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ORIGINAL ARTICLE

The Effect of School Games on Motor Skills Development in Children with Autism

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ABSTRACT

Background. Childhood stands out as a pivotal phase in motor development, making it essential to explore interventions that promote motor skills in children with autism spectrum disorder (ASD). **Objectives.** This study investigated the impact of school-based games on motor skill development in children with ASD. **Methods.** The study included 80 elementary school students, aged 11-12, from which 20 were randomly assigned to either an experimental group (n=10) or a control group (n=10). Employing a pretest-posttest design, the 8-week intervention consisted of 50-60 minute school-based game sessions, twice weekly. Assessment tools encompassed the Childhood Autism Test, the Oseretsky Motor Proficiency Test, and a researcher-designed School Games Checklist. **Results.** Results revealed significant between-group differences favoring the experimental group ($P<0.05$) in post-test scores on both gross motor skills (running speed and agility, balance, bilateral coordination, strength) and fine motor skills (reaction time, visual motor control, upper limb speed, and dexterity). **Conclusion.** The games-based program effectively enhanced motor skills in children with ASD, underlining the importance of tailored movement and sports programs to support their physical, cognitive, and social development.

KEYWORDS: ***Autism Spectrum Disorder, Fine Motor Skills, Gross Motor Skills, School-Based Games.***

INTRODUCTION

Childhood stands as a pivotal phase in the continuum of human motor development, characterized by a dynamic interplay of physical, cognitive, and emotional growth. This critical period presents a unique opportunity for interventions that can foster comprehensive development in children, offering the potential to achieve a wide array of goals with relatively modest investments in terms of time and resources. Among the avenues available for eliciting developmental progress and addressing behavioral challenges in early childhood, play-based activities emerge as a promising and engaging approach (1). Children undergo a continuous evolution in their motor skills as they grow. These changes in motor abilities are closely intertwined with shifts in psychological and social functioning, making the study of childhood motor development, a window into holistic maturation during this vital stage of life (2). Language-based play, in particular, assumes a central role in cognitive and motor development during childhood. Through playful activities, children not only gain a deeper understanding of their bodies and emerging physical abilities but also advance their cognitive and emotional maturation. Presenting activities that align with children's interests provides an opportunity to

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deliver enriching experiences that are developmentally significant (3). The significance of play in child development cannot be overstated. While some may view play as a form of entertainment, it serves as a powerful medium for identity formation and experiential learning during childhood. By assuming various roles in the play, children explore different characters with their associated responsibilities, learning important life skills in the process. The play offers children a realm of experiential learning, fostering independence, self-esteem, language proficiency, and social adeptness. Through play, children not only develop respect for others and emotional regulation but also gain insights into the risks and rewards associated with different roles (4). Amid the multifaceted landscape of child development, autism spectrum disorder (ASD) has garnered increasing attention from both scholarly experts and global health authorities. The rising prevalence of ASD has prompted coordinated efforts to understand, develop, and implement early interventions for this condition. World Autism Awareness Day, established by the World Health Organization, underscores the urgency of addressing ASD and developing effective interventions, especially during the early stages of a child's life (5). Recognizing the central role of communication abilities for social inclusion, interventions targeting children with high-functioning autism have been proposed and implemented. Many existing programs are formalized and systematic, typically delivered within educational or clinical settings (6). However, the environment in which interventions occur has a substantial impact on child development, particularly for those with autism spectrum disorder, who are engaged in an ongoing process of social adaptation. Recreational activities for this population should be thoughtfully designed to address their unique emotional and physical needs based on the specific subtype of the disorder (7). This study aims to explore the potential effectiveness of play-based activities in enhancing motor development among children with autism. It seeks to shed light on how play, with its inherent appeal and engagement, can be harnessed as a valuable tool in promoting motor skills and overall development in this population. Through rigorous investigation and analysis, we aim to contribute to the growing body of knowledge regarding interventions for children with autism and their developmental needs.

MATERIALS AND METHODS

Participants. This semi-experimental pretest-posttest control group study recruited 80 children with autism aged 11-12 years. The participants were randomly assigned to two groups: experimental (n=10) and control (n=10). The inclusion criteria were an autism test score of 26 or higher and parental consent. A purposive and accessible sampling method was used.

Training protocol. The training was done 4 weeks, 8 sessions (30 minutes) with 4 model training. (7). Amoo Zanjirbaf, Gorgam behave, Ghayem Mooshak, Sanjab&Gerdoo. As mentioned earlier, during all the sessions, the researcher, along with the teacher, taught and performed the groups to the groups, thus attracting and controlling the attention of the subjects.

Autism Scale. This scale was developed by Ayung, Baron-Cohen, Will Wright, and Ellison (2008) at the Autism Research Center in Cambridge to assess autistic symptoms in typically developing children aged 4 to 11 years. It consists of 50 items, each with four response options, which are completed by the child's parent. The child's total score is calculated based on the scores assigned to each item in the scoring key. The scale has a cutoff score of 76, a sensitivity of 95%, and internal consistency reliability (Cronbach's alpha) of 0.85. The subscales for social skills, attention to detail, attention decals, interactions, and imagination also have high internal consistency reliabilities, ranging from 0.8 to 0.89.

School Games Questionnaire. Andam et al. (2023) used a researcher-developed questionnaire because no existing questionnaire was appropriate for the topic of their research. The researchers identified the most important variables related to the topic and developed a list of questions. The questionnaire was then reviewed and approved by a panel of experts. After making the necessary corrections, the final questionnaire consisted of 31 questions with a 5-point Likert scale. The Cronbach's alpha coefficient for the overall questionnaire was 0.86, indicating good internal consistency. The internal consistency coefficients for the subscales were also acceptable: psychological factor (0.75), organizational factor (0.75), environmental factor (0.75), cultural factor (0.60), and intrapersonal factor (0.57).

Bruninex-Ozertsky Motor Proficiency Test. The Bruninex-Ozertsky Motor Proficiency Test (BOMP) is a standardized motor assessment tool for children aged 4 to 14.5 years. It measures both gross motor skills (running speed and agility, balance, two-way coordination, and strength) and fine motor skills (response speed, visual-motor control, and speed and agility of the upper limb). The BOMP is available in two forms: a long-form with 46 items and a short form with 14 items. Both forms have high reliability (long form: α=0.87; short form: α=0.86). The BOMP is administered individually and takes approximately 30-45 minutes to complete. It measures a wide range of motor skills, including finger agility, eye-hand coordination, balance, and strength of the arms and legs. The test also assesses the ability to integrate movement across the two sides of the body. The BOMP is a valuable tool for identifying children with motor delays or disabilities. It can also be used to track a child's motor development over time and to evaluate the effectiveness of motor intervention programs (8, 9).

Data analysis. The obtained data were analyzed with the analysis of the covariance method and SPSS software. The significance level was $p<0.05$.

RESULTS

In Table 1, we present the mean and standard deviation (SD) values related to the gross motor skills of the participants in both the experimental and control groups at two different time points: pre-test and post-test.

In Table 2, we present the mean and standard deviation (SD) values related to the gross motor skills of the participants in both the experimental and control groups at two different time points: pre-test and post-test.

Table 1. Mean and SD related to gross motor skills

Group	Step	Running speed and agility	Balance	Two-way coordination	Force
Experimental	Pre test	3.10±1.96	5.80±3.96	2.90±2.02	4.30±3.12
	Post-test	6.60±2.50	11.90±2.23	8.60±3.71	13.40±3.53
Control	Pre-test	3.20±2.09	3.90±3.66	2.10±1.44	8.60±5.39
	Post-test	3.90±2.13	4.60±3.23	3.20±2.20	6.50±4.32

Table 2. Mean and SD related to fine motor skills

Group	Step	Speed of response	Motor vision control	Speed and agility of upper limb
Experimental	Pre-test	3.72±1.90	6.52±2.66	4.14±1.62
	Post-test	6.60±1.87	9.41±2.46	7.36±1.85
Control	Pre-test	3.91±1.60	6.25±2.89	4.32±1.39
	Post-test	3.80±1.83	6.32±2.71	4.35±1.55

Based on the findings shown in Table 3 and Table 4, participation in school games had a significant impact on the development of both gross motor skills and fine motor skills among students with autism. These results highlight the positive influence of engaging in school games on the enhancement of motor skills in this specific population.

Based on the test statistics in Table 3, a significant difference was observed between the groups in the variable of running speed and agility, with an effect size of 0.267 ($F=5.092$, $\eta2=0.267$, $p=0.041$). The results indicated that participants in the experimental group had a higher running speed and agility compared to the control group, with an average difference of 3.06 ($p<0.05$). Additionally, a significant difference was found between the groups in two-way coordination, with an effect size of 0.427 ($F=10.194$, $\eta2=0.427$, $p=0.007$). The results indicated that participants in the experimental group had a significantly higher two-way coordination compared to the control group, with an average difference of 8.42 ($p<0.05$). Similarly, there was a significant difference between the groups in terms of force, with an effect size of 0.345 ($F=7.383$, $\eta2=0.345$, $p=0.017$). Participants in the experimental group exhibited a higher level of force compared to the control group, with an average difference of 6.31 ($p<0.05$). Finally, there was a significant difference between the

groups in terms of force, with an effect size of 0.345 (F=5.214, η2=0.289, p=0.0.026). Participants in the experimental group exhibited a higher level of force compared to the control group, with an average difference of 7.19 (p<0.05).

Regarding fine motor skills, as shown in Table 4, a significant difference was observed between the groups in the variable of speed of response, with an effect size of 0.330 (F=7.372, η2=0.330, p=0.0.016). The results indicated that participants in the experimental group had a higher Speed of response compared to the control group, with an average difference of 2.71 (p<0.05). Additionally, a significant difference was found between the groups in motor vision control, with an effect size of 0.427 (F=5.525, η2=0.269, p=0.0.033). The results indicated that participants in the experimental group had significantly higher motor vision control compared to the control group, with an average difference of 2.87 (p<0.05). Finally, there was a significant difference between the groups in terms of speed and agility of the upper limb, with an effect size of 0.345 (F=8.326, η2=0.375, p=0.011). Participants in the experimental group exhibited a higher level of speed and agility of the upper limb compared to the control group, with an average difference of 2.94 (p<0.05).

Table 3. Comparison of gross motor skills in the experimental and control groups

Variable	F-Value	η^2 (Eta-squared)	p-Value
Running Speed & Agility	5.092	0.267	*0.041
Two-way Coordination	10.194	0.427	*0.007
Force	7.383	0.345	*0.017
Balance	5.214	0.289	*0.026

*: Significant differences between experimental and control groups at p<0.05.

Table 4. Comparison of fine motor skills in the experimental and control groups

Variable	F-value	η^2 (Eta-squared)	p-value
Speed of response	7.372	0.330	*0.016
Motor vision control	5.525	0.269	*0.033
Speed and agility of upper limb	8.326	0.375	*0.011

*: Significant differences between experimental and control groups at p<0.05.

DISCUSSION

It is worth emphasizing that games not only have a positive impact on children's emotional and cognitive development but are also instrumental in fostering motor skills development. A key reason perceptual-motor exercises are effective in this context is their adaptability to the unique needs of each child. (10). This study aimed to explore whether providing children with autism special conditions, such as engaging in games, could lead to improvements in their motor performance and potentially compensate for motor retardation. The results of this study shed light on the significant benefits of games as a means to facilitate motor performance in children with autism. Games offer a form of vigorous activity that can help reduce movement disorders, and they contribute to the physical and psychomotor development of both typical and atypical children (5). Games serve as purposeful physical activities that actively contribute to child development. Engaging in group games provides children with unique opportunities to observe and imitate the psychomotor skills of their peers, enabling them to practice these skills themselves. These games are typically designed to match the abilities of the children, fostering their active participation and skill development without the discouragement of failure or frustration. One of the benefits of the games is to support the physical and psychomotor development of both typical and atypical children. Play is a purposeful physical activity that contributes to child development (11). Furthermore, teaching group games provide children with opportunities to observe and imitate the psychomotor skills of others and to practice these skills themselves. Because these games are designed to match the abilities of the children, they are encouraged to participate and develop their skills without experiencing failure or frustration (12). Games and rhythmic education have also been shown to be effective in improving the outcomes of children with autism (13). Sensory-motor exercises are useful for developing motor skills in children with intellectual disabilities (ID) (14). A study

found that participation in a basketball movement program improved motor skills in children with educable ID and that the program had a greater impact on gross motor skills in boys. Games can have a positive impact on children's emotional and cognitive development (15). Providing children with the right tools and physical positions to participate in a variety of activities and games will support their development. When children engage in play, they develop their motor skills. One of the main reasons why perceptual-motor exercises are effective for improving motor skills is that they are tailored to the needs of the children (16). Factors such as facilities, equipment, time, and appropriate encouragement are essential for providing children with opportunities to develop their motor skills. Lack of facilities and equipment, as well as insufficient encouragement, can limit training opportunities (17). A child who is not properly encouraged and guided by their caregivers may become frustrated with their first unfavorable experience and miss opportunities for development. Adequate facilities, equipment, time, and encouragement are essential for developing motor skills, especially in children with special needs; however, they are not sufficient. Without a proper development plan, many children will not reach their full potential in terms of motor skills (18, 19).

One low-cost way to mitigate these shortcomings is to consider appropriate movement programs and games that promote growth. Another factor that contributes to the effectiveness of indigenous-local games in developing motor skills is the principle of similarity between the components of the task and the motor actions being learned. According to this principle, the group of school games that require movements similar to those needed for the skill model may have shown better performance due to the greater practice and repetition of those movements. Providing children with the right tools and physical positions to participate in a variety of activities and games will support their development.

CONCLUSION

In conclusion, the findings from this study underscore the effectiveness of school-based games in promoting motor skill development in children with autism spectrum disorder (ASD). The results demonstrated significant improvements in both gross and fine motor skills among participants in the experimental group compared to the control group. These findings highlight the importance of tailored movement and sports programs as a means to support the physical, cognitive, and social development of children with ASD. Implementing such interventions in school settings could potentially contribute to the overall well-being and holistic development of children with ASD, emphasizing the significance of integrating motor skill interventions within educational environments to enhance the lives of these individuals.

APPLICABLE REMARKS

- The benefits of incorporating school-based games and movement programs to promote motor skill development in children with autism spectrum disorder (ASD) are crucial.
- The significant improvements in both gross and fine motor skills among children with ASD are provided by games-based intervention.
- Implementing such interventions in school settings could potentially contribute to the overall well-being and holistic development of children with ASD, emphasizing the significance of integrating motor skill interventions within educational environments to enhance their lives.

AUTHORS' CONTRIBUTIONS

Study concept and design: Gholam Reza Zourmand. Acquisition of data: Gholam Reza Zourmand. Analysis and interpretation of data: Gholam Reza Zourmand. Drafting the manuscript: Morteza Taheri. Critical revision of the manuscript for important intellectual content: Gholam Reza Zourmand. Statistical analysis: Gholam Reza Zourmand. Administrative, technical, and material support: Gholam Reza Zourmand. Study Supervision: Gholam Reza Zourmand.

CONFLICT OF INTEREST

The research has no conflict of interest.

REFERENCES

1. Lazar M, Miles LM, Babb JS, Donaldson JB. Axonal deficits in young adults with High Functioning Autism and their impact on processing speed. NeuroImage: Clinical. 2014;4:417-25. [doi:10.1016/j.nicl.2014.01.014] [PMid:24624327]

2. Meirsschaut M, Roeyers H, Warreyn P. Parenting in families with a child with autism spectrum disorder and a typically developing child: Mothers' experiences and cognitions. Research in Autism Spectrum Disorders. 2010;4(4):661-9. [doi:10.1016/j.rasd.2010.01.002]
3. Voigt RG, Macias MM, Myers SM, Tapia CD. Developmental and behavioral pediatrics: American Academy of Pediatrics; 2011. [doi:10.1542/9781581105506]
4. Wilson KE. The effect of swimming exercise on amount and quality of sleep for children with autism spectrum disorder: University of Akron; 2019.
5. LeardMann CA, McMaster HS, Warner S, Esquivel AP, Porter B, Powell TM, et al. Comparison of Posttraumatic Stress Disorder Checklist Instruments From Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition vs Fifth Edition in a Large Cohort of US Military Service Members and Veterans. JAMA Netw Open. 2021;4(4):e218072. [doi:10.1001/jamanetworkopen.2021.8072] [PMid:33904913]
6. Rajendran V, Finita G. Motor development and postural control evaluation of children with sensorineural hearing loss: a review of three inexpensive assessment tools-PBS, TGMD-2, and P-CTSIB. Iranian Journal of Child Neurology. 2010;4(4):7-12.
7. Jarani J, Grøntved A, Muca F, Spahi A, Qefalia D, Ushtelenca K, et al. Effects of two physical education programmes on health- and skill-related physical fitness of Albanian children. Journal of Sports Sciences. 2016;34(1):35-46. [doi:10.1080/02640414.2015.1031161] [PMid:25854535]
8. Payne VG, Isaacs LD. Human motor development: A lifespan approach: Routledge; 2017. [doi:10.4324/9781315213040]
9. A. K. Psychology and education of children and adolescents with special needs: Avaye Noor Publications; 2011.
10. Frey JN, Ruhnau P, Weisz N. Not so different after all: The same oscillatory processes support different types of attention. Brain Research. 2015;1626:183-97. [doi:10.1016/j.brainres.2015.02.017] [PMid:25721788]
11. Quitério A, Martins J, Onofre M, Costa J, Mota Rodrigues J, Gerlach E, et al. MOBAK 1 Assessment in Primary Physical Education: Exploring Basic Motor Competences of Portuguese 6-Year-Olds. Perceptual and Motor Skills. 2018;125(6):1055-69. [doi:10.1177/0031512518804358] [PMid:30413140]
12. Khanzadeh A. Teaching social skills to children and adolescents: Tehran: Roshde Farhang Publications; 2010. 288-90 p.
13. Gifford-Thomas T, Bhat A. The use of robots and rhythmic to improve education for children with autism2011.
14. Raney MA, Hendry CF, Yee SA. Physical Activity and Social Behaviors of Urban Children in Green Playgrounds. American Journal of Preventive Medicine. 2019;56(4):522-9. [doi:10.1016/j.amepre.2018.11.004] [PMid:30772148]
15. Sowa M, Meulenbroek R. Effects of physical exercise on Autism Spectrum Disorders: A meta-analysis. Research in Autism Spectrum Disorders. 2012;6(1):46-57. [doi:10.1016/j.rasd.2011.09.001]
16. Aghdasi M, Tuba N, Jahangirzadeh M. The Comparison of Elderly and Youngs Attitude towards Indigenous and Native Plays of Azerbaijan. The Online Journal of Recreation and Sport. 2013;2(1):27-9.
17. Schulze C. Effect of playing golf on children's mental health. Mental Health & Prevention. 2019;13:31-4. [doi:10.1016/j.mhp.2018.11.001]
18. Ulrich DA, Sanford CB. Test of gross motor development. 3 ed: Pro-ed Austin, TX; 2016.
19. Nahashiaan H, Badri R, Naghashiaan H, Faroughi R, Naghashiaan H. Somatic Symptoms and Mental Health in Parents of Children with and without Autism: A Comparative Study. International Journal of Body, Mind & Culture (2345-5802). 2022;9(3).