

Assessing Motor Proficiency in Children with Autism Spectrum Disorder

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Abstract

Background: Several factors may relate to motor proficiency in children with Autism Spectrum Disorder (ASD) including the severity of social impairment (Hirata et al., 2014) and impaired executive functioning (Hartman et al., 2010). However, limited research has examined these associations.

Purpose: This study explored the association of motor proficiency with social impairment and executive functioning in children with ASD as well as the challenges with assessing motor proficiency in this sample.

Methods: Four children (Age 7-9 years old) with ASD, and a parent participated in this study. A researcher administered the Bruininks-Oseretsky Test, Second Edition (BOT-2) Short Form with each child to assess motor proficiency. Parents completed the Behavior Rating Inventory of Executive Functioning (BRIEF) and the Social Responsiveness Scale, Second Edition (SRS-2; severity of social impairment). Given the small sample size, scatterplots were used to analyze the relationship between scores on the BOT-2, SRS-2, and BRIEF. Data collected were part of a baseline assessment from a pilot physical activity program. **Results:** Three of the children scored well-below average on their motor proficiency and the other child scored average. Behavioral techniques used for three children while administering the BOT-2 included: a visual schedule—crossing off completed items (n=2) and earning a short break for completing tasks (n=1). Children (n=3) were classified as having moderate and severe (n=1) social communication impairments on the SRS-2. Based on the scatterplots, there appeared to be a negative relationship between BOT-2 and SRS-2 scores with children with greater social impairment scoring lower in motor proficiency. There seemed to be little relationship between BOT-2 and BRIEF. **Conclusion:** Children with ASD demonstrated challenges in motor proficiency and their ability to attend, communicate, and mimic multi-step tasks needs consideration during assessments. Despite the small sample size, it appeared that motor proficiency may be related to social impairment.

Introduction

- Several factors may relate to motor proficiency in children with Autism Spectrum Disorder (ASD)
 - Lower motor proficiency as assessed using the Movement Assessment Battery for Children 2 was related to greater social impairment in youth with Autism aged 7-16 years old (Hirata et al., 2014)
 - Lower motor proficiency was associated with impaired executive functioning (Hartman et al., 2010)
- The Bruininks-Oseretsky Test, Second Edition (BOT-2; Bruininks & Bruininks, 2005) is designed to comprehensively measure motor development in individuals from 4 to 21 years of age
 - Assesses motor proficiency across four domains: fine manual control, manual coordination, body coordination, and strength and agility
 - It is a reliable and valid evaluation of motor proficiency in children 4 to 18 years old, with intellectual disabilities (Wuang, Lin, & Su, 2009)
 - It also has been used with children with ASD (Pan et al., 2017)

Methods

Procedures

- A researcher administered the BOT-2 for each child
- During this time, the parent completed a series of questionnaires
- Measures taken at a baseline of a pilot for a physical activity intervention

Measures

Bruininks-Oseretsky Test, Second Edition (BOT-2; Bruininks & Bruininks, 2005)

- Assesses motor competency across four domains: fine manual control, manual coordination, body coordination, and strength and agility
- For the BOT-2, lower total scores represent greater deficits in motor proficiency

Behavior Rating Inventory of Executive Functioning (BRIEF; Gioria et al., 2013)

- Assesses the parent's rating of impairment in executive functioning in children across three domains—behavioral, emotional, and cognitive
- For the BRIEF, a greater Global Executive Composite (GEC) score, represented a greater deficit in executive functioning

Social Responsiveness Scale, Second Edition (SRS-2; Constantino, 2012)

- Identifies the presence and severity of social impairment of individuals
- For the SRS-2, a greater Social Communication (SCI) score, represented more severe social impairment

Purpose

To explore the association of motor proficiency with social impairment and executive functioning in children with ASD as well as the challenges with assessing motor proficiency

Participants

	A	B	C	D
Child Age	8	7	7	9
Child Gender	Female	Male	Female	Male
Child Ethnicity	Multi-racial	White	White	Multi-racial
Child Grade	2	2	1	3
Primary Diagnosis	ASD	ASD	ASD	ASD
Secondary Diagnosis	SPD	n/a	n/a	n/a
Services Received	Instructional aide, OT, PT, Speech, Social skills group	Autism-specific, Speech, ABA (at school), in-home ABA	ABA, OT, Speech	Speech
Number of Siblings	0	0	4	3
Parent Age	44	46	48	34
Parent Gender	Female	Female	Female	Female
Parent Ethnicity	Multi-racial	Latino	Latino	Latino
Marital Status	Married	Married	Married	Married
Highest Education	Some College	Some College	High School	Some College

Challenges with Assessing Motor Proficiency

- There were challenges observed by the primary researcher while administering the BOT-2 for children with ASD:
- Some children appeared capable of performing certain motor skills, however, they seemed unable to attend to the task and/or mimic the multi-step skills that the researcher presented
 - e.g., child would do the specific task such as jumping when not asked
 - Use of further directives and prompts could not be given to the participants, despite their observed need for them in order to follow the test administration protocol
 - Challenging behaviors in the form of elopement were presented by one child during the administration of the BOT
- Applied Behavioral Analysis (ABA) techniques that were utilized during the administration of the BOT-2
- A visual schedule was used with several participants (A, B)
 - A list of all tasks that had to be completed, and crossing each activity off as it was completed, prior to the child earning a preferred activity
- One participant (C) earned a short break with a preferred item or stimulus after completing each task
 - The preferred item or stimulus was removed prior to presenting the next task

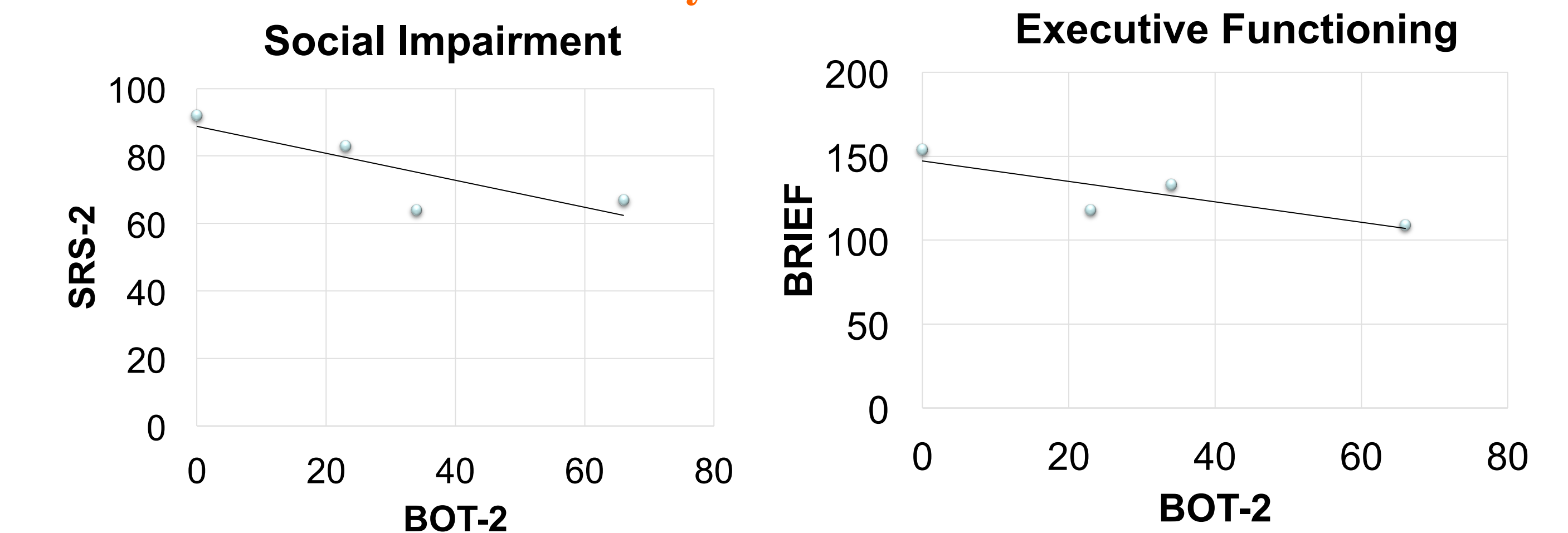
Results

Analysis

- Scatterplots were used to analyze the relationship between scores on the BOT-2, BRIEF and SRS-2

- Total point raw scores were used for the BOT-2
- Global Executive Composite raw scores were used for the BRIEF
- Social Communication (SCI) raw scores were used for the SRS-2

Association with Motor Proficiency



Individuals with higher motor proficiency appeared to have lower social impairment

Individuals with higher motor proficiency appeared to have lower executive functioning

	A	B	C	D
BOT-2	34	23	0	66
	Well below average	Well below average	Well below average	Average
BRIEF	133	118	154	109
	96 th Percentile	86 th Percentile	>99 th Percentile	77 th Percentile
SRS-2	64	83	92	67
	Moderate	Moderate	Severe	Mild

Discussion

- Both scatterplots showed a negative relationship when comparing each measure to the BOT-2
- Lower motor proficiency was associated with greater social impairment
 - Previously manual dexterity was related to higher social impairment (Hirata et al., 2014)
 - The communication ability of the child such as ability to pay attention appeared to be related to performing specific movement tasks
 - Extends previous research that examined this relationship using the Movement Battery for Children (Hirata et al., 2014)
- Lower motor proficiency was associated with greater deficits in executive functioning
 - Consistent with previous research that relationship between executive functioning and motor proficiency (Hartman et al., 2010)
 - May relate to ability to maintain attention and inhibit other behaviors that make up a part of executive functioning
- Despite utilizing these ABA techniques, there were still challenges while administering the BOT-2 to children with ASD, raising concern that the BOT-2 might not capture this population's true motor proficiency

Limitations

- Small sample size precluded the calculation of statistics to evaluate the relationships and generalizability

Future Directions

- Explore the BOT-2 with varying degrees of disability
- Explore how stereotypy relate to motor proficiency