Med. J. Cairo Univ., Vol. 87, No. 2, March: 953-957, 2019
www.medicaljournalofcairouniversity.net

Correlation between Functional Capacity and Autistic Features for Children with Autism Spectrum Disorder

HADEER A. ABD EL-KHALIK, M.Sc.*; EMAN I. EL-HADIDY, Ph.D.**;
SAMIA A. ABD EL-RAHMAN, Ph.D.** and KAMILIA S. ABD EL-HAMID, Ph.D.***

The Department of Physical Therapy, Mattaria Teaching Hospital, The Departments of Physical Therapy for Pediatrics, Faculty of Physical Therapy** and Psychology, Faculty of Art***, Cairo University*

Abstract

Background: Autism spectrum disorder is a life-long neuro-developmental condition interfering with the person's ability to communicate and relate to others. Autistic features are stereotype behavior, deficits in social interaction and communication.

Aim of Study: To examine the relation between the autistic features and the functional capacity in children with autism spectrum disorder.

Patients and Methods: 30 children with autism spectrum disorder aged from 5 to 8 years old were recruited from the Pediatric Clinic of El-Mattaria Teaching Hospital in Mattaria, Cairo. Their autism index ranged from mild to moderate according to the Arabic version of the Gilliam Autism Rating Scale. Autistic features were assessed by Arabic version of the Gilliam Autism Rating Scale while the functional capacity was assessed by the six-minute walk test.

Results: There was no relation between the autistic features and the functional capacity of all participated children.

Conclusion: Autistic features did not affect the functional capacity in children with autism spectrum disorder.

Key Words: *Autism Spectrum Disorder – Autistic features – Gilliam autism rating scale – Functional capacity – Six-minute walk test.*

Introduction

AUTISM Spectrum Disorder (ASD) is a life-long neuro-developmental condition interfering with the person's ability to communicate and relate to others [1,2]. According to the American Psychiatric Association [3], the autistic features include difficulty with social interaction, delayed or limited development of communication skills, and restrictive patterns of behavior or interests. Stereotype behavior is a frequent mechanical repetition of the same posture, movement or form of speech [4]. Features of autism vary from mild to profound [5].

Individuals with ASD may also experience delays or deficits in the development of motor behaviors [6,7]. Impairments in motor development observed in children with ASDs included motor stereotypies such as hand and finger mannerisms, body rocking, and arm flapping, early motor delays, gait abnormalities like stiffer gait, difficulties maintaining a straight line while walking, difficulties with gross and fine motor coordination, postural control especially when somatosensory input was disrupted [8].

Physical activity levels in children with ASD were significantly lower compared with their peers who were developing typically [9]. It was hypothesized that a lack of motor-skill proficiency in children with autism may result in withdrawal from active play, so opportunities to engage in social and communication-based interactions may be greatly reduced, thus limiting opportunities to practice and improve on areas of development (social, communication, and behavioral skills) that are already delayed [10].

Gilliam Autism Rating Scale (GARS) is considered as a standardized instrument for the evaluation and diagnosis of autism. Age ranges between 3-22 years [11]. The internal consistency of each subscale, as well as the whole test, was determined via Cronbanch's co-efficient alpha revealed that each subtest as well as the total autism index were highly consistent and thus sufficient for the diagnosis of autism. Concurrent validity was analyzed by GARS with Autism Behavior Checklist (ABC). The subscales on GARS were matched to five subtests on ABC Correlations on matched subtest

Correspondence to: Dr. Hadeer A. Abd El-Khalik,
The Department of Physical Therapy, Mattaria Teaching Hospital

pairing and on total scores were all significant. All matched subtests had correlations that were large to very large. Moderate to strong correlations were evident and range 0.56 for social interaction (GARS) and social and self-help (ABC) to a high of 0.78 for stereotyped behaviors (GARS) and body/object use (ABC). The test also revealed that individuals with autism scored significantly higher than did individuals in the control group suggesting that GARS had a high discriminative ability. It was created with a set of norms based on 1,107 children and young adults between 3-22 years old [12].

Test-retest reliability is indicated a significant and high in magnitude correlations for: Stereotyped behavior, r (18)=.97, p=.01; communication, r (18) =0.97, p=0.01; and social interaction, r (18)=.95, p=.01 . Internal consistency reliability indicated that split-half coefficient is 89. These results indicate a relatively high internal consistency. Pearson correlation between the final diagnosis made by the GARS-2 and the final diagnosis made by the ABC was highly significant, r (48)=.90, p=.05. It was created with set of norms based on 100 children aged between 3- 13 years old [13].

Functional capacity evaluation is an important systematic method that measures an individual's ability to fulfill essential tasks mostly needed in daily living that require sustained aerobic metabolism. It provides diagnostic and prognostic information in the majority of research and clinical practice [14].

The most popular clinical exercise testing are stair climbing, six-minute walk test, shuttle walk test, cardiac stress test and cardiopulmonary test [15].

Six-minute walk test assesses the sub-maximal level of functional capacity. It reflects the functional exercise level for daily physical activities [15]. Several studies used six-minute walk test to evaluate functional capacity in children with ASD [16,17].

Therefore, the purpose of this study was to determine the relation between the autistic features and functional capacity in children with ASD.

Patients and Methods

Subjects:

Thirty children (25 boys and 5 girls) diagnosed with ASD participated in this study. They were selected as a convenience sample from the Pediatric Clinic of El-Mattaria Teaching Hospital, Cairo-Egypt. The duration of this study was 10 months from November 2016 to August 2017.

Inclusive criteria:

According to the following criteria A) Children diagnosed as ASD; B) Their ages ranged from 5 to 8 years; C) They suffered from mild to moderate autistic features according to the Arabic version of GARS, second edition.

Exclusive criteria:

Children were excluded if they had: (A) History of cardiac or respiratory diseases, infection, fever, epilepsy or psychiatric disorder; (B) Visual or auditory defects and/or (C) Any deformities in lower extremities.

Instruments and tools:

1- The Arabic version of GARS, second edition, was used for selection of participants and evaluation of the autistic features.

2- Six-minute walk test was used to evaluate the functional capacity.

Procedures:

A non-experimental research was applied to determine the relation between the autistic features and functional capacity in the children with ASD. Approval from the Ethical Committee of the Faculty of Physical Therapy, Cairo University as well as from the Pediatric Clinic of El-Mattaria Teaching Hospital was obtained and the consent forms were obtained from the parents or guardians after explanation of the procedures in details. Children were examined by the researcher for the inclusion and exclusion criteria. Each eligible child (according to the consent form and examination) participated in the study.

Evaluation of the autistic features including stereotype behavior, social interaction and communication was performed for each child by the Arabic version of the GARS. Items on the first three behavioral subscales are rated on a four point like scale ranging from Never Observed (0) to Frequently Observed (3). Items on the developmental subscale address behaviors and milestones in the first 36 months of life. After completing it, the examiner calculated the total raw scores then converted into scaled scores and percentile ranks according to the examiner's manual. Higher scaled scores on a subscale represent severe autistic behavior. Finally, the total scaled scores were calculated to measure the autism index according to the examiner's manual. The higher the autism index, the higher the

probability the individual has autism and the more severe the autistic behavior [18].

Six-minute walk test was used for evaluation of functional capacity. Children performed it in a corridor of 30 meters long in the pediatric physical therapy clinic while wearing comfortable clothes and shoes for walking. A light meal was acceptable before it. They were not allowed to do vigorous exercises within 2 hours of the beginning of it. The child sat in a chair at the starting point then was asked to stand and walk then the timer started. Each time the child returns to the starting point, the examiner clicks the lap encounter once and telling the child 'you are doing well' each minute in an even tone. If the child stops walking during the test, he could lean against the wall then continue walking whenever he feels able and not stopping the timer. If the child refuses to continue before 6 minutes, the examiner discontinues the test and the distance, time stopped and the reason for stopping it prematurely. The outcome of the test is the 6-minute walk distance (6 MWD) [19].

Statistical analysis:

Statistical Package for Social Sciences (SPSS) computer program (Version 19 windows) was used for data analysis. Descriptive statistical analysis was performed for age. Correlation between the 6 MWD and stereotype behavior, communication, social interaction and autism index for all children was performed using Spearman's rho correlation coefficient. p-value ≤ 0.05 was considered significant.

Results

The mean and standard deviation of age of 30 children was 6.193 ± 0.9794 years. The results revealed no statistical significant correlation between 6 MWD and stereotype behavior (r=–0.228 and p=0.226), communication (r=–0. 112 and p=0.554), social interaction (r=–0.053 and p=0.781) and autism index (r=–0. 150 and p=0.429) measured pre-treatment for all patients (n=30) (Table 1).

Table (1): Correlation between six-minute walk distance and autistic features.

Autistic features	Six-minute walk distance	
	Correlation coefficient	p-value
Stereotype behavior	–0.228	0.226 (NS)
Communication	–0.112	0.554 (NS)
Social interaction	–0.053	0.781 (NS)
Autism index	–0.150	0.429 (NS)

NS: Non-Significant.

Discussion

The results of the present study showed no correlation between stereotype behavior and the 6 MWD which agree with Stevenson et al., [20] reported that there were no significant difference in movement patterns including step time, stride length and step length during Self-Selected Velocity test (SSV) using the GAITRite instrumented walkway (which is a plantar pressure mat system used to collect data with total length of the walkway was 4.88m and mobility lab sensors attached to bilateral wrist, ankles, chest, and waist) between children with ASD and those of typically developing children aged from four to eight years old.

The results of the present study showed no correlation between stereotype behavior and the 6 MWD which disagree with MacDonald et al., [21] who studied the relationship of motor skills and adaptive behavior skills in young children with ASD. A total of 233 young children with ASD (n=172), pervasive developmental disorder-not otherwise specified (PDD-NOS) (n=22) and non-ASD (developmental delay, n=39) between the ages of 14-49 months were recruited. Children with weaker motor skills displayed greater deficits in adaptive behavior skills. The motor skills of young children with ASD are related to their adaptive behavior, daily living skills and adaptive social and communicative skills.

MacDonald et al., [22] studied the relationship between motor skills and social communicative skills in school-aged children with ASD. A total of 35 children with ASD between the ages of 6-15 years participated. Children with weaker motor skills have greater social communicative skill deficits. Object-control motor skills significantly predicted calibrated ASD severity but the locomotor subscale did not predict calibrated ASD severity. While neither of them predicted social skills.

The results of the present study showed no correlation between autism index and the 6 MWD which disagree with the study performed by MacDonald et al., [23] who studied the relationship of motor skills and calibrated autism severity inyoung children with ASD. A total of 159 young children with a diagnosis of ASD (n=110), pervasive developmental disorder-not otherwise specified (PDD-NOS) (n=26), and non-ASD (n=23) between the ages of 14-33 months participated. Their results indicated that gross motor skills were related to calibrated autism severity. The final model indicated

that children with lower gross and fine motor skills had a higher calibrated autism severity.

The non-correlation between functional capacity and autistic features might be due to the early intervention that may alleviate these symptoms from affecting the functional capacity of those children.

Conclusion:

There was no relation between functional capacity and autistic features in that sample. It would be beneficial for future research to include a randomized design with a larger sample.

References

1- AMARAL D.G., SCHUMANN C.M. and NORDAHL C.W.: Neuroanatomy of autism. Trends in Neurosciences, 31: 137-45, 2008.

2- FOMBONNE E., QUIRKE S. and HAGEN A.: Epidemiology of pervasive developmental disorders. In D.G. Amaral, G. Dawson, & D.H. Geschwind (Eds.), Autism spectrum disorders Oxford: Oxford University Press, 2011.

3- American Psychiatric Association: Diagnostic and statistical manual of mental disorders. Fifth edition. Washington, DC: American Psychiatric Association, 2013.

4- MAYS M.N.: Using antecedent aerobic exercise to decrease stereotypic behavior in children with autism. Department of Educational Psychology, Special Education and communication Disorder, Dissertation, Georgia State University, 2013.

5- JIN J.: Screening for Autism Spectrum Disorder. Journal of American Medical Association, 315: 718, 2016.

6- GREEN D., CHARMAN T., PICKLES A., CHANDLER S., LOUCAS T., SIMONOFF E. and BAIRD G.: Impairment in movement skills of children with autistic spectrum disorders. Developmental Medicine and Child Neurology, 51: 311-6, 2008.

7- OZONOFF S., YOUNG GS., GOLDRING S., GREISS-HESS L., HERRA A.M., STEELE J., MACARI S., HEPBURN S. and ROGERS S.J.: Gross motor development, movement abnormalities, and early identification of autism. Journal of Autism and Developmental Disabilities, 38: 644-56, 2008.

8- McCLEERY J., ELLIOTT N., SAMPANIS D. and STEFANIDOU C.: Motor development and motor resonance difficulties in autism: Relevance to early intervention for language and communication skills. Frontiers in Integrative Neuroscience,7: 30-51, 2013.

9- SRINIVASAN S.M., PESCATELLO L.S. and BHAT A.N.: Current perspectives on physical activity and exercise recommendations for children and adolescents with autism spectrum disorder. Journal of American Physical Therapy Association, 94: 875-89, 2014.

10- BREMER E. and LIYOD M.: School-based fundamental-motor-skill intervention for children with autism-like characteristics: An exploratorystudy. Adapted Physical Activity Quarterly, 33: 66-88, 2016.

11- HUSSEIN H., TAHA G.R. and ALMANAESF A.: Characteristics of autism spectrum disorder in a sample of Egyptian and Saudi patients: Transcultural cross sectional study. Child and AdolescentPsychiatry and Mental Health, 5: 34-46, 2011.

12- MONTGOMERY J.M., NEWTON B. and SMITH C.: Review of GARS-2: Gilliam Autism Rating Scale-second edition. Journal of Psycheducational Assessment, 26: 395-401, 2008.

13- AL-JABERY M.: The examination of validity and reliability indicators of the Jordanian translated Arabic Version of The Gilliam Autism Rating Scale (GARS-2), Wayne State University. ProQuest Dissertations Publishing: 104-25, 2008.

14- TOMRUK M., KARADIBAK D., YAVUZŞEN T. and AKMAN T.: Predictors of functional capacity in colorectal cancer patients. Support Care Cancer, 23: 2747-54, 2015.

15- ABD EL-RAHMAN S.A. and ALNEGIMSHI A.A.: Normative values of six minute walk distance for healthy Saudi girls. World Applied Sciences Journal, 32: 1721-30, 2014.

16- HINCKSON E., DICKINSON A., WATER T., SANDS M. and PENMAN L.: Physical activity, dietary habits and overall health in overweight and obese children and youth with intellectual disability or autism. Research in Developmental Disabilities, 34: 1170-8, 2013.

17- GUERRA-BALIC M., OVIEDO G., JAVIERR C., FORTUN J., BARNET-LOPEZ S., NIN O., ALAMO J. and FERNHALL B.: Reliability and validity of the 6-min walk test in adults and seniors with intellectual disabilities. Research in Developmental Disabilities, 47: 144-53, 2015.

18- GILLIAM J.E.: Gilliam Autism Rating Scale, Third Edition, Examiner's Manual. Austin, TX; PRO-ED, 2014.

19- American Thoracic Society: ATS statement: Guideline for the six-minute walk test. American Journal of Respiratory and Critical Care Medicine, 166: 111-7, 2002.

20- STEVENSON P., NOVOTNY S., MAY J. and ANCELL C.: Comparing Functional Motor Control and Gait Parameters in Children with Autism to those of Age-Matched Peers who are Typically Developing. UNLV Theses, Dissertations, Professional Papers, and Capstones, 2319, 2015.

21- MacDONALD M., LORD C. and ULRICH D.: The relationship of motor skills and adaptive behavior skills in young children with autism spectrum disorders. Research in Autism Spectrum Disorders, 7: 1383-90, 2013A.

22- MacDONALD M., LORD C. and ULRICH D.: The relationship of motor skills and social communicative skills in school-aged children with autism spectrum disorder. Adapted Physical Activity Quarterly, 30: 271-82, 2013B.

23- MacDONALD M., LORD C. and ULRICH D.: Motor skills and calibrated autism severity in young children with autism spectrum disorder. Adapted Physical Activity Quarterly, 31: 95-105, 2014.

تآثير التمرينات الهوائية على سمات التوحد فى الآطفال المصابين بالتوحد

مقدمة: إضطراب التوحد هو حالة عصبية تنموية تستمر طوال الحياة تآثر فى قدرة الشخص على التواصل مع الآخرين حيث آن سمات التوحد عبارة عن السلوكيات النمطية ومشاكل فى التواصل والتفاعل الإجتماعى.

\الآهداف: التحقق من وجود علاقة بين سمات التوحد والقدرة الوظيفية لدى الآطفال المصابون بالتوحد.

\الطرق والآساليب: آجريت الدراسة على ٣٠ طفلا مصابون بإضطراب التوحد ممن تتراوح آعمارهم من ٥ إلى ٨ سنوات، تم إختيارهم من عيادة طب الآطفال بمستشفى المطرية التعليمى حيث تراوح مؤشر التوحد لديهم من خفيفة إلى متوسطة وفقا للنسخة العربية من مقياس تقييم جيليام للتوحد. تم تقييم سمات التوحد عن طريق النسخة العربية من مقياس تقييم جيليام للتوحد فى حين تم القدرة بإستخدام إختبار المشى لمدة ٦ دقائق.

\النتائج: كشفت النتائج عدم وجود علاقة بين سمات التوحد والقدرة الوظيفية لجميع الآطفال المشاركين.

\الإستنتاج: إن سمات التوحد لم تؤثر على القدرة الوظيفية للآطفال المصابون بإضطراب التوحد.