

# Attention-Deficit/Hyperactivity Disorder Symptoms in Mothers and Fathers: Family Level Interactions in Relation to Parenting

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**Abstract** Previous studies linking parent ADHD symptoms to parenting have typically focused on each parent individually. To provide a broader understanding of family context, in this study, levels of inattention and hyperactivity-impulsivity in mothers and fathers were examined, both individually and in combination, in relation to negative parenting and child-rearing disagreements. Two-parent families of 5 to 13 year old boys (126 with ADHD and 53 typically developing) participated. Parents reported their own ADHD symptoms and their perceptions of child-rearing disagreements. Parenting was measured using self-, partner-, and child-reports as well as observations. Controlling for child ADHD symptoms, inattention symptoms in fathers predicted parenting difficulties. For mothers, inattention symptoms were linked to parenting problems only when fathers also had high levels of inattention. In contrast, parenting was most problematic for both mothers and fathers in families in which fathers had higher and mothers had lower levels hyperactivity-impulsivity symptoms. These results remained essentially unchanged when child externalizing behavior and mother depression and hostility were controlled, but father depression reduced the significance of some interactions. The results highlight the importance of the match between father and mother levels of symptoms, and point to differential relations of parenting to inattention and hyperactivity-impulsivity symptoms in parents.

**Keywords** ADHD · Parenting · Coparenting

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Attention-deficit/hyperactivity disorder (ADHD) is increasingly recognized as occurring throughout the life span, and is likely to co-exist in children and parents within families (American Psychiatric Association 2013; Faraone 2014). Focusing on the family context, several recent studies have illuminated the generally deleterious impact of adult ADHD symptoms on parenting and child outcomes (see Johnston et al. 2012 for a review). This work on parent ADHD symptoms in relation to parenting is important as it holds the potential to complement studies of the genetic transmission of the disorder with an understanding of phenotypic or environmental factors that may mediate, interact with, or independently contribute to negative child trajectories. However, there remain gaps in this growing body of literature. Specifically, most studies have focused on mothers and the few that have included fathers have examined mother and father effects independently. In this study, we take a family-level approach linking parenting difficulties, not only to the level of ADHD symptoms in each parent, but also to the level of partner symptoms and to the interaction of mothers' and fathers' symptom levels. We also examine, not only how parent ADHD symptoms are related to impaired parenting, but also to problems in the coordination of mother-father parenting. Finally, we consider the role of both parent and child comorbidities in accounting for the relations between parenting and parent ADHD symptoms.

## Parent ADHD Symptoms and Parenting

As reflected in this special section, studies of how parent ADHD symptoms are related to parenting are growing and providing important insights into the struggles of families where parents and/or children have high symptom levels. Although there are suggestions that in some parenting domains, such as empathy or tolerance, high levels of ADHD symptoms may buffer parents from the negative effects of child ADHD symptoms (e.g.,

Psychogiou et al. 2007; Johnston et al. 2016), most research has centered on the associations between parent ADHD symptoms and parenting difficulties such as over-reactive or inconsistent/lax parenting. Numerous studies have demonstrated that parent ADHD symptoms are associated with these parenting problems (e.g., Chronis-Tuscano et al. 2008; Mokrova et al. 2010; Murray and Johnston 2006; Tung et al. 2015). The wide majority of these studies have focused exclusively on mothers, with only a few considering ADHD symptoms in fathers. In the studies that have included fathers, most suggest an overall similarity to the pattern demonstrated for mothers, with ADHD symptoms related to more negative parenting among fathers (e.g., Agha et al. 2013; Harvey et al. 2003; Mokrova et al. 2010).

The inclusion of fathers is an exciting and necessary development. However, this represents only the beginning of a full understanding of the ways that each parent's ADHD symptoms may be associated with both their own and their partner's parenting. In previous studies that have included fathers, analyses have predominantly treated mothers and fathers as individuals, resulting in a gap in our knowledge of potential interactive effects of symptom levels across both parents in a family. In this study, we not only include fathers, but we also test the relation of both mother and father ADHD symptoms levels to parenting within the context of the other parent's symptom levels. That is, we consider both mother and father ADHD symptoms and their interaction in association with parenting difficulties.

Based on previous studies, we predict that each parent's ADHD symptoms will be positively related to their own negative parenting. However, we also explore independent and interactive effects of the parenting partner's level of ADHD symptoms. The lack of prior research prevents explication of clear hypotheses regarding these partner and interactive effects. Drawing from the family systems literature (e.g., Erel and Burman 1995), one might expect cross-over effects, whereby impairments or psychopathology in one parent negatively influence the partner's parenting. Alternately, compensatory processes might be at play, such that a parent will show more positive parenting in the face of ADHD symptoms in the parenting partner. Such effects have been examined in studies of parent depressive symptoms, with a range of findings including partner symptoms being related in a compensatory fashion to the coparent's more positive responses to children (Nelson et al. 2009), in a cross-over fashion such that mother and child depressive symptoms are more strongly linked when the father's level of symptoms is high (Gere et al. 2013), and parent depressive symptoms either exacerbating or buffering the extent to which marital conflict impacts parenting, depending on parent gender and time lag between measurements (Kouros et al. 2014). In sum, studies of other dimensions of parent psychopathology point to the importance of considering how mother and father ADHD symptoms may interact in a cross-over or compensatory fashion in relation to parenting, but offer no clear picture of the anticipated direction of these relations.

On one hand, one might expect essentially additive negative effects, such that at higher levels of each parent's ADHD symptoms there will be greater difficulties in both the parent's own and their partner's parenting. This prediction is based on the premise that ADHD symptoms not only disrupt the parent's own ability to be consistent or patient as a parent, but also a cross-over whereby higher levels of ADHD symptoms in the coparent serve to increase parent frustration or disorganization, and introduce additional interference with appropriate parenting. Alternately, similar to the buffering or protective effects on parenting that are sometimes seen when both parent and child have high levels of ADHD symptoms (e.g., Johnston et al. 2016), it is possible to speculate that the most difficult situations for parenting are those in which the two parents' levels of ADHD symptoms are mismatched. Thus, parents who are similar in their levels of ADHD, either high or low, may be more likely to share the same tempo or approach to parenting, and be less likely to frustrate or stress each other, lowering the likelihood of either parent engaging in over-reactive or lax parenting. This focus on match or mismatch of parent symptom levels also suggests that a parent may experience the greatest parenting difficulty when their own level of ADHD symptoms, and therefore their tempo or approach to parenting, is discordant from that of their partner. That is, the relation between each parent's own ADHD symptoms and their negative parenting is predicted to depend on the level of ADHD symptoms in the other parent, with the most negative parenting occurring when either the own parent's symptoms are relatively low and the partner's are higher, or vice versa.

## Parent ADHD and Coparenting

The discussion above suggests that inter-parent or coparenting interactions may be an important piece in the picture of family-level effects of parent ADHD symptoms. Thus, we extend our measurement of parenting to include the ability of the parenting partners to communicate about and coordinate their parenting efforts (Feinberg 2003). Specifically, we focus on couples' disagreements related to child-rearing, a construct that shows consistent links to marital dissatisfaction, child problems and negative parenting within each parent (Chen and Johnston 2012; O'Leary and Vidair 2005). Consistent with a family systems framework, difficulties in coparenting or the marital relation related to parent ADHD symptoms would be expected to spill over to the parenting context. Although Wymbs et al. (2015) documented how child and parent levels of ADHD interact to predict difficulties in inter-parent communication, their study did not examine the interaction between mother and father levels of ADHD symptoms. In contrast, Agha et al. (2013) did examine both mothers' and fathers' ADHD symptoms in relation to family conflict and parenting, but did not specifically assess child-rearing disagreements. However, they did find that family

environment, specifically higher conflict and less cohesion, was associated with mothers' level of ADHD symptoms, but not with fathers'. Interestingly, and suggesting a possible family-level compensatory process, when fathers had high levels of ADHD symptoms, children reported that their mothers were warmer. Finally, in a small sample, Williamson and Johnston (2013) reported a number of significant negative bivariate relations between fathers' ADHD symptoms and marital functioning and parenting alliance. However, many of these associations were accounted for by child ADHD or parent comorbidities.

Despite these suggestive leads, the association between parent ADHD symptoms and coparenting remains relatively unexplored. In particular, whether child-rearing disagreements are related, not only to each parent's level of ADHD symptoms, but also to the interaction of the couple's symptoms levels has not been tested. In this study, we examine this question. As with parenting, we might expect additive and cross-over effects, such that high levels of impulsivity or distractibility in both parents would hinder the couples' ability to effectively communicate and agree about child-rearing. Alternately, we might predict that couples will have more difficulties with coparenting or supporting each other in child-rearing when they differ in their levels of ADHD symptoms.

## ADHD in Adults

At present, best practices for assessing levels and types of ADHD symptoms in adults remain in flux. Although full diagnostic assessments, including self- and collateral reports as well as structured interviews, are needed to confirm symptoms and their history and to confidently understand the influence of comorbid conditions (Ramsay 2015), there also is value in adults' self-reports of ADHD symptoms. Such reports are significantly and often quite strongly related to more objective measures (e.g., Barkley et al. 2011), and show expected patterns of convergent, divergent, and predictive validity (e.g., Barkley 2011; Erhardt et al. 1999). In addition, self-reported ratings of ADHD symptoms align with current thinking about the dimensional nature of ADHD (Levy 2014), and with the fact that even subdiagnostic levels of symptoms can be impairing (Kooij et al. 2005). Reflecting these advantages, we rely on parents' self-reported ADHD symptoms in this study, although we acknowledge the potential for these reports to differ from those provided by other informants (e.g., Barkley et al. 2011; Zucker et al. 2002).

With regard to types of ADHD symptoms, studies have provided somewhat different models and levels of support to describe the factor structure of ADHD symptoms. Many recent studies support a bifactor model with inattention and hyperactivity-impulsivity symptom clusters subsumed under an over-arching ADHD factor in both childhood and adulthood

(e.g., Martel et al. 2012; Toplak et al. 2009). As in childhood (e.g., Burns et al. 2009), in adults, the inattention and hyperactivity-impulsivity symptom clusters have somewhat distinctive patterns of correlates, including differential relations to measures of executive functioning (Jarrett 2016) and personality (Gomez and Corr 2014). The two symptom dimensions also have demonstrated some divergence in their relations to parenting. Across a number of studies, parents' reports of their inattention symptoms have been consistently linked to lax and over-reactive parenting, but the evidence linking hyperactivity-impulsivity symptoms to parenting is more inconsistent (Johnston et al. 2012). In this study, we consider each symptom dimension separately and, as in previous studies, we expect that inattention symptoms will be more consistently linked to parenting and coparenting difficulties.

## Child ADHD and Parent and Child Comorbid Problems

Given the genetic nature of ADHD, it is necessary to account for the impact of child ADHD symptoms in all analyses of relations between parent ADHD symptoms and parenting. In addition, the literature on parenting in families of children with ADHD points to strong associations between parenting problems and child externalizing behaviors (Johnston and Mash 2001; Wymbs et al. 2015). Thus, as well as controlling for child ADHD symptoms, we also explore the role of child externalizing problems in accounting for links between parent ADHD symptoms and negative parenting. Similarly, given the highly comorbid nature of ADHD in adults (e.g., Kessler et al. 2006), we examine the extent to which the relations of parenting with adult ADHD symptoms are independent from relations that might be attributed to other parent psychological difficulties. Based on studies demonstrating their potential to account for the relations of ADHD symptoms with parenting, we focus on depressed mood (Chronis-Tuscano et al. 2008) and hostility (Agha et al. 2013) as important covariates.

## Current Study

In summary, in this study, we examine how mothers' and fathers' levels of ADHD symptoms independently and interactively relate to negative parenting and child-rearing disagreements. We examine inattention and hyperactivity-impulsivity symptoms separately. We use a multi-informant, multi-method assessment of negative parenting, and control for child ADHD symptoms and demographics. We predict that each parent's level of inattention and hyperactivity-impulsivity symptoms will be associated with an elevation in negative parenting and reports of child-rearing disagreements for that parent. We also expect that inattention and

hyperactivity-impulsivity symptoms in the two parents will interact in association with each parent's parenting and coparenting. Finally, for both negative parenting and child-rearing disagreements, we test whether comorbid child or parent problems can account for the associations with parent inattention and hyperactivity-impulsivity symptoms.

## Method

### Participants

One hundred seventy-nine two-parent families of 5 to 13 year old boys identified in the community as having ( $n = 126$ ) or not having ( $n = 53$ ) ADHD were recruited from community sources, a registry of families interested in participating in research, and ADHD speciality clinics, psychiatrists, and psychologists. Because our focus was on parent ADHD symptoms, we elected to measure child ADHD symptoms dimensionally and to not require independent confirmation of the child's ADHD diagnoses. As a result, the children with ADHD in this study were diagnosed prior to participating and all analyses involving child ADHD used continuous symptom measures. To ensure variability of ADHD symptoms in parents, families of children with ADHD were oversampled and to eliminate the need to consider child and parent gender interactions, we focused exclusively on boys. Eligibility criteria for families required that both parents agree to participate, and that the family members be sufficiently fluent in English to complete questionnaires. Families were considered to be two-parent families if both parents had an

active parenting role even if the child's biological family was no longer intact. In the majority of families (81.5%), parents were married or cohabiting with their child's biological parent. Divorced or separated couples were included (8.4% of families) if both parents were willing to participate and if the non-resident parent had regular contact with the child (e.g., at least two weekends a month). In step-parent families, preference was given to having the nonresident biological parent participate, but if this was not possible or if this parent did not have sufficient contact with the child, the step-parent participated (6.7% of families). Families with adoptive parents constituted 3.4% of the sample. Comprehensive demographic information is provided in Table 1.

### Procedures

The study was approved by our university's ethics review board, and informed consent was obtained from parents and assent from children. Families participated in a lab visit, during which each parent completed questionnaires assessing their child, their parenting, their psychological functioning, and their partner's parenting. The child also completed questionnaires about each of his parents. In addition, each parent interacted with the child for 30 min, in a free play interaction, a situation in which the parent instructed the child to complete chores, and a situation in which the parent taught the child a simple sports skill and construction project. To prevent children from repeating the same tasks or chores with the mother and father, two parallel sets of materials were available. Assignment of the sets of materials, as well as the order of the situations and of which parent interacted first with the

**Table 1** Sample characteristics

	Mean (SD)	Range	Percentage
Child age in years	9.69 (1.9)	5–13	
Mother age in years	41.96 (5.27)	24–56	
Father age in years	44.17 (6.02)	24–65	
Mother education			
High School or Less			7.3
Partial College/University			25.8
College/University			42.7
Graduate/Professional training			24.2
Mother ethnicity			
European/North American			61.6
Asian			27.6
Other			10.8
Father education			
High School or Less			18.4
Partial College/University			26.9
College/University			34.3
Graduate/Professional training			20.6
Father ethnicity			
European/North American			61.7
Asian			23.6
Other			14.7
Family income	~\$75,000	<\$20,000- > \$200,000	

child were counterbalanced across families. The parent-child interactions were video-recorded for later coding. Families received \$75 following the completion of their lab visit.

If a child with ADHD was currently taking short-acting stimulant medication, parents were asked to stop administering the medication 24 h prior to the lab visit. Eighty children were taking medication for ADHD, and 71 of these were taking stimulant medication. Fifty-one of those children were withdrawn from medication for the lab visit. Forty-seven mothers and 22 fathers were taking medication for a mental health problem, but only six of these mothers and four of the fathers were taking ADHD medication. These parents were asked to not take the medication for 24 h prior to their participation in the study and of the 10 parents taking ADHD medication, 2 mothers and 2 fathers did not withdraw from the medication.

## Measures

**Parent ADHD Symptoms** Parent ADHD symptoms were measured using the Barkley Adult ADHD Rating Scale (BAARS; Barkley 2011). Each parent rated 18 items corresponding to DSM-5 symptom criteria for ADHD (American Psychiatric Association 2013). Each item is rated on a 1 to 4 scale, as present *never or rarely, sometimes, often, or very often* and items were averaged to form a total score. As reported by Barkley (2011) and Kooij et al. (2005), this measure shows good internal consistency and reasonable test-retest reliability. Scores on the BAARS correlate significantly with other measures of ADHD symptoms and functioning, and are useful in screening for the disorder in adults (Barkley 2011). In this sample, the internal consistency of inattention symptoms was 0.84 for mothers and 0.82 for fathers. The internal consistency of hyperactivity-impulsivity symptoms was 0.77 for mothers and 0.81 for fathers.

**Negative Parenting** Using self-, partner, and child reports as well as observations, we assessed two, related aspects of negative parenting, over-reactivity and laxness, given their links to parent ADHD symptoms in previous studies (e.g., Johnston et al. 2012). The Alabama Parenting Questionnaire (APQ; Shelton et al. 1996) was completed by the parent, child, and partner. For each item, participants reported the frequency of a given parenting practice in the past 4 weeks on a 5-point scale from 0 (*never*) to 4 (*always*). To avoid reading difficulties, the questionnaire was read aloud to children. Both parent and child versions of the APQ have generally acceptable internal consistencies and discriminate clinic-referred and non-problem families (e.g., Scott et al. 2011; Shelton et al. 1996). Parent and child versions of the scale also have shown relative factor invariance (Russell et al. 2016) and child and parent scores contribute unique variance to predicting parenting and child outcomes (Barry et al. 2008; Scott et al. 2011). In this

study, we combined scores on the inconsistent discipline and poor monitoring subscales to form a negative parenting score. The alphas for mothers', children's, and fathers' reports of mothers' negative parenting were 0.75, 0.68 and 0.94, respectively. For fathers, the alphas for fathers', children's, and mothers' reports were 0.86, 0.64, and 0.91, respectively.

The Parenting Scale (PS; Arnold et al. 1993) also was used to assess self-reported dysfunctional parenting practices. This measure contains 13 items, on which parents rate their parenting practices on a 7-point Likert scale. Each item has anchors ranging from effective to ineffective parenting strategies and parents indicate to what extent each anchor is like them. The items on the parenting scale represent parenting Over-reactivity (e.g., "When my child misbehaves...", 1 = *I speak to him calmly* to 7 = *I raise my voice and yell*) and Laxness (e.g., "When my child does something I don't like..." 1 = *I do something about it every time it happens* to 7 = *I often let it go*). The PS has shown good internal consistency in previous studies (e.g., Harvey et al. 2003). We combined the Over-Reactivity and Laxness scales into a Negative parenting scale with internal consistency of 0.73 for mothers and 0.77 for fathers.

The mother-child and father-child interactions were coded using an observational coding system that was developed for this study to map onto the two aspects of negative parenting assessed by the questionnaires: overreactivity and laxness. Overreactivity was coded when a parent's response to child misbehaviour (e.g., noncompliance) was disproportionately negative given the severity of the misbehavior (e.g., harsh tone of voice, belittling, shaming). Laxness was coded when parent responses to child misbehaviour were overly permissive (e.g., no response to child misbehaviour, pleading with the child to stop). Overreactive and lax parenting behavior each were coded once per minute during the 30-min parent-child interactions on 8-point scales, with 0 indicating an absence and 7 an extreme level of overreactive or lax parenting. These negative parenting behaviors were coded only for intervals in which the child displayed misbehavior. Across the intervals in which the child misbehaved, average overreactive and lax parenting ratings were computed. These scores were then combined into a measure of observed negative parenting.

Coding was conducted by a group of undergraduate and graduate students. Thirty percent of the interactions were independently coded by two coders, and coders were blind to which interactions were being double-coded. Coders were rated as in agreement if their ratings of negative parenting for a given interval were within 1-point of each other. Weekly meetings were held to ensure adherence to the coding manual. The inter-observer agreement for the observed negative parenting was good (ICC = 0.82).

Finally, a comprehensive measure of negative parenting was created utilizing both self- and other reports on the questionnaires as well as the observations. Each parent's scores

from the self-, other parent, and child ratings of negative parenting on the APQ, the parent self-reported negative parenting on the PS, and observed negative parenting were standardized and averaged to form this composite.

**Child-Rearing Disagreements** The extent to which mothers and fathers disagree about appropriate child-rearing practices was assessed with the Child-Rearing Disagreements Scale (CRD; Jouriles et al. 1991). The CRD is a 21 item measure assessing the frequency of disagreements between parents about common aspects of child-rearing (e.g., “being too tough in disciplining our child”) rated from 1 (*never*) to 6 (*daily*). The CRD has previously demonstrated good internal consistency, convergent and predictive validity (Jouriles et al. 1991; Sturge-Apple et al. 2006). In this sample,  $\alpha$ 's were 0.89 for mothers and 0.92 for fathers.

**Child ADHD Symptoms** Child ADHD symptoms were assessed using the ADHD Rating Scale-IV (DuPaul et al. 1998). Each parent rated their child's level of ADHD symptoms on 18 items reflecting DSM criteria for ADHD. Each item is rated on a 0 to 3 scale, from *never or rarely*, to *very often* and items were averaged to form a total scale. Internal consistency for both mother and father reports of child ADHD symptoms was 0.96. Mother and father ratings of child ADHD were correlated at  $r(175) = 0.76, p < 0.001$ , and were combined to create a single estimate of child ADHD symptoms.

**Child Externalizing Problems** Child externalizing behaviors were assessed with the Child Behavior Checklist for Ages 6–18 (CBCL/6–18; Achenbach and Rescorla 2001). The CBCL/6–18 is a 118 item parent-report measure of child emotional and behavioural difficulties rated on a 3-point scale (0 = *not true*, and 2 = *often true*) with excellent psychometric properties (Achenbach and Rescorla 2001). Both parents completed the CBCL/6–18 and the broad band Externalizing score was used. The correlation between mother and father externalizing scores was  $r(173) = 0.78, p < 0.001$ . The average of mother and father scores was used.

**Parent Comorbidity** Each parent completed the Depression and Hostility subscales of the Brief Symptom Inventory (BSI; Derogatis 1993), with items rated on a 5-point Likert scale (0 = *not at all*, and 4 = *extremely*). The BSI has good psychometric properties (Derogatis 1993). In this study,  $\alpha$ 's for the depression subscale were 0.86 for mothers and 0.88 for fathers; and  $\alpha$ 's for the hostility subscale were 0.73 for mothers and 0.78 for fathers.

## Data Analytic Plan

Before conducting analyses, we examined the demographic characteristics of the sample and ran descriptive statistics on all variables, comparing the results to published norms where available. Next, bivariate correlations and chi-square tests were conducted to understand the relations between demographics and study variables, and among study variables.

To address the primary research questions, hierarchical multiple regressions were conducted using mothers' and fathers' ADHD symptom scores to predict their scores on the composite measure of negative parenting and their reports of child-rearing disagreements. For each parent, two regressions were conducted predicting negative parenting, one examining inattention symptoms and a second examining hyperactivity-impulsivity symptoms. In each regression, at Step 1, relevant demographic variables and, to account for the influence of child ADHD symptoms, the average of mother and father ratings of the child's ADHD symptoms were entered. At Step 2, both parents' scores on the relevant ADHD symptom dimension were entered. At Step 3, the interaction of mothers' and fathers' symptom scores was entered (scores were centered prior to forming the interaction term). These regressions were then repeated with child-rearing disagreements as the dependent variable. Finally, we tested whether child externalizing problems, parent depression, or parent hostility symptoms could account for the relations between parenting and parent ADHD symptoms, by adding each of these variables individually to Step 1 of the regression models,

## Results

### Parent and Child Characteristics

As noted in Table 1, the parents were typically well-educated, relatively affluent people of North American/European descent. Correlations were examined between the potential covariates of marital status, child age, and household income and each dimension of parent ADHD symptoms, negative parenting, and child-rearing disagreements. Only household income was significantly related to both a predictor (mothers' inattention symptoms,  $p = 0.03$ ) and outcome variables (mothers' negative parenting and fathers' child-rearing disagreements,  $p = 0.008$ ).<sup>1</sup> Income was, therefore, controlled in all analyses.

Table 2 provides descriptive information for the variables assessed. Parent-reported child ADHD symptoms fell, on average, slightly below the 90th percentile. On the BAARS, mothers' mean level of both inattention and hyperactivity-impulsivity symptoms fell between the 51st and 75th

<sup>1</sup> All analyses were re-run utilizing only the data from families with married parents and the pattern of results was unchanged.

**Table 2** Means and standard deviations

	Mothers			Fathers		
	Mean	SD	Range	Mean	SD	Range
BAARS Inattention	1.55	0.47	1–3.44	1.60	0.46	1–3.22
BAARS Hyperactivity-Impulsivity	1.52	0.41	1–3.05	1.62	0.51	1–3.38
APQ composite	1.22	0.39	0.35–2.36	1.20	0.38	0.36–2.20
PS total	2.75	0.68	1.27–4.33	2.67	0.74	1.27–5.80
Observed negative parenting behavior total <sup>a</sup>	0.28	0.29	0–1.85	0.21	0.29	0–2.38
Child rearing disagreements	1.90	0.62	1–4.29	1.92	0.68	1–4.67
BSI depression	0.48	0.59	0–3.17	0.58	0.71	0–3.50
BSI hostility	0.68	0.51	0–2.80	0.62	0.58	0–3.20
	Mean		SD			Range
Child ADHD symptoms	1.46		0.74			0–3.00
Child externalizing symptoms	12.44		9.67			0–42.5

BAARS Barkley Adult ADHD Rating Scale, APQ Alabama Parenting Questionnaire, PS Parenting Scale, BSI Brief Symptom Inventory

<sup>a</sup> This was measured with an observational coding system and scores computed as the weighted average of the frequency and intensity of negative parenting behavior as a response to child misbehaviour

percentile, with 6% of mothers at or above the 95th percentile for ADHD symptoms. The mean level of inattention and hyperactivity-impulsivity symptoms endorsed by fathers also fell between the 51st and 75th percentiles, with 11% of fathers reaching the 95th percentile for ADHD symptoms. Regarding comorbidities, mothers on average, were at the 73rd and 84th percentile for depressive and hostile symptoms. Fathers’ mean levels of depressive and hostile symptoms were at the 50th and 45th percentile. The average parent-reported child Externalizing score on the CBCL/6–18 was at the 79th percentile.

**Bivariate Correlations**

After checking for issues with outliers and normality and finding none (skew ranged from –0.3 to 1.5), we ran correlations between all study variables within each parent (Table 3). Child

ADHD symptoms were related to both types of father symptoms, but were not significantly related to either symptom dimension in mothers. Child ADHD symptoms were associated with more negative parenting and more child-rearing disagreements as reported by mothers. For fathers, child ADHD symptoms also were associated with child-rearing disagreements, but not with negative parenting. Fathers’ ADHD symptoms were significantly related to their negative parenting and reported child-rearing disagreements, while mothers’ symptoms were only marginally related to their negative parenting and child-rearing disagreements. Negative parenting and child-rearing disagreements were positively associated for both mothers and fathers.

In terms of how parent ADHD symptoms, negative parenting, and child-rearing disagreements were related to other psychological difficulties in the family, mothers’ and fathers’ ADHD symptoms were each significantly related to their own

**Table 3** Bivariate correlations among family ADHD symptoms, child-rearing disagreements, and co-occurring psychological problems

	Inattention	Hyperactivity-Impulsivity	Negative parenting	CRD	BSI depression	BSI hostility	Child ADHD	Child externalizing
Inattention		0.53***	0.14+	0.13+	0.29***	0.33***	0.08	-0.02
Hyperactivity-Impulsivity	0.60***		-0.01	0.09	0.19**	0.26***	0.07	-0.05
Negative parenting	0.33***	0.19**		0.15*	0.11	0.28***	0.16*	0.31***
CRD	0.19**	0.28***	0.30***		0.38***	0.29***	0.25***	0.32***
BSI depression	0.37***	0.29***	0.22**	0.36***		0.52***	0.11	0.21**
BSI hostility	0.34***	0.43***	0.26***	0.37***	0.71***		0.10	0.19**
Child ADHD	0.22**	0.31***	0.12	0.16*	0.20**	0.30***		0.63***
Child externalizing	0.26***	0.31***	0.29***	0.36***	0.28***	0.40***	0.63***	

Correlations among mother variables appear above the diagonal and correlations with father variables appear below the diagonal

CRD Child-Rearing Disagreements Scale, BSI Brief Symptom Inventory

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

depression and hostility. Fathers', but not mothers', ADHD symptoms were associated with their child's externalizing behaviours. Negative parenting in fathers was consistently related to their psychological symptoms. In contrast, mothers' negative parenting was only related to their hostility.

We then examined correlations of parent ADHD symptoms and the parenting variables across parents (Table 4). Mothers' and fathers' own ADHD symptoms were seldom related to their partner's symptoms, negative parenting, or child-rearing disagreements (only fathers' inattention symptoms were associated with mothers' reports of child-rearing disagreements). However, negative parenting and child-rearing disagreements were both significantly related between mothers and fathers.

### Mother and Father ADHD Symptoms and Negative Parenting

To test the primary hypotheses, two regressions were conducted for each parent, examining how their own and their partner's level of each type of ADHD symptom predicted their negative parenting. Each regression was examined for assumption violations, and none were found for any model. Because inattention symptoms and hyperactivity-impulsivity symptoms were highly correlated in both mothers and fathers, we chose to conduct the regressions separately for each dimension to reduce the influence of this colinearity. In the first regression, at Step 1, child ADHD and family income were entered. In Step 2, each parent's inattention symptom score was entered. Then at Step 3, the interaction of the two parents' inattention symptom scores was entered (scores centered). Interactions were examined and decomposed where significant. The interactions were decomposed twice, once with mother symptoms as the x-axis and again with father symptoms as the x-axis. This was done in order to clarify whether mother and father symptoms were uniformly related to the parenting variables across all levels of the partner's symptoms. This procedure was then repeated for parent hyperactivity-impulsivity symptoms.

For mothers, negative parenting was significantly predicted by child ADHD and family income, but the addition of mother and father inattention symptoms independently did not

significantly add to the model (Table 5). However, at Step 3, a significant interaction between mother and father inattention symptoms emerged. Increasing mother inattention was associated with more negative mother parenting when fathers also had higher levels of inattention symptoms, but the relation between mother inattention and her negative parenting was not significant in families with fathers with lower or mean levels of inattention symptoms (Fig. 1a). When the interaction was examined from the other direction, a similar pattern was found: for mothers with higher levels of inattention, increasing inattention in fathers was associated with more negative parenting in mothers, but this was not true for mothers with mean or lower levels of inattention symptoms (Fig. 1b). This interaction suggests that mothers' parenting is only compromised in the presence of higher levels of both mother and father inattention.

Using hyperactivity-impulsivity symptoms as the predictors of mothers' negative parenting, Step 1 was not significant, at Step 2 the mother and father symptom levels independently were not significant, but again a significant interaction between mother and father hyperactivity-impulsivity symptoms was found at Step 3 (Table 5). However, this interaction was contrary to that for inattention. When fathers had very high levels of hyperactivity-impulsivity symptoms, lower levels of mother hyperactivity-impulsivity were associated with more negative parenting in the mothers. However, mothers' hyperactivity-impulsivity was not related to their negative parenting in families of fathers with moderately high, mean, or lower levels of hyperactivity-impulsivity symptoms (Fig. 2a). Examined from the other direction, for mothers with lower levels of hyperactivity-impulsivity symptoms, higher levels of fathers' hyperactivity-impulsivity symptoms were associated with more negative parenting in mothers. However, for mothers with mean and higher levels of hyperactivity-impulsivity symptoms, there was no association between their own negative parenting and fathers' level of hyperactivity-impulsivity symptoms (Fig. 2b). This interaction suggests that when mothers' and fathers' hyperactivity-impulsivity symptoms are mismatched such that fathers have higher levels, and mothers have lower levels of symptoms, there is a significant increase in mothers' negative parenting.

**Table 4** Correlations between mother and father ADHD symptoms, negative parenting, and child-rearing disagreements

		Mother variables			
		Inattention	Hyperactivity-Impulsivity	Negative parenting	Child-Rearing disagreements
Father variables	Inattention	-0.03	0.02	0.10	0.17*
	Hyperactivity-Impulsivity	-0.05	-0.05	0.10	0.13+
	Negative parenting	-0.01	-0.11	0.51***	0.26***
	Child-Rearing disagreements	0.02	-0.03	0.36***	0.26***

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*\*  $p < 0.001$

**Table 5** Regression models predicting negative parenting in mothers and fathers from parent inattention and hyperactivity/impulsivity symptoms

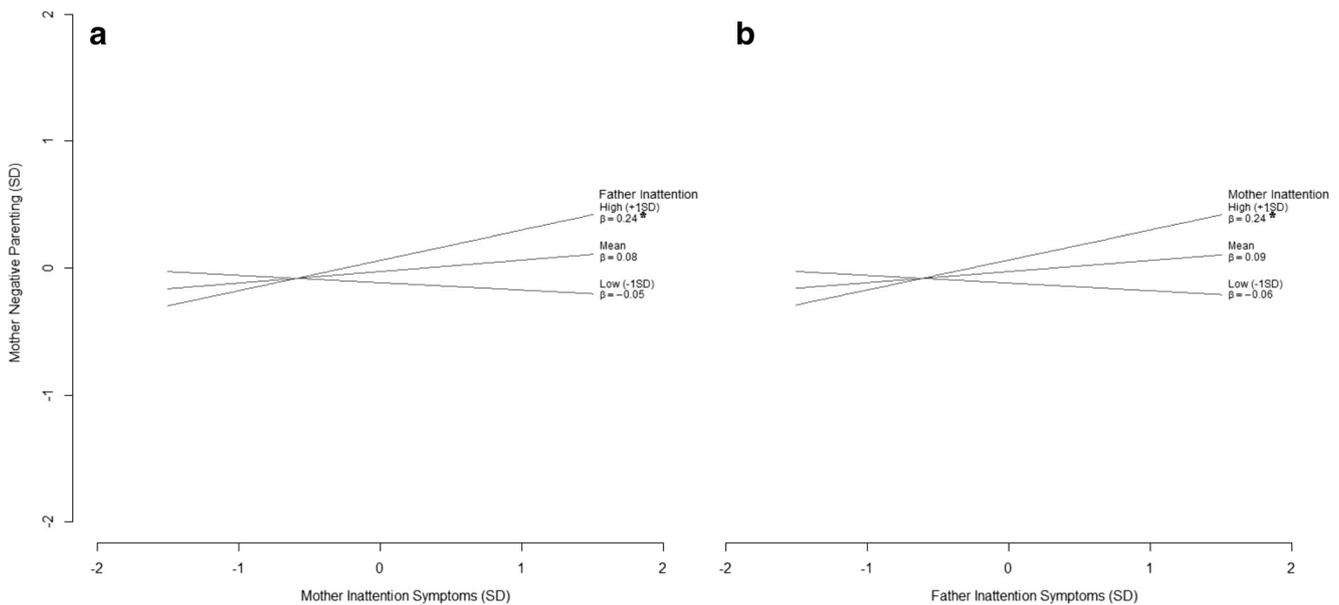
	Mothers' Negative Parenting			Fathers' Negative Parenting		
	Step 1 β	Step 2 β	Step 3 β	Step 1 β	Step 2 β	Step 3 β
Household Income	-0.22**	-0.22**	-0.19**	-0.11	-0.11	-0.12
Child ADHD Symptoms	0.17*	0.15*	0.16*	0.12	0.06	0.05
Mother Inattention		0.09	0.09		-0.03	-0.03
Father Inattention		0.07	0.08		0.32***	0.31***
Interaction of mother and father Inattention			0.15*			-0.10
R <sup>2</sup>	0.06***	0.08**	0.10**	0.03	0.13***	0.13***
ΔR <sup>2</sup>		0.02	0.02		0.10**	0
Household Income	-0.22**	-0.22**	-0.21**	-0.11	-0.12	-0.12
Child ADHD Symptoms	0.17*	0.16*	0.14+	0.12	0.09	0.06
Mother Hyperactivity-Impulsivity		-0.03	-0.05		-0.12	-0.14+
Father Hyperactivity-Impulsivity		0.06	0.06		0.15+	0.15+
Interaction of mother and father Hyperactivity-Impulsivity			-0.16*			-0.18*
R <sup>2</sup>	0.07	0.08**	0.10**	0.03	0.06	0.09**
ΔR <sup>2</sup>		0.01	0.02		0.03*	0.03*

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

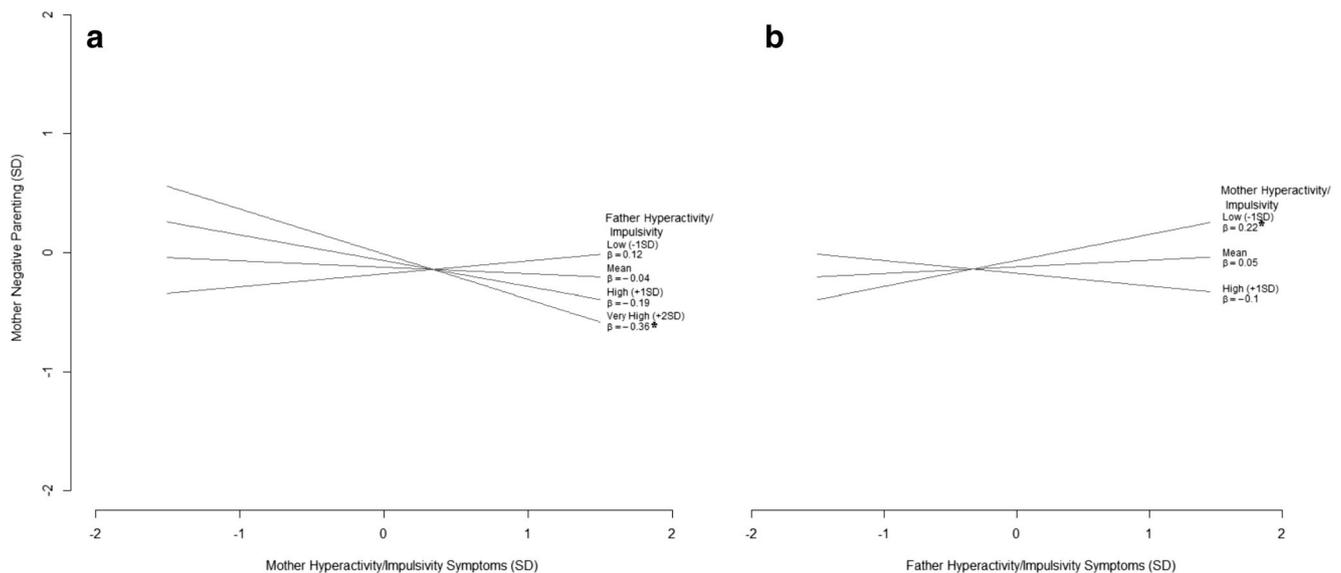
Using inattention symptoms to predict fathers' negative parenting, there were no significant predictors at Step 1, but at Step 2, fathers' own inattention symptoms were significantly associated with their negative parenting (Table 5). However, there was no significant interactive effect of mothers' and fathers' inattention symptoms at Step 3. Thus, for fathers, greater levels of their own inattention symptoms were related to more negative parenting, but there was no evidence of relations with the mothers' level of symptoms.

Turning to hyperactivity-impulsivity symptoms in relation to fathers' negative parenting, there were no significant predictors at Steps 1 or 2, but a significant interaction did emerge between mothers' and fathers' hyperactivity-impulsivity at

Step 3 (Table 5). Similar to the interaction found for mothers, higher father hyperactivity-impulsivity was associated with more negative father parenting, in families with mothers with mean or lower levels of hyperactivity-impulsivity symptoms,  $\beta(172) = 0.16, p = 0.03$ ,  $\beta(172) = 0.33, p = 0.02$ , respectively. However, in families where mothers had higher levels of hyperactivity-impulsivity symptoms, father hyperactivity-impulsivity symptoms were not associated with more negative parenting,  $\beta(172) = -0.02, p > 0.10$ . Analyzed in the reverse direction, for fathers with mean or higher levels of hyperactivity-impulsivity symptoms, decreasing levels of mother hyperactivity-impulsivity symptoms were associated with more negative parenting in fathers,  $\beta(172) = -0.13$ ,



**Fig. 1** Mothers' and fathers' inattention symptoms as a moderator of the relation between their partner's inattention symptoms and mothers' negative parenting. \*  $p < 0.05$



**Fig. 2** Mothers' and fathers' hyperactivity-impulsivity symptoms as a moderator of the relation between their partner's hyperactivity-impulsivity symptoms and mothers' negative parenting. \*  $p < 0.05$

$p = 0.03$ ,  $\beta(172) = -0.31$ ,  $p = 0.02$ , respectively. Again, this interaction suggests that in families characterized by higher levels of father hyperactivity-impulsivity symptoms and lower levels of these symptoms in mothers, father' negative parenting is increased.

### Mother and Father ADHD Symptoms and Child-Rearing Disagreements

Regressions were conducted to examine the associations between parents' symptoms and their reports of child-rearing disagreements. In the regressions considering mothers' reports of child-rearing disagreements, only child ADHD was a significant predictor at Step 1. Neither type of parent ADHD symptom nor their interaction was associated with mothers' reports of child-rearing disagreements (Table 6). Thus, for mothers, there was little evidence that either their own or their partner's ADHD symptoms were related to their experience of coparenting.

For fathers, at Step 1 of the regressions both household income and child ADHD were associated with fathers' reports of child-rearing disagreements. In the regression examining parent inattention symptoms, fathers' own inattention symptoms were positively related to fathers' child-rearing disagreements at Step 2, but there was no significant interaction of mothers' and fathers' inattention symptoms at Step 3 (Table 6). In the regression examining hyperactivity-impulsivity symptoms in the prediction of fathers' reports of their child-rearing disagreements, fathers' symptoms were a significant predictor at Step 2, but there also was a significant interaction between mothers' and fathers' hyperactivity-impulsivity symptoms at Step 3 (Table 6). As with negative parenting, for mothers with mean or lower levels of hyperactivity-

impulsivity symptoms, increasing father hyperactivity-impulsivity symptoms were associated with more father-reported child-rearing disagreements. However, when mothers had higher levels of hyperactivity-impulsivity symptoms, there was no association between fathers' symptoms and child-rearing disagreements (Fig. 3a). This interaction was also examined from the other direction, revealing that for fathers with higher levels of hyperactivity-impulsivity symptoms, decreasing levels of these symptoms in mothers was associated more father-reported child-rearing disagreements (Fig. 3b). Consistent with the findings for negative parenting, these results suggest that when there is a mismatch in mother and father hyperactivity-impulsivity symptoms, such that fathers have high levels and mothers have low levels of symptoms, fathers report more child-rearing disagreements.

### Child and Parent Comorbidities

The effects of other parent symptoms (depression and hostility) and child externalizing problems were examined by including each of these variables – one at a time – in Step 1 of the regression models reported for mother and father negative parenting and child-rearing disagreements. When child externalizing problems were included in the models, the pattern of results remained essentially the same, although two interactions were reduced to marginal significance (the interaction between parents' inattention symptoms in the prediction of mothers' negative parenting, and the interaction between parents' hyperactivity-impulsivity symptoms in the prediction of father-reported child-rearing disagreements). Neither mothers' depression nor hostility symptoms changed the significance or pattern of results of any of the models when they were individually added, but including fathers' depressive

**Table 6** Regression models predicting child-rearing disagreements in mothers and fathers from parent inattention and hyperactivity-impulsivity symptoms

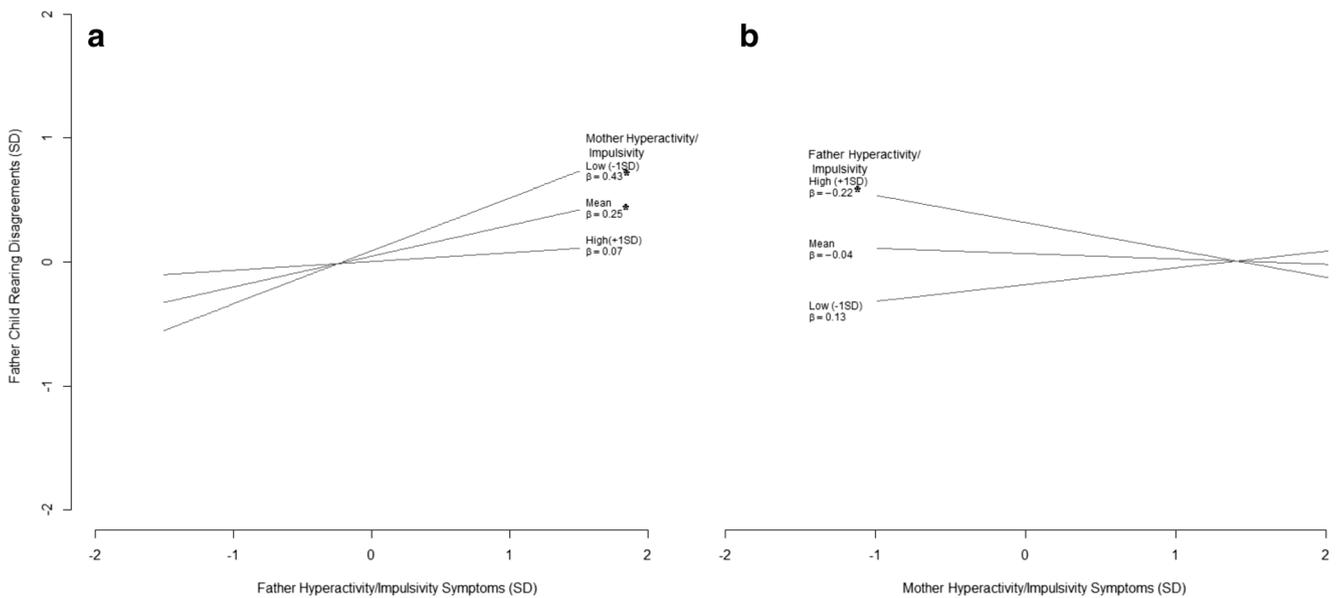
	Mothers' Child-Rearing disagreements			Fathers' Child-Rearing disagreements		
	Step 1 β	Step 2 β	Step 3 β	Step 1 β	Step 2 β	Step 3 β
Household income	-0.10	-0.08	-0.08	-0.25**	-0.25**	-0.25**
Child ADHD symptoms	0.26***	0.22**	0.21**	0.18*	0.14+	0.15+
Mother Inattention		0.09	0.09		-0.03	-0.03
Father Inattention		0.13+	0.13+		0.16*	0.16*
Interaction of mother and father Inattention			-0.07			0.03
$R^2$	0.07	0.10***	0.10***	0.09***	0.11***	0.11***
$\Delta R^2$		0.03*	0		0.02	0
Household income	-0.10	-0.09	-0.09	-0.25***	-0.25***	-0.25***
Child ADHD symptoms	0.26***	0.24**	0.24**	0.18*	0.10	0.08
Mother Hyperactivity-Impulsivity		0.07	0.07		-0.03	-0.05
Father Hyperactivity-Impulsivity		0.06	0.06		0.25***	0.25***
Interaction of mother and father Hyperactivity-Impulsivity			0.02			-0.17*
$R^2$	0.07**	0.08**	0.08**	0.09***	0.15***	0.17***
$\Delta R^2$		0.01	0		0.06***	0.02

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

symptoms in the models resulted in a non-significant interaction ( $p = 0.23$ ) in the model predicting mothers' negative parenting from inattention symptoms and in the model predicting father-reported child-rearing disagreements from hyperactivity-impulsivity symptoms ( $p = 0.26$ ). In sum, inclusion of child and mother comorbidities did little to alter the pattern of results, however, fathers' depressive symptoms appeared to account for the interactions of father and mother ADHD symptoms.

**Discussion**

In this study, we extended the study of parent ADHD symptoms and parenting to include examination of how inter-parent levels of symptoms relate to each parent's parenting and coparenting difficulties. The results point to the importance of joint consideration of mother and father ADHD symptom levels within families, and to differences between mothers and fathers, and in the links between inattention and hyperactivity-



**Fig. 3** Mothers' and fathers' hyperactivity-impulsivity symptoms as a moderator of the relation between their partner's hyperactivity-impulsivity symptoms and fathers' reports of child-rearing disagreements. \*  $p < 0.05$

impulsivity and parenting. For inattention symptoms, mothers' parenting appeared compromised only in the presence of both mother and father symptoms while fathers' parenting was related only to their own inattention symptoms and did not appear affected by the mothers' inattention. However, for hyperactivity-impulsivity, for both parents, there was evidence of parenting being more problematic when there was a mismatch of mothers with lower symptom levels paired with fathers with higher symptom levels.

### Relations for Mothers and Fathers

Not surprisingly, given the genetic nature of ADHD and the fact that the majority of parents in the sample were parenting children with ADHD, parents reported relatively high mean levels of ADHD symptoms. For both mothers and fathers, the average level of symptoms was between the 51st and 75th percentile, and 6% of mothers and 11% of fathers reported clinically significant levels of symptoms (above the 95th percentile). Looking to the bivariate correlations to illuminate the relations of ADHD symptoms and parenting within each parent, we found a differing pattern for mothers and fathers. For fathers, replicating previous studies (e.g., Agha et al. 2013; Harvey et al. 2003), both their inattention and hyperactivity-impulsivity symptoms were significantly related to their negative parenting and child-rearing disagreements. In contrast, for mothers in this sample, only their inattention symptoms were marginally related to their parenting and child-rearing disagreements. This absence of significant relations is somewhat surprising and contrary to previous studies (e.g., Agha et al. 2013; Chronis-Tuscano et al. 2008; Tung et al. 2015). We speculate that the nature of the sample may account for this difference. In contrast to samples that focused exclusively on mothers and may have included a substantial percentage of single mothers (e.g., 29% in Chronis-Tuscano et al. 2008; 32% in Murray and Johnston 2006), the sample in this study was comprised of exclusively two-parent families. It may be that the presence of a parenting partner and the relatively advantaged nature of these two-parent families may attenuate the negative influence of mothers' symptoms on their parenting. It is not clear why the same effect is not present for fathers, but the difference may be related to the parenting roles that mothers and fathers often assume as discussed below.

### Parents' Inattention and Hyperactivity-Impulsivity Symptoms

Consistent with previous studies suggesting important differences between the two symptom dimensions in relation to parenting (c.f., Johnston et al. 2012), our regression analyses illustrated that parent inattention symptoms were consistently related to parenting difficulties. Strong relations between inattention symptoms and fathers' negative parenting were

found, and when an interaction between mother and father inattention symptoms emerged in the prediction of mothers' negative parenting, it was the presence of high levels of inattention in both mothers and fathers that was associated with the highest levels of mothers' negative parenting. As would be expected indicating both main and cross-over effects of parent ADHD symptoms, within- and between-parent difficulties with organization, focusing, and forgetfulness appear to consistently interfere with effective parenting. Similar results emerged at least for fathers' perceptions of child-rearing disagreements, which were related to both their own or their partner's inattention symptoms. However, mothers' reports of child-rearing disagreements were significantly related only to child ADHD, perhaps because the more central role of mothers in care-giving provides greater opportunities to be negatively affected by the challenge of jointly managing a difficult child. It will be important in future research to assess each parent's involvement in childcare in order to more fully understand if and how differences in care-giving duties account for different results found across mothers and fathers.

In contrast to inattention symptoms, the relation between parent hyperactivity-impulsivity symptoms and negative parenting was not as uniformly negative. In the prediction of both mothers' and fathers' negative parenting, it was the mismatch between mother and father hyperactivity-impulsivity symptoms that was associated with the highest levels of negative parenting. Further, the direction of this mismatch was important. Negative parenting was elevated only when fathers' hyperactivity-impulsivity symptoms were high, and mothers' symptoms were at average (when predicting negative parenting in fathers) or lower levels (when predicting negative parenting in fathers or mothers). We found no evidence of increased levels of negative parenting when the mismatch was in the direction of mothers with higher levels of hyperactivity-impulsivity symptoms paired with fathers with lower levels, or even when both parents had higher levels of these symptoms. As with inattention symptoms, relations of hyperactivity-impulsivity symptoms to child-rearing disagreements generally mirrored the findings for negative parenting. Mothers' perceptions of child-rearing disagreement were not related to hyperactivity-impulsivity symptoms, but for fathers the highest level of disagreements emerged in families where fathers had higher and mothers had lower levels of hyperactivity-impulsivity symptoms.

This difference in the ways in which parent inattention and hyperactivity-impulsivity symptoms are associated with parenting offers important new information in understanding how ADHD symptoms in parents are linked to family functioning. Inattention symptoms were always associated with more parenting problems, with evidence of additive or compounding, cross-over effects for mothers. In clear contrast, for parent hyperactivity-impulsivity symptoms there was no evidence of additive negative relations. Instead, it was the combination of

higher levels of father hyperactivity-impulsivity symptoms and lower levels of such symptoms in mothers that was consistently related to more parenting difficulties. The overall deleterious effects of inattention are consistent with previous literature (Johnston et al. 2012), and the more complex relations between parent hyperactivity-impulsivity symptoms and parenting also have been demonstrated both in a study focusing on positive parenting behaviors and cognitions within this same sample (Johnston et al. 2016), and in other studies (Chen and Johnston 2007; Johnston et al. 2012). This differing pattern of results by symptom type suggests that being inattentive has no benefits for family functioning. If one parent is forgetful, unable to pay attention, or disorganized, their parenting is likely to be more negative, and if both parents have these difficulties, problems may be compounded, at least for mothers.

Hyperactivity-impulsivity symptoms in parents appear to operate differently. Such symptoms, while undeniably impairing, appear to be most problematic when they are present in the father and not in the mother. That is, the combination of a father who is more impulsive or restless and a mother who does not share these characteristics appears to create a parenting environment in which parents struggle - both individually and as a couple. However, surprisingly, and in contrast to inattention, when both parents have higher levels of hyperactivity-impulsivity symptoms, parenting does not appear as adversely affected. It is possible that hyperactivity-impulsivity symptoms are related to characteristics such as exuberance, faster cognitive tempo, tolerance for spontaneity, or energy level. A synchrony between parenting partners in these characteristics may lead to a reduction in each parent's stress or frustration, and hence to better within- and between-parent parenting. However, it is important to simultaneously remember that the bivariate correlations suggest that hyperactivity-impulsivity symptoms, at least for fathers, are impairing. It is also possible that differences in over- or under-reporting of symptoms on self-report measures might contribute to the pattern of results. In particular, if parents are particularly prone to under-report hyperactivity-impulsivity symptoms, this might explain why parent inattention symptoms were more consistently related to parenting.

Why the particular mismatch of fathers with higher levels of hyperactivity-impulsivity symptoms partnered with mothers with lower levels was most problematic (in contrast to mothers being high and fathers being low in symptom levels) suggests an intersection of symptom patterns and gendered parenting roles. Perhaps when fathers have lower levels of symptoms they are able to increase their parenting responsibilities to compensate for their partner's difficulties, reducing the impact of the mother's symptoms, similar to the interaction which emerged for inattention symptoms which suggested that mothers' parenting difficulties only occur in families where the fathers also have high symptom levels and are, presumably, less able to compensate for mothers' difficulties.

Mothers, in contrast, are likely the primary caregivers (Finley et al. 2008) and may be less able or willing to further stretch their responsibilities when fathers have high levels of symptoms. The primary role of mothers in care-giving also may explain why the interaction of hyperactivity-impulsivity symptoms and child-rearing disagreements was significant for fathers, but not for mothers. If mothers are the primary caregivers, they may not only be more susceptible to the stresses of managing a child with ADHD, but their perceptions of childrearing disagreements may be less linked to either their own or their partner's symptoms. Mothers may focus more on their own parenting choices, and be more likely to disregard or dismiss coparenting since they will be the parent most likely to be responsible for implementing parenting strategies. In contrast, a highly impulsive father may perceive that he frequently disagrees with his partner with low levels of symptoms, not only because his opinions on child-rearing may be different, but also because of a history of his opinions being devalued by his partner.

### Co-Occurring Psychological Symptoms

Importantly, our consideration of child ADHD symptoms and both parent and child comorbid problems suggested that the findings from parent ADHD symptoms cannot be fully explained by these co-occurring conditions. Child ADHD symptoms were included in every model and, confirming the expected impact of such child problems on parenting, they were significantly associated with mothers' negative parenting and both mothers' and fathers' reports of child-rearing disagreements. However, supporting important independent relations related to parent ADHD symptoms, the significant relations between the parenting variables and parent ADHD symptoms emerged even with child ADHD controlled. Similarly, analyses which added child externalizing problems to the models confirmed that these problems did not meaningfully change the pattern of findings for parent ADHD symptoms.

Consistent with previous studies (Agha et al. 2013; Chronis-Tuscano et al. 2008), depression and hostility symptoms were significantly correlated with ADHD symptoms in both mothers and fathers in this sample. For mothers, controlling for these psychological problems did not affect the relations found for parent ADHD symptoms. However, for fathers, the inclusion of depression symptoms did lead to the two of the interactions of mother and father hyperactivity-impulsivity symptoms no longer being significant. This potentially questions the distinctiveness of the findings regarding father ADHD symptoms and points to a need for further studies to tease apart the unique contributions of depressive and hyperactivity-impulsivity symptoms to parent functioning. An additional important direction for future studies would be consideration of possible interactive effects that may be observed among different types of parent psychopathology as they

relate to parenting (e.g., do symptoms of depression or antisocial personality disorder further moderate the relation of parent ADHD to parenting).

### Limitations and Future Directions

A number of limitations should be considered when interpreting our results. Our focus on the interactive effects of mothers' and fathers' ADHD symptoms offers an important advance in understanding the relations of ADHD symptoms to parenting at a family-level. Clearly, exploration of potential three-way interactions of mother-father-child levels of symptoms stands as an intriguing next possibility, as does the possibility of understanding parenting in situations where parents jointly and simultaneously interact with their child. Unfortunately, our sample size and focus on dyadic interactions limit our ability to test such interactions or other, more sophisticated models such as actor-partner analyses or nested structural models. As such, we suffice with controlling for child ADHD and await future opportunities to examine other family-level relationships with sample sizes sufficient to confidently conduct such analyses.

To test specific questions, we conducted analyses separately for mother and father parenting variables and separately for each dimension of ADHD symptoms. However, we recognize that testing this number of analyses with a traditional alpha-level increases the risk of Type I errors. Although this is a possibility, we believe it is unlikely because of the consistent pattern of results found across parent gender and ADHD symptom dimensions. Our decision to consider inattention and hyperactivity-impulsivity dimensions separately was based on consistency with previous studies and the difficulties of interpretation that would arise if the two, highly collinear, dimensions were considered simultaneously. Future research will be needed to address ways to best study the unique contributions of each symptom dimension to parenting. We also acknowledge that our reliance on parent self-report of ADHD symptoms is a limitation, as studies have demonstrated discrepancies across self- and collateral reports (e.g., Barkley et al. 2011). Although we believe that a dimensional, self-report approach to ADHD symptoms was appropriate for this study, it is possible that the pattern of results would change in a sample of parents diagnosed with ADHD using multiple methods and multiple raters. The relatively low rate of clinically significant levels of parent ADHD symptoms in this sample suggests that recruitment from two-parent families willing and able to participate in the research probably led to a recruitment bias that reflects the role of ADHD symptoms in relatively high functioning families. Future research with parents meeting clinical

diagnoses based on a range of information sources is necessary to address this possibility.

Our study also is limited by a focus exclusively on male children, by the use of a measure that compounded two aspects of negative parenting, and by our limited assessment of parent and child comorbidities. Future research including girls, teasing apart the various types of negative parenting in relation to parent ADHD, and including a broader range of comorbidities, such as antisocial personality disorder and depression, is clearly needed. Finally, the cross-sectional nature of the study design is a clear limitation. Longitudinal designs are required to more comprehensively address questions regarding pathways of influence between parent ADHD symptoms and parenting difficulties, and to consider how these parent variables interact with child influences over time. Similarly, more genetically-informed designs are needed to illuminate the extent to which biological factors underlie observed phenotypic variations among parents and child ADHD, and parenting characteristics. Fortunately, other papers in this special section address these important questions.

### Conclusion

This study builds on previous literature investigating the role of parent ADHD symptoms and negative parenting by examining how the relation between these two variables varies by parent gender and by symptom dimension. Importantly, we found that fathers' inattention symptoms were consistently associated with parenting difficulties in both parents. In contrast, increased levels of hyperactivity-impulsivity symptoms in fathers were associated with parenting difficulties only when their partners had lower levels of such symptoms. Our findings highlight the importance of addressing the complexities of ADHD symptom dimensions and gendered parenting roles. The findings also point to ways in which the focus of our clinical efforts may need to be modified in working with families with parents who exhibit ADHD symptoms. Specifically, clinicians are urged to consider not only the impact of each parent's own symptoms on parenting, but also to be mindful of the context presented by the parenting partner's symptom levels. For inattention symptoms, the role of the father's symptom level appears paramount, either in predicting his own parenting difficulties or in reducing his ability to buffer the negative effect of the mother's inattention. For hyperactivity-impulsivity symptoms, again, it is father's symptoms that appear related to both mother and father parenting problems, but only when mothers do not have these same problems. Surprisingly, and speaking to the potential protective effects of matching in levels of parents' symptoms, when both parents had higher levels of hyperactivity-impulsivity symptoms, these were not related to more parenting problems.

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### Compliance with Ethical Standards

**Conflict of Interest** The first four authors have no conflicts of interest to declare. Margaret Weiss has received grant funding from Purdue Pharma, and honoraria and speaker fees from Shire, Eli Lilly, Purdue and Janssen.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

### References

- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms and profiles*. Burlington: University of Vermont Research Centre for Children Youth & Families.
- Agha, S. S., Zammit, S., Thapar, A., & Langley, K. (2013). Are parental ADHD problems associated with a more severe clinical presentation and greater family adversity in children with adhd? *European Child & Adolescent Psychiatry*, *22*, 369–377. doi:10.1007/s00787-013-0378-x.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington: Author.
- Arnold, D. S., O'Leary, S. G., Wolff, L. S., & Acker, M. M. (1993). The parenting scale: a measure of dysfunctional parenting in discipline situations. *Psychological Assessment*, *5*, 137–144. doi:10.1037/1040-3590.5.2.137.
- Barkley, R. A. (2011). *Barkley adult ADHD rating scale-IV (BAARS-IV)*. New York: Guilford.
- Barkley, R. A., Knouse, L. E., & Murphy, K. R. (2011). Correspondence and disparity in the self- and other ratings of current and childhood ADHD symptoms and impairment in adults with ADHD. *Psychological Assessment*, *23*, 437–446.
- Barry, C. T., Frick, P. J., & Grafeman, S. J. (2008). Child versus parent reports of parenting practices: implications for the conceptualization of child behavioral and emotional problems. *Assessment*, *15*, 294–303. doi:10.1177/1073191107312212.
- Burns, G. L., Desmul, C., Walsh, J. A., Silpakit, C., & Ussahawanitchakit, P. (2009). A multitrait (ADHD-IN, ADHD-HI, ODD toward adults, academic and social competence) by multisource (mothers and fathers) evaluation of the invariance and convergent/ discriminant validity of the child and adolescent disruptive behavior inventory with Thai adolescents. *Psychological Assessment*, *21*, 635–641. doi:10.1037/a0016953.
- Chen, M., & Johnston, C. (2007). Maternal inattention and impulsivity and parenting behaviors. *Journal of Clinical Child and Adolescent Psychology*, *36*, 455–468.
- Chen, M., & Johnston, C. (2012). Interparent childrearing disagreement, but not dissimilarity, predicts child problems after controlling for parenting effectiveness. *Journal of Clinical Child and Adolescent Psychology*, *41*, 189–201. doi:10.1080/15374416.2012.651997.
- Chronis-Tuscano, A., Raggi, V. L., Clarke, T. L., Rooney, M. E., Diaz, Y., & Pian, J. (2008). Associations between maternal attention-deficit/hyperactivity disorder symptoms and parenting. *Journal of Abnormal Child Psychology*, *36*, 1237–1250.
- Derogatis, L. R. (1993). *BSI brief symptom inventory. Administration, scoring, and procedures manual* (4th ed.). Minneapolis: National Computer Systems.
- DuPaul, G. J., Powers, T. J., Anastopoulos, A. R., & Reid, R. (1998). *ADHD rating scale IV - checklists, norms, and interpretation*. New York: Guilford.
- Erel, O., & Burman, B. (1995). Interrelatedness of marital relations and parent-child relations: a meta-analytic review. *Psychological Bulletin*, *118*, 108–132. doi:10.1037/0033-2909.118.1.108.
- Erhardt, D., Epstein, J. N., Conners, C. K., Parker, J. D. A., & Sitarenios, G. (1999). Self-ratings of ADHD symptoms in adults: II. Reliability, validity, and diagnostic sensitivity. *Journal of Attention Disorders*, *3*, 153–158.
- Faraone, S. V. (2014). Advances in the genetics of attention-deficit/hyperactivity disorder. *Biological Psychiatry*, *76*, 599–600. doi:10.1016/j.biopsych.2014.07.016.
- Feinberg, M. E. (2003). The internal structure and ecological context of coparenting: a framework for research and intervention. *Parenting: Science and Practice*, *3*, 95–131.
- Finley, G. E., Mira, S. D., & Schwartz, S. J. (2008). Perceived paternal and maternal involvement: factor structures, mean differences, and parental roles. *Fathering: A Journal of Theory, Research, and Practice about Men as Fathers*, *6*, 62–82.
- Gere, M. K., Hagen, K. A., Villabo, M. A., Arnberg, K., Neumer, S., & Torgersen, S. (2013). Fathers' mental health as a protective factor in the relationship between maternal and child depressive symptoms. *Depression and Anxiety*, *30*, 31–38.
- Gomez, R., & Corr, P. J. (2014). ADHD and personality: a meta-analytic review. *Clinical Psychology Review*, *34*, 376–388. doi:10.1016/j.cpr.2014.05.002.
- Harvey, E., Danforth, J. S., Eberhardt McKee, T., Ulaszek, W. R., & Friedman, J. L. (2003). Parenting of children with attention-deficit/hyperactivity disorder (ADHD): the role of parental ADHD symptomatology. *Journal of Attention Disorders*, *7*, 31–42.
- Jarrett, M. A. (2016). Attention-deficit/hyperactivity disorder (ADHD) symptoms, anxiety symptoms, and executive functioning in emerging adults. *Psychological Assessment*, *28*, 245–250. doi:10.1037/pas0000190.
- Johnston, C., & Mash, E. J. (2001). Families of children with attention-deficit/hyperactivity disorder: review and recommendations for future research. *Clinical Child and Family Psychology Review*, *4*, 183–207.
- Johnston, C., Mash, E. J., Miller, N., & Ninowski, J. E. (2012). Parenting in adults with attention-deficit/hyperactivity disorder (ADHD). *Clinical Psychology Review*, *32*, 215–228. doi:10.1016/j.cpr.2012.01.007.
- Johnston, C., Williamson, D., Noyes, A., Stewart, K., & Weiss, M.D. (2016). Parent and child ADHD symptoms in relation to parental attitudes and parenting: testing similarity-fit hypotheses. *Journal of Clinical Child and Adolescent Psychology*.
- Jouriles, E. N., Murphy, C. M., Farris, A. M., & Smith, D. A. (1991). Marital adjustment, parental disagreements about child rearing, and behavior problems in boys: increasing the specificity of the marital assessment. *Child Development*, *62*, 1424–1433.
- Kessler, R. C., Adler, L., Barkley, R., Biederman, J., Conners, C. K., Demler, O., et al. (2006). The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey replication. *The American Journal of Psychiatry*, *163*, 716–723.

- Kooij, J. J. S., Buitelaar, J. K., van den Oord, E. J., Furer, J. W., Rijnders, C. A. T., & Hodiamont, P. P. G. (2005). Internal and external validity of attention-deficit hyperactivity disorder in a population-based sample of adults. *Psychological Medicine*, *35*, 817–827. doi:10.1017/S003329170400337X.
- Kouros, C. D., Papp, L. M., Goetze-Morey, M. C., & Cummings, E. M. (2014). Spillover between marital quality and parent-child relationship quality: parental depressive symptoms as moderators. *Journal of Family Psychology*, *28*, 315–325.
- Levy, F. (2014). DSM-5, ICD-11, RDoC and ADHD diagnosis. *Australian and New Zealand Journal of Psychiatry*, *48*, 1163–1164. doi:10.1177/0004867414557527.
- Martel, M. M., von Eye, A., & Nigg, J. (2012). Developmental differences in structure of attention-deficit/hyperactivity disorder (ADHD) between childhood and adulthood. *International Journal of Behavioral Development*, *36*, 279–292. doi:10.1177/0165025412444077.
- Mokrova, I., O'Brien, M., Calkins, S., & Keane, S. (2010). Parental ADHD symptomatology and ineffective parenting: the connecting link of home chaos. *Parenting: Science and Practice*, *10*, 119–135.
- Murray, C., & Johnston, C. (2006). Parenting in mothers with and without attention-deficit/hyperactivity disorder. *Journal of Abnormal Psychology*, *115*, 52–61. doi:10.1037/0021-843x.115.1.52.
- Nelson, J. A., O'Brien, M., Blankson, A. N., Calkins, S. D., & Keane, S. P. (2009). Family stress and parental responses to children's negative emotions: tests of the spillover, crossover and compensatory hypotheses. *Journal of Family Psychology*, *23*, 671–679.
- O'Leary, S. G., & Vidair, H. B. (2005). Marital adjustment, child-rearing disagreements, and overreactive parenting: predicting child behavior problems. *Journal of Family Psychology*, *19*, 208–216. doi:10.1037/0893-3200.19.2.208.
- Psychogiou, L., Daley, D., Thompson, M., & Sonuga-Barke, E. (2007). Testing the interactive effect of parent and child ADHD on parenting in mothers and fathers: a further test of the similarity-fit hypothesis. *British Journal of Developmental Psychology*, *25*, 419–433.
- Ramsay, J. R. (2015). Psychology assessment of adults with ADHD. In R. A. Barkley (Ed.), *Attention deficit hyperactivity disorder: a handbook for diagnosis and treatment* (4th ed., pp. 475–500). New York: Guilford.
- Russell, J. D., Graham, R. A., Neill, E. L., & Weems, C. F. (2016). Agreement in youth-parent perceptions of parenting behaviors: a case for testing measurement invariance in reporter discrepancy research. *Journal Youth and Adolescence*.
- Scott, S., Briskman, J., & Dadds, M. R. (2011). Measuring parenting in community and public health research using brief child and parent reports. *Journal of Child and Family Studies*, *20*, 343–352.
- Shelton, K. K., Frick, P. J., & Wootton, J. (1996). Assessment of parenting practices in families of elementary school-age children. *Journal of Clinical Child Psychology*, *25*, 317–329.
- Sturge-Apple, M. L., Davies, P. T., & Cummings, E. M. (2006). Hostility and withdrawal in marital conflict: effects on parental emotional unavailability and inconsistent discipline. *Journal of Family Psychology*, *20*, 227–238.
- Toplak, M. E., Pitch, A., Flora, D. B., Iwenofu, L., Ghelani, K., Jain, U., & Tannock, R. (2009). The unity and diversity of inattention and hyperactivity/impulsivity in ADHD: evidence for a general factor with separable dimensions. *Journal of Abnormal Child Psychology*, *37*, 1137–1150. doi:10.1007/s10802-009-9336-y.
- Tung, I., Brammer, W. A., Li, J. J., & Lee, S. S. (2015). Parenting behavior mediates the intergenerational association of parent and child offspring ADHD symptoms. *Journal of Clinical Child and Adolescent Psychology*, *44*, 787–799. doi:10.1080/15374416.2014.913250.
- Williamson, D., & Johnston, C. (2013). Marital and coparenting relationships: associations with parent and child symptoms of ADHD. *Journal of Attention Disorders*. doi:10.1177/1087054712471717.
- Wymbs, B. T., Wymbs, F. A., & Dawson, A. E. (2015). Child ADHD and ODD behavior interacts with parent ADHD symptoms to worsen parenting and interparental communication. *Journal of Abnormal Child Psychology*, *43*, 107–119. doi:10.1007/s10802-014-9887-4.
- Zucker, M., Morris, M. K., Ingram, S. M., Morris, R. D., & Bakeman, R. (2002). Concordance of self- and informant ratings of adults' current and childhood attention-deficit/hyperactivity disorder symptoms. *Psychological Assessment*, *14*, 379–389.