The effect of comorbidity on cognitive efficiency in autism spectrum disorder

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Background

- Psychiatric co-morbidities in autism spectrum disorder (ASD) are common, occurring in as many as 72% of children with ASD[1].
- Children with ASD often have deficits in aspects of cognitive efficiency, specifically working memory, processing speed, and/or executive functioning, though findings are mixed[2].
- Psychiatric comorbidity has negative consequences on cognitive functioning, including executive functioning.
- Understanding whether secondary conditions or comorbidities have unique or shared impact on ASD compared to other diagnostic groups has important implications for assessment and treatment.

Objective: To study the effect of comorbidity on cognitive efficiency in individuals with ASD compared to individuals with other childhood psychiatric conditions.

Methods

Procedures:

- Use of archival clinic database from an academic medical center clinic specializing in developmental disability evaluations.
- Cognitive assessments were conducted by licensed psychologists, and final consensus diagnosis was determined by a multidisciplinary team consisting of psychology, psychiatry, and speech/language specialists following comprehensive evaluation.

Measures:

- *Wechsler Intelligence Scale for Children, 3rd & 4th Edition* (WISC-III, WISC-IV)
- *Wechsler Adult Intelligence Scale, 3rd Edition* (WAIS-III)
- *Behavior Rating Inventory of Executive Function* (BRIEF)

Inclusion/Exclusion Criteria:

- Primary diagnosis of ASD (ASD) or other psychiatric disorder (Non-ASD).
- Excluded: Children diagnosed with a primary or comorbid Intellectual Disability, cerebral palsy, or children with no clinical diagnosis.

Participant Demographics:

	N	Sex (M, F)	Age (*SD*)
ASD	307	225, 46	9.76 (3.75)
Non-ASD	108	79, 14	10.90 (3.84)

Non-ASD Group Diagnoses	*n*		*n*
ADHD	17	Obsessive Compulsive Disorder	1
Anxiety Disorders	17	Oppositional Defiant Disorder	1
Conduct Disorder	2	Reactive Attachment Disorder	3
Global Developmental Delay	5	Childhood Schizophrenia	3
Major Depressive Disorder	6	Tourette's Syndrome	3
Mood Disorders	5	Other	3
Language Disorders	14		

- There was a significant difference in age between the ASD and Non-ASD group, $t(399)=-2.66$, $p<.01$.
- There was no significant difference in sex [$\chi^2(3,415)=3.77$, $p=.29$].
- There was no significant difference in race [$\chi^2(6,415)=3.61$, $p=.73$].
  - ASD Group: Caucasian: 37%; Asian: 1%; African American: 1%; Indian: <1%; and Multi-racial: 2%.
  - Non-ASD Group: Caucasian: 36%; Asian: 4%; African American: 2%; Indian: n/a; and Multi-racial: 3%.

Methods, cont.

Statistical Analyses:

- Comparison of group differences were analyzed using factorial ANCOVAs with the independent variables of either diagnostic group (ASD and non-ASD) and/or comorbidity group (presence or absence of a comorbid or secondary diagnosis) controlling for age.

Results

Diagnostic Group Comparison

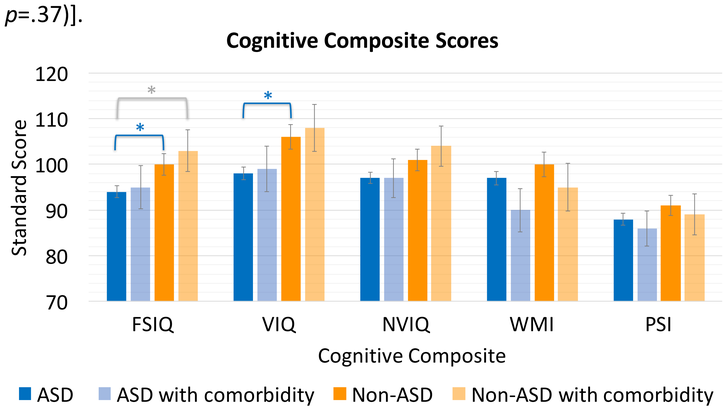
- The ASD group had significantly lower Full Scale IQ (FSIQ) than the Non-ASD group [$F(1,381)=8.50$, $p<.01$].
- Of the Verbal, Nonverbal, Working Memory and Processing Speed composite scores, there was only a significant difference in Verbal Standard Scores between the ASD and Non-ASD group [$F(1,340)=9.59$, $p<.01$].

Comorbid or Secondary Diagnosis Group Comparisons

- Comorbid conditions were diagnosed in 7% ($n=22$) of individuals with ASD and 20% ($n=22$) of individuals in the non-ASD group ($\chi^2=14.70$, $p<.01$).

Comorbid or Secondary Diagnosis	ASD [*n* (%)]	Non-ASD [*n* (%)]
ADHD	5 (2%)	4 (4%)
Learning Disorder	9 (3%)	6 (6%)
Tourette's Syndrome	4 (1%)	1 (<1%)
Childhood Schizophrenia	1 (<1%)	0
Other developmental conditions	2 (<1%)	0
Mood or Anxiety Disorder	0	11 (10%)

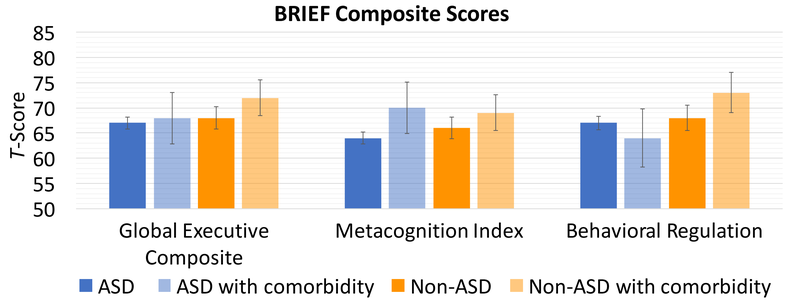
- **FSIQ:** There was no significant interaction between diagnostic group and comorbidity status on FSIQ [$F(1,379)=0.20$, $p=.66$]. There was a main effect of diagnostic group [$F(1, 379)=5.06$, $p=.03$].
- **Verbal:** There was no main effect of comorbidity [$F(1,338)=0.13$, $p=.72$], but there was a main effect of diagnostic group [$F(1,338)=5.04$, $p=.03$] on Verbal Standard Scores. There was no significant interaction between comorbidity and diagnostic group [$F(1,338)=0.01$, $p=.91$].
- **Nonverbal:** There was no main effect of comorbidity status [$F(1,338)=0.34$, $p=.56$] or diagnostic group [$F(1,338)=2.66$, $p=.10$].
- **Working Memory and Processing Speed:** There was no main effect of comorbidity status or diagnostic group on WMI [($F(1,283)=2.30$, $p=.13$), ($F(1,283)=1.25$, $p=.26$)] or PSI [($F(1,277)=0.48$, $p=.49$), ($F(1,277)=0.82$, $p=.37$)].



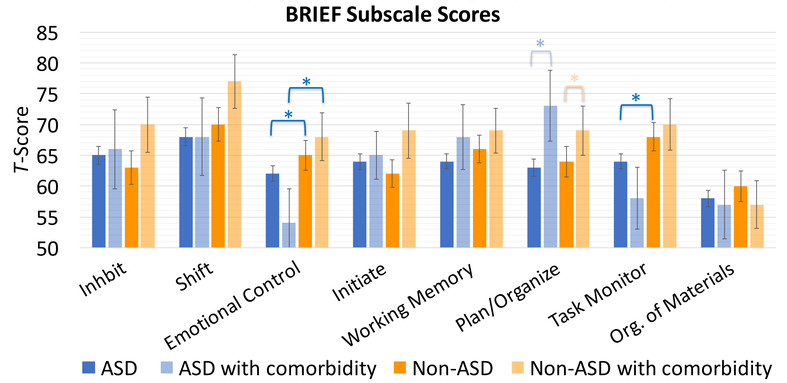
Results, cont.

Executive Functioning (EF):

- There were no significant differences in overall executive functioning (GEC), Behavioral Regulation Index (BRI), or Metacognitive Index (MI).



- Children in the Non-ASD group had significantly greater deficits in Emotional Control [$F(1,105)=4.68$, $p=.03$] and Task Monitoring [$F(1, 96)=5.27$, $p=.02$] than the ASD group.
- Post hoc analyses revealed the same effect for Emotional Control between the Non-ASD with comorbidity ($M^a=68$, $SE=3.9$) and ASD with comorbidity ($M^a=54$, $SE=5.59$) groups ($p=.05$).
- Children with a comorbid condition in both diagnostic groups had significantly greater deficits in Planning/Organizing [$F(1,104)=4.19$, $p=.04$]; there was no significant interaction [$F(1,104)=0.39$, $p=.54$].
- Due to restricted sample size for comorbid groups, results are preliminary.



Discussion

- Comorbidity did not differentially impact core cognitive abilities or cognitive efficiency in children with ASD or another psychiatric condition.
- Comorbidity increased impairment in one domain of EF in both ASD and Non-ASD groups, specifically planning and organizing work or activities. Analysis with a larger sample with comorbidity is needed.
- A limitation was the small sub-samples on the BRIEF, as well as within each comorbid condition that did not allow for more nuanced analysis of specific disorder(s) differential impact on cognitive processes.

References

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2. Hill, E.L. (2004). Executive dysfunction in autism. *Trends Cogn Sci*, 8(1):26–32. doi:10.1016/j.tics.2003.11.003

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