

The Association Between Motor Proficiency and Performing Recreational and Leisure Activities in School for Children with Autism Spectrum Disorder

Mahsa Kheirollahzadeh¹, Mehdi Alizadeh Zarei^{1*}, Malek Amini¹, Faezeh Dehghan Tarzjani²

1. Department of Occupational Therapy, School of Rehabilitation, Iran University of Medical Sciences, Tehran, Iran

2. Department of Neuroscience, School of New Technologies, Iran University of Medical Sciences, Tehran, Iran

Article Info

Received: 2018/01/17

Accepted: 2018/03/15

Published Online: 2018/10/29

DOI:

10.30699/fdisj.01.2.1

How to Cite This Article

Kheirollahzadeh M, Alizadeh Zarei M, Amini M, Dehghan Tarzjani F. The Association Between Motor Proficiency and Performing Recreational and Leisure Activities in School for Children with Autism Spectrum Disorder. *Function and Disability Journal*. 2018 (spring). Vol 1.No2 Pages: 1-8.

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ABSTRACT

Background and Objectives: Performing recreational and leisure activities are an important part of children's school function, including children with autism spectrum disorder (ASD). The purpose of this study was to examine the association between motor proficiency, performing recreational, and leisure activities in school for the children with autism spectrum disorder.

Methods: In this cross-sectional study, 52 students with autism spectrum disorder aged 7-12 years old were selected by available sampling method and the students with co morbidity were excluded from the study. Data were collected using a school function assessment (SFA) and the Bruininks-Oseretsky test of motor proficiency-Second Edition (BOTMP-2).

Results: The results of Pearson correlation coefficient showed that there was a significant positive linear relationship with moderate strength between performing recreational and leisure activities and components of motor proficiency, including gross motor skills ($P = 0.001$, $r = 0.41$), upper limb coordination ($P = 0.000$, $r = 0.44$), and fine motor skills ($P = 0.00$, $r = 0.58$). Also, the results of multiple linear regression model indicated that only the fine motor skills as one of the components of motor proficiency had the ability to predict performing recreational and leisure activities ($\beta = 0.5$, $P = 0.002$).

Conclusion: The results of this study revealed that there was a relationship between performing recreational, leisure activities, and motor proficiency and the highest correlation was observed with fine motor skills, upper limb coordination, and gross motor skills, respectively. Also, fine motor skills had a moderate predictive ability. Thus, in order to improve student's function in their school, perceptual motor interventions would be an important part of their treatment program.

Keywords: Recreational, Leisure activities, Motor skills, Activities of daily living, Autism Spectrum Disorder (ASD) Autism Spectrum Disorder (ASD)

Corresponding information:

Mehdi Alizadeh Zarei, Department of Occupational Therapy, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran. Email: mehdii.alizadeh@yahoo.com Tel;+98-2122228051

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Introduction

Performing recreational and leisure activities is considered as one of the areas of participation in the international classification of function, disability and health (ICF). In the ICF, recreation is defined as common activities such as games, sports, theater, arts and tourism. Participation in recreational and leisure activities is essential for the health and development of the children. The participation of children in appropriate recreations

is very effective on their physical and mental health. Some studies have shown the impact of recreational and leisure activities on the reduction of behavioral and emotional problems in children (Potvin M et al., 2013).

Promoting performance of the recreation and leisure activities in children with disabilities is also important (Murphy & Carbone, 2008). Recreational and leisure activity is one of the subject are as listed in

the special education program for individuals with disabilities and should be a part of the individualized education program (IEP) for the students with special needs (Schultheis S, Boswell B, and Decker J 2016). Prevention of recreational and leisure activities will deprive children with disabilities of the opportunity for physical and psychosocial experiences. As a result, they will be deprived of the development of basic movement patterns, psychomotor competency, psychosocial awareness, learning, joining the community, and fitness (Schleien S et al., 1987).

Performing recreational and leisure activities in children with autism spectrum disorder (ASD) is very limited and leads to reduction in satisfaction and quality of life (Law M et al., 2006). In their retrospective study, Billstedt et al (2011) showed that participation in recreational and leisure activities is the most effective factor in the quality of life from the viewpoint of adolescents and adults with autism (Billstedt E, Gillberg C, and Gillberg C, 2011). According to Potvin et al, the recreations of children with ASD differed from peers in terms of social aspects, diversity, and locations, but did not differ in terms of tendency to recreation and enjoying (Potvin M et al. 2013). Some studies have examined the reasons of restraint in performing recreational and leisure activities in children with ASD. The factors such as communication disorders, social deficits, stereotyped behaviors, motor skills and non-adaptive behaviors have been suggested as barriers to the participation in recreation (Potvin M et al., 2013).

The motor activity limitations in children with ASD will deprive them of the opportunity to interact and learn (Downey R and Rapport M, 2012; Staples K and Reid G, 2010). The greater the severity of autism disorder is, the weaker the motor skills are. This lessens the level of participation and enjoyment of recreational and leisure activities (majnemer A et al. 2008; Eversole M et al., 2015). According to the study conducted by Must et al, more than 60% of the children with ASD had difficulty in performing motor activities and needed to be monitored (Must A et al., 2015). The study by Pan et al. showed a marked difference in performing motor activities in school between

children with ASD and their peers (Pan CH, 2008). It seems that the study of limiting factors of recreational and leisure activities in children with ASD have been neglected despite their important role in the quality of life, development and learning (Potvin M, Prelock P, and Snider L, 2008). Therefore, in this study, the association between motor proficiency and performing recreational and leisure activities was examined, which has not been adequately addressed so far.

Materials and Methods

Participants

The participants were 52 students aged 7 -12 years old with diagnosis of ASD in high functioning level. The inclusion criteria were: the diagnosis of ASD by the Gilliam Autism Rating Scale-2 (GARS-2) or diagnosis confirmed by a child psychiatrist, lack of co morbid psychiatric disorders such as attention deficit hyperactivity disorder (ADHD), anxiety, and depression based on the child symptom inventory -4 (CSI-4), the age between 7 and 12 years, and studying at special schools for autistic children.

Procedure

The present study was a comparative cross-sectional study. The research project was approved and a certificate in ethics (ID number: IR.IUMS.REC1395.9411255002) was issued by Iran University of Medical Sciences. Then, three schools specifically for the autistic children; Peyk-e-honar, Beshaarat and payambar-e-azam, were visited in the three districts of Tehran. With the cooperation of the schools principals and by referring to the data files, the students who were matched to inclusion in term of age were selected. The parents of the students were invited to participate in the study. They received a written consent form for the participation in the research, CSI-4, ASSQ and GARS questionnaire to fill out. The parents were asked to complete the questionnaires and return them to the school principal within 3 days. During this time, the researcher was available to answer any question through telephone calls. After assessing the completed CSI-4, ASSQ and GARS questionnaire, 67 students were subjected to ASD diagnosis with high functioning level,

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and 15 of them were excluded from the study because of the ADHD co morbidity. Eventually, 52 children were included in the study. The Bruininks-Oseretsky test of motor proficiency (BOTMP-2) was conducted in a room of the school by maintaining the standards of the test regarding the space and appropriate ventilation. The researcher for four students per day performed the motor test. Initially, subtests of gross motors were assessed. If the child had enough attention to continue the test. The subtests of fine motors and coordination would also be evaluated. Otherwise, the continuation of the test would be postponed to another day.

Measurement tools

1. **School Function Assessment (SFA):** Coster et al. in the United States developed SFA in 1998. The validity and reliability of this test have generally been verified. Moreover, they have been proven in the Iranian context as well. The Cronbach's alpha coefficient for the different parts of this tool was excellent ($0.84 < \alpha < 0.99$). The test-retest reliability of the test was good for the subtest of this tool ($0.85 < ICC < 0.99$) (Ghorbani Kouhbanani N et al. 2018), (Shojaee M et al. 2017). This tool is deemed as a comprehensive assessment tool for evaluating the function and participation of preschool students up to the sixth grade. The time required to complete the form is 45 minutes to 1 hour. The SFA includes 320 items categorized into three sections as follows: participation, task support, and activity performance. In the section related to the activity performance, the therapist can evaluate the students' participation in usual recreational activities occurring in school through 11 questions. Teachers, occupational therapists, speech and language pathologists, physiotherapists, teachers, and other support staff can complete the items. Each aforementioned group can answer the relevant items to them (Coster W et al 1998).
2. **The Bruininks-Oseretsky test of motor proficiency - Second Edition (BOTMP-2):** This is a norm-referenced test designed to assess mo-

tor function of the children aged from 4 years 6 months to 14 years 6 months. The Complete Form of the BOTMP consists of 46 items, which are divided into eight subtests, and the BOTMP Short Form comprises a subset of 14 items of the BOTMP Complete Form and provides a brief survey of general motor proficiency. Bruininks (1987) has provided this test by modifying Oseretsky test of motor proficiency. Test-retest reliability was 0.87 and its validity was 0.84. Performing the Complete Form of the BOTMP requires approximately 45 to 60 minutes and the BOTMP Short Form takes about 15 to 20 minutes. Each of the 8 subtests is designed to measure a specific aspect of motor development. Four of the subtests measure gross motor skills, one of the subtests assesses the motor coordination, and three of them evaluate fine motor skills (Bruininks RH 1978).

3. **The Gilliam Autism Rating Scale –Second Edition (GARS-2):** The Gilliam Autism Rating Scale (Gilliam, 1995) is a tool for the diagnosis and screening of autism for individuals between the ages of 3 and 22. The GARS-2 consists of 56 items divided into 4 subscales: stereotyped behaviors, communication, social interaction, and developmental disorders. Each item uses a 4-point Likert scale (Never, Rare, Sometimes, Often). The total scores are converted to standard scores. The psychometric properties of the GARS-2 have been investigated in Iran. The cutoff point for the GARS-2 is 52, and the sensitivity and specificity are obtained 90% and 100%, respectively. The reliability of this scale was also estimated using the Cronbach's alpha coefficient of 0.89 (Ahmadi SJ et al., 2011).
4. **Autism spectrum screening questionnaire (ASSQ):** The ASSQ was designed to assess the children aged 6 to 17 years old with normal intelligence to mild mental retardation, and is a screening measure (not a diagnostic measure). It was originally developed for Asperger Syndrome, later, it was also found suitable for other conditions on the Autism Spectrum. The ques-

tionnaire used here is the High-Functioning Autism Spectrum Screening Questionnaire (ASSQ). It has 27 questions that are filled in by parents or teachers of children or adolescents. Test-retest reliability in 34 parents of autism spectrum group was obtained($r=0.467$). The content validity over 0.3 was assessed (Kasechi M et al., 2014).

5. **Child symptom inventory -4 (CSI-4):** This is a behavior rating scale that was first developed in 1984 to screen 18 emotional and behavioral disorders in children between the ages of 5 to 12 years old, and in 1994, the fourth edition of DSM-IV was revised and named to CSI-4. The CSI-4 has two forms for parents and for teachers. The parent form of the CSI-4 has 112 items, which is considered for 11 major groups and an additional group of behavioral disorders. The teacher form has 77 items that covers 9 major groups of behavioral disorders. The comments and the positive judgments of professionals related to the content of CSI-4 with the tested area has validated content validity of the questionnaire as a tool for identification and screening the behavioral and emotional disorders in children. Comparing the scores of categories of questionnaire with the psychiatric-based diagnosis, criterion validity was assessed and high sensitivity and specificity of most of the disorders of the questionnaire, particularly parents' questionnaire, suggests criterion validity of this instrument (Esmaeili M, 2007).

Statistical analysis

All data were analyzed using SPSS version 21. In this study, descriptive and analytical statistics including

One-Sample Kolmogorov-Smirnov Test were used to check the normality of the data. Considering the normality of the data, Pearson's correlation coefficient was used to describe the relationship and assess the difference in communication models between variables. Moreover, multiple linear regression model was used to investigate the role of motor proficiency in predicting the implementation of recreational and leisure activities.

Results

The participants in the study were boys aged 6-12 years (median 117 months) who were studying at pre-school class through fifth grade. The results of Pearson's correlation coefficient and statistical analysis showed that there was a moderate significant relationship between motor proficiency and performing recreational and leisure activities, and the highest correlation was with fine motor skills ($P = 0.00$, $r = 0.58$), upper limb coordination ($P = 0.00$, $r = 0.44$) and gross motor skills ($P = 0.001$, $r = 0.41$), respectively. Moreover, the results of multiple linear regression model indicated that the independent variable of motor proficiency had the ability to predict 31% of the variation in the dependent variable of performing recreational and leisure activities (adjusted R square = 0.31). Regression coefficients (β) showed that only fine motor skills as one of the components of motor proficiency had the ability to predict the implementation of recreational and leisure activities. It means that a standard deviation from fine motor skills would result in a 50% standard deviation in the variable of performing recreational and leisure activities ($\beta = 0.5$, $P = 0.002$).

Table 1. Pearson correlation and multiple linear regression model for dependent variable of performing recreational and leisure activities and independent variable of motor proficiency.

performing recreational and leisure activities									
		Pearson's correlation coefficient	Significance level	R	R square	Adjusted R square	Significance level of the model	β	Significance level
motor proficiency	gross motor skills	0.41	0.001**					-0.09	0.68
	upper limb coordination	0.44	0.00**	0.59	0.35	0.31	0.00	0.21	0.34
	fine motor skills	0.58	0.00**					0.50	0.002

**correlation is significant at the 0.01 level (1tailed)

Discussion

The purpose of this study was to examine the association between motor proficiency, performing recreational, and leisure activities in school for children with autism spectrum disorder. In this study, motor proficiency was generally considered as a set including fine and gross motor skills, and upper limb coordination. In the gross motor skills, four subtests, i.e. running speed, agility, balance, bilateral coordination and strength were measured ; in the fine motor skills, three subtests, i.e. response speed, visual-motor control, and upper-limb speed and dexterity were measured. Recreational and leisure activities in school function assessment were 11 cases: including playing with moving equipment such as swings and see-saws, throwing and catching a big ball, playing with stable equipment at ground level such as slides and ladders, catching an accelerated ball, running over at least 6 m on a straight track, running without falling with a change in direction or speed, the ability to hopscotch, jumping rope, catching and throwing a small ball like a tennis ball, shooting a ball, throw or hit the target, and play with stable equipment at high level like a horizontal bar. Based on the obtained results, there was a moderate significant relationship between motor proficiency and performing recreational and leisure activities in school. In other words, whatever motor proficiency in children with ASD was better; they were more successful in performing recreational and leisure activities. Moreover, the highest correlation of performing recreational and leisure activities in school was with fine motor skills, upper limb coordination, and gross motor skills, respectively. In addition, fine motor skills as one of the components of motor proficiency had the ability to predict the implementation of recreational and leisure activities. This means that the deficiency in fine motor skills at preschool ages could limit performing recreational and leisure activities in school, and whatever fine motor skills of the children at preschool ages improved, they would face less difficulty in performing recreational and leisure activities in school. Performing recreational and leisure activities in school would lead to communica-

tion and interaction with teachers and other students. As Liu and Macdonald also showed in their study on the children with ASD, the deficiency in motor proficiency, especially the object-control skill, which is a component of fine motor skills, would limit social interactions (MacDonald M, Lord C, and Ulrich D, 2013; Liu T et al., 2014). Given that fine motor skills could predict the implementation of recreational and leisure activities, therapy interventions to improve fine motor skills would prevent the presence of limitation in performing recreational and leisure activities in school. The findings from Barnett et al. study also confirmed that the development of motor skills in childhood is one of the key interventions for promoting motor activities in the future (Barnett L et al., 2009). In addition, according to the study conducted by Shields, motor skill training for children with disabilities facilitates their participation in everyday motor activities, including recreational and leisure activities (Shields N, Synnot A, and Barr M, 2012). Thus, occupational therapists by developing a treatment planning based on the Bruininks-Oseretsky test of motor proficiency can provide the basis for more participation of the children with ASD in performing recreational and leisure activities.

Limitations of the Study

The limitation of the present study was the lack of access to the same number of students per grade.

Conclusion

The results of this study showed a moderate significant relationship between motor proficiency and performing recreational and leisure activities in school. That means, better motor skills in children with ASD help them for better performing in recreational activities. In other word, whatever motor proficiency in children with ASD was better; they would be more successful in performing recreational and leisure activities. In addition, the highest correlation of performing recreational and leisure activities in school was observed with fine motor skills, upper limb coordination, and gross motor skills, respectively. Moreover, fine motor skills as one of the components of the motor proficiency had the ability to predict the

implementation of recreational and leisure activities. This means that the deficiency in fine motor skills at preschool ages could limit performing recreational and leisure activities in school. Recreational and leisure activities as a part of the children's school performance, including children with ASD have been neglected despite their important role in their satisfaction and quality of life. Thus, in order to improve the students function in their school, perceptual motor interventions would be an important part of their treatment program.

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Acknowledgement

This study was obtained by the Master's thesis in occupational therapy in Iran University of Medical Sciences (ID number: IR.IUMS.REC1395.9411255002). We would like to thank the parents of participants and the staff at schools of Peik-e-Honar and Besharat and Payambar-e-Azam who collaborated with us on sampling of this study.

Conflict of interest statement

Authors declared no conflict of interest.

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پیوستگی بین مهارت‌های حرکتی و انجام فعالیت‌های خلاقانه و تفریحی در مدرسه برای کودکان مبتلا به اختلال طیف اوتیسم

مهسا خیراله‌زاده^۱، مهدی علیزاده زارعی^{۱*}، مالک امینی^۱، فائزه دهقان طرزجانی^۲

۱. گروه کاردرمانی، دانشکده توانبخشی، دانشگاه علوم پزشکی ایران، تهران، ایران
 ۲. گروه علوم اعصاب، دانشکده فن آوری های جدید، دانشگاه علوم پزشکی ایران، تهران، ایران

اطلاعات مقاله	چکیده
تاریخ وصول: ۱۳۹۶/۱۰/۲۷	<p>زمینه و هدف: اجرای فعالیت‌های تفریحی، بخش مهمی از فعالیت‌های مدارس کودکان از جمله کودکان مبتلا به اختلال طیف اوتیسم است. هدف پژوهش حاضر بررسی ارتباط کفایت حرکتی با اجرای فعالیت‌های تفریحی در مدرسه، و به‌ویژه کودکان مبتلا به اوتیسم است.</p> <p>روش کار: در این مطالعه مقطعی (Cross sectional)، ۵۲ دانش‌آموز ۷ تا ۱۲ سال مبتلا به اوتیسم به روش نمونه‌گیری در دسترس انتخاب شدند و دانش‌آموزانی که هم‌بودی داشتند، از مطالعه خارج شدند. داده‌ها با استفاده از آزمون عملکرد مدرسه (School function assessment) (SFA) و آزمون کفایت حرکتی برونیکس اوزرتسکی (BOTMP-۲) جمع‌آوری شد.</p> <p>یافته‌ها: نتایج حاصل از آزمون همبستگی پیرسون نشان داد بین فعالیت‌های تفریحی و اجزای کفایت حرکتی شامل مهارت‌های حرکتی درشت ($r=0/41$، $P=0/001$)، هماهنگی اندام فوقانی ($r=0/44$، $P=0/00$) و مهارت‌های حرکتی ظریف ($r=0/44$، $P=0/00$) رابطه معنادار و مثبتی با شدت متوسط وجود دارد. همچنین نتایج تحلیل مدل رگرسیون چندگانه خطی نشان داد که فقط بعد مهارت‌های حرکتی ظریف، قابلیت پیش‌بینی فعالیت‌های تفریحی را میسر کرد ($\beta=0/5$، $P=0/002$).</p> <p>نتیجه‌گیری: نتایج مطالعه حاضر نشان می‌دهد اجرای فعالیت‌های تفریحی، ارتباط معناداری با کفایت حرکتی دارد. این ارتباط معنادار به ترتیب بیشتر تا کمتر، مهارت‌های حرکتی ظریف، هماهنگی اندام فوقانی و مهارت‌های حرکتی درشت را در بر می‌گیرد. همچنین قدرت پیش‌بینی مهارت‌های حرکتی ظریف برای اجرای فعالیت‌های تفریحی در مدرسه متوسط است. بنابراین برای بهبود عملکرد دانش‌آموزان در مدرسه، مداخلات ادراکی - حرکتی بخش مهم و تعیین‌کننده‌ای در برنامه درمانی آنها خواهد بود.</p> <p>واژه‌های کلیدی: فعالیت‌های تفریحی، عملکرد مدرسه، کفایت حرکتی، اختلال طیف اوتیسم</p>
تاریخ پذیرش: ۱۳۹۷/۲/۱۲	
انتشار آنلاین: ۱۳۹۷/۸/۷	
نویسنده مسئول: مهدی علیزاده زارعی گروه کاردرمانی، دانشکده توانبخشی، دانشگاه علوم پزشکی ایران، تهران، ایران پست الکترونیک: mehdi.alizadeh@yahoo.com	
تلفن: ۰۲۱-۲۲۲۲۸۰۵۱	