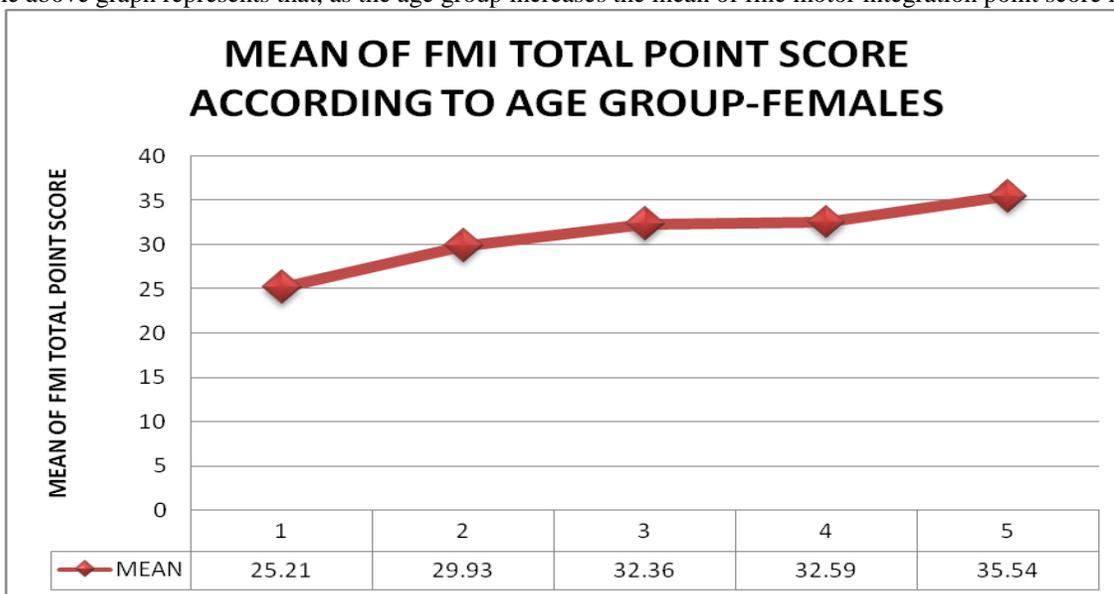


Fig 5: The above graph represents that, in female as age group increases, mean of fine motor integration point score increases

Interpretation: The above graph represents that, in female as age group increases, mean of fine motor integration point score increases.

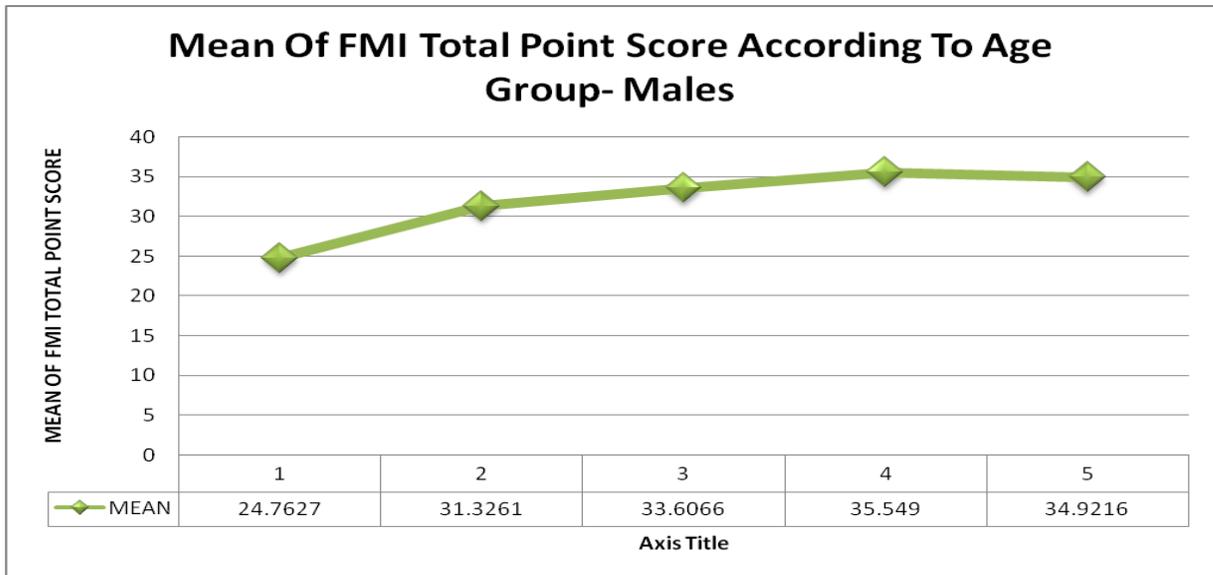


Fig 6: Graph 6 represents that as the age group increases the mean of point score of males also increases in linear pattern

Interpretation: Graph 6 represents that as the age group increases the mean of point score of males also increases in linear pattern.

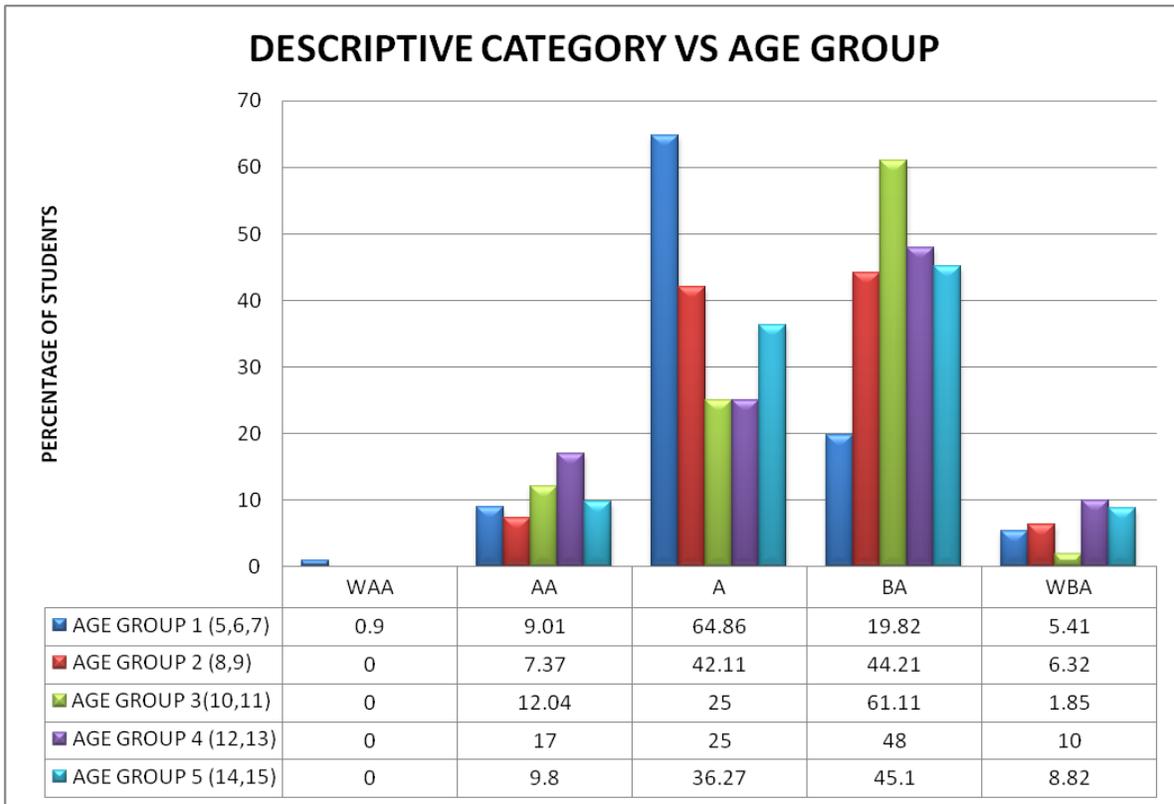


Fig 7: Descriptive category versus age group: Combined

Interpretation: The graph 7 represents 64.86% students of age group 1 lie in Average category, whereas 44.21%, 61.11%, 48% and 45.1% students of age group 2, 3, 4 and 5 respectively fall under Below Average category.

Discussion

The primary aim of the study was to assess the fine motor integration using Bruininks-Oseretsky Test Of Motor Proficiency, 2nd edition in 5 to 15 years of school going children. It consisted of 8 subtests for assessing fine motor integration. The total study population was 516 out of that 248 were males and 268 were females. The mean age of 5 years to 15 years 11 months was 10.67 years and standard deviation was 3.03. The mean age and standard deviation for males was 10.66 and 3.02 respectively and that for females was 10.69 and 3.04 respectively. In the study mean of point score was more in males i.e. 31.88 than females which was 31.08. Considering the descriptive category, more males fall under Above Average and average category and females fall under Well Below Average and Below Average category. Therefore, motor impairment is more in females than males as they fall more in below average and well below average category. Our result goes in accordance with the study done by Duger T, Bumin G, et al. in July 2009 which stated that there was significant difference in subtest 2 viz. fine motor integration; it was seen that fine motor skills in childhood showed variety between age, sex and academic learning. Another study done by Satabdi Ghosh, Sutanu Chowdhury, et al. in 2013 stated that nutritional status appear to be significant predictors for fine motor development. It may alter the learning process by influencing brain development and physical growth, and accordingly modify the movement proficiency of children by adjusting the strength, power, coordination and perception [3,6]. In this study we also found that, as age group increases total point score increases in males and females. This goes in accordance with the study done by Deurenberg et al. in 2005 which stated that motor development is the gradual process by which a child gains use and coordination of the large muscles of the legs, trunk and the smaller muscles of the hand. Neuromuscular development starts in embryonic stage and it continues after birth. Another study was done in 2009 by Wouter Cools et al. stated that at an early age, fine movement skills are necessary for the development of basic self-help skills. Drawing and writing are based on fine movement skill development. This is because as the age increases the neurological development occurs in the child and hand to eye coordination improves [2]. Further result shows the performance between different age groups. It says that by considering the norms given in the BOT-2 manual, more subjects from age group 1 i.e. 64.89% fall in average category and the number deteriorates as the age increases. Only 0.9% from age group 1 falls in Well Above Average category. There is no age group from 2 to 5 that fall under well above average. Likely, more subjects from age group 5 i.e. 8.82% fall in well below average category and the number decreases sometimes and even increases with age. Thus, more children from age group 5 have motor impairment than other age groups. This result is in contrast with point score result as the descriptive categories are allotted according to the scale score. Brenda N. Wilson et al. in their study said that, the use of subtest point score will result in a more precise

measurement of function, because gains or deterioration will be related to specific areas of motor control. In addition, score that have undergone statistical transformations will be less exact in their ability to detect real changes that occurred. Because these standard scores are age adjusted, progress will not be reflected in the test scores unless the progress is faster than typical maturation. Therapists should consider using the subtest point scores as a more accurate measure of change [5]. The study has outlined the limitation of not taking the socioeconomic status and Body Mass Index for nutritional status. Because studies have shown that socioeconomic status alters the motor performance of child. According to Özgür Mülazımoğlu-Ballı in his study stated that there were significant differences in the BOT-2 score and total score of different socioeconomic groups, in favor of high socioeconomic groups [7].

Conclusion

The conclusion to be drawn is fine motor integration is more in male children than female children. Also as the age increases the integration improves in both male children and female children.

Acknowledgement

Having surmounted all the difficulties and after reaching the shore by completing the work of this study, I am realizing the limitations of language and words while acknowledging thanks to all those who helped me in this voyage. I thank my mother Mrs. Meena Gondkar, my father Mr. Mahesh Gondkar & my sister Sakshi Gondkar for their moral support, prayers and encouragement that have been a pillar of strength throughout this work. I also thank Dr. D. Y. Patil University for giving us opportunity to carry this project work. Words are few and language seems feeble when the heart is full of gratitude, these few words cannot express my deep sense of gratitude to my esteemed Guide Dr. Mrs. Sanjivani Dhote, who has been a constant source of inspiration to me since the very beginning of this work. Her unsurpassable teaching experience & scientific approach has increased my interest and knowledge in the subject. It is only because of her constructive supervision and overall encouraging sympathetic attitude that my work has acquired the present shape. It is with deep sense of gratitude and sincerity that I thank Dr. Tushar Palekar, principal of Dr. D. Y. Patil College of Physiotherapy, Pimpri, Pune for helping me to successfully complete this study. From him I have tried to imbibe values, vast knowledge, experience and a high sense of professionalism. I am highly indebted to My Friends especially Mohammed Zaid, Prajakta Karambe, Antara Pande and Ashish Joseph for constantly supporting me and for bearing the brunt of this Herculean task.

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light of day. Lastly I would like to thank God for sending all these wonderful opportunities and giving me a chance to prove myself.-Diksha Gondkar.

Conflict of interest: We declare that we have no conflict of interest.

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Abbreviations, units, Etc

BOT-2 : Bruininks-Oseretsky Test Of Motor Proficiency

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