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ORIGINAL PAPER

Relations between Parenting Stress, Parenting Style, and Child Executive Functioning for Children with ADHD or Autism

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Abstract Relations among parenting stress, parenting style, and child executive functioning for children with disabilities are not easily teased apart. The current study explored these relations among 82 children and adolescents age 7–18: 21 with attention deficit/hyperactivity disorder, 33 with autism spectrum disorder, and 28 typically developing. Results indicated that children with attention deficit/hyperactivity disorder or autism spectrum disorder had more executive functioning deficits, and their parents reported more parenting stress and a greater use of permissive parenting, compared to typically developing children. In general, increased parenting stress was associated with greater use of authoritarian and permissive parenting styles, as well as more problems with behavior regulation for children. Authoritarian and permissive parenting styles were associated with poorer child executive functioning. Child diagnostic group (attention deficit/hyperactivity disorder, autism spectrum disorder, typically developing) moderated relations between parent stress and child functioning, and between parenting style and child functioning. Implications for intervention with families of children with disabilities are discussed.

Keywords Parenting stress · Parenting style · ADHD · Autism · Executive functioning · ASD

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Introduction

Raising a child with special needs is a unique experience for parents. They may find their lives greatly altered by the addition of a child into the family who requires extraordinary time and attention. While all parents experience stress while raising children, most parents also experience an increase in self-efficacy and a decrease in stress as time goes by, improvements that may not be observed for parents of children with disabilities (Deater-Deckard 2004). Indeed, a large body of prior research indicates that parents of a child with a disability experience elevated parenting stress compared to parents of typically developing children (Dabrowska and Pisula 2010; Vitanza and Guarnaccia 1999; Woolfson and Grant 2006). There are many characteristics of children with disabilities that may cause stress for families (e.g., poor social or language skills, odd behavior or appearance, developmental delays), as well as broader contextual factors (e.g., limited social support, disagreements with spouse or grandparents, difficulty obtaining appropriate medical/educational resources) that might be stressful for parents of a child with a disability (Derguy et al. 2016). However, much research attention has focused on the parenting stress linked in particular with children's behavior problems, self-regulatory skills, and executive functioning (EF).

Self-regulation is a key component of EF (i.e., higher-order thinking skills, such as the ability to control, plan/organize, initiate, and monitor one's own behavior; Gioia et al. 2000). Although children with a variety of disabilities may have some degree of behavioral problems, attention deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), in particular, are two disabilities that feature particularly strong, if not definitional, deficits in EF (Barkley 1997; Winsler et al. 2007). Researchers have often

found that parents experience particularly high levels of stress when the child's disability is one involving severe deficits in EF, such as with ADHD or ASD, as opposed to other disabilities, such as Down syndrome or intellectual disability (Hayes and Watson 2013; Wiener et al. 2016).

Child behavior problems resulting from poor self-regulatory abilities of children relate strongly to parenting stress, as opposed to other features of child disabilities (i.e., adaptive skills) (Graziano et al. 2011; Vitanza and Guarnaccia 1999). For instance, Baker et al. (2003) found that children with developmental disabilities exhibited more problem behavior than children without disabilities, and parents of children with disabilities reported more stress than parents of those without disabilities. However, stress was related to severity of problem behavior, rather than to the type of developmental disability itself. Similarly, Lecavalier et al. (2006) demonstrated that, for children with ASD, behavior problems were related to parenting stress, but other characteristics (i.e., poorer adaptive skills, lower functioning levels) were not associated with parenting stress. Further, parenting behavior and parenting styles come into play as parents both shape and react to children's behavior over time.

While some assume that parenting stress leads directly or indirectly to deficits in children's behavior regulation (Crnic et al. 2005), and others assume it is child behavior that exacerbates parenting stress (Tomanik et al. 2004; Vitanza and Guarnaccia 1999), both of these positions are too simplistic of an explanation for the complex exchanges between parent and child. A transactional framework more appropriately captures the bidirectional relationship between these constructs, which stipulates that parent and child characteristics interact over time to influence and change one another (Baker et al. 2003; Lecavalier et al. 2006; Sameroff and MacKenzie 2003). For instance, poor self-regulatory abilities on the part of the child lead to increased stress and dysfunction in parents, and, at the same time, maladaptive parenting behavior leads to increased problem behaviors and further dysfunction in the child.

The transactional nature of development postulates that child outcomes reside "not in the individual, but in the adaptiveness of the relationship between individual and context" (Sameroff and Mackenzie 2003, p. 613). In other words, the experiences of the child in the surrounding environment (e.g., interactions with a caregiver) modify the child's behavior, and the changed child, in turn, influences the surrounding environment through his/her evolved behavior. Bidirectional influences continue in this manner, resulting in changes in child behavior, parent behavior, and child–parent interactions over time. Both Baker et al. (2003) and Lecavalier et al. (2006), for example, found support for transactional relations, where elevated parental stress increased behavior problems in children, and in turn, behavior problems in children contributed negatively to parental stress. Interestingly, Zaidman-Zait et al. (2014) followed a sample of children with ASD for 4 years and found that the general construct of parent general distress predicted child behavior problems over time and not the other way around, showing evidence of parent but not child effects. Evidence for bi-directionality was found for the more specific construct of parenting distress and child behavior problems.

Other parenting variables, such as parenting style, might influence bidirectional relations between parenting stress and child behavior. Baumrind's (1966) landmark research identified three central parenting styles—permissive, authoritarian, and authoritative. Parents with a permissive style place few demands on the child, exert little control, and provide little to no structure, rules, and expectations, yet they are warm and nurturing. Parents with an authoritarian style exert high levels of control, do not typically explain reasons for rules to the child, expect obedience, and frequently use punishment to obtain compliance. These parents often restrict a child's autonomy and are low in warmth and nurturance (Baumrind 1966). Finally, parents with an authoritative style place rules and demands on the child, but explain the reasoning behind them. They provide structure, but also allow for child autonomy, and are high in warmth and nurturance (Baumrind 1966). In general, an authoritative parenting style is related to healthier and more positive developmental outcomes for children compared to authoritarian or permissive parenting styles (Williams et al. 2009). Parenting style can either exacerbate or lessen negative behavior in the child, lending additional support for transactional parent–child processes (Woolfson and Grant 2006).

Further, harsh, inconsistent, and ineffective parenting is related over time to increased parenting stress (Crnic and Low 2002; Deater-Deckard and Scarr 1996). Over time, children with poor self-regulatory skills (such as those with ASD and ADHD) may elicit harsher parenting, which in turn relates to further behavior problems displayed by children (Deater-Deckard 2004; Winsler 1998). Parents of children with behavior problems tend to use more punishment in general (both verbal and corporal) and harsher techniques than other parents (Nicholson et al. 2005). Deater-Deckard and Scarr (1996) found that parental stress was positively correlated with parental authoritarianism and harsh and rigid parenting was positively correlated with child behavior problems. Deater-Deckard (2004) posited a mediational model, where parental stress leads to negative child outcomes through low-quality parenting. However, this mediational hypothesis has received mixed support. For instance, Crnic et al. (2005) found a direct effect of parental stress on children, but did not find support for a mediational effect through parenting behavior. Additional research is

needed that examines how parenting stress relates to self-regulatory abilities of children with EF deficits, and how parenting practices/behavior might play a role in this relationship.

If transactional processes are at work, Sameroff and MacKenzie (2003) advocate the use of moderator analyses to test hypotheses, because moderated relationships allow for multiple pathways between variables. Not all children with behavioral difficulties are subjected to harsher parenting styles, and parents with relatively ineffective parenting styles do not all have children with disabilities. Although parents of children with ADHD and ASD both experience increased stress compared to parents of typically developing children, it is possible that the types of stress experienced and links to parenting style and child behavior might be different depending on the nature of the child's disability. For example, among families with a child with ASD, the stress generated from social interaction difficulties likely centers around the child's lack of skill or interest in social interaction, whereas for parents of children with ADHD, stress likely emerges from parent–child social interactions being characterized by increased conflict, negativity, control, and noncompliance (Wiener et al. 2016). Finally, at least among very young children with ASD, when many parents participate in extremely labor-intensive behavioral therapy and intervention, the structure of parenting stress for parents of children with ASD appears to be unique (Zaidman-Zait et al. 2011).

Most prior studies examining ADHD or ASD and parenting stress have compared a clinical group of children to typically developing controls (Baker-Ericzen et al. 2005) or to children with other developmental disabilities (i.e., Down Syndrome; Dabrowska and Pisula 2010). The present study examines two clinical groups of children with EF difficulties with distinct behavioral profiles (ASD and ADHD) in addition to a comparison group of typically developing children. We first examined whether parenting stress, parenting style, and child EF varied by diagnostic group (ASD, ADHD, Comparison). We expected that, for children with ADHD or ASD, parents would exhibit greater parenting stress and children would exhibit poorer EF compared to typically developing children. We also expected that greater child EF deficits would be related to less authoritative and more authoritarian parenting. Next, we examined relations between parenting style, parenting stress, and child EF, and whether these relations were the same for all three groups.

Method

Participants

Eighty-two children (64 males) between the ages of seven and 18 ($M = 11.1$, SD = 2.9) from a mid-Atlantic metropolitan area participated in this study. This included 21 children (8 girls) clinically diagnosed with ADHD ($M_{age} = 11.0$, SD = 2.3), 33 diagnosed with ASD (1 girl; $M_{age} = 11.6$, SD = 2.8), and 28 typically developing children (9 girls; $M_{age} = 10.4$, SD = 3.2). Of the 33 children with ASD, 28 % ($N = 9$) were diagnosed with high-functioning autism, 56 % ($N = 18$) with Asperger's, and 16 % ($N = 5$) with pervasive developmental disorder (PDD-Not otherwise specified).

Table 1 details descriptive statistics for each of the demographic variables by group. Average family income of participants was US$100,000–$125,000 (average for the location), with 67 % coming from dual-income families. Parents ranged in age from 30 to 62 years ($M = 43.0$, SD = 6.0). The majority (79 %) of the parents had a college degree, and most (89 %) were married. Most parents (92 %) were Caucasian, 4 % were African-American, and 4 % were other/mixed. We asked for the adult who spends the most

Table 1 Demographics by group

	Group		
	Comparison ($n = 28$)	ASD ($n = 33$)	ADHD ($n = 21$)
Age of child	$M = 10.43$, SD = 3.22 range 7–18	$M = 11.64$, SD = 2.8 range 7–17	$M = 11.00$, SD = 2.3 range 7–15
Gender of child*	69.2 % male	97 % male	62 % male
Gender of parent	88.5 % female	84.4 % female	95 % female
Age of parent*	$M = 40.7$, SD = 4.47 range 30–50	$M = 43.8$, SD = 6.46 range 32–62	$M = 45.3$, SD = 5.97 range 35–57
Education of parent	$M = 5.68$, SD = 1.3 range 4–8	$M = 5.70$, SD = 1.2 range 4–8	$M = 5.52$, SD = 1.4 range 3–8
Family income	$M = 6.68$, SD = 2.0 range 4–11	$M = 6.70$, SD = 12.0 range 3–11	$M = 8.06$, SD = 1.9 range 6–11
Marital status	89.3 % married	95.2 % married	84.8 % married
Family income	$M = 6.68$, SD = 2.0 range 4–11	$M = 6.70$, SD = 12.0 range 3–11	$M = 8.06$, SD = 1.9 range 6–11
Full scale IQ	NA	$M = 112.2$, SD = 14.4 range 85–126	$M = 107.1$, SD = 14.8 range 95–138
PPVT-III percentile*	$M = 86.84$, SD = 10.62 range = 61–99.8	$M = 61.91$, SD = 37.31 range 19–99.9	$M = 71.57$, SD = 26.94 range 29–99.9

* = $p < .05$; ** = $p < .01$

time with the child to be the participating parent/guardian, which was typically female. For the majority (85.4 %) of children, the biological mother was the caregiver that completed surveys on child EF, parenting practices, and parenting stress. For seven children, surveys were completed by the biological father, and for five children, surveys were completed by an adoptive parent, stepparent, or other guardian. There were no group differences in demographics, except that parents of children with ADHD were somewhat older than parents of control children.

Children with ASD were recruited from and diagnosed at a hospital with a nationally recognized specialty clinic for children with ASD. Some of the children with ASD (and all with ADHD) were recruited from local agencies, clinics, school district special education services, and local support groups. Fliers describing the study were distributed, and emails or announcements of invitation were distributed through listservs and newsletters of local support groups for parents of children with ADHD or ASD, and through the county school systems' email support lists for children with special needs.

Participants with ADHD or ASD were required to provide to the researchers a copy of their formal psycho-educational/neuropsychological/clinical assessment report supporting a primary clinical diagnosis (DSM-IV at the time) of either ADHD (all happened to be either combined or predominantly hyperactive-impulsive types), Asperger syndrome, autism, or PDD-NOS. Thus, all diagnoses were required to have evidence of a rigorous evaluation/assessment process from an individual specially trained to assess and diagnose these clinical conditions (as opposed to, for example, simply receiving a diagnosis from a family doctor). Inclusion criteria for the clinical cases included a primary diagnosis of ADHD, Asperger syndrome, autism, or PDD-NOS. Children were excluded if they held a secondary diagnosis that included psychotic features, if their tested IQ was below 85 (according to the psycho-educational reports provided to us only by the parents of the clinical groups), or if their English skills were not adequate for understanding experimental directions. Three of the children with ASD as their primary diagnosis also had ADHD as a secondary diagnosis. Other secondary diagnoses present among children with autism included (one each) depression, dyslexia, anxiety, and Obsessive Compulsive Disorder. Secondary diagnoses present for children with primary diagnoses of ADHD included Learning Disabilities (3), Oppositional Defiant Disorder (1), and Tourettes (1).

Comparison children were recruited in the same ways described above, as well as through informal contacts and a database of families who had expressed interest in participating in studies at the university. About half (57 %) of the children with ASD and 90 % of the children with ADHD were taking medication of some kind for a mental health/behavioral concern. Children taking stimulant medication for ADHD symptoms (regardless of group) were seen during a wash-out period, a day that their parents had agreed not to administer the medication for at least 24 h before the visit. Given that the half-life of regular Methylphenidate (what the participants were mostly taking at the time, not the more recently available sustained release versions or other longer-lasting stimulants) for children is 2.5 h, and that after five half-lives, 98 % of the substance is removed from the system, 24 h was deemed a sufficient wash-out period (US Food and Drug Administration n.d.). Other medications for other conditions such as anxiety, mood disorders, or social skill difficulties (i.e., Prozac) were not disrupted. The sample participated in a larger study examining the language and EF of children with ASD and ADHD, which required that the children with ASD be high functioning with basically intact language (Winsler et al. 2007).

Procedure

After an initial intake/screening interview conducted over the phone, families who fit inclusion criteria were scheduled to come to campus for a one-time session. Families were given $25 and a copy of the videotape of their session as incentives for participation. After arriving at the lab, researchers briefly explained the study to the parent and child, and parents (and children 16 years of age and older) signed consent forms. All children regardless of age provided verbal assent to participate. While children were completing other tasks unrelated to the current study, parents filled out surveys, including a demographic questionnaire, the Parenting Practices Questionnaire (PPQ), and the Parenting Stress Index (PSI) or the Stress Index for Parents of Adolescents (SIPA). At the end of the session, children completed the Peabody Picture Vocabulary Test (PPVT), followed by the computerized version of the Wisconsin Card Sort Task. At that time, parents filled out the Behavior Rating Inventory of Executive Function (BRIEF).

Measures

Direct Assessment of EF

All children completed the *Wisconsin Card Sort Task: Computer Version* (WCST: CV; Harris 1990). The WCST has long been used as a measure of cognitive flexibility, set-shifting, and executive processing (Heaton et al. 1999; Ozonoff 1995). More recently, standard practice has been to administer the task on the computer, a format found to be equally valid and reliable (Artiola i Fortuny and Heaton 1996). Based on prior research, scores used in analyses

included the percent of perseverative errors (card incorrectly placed into a pile known to be incorrect due to feedback provided from the previous card) and the total number of categories achieved (range = 0–6) (Barkley et al. 1992). Three children did not complete the WCST.

Parental Report of EF

Parents completed the BRIEF (Gioia et al. 2000), which is designed to tap into eight aspects of EF in children and adolescents aged 5–18. The BRIEF has been useful in evaluating the EF of children with a wide spectrum of disabilities, including ADHD and ASD (Gioia et al. 2000). It has also been used frequently in studies examining stress and/or parenting style for parents of children with disabilities (Graziano et al. 2011; Rogers et al. 2009). Compared to EF assessments conducted in the laboratory that assess child behavior during novel and often computerized cognitive tasks unlikely to be a part of the child's natural environment, the BRIEF can be seen as a more ecologically valid measure of child EF that taps "everyday" aspects of child EF in the home as reported by the parent (Isquith et al. 2005). It is composed of 86 items, and ask the parent to rate the child's behavior on a 3-point Likert scale (never, sometimes, and often). Collectively, the items represent a child's global executive composite (GEC), a measure of overall EF. Higher ratings indicate greater impairment in child functioning as perceived by the parent. The BRIEF demonstrated high internal consistency reliability (α's = .82–.98) in the original norming sample (Gioia et al. 2000), as well as with the current sample ($\alpha = .95$ for the GEC).

Parenting Practices and Parenting Stress

Parents completed the PPQ, which measures parenting in a manner consistent with Baumrind (1966) (PPQ; Robinson et al. 1995). It is a 62-item survey with responses for each item on a 5-point Likert scale ranging from "never" to "always." The items yield scores for each parent's level of authoritativeness, authoritarianism, and permissiveness. The higher the score for each parenting style, the more often the parent engages in behaviors consistent with that style. The three-factor structure of the scale was confirmed by the developers (Robinson et al. 1995). Internal consistency reliability was high for the present sample ($\alpha = .86$ for authoritative, $\alpha = .80$ for authoritarian, and $\alpha = .81$ for permissive).

The Parenting Stress Index: Third Edition, Short Form was utilized to assess level of stress for parents with children 12 years old or younger (PSI; Abidin 1995). The PSI has 36 items with a 5-point Likert scale, with response options ranging from "strongly agree" to "strongly disagree." Responses on the measure are summed to create a total stress (TS) composite, which provides an indication of the amount of stress adults are experiencing due to their role as a parent (Abidin 1995). Internal consistency reliability was high for TS ($\alpha = .90$).

Parents with children 13 years and older completed the 112-item Stress Index for Parents of Adolescents, a developmentally appropriate extension of the PSI (SIPA; Sheras Abidin and Konold 1998). It focuses on the specific issues and behaviors that parents face in their interactions with and concerns about their children (Sheras et al. 1998). The score representing total parenting stress (TS) was used in analyses. Internal consistency reliability was high for the TS composite in the current sample ($\alpha = .90$). The TS composite scores from the PSI and SIPA were standardized so that they could be combined into one variable representing parenting stress for all children in the sample.

Peabody Picture Vocabulary Test

The well-known PPVT was used to assess children's receptive language skills (PPVT-III; Dunn and Dunn 1997). The PPVT was not completed for six participants who were unable to stay for the entire assessment period.

Data Analyses

We first engaged in preliminary analyses to explore Pearson correlations between family/demographic variables and the outcomes of interest. Then, we tested for group differences in EF and parenting stress with analyses of variance (ANOVAs) with group (ADHD, ASD, Typical) as the IV and the relevant EF or parenting stress measure as the dependent variable. Then we examined associations between parenting stress and child EF via Pearson correlations. We then tested whether the relations between parenting stress and EF were different by diagnosis group with moderated multiple regression analyses. Similarly, we conducted moderated multiple regression analyses to examine whether links between parenting style and child EF were the same for different groups of children. For both of these regressions, we examined planned contrasts between the clinical (ADHD and ASD combined) vs. typically developing children, and differences between the two clinical groups (ADHD vs. ASD).

Results

We initially examined whether child age, gender, verbal ability, and family income were associated with measures of interest. Age and gender of the child were not associated with BRIEF, PSI/SIPA, PPQ, or WCST scores. Since the age range of the sample was wide, we tested age [child vs. adolescent (>age 12)] as a potential moderator in analyses;

however, it was not significant for any relationships described below. We also did analyses with age as a covariate but the results did not change, so we report the analyses without age included below. Child PPVT was negatively associated with the BRIEF, $r = -.35$, $p = .003$; children with a larger vocabulary had fewer deficits in EF as reported by parents. Vocabulary was also associated positively with number of categories completed on the WCST ($r = .45$, $p < .001$) and negatively with perseverative errors ($r = -.34$, $p = .003$). Children with greater receptive vocabulary skills tended to have parents with less perceived stress ($r = -.24$, $p = .023$). Language skills were not related to parenting style. Given that others have argued against the practice of controlling for PPVT/IQ in studies of EF and the fact that results were essentially the same regardless of whether we controlled for PPVT, we report the models without the covariates below (Berlin et al. 2004). Lastly, family income was not associated with scores on the PPQ or WCST, but was positively associated with the BRIEF ($r = .26$, $p = .032$); children with greater reported EF deficits tended to be from more affluent families. Family income was also positively associated with parenting stress ($r = .26$, $p = .032$). Because controlling for income did not change the results, we report unadjusted statistics below.

Group Differences in Stress, Style, and EF

Table 2 displays the group means for child EF, parenting stress, and parenting style. To examine whether these differed by group (comparison, ADHD, or ASD), one-way ANOVAs were conducted with group as the independent variable and the relevant EF, parenting style or stress indices as separate dependent variables. As hypothesized, children with ADHD or ASD had a greater degree of impairment in parent-reported EF, $F(2, 79) = 88.26$, $p < .001$ (for ADHD vs. comparison, $d = 3.30$; for ASD vs. control, $d = 2.82$, Least Significant Difference post hoc contrasts $p < .001$). There were no significant differences between the ADHD and ASD groups. There was also a significant effect of group for number of WCST categories completed, $F(2, 76) = 4.81$, $p < .011$, and a marginal effect for WCST perseverative errors, $F(2, 76) = 2.94$, $p = .06$. Specifically, the ASD group completed a fewer number of categories ($d = .82$), and had more perseverative errors ($d = .64$), compared to the control group.

Also as hypothesized, parents of children with ADHD or ASD reported more parenting stress than parents of typically developing children, $F(2, 78) = 39.00$, $p < .001$ (ADHD vs. comparison $d = 2.33$; ASD vs. comparison $d = 1.98$). There was no difference in parental stress between the two clinical groups. Finally, there were no significant differences between the three groups on authoritative, $F(2, 79) = .09$, $p = .92$, or authoritarian parenting, $F(2, 79) = 2.14$, $p = .13$.

Table 2 Group differences in EF, parenting stress, and parenting style

Measure	Group		
	ADHD	ASD	Comparison
BRIEF*[a]	$M = 168.10$	165.51	106.84
	SD = (14.05)	(20.34)	(21.28)
WCST			
# Categories completed*[b]	$M = 1.80$	1.45	2.21
	SD = (1.01)	(1.03)	(0.79)
Perseverative errors+[b]	$M = 14.70$	16.79	10.03
	SD = (7.41)	(12.69)	(7.41)
Parenting stress*[a]	$M = .67$	.39	−.95
	SD = (.81)	(.73)	(.60)
Parenting style*[a]			
Permissive*[a]	$M = 2.00$	2.00	1.60
	SD = (.23)	(.33)	(.32)
Authoritative	$M = 3.96$	3.99	4.01
	SD = (.36)	(.34)	(.36)
Authoritarian	$M = 1.82$	1.88	1.71
	SD = (.28)	(.36)	(.27)

*$p < .05$; +$p < .10$

[a] ADHD and ASD more EF difficulties, stress, and permissiveness than controls

[b] ASD more errors than controls

However, parents of comparison children rated themselves as significantly less permissive than parents of children with ASD ($d = 1.23$) and ADHD ($d = 1.42$), $F(2, 79) = 16.20$, $p < .001$. Parents of children with ASD were not different in permissiveness from parents of children with ADHD (see Table 2).

Relations between Parenting Stress, Parenting Style, and Child EF

Table 3 shows the Pearson correlations between parenting stress and child EF, as well as those between child EF and parenting style. Results revealed a strong positive correlation between parenting stress and parental report of child EF. As hypothesized, parents who reported more stress also reported that their children had more EF difficulties. Interestingly, parental stress was not associated with child EF as directly measured by the WCST.

As hypothesized, authoritarian parenting was positively associated with EF problems as reported by parents. Authoritarian parenting also had a marginal negative association with number of categories completed on the WCST ($p = .08$), but was not associated with WCST perseverative errors. Thus, partially consistent with hypotheses, parents who reported more authoritarian parenting had children

with more EF problems determined by subjective (BRIEF) parent measures and to a lesser extent for the direct (WCST) measure of EF. Greater permissive parenting was positively associated with parent-reported EF problems. Permissive parenting was not associated with categories completed on the WCST, but was positively associated with perseverative errors. In general, parents who had children with more EF difficulties reported more permissive parenting. Contrary to hypotheses, authoritative parenting was not associated with any measure of children's EF (Table 3).

Table 3 Correlations between parenting style, stress, and children's EF

EF Measure	Parenting style		
	Authoritarian	Permissive	Authoritative
BRIEF			
GEC	.41*	.58*	−.14
WCST			
# Categories completed	−.20^{+}	−.18	−.01
Perseverative errors	.14	.23*	.07

EF measure	Parenting stress
BRIEF	
GEC	.78*
WCST	
# Categories completed	−.14
Perseverative errors	.18

*$p < .05$; $^{+}p < .10$

To examine whether relations between parent stress and child EF were the same across groups, we first selected just the two clinical groups of children (ADHD and ASD). We conducted three separate moderated regressions, one for each of three DVs. In each regression, parenting stress and child diagnosis (ADHD = 0 and ASD = 1) were entered in the first step, followed by the interaction term in the second step, with a measure of EF as the DV. Only the results of the interaction term are discussed below.

Child diagnosis was a significant moderator of the relationship between parenting stress and parent-report of child EF, $\Delta F(1, 49) = 14.576$ $p < .001$ (see Table 4). Further exploration of this interaction revealed that for parents of children with ASD, increased stress was linked with child EF problems more so than it was for parents of children with ADHD. Similarly, lower stress was linked with *fewer* parent-reported EF problems for children with ASD but not as much for children with ADHD. This pattern is shown

Table 4 Hierarchical regression models examining child diagnosis/group as a moderator of the relationship between parenting stress/style and parent-reported EF

	B	SE *B*	*β*	ΔR^2	Total R^2
Step 1	–	–	–	.209*	.209
Parent stress	10.50	2.96	.454*	–	–
Child diagnosis (ADHD vs. ASD)	−0.53	4.61	−.015	–	–
Step 2	–	–	–	.183*	.392
Parent stress	−0.85	3.95	−.037	–	–
Child diagnosis	−11.63	5.00	−.323*	–	–
Stress*diagnosis	20.27	5.28	.681*	–	–
Step 1	–	–	–	.772*	.772
Parent stress	13.63	2.59	.398*	–	–
Child group (clinical vs. control)	39.39	5.37	.554*	–	–
Step 2	–	–	–	.013*	.785
Parent stress	23.30	5.16	.680*	–	–
Child group	31.75	6.34	.446*	–	–
Stress*group	−12.73	5.92	−.249*	–	–
Step 1	–	–	–	.702	.702*
Authoritative parenting	−10.63	6.06	−.108^{+}	–	–
Child group (clinical vs. control)	59.36	4.42	.826*	–	–
Step 2	–	–	–	.021	.723*
Authoritative parenting	−29.83	9.84	−.303*	–	–
Child group	−59.98	49.23	−.835	–	–
Authoritative*group	29.86	12.27	1.671*	–	–

*$p < .05$

DV = parent report of EF (BRIEF, GEC)

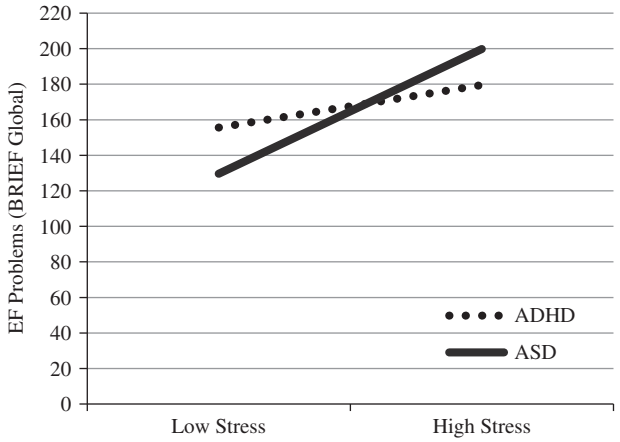

Fig. 1 Clinical group (ADHD vs. ASD) as a moderator of the parent stress–child EF relationship

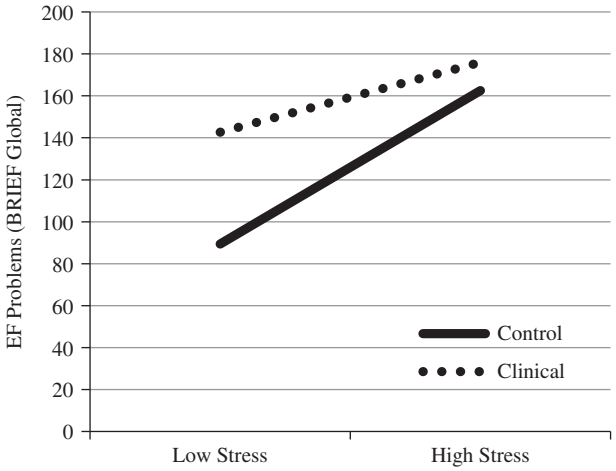

Fig. 2 Child group (ADHD or ASD vs. Control) as a moderator of the parent stress–child EF relationship

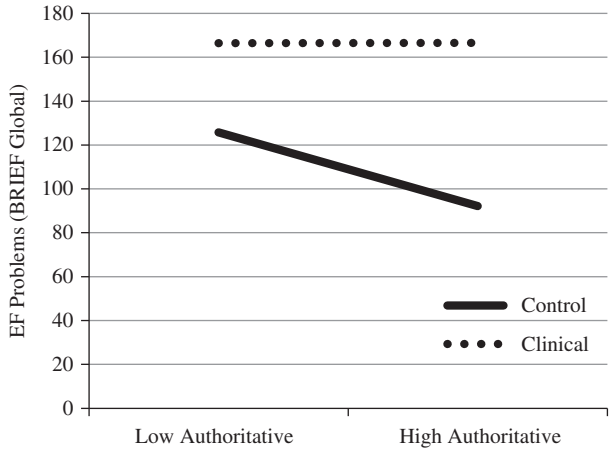

Fig. 3 Child group (Clinical vs. Control) as a moderator of the relationship between authoritative parenting and child EF

visually in Fig. 1. The same analysis was run with the direct measure of EF (WCST), however, child diagnosis did not moderate the relationship between parenting stress and child EF as measured by the WCST.

Next, we explored whether child group moderated relations between parenting stress and child EF when both clinical groups were combined and compared to typically developing children. Results revealed that child clinical status was a moderator of the relationship between stress and parent-report of EF, $\Delta F(1, 77) = 4.63$, $p = .037$ (see Table 4). For the comparison group, parents reported lower amounts of stress and EF problems overall (smaller intercept) compared to the clinical group, but as stress increased, child functioning problems increased at a faster rate for comparison children (larger slope). This pattern is shown visually in Fig. 2. For both WCST measures, child group did not moderate the relationship between parenting stress and child EF.

We then conducted multiple regressions to examine whether child diagnosis moderated relations between parenting style and child EF. As with the above analyses, we first compared just the two clinical groups of children. In each regression, one parenting style and child diagnosis were entered in the first step. The computed interaction term between diagnosis and parenting style was entered in the second step. Results revealed that relations between parenting styles and child EF were the same for children with ASD and ADHD.

Next, we combined the two clinical groups to compare children with an EF-related clinical diagnosis to comparison children. We again conducted the regressions with one parenting style and child group entered in the first step and the computed interaction term entered in the second step. For permissive and for authoritarian parenting, child group did not moderate relations between parenting style and child functioning. In other words, relations between parenting style and child functioning (from both parental and objective measures) were not different for children with a diagnosis compared to typical children. For authoritative parenting, however, group was a moderator of the relation between parenting style and parent report of EF, $\Delta F(1, 78) = 5.92$, $p = .015$ (see Table 4). For typically developing children, the more that parents engaged in authoritative parenting, the fewer parent-reported EF problems their children had. However, for children with an ADHD or ASD diagnosis, child problems did not change much in the presence of increased authoritative parenting. This pattern is shown visually in Fig. 3. For the WCST, child group did not moderate relations between authoritative parenting and child functioning.

Discussion

Consistent with prior research and our hypothesis, children diagnosed with ADHD and/or ASD were rated by their parents as having more problems with EF compared to typically developing children. This is not surprising as ADHD and ASD are seen by many as disorders that involve central deficits in EF (Barkley 1997; Winsler et al. 2007). Children with ADHD have difficulty sustaining attention, regulating their behavior, and switching from one task to another, all behaviors that are part of EF (Barkley 1997). The two clinical groups of children were not rated differently on EF, implying that parents perceived these two groups as similar, at least in terms of global estimates of behavioral EF at home. This is interesting, as children with these diagnoses have not often been compared to each other in terms of EF. In one study, parents and children reported on effortful control for typically developing children and those with ADHD or ASD (Samyn et al. 2011). While both parents and children reported poorer control for children with a clinical diagnosis compared to typically developing children, it was difficult to distinguish between the two clinical groups.

However, results of the objective measures of particular aspects of EF (cognitive flexibility) for the current study indicated that the ASD group had more perseverative errors on the WCST compared to the control group. The ADHD group fell in the middle, not different from the other groups. The WCST is frequently used as a measure of cognitive flexibility or set-shifting, an important component of EF (Pennington and Ozonoff 1996). In a review of 13 studies that used the WCST with participants with ADHD, only eight studies showed differences between the ADHD group and controls (Barkley et al. 1992). Studies with null findings are criticized for having small sample sizes and wide age ranges, two features true of the current study (Barkley et al. 1992). This might account for the null findings between our ADHD and comparison group. Or it is possible that children with ASD actually have more difficulty with the specific EF aspect of cognitive flexibility (assessed by the WCST) compared to children with ADHD. This might be expected given that DSM-V diagnostic criteria for ASD (and not for ADHD) include things like "insistence on sameness, inflexible adherence, and rigid thinking." Indeed, Ozonoff et al. (1991) found that children with ASD made more perseverative errors compared to children with learning disabilities, including some with ADHD.

Also consistent with prior research and our hypotheses, parents of children diagnosed with ADHD or ASD reported more parenting stress than parents of typically developing children. Some research has indicated that parents of children with ASD report more stress than parents of children with other disabilities, such as Down syndrome (Dabrowska and Pisula 2010). Our results shed new light, as parents of children with ASD did not report stress levels significantly different from parents of children with ADHD. It may be that the type of disability itself is not that important for parental stress, but rather it is behavior problems related to their child's difficulties with EF that create stress for parents. Indeed, parents of children with ASD are particularly stressed by the negative view that others have of their child's behavior (Sharpley et al. 1997). Parents who reported higher levels of stress also perceived their children as having greater EF difficulties, as hypothesized. This resonates with prior findings that children who exhibit more difficulties with regulating behavior, controlling impulses, shifting and focusing attention, and working through problems have parents who are more stressed (Joyner et al. 2009). Parenting stress, however, was not related to perseverative errors on the WCST (discussed below).

Parents of clinically diagnosed children did not report using different levels of authoritative or authoritarian parenting compared to parents of control children. However, permissive parenting was reported as occurring more often among parents of children with ADHD or ASD. In prior studies, parents of children with ASD have reported more use of authoritarian parenting compared to controls (Gau et al. 2010), and parents of typically developing children have reported more use of authoritative parenting compared to those who have a child with ASD (Rutgers et al. 2007). In our study, we were relying on self-report of parenting behavior, which is a drawback, as parents likely underreport their own use of parenting behaviors that might be viewed as negative. The limited variability on our three parenting behavior variables supports this point.

As hypothesized, child EF difficulties were associated with greater authoritarian and permissive parenting. These associations were stronger for parent report of EF compared to our objective measure (WCST) but present for both measures of EF. In other words, as EF problems increased for children, parents reported using both less restrictive (permissive) and more restrictive (authoritarian) parenting. It is well known that engaging in permissive and/or authoritarian parenting behaviors is associated with negative outcomes for children, while authoritative parenting is associated with more positive child outcomes (Baumrind et al. 2010).

There are clearly bidirectional, transactional effects at play between children and parents, with parenting behavior affecting the child and child behavior affecting parenting (Kiff et al. 2011; McLaughlin and Harrison 2006; Sameroff and MacKenzie 2003). Indeed, it is often difficult for parents of children with behavior problems and/or developmental disabilities to engage in optimal authoritative parenting. For instance, if a parent's child with special needs is engaging in a temper tantrum to avoid doing a

particular task, the parent may find it easier to give in to the child's demands, or to harshly punish the child, and end the temper tantrum quickly, as opposed to other more authoritative options. This will likely lead to more of this style of parenting in the future, with little improvement in child behavior, reflecting a transactional developmental process (Sameroff and MacKenzie 2003). This point is supported by the observation that for parents of children with developmental disabilities, the use of authoritative parenting became less common for older children compared to younger children, a pattern not found for typically developing controls (Woolfson and Grant 2006).

Although part of parents' behavior is driven by the child, longitudinal and intervention research suggests that parent-to-child effects are larger than the reverse, and that parental behaviors, responsiveness, scaffolding, interactive styles, and disciplinary techniques play a significant role in the development and remediation of child behavior problems, even for the development of children' EF skills (Fay-Stammbach et al. 2014). Even among families with children with ASD, parent general distress predicted child behavior problems over time and not the other way around, showing evidence of parent but not child effects (Zaidman-Zait et al. 2014).

The point here is not that the child's behavior is the parent's fault, but that it is important to also pay attention to and support the parents of children with disabilities, especially since often the focus is solely on the child and his or her problems. Parents with a child with special needs need support and may benefit from education about the potential long-term outcomes of non-authoritative parenting styles and targeted interventions on more adaptive parenting practices for challenging children. Indeed, numerous behavioral parent training interventions that address parenting skills and dysfunctional parenting styles, such as the Incredible Years (Webter-Stratton et al. 2011), Triple P (Tellegen and Sanders 2014), the New Forest Parenting Package (Sonuga-Barke et al. 2001), Parent–Child Interaction Therapy (Lesack et al. 2014), and others (Kasari et al. 2015) have shown promising effects on parent and child behavior for children with ADHD or ASD. Importantly, these parenting interventions are typically geared toward parents with younger (preschool) children. More work is needed in the area of parent support and intervention for older children with ASD or ADHD.

Parents who reported more stress also reported more authoritarian and permissive parenting. Prior research has shown that, for parents of children with externalizing behavior problems such as ADHD, higher stress is related to more controlling parenting practices (Rogers et al. 2009). In the current study, stress was not, however, associated with authoritative parenting. Indeed, parents of children with ADHD or ASD reported more engagement in permissive parenting compared to controls, though there were no differences in authoritarian parenting.

Relations between parenting stress and child functioning were different for those with ADHD and those with ASD. For children with better EF (parent report), parents of children with ADHD reported more stress than parents of children with ASD. However, for children with greater EF problems, the pattern reversed, where parents of children with ASD reported more stress than parents of children with ADHD. In other words, parenting stress may matter more for children with ASD, since higher levels of stress were associated with more problems for these children. On the other hand, it seems that something else about being the parent of a child with ADHD is related to parenting stress. Child group did not moderate relations between parenting style and child functioning. The patterns for the associations between parenting style and child functioning were similar for children with ADHD and ASD. In other words, adaptive parenting relates to child functioning in the same way no matter the diagnosis of the child. Similarly, maladaptive parenting also relates to child functioning in the same way despite the diagnosis of the child.

When contrasting typically developing children to both groups with a diagnosis, we found that clinical status moderated the parenting stress–child functioning relationship. As would be expected, for comparison children, stress was much lower for children with few EF problems, and stress increased linearly as child EF problems increased. However, for children with either ASD or ADHD, stress levels remained relatively high, regardless of the current EF levels of the child. It is possible that this finding is a reflection of parental expectations and history. Parents of children with a diagnosis of ADHD or ASD, given a long history of difficulties, may come to expect to experience high parenting stress and child difficulties. Parents of typically developing children have no reason to have this a priori expectation, so when these children do show some functioning difficulties, parenting stress might increase at a quick rate as a result. Other factors, such as limited positive reinforcement coming from the children, challenges of advocating for services for one's child with special needs, and increased demands on their time for therapy and intervention, may also contribute to the increased stress observed among parents of children with disabilities.

Relations between authoritative parenting and child EF (according to parent report) were different as a function of having a disability. For typically developing children, authoritative parenting was linked to fewer EF problems reported for their children. However, for children with a disability, EF problems were not associated with authoritative parenting. This may indicate that other factors must be addressed to help improve child functioning, such as parent stress, other aspects of family dynamics, or

intervention for the disability itself that are not addressed in this study. The finding that relations between authoritative parenting and child outcomes were different depending on whether the child had a diagnosis resonates with other research showing that child outcomes associated with parenting styles depend on cultural and child contexts (Chao 1994).

The current study employed both a subjective (parent report) and objective (direct assessment) measure of child EF. We felt it was important to include both measures given that parental subjective perceptions of their parenting or child behavior are more strongly associated with parenting stress and parent mental health than objective measures of child functioning (Vitanza and Guarnaccia 1999). According to Milgram and Atzil (1988), "life satisfaction [of parents] is more affected by what parents do to cope with their child's atypical development than by the atypical development itself" (p. 422). Results from the current study supported this notion, where parent report of child EF was more strongly associated with parenting stress and parenting style than was our direct measure of EF. Indeed, parenting stress was not related to the direct measure of EF. Additionally, child group moderated relations between parenting stress and (only parent-reported) EF (ADHD vs. ASD) and between authoritative parenting and (only parent-reported) EF (clinical vs. control). Although our findings may be due in part to common-method variance from parental report, they also highlight the importance of addressing parental cognitions and parental perceptions in intervention work, as opposed to solely targeting child functioning. It is also the case that the BRIEF and WCST tap different components of children's EF difficulties, with the BRIEF focusing on behavioral aspects EF in the home and the WCST getting at more cognitive aspects during problem solving. Finally, it is worth noting that for those taking stimulant medication, the direct measure of EF was administered while off medication but the parent report of EF problems on the BRIEF tapped child day-to-day functioning on medication.

Limitations and Implications

This study has limitations that need to be noted. First, the sample represented families from middle-income to higher-income backgrounds. Therefore, one must be cautious when generalizing the findings to lower-income families. Low-income families are known to have additional risk factors and may therefore experience more stress (Noel et al. 2008) or more maladaptive child and parenting behavior (Qi and Kaiser 2003), and may have fewer resources to care for children with special needs (Pinderhughes et al. 2000). One must also be careful about generalizing our results to families with children with other kinds of disabilities. Although stress and behavioral difficulties are common for families with children with any type of disability, prior research has sometimes indicated that parents of children with ASD or ADHD report more or different types of parental stress than parents of children with other kinds of disabilities, such as Down syndrome (Dabrowska and Pisula 2010).

Also, our ASD sample was limited to older children and those with high-functioning autism so the extent to which our findings hold for lower-functioning and younger children with ASD are unclear. We were also limited with the size of our sample, especially when broken down into the three groups (ADHD, ASD, control), resulting in decreased power to find significant effects. However, it is impressive that significant results were found even in this relatively small sample, suggesting the promise for follow-up research with larger samples. Finally, although we contrasted children diagnosed with either ASD or ADHD using DSM-IV criteria, changes made with the DSM-V make it easier for children to be diagnosed with both of these conditions, and our findings do not speak to what might be the case for such children who are co-morbid for both conditions.

In line with the transactional framework of development, intervention for families with children with disabilities needs to take a family systems perspective (Campbell 1995). Simply "fixing" the child (i.e., with medication or behavioral interventions) is not enough to improve parent–child interaction patterns. The child's environment must also be a key focus. The ways parents perceive and respond to their children with behavioral difficulties needs to be addressed. Promising results from numerous studies have indicated that parents can benefit from training programs, where they are taught more effective ways to manage parenting stress and to interact more positively with their children with special needs (Chronis et al. 2004; Treacy et al. 2005). Reductions in parenting stress as well as improvements in parenting behaviors are found after participation in such programs (Chronis et al. 2004; Treacy et al. 2005). Improvements in parent and child behavior as well as parent–child interaction after program participation highlights the need for further longitudinal exploration of these processes from a transactional perspective.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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