Examining the Role of Attention Problems in Motor Stereotypy in Children with Autism Spectrum Disorder (ASD)

Julia Nauman, B.S. – naumanj@msu.edu & Brooke Ingersoll, Ph.D. – ingers19@msu.edu

Michigan State University

Background

- Motor Stereotypy is a subcategory of restricted and repetitive behavior (RRB)[1]. ASD and non-ASD stereotypy are not easily distinguishable[2,3]
- ASD frequently cooccurs with attention problems and Attention Deficit Hyperactivity Disorder[4,5,6]
- Research suggests a relationship between motor stereotypy and attention dysfunction[7,8], and **attention problems and motor stereotypy are concurrently related in a large sample of autistic children[9]**

Research Question

Do attention problems predict change over time in motor stereotypy in children with ASD?

Hypothesis

Attention problems will account for changes in motor stereotypy over time in a sample of ASD youth ages 4-18 years

Methods

Participants

- Data was collected through the Simons Simplex Collection (SSC), which includes phenotypic data from >2,600 families[10]
- N = 274 proband children between the ages of 4 and 13 years at Time 1 with complete data on the measures of interest between 46-96 months after the initial study (*M* = 67.93 months, *SD* = 1.88 months)

Measures

Child Behavior Checklist (CBCL):

- Measured attention problems using the Attention Problems T-Score[11]

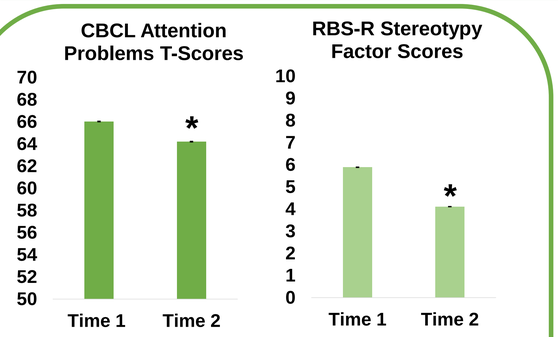
Repetitive Behavior Scale-Revised (RBS-R):

- Used an 8-item Stereotypy Factor calculated from a prior factor analysis on this data set[12,13]

	Number	Percent
Race		
African American	5	1.8%
Asian	11	4.0%
More than one race	23	8.4%
Native American	1	0.4%
Not specified	1	0.4%
Other	7	2.6%
White	226	82.5%
Sex		
Female	45	16.4%
Male	229	83.6%

Descriptive Statistics	**Mean**	**SD**	**Range**
Full Scale IQ	82.62	28.45	17-155
Age (months) at Time 1	87.13	26.03	48-155
Attention Problems T-Score at Time 1	66.03	10.26	50-100
Stereotypy Factor at Time 1	5.89	4.10	0-20
Age (months) at Time 2	155.05	27.14	99-215
Attention Problems T-Score at Time 2	64.21	10.18	50-95
Stereotypy Factor at Time 2	4.11	3.69	0-21

Results



CBCL Attention Problems T-Scores significantly decreased from intake (*M*=66.03, *SD*=10.26) **to follow up** (*M*=64.21, *SD*=10.18) assessment, *t*(273) = 2.96, *p*=.003, **as did RBS-R Stereotypy Factor Scores** from intake (*M*=5.89, *SD*=4.10) to follow up (*M*=4.11, *SD*=3.69), *t*(273) = 9.01, *p*<.001

Attention problems at Time 2 significantly predicted motor stereotypy at Time 2 after controlling for age, sex, and IQ ($p \leq .001$), replicating our previous findings from the larger sample at Time 1

Hierarchical Regression Analysis to Replicate Variables Predicting RBS-R Stereotypy Factor Score at Time 1 at Time 2

N = 274	Model 1		Model 2	
Variable	β	t	β	t
Age at Time 2	-.10	-1.90	-.07	-1.32
Sex	-.13	-2.35	-.19	-3.50*
Full Scale IQ	-.43	-7.78*	-.34	-6.29*
CBCL Attention Problems T-Score at Time 2			.34	6.27*
R^2	.192		.295	
F Change	21.37		39.33	

*$p \leq .001$

However, **attention problems at Time 1 did not significantly predict motor stereotypy at Time 2** when controlling for age, sex, IQ, and motor stereotypy at Time 1 ($p = .354$)

Hierarchical Regression Analysis for CBCL Attention Problems at Time 1 Predicting RBS-R Stereotypy Factor Score at Time 2

N =274	Model 1		Model 2	
Variable	β	t	β	t
Age at Time 2	-.04	-.84	-.03	-.60
Sex	-.03	-.73	-.03	-.64
Full Scale IQ	-.22	-4.55*	-.23	-4.61*
RBS-R Stereotypy Factor Score at Time 1	.57	11.71*	.58	11.40*
CBCL Attention Problems T-Score at Time 1			-.05	-.93
R^2	.465		.467	
F Change	58.41		.86	

*$p \leq .001$

Conclusions

- **There is a concurrent relationship between attention problems and motor stereotypy**, which supports previous studies that also found that motor stereotypy correlated with attention dysfunction[7,8]
- However, **attention problems did not appear to predict later motor stereotypy**

Limitations

- **Some executive functions may be more related to motor stereotypy than others**[14,15]
- Our measure of attention problems was limited to a parent-report that cannot distinguish between specific attention or executive function difficulties
- Shared method variance may account for some findings

Future Directions

- **There are conflicting interviewee accounts as to the exact relationship between attention dysfunction and motor stereotypy even within ASD**[16,17]
- Research should compare neurological function, psychological profiles, and accounts of motor stereotypy to examine how motor stereotypy and attention dysfunction compares across different diagnostic groups and within ASD

Presenter: Julia Nauman, B.S.
Email: naumanj@msu.edu
Twitter: @julia_nauman

For more information including acknowledgements and references, please scan the QR code below:

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Abstract

Examining the Role of Attention Problems in Motor Stereotypy in Children with ASD

Background: Motor stereotypy, repetitive behaviors that occur with little conscious effort and are suppressible by sensory stimuli or distraction, is a subcategory of restricted and repetitive behavior commonly associated with Autism Spectrum Disorder (ASD). They are not exclusive to ASD, and visual descriptions of motor stereotypies cannot distinguish between stereotypy in those with and without ASD. Individuals without ASD who have motor stereotypy often struggle with executive function and attention, suggesting a relationship between motor stereotypy and attention dysfunction. Our previous cross-sectional work found an association between attention problems on the Child Behavior Checklist (CBCL) and motor stereotypy on the Repetitive Behaviors Scale – Revised (RBS-R) in a large sample of children with ASD from the Simons Simplex Collection (SCC). However, due to the cross-sectional nature of the dataset, causality cannot be inferred.

Objectives: The goal of this study is to examine whether attention problems predict change over time in motor stereotypy in children with ASD.

Methods: Data were collected through the Simons Simplex Collection, a permanent repository of behavioral and genetic samples from >2,600 simplex families. Our sample included 274 children ages 4-13 years who had a diagnosis of ASD and completed follow-up assessments for the measures of interest between 46-94 months after the initial study (M = 67.93 months, SD = 11.88 months). Stereotypy was measured using the Stereotypy Factor derived in a prior factor analysis (Russell et al., 2019) from the RBS-R. Attention problems were measured using the Attention Problems T-Score from the CBCL. Changes over time in attention problems and motor stereotypy were examined by conducting paired samples t-tests using Time 1 and Time 2 data. We used hierarchical regression to examine the association between attention problems and motor stereotypy in the follow up sample, controlling for age, sex, and IQ. In addition, we used hierarchical regression to examine the association between Time 1 attention problems and Time 2 motor stereotypy, controlling for age, sex, IQ, and Time 1 motor stereotypy.

Results: CBCL Attention Problems T-Scores significantly decreased from intake (M=66.03, SD=10.26) to follow up (M=64.21, SD=10.18) assessment, $t(273)=2.96$, p=.003, as did the RBS-R Stereotypy Factor Scores from intake (M=5.89, SD=4.10) to follow up (M=4.11, SD=3.69), $t(273) = 9.01$, p<.001. Attention problems significantly predicted stereotypy after controlling for age, sex, and IQ at Time 2 ($p < .001$), replicating our previous findings from the larger sample at Time 1. However, attention problems at Time 1 did not significantly predict stereotypy at Time 2 when controlling for Time 1 stereotypy ($p = .354$).

Conclusions: Despite a consistent relationship between attention problems and motor stereotypy in children with ASD, attention problems do not appear to play a causal role in stereotypy. Further investigation is necessary to determine the mechanisms that influence stereotypy in ASD.