

Determining Balance Performances in Children Having Autism Spectrum Disorder

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ABSTRACT

BACKGROUND: Autism spectrum disorder is a behavior disorder that is usually characterized by communication and social deficits and presence of repetitive/ stereotyped behavior, however there is a complex interaction between ASD, sensory-motor integration and balance and gross motor skills which needs to be assessed systematically.

AIMS AND OBJECTIVE: To determine the balance performances in children with autism spectrum disorder

METHODOLOGY: 30 subjects were selected purposively from various pediatric clinics. Prior consent was taken from parents and M-chart was filled to assess the symptomatology of child and thereafter children falling into low and moderate ASD symptoms were further assessed using pediatric balance scale

OUTCOME MEASURE: Pediatric balance scale (PBS)

CONCLUSION: The results obtained showed that 86% of subjects with ASD had score ranging from 35-45 whereas 6.6% of subjects had score below 35 and only 6.6% of subjects with ASD had score more than 45 which thus indicates balance deficits in children with ASD

Key words: ASD, Autism, balance, PBS

INTRODUCTION

Childhood is recognized in as a period of vulnerability and progressive development toward adult personality and character and any sort of variations in children's behaviors reflect a blend of intrinsic biologic characteristics and the environments with which the children interact¹. Behavioral problems in childhood are very common and such behavioral disorders in children and adolescents are increasingly coming into focus as serious treatable conditions and as precursor of adult psychopathology.² Pervasive developmental disorders (PDD) refer to a group of disorders characterized by delays in the development of socialization and communication skills. Parents may note symptoms as early as

infancy, although the typical age of onset is before 3 years of age.³

Under DSM-IV, pervasive developmental disorder included four separate disorders:

1. Autistic disorder
2. Asperger's disorder
3. Childhood disintegrative disorder
4. Rett syndrome
5. Pervasive developmental disorder not otherwise specified (PDD-NOS).⁴

Amongst which, ASD is defined by the Diagnostic Statistical Manual of Mental Disorders 5 (DSM 5), as a neurobehavioral disorder manifested by persistent deficits in social and communication interaction, deficits in developing, understanding and maintaining relationships, as well as abnormal and fixed interests and repetitive

behavior. Symptoms must be present at early childhood and interfere with daily function.⁵

The prevalence of autistic disorder has increased in recent surveys and current estimates of prevalence are around 20/10,000 and also, ASD is 4–5 times more prevalent in males than in females. India is a populous country of nearly 1.3 billion people with children ≤ 15 years constituting nearly one-third of the population and it has been estimated that more than 2 million people might be affected with ASD in India.⁶

The main cause of ASD is genetic. However, in search for specific genes responsible for ASD it became obvious that there are numerous candidate genes on many chromosomes, and only rare cases of ASD can be related to specific genes. Thus, ASD seems to result from the interaction of genetic factors and the prenatal and postnatal environment.⁷

Any history of deficiencies in the following areas is an indication for an evaluation for ASD⁸:

1. Language development
2. Social interaction
3. Sensory integration

However, studies suggest that there are abnormalities in two major areas of sensory system that in turn are leading to such motor impairments which are (A) Poor integration of information (sensory inputs) which in turn can lead to inefficient motor planning and later motor execution. (B) There is an increased variability in sensory inputs as well as motor outputs.⁹

Autism spectrum disorder refers to a group of complex neurodevelopment disorders which are characterized by difficulties in social communication and interaction along with repetitive stereotypical behaviors²⁰, however in addition to these hallmark features, children with autism also consistently display motor deficits which displays clumsy gait, poor muscle tone, imbalance, as well as poor manual dexterity and coordination.⁹

Although sensory and motor impairments in Autism Spectrum Disorder (ASD) are not considered to be main features of autism, there is increasing studies which shows that they are highly prevalent and can also have a significant impact on quality of life and social behavior of a child.⁹

Motor deficits in autism include impairment in basic motor control which includes gait, tone, posture, coordination and balance but due to lack of research on the efficacy of motor examinations in diagnostic assessments of suspected ASD patients, it is an area that warrants further scrutiny by the scientific community there has not been a gold standard tool to examine and assess such motor impairments in children with autism spectrum disorder.¹⁰

Unfortunately, fundamental motor skills and physical activity are frequently neglected in fields such as psychology (Rosenbaum, 2005) and the motor skills of young children with ASD are habitually not a priority for early intervention teams who may focus primarily on communication and behavioral concerns.¹¹

Balance control is thought to be quite interesting from a cognitive science perspective since it involves a complex interplay between information processing, motor planning as well as timing and sequencing of muscle movements of which sensory processing is seemed to be affected in children with autism spectrum disorder due to varying reasons which are mentioned below.¹²

Functional Balance in children can be defined as the ability to maintain the centre of mass with respect to base of support during typical childhood activities of daily living and children with autism spectrum disorder have decreased postural stability and imbalance especially in circumstances where there is sensory conflict.¹¹

Sensory abnormalities have been long recognized as being associated with autism spectrum disorder (ASD) however they have never been considered necessary for diagnosis of autism spectrum disorder (ASD) nor its impacts have been

acknowledged in causing an underlying neurobiological abnormality.¹²

Thus, it is clearly evident that there is a very complex interaction between autism spectrum disorder symptomatology, sensory-motor integration, balance and development of gross motor skills which has not yet been studied systematically and clearly deserves attention.¹²

METHOD

This cross-sectional study was conducted using purposive sampling where the data was collected from various pediatric specialization hospitals, clinics, special schools. Children having 6-12 years of age and who were clinically diagnosed with Autism Spectrum Disorder were included in the study. Children falling under the low and moderate symptomatology of ASD (according to M-chart) were only included whereas children having severe symptoms of ASD were not included from the study. Prior consent was taken from their respective guardians and all their concerns and queries were respectfully answered. Total of 42 subjects were screened for the study however 12 of the subjects did not fit the inclusion criteria and thus were not

included in the study. Few other limitations like children who were not able to follow commands, who were dependent for their daily activities were also not included in the study.

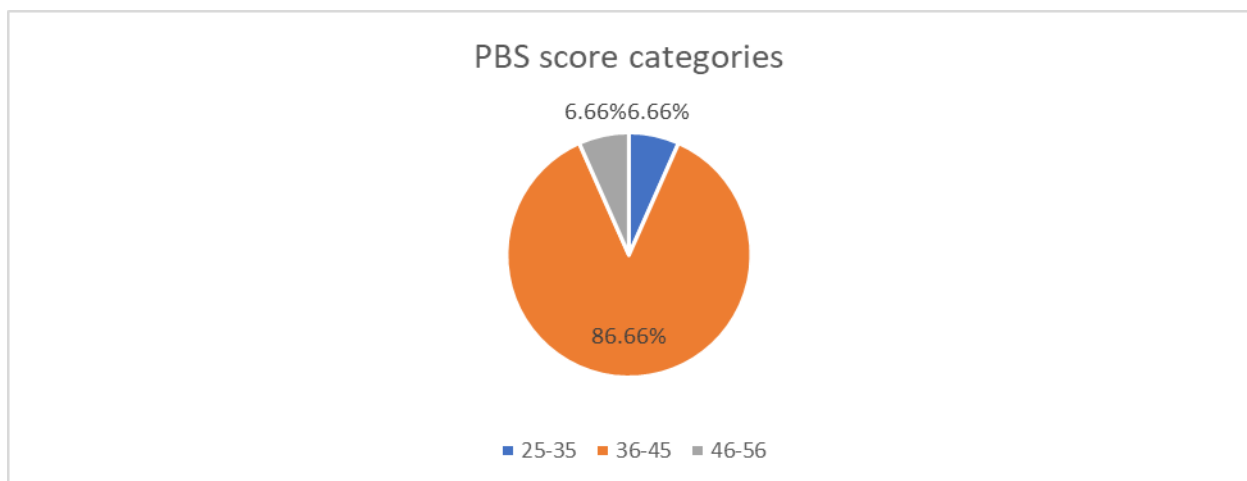
M-chart was used to segregate the children into low, moderate and severe symptomatology and later balance of children with low and moderate symptoms was tested using pediatric balance scale (PBS) which is a 14 component scale testing both static and dynamic balance and it has a reliability of 0.923.

Statistical Analysis

The reporting of balance performances of children with autism spectrum disorder, aged between 6-12 years was analyzed using simple % technique with 90% confidence interval. Statistical analysis was done using Microsoft excel 2010

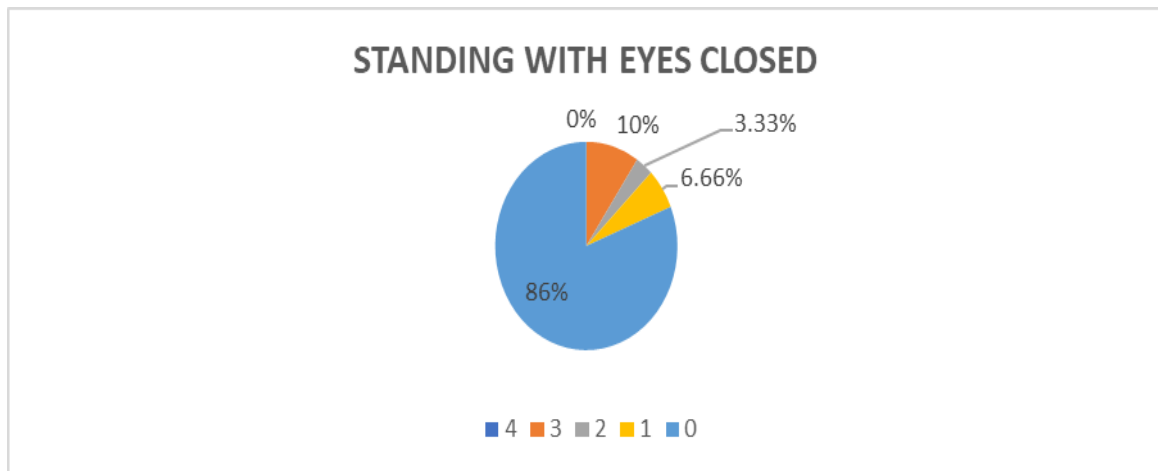
RESULTS

The total scoring of PBS of 56 was divided into 3 categories that is scores ranging from 25-35, 36-45 and 46-56. Analysis shows that 86.66% of children fell into the category of 36-45 score

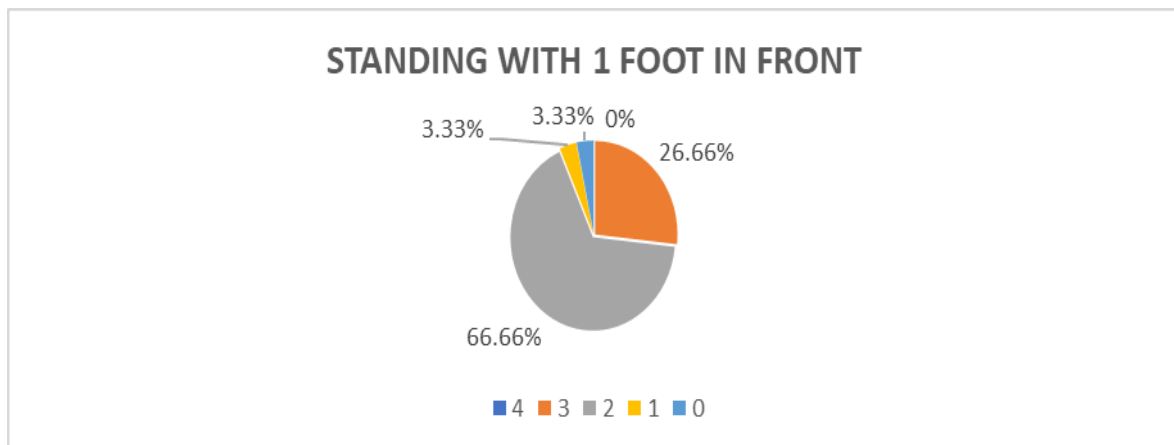


Out of 14 components of PBS, there were 4 components which showed greater affection as compared to other components.

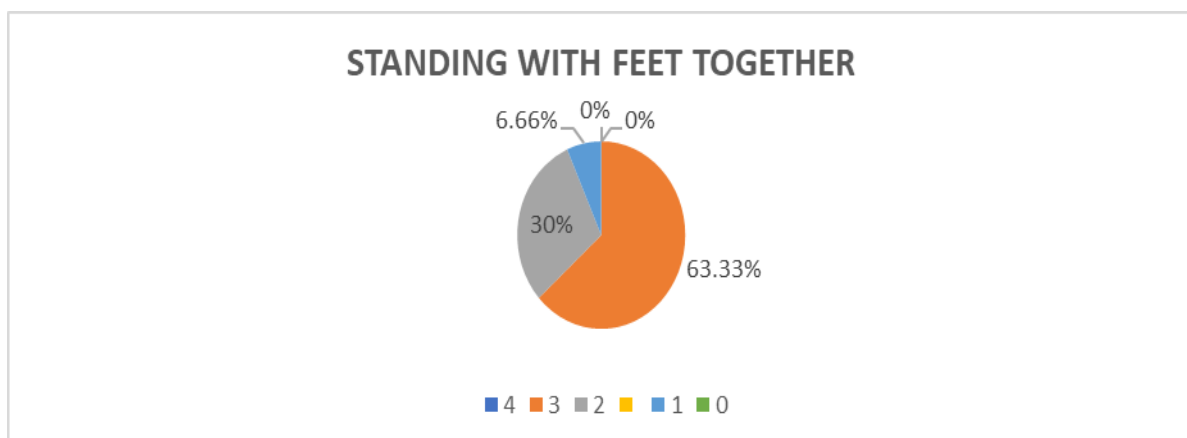
For the test, standing with eyes closed 86% of children having ASD showed grade 0 which means that they were not even able to attain the position.



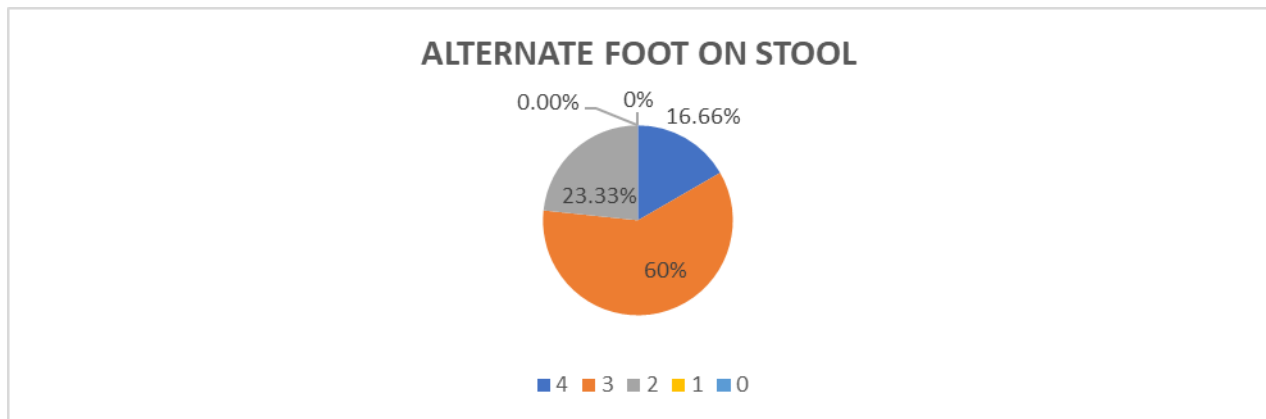
For the test, standing with one feet in front of the other 66.66% of children showed grade 2 which means that they took relatively smaller steps and were able to maintain the position for roughly around 30 seconds



For the test, standing with feet together, 30% of children showed grade 2 which means that they were able to attain the position but not able to sustain the position.



For the test, placing alternate foot on the stool, 23.33% of children showed grade 2 which means that children having ASD could take 4 steps on the stool and they did not require assistance but did require supervision.



DISCUSSION

The current study was conducted to evaluate the balance performances in children having autism spectrum disorder and one such study done by Stins J. et al supports the results as they have said that circuits in the brain linking perceptual information and action is not fully developed, leading to “disembodied” pathways for information processing and this relative lack of embodiment manifests itself in phenomena such as balance problems in ASD¹¹

Similar study conducted by Downey R et al in their study concluded that children with ASD rely on visual inputs more than any other sensory inputs which can be correlated to 86% of children having ASD who showed grade 0 on standing with eyes closed component.¹²

Another similar study done by Cheldavi H. et al concluded that that amount of postural sways often increases during upright stance when vision is restricted due to poor integration of vestibular, somatosensory and visual inputs.¹³

Various reasons enumerated by Gowen E. et al in their study which can be the possible cause of balance affection in children with ASD are firstly, simple sensory inputs seems to be same but higher order sensory processing is abnormal. Secondly, integration of different senses happens at different pace which further leads to abnormality and also overreliance on one of the sensory systems¹⁴

CONCLUSION

The current study thus concludes that the children having autism spectrum disorder (ASD) shows balance deficits when assessed using pediatric balance scale (PBS). Both static and dynamic balance seems to be affected at varying levels and the study can thus support an emerging insight that ASD not only affects communication, cognition, mood or behavior but also affects static and dynamic balance

There are various limitations of the study first one being that although the age group selected was 6-12 years the subjects obtained were mainly 6-8 years as children more than 8 years fell under severe symptoms category according to M-chart. Secondly, symptomatology of ASD was assessed using parent reported M-chart. Thirdly, the results cannot be generalized for all children having ASD as subjects which had severe symptoms (M-chart) were not included in the study

Further research could be conducted to test various reasoning suggested in the current study, it would be helpful to examine the sensory input and motor output variability in more detail to conclude the exact system affection. Future research should also examine the exact role of sensory input noises on motor abilities in autistic children and also the link between the two. A useful future approach should be to explore the weighting of vision, proprioception and vestibular systems on sensory inputs and how it impacts the motor execution. Further work can be done using kinematic analysis,

useful in identifying the route and nature of motor difficulties in children with autism.

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Ethical Approval: Approved

REFERENCES

1. Datta P. et al. The prevalence of behavioral disorders among children under parental care and out of parental care. A comparative study in India. *International journal of pediatrics and adolescents medicine* 2018 (5) 145-151.
2. Salwa SH. Et al. Emotional and behavioral problems among school children. *International journal of development research*. 2014 4(5) 974-978.
3. Pervasive development disorders. *National institute of neurological stroke and disorders* 2021
4. Chill S. et al. Pervasive development disorders. *Medscape* 2018 1-15
5. Ovnoy A., Weinstein F et al. Prenatal factors associated with autism spectrum disorders. *Elsevier* 2015
6. Fombonne E. Epidemiology of pervasive development disorders. *International pediatric research foundation* 2009 65(6)
7. Tchaconas A, Adesman A. Autism spectrum disorders: A pediatric overview and update. *Curr opin pediatr* 2013 25:130-44
8. The American Psychaitry Association. *Diagnostic and statistical manual of meantal disorders (DSM 5)*. Washington DC: The American psychiatry publishing 2019 9-50
9. Landa RJ, Gross AL. Developmental trajectories in children with/without ASD: First 3 years. *Child Dev* 2013 84:429-42
10. Lloyd M, Macdonald M et al. Motor skills of toddlers with ASD. *National institute of health* 2013 17(2):133-146
11. Stins J, Emck C. Balance performance in autism: A brief overview. *Journal Frontiers in Psychology* 2018 2-10
12. Downey R, Jane M. Motor activities in children with autism: A review of current literature. *Pediatr phys ther* 2012 24:2-20
13. Cheldavi H. et al. The effects of balance training interventions on postural control of children with autism spectrum disorder: Role of sensory information. *Research in ASD* 2018 8:8-14
14. Gown H, Hamilton A. Motor abilities in autism: A review using computational context. *J Dev Disorder* 2012

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