

# Everyday executive functioning influences adaptive skills in autism spectrum disorders

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## ABSTRACT

*Adaptive skills are often defined as a set of behaviors or constellation of skills that allow for an individual to function independently and meet environmental demands. Adaptive skills have been linked with an array of social and academic outcomes. Executive functions (EF) have been defined as a set of “capacities that enable a person to engage successfully in independent, purposive, self-serving behavior”. While the literature has demonstrated some overlap in the definitions of adaptive skills and the purpose of executive functions, little has been done to investigate the relationship between the two. The current study sought to investigate this relationship within Autistic Spectrum Disorders (ASD), a clinical grouping that has demonstrated a predisposition towards deficits within both of these functional domains. ASD are oftentimes associated with EF deficits, especially in the domains of cognitive flexibility, planning, and working memory. Deficits in adaptive skills have also been commonly reported in relation to ASD, with a wide range of abilities being noted across previous studies. The purpose of this study was to examine relationships between adaptive skills and EF in individuals with ASD with the idea that an understanding of such relationships may offer insight into possible focus for intervention.*

**Keywords:** Autism spectrum disorders; Executive functions; Adaptive skills

## 1. INTRODUCTION

Adaptive skills are often described as a set of behaviors or constellation of skills that allow for an individual to function independently and meet environmental demands (Harrison & Oakland, 2003). In children, the development of adaptive skills allows them to learn and apply life skills to such environments as school, home, and community. Examples of such skills include domestic skills (e.g., sorting laundry, dishwashing, meal preparation); self-care (e.g., grooming, hygiene, and dressing); and community skills (e.g., appropriate greetings, recognition of danger, and helping others).

Adaptive skills have been linked with an array of social (Stein, Szumowski, Blondis & Roizen, 1995; Stuss & Alexander, 2000) and academic outcomes (McGee et al., 1991). For example, individuals diagnosed with ADD and ADHD display deficits in adaptive functioning, specifically in terms of socialization, communication, and daily living skills and those diagnosed with an intellectual disability display adaptive skill deficits in conceptual, social, and practical skills (AAIDD website, 2013). Likewise, deficits in adaptive skills and behaviors create difficulties in daily life adjustment. For example, individuals with muscular dystrophy lack communication, daily living, socialization, and motor skills, which impact their ability to be independent and self-sufficient (Cyrulnik & Hinton, 2008).

Executive Functions (EF) have been defined as a set of “capacities that enable a person to engage successfully in independent, purposive, self-serving behavior” (Lezak et al., 2004, p. 35). Examples of executive functioning include, planning, organization, time management, cognitive flexibility, working memory, response inhibition, and meta-cognitive and self-regulation. EF has been found to be a significant predictor in the development of future academic ability (Brock, Rimm-Kaufman, Nathanson & Grimm, 2009). Likewise, difficulties in EF are correlated with difficulties in emotional and social regulation, peer-to-peer and adult-child interactions, and attention-related deficits (Blair & Razza, 2007).

While the literature has demonstrated some overlap in the definitions of adaptive skills and the purpose of executive functions, little has been done to investigate the relationships between the two. Given the limited evidence, the purpose of the current study sought to investigate this relationship within the Autism Spectrum Disorders (ASD) population, a clinical grouping that has demonstrated a predisposition towards deficits within both of these functional domains. Pulling from the literature, we hypothesized that there is a significant correlation between adaptive skills and executive functioning.

Autism is a severe neurodevelopmental disorder characterized by impairment in communication, reciprocal interaction, and a markedly restricted

repertoire of activities and interests (APA, 2000). Aside from the core features, deficits in EF have also been reported, especially in the domains of cognitive flexibility, planning, and working memory (Ozonoff & Strayer, 2001). Deficits in adaptive skills have also been commonly reported in relation to ASD, with a wide range of abilities being noted across previous studies (Sparrow, Cicchetti & Balla, 2006). The profile of adaptive behaviors commonly reported for individuals with ASD consists of substantial delays in adaptive social skills, lesser delays in adaptive communication, and relatively intact daily living skills (Volkmar et al., 1987; Carter et al., 1998; Bölte & Poustka, 2002). The current study sought to examine relationships between adaptive skills and EF in individuals with ASD by correlating different measures with the idea that an understanding of such relationships may offer insight into possible focus for intervention.

## 2. METHODS

An archival data set of 120 participants (80.8% male, 12.9% female) was utilized for the current study. All participants included children and adolescents between the ages of 4 and 19 (mean = 9.47, SD = 3.244) who had been diagnosed with an Autism Spectrum Disorder (i.e., Autism, Asperger's, or PDD-NOS according to the DSM-IV) and previously evaluated at an outpatient neuropsychology clinic. Education ranged from one to 12 years (mean = 4.15, SD = 2.985). All participants' parents or caregivers completed the Behavior Rating Inventory of Executive Function (BRIEF) and the Adaptive Behavior Assessment System-Second Edition (ABAS-II) as part of their clinical evaluation.

## 3. MEASURES

The ABAS-II is a norm-based measure of adaptive behavior skills for children and adults from birth to 89 years. It measures independent functioning and interactions across 11 skill areas: communication, community use, functional academics, health and safety, home or school living, leisure, self-care, self-direction, social, motor, and work resulting in four domain composite scores (Conceptual, Social, Practical, General, and General Adaptive). Reliability scores ranged from .97 to .99 for the GAC (General Adaptive Composite) scores, .91 to .98 for the adaptive domains (i.e., Con-

ceptual, Social), and .80 to .97 for the 10 individual skill areas (Harrison & Oakland, 2003).

The BRIEF is a 86-item questionnaire that measures executive functioning in the home and school environments in eight clinical scales (inhibit, shift, emotional control, initiate, working memory, plan/organization, organization of materials, and monitor) and two validity scales (Behavioral Regulation and Metacognition) to form a Global Executive Composite.

#### 4. RESULTS

A Pearson's correlation analysis was conducted using BRIEF and ABAS scores. *Table 1* shows the correlations between ABAS-II and BRIEF outcomes at or below .001 significance and between .05 and .002 significance. Results demonstrated that the vast majority of outcomes on the BRIEF were significantly correlated with outcomes on the ABAS-II; specifically, Behavioral Regulation, Initiation, Monitoring, Metacognition, and Global Executive Control were significantly correlated with all ABAS outcomes. The domains of Shifting, Working Memory, and Planning and Organization were significantly correlated with the majority of ABAS outcomes.

#### 5. DISCUSSION

In the present study, we sought to analyze the relationship between adaptive skills and executive functioning in children and adolescents diagnosed with autism. Results demonstrated that the vast majority of outcomes on the BRIEF were significantly correlated with outcomes on the ABAS-II. Specifically, behavior regulation, initiation, monitoring, metacognition, and global executive control were significantly correlated with all ABAS-II outcomes and shifting, working memory, and planning and organization were significantly correlated with the majority of ABAS-II outcomes.

Furthermore, findings may suggest weakness in daily functioning in individuals with ASD are likely influenced by EF deficits. Due to the converging evidence, targeted interventions to improve EF may improve adaptive skills thereby increasing individual functional capacities. Without proper behavioral modification, children and adolescents with ASD often do not outgrow these deficits, which persist into adulthood and negatively impact social, emotional, and occupational functioning.

Table 1

<i>BRIEF</i>											
	I	S	EC	BRI	IN	WM	PO	OM	M	MI	GEC
<i>ABAS-II</i>											
COM	-.444**	-.500**	-.394**	-.523**	-.431**	-.340**	-.434**	-.173	-.488**	-.458**	-.553**
CU	-.166	-.276	-.300*	-.320**	-.345**	-.261*	-.336**	-.010	-.314**	-.308**	-.333**
FA	-.298*	-.314**	-.308**	-.363**	-.451**	-.389**	-.452**	-.187	-.475**	-.480**	-.487**
HL	-.234*	-.265	-.193	-.301**	-.341**	-.207	-.291*	-.397**	-.408**	-.386**	-.376**
HS	-.307**	-.223	-.234*	-.339**	-.306**	-.223	-.265*	-.118	-.381**	-.306**	-.338**
L	-.443**	-.518**	-.445**	-.568**	-.482**	-.272*	-.361**	-.237*	-.505**	-.442**	-.555**
SC	-.364**	-.324**	-.241*	-.365**	-.513**	-.376**	-.477**	-.387**	-.598**	-.559**	-.548**
SD	-.279*	-.361**	-.353**	-.399**	-.453**	-.384**	-.432**	-.206	-.492**	-.482**	-.501**
S	-.480**	-.445**	-.329**	-.509**	-.482**	-.305**	-.384**	-.248*	-.558**	-.473**	-.542**
GAC	-.462**	-.413**	-.392**	-.521**	-.510**	-.376**	-.458**	-.282*	-.580**	-.531**	-.585**
C	-.417**	-.378**	-.376**	-.476**	-.526**	-.421**	-.512**	-.254*	-.539**	-.558**	-.587**
SOC	-.516**	-.437**	-.403**	-.556**	-.509**	-.288*	-.409**	-.300**	-.555**	-.498**	-.582**
P	-.357**	-.295*	-.290*	-.402**	-.475**	-.340**	-.416**	-.299*	-.512**	-.489**	-.495**

BRI = Behavior Regulation Index; C = Conceptual; COM = Communication; CU = Community Use; EC = Emotional Control; FA = Functional Academics; GAC = General Adaptive Composite; GEC = Global Executive Composite; HL = Home Living; HS = Health and Safety; I = Inhibit; IN = Initiate; L = Leisure; M = Monitor; MI = Metacognition Index; OM = Organization of Materials; P = Practical; PO = Plan/Organize; S = Shift; SC = Self-Care; SD = Self-Direction; SOC = Social; WM = Working Memory.

\*\* Significance at or below .001; \* Significance between .05 and .002.

In fact, studies have shown that adults with high-functioning autism and Asperger's syndrome have a greater likelihood of being unemployed and have jobs that are not commensurate with their cognitive skills and/or level of education (Szatmari, Bartolucci & Bremner, 1989). In addition, these adults are far less likely to have satisfying social relationships (Venter, Lord & Schopler, 1992).

Parent training and classroom behavioral management techniques targeted at improving EF have been shown to be at least marginally effective with individuals diagnosed with ASD (Soorya & Halpern, 2009). The behavioral interventions involve parent or teacher training in the use of effective reinforcement and punishment procedures. The rationale for these interventions is to provide compensatory systems for the executive functioning deficits found in ASD. Targeted skills and behaviors are broken down into small steps, and taught using prompts, which are gradually eliminated as the steps are mastered. The child is given repeated opportunities to learn and practice each step in a variety of settings. Each time the child achieves the desired results (e.g., mastery of adaptive skills or EF), he or she receives positive reinforcement such as verbal praise of something that the child finds to be highly motivating. Parents and other caregivers can learn how to effectively implement treatment mechanisms into the child's everyday life enabling treatment to become consistent and routine for children with ASD. Given the limited research, however, further investigation of the relationship between improvements in adaptive behavior skills secondary to EF interventions may prove useful in the ASD population. In particular, future research may want to consider limiting the age range of participants or creating subgroups of participants based upon diagnosis (i.e. ASD, PDD-NOS, etc.).

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