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"The relationship between motor skills and social communication skills in children with autism spectrum disorder"

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ABSTRACT

Children with autism often experience motor skill challenges that continue into their school years. While interventions primarily focus on improving social communication skills, this study aimed to investigate the connection between motor skills and social abilities in children aged 6 to 15 with high-functioning autism. The results suggest that children with better object control skills tend to have less severe autism symptoms, indicating a potential link between motor skills and social communication. Further research is needed to understand this relationship in more detail.

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Introduction:

Autism Spectrum Disorder (ASD) is a condition affecting brain development. People with ASD often have trouble communicating and interacting with others. They may also engage in repetitive behaviors or have intense interests. Recent studies indicate that about one in 59 children is diagnosed with ASD, (Centers for Disease Control,2019)(APA, 2013) Diagnosing autism in very young children is difficult because individuals with autism exhibit a wide range of symptoms and the causes of the condition vary greatly.(Christensen, 2016), While it's technically possible to diagnose autism as early as 24 months, it usually isn't diagnosed until children reach the age of 40 months.

Even though motor skill problems aren't officially part of an autism diagnosis, they are common in people with autism. Early descriptions of autism by Kanner,(Kanner, 1968) Kanner's early descriptions of autism noted difficulties with spontaneous actions and physical coordination. More recent research has confirmed that many individuals with autism experience various motor challenges, such as awkwardness, poor coordination, balance issues, and problems with both large and small muscle movements compared to typically developing people.(Fournier,2010 , Dewey, 2007)

Children with autism continue to experience motor skill challenges throughout their school years,(Green,2002) A recent study involving 101 children with autism aged 10 to 14 found that 79% had difficulties with motor skills. Some experts believe that the severity of these motor skill problems is linked to overall intellectual ability, suggesting that children with lower developmental levels tend to have more significant motor skill challenges.(Green, 2009) However, research shows that intellectual ability alone can't fully explain motor skill problems in children with autism. When comparing a group of high-functioning children with autism to children with a specific motor skill disorder called developmental coordination disorder (DCD), the children with autism actually had more severe motor skill difficulties. This discovery highlights the extent of motor skill challenges faced by children with autism.

In the early stages of life, physical abilities like rolling over, crawling, and walking are crucial for babies to explore their surroundings. These milestones are well-known indicators of development.(Bhat, A.N., Landa, 2011) However, recent studies have started to investigate the connection between motor skills and overall social and cognitive development. Considering the increasing evidence of early motor problems in children with autism and those at high risk due to family history.(Leonard, H.C, 2014)

Studies on social skills training for school-aged children with autism have shown some short-term improvements in social behavior. However, these gains often don't last over time, and children may struggle to apply what they've learned in new situations. Despite these challenges, it's clear that social skills programs are essential for children with autism due to their significant difficulties in social interactions.(McConnell, 2002)

While motor skill issues exist in school-aged children with autism, the main focus of development and intervention is on social communication skills. The importance of effective social programs for these children is well-established. However, there's less consensus on the exact content of these social skills programs.(Bellini, S., Peters,2007 , Gresham, 2001)

This study aims to investigate the relationship between Motor skills, measured by the TGMD-2 test, and social communication skills in high-functioning children with autism aged 6 to 15. The researchers believe that children with stronger physical skills will also have better social communication skills.

Method

Participants

The children involved in this study were part of a larger school-based research project focused on social skills. All of them were officially diagnosed with autism based on the ADOS assessment and were between the ages of 6 and 9, To participate in the study, children needed to have an IQ of 64 or higher, as the project focused on high-functioning children with autism. None of the children had additional sensory or physical disabilities. The study was approved by the Institutional Review Board, and permission was obtained from school officials and parents before the study began. All participants agreed to take part in the research.

Measurements:

Motor skill measurement: To measure motor skills, the TGMD-2 test was used. (Ulrich, D. 2000)This is a well-established test for assessing children's physical abilities. It includes two parts: movement skills and object control skills. While designed for children aged 3 to 10, it has been used effectively with older children, especially those with disabilities.(Berkeley, S.L., Zittel, L.L., Pitney, L.V., & Nichols, S.E. 2001) The highest possible score for each part of the test is 48. To ensure accuracy, the researchers practiced using the test together until they agreed on the scoring 80% of the time.

Child diagnostic measure: To confirm an autism diagnosis, all children were assessed using the ADOS, a standardized test for evaluating communication, social interaction, and play skills. The researchers were trained in using the ADOS and consistently agreed on their ratings.(Gotham, K., Risi, S., Pickles, A., & Lord, C. 2007)

Intelligence quotient (IQ): To measure intelligence, the Stanford-Binet Intelligence Scales test was used. This is a well-established test for people

aged 2 to 85. It was used to confirm that the children in the study had an IQ above 64, as required for the research. The researchers were experienced in administering this test.(Roid, G. 2003)

Measure of social skills: To assess social skills, teachers completed the Social Skills Improvement System (SSIS) rating scale. (Gresham, F., Sugai, G., & Horner, R. 2001) This is a well-established tool for evaluating children's social abilities. The SSIS provides an overall social score based on social skills, behavioral issues, and academic performance.

Procedures:

The majority of assessments were completed in one session. However, in some cases, children needed a short break and the evaluation was finished over two days.

Results:

Twenty-four children were included in the study, with 16 diagnosed with autism and 8 with PDD-NOS. The average age of the participants was 7.4 years old. Detailed information about the participants is presented in Table 1.

Table 1 Descriptive Characteristics of the Participants N=24

Variable	Mean/Frequency
Age (years)	7.4
Gender	15M, 9F
Autism diagnostic classification	16 ASD, 8 PDD-NOS
Test of gross motor development–total	*53.3(6.8)
Test of gross motor development–locomotor	*24.6(4.0)
Test of gross motor development–object-control	*22.5(5.4)
IQ–Stanford Binet	*89.61(13.82)
Calibrated autism severity score	3–10 (range)

*Mean (standard deviation)

Motor Skills and Calibrated ASD Severity:

A statistical analysis called GLM was conducted to examine the relationship between total motor skills scores from the TGMD-2 test, IQ, age, gender, ethnicity, and autism diagnosis. (Gotham, et al., 2007). The GLM statistical method is used to conduct regression and ANOVA analyses. It can incorporate fixed factors, random factors, and other variables as predictors in the model. (Garson, 2012) The results showed that movement skills (locomotion) did not predict the severity of autism. However, when analyzing object control skills, it was found that better object control skills were associated with less severe autism symptoms. Interestingly, gender was found to be a factor influencing both movement and object control skills, regardless of autism severity.

Motor Skills and Standardized Social Skills

Statistical analyses were conducted to examine the relationship between overall motor skills, IQ, age, gender, ethnicity, autism diagnosis, and social skills. No interactions between these factors were found. Further analysis of specific motor skills (movement and object control) also did not show a relationship with social skills.

Table 2 Univariate GLM for TGMD-2 Raw Scores on Calibrated Autism Severity Scores

Motor Skills	Mean (Standard. Deviation)	p	F
Total (raw score)	*53.3(6.8)	0.210	1.263
Locomotor (raw score)	*24.6(4.0)	0.753	0.136
Object-control (raw score)	*22.5(5.4)	0.265	3.387

* Indicates statistical significance ($p < .05$)

Discussion:

The study found that children with autism who had better object control skills also tended to have less severe autism symptoms, which often include difficulties with social communication. (Gotham, et al., 2009). While the relationship between overall motor skills and social skills measured by the SSIS was not found, the results suggest that the calibrated autism severity scale might be a better indicator of social communication abilities in children

with autism. This scale has been proven to be accurate in diagnosing autism.(Gotham, et al., 2009; Gotham, et al., 2007) Children with autism often have challenges with both social communication and motor skills, but the connection between these abilities has not been studied extensively. (Berkeley, et al., 2001; Green, et al., 2002; Green, et al., 2009; Staples & Reid, 2010) While research has shown that these children struggle with motor skills, most interventions focus on improving social skills. The calibrated autism severity scores are considered a good way to track changes in autism symptoms over time and to evaluate these symptoms without relying on verbal intelligence. (MacDonald et al., 2012; McConnell, 2002) The study found a connection between object control skills and the severity of autism symptoms. Children with better object control skills tended to have less severe autism symptoms, suggesting that motor skills might influence social communication abilities in children with autism. (Gotham et al., 2009).

Before the development of calibrated severity scores, researchers used various measures to assess the severity of autism, including language delays, cognitive abilities, behavioral problems, and raw scores from the ADOS. However, none of these methods were consistently accurate in measuring autism severity. Calibrated severity scores were derived from ADOS data, which focuses on social communication difficulties, the core symptoms of autism. Importantly, these scores are not influenced by intellectual abilities. (Gotham, et al., 2009)

Social difficulties are the most prominent challenge for children with autism, and most interventions focus on improving these skills. However, while social skills training often leads to short-term improvements, long-term benefits and the ability to apply these skills in different situations are limited. Despite these challenges, it's clear that social skills programs are essential for children with autism. (Lord, et al., 2000; Lord et al., 2005; McConnell, 2002).

The study suggests that better object control skills are linked to less severe autism symptoms, which include social communication difficulties. This finding implies that improving motor skills might positively impact social skills in children with autism. While overall motor skills didn't predict autism severity, the study found that boys with autism tended to have more significant social communication challenges than girls. Future research should explore this difference. Interestingly, children who participate in playground games like soccer or four-square often demonstrate better social communication skills. (Kasari, et al., 2010) It's unclear whether children with autism avoid

playground games due to poor motor skills or social anxiety. Creating opportunities for children to practice social skills in a fun environment is essential, and playgrounds offer valuable social settings. Future research should investigate how improved motor skills might influence children's ability to participate in and benefit from playground games.

While this study did not find a direct link between motor skills and standardized social skills, there's a need for better assessment tools to measure changes in social abilities following interventions. These tools should accurately identify improvements in social skills. The calibrated autism severity scores are currently the best available option for tracking social communication changes in children with autism, as they were specifically designed for this population. (Gotham et al., 2009)

Conclusion:

Children with autism often struggle with both physical and social skills, with social difficulties being the primary concern. This study found a connection between motor skills and the severity of autism symptoms, suggesting that improved motor skills might positively impact social abilities. While more research is needed to understand how motor skills and social skills interact, it's clear that both areas should be considered when developing intervention programs for children with autism.

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