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Parenting Mediates Symptoms and Impairment in Children with ADHD-Inattentive Type

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Abstract

The current study investigates potential pathways between inattentive symptom severity, positive and negative parenting practices, and functional impairment (i.e., academic, social, and home impairment) in a sample of children diagnosed with ADHD, Predominantly Inattentive Type (ADHD-I). Participants included 199 children and their parents and teachers enrolled in a randomized clinical trial investigating the efficacy of an integrated psychosocial intervention for children with ADHD-I. Boys constituted just over half the sample; children averaged 8.6 years of age (range 7–11) and were from varied ethnic/racial backgrounds. As part of the initial screening and assessment procedures, parents and teachers completed questionnaires assessing child behavior and parent/family functioning. Results supported both main effects of symptoms and parenting on impairment, as well as a mediational path between symptoms and impairment via parenting, as observed by parents in the home setting. Specifically, higher severity of inattention was associated with higher rates of homework, social, and home impairment. Negative parenting contributed to homework and home impairment, and positive and negative parenting contributed to social impairment, incrementally above and beyond the impact of inattention symptom severity alone. Negative parenting partially mediated the relationship between inattentive symptom severity and impairment, such that higher rates of inattention were associated with higher rates of negative parenting, which in turn was associated with higher rates of homework, social, and home impairment. Results provide support for underlying mechanisms for associations between symptoms and impairment in children with ADHD-I, and also identify potential intervention targets to improve impairment experienced by these children.

Keywords

ADHD; Inattention; Impairment; Parenting

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common and widespread childhood mental health disorders, affecting 3–8% of individuals worldwide (American Psychological Association [APA], 2013; Faraone et al., 2003; Willcutt, 2012). Up to this point, most research on ADHD has been limited to children with ADHD-Combined type (ADHD-C), or has failed to parcel out results by subtype. This leaves a gap in the literature in relation to children with ADHD, Predominantly Inattentive type[1] (ADHD-I), who make up 36–57% of all children with ADHD (Willcutt, 2012). Children with ADHD-I experience a profile of ADHD symptoms and functional impairment at home, school and with their peers that is partially distinct from ADHD-C (Milich et al., 2001; Pfiffner et al., 2007). The similarities and differences between subtypes highlight the need to understand the relationship between the unique constellation of ADHD-I symptoms and areas of functional impairment.

Pathways between ADHD Symptoms, Parenting, and Functional Impairment

A developmental psychopathology perspective views the development and manifestation of ADHD and its outcomes across impairment domains as resulting from a process of multiple causes and pathways (Dealt, 2010). For example, a child may experience a biological predisposition to ADHD symptom presentation, as well as exposure to contextual protective and risk factors, such as positive and negative parenting practices (Johnston & Mash, 2001). This perspective has been supported in ADHD-C and mixed subtype samples. A study by Gathje et al. (2008) demonstrated significant and small-to-moderate associations between ADHD symptom severity and maternal ratings of school competence ($r = -.28$), social competence ($r = -.46$), and home impairment ($r = .28$), suggesting that whereas symptomatology explains some of the variance in impairment, most of the variability is explained by other factors. For example, a child's inattention may partially explain his or her level of academic impairment (e.g., an inability to focus impairs schoolwork completion), but other factors (e.g., the teacher's level of classroom monitoring, the quality of parental involvement during homework hour) also may be relevant. Similarly, social impairment may be related to the level of inattention one displays (e.g., a child is neglected by peers because s/he does not attend to conversations and/or games), along with other factors (e.g., the amount of social interaction modeled by the parent).

Furthermore, substantial research in the general child psychopathology literature has supported a dynamic, bidirectional model of parent and child behavior (e.g., Bell [1986], Belskey, [1984], and Patterson [1982]), such that child characteristics influence parental responses which in turn influence child behavior creating an interaction cycle that inherently reinforces itself over time (see Pardini, 2008 for review). Although little empirical research examining the bidirectional model in families of children with ADHD-I exists, it is not

[1]Note: The current study utilized DSM-IV criteria for assessment and screening, Thus, the DSM-IV terminology (i.e., ADHD, Predominately Inattentive Type) is throughout the text in lieu of the DSM-V terminology (i.e. ADHD, Inattentive presentation).

difficult to postulate how such a cycle may unfold in this population. For example, consider a child with ADHD-I who exhibits a high severity of symptomotology (e.g., inattention) during chore completion at home. The parents of this child in response may engage in negative, ineffective parenting (e.g., repeat the chore instructions several times and provide frequent reminders to stay on task), which although well intentioned, may actually lead to the child's impairment in the home setting (e.g., difficulty with independent task completion). This cycle may be perpetuated by escalated negative parenting in response to continued inattention (e.g., parent becoming frustrated and either doing the chore alongside the child or simply giving in and doing the chore themselves), preventing the child from becoming independent with task completion at home. One can easily imagine how this cycle would contribute to more severe generalized home impairment, such as more negative parent-child relationships, parent stress, and family chaos/disorganization. Alternatively, if a parent of a child with severe inattention learns to develop a clear and consistent chore system in which the child must comply with the expectations in order to earn a reward/privilege, the child may learn to complete tasks independently and thus the child's inattention may not result in home impairment (or at least not to the same degree as the former example). Although research examining the relationship between child and teacher behavior in this population is more scarce, it seems logical that this relationship would follow similar suit to that between parents and children.

Indeed, empirical research has demonstrated that contextual factors, and most notably positive and negative parenting practices, influence the manifestation of functional impairment as measured globally (e.g., Latimer et al., 2003; Pressman et al., 2006) and using specific domains of impairment. Rogers et al. (2009) found that parenting was related to school impairment displayed by children with ADHD, such that lower rates of supportive involvement and higher rates of controlling involvement were associated with lower academic achievement. Parenting has been shown to relate to social impairment in children with ADHD, with lower rates of positive parenting (e.g., warmth, authoritative parenting beliefs) and higher rates of negative parenting (e.g., power assertion, lax disciplinary practices) being associated with more social impairment (e.g., more problem social behavior, more conduct problems, and less positive/more negative peer nominations: Hinshaw et al., 1997; Hurt et al., 2007; Keown & Woodward, 2006). The relationship between parenting and social impairment appears to be especially robust in children with ADHD, such that the positive association between authoritative parenting beliefs and negative peer nominations was stronger in families of children with ADHD than in control families (Hinshaw et al., 1997). A general finding is that low rates of positive parenting (e.g., warmth) and high rates of negative parenting (e.g., ineffective discipline) are associated with higher rates of home impairment, such as more chaos and less harmony in the family system (e.g., Dumas et al., 2006; Lau et al., 1990). In addition to the literature associating parenting and functional impairment, other research has investigated the direct relationship between ADHD symptoms and parenting, such that children who display a higher severity of symptoms receive more negative and less positive parenting (e.g., Ellis & Nigg, 2009; McLaughlin & Harrison, 2005; see Deault 2006 & Modesto-Lowe et al., 2008 for reviews). Although parenting, inattention, and impairment consistently have been

associated with one another, more research is needed to better understand the pathways by which these variables may influence one another.

In one of the few existing studies examining possible pathways between symptoms, parenting, and impairment, Kaiser et al. (2011) evaluated three empirical models (i.e., a main effects model, a mediational model, and a moderational model) between symptom severity, positive/negative parenting practices, and social impairment, in children with any type of ADHD. The results suggested that both ADHD severity and parenting practices uniquely predict significant variance in child social impairment. The results also supported a mediational model, such that parenting (and particularly negative maternal parenting practices) partially mediated the relationship between ADHD severity and social impairment. Higher ADHD severity was related to higher rates of negative parenting, which in turn predicted more social impairment (Kaiser et al., 2011).

No studies to the authors' knowledge have investigated pathways between ADHD symptoms and *other* types of functional impairment. Furthermore, no studies have investigated the relationship between symptoms, parenting, and impairment in children with ADHD-I. Linkages and pathways may differ from those found in mixed subtype or predominantly ADHD-C samples, because of differences in symptom profiles, comorbidities, and associated impairments between the two ADHD types (APA, 2013; McBurnett et al., 2001; Milich et al., 2001; Willcutt et al., 2012). Specifically, both disorders are characterized by symptoms of inattention; however, the nature of inattention tends to differ by subtype, such that children with ADHD-I sometimes display greater elevations on sluggish cognitive tempo (SCT) symptoms compared to children with ADHD-C (APA, 2013; Milich et al., 2001; McBurnett et al., 2001; Willcutt et al., 2012). Additionally, the quality of impairment manifests differently for children across the two subtypes (APA, 2013; McBurnett et al., 2001; Milich et al., 2001; Willcutt et al., 2012). Within the domain of school impairment, children with ADHD-I tend to demonstrate underlying organization deficiencies resulting in difficulties such as homework problems and lower academic achievement results, compared to children with ADHD-C who also tend to display school difficulties which are behavioral in nature (Langberg et al., 2011; Milich et al., 2001; Willcutt et al., 2012). Social impairment in children with ADHD-I typically stems from behavior that is withdrawn, passive, and deficient in social knowledge leading to neglect and isolation from peers, as compared to the more impulsive and intrusive social difficulties from children with ADHD-C leading to active rejection from peers (Bauermeister et al., 2005; Solanto et al., 2009; Milich et al., 2001; Willcutt et al., 2012). There is limited research examining home impairment within the ADHD-I population; however, one study by Bauermeister et al. (2005) found that children with ADHD-I *and* ADHD-C contributed to more impaired home environments, although children with ADHD-C contributed to more sibling conflict and family financial strain than did children with ADHD-I. Knowledge of the pathways between symptoms and impairment in children with ADHD-I may provide clues to underlying mechanisms for impairment manifestation and also may justify potential intervention targets to improve impairment experienced by these children.

Current Study

Our goal was to investigate potential pathways between inattentive symptom severity, positive and negative parenting practices, and functional impairment in a sample of children diagnosed with ADHD-I. In particular, we were interested in the possibility that parenting styles might add to the functional impairment that accompanies ADHD-I, and in the possibility that parenting styles might mediate the relationship between parent-observed inattention and associated functional impairment. Such models could have implications regarding how psychosocial treatments should target core symptoms vs. parenting.

The pathway between inattention and impairment via parenting were examined for the current study utilizing both parent and teacher report. We predicted significant main effects of both inattentive symptoms and parenting on impairment as rated by parents: first, higher severity of parent-observed child inattention would be related to higher rates of homework, social, and home impairment. Second, higher rates of positive parenting were predicted to relate to lower rates of homework, social, and home impairment, above and beyond the effect of inattention; and higher rates of negative parenting were predicted to relate to higher rates of homework, social, and home impairment, above and beyond the effect of inattention. Additionally, we hypothesized that parenting would at least partially mediate the relationship between inattention and each of the impairment domains, such that greater symptom severity would be associated with lower rates of positive parenting and higher rates of negative parenting, which in turn would be associated with greater homework, social, and home impairment. We also predicted significant main effects of both inattentive symptoms and parenting on impairment as rated by teachers (i.e., teacher-rated inattention, academic impairment, and social impairment). Specifically, higher severity of teacher-observed child inattention would be related to higher rates of academic and social impairment in the classroom. Second, higher rates of positive parenting were predicted to relate to lower rates of academic and social impairment, above and beyond the effect of inattention; and higher rates of negative parenting were predicted to relate to higher rates of academic and social impairment, above and beyond the effect of inattention. Finally, we hypothesized that parenting would at least partially mediate the relationship between inattention and each of the impairment domains, such that greater symptom severity would be associated with lower rates of positive parenting and higher rates of negative parenting, which in turn would be associated with greater academic and social impairment.

Method

Participants

Participants included 199 parents and children participating in a randomized clinical trial (RCT) investigating the efficacy of an integrated psychosocial intervention for children with ADHD-I across two urban academic institution sites. Boys constituted just over half the sample (58.3%); children averaged 8.6 years of age (range 7–11) and were from varied ethnic/racial backgrounds. At the time of assessment, 4.5% of children were taking stimulant medication to address ADHD-related symptoms. Relatively low rates of comorbidities were observed in the current sample, with 6% of children meeting criteria for Oppositional Defiant Disorder (ODD) and 2% of children meeting criteria for other mood disorders. Each

child had one caretaker designated as the “primary parent” complete all questionnaires and measures. More complete demographic information for parents and children may be found in Table 1.

Children primarily were referred for the study through mailings to principals, school mental health providers, and learning specialists, with the remaining recruited through postings in on-line parent networks, offices of pediatricians and child psychiatrists, and through word-of-mouth. To participate in the study, children needed to have a DSM-IV diagnosis of ADHD-I (see below for screening/assessment description), a Full Scale IQ > 80, placement with at least one biological or adoptive parent for past year, and teacher consent to participate in a school-based treatment. Children were excluded from the study if they were taking or anticipating initiation of non-stimulant psychotropic medication during the study period, had a significant developmental disorder (e.g., pervasive developmental disorder) or neurological illness, or if they were in an all-day special education classroom.

Procedure

Parents and teachers completed a series of questionnaires, including measures of child behaviors, parenting/family functioning, as part of the initial screening and assessment procedure. Participants provided informed consent and children provided assent; study procedures were approved by the Committee on Human Research at the participating universities. Initial screenings included parent and teacher telephone interviews to assess eligibility for demographics, school, medication status, and adequate level of ADHD-I symptoms and related impairment. Specifically, parents and teachers each completed the ADHD module of the Child Symptom Inventory (CSI; Gadow & Sprafkin, 2002) to assess ADHD symptoms. The small number of children taking stimulant medication completed a one-week wash-out to assess behavior and obtain ratings off-medication. On the CSI, a symptom was judged to be present if rated “often” or “very often” by either parent or teacher. Cases meeting the following guidelines were invited for a diagnostic visit: a) at least five independent symptoms of inattention) endorsed on the CSI by parent or teacher, b) five or fewer independent symptoms of hyperactivity and impulsivity endorsed on the CSI by parent or teacher, and c) evidence of impairment due to inattention as rated by both parents and teachers on the IRS (i.e., at least one area of functioning had to be rated ≥3 by each informant; Fabiano et al., 2006). Some cases that narrowly missed this guideline but were otherwise significant for ADHD-I also were invited to a diagnostic visit. Screening guidelines were intentionally set low, in order not to exclude children who would ultimately meet symptom count and impairment criteria for ADHD-I.

To determine diagnostic status, parents were interviewed by a licensed child clinical psychologist and were asked about their child’s clinical and developmental history and administered modules from the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS-PL; Kaufman et al, 1997) assessing ADHD, oppositional defiant disorder, conduct disorder, anxiety disorders, major mood disorders, and psychoses. The K-SADS has good psychometric properties, including adequate test-retest reliability (Kaufman et al, 1997). All cases met full DSM-IV criteria for ADHD-I. Twenty percent of the randomly selected audio-recorded K-SADS interviews were rated by

an independent clinician with 100% agreement for an ADHD-I diagnosis (kappa =1.0). Parents also completed a battery of questionnaires over two visits, and children were administered the WISC-IV and a battery of tests and questionnaires. All cases that progressed from the screening stage met full DSM-IV criteria for ADHD-I.

Measures

ADHD Symptoms

Child Symptom Inventory **(CSI; Gadow & Sprafkin, 2002):** The CSI contains 18 items corresponding directly to the DSM-IV-TR inattentive (IA) and hyperactive/impulsive (HI) symptoms. Each symptom is rated on a 4 point scale from *never* to *very often*. For purposes of the current study, the IA severity subscale of the CSI was examined, which computes a mean severity score for the nine IA symptoms. The IA severity subscale of the CSI contains normative data, acceptable test-re-test reliability, and predictive validity for categorical diagnosis of ADHD (Gadow & Sprafkin, 2002). Chronbach's alpha for the IA scale in the present sample was .82.

Parenting

Alabama Parenting Questionnaire **(APQ; Shelton et al. 1996):** The APQ is a 42-item self-report measure assessing positive and negative parenting practices. Sums of items are created for five parenting practices (Involvement, Positive Parenting, Poor Monitoring/ Supervision, Inconsistent Discipline, and Corporal Punishment). Each item is scored on a scale ranging from 1 (*never*) to 5 (*always*) with higher scores representing more of that type of parenting. The APQ has demonstrated good internal consistency and construct validity (Essau et al. 2006; Shelton et al. 1996).

Parent-Child Relationship Questionnaire-Brief Version **(PCRQ; Furman & Giberson, 1995):** The PCRQ is a 40-item self-report measure that assesses both positive and negative aspects of the parent's relationship with their child. This measure generates five subscales: Warmth, Disciplinary Warmth, Power Assertion, Personal Relationship, and Possessiveness. Each item is scored on a scale ranging from 1 (*hardly at all*) to 5 (*extremely*). The PCRQ has demonstrated adequate psychometric properties, including convergent validity (Furman & Giberson, 1995).

Data reduction: In order to reduce the number of parenting variables, the current study examined two factors (i.e., positive parenting and negative parenting) as derived from the APQ and PCRQ in previous factor analyses with a large national sample of children with ADHD (Hinshaw et al., 2000; Wells et al., 2000). The positive parenting factor is comprised of 40 items drawn from the APQ Involvement and Positive Parenting subscales and the PCRQ Warmth and Disciplinary Warmth subscales. Sample items include, "You reward or give something extra to your child for obeying you or behaving well" and "How much do you and this child care about each other?" The negative parenting factor includes 24 items drawn from the APQ Inconsistent Discipline and Corporal Punishment subscales and the PCRQ Power Assertion subscale. Sample items include, "Your child talks you out of being punished after he/she has done something wrong" and "How much do you yell at this child

when he/she has been bad?." Cronbach's alphas for these factors in the present sample were .90 and .79 for positive and negative parenting, respectively.

Homework Impairment

Homework Problem Checklist **(HPC; Foley & Epstein, 1993):** The HPC contains 20 parent-report items, ranging from 1 (*never*) to 4 (*always*), with higher scores indicating greater homework impairment. Sample items include: "Doesn't do homework satisfactorily unless someone is in the room" and "Fails to bring home assignments and necessary materials (textbooks, copies, etc.)." For the purposes of this study, the total raw score of the HPC was examined. The measure has demonstrated adequate psychometric properties including test-retest reliability (Foley & Epstein, 1993). Chronbach's alpha for this scale in the present sample was .87.

Social Impairment

Social Skills Improvement System **(SSIS; Gresham & Elliott, 2008):** The SSIS contains 79 items ranging from 1 (*never*) to 4 (*always*). The total Social Skills scale score was used in this study and reversed-scored so that higher ratings reflect more social impairment. Sample items include: "Takes turns in conversations" and "Makes friends easily." The SSIS was normed on a large and diverse sample and the parent and teacher versions have adequate internal consistency (Cronbach's alpha = .95 and .94, respectively) and test-retest reliability (r_{xx}s = .84 and .81, respectively) and construct validity (Gresham & Elliott, 2011).

Home Impairment

Parent Daily Hassles **(PDH; Crnic & Greenberg, 1990):** The PDH contains 20 parent-report items, ranging from 1 (*no hassle*) to 5 (*big hassle*), with higher scores indicating greater impairment related to child behavior at home. Sample items include: "Child needs constant reminders in the morning to get ready (getting dressed; eating breakfast; brushing teeth)" and "Always cleaning up messes of toys, belongings, or food." The measure has demonstrated adequate psychometric properties, such as convergent validity by correlating with theoretically related measures (Crnic & Greenberg, 1990). Cronbach's alpha for this scale in the present sample was .82.

Academic Impairment

Academic Competency Evaluation Scale (ACES; DiPerna & Elliott, 1999): The ACES contains teacher-report items rated on a 5-point scale (never, seldom, sometimes, often and almost always) assessing interpersonal skills, engagement, motivation, and study skills. The measure has adequate psychometric properties including test–retest reliability and internal consistency (alpha at or above .98). The total Academic Enablers score was used in this study and reversed-scored so that higher scores indicate more impairment.

Data Analysis

Bivariate correlations were examined in IBM SPSS version 20 (SPSS, 2011) in order to determine which paths would be specified in the subsequent main effects and mediation models of inattention and positive/negative parenting on impairment. Next, hierarchical

linear regressions were performed to determine the incremental contributions of parenting to impairment beyond that of inattentive symptoms. Specifically, inattention was considered in the initial models, and the incremental effects of positive and negative parenting considered in the subsequent models.

A path analytic model was tested using MPlus version 5.12 (Muthén & Muthén, 2010) in order to evaluate the mediating effects of parenting on the relationships between the severity of children's inattention and their impairment. The specification of paths in the model was based on the pattern of significant bivariate relationships, as mentioned above. Next, a simultaneous path model was computed using the MODEL INDIRECT statement in order to obtain accurate estimates of indirect effects and their standard errors based on the Sobel test, as described by MacKinnon and colleagues (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Criteria described by Baron and Kenny (1986) were also considered. Specifically, this approach requires that a predictor is significantly associated with a mediating variable (path a), the mediating variable is significantly associated with the outcome variable (while simultaneously regressing the outcome on the mediating and predictor variables; path b), and that the predictor variable is significantly associated with the outcome variable (path c). Moreover, the relationship between the predictor and outcome variables must be reduced in magnitude or non-significant when regressing the outcome on the mediating and predictor variables simultaneously (path c') in order to demonstrate partial or full mediation, respectively. Related to this model, the indirect effect (path a*path b) tested inferentially by the Sobel test is interpreted as the difference in magnitude between the coefficients for path c and path c'. In other words, the Sobel test determines whether or not the addition of a mediator significantly reduces the magnitude of the relationship between the predictor and the outcome variables. MPlus uses full information maximum likelihood estimation procedures to estimate unbiased parameters when data are missing at random. Data were missing for only three individuals.

All analyses were re-computed controlling for child gender, family income, and parent ratings of hyperactivity/impulsivity, but the results remained unchanged. Thus, the uncontrolled analyses are presented and any differences that resulted from including the control variables are noted. In order to ensure that these results were not influenced by the inclusion of children with subthreshold Hyperactivity/Impulsivity symptoms, the analyses were also re-computed in a restricted sample of children who had 2 or fewer Hyperactivity/Impulsivity symptoms reported by their parents (n=158; 79%) and all results remained consistent.

Results

Bivariate Associations

Means and standard deviations for each variable are presented in Table 2. Bivariate correlations were examined in order to determine which paths would be specified in the main effect and path analysis models (see Table 3 for correlations). Parent-rated inattentive symptoms had significant and small to medium-sized associations with negative parenting, as well as with social and home impairment. Parent-rated inattention also was significantly and moderately to strongly associated with greater homework impairment, but was not

related to positive parenting. Although the lack of a significant association between parent-rated inattention and positive parenting precluded the inclusion of positive parenting as a mediator in the subsequent path analysis model, positive parenting did have a significant and moderate (negative) association with social impairment. Finally, negative parenting had significant and medium-to-large large associations with homework, social, and home impairment. The only teacher-rated measure that was significantly associated with positive or negative parenting was social impairment. However, teacher-rated inattention was not significantly associated with positive or negative parenting, which precluded tests for mediation. Thus, only inattention and impairment as observed by parents in the home setting were examined in further analysis.

Main Effects- Home Model

For homework impairment, the initial model including inattention was significant and accounted for a moderate to large proportion of variance, $F(1, 195) = 43.18$, $p < .001$, $R^2 = .18$. Specifically, children with more severe inattention had more severe homework impairment, $\beta = .43$, $p < .001$. The subsequent model, which included negative parenting in addition to inattention, accounted for a significant but small proportion of additional variance beyond the initial model, $\Delta F (1, 194) = 15.36$, $p < .001$, $\Delta R^2 = .06$, and indicated that negative parenting incrementally contributed to more homework impairment, $\beta = .25$, $p < .001$, above and beyond the contributions of inattention.

For social impairment, the initial model, including inattention, was significant, $F(1, 194) = 10.23$, $p = .002$, $R^2 = .05$, and indicated that children with more severe inattention had more severe social impairment, $\beta = .22$, $p = .002$. When positive and negative parenting were added in the subsequent model, the overall model accounted for a significant and medium proportion of additional variance in social impairment, $\Delta F (2,192) = 14.58$, $p < .001$, $\Delta R^2 = .14$, and both positive, $\beta = -.31$, $p < .001$, and negative $\beta = .15$, $p = .027$ parenting incrementally contributed to less social impairment, above and beyond the contributions of inattention.

Finally, for home impairment, the initial model was significant, $F(1, 195) = 15.25$, $p < .001$, $R^2 = .07$, and indicated that children with more severe inattention had more severe home impairment, $\beta = .27$, $p < .001$. When negative parenting was added in the subsequent model, the overall model accounted for a significant and large proportion of additional variance in home impairment, $\Delta F (1,194) = 50.02$, $p < .001$, $\Delta R^2 = .26$, and negative parenting incrementally contributed to more home impairment, $\beta = .44$, $p < .001$, above and beyond the contributions of inattention.

Path Analysis- Home Model

In the path analytic model, the relationships between inattention and homework, social, and home impairment were examined, as well as the mediating role of negative parenting in these relationships (see Figure 1). Overall model fit statistics could not be computed because the model was fully saturated (i.e., just-identified). Significant direct paths were found between inattention and homework ($\beta = .38$, $p < .001$), social ($\beta = .18$, $p = .007$), and home impairment ($\beta = .19$, $p = .002$). The indirect paths between inattention and homework,

social, and home impairment via negative parenting revealed that inattention significantly contributed to more negative parenting (β = .19, p = .007), which in turn significantly contributed to more homework (β = .25, p < .001), social (β = .21, p = .002), and home impairment (β = .44, p < .001). These findings satisfy the initial Baron and Kenny (1986) criteria for partial mediation, as the direct relationship between inattention and each outcome was reduced, but still significant and all other paths were significant. The Sobel test of the indirect effects were also tested and revealed that the addition of negative parenting to the model significantly reduced the paths between inattention and homework impairment (ab = .05, p = .025), social impairment (ab = .04, p = .043), and home impairment (ab = .08, p = .011) via negative parenting. In other words, these indirect effects are equal to the difference in the paths between inattention and homework, social, and home impairments when negative parenting was and was not included in the model as a mediator. These findings indicate that negative parenting partially mediates the relationships between inattention and homework, social, and home impairment according to the Barron and Kenny criteria for partial mediation and the Sobel test of the indirect effects. These findings remained consistent when controlling for hyperactive/impulsivity severity. An additional model was considered that tested whether or not these mediation models differed between boys and girls (i.e., moderated mediation), but no differences were found.

Discussion

Overall, the current study examining children with ADHD-I supported both main effects of symptoms and parenting on impairment, as well as a cross-sectional mediational path between symptoms and impairment via parenting, as observed by parents in the home setting. As predicted, both inattention severity and parenting contributed to functional impairment in children with ADHD-I. Specifically, higher severity of parent-rated inattention was associated with higher rates of homework, social, and home impairment, accounting for 5–19% of the variance in impairment domains. Negative parenting contributed to homework and to home impairment, and positive and negative parenting contributed to social impairment, incrementally above and beyond the impact of inattention severity alone, accounting for between 6–26% of additional variance in the domains of impairment. These results are consistent with research on mixed ADHD subtype or predominantly ADHD-C samples, which indicates that both symptoms and parenting uniquely predict severity and type of functional impairment (e.g., Hinshaw et al., 1997; Kaiser et al., 2011).

Results also illustrate which types of parenting may be most strongly linked to specific domains of impairment in children with ADHD-I as observed in the home setting by parents; specifically, both positive and negative parenting appear to be associated with social impairment, while only negative parenting appears to be associated with homework and home impairment. There are several explanations for these findings. Positive parenting may have more theoretical relevance to the type of social impairment found in ADHD-I (i.e., withdrawal vs. confidence in social interactions) than to homework or home impairment. Specifically, positive parenting may be important for facilitating greater social engagement via social learning mechanisms (e.g., direct modeling of appropriate social behavior and assertion, facilitation of play dates with supervision from parents; McDowell & Parke, 2009)

but less important for other impairment domains which may be governed more by inattention related to disinterest or avoidance of undesired tasks. Negative parenting, on the other hand, may have deleterious effects on sustaining attention to less desired tasks, as well as on learned social behavior, and thus interfere with functioning across domains (DuPaul & Ervin, 1996).

As predicted, parenting partially mediated the relationship between inattentive symptoms and functional impairment as observed by parents in the home setting. These results are consistent with the one known study examining pathways between ADHD symptoms, parenting and impairment (i.e., Kaiser et al.'s [2011] study examining a mixed sample of children with ADHD types). Specifically, findings from both the current study and Kaiser et al.'s (2011) study suggest that negative parenting partially mediates the relation between ADHD symptoms and social impairment, such that more severe symptomatology relates to more negative parenting, which in turn relates to more social impairment. The current study expands upon Kaiser et al.'s (2011) by demonstrating a similar mediational pathway with other impairment domains (i.e., homework and home impairment).

Results supporting a relation between inattention, parenting, and impairment observed by parents in the home setting were not replicated in examination of reports by teachers in the classroom setting. There are several potential explanations for this. First, it is possible that shared method variance contributed to the significant findings in the home setting model, thus explaining the lack of findings when both parents and teachers provided ratings for the classroom model. However, it also is possible that the manifestation of impairment differs between settings. For example, it seems plausible that inattention is associated with the development impairment via parenting when inattention and impairment are observed/perceived by parents, but another factor (e.g., teaching style) mediates the relationship between inattention and impairment observed/perceived by teachers.

Implications

Although we acknowledge that the cross-sectional nature of the current study design precludes causal conclusions, several implications can be considered from the study's findings. First, results generally support previous intervention research with predominantly ADHD-C samples indicating that reductions in negative parenting following treatment mediate improvement of child impairment (e.g., Chronis et al., 2011; Hinshaw et al., 2000). Furthermore, given results suggesting that both inattention and positive/negative parenting related to impairment displayed by children with ADHD-I as observed by parents in the home setting, it appears that a multi-pronged treatment approach (e.g., targeting parenting skills and child symptoms) may be needed to produce meaningful outcomes in the various domains of functional impairment experienced by children with ADHD-I. This contention is supported by results of Pfiffner et al. (2007; 2014) demonstrating the impact of multi-component behavioral treatment on symptoms and impairment in children with ADHD-I. In terms of which mechanisms may be most influential on different domains of impairment in children with ADHD-I, we may extrapolate that increases in positive parenting (e.g., increased warm and shared communication and activities between parents and children) may be effective at reducing social impairment regardless of the severity of inattention a child

displays. Additionally, decreases in negative parenting (e.g., less ineffective and inconsistent discipline) may be successful at reducing homework, social, and home impairment. One final implication from the current study pertains to the measurement of parenting as a single versus multi-factor construct. Given that positive and negative parenting had unique associations with inattention and impairment in the current study, and positive and negative parenting constructs only displayed a moderate association with one another ($r = -.195$), it would appear that combining positive and negative parenting into a single variable in research and/or clinical settings could obfuscate results.

Limitations

Several limitations of the current study should be acknowledged. First, the current study uses cross-sectional data. Causal implications should be interpreted with caution. We show evidence for statistical mediation, but true mediation requires temporal separation of predictor, mediator, and criterion variables (Kraemer et al., 2001; MacKinnon et al., 2007). Future research should utilize longitudinal and/or treatment outcome designs to further investigate the developmental pathway between inattention, parenting, and impairment in children with ADHD-I.

As described above, given that findings only emerged in the home-setting model, it is possible that results could be attributed to shared method variance (e.g., all comparisons of parent-reported variables could be significant because of an overall negative bias on the part of the informant). We cannot rule out such bias as a factor in bivariate associations. However, the global bias construct cannot readily explain the pathways in which parenting partially mediated the associations of inattention and impairments. Our reasoning here is that global bias may add a single source of variance to variables and thus increase their association, but we could not generate a credible explanation as to how a global measurement effect could create a mediational relationship when no such relationship exists among the “true” variables. By the same reasoning, global bias also does not explain the prior results of Kaiser et al. (2011), which rejected direct and moderational models in favor of a mediational model. Thus, the totality of evidence suggests that method variance may be an influence on these data, but it does not completely account for the model findings.

Finally, given the study inclusion criteria requiring an ADHD-I diagnosis, all children in the sample displayed a high count of inattentive symptoms and a low count of hyperactive-impulsive symptoms, thus introducing range restriction. In acknowledging this complication, we also note that range restriction would not be expected to contribute to positive findings, and also that this kind of range restriction is a feature of most clinical research. However, it is possible that the restricted range accounted for the absence of positive parenting as a mediator in the home setting model. Replication of the current results in nonclinical, subclinical and/or mixed-subtype samples, with broader ranges of symptoms, and with multiple indicators of key constructs, may shed further light on the proposed relation between inattention and impairment via parenting.

Conclusions

The current findings provide several novel additions to the existing ADHD literature. Although there is substantial evidence for the association between ADHD symptoms and functional impairment (e.g. Gathje et al., 2008; Willcutt et al., 2012) and parenting and global impairment (e.g., Latimer et al., 2003; Pressman et al., 2005), this study is the first of its kind to support such relations specifically for children with ADHD-I and with respect to multiple domains of functional impairment (i.e., homework, social, and home impairment). Additionally, the current study follows Kaiser et al. (2011) in supporting a pathway between symptoms and impairment via parenting. Findings provide evidence for underlying mechanisms between symptoms and impairment in children with ADHD-I, and suggest potential intervention targets to improve homework, social, and home impairment experienced by these children.

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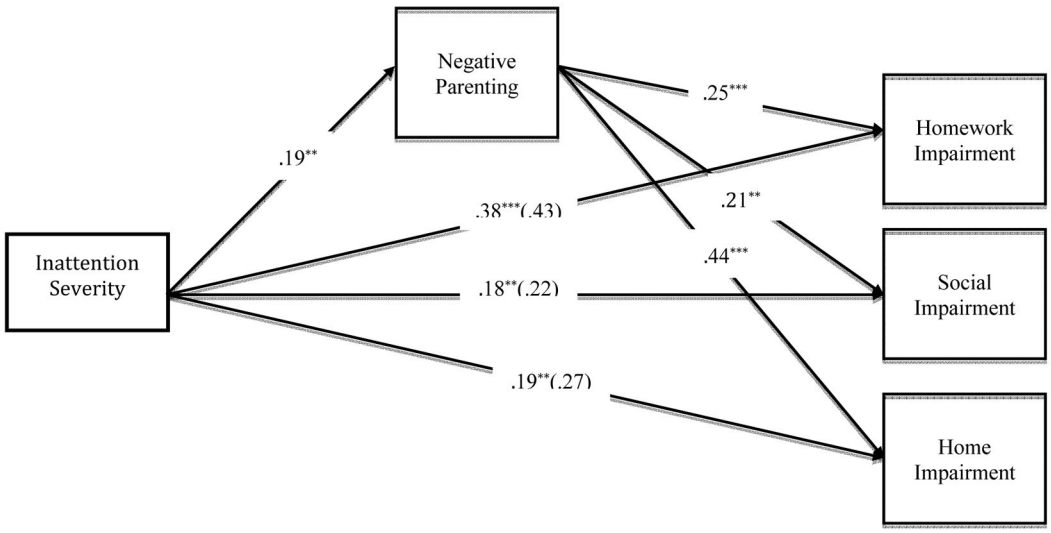

Figure 1.

Parenting as a Mediator of Parent-rated Inattention Severity and Homework, Social, and Home Impairment.

*p <.05; **p <.01; ***p <.001. Coefficients presented in parentheses represent relationships without Negative Parenting in the model.

Table 1

Parent and Child Demographics

Parent		Child	
Single parent, *n* (%)	25 (12.6)	Age, *M* (SD)	8.64 (1.16)
Education, *n* (%)		Gender, *n* (%)	
Graduated high school/GED	4 (2)	Female	83 (41.7)
Some college	33 (16.8)	Male	116 (58.3)
College graduate	79 (40.1)	Grade, *n* (%)	
Graduate or professional degree	81 (41.1)	2^{nd} – 3^{rd}	113 (56.8)
Income, *n* (%)		4^{th} – 5^{th}	86 (43.2)
$40,000 or less	16 (8.3)	Race/Ethnicity, *n* (%)	
$40,001–60,000	17 (8.9)	Caucasian	107 (53.8)
$60,001–80,000	25 (13.1)	Hispanic/Latino	33 (16.6)
$80,000–100,000	23 (12.1)	Asian	16 (8)
$100,001–150,000	55 (28.8)	African American	10 (5)
More than $150,000	55 (28.8)	Mixed Race/other	33 (16.6)
Relationship to child		Number of Symptoms[+] *M* (SD)	
Biological Mother	167 (84)	ADHD-Inattentive	7.6 (1.1)
Biological Father	13 (6.5)	ADHD-Hyperactive/Impulsive	1.2 (1.2)
Adoptive Mother	10 (5)	Oppositional Defiant Disorder	.9 (1.4)
Adoptive Father	3 (1.5)		
Other relative	6 (3.5)		

Note: $N = 199$.

[+] Symptom presence based on the K-SADS-PL interview with parent (Kaufman et al., 1997)

Table 2

Means and Standard Deviations of all Measures

Measures	Mean	Standard Deviation
Parent Measures		
Inattention Severity	2.01	.48
Positive Parenting	3.89	.34
Negative Parenting	2.24	.33
Homework Impairment	2.61	.49
Social Impairment* (Standard Score, reversed)	111.83	12.94
Home Impairment	2.35	.41
Teacher Measures		
Inattention Severity	2	.54
Social Impairment (Standard Score)	115.13	12.6
Academic Impairment	2.6	.57

* The total SSIS (Gresham & Elliott, 2008) Social Skills scale score was used and reversed-scored so that higher ratings reflect more social impairment.

Table 3

Bivariate Correlations Between Predictor, Mediator, and Outcome Variables.

	1	2	3	4	5	6	7	8	9
Parent measures									
1) Inattention Severity	1								
2) Positive Parenting	−.02	1							
3) Negative Parenting	.19**	−.2**	1						
4) Homework Impairment	.43***	−.01	.32***	1					
5) Social Impairment	.22**	−.34***	.25**	.2**	1				
6) Home Impairment	.27***	−.07	.48***	.45***	.21**	1			
Teacher Measures									
7) Inattention Severity	.11	.12	−.03	.11	.03	.02	1		
8) Social Impairment	.03	.05	.14*	.07	.32**	.02	.24**	1	
9) Academic Impairment	.13	−.01	.1	.14	.29**	0	.5***	.64***	1

Note:

* $p<.05$,

** $p<.01$,

*** $p<.001$

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