Examining the Effects of ADHD Symptoms and Parental Involvement on Children's Academic Achievement

Jaida S. Condo[1], **Elizabeth S.M. Chan, M.A., M.S.**[1], **Michael J. Kofler, Ph.D.**[1]

[1]Florida State University, Department of Psychology

Abstract

Objective: Our understanding of the role of parental involvement in academic outcomes for children with ADHD is limited, with mixed evidence suggesting a positive association between parental involvement and academic achievement for pediatric ADHD but limited evidence regarding how this varies based on ADHD symptom severity, ADHD symptom domains, or co-occurring ODD symptoms. In this context, the present study aimed to examine the effects of parental involvement, ADHD symptoms, and comorbid ODD on children's overall, reading, and math achievement.

Method: A well-characterized clinically-evaluated sample of 162 children recruited through a university-based children's learning/behavioral health clinic and community resources (ages 8–13; 50 girls; 69% Caucasian/Non-Hispanic) were administered standardized academic achievement tests, with parents and teachers completing measures of parental involvement and ADHD symptoms, respectively.

Results: Inattention, but not hyperactivity-impulsivity, was associated with lower academic achievement in all tested models (β= −.16 to −.22, all p<.03). Surprisingly, parental involvement had significant *negative* associations with math and overall academic achievement (β= −.13 to −.26, both $p \leq .05$) and did not moderate the relations between ADHD symptoms and academic achievement in any tested model. Comorbid ODD symptoms did not significantly predict academic achievement or interact with parental involvement in any tested model. These findings were robust to control for child IQ, age, sex, SES, anxiety, and depression.

Conclusion: Parental involvement may not serve as a protective factor against academic underachievement for children with clinically elevated ADHD symptoms, and may predict lower rather than higher academic achievement for clinically evaluated children in general.

Corresponding Author:, Michael J. Kofler, Ph.D. Florida State University |Department of Psychology, 1107 W. Call Street | Tallahassee, FL 32306-4301, Phone: (850) 645-0656, Fax: (850) 644-7739, kofler@psy.fsu.edu.

CRediT Author Statement

All authors contributed substantively, collaboratively, and interactively in the production of this manuscript. The authors decline to parcel credit for specific tasks to specific people because we feel this promotes competition rather than collaboration.

Conflict of Interest:

The authors have no conflicts of interest to report.

Keywords

ADHD; academic achievement; parental involvement

What this Paper Adds

Parental involvement has been shown to exert protective or promotive benefits for children's academic achievement across racial groups, socioeconomic status, and cultures worldwide. However, emerging evidence suggests that factors that promote positive outcomes for children in general may not exert the same benefits for children with neurodevelopmental disorders such as ADHD. In a relatively large, clinically evaluated sample that completed a multi-informant/multi-method assessment and objective evaluation of academic achievement, the current study confirmed that children's inattentive symptoms predict lower academic achievement in reading and math. Contrary to expectations, higher levels of parental involvement did not buffer against the risk conveyed by elevated ADHD inattentive symptoms, but instead uniquely predicted further academic difficulties in math and overall achievement. These findings add to a growing body of evidence suggesting that promotive factors identified in the general population cannot be assumed to operate similarly for clinically evaluated children, while emphasizing the need for further research to identify qualitative differences in parental involvement that may explain why similar levels of parental involvement predict differently valanced outcomes for these children.

Examining the Effects of ADHD Symptoms and Parental Involvement on Children's Academic Achievement

Attention-deficit/hyperactivity disorder (ADHD) is a chronic neurodevelopmental disorder that affects approximately 5% of school-aged children (Polanczyk et al. 2014). ADHD is associated with clinically significant impairments in the family, peer, and academic domains (Pelham et al., 2005) at an annual U.S. cost of illness of over $100 billion (Zhao et al., 2019). Academic underachievement is prominent in ADHD, with approximately 33% to 63% of children with ADHD exhibiting difficulties in one or more school subjects, such as reading and math (Mayes & Calhoun 2006; Barry et al., 2002). ADHD academic difficulties start early and often persist through middle and high school (Scholtens et al., 2013; DuPaul et al., 2001). Moreover, ADHD-related academic difficulties are associated with myriad negative outcomes including increased incidence of failing grades, lower grade point averages and standardized test scores, higher rates of high school dropout, and lower college attendance when compared to their typically developing peers (Arnold et al., 2020; Kent et al., 2011; Kuriyan et al., 2013; Barkley, 2006; Frazier, 2007). ADHD status has also been found to predict later academic and occupational difficulties (McGee et al. 2002; Fredrikson et al., 2014), as well as socioeconomic status over 30 years even after controlling for IQ (Ritchie & Bates, 2013). In the context of the extensive early and long-term difficulties associated with academic impairment in ADHD, it is important to determine potential protective factors (i.e., factors associated with reducing the negative impact of risk) to combat ADHD-related academic difficulties and associated negative outcomes. Towards this aim, one factor that has been shown to have a positive effect on academic achievement

in the developmental literature (e.g., Castro et al, 2015), but has not been studied extensively in children with ADHD, is parental involvement.

Parental Involvement and Academic Achievement

Parental involvement refers to a parent's participation in school- and home-based activities with their child (Castro et al, 2015; Fan & Chen, 2001). Parental involvement has been recognized by the research community, school systems, and policy makers as a positive influence on academic achievement (Graves & Wright, 2011; Wilder, 2014; Van der Werf, Creemers, & Guldemond, 2001). Meta-analytic evidence indicates that parental involvement has a significant, small to medium magnitude effect for improving academic achievement as measured by both standardized measures of achievement and GPA for typically developing children (Fan & Chen, 2001; Jeynes, 2005; Wilder, 2014). Notably, parental involvement has also been found to positively influence academic achievement across demographic indicators, including race, socioeconomic status, and cultures worldwide (Jeynes, 2005; Kieth & Lichtman, 1994; Tam & Chan, 2009; Olatoye & Ogunkola, 2008). While parental involvement has consistently been found to positively affect academic achievement in general, there are limited and contradictory findings in regard to its impact on specific subject to overall academic achievement across areas (Boonk et al., 2018; Patall et al., 2008; Wilder, 2014). In addition, to our knowledge there have been no studies examining the association between parental involvement and specific academic domains for children with high vs. low levels of ADHD symptoms. Moreover, despite the established importance of parental involvement for educational outcomes among typically developing children, little is known about the role of parental involvement for academic outcomes in children with neurodevelopmental disorders such as ADHD. This paucity of research is concerning given that children with ADHD are at high risk for academic difficulties as noted above (e.g., Arnold et al., 2020; Kent et al., 2011), as well as nascent evidence that these children may not respond to promotive factors the same way as their non-ADHD peers (Chan et al., 2021; Dvorsky & Langberg, 2016).

Parental Involvement and Academic Achievement in ADHD

Among the few studies examining how parental involvement impacts academic achievement for children with ADHD, the findings are mixed. For example, Rogers et al. (2009a) showed that parents of children with ADHD exhibited lower levels of quality involvement in their children's schools. Interestingly, however, in a separate study they found that supportive parental involvement was still associated with higher academic achievement for these children (Rogers et al., 2009b). Similarly, Corcoran & Dattalo (2006) conducted a meta-analytic review on psychosocial treatments for children with ADHD and concluded that parental involvement was positively associated with academic achievement. In contrast, Shelleby & Ogg (2020) found no evidence for parental involvement affecting reading achievement longitudinally, despite finding that early ADHD symptoms predicted lower levels of later parental involvement.

Thus, findings from the extant literature on parental involvement, while mixed, predominantly suggest that parental involvement may have a positive impact on academic achievement for children with ADHD. However, further research is needed to understand

additional factors that may influence whether and to what extent parental involvement is associated with academic achievement in ADHD. For example, the literature indicates ADHD symptom severity is associated with greater academic difficulties (e.g., Arnold et al., 2020; Kent et al., 2011). Moreover, evidence suggests that the different ADHD symptom clusters (inattentive vs. hyperactive/impulsive) may differentially affect academic achievement. Specifically, inattention symptoms have been found to be a greater risk factor when compared with hyperactive-impulsive symptoms on academic achievement (Weiss et al., 2003; Breslau et al., 2009). In contrast, hyperactive-impulsive symptoms have minimal, if any, impact on this domain (Rogers et al., 2009b; Weiss et al., 2003; Breslau et al., 2009). Interestingly, longitudinal and experimental/intervention studies indicate that the relation between ADHD symptomology and parental involvement appears to be unidirectional, such that children's ADHD behaviors drive lower levels of parental involvement rather than vice versa (Shelleby & Ogg, 2020; Corcoran & Dattalo, 2006). In turn, Rogers et al. (2009a) found that for children with ADHD, supportive parental involvement was associated with higher academic achievement through lower levels of inattention.

Additional factors that may influence the relation between parental involvement and academic achievement in pediatric ADHD include co-occurring disorders. Research further demonstrates that academic underachievement in ADHD tends to increase with each additional co-morbid diagnosis (Larson et al., 2011). This is of note given the high rates of comorbid disorders in ADHD, in particular oppositional defiant disorder (ODD, 30–60%; Tung et al., 2016; Jensen et al., 2001) and learning disabilities (LD, 27–31%; DuPaul & Volpe, 2009). ODD and LD are two of the most prominent co-occurring disorders in ADHD, and both disorders have been shown to be associated with greater ADHD symptom severity (Hurtig et al., 2007; Mayes, Calhoun, & Crowell, 2000; Connor & Doerfler, 2007) and identified as risk factors for subsequent academic problems (Leadbeater & Ames, 2016; Mayes, Calhoun, & Crowell, 2000; Smith & Adams, 2006). Initial findings on these diagnoses in relation to parental involvement and academic achievement, however, surprisingly suggests that ODD has no incremental, detrimental effect on parental involvement for children with ADHD (Fergusson & Horwood, 1995; Fergusson et al., 1997; Rapport et al., 1999; Rogers et al., 2009), and that for children with LD without ADHD, parental involvement does not have a significant impact on academic achievement (Patrikakou, 1996).

Current Study

In summary, children with elevated ADHD symptoms are at high risk for both short- and long-term academic difficulties and associated negative outcomes (Arnold et al., 2020; Kent et al., 2011; Kuriyan et al., 2013; McGee et al. 2002; Scholtens et al., 2013). Thus, identifying targets for academic intervention is crucial for improving outcomes for these children (Chacko et al., 2014). Among typically developing children, there is substantial evidence that parental involvement positively impacts academic achievement (Wilder, 2014; Fan & Chen, 2001; Jeynes, 2005). However, our understanding of the role of parental involvement on academic outcomes for children with elevated ADHD symptoms is limited, with mixed evidence suggesting a positive association between parental involvement and academic achievement for pediatric ADHD but limited evidence regarding how this

varies based on ADHD symptom severity, ADHD symptom domains, or co-occurring ODD symptoms (Rogers et al. 2009; Corcoran & Dattalo 2006; Shelleby & Ogg, 2020). Additionally, there is mixed evidence regarding how parental involvement specifically affects different academic domains (e.g., reading versus math) in the developmental literature (Wilder, 2014), and to our knowledge no literature examining this difference in ADHD populations.

To address these gaps in the literature, the primary aims of our study were to 1) examine whether parental involvement is significantly related to academic achievement in a clinically evaluated sample of children representing the full spectrum of ADHD symptom frequency/severity, 2) determine whether parental involvement moderates the relation between ADHD symptoms and academic underachievement, and 3) explore whether co-occurring ODD impacts the expected association between parental involvement and academic achievement. We hypothesized that parental involvement would be significantly, positively related to academic achievement in our clinically evaluated sample of children (Wilder, 2014; Rogers, 2009). We also hypothesized that parental involvement would moderate the relation between ADHD symptomatology and academic achievement, such that the negative impact of ADHD symptoms on academic achievement would be mitigated (lessened) for children with more involved parents. For our exploratory analyses, we expected that increased levels of ODD symptoms would significantly and negatively moderate (i.e., decrease) the positive relation between parental involvement and academic involvement, over and above the expected impact of ADHD inattentive and hyperactive/impulsive symptoms.

Method

Participants and Procedures

The sample comprised 162 children aged 8 to 13 years (M = 10.32, SD = 1.52; 112 boys, 50 girls) from the Southeastern United States, recruited by or referred to a university-based Children's Learning Clinic (CLC) through community resources (e.g., pediatricians, community mental health clinics, school system personnel, self-referral) from 2015 to 2020 who were included in Chan et al. (2021). The CLC is a research-practitioner training clinic known to the surrounding community for conducting developmental and clinical child research and providing *pro bono* comprehensive diagnostic and psychoeducational services. Its client base consists of children with suspected learning, behavioral or emotional problems, as well as typically developing children (those without a suspected psychological disorder) whose parents agreed to have them participate in developmental/clinical research studies. All parents and children gave informed consent/assent, and the Florida State University Institutional Review Board approval was obtained/maintained prior to/throughout data collection. Sample ethnicity was mixed with 111 White Non-Hispanic (69%), 17 Hispanic (10%), 19 Black (12%), 3 Asian (2%), and 12 Multiracial children (7%; Table 1). All children spoke English.

All children and caregivers completed a comprehensive evaluation that included detailed, semi-structured clinical interviewing and multiple norm-referenced parent and teacher questionnaires. A detailed account of the comprehensive psychoeducational evaluation can be found in the larger study's preregistration: : https://osf.io/nvfer. A psychoeducational

report was provided to parents. The final sample included 40 children (10 girls) with ADHD only; 64 children with ADHD and common comorbidities (18 girls, 14% oppositional defiant disorder/ODD, 19% autism spectrum disorder/ASD, 6% depressive disorders, 39% anxiety disorders, and 23% with reading and/or 19% math specific learning disorders); 28 children (10 girls) with common clinical diagnoses but not ADHD (57% with anxiety disorders, 29% ASD, 7% ODD, 11% depressive disorders, and 7% with reading and/or 14% math specific learning disorders); and 30 neurotypical children (12 girls). Thirty-six (35%) children with ADHD were prescribed psychostimulant medication. Children were excluded for gross neurological, sensory, or motor impairment; history of seizure disorder, psychosis, or intellectual disability; or non-stimulant medications that could not be withheld for testing.

Children participated in a baseline psychoeducational assessment included in a larger research battery that spanned three sessions. Children were included in the present study if they completed Kaufman Test of Educational Achievement (KTEA-3; Kaufman & Kaufman, 2014) testing, their parent completed the Parenting Relationship Questionnaire, and their teacher completed the ADHD-RS-4/5 and CSI-4 questionnaires described below.

Measures

Parental Involvement—The Parenting Relationship Questionnaire (PRQ) – Child/Adolescent was completed by parents to assess the quality of the parent-child relationship (Kamphaus & Reynolds, 2006). The PRQ Involvement subscale was selected *a priori* for the present study and measures the extent to which a parent and child participate together in a variety of common activities, along with the parent's knowledge of the child's activities (Kamphaus & Reynolds, 2006). The Involvement subscale consists of 9 items rated on a 4-point Likert scale. Example items include "I teach my child new things" and "My child and I work on projects together." The PRQ Involvement subscale has demonstrated high internal consistency reliability (α=.89-.90). Higher scores indicate higher levels of parental involvement in their child's life.

Academic Achievement—The Kaufman Test of Educational Achievement (KTEA-3; Kaufman & Kaufman, 2014) was used to assess academic attainment (1–2 week test-retest = .80-.96; α = .92-.99). The Reading Composite (reading comprehension, letter-word identification subtests) and Math Composite (math computation, math concepts and applications subtests) scores were used in this study. Higher standard scores (age norms) reflect higher achievement.

ADHD Symptoms—The ADHD Rating Scale for DSM-IV/5 (ADHD-RS-4/5; Du Paul et al., 2016) was used to assess the frequency and severity of ADHD symptoms based on DSM criteria in children and adolescents aged 5 to 17 (18 items; 4-point Likert scale). The ADHD-RS-4/5 includes two symptom subscales: Inattention (9 items) and Hyperactivity/Impulsivity (9 items). Psychometric support on the ADHD-RS-4/5 includes high internal consistency (α=0.94) and test-retest reliability (r= 0.79 to 0.85; DuPaul et al., 2016). We selected teacher reports *a priori* for the current study to prevent spurious associations attributable to mono-informant bias as would occur if parents reported on both their relationship with their child and their child's behaviors. Additionally, teacher

reports have been shown to outperform parent reports in regard to sensitivity, specificity, and classification accuracy of ADHD diagnosis (Tripp et al., 2006). Evidence for the validity of teacher-rated ADHD symptoms on the ADHD-RS-4/5 is supported via high correlations with other informant-based ADHD symptom measures as well as predictive validity relative to important areas of ADHD-related functional impairments (DuPaul et al., 2016).

ODD Symptoms—To assess the presence and severity of ODD symptoms, the Child Symptom Inventory-4 (CSI-4; Gadow & Sprafkin, 1994) ODD subscale was used. The teacher version was selected *a priori* based on the above rationale. The ODD subscale contains 8 items corresponding to the DSM-5 ODD criteria (4-point Likert scale). Discriminant and convergent validity of teacher-rated CSI-4 ODD symptoms are supported via associations with well-established standardized behavioral measures of externalizing symptoms and semi-structured diagnostic interviews (Gadow et al., 2004; Reich, Shayka, & Taibleson, 1991).

Intellectual Functioning (IQ) and Socioeconomic Status (SES)—All children were administered the WISC-V Short Form (Sattler et al. 2016) to obtain an estimate of intellectual functioning. Hollingshead (1975) SES was estimated based on caregiver(s)' education and occupation.

Data Analysis Overview

Preliminary analyses.: Our *a priori* data analytic plan called for a series of backward regressions to remove nonsignificant demographic predictors, followed by hierarchical multiple regressions that retained the significant demographic predictors identified in the preliminary analyses and added the primary variables of interest as described below. For the preliminary analyses, child age, sex, SES, medication status, and IQ were entered into a series of backward regressions, separately for each of the academic domains (overall academics, math, reading). Significant predictors in each model ($p < .05$) were retained.[1]

Primary analyses.: To assess the associations between ADHD symptoms and academic achievement, and the hypothesized moderating role of parental involvement, a series of hierarchical multiple regressions were conducted. Overall academic achievement was examined first, followed by separate analyses examining math and reading achievement. As noted above, the significant demographic predictors from the preliminary analyses were entered in Step 1. ADHD inattentive and hyperactive-impulsive symptoms (Step 2) and parental involvement (Step 3) were then added. With these main effects included in the models, interaction effects of inattention x parental involvement and hyperactivity/impulsivity x parental involvement were then added (Step 4). Finally, as exploratory analyses, ODD symptom severity (Step 5) and the interaction of ODD x parental involvement (Step 6) were entered.

[1]Exploratory analyses were conducted to probe the impact of our *a priori* decision to remove non-significant demographic predictors from each model prior to adding the primary variables of interest. Results indicated that the pattern and interpretation of all models was unchanged from those reported herein.

Results

Data Screening/Cleaning

All independent and dependent variables were screened for univariate outliers, defined as values greater than 3 SD above or below the within-group mean. Outliers were corrected to the most extreme value 3 SD above or below the within-group mean, with 0.12% of all data points being affected by this process. KTEA-3 reading data for a subset of the current sample was reported in Kofler et al. (2019) for the purposes of validating an experimental reading test; parental involvement data have not been previously reported for any children in the current sample. Intercorrelations among study variables are shown in Tables 2 and 3.

Preliminary Analyses: Demographic Predictors of Academic Achievement

Overall academic achievement.—Results for the backward regression model indicated that age ($p = .001$), IQ ($p < .001$), and SES ($p = .02$) were significant predictors of overall academic achievement; medication status ($p = .24$) and sex ($p = .37$) were not retained.

Math achievement.—Sex ($p = .02$), age ($p = .02$), SES ($p = .04$), and IQ ($p < .001$) were significant predictors of math achievement; only medication status ($p = .31$) was not retained for the primary analyses below.

Reading achievement.—Only age ($p = .01$) and IQ ($p < .001$) were significant predictors of reading achievement; medication status ($p = .70$), sex ($p = .74$), and SES ($p = .11$) were not retained.

Primary Analyses: ADHD, Parental Involvement, and ODD as Predictors of Academic Achievement

Overall academic achievement.—After controlling for age, IQ, and SES (Step 1), only inattention significantly predicted overall academic achievement ($\beta = -.17$, $p = .006$), while hyperactivity/impulsivity was not a significant predictor ($\beta = -.02$, $p = .71$; Step 2). In Step 3 parental involvement was found to significantly but negatively predict overall academics ($\beta = -.13$, $p = .01$), suggesting that parents who report higher levels of involvement tend to have children with more academic difficulties. No subsequent variables in the overall academic achievement model were significant (See Table 4).

Math achievement.—After controlling for sex, age, SES, and IQ (Step 1), only inattention was found to be a significant risk factor for lower math scores ($\beta = -.22$, $p < .001$), while hyperactivity/impulsivity ($\beta = -.01$, $p = .94$; Step 2) and parental involvement ($\beta = -.08$, $p = .14$; Step 3) failed to significantly predict math achievement. With the interaction terms included in the model (Step 4), parental involvement significantly but negatively predicted math achievement ($\beta = -.26$, $p = .05$). However, no significant interactions effects between inattention and parental involvement ($\beta = .32$, $p = .20$) or hyperactivity/impulsivity and parental involvement ($\beta = -.01$, $p = .98$) were found. ODD symptoms did not predict or interact with parental involvement to predict math achievement (Steps 5–6; both $p > .28$; Table 5).

Reading achievement.—After controlling for age and IQ (Step 1), similar to prior models only inattention was a significant risk factor for reading scores (β = −.16, *p* = .03), while hyperactivity/impulsivity failed to significantly predict reading scores (β = .01, *p* = .92; Step 2). These findings remained in Steps 3–6, where no additional variables significantly predicted reading achievement (Table 6).

Sensitivity Analyses

A final set of analyses were run to probe the impact of our *a priori* decisions to (a) recruit a clinically heterogeneous sample that included disorders beyond just ADHD, ODD, and reading/math difficulties; and (b) include IQ as a covariate despite the potential for mono-method effects given that the IQ and academic testing were both conducted with the child (as expected, IQ correlated highly with the academic achievement outcomes at *r*=.65-.73; Table 2). We also explored potential interactions between ADHD and ODD symptoms given co-occurring ODD symptoms may exacerbate ADHD symptom severity as reviewed above (e.g., Hurtig et al., 2007). Finally, we probed the impact of various methods for correcting for family-wise error on the primary analyses. Results are summarized below and detailed in Supplementary (Online) Tables S1–S9.

First, to probe the impact of our clinically heterogeneous sample, we repeated the primary analyses above, this time including covariates for each diagnostic category (coded as 0=no, 1=yes for anxiety, depression, and ASD; ADHD, ODD, SLD-math, and SLD-reading diagnoses were not included because those diagnoses were based, in whole or part, on the continuous variables already included in our models). The pattern and interpretation of results was unchanged from those reported above, and none of the co-occurring diagnostic categories significantly predicted math, reading, or overall academic achievement (all *p*>.55).

Next, we repeated the primary analyses again, this time without IQ. As expected, these models explained less variance in academic outcomes (R2 = .24-.33 vs. .47-.63). Interestingly, however, the pattern of results was otherwise highly consistent with those reported above, including significant main effects of inattentive symptoms (β= −.34 to −.40, all *p*<.001) and parental involvement (β= −.21 to −.36, all *p*<.01) in all tested models, and no evidence of interaction effects between parental involvement and inattentive, hyperactive/impulsive, or ODD symptoms in any tested model (all *p*>.43). The only differences were that when IQ was omitted, parental involvement also predicted reading achievement (β= −.21, *p*=.01), age was not a significant predictor in any model (all *p*>.43), and SES was a significant predictor in all tested models (β=.26-.32, all *p*<.001) rather than only in the math and overall achievement models as noted above.

Next, we added interaction terms for inattention x ODD and hyperactivity/impulsivity x ODD. Once again, the pattern and interpretation of results was unchanged from the primary models, and neither of these ADHD x ODD interaction terms predicted any assessed academic outcome (all *p*>.11). This was also the case when exploring 3-way interactions of inattention x ODD x parent involvement and hyperactivity/impulsivity x ODD x parent involvement (all *p*>.33).

Finally, we examined the extent to which the primary findings were robust to correction for family-wise error. This final step was not planned *a priori* but was added during the peer review process. Applying the Holm-Sidak false discovery rate (FDR) correction to the primary main and interaction effects of interest for each model did not change the significance or interpretation of the results reported above. In contrast, other family-wise error correction methods (Benjamini & Hochberg [1995], Bonferroni correction) produced minor changes such that parental involvement no longer predicted math achievement and/or inattention no longer predicted reading achievement. In all cases, the significance and interpretation of results in the primary model (overall academic achievement) was unchanged, suggesting that the primary findings were not likely an artifact of Type 1 error.

Summary

In summary, results revealed that inattention symptoms uniquely and negatively predicted math, reading, and overall academic achievement ($\beta = -.16$ to $-.22$ when controlling for IQ, $\beta = -.32$ to $-.50$ when not controlling for IQ), such that higher inattentive symptoms were associated with lower academic attainment. There were also significant negative main effects of parental involvement on math and overall academic achievement ($\beta = -.13$ to $-.26$) when controlling for IQ, and on all three academic outcomes when not controlling for IQ ($\beta = -.24$ to $-.36$), such that children whose parents reported being more involved with their child tended to score lower on the academic achievement tests. In contrast, hyperactivity/impulsivity and ODD symptoms failed to predict academic achievement, and parental involvement did not interact with child ADHD/ODD symptoms in any tested model. These findings were robust to control for clinical comorbidities, child demographic characteristics, did not appear attributable to Type 1 error, and exploratory analyses indicated that ADHD and ODD symptoms did not interact with each other or with parental involvement to predict any assessed academic outcomes.

Discussion

Academic problems are highly prevalent in ADHD (Frazier et al., 2007) and can lead to both short- and long-term negative outcomes (Arnold et al., 2020; Kent et al., 2011; Kuriyan et al., 2013; McGee et al. 2002; Ritchie & Bates., 2013). Given the prominence of ADHD-related academic risks, it is imperative to identify factors such as parental involvement (Rogers et al., 2009) that both reduce risk and promote success for children with ADHD (Chan et al., 2021). Prior ADHD studies that have examined the role of parental involvement on children's academic achievement are surprisingly sparse and the findings are mixed (e.g., Shelleby & Ogg, 2020; Rogers et al., 2009). To our knowledge, the present study was the first to examine the influence of parental involvement on multiple, objectively-assessed domains of academic achievement among children across the full range of ADHD inattentive and hyperactive/impulsive symptom frequency/severity. An additional unique contribution of the present study was the examination of whether co-occurring ODD symptoms – which are a risk-factor for ADHD symptom severity (Hurtig et al., 2007) and potentially subsequent academic problems (Leadbeater & Ames, 2017; cf. Rapport et al., 1999) – impact the association between parental involvement and academic achievement.

Of primary interest in the present study was whether parental involvement attenuates (buffers against) the association between elevated ADHD symptoms and adverse academic achievement outcomes. Consistent with prior literature, we found that inattentive symptoms (β= −.16 to −.22; 3–4% variance explained), but not hyperactive/impulsive symptoms, exerted direct and negative effects on academic achievement (Weiss et al., 2003; Breslau et al., 2009). However, consistent with Shelleby & Ogg (2020), we did not find significant moderating effects of parental involvement on the relations between inattention symptoms and any assessed academic domain. Taken together, the main effect of inattention and the lack of inattention x parental involvement interactions (a) confirm that ADHD inattentive symptoms predict lower academic achievement; while (b) suggesting that parental involvement may not buffer against academic underachievement for children with elevated ADHD inattentive symptoms. Despite the consistency between our findings and prior studies that included children with ADHD (Shelleby & Ogg, 2020), this finding differs from expectations based on the developmental literature (Fan & Chen, 2001; Jeynes, 2005; Wilder, 2014), where parental involvement has been shown to protect against academic underachievement. One possible explanation for this discrepancy may be that inattention serves as a limiting factor for a child's ability to engage with or benefit from parental attempts to bolster their child's learning (Shelleby & Ogg, 2020). Similarly, it may be that different facets of parental involvement such as the quality (e.g., warm versus controlling; Pomerantz et al., 2007; Silinskas & Kikas, 2017), as well as whether the parent-child interactions predominantly occur at school or home (Castro et al., 2015; Fan & Chen, 2001), may also be important determinants of the relation between parental involvement and academic achievement. For example, Rogers et al. (2009a) found that a controlling parental style (defined as parental exertion of pressure through the use of commands, punishment, or coercive interactions) was associated with higher parent reported ADHD symptoms and lower academic achievement. In contrast, warm or supportive parental involvement (defined as parents demonstrating interest, attention, praise, and reinforcement related to learning) was associated with fewer parent-rated ADHD symptoms and better academic achievement. Further research is needed to assess the specific parent, child, and setting characteristics that may impact the association between parental involvement and academic achievement among children with ADHD.

Unexpectedly, parental involvement had a significant but *negative* direct effect on overall, math, and potentially reading achievement in our clinically evaluated sample, explaining an additional 1–2% of the variance in academic achievement over and above child demographics and cognitive abilities (β= −.08 to −.13, ΔR^2 = .01 to .02). At first glance, these findings appeared surprising given the extensive evidence documenting the *positive* influence of greater parental involvement on higher academic achievement among typically developing children (Castro et al., 2015; Jeynes, 2005). One potential explanation for this unexpected finding may be that children with ADHD and/or other clinical disorders are at risk for experiencing negative parent-child interactions such as greater parental stress (Theule et al., 2010), hostility (Lifford et al., 2009), and negative and coercive disciplinary practices (Evinç et al., 2018; Rogers et al., 2018b) that can negatively predict academic achievement (Niggli et al., 2007).

In other words, parental involvement for clinical populations may be qualitatively different than it is for developmental samples (Rogers et al., 2009b). Thus, the same quantitative levels of parental involvement may be associated with higher vs. lower child achievement depending, qualitatively, on what that parental involvement entails and why it is initiated. This interpretation may be unlikely, however, given the lack of parental involvement x ADHD and/or ODD symptom interactions, suggesting that the negative association between parental involvement and achievement held for children with both higher and lower levels of ADHD- and ODD-related difficulties. Alternatively, the negative relation between parental involvement and academic achievement may reflect parents becoming more involved by necessity because their child is experiencing more academic difficulties (rather than greater parental involvement causing worse academic outcomes). This hypothesis is speculative, of course, but generally consistent with evidence that parents become more involved in their child's homework and school life when their child is exhibiting academic underachievement (Silinskas et al., 2015; Dauber & Epstein, 1993; Levin et al., 1997).

Interestingly, in the present study ODD, anxiety, and depression were not associated with lower parental involvement or worse academic achievement after controlling for ADHD symptoms. These results contrasted with some prior research indicating that co-occurring conditions are associated with worse academic outcomes for children with ADHD (Larson et al., 2011). In contrast, our results were consistent with literature demonstrating ADHD symptoms may account for the relation between anxiety and academic achievement (Goldston et al., 2007), as well as moderate the relation between depression and ODD to academic achievement (Carroll et al., 2005; Visser et al., 2020; Willcutt & Pennington, 2000). Additional evidence that ODD symptoms may not directly influence academic achievement further support this lack of significance (e.g., Evans et al., 2019; Fergusson & Horwood, 1995; Rapport et al., 1999). Our results were also aligned with Rogers et al. (2009a), who found no difference in the relation between ODD and parental beliefs regarding parental involvement in a sample of children with ADHD. In the context of the discussed literature, our findings suggest that ODD symptoms may be associated with specific dimensions of the parent-child relationship such as disciplinary practices (Kashdan et al., 2004) and stress (Van de Oord et al., 2006; Kashdan et al., 2004), but not involvement *per se*. As a result, ODD symptoms do not appear to be a significant influence on the relation between parental involvement and academic achievement after controlling for ADHD symptoms.

Collectively, our findings indicate that parental involvement may not protect against academic underachievement for children with elevated ADHD symptoms (Jeynes, 2005; Fan & Chen, 2001), and may even be associated with lower rather than higher academic achievement for clinically evaluated children in general. These findings are disappointing in the sense that they suggest that increasing parental involvement may not be a viable intervention strategy for facilitating positive academic outcomes for children with ADHD (or children presenting for clinical evaluation in general). Nevertheless, our results are generally consistent with an emerging body of research indicating that (a) assets considered protective for children in general (Masten, 2014) may not confer the same degree of benefits for children experiencing clinically significant symptoms (e.g., Chan et al., 2021); and (b) evidence-based parent training interventions generally fail to improve academic outcomes

for children with ADHD despite demonstrating robust improvements in parent involvement and parent-child relationship quality (e.g., Chacko et al., 2014). At the same time, it would seem premature to completely rule out parent involvement as a facilitative strategy because the current study and most prior work has been unable to examine whether specific facets of parental involvement (e.g., supportive versus controlling) may be related to academic outcomes for high-risk samples such as children with ADHD.

Limitations

The current study examined relations between parental involvement, ADHD symptoms, and academic achievement across three academic domains in a clinically evaluated sample spanning the full range of ADHD inattentive and hyperactive/impulsive symptom frequency/severity. A strength of our study was the use of a psychometrically validated measure of parental involvement and objective assessment of children's academic achievement. At the same time, informant report measures such as those used to measure parental involvement and ADHD symptoms introduce confounds such as social desirability bias (Nederhof, 1985) and retrospective recall bias (Gorin & Stone, 2001). Thus, it is possible that there may be different thresholds for, and different activities that, a parent considers to be parental involvement, which may not be detectable when using a global measure of parental involvement.

Furthermore, the cross-sectional design of the present study precludes us from drawing conclusions about cause and effect, and the lack of significant ADHD x parental involvement interactions can be interpreted differently depending on one's frame of reference. That is, for researchers focused on ADHD, the negative main effect of ADHD inattention and its nonsignificant interaction with parental involvement suggests that parental involvement does not provide the hypothesized buffer against the negative impact of attention problems on underachievement. In contrast, for researchers focused on parental involvement, the negative main effect of parental involvement and its nonsignificant interaction with ADHD symptoms suggests that parental involvement may predict worse academic outcomes for children at both high and low levels of ADHD symptoms. Longitudinal and experimental designs will be important in expanding this line of work to clarify the influence of specific facets of parental involvement on specific ADHD symptom clusters (i.e., inattentive versus hyperactive/impulsive symptoms) and specific academic domains (e.g., Shelleby & Ogg, 2020).

In addition, while the use of dimensional rather than categorical measurement of ADHD symptomatology was a strength of our study, future studies may benefit from comparison of the relative influence of parental involvement on academic outcomes among children with and without ADHD. Similarly, though comorbid ODD, ASD, anxiety, and depression symptoms were explored in relation to parental involvement and academic achievement, additional study is needed to determine the extent to which parental involvement may reflect a protective cause vs. compensatory outcome of children's academic performance for different groups of children (e.g., children with learning or intellectual disabilities). Relatedly, the current study focused on reading and math achievement; further study on a

broader range of academic outcomes (e.g., written expression) in the context of elevated ADHD symptoms and parental involvement are needed.

Finally, an examination of the complete scope of parent-child involvement will be critical for understanding the effects of parental involvement on academic achievement in the ADHD population (Montes & Montes, 2020). Future studies should specifically examine the differential effect that supportive versus controlling parental involvement may have in buffering against the negative impact of children's inattention and academic achievement. Similarly, the current study measured overall parental involvement based on parent report; future work may care to differentiate parental involvement that occurs at home, in school, or in other important settings (Castro et al., 2015; Fan & Chen, 2001).

Clinical and Research Implications

The present study found that parental involvement does not appear to attenuate the risk for academic underachievement conveyed by ADHD inattentive symptoms, and may even predict lower rather than higher academic achievement for clinically evaluated children in general. These results were somewhat surprising given that parental involvement has consistently been associated with higher academic achievement within the developmental literature (Olatoye & Ogunkola, 2008; Fan & Chen, 2001; Jeynes, 2005; Wilder, 2014). Nevertheless, our findings are consistent with a nascent literature demonstrating that factors considered promotive for typically developing children (Masten, 2014) may not be associated with the same positive effects for children at higher levels of risk (Chan et al., 2021; Dvorsky et al., 2016). In terms of next steps, additional research is needed to understand different dimensions of parental involvement (e.g., warmth vs. controlling) and parental involvement as it occurs in different settings (e.g., home vs. school) that may help synthesize the mixed findings across the developmental and clinical child/ADHD literatures. At present, based on the current findings and prior literature reviewed above, we recommend that clinicians and educators provide evidence-based academic interventions rather than focusing on parental involvement if the goal is to remediate academic underachievement for children with ADHD (Evans et al., 2018; DuPaul et al., 2011; Chan, Shero et al., 2021).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

This work was supported in part by NIH grants (R34 MH102499, R01 MH115048, PI: Kofler). The sponsor had no role in design and conduct of the study; collection, management, analysis, and interpretation of the data; or preparation, review, or approval of the manuscript.

References

Achenbach TM, & Edelbrock C. (1991). Child behavior checklist. Burlington (Vt), 7, 371–392.

Arnold LE, Hodgkins P, Kahle J, Madhoo M, & Kewley G. (2020). Long-Term Outcomes of ADHD: Academic Achievement and Performance. Journal of Attention Disorders, 24(1), 73–85. https://doi.org/10.1177/1087054714566076

Barkley RA, Fischer M, Smallish L, & Fletcher K. (2006). Young adult outcome of hyperactive children: adaptive functioning in major life activities. Journal of the American Academy of Child & Adolescent Psychiatry, 45(2), 192–202.

Barry TD, Lyman RD, & Klinger LG (2002). Academic Underachievement and Attention-Deficit/Hyperactivity Disorder. Journal of School Psychology, 40(3), 259–283. doi:10.1016/s0022-4405(02)00100-0

Boonk L, Gijselaers HJ, Ritzen H, & Brand-Gruwel S. (2018). A review of the relationship between parental involvement indicators and academic achievement. Educational Research Review, 24, 10–30.

Breslau J, Miller E, Breslau N, Bohnert K, Lucia V, & Schweitzer J. (2009). The impact of early Behavior disturbances on academic achievement in high school. PEDIATRICS, 123(6), 1472–1476. doi:10.1542/peds.2008-1406

Carroll JM, Maughan B, Goodman R, & Meltzer H. (2005). Literacy difficulties and psychiatric disorders: Evidence for comorbidity. Journal of child psychology and psychiatry, 46(5), 524–532.

Castro M, Expósito-Casas E, López-Martín E, Lizasoain L, Navarro-Asencio E, & Gaviria JL (2015). Parental involvement on student academic achievement: A meta-analysis. Educational Research Review, 14, 33–46. doi:10.1016/j.edurev.2015.01.002

Chacko A, Kofler M, & Jarrett M. (2014). Improving outcomes for youth with ADHD: A conceptual framework for combined neurocognitive and skill-based treatment approaches. Clinical Child and Family Psychology Review, 17(4), 368–384.

Chan ESM, Groves NB, Marsh CL, Miller CE, Richmond KP, & Kofler MJ (accepted 2021). Are there resilient children with ADHD? Journal of Attention Disorders.

Chan ESM, Shero JA, Hand ED, Condo JS, Macias M, & Kofler MJ (2021). A meta-analytic review of reading intervention treatment effects for ADHD. Poster at the Society for Research in Child Development (SRCD) Biennial Meeting, Virtual Convention.

Cohen J, Cohen P, West SG, & Aiken LS (2003). Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.). Hillsdale, NJ: Erlbaum.

Connor DF, & Doerfler LA (2007). ADHD With Comorbid Oppositional Defiant Disorder or Conduct Disorder. Journal of Attention Disorders, 12(2), 126–134. doi:10.1177/1087054707308486

Corcoran J, & Dattalo P. (2006). Parent Involvement in Treatment for ADHD: A Meta-Analysis of the Published Studies. Research on Social Work Practice, 16(6), 561–570. https://doi.org/10.1177/1049731506289127

Dauber SL, & Epstein JL (1993). Parents' attitudes and practices of involvement in inner-city elementary and middle schools. Families and schools in a pluralistic society, 53–71.

DuPaul GJ, McGoey KE, Eckert TL, & VanBrakle J. (2001). Preschool children with attention-deficit/hyperactivity disorder: Impairments in behavioral, social, and school functioning. Journal of the American Academy of Child & Adolescent Psychiatry, 40(5), 508–515.

DuPaul GJ, Reid R, Anastopoulos AD, Lambert MC, Watkins MW, & Power TJ (2016). Parent and teacher ratings of attention-deficit/hyperactivity disorder symptoms: Factor structure and normative data. Psychological Assessment, 28(2), 214–225. doi:10.1037/pas0000166

DuPaul GJ, & Volpe RJ (2009). Adhd and learning disabilities: Research findings and clinical implications. Current Attention Disorders Reports, 1(4), 152–155. https://doi.org/10.1007/s12618-009-0021-4

DuPaul GJ, Weyandt LL, & Janusis GM (2011). Adhd in the classroom: Effective intervention strategies. Theory Into Practice, 50(1), 35–42. doi:10.1080/00405841.2011.534935

Dvorsky MR, & Langberg JM (2016). A review of factors that promote resilience in youth with adhd and adhd symptoms. Clinical Child and Family Psychology Review, 19(4), 368–391. doi:10.1007/s10567-016-0216-z

Evans SC, Cooley JL, Blossom JB, Pederson CA, Tampke EC, & Fite PJ (2019). Examining ODD/ADHD SYMPTOM dimensions as predictors of social, emotional, and ACADEMIC trajectories in middle childhood. Journal of Clinical Child & Adolescent Psychology, 49(6), 912–929. doi:10.1080/15374416.2019.1644645

Evans SW, Owens JS, Wymbs BT, & Ray AR (2017). Evidence-based psychosocial treatments for children and adolescents with attention deficit/hyperactivity disorder. Journal of Clinical Child & Adolescent Psychology, 47(2), 157–198. doi:10.1080/15374416.2017.1390757

Evinç ŞG, Özdemir DF, Karadağ F, Akdemir D, Gençöz T, Sürücü Ö, & Ünal F. (2018). A qualitative study on corporal punishment and emotionally abusive disciplinary practices among mothers of children with adhd. Psychiatry and Clinical Psychopharmacology, 28(3), 276–284. https://doi.org/10.1080/24750573.2018.1505284

Fan X, Chen M. Parental Involvement and Students' Academic Achievement: A Meta-Analysis. Educational Psychology Review, 13, 1–22 (2001). https://doi.org/10.1023/A:1009048817385

Frazier TW, Youngstrom EA, Glutting JJ, & Watkins MW (2007). ADHD and Achievement: Meta-Analysis of the Child, Adolescent, and Adult Literatures and a Concomitant Study With College Students. Journal of Learning Disabilities, 40(1), 49–65. https://doi.org/10.1177/00222194070400010401

Fredriksen M, Dahl AA, Martinsen EW, Klungsoyr O, Faraone SV, & Peleikis DE (2014). Childhood and persistent adhd symptoms associated with educational failure and long-term occupational disability in adult adhd. ADHD Attention Deficit and Hyperactivity Disorders, 6(2), 87–99. https://doi.org/10.1007/s12402-014-0126-1

Gadow KD, & Sprafkin JN (1994). Child symptom inventories. Checkmate Plus.

Gadow KD, Sprafkin J, Salisbury H, Schneider J, & Loney J. (2004). Further Validity Evidence for the Teacher Version of the Child Symptom lnventory-4. School Psychology Quarterly, 19(1), 50.

Graves SL, & Brown Wright L. (2011). Parent involvement at school entry: A national examination of group differences and achievement. School Psychology International, 32(1), 35–48. https://doi.org/10.1177/0143034310396611

Goldston DB, Walsh A, Mayfield Arnold E, Reboussin B, Sergent Daniel S, Erkanli A, Nutter D, Hickman E, Palmes G, Snider E, & Wood FB (2007). Reading problems, psychiatric disorders, and functional impairment from mid- to late adolescence. Journal of the American Academy of Child & Adolescent Psychiatry, 46(1), 25–32. https://doi.org/10.1097/01.chi.0000242241.77302.f4

Gorin AA, & Stone AA (2001). Recall biases and cognitive errors in retrospective self-reports: A call for momentary assessments. Handbook of health psychology, 23, 405–413.

Hollingshead AB (1975). Four factor index of social status.

Hurtig T, Ebeling H, Taanila A. et al. ADHD and comorbid disorders in relation to family environment and symptom severity. European Child Adolescent Psychiatry, 16, 362–369 (2007). https://doi.org/10.1007/s00787-007-0607-2

Jensen PS, Hinshaw SP, Kraemer HC, Lenora N, Newcorn JH, Abikoff HB, … Vitiello B. (2001). ADHD Comorbidity Findings From the MTA Study: Comparing Comorbid Subgroups. Journal of the American Academy of Child & Adolescent Psychiatry, 40(2), 147–158. doi:10.1097/00004583-200102000-00009

Jeynes WH (2005). A Meta-Analysis of the Relation of Parental Involvement to Urban Elementary School Student Academic Achievement. Urban Education, 40(3), 237–269. https://doi.org/10.1177/0042085905274540

Kamphaus RW, Reynolds CR (2006) PRQ: parenting relationship questionnaire. Pearson, Minneapolis

Kashdan TB, Jacob RG, Pelham WE, Lang AR, Hoza B, Blumenthal JD, & Gnagy EM (2004). Depression and anxiety in parents of children with adhd and varying levels of oppositional defiant behaviors: Modeling relationships with family functioning. Journal of Clinical Child & Adolescent Psychology, 33(1), 169–181. doi:10.1207/s15374424jccp3301_16

Kaufman AS (2014). K-TEA-3: Kaufman Test of Educational Achievement. Pearson.

Kaufman J, Birmaher B, Brent D, et al. (1997). Schedule for affective disorders and schizophrenia for school-age children (K-SADS-PL): Initial reliability and validity data. The American Academy of Child & Adolescent Psychiatry, 36, 980–988.

Keith PB, & Lichtman MV (1994). Does parental involvement influence the academic achievement of Mexican-American eighth graders? Results from the National Education Longitudinal Study. School Psychology Quarterly, 9(4), 256.

Kent KM, Pelham WE, Molina BS, et al. (2011). The academic experience of male high school students with adhd. Journal of Abnormal Child Psychology, 39(3), 451–462. https://doi.org/10.1007/s10802-010-9472-4

Kuriyan AB, Pelham WE, Molina BS, Waschbusch DA, Gnagy EM, Sibley MH, Babinski DE, Walther C, Cheong JW, Yu J, & Kent KM (2013). Young adult educational and vocational outcomes of children diagnosed with adhd. Journal of Abnormal Child Psychology, 41(1), 27–41. https://doi.org/10.1007/s10802-012-9658-z

Larson K, Russ S, Kahn R, & Halfon N. (2011). Patterns of Comorbidity, Functioning, and Service Use for US Children With ADHD, 2007. Pediatrics, 127(3). doi:10.1542/peds.2010-0165d

Leadbeater BJ, & Ames ME (2017). The longitudinal effects of oppositional defiant disorder symptoms on academic and occupational functioning in the transition to young adulthood. Journal of Abnormal Child Psychology, 45, 749–763. https://doi.org/10.1007/s10802-016-0190-4.

Levin I, Levy-Shiff R, Appelbaum-Peled T, Katz I, Komar M, & Meiran N. (1997). Antecedents and consequences of maternal involvement in children's homework: A longitudinal analysis. Journal of Applied Developmental Psychology, 18(2), 207–227. doi:10.1016/s0193-3973(97)90036-8

Lifford KJ, Harold GT, & Thapar A. (2009). Parent-child hostility and child adhd symptoms: A genetically sensitive and longitudinal analysis. Journal of Child Psychology and Psychiatry, 50(12), 1468–1476. doi:10.1111/j.1469-7610.2009.02107.x

Masten AS (2014). Global perspectives on resilience in children and youth. Child Development, 85(1), 6–20. doi:10.1111/cdev.12205

Mayes SD, & Calhoun SL (2006). Frequency of reading, math, and writing disabilities in children with clinical disorders. Learning and Individual Differences, 16(2), 145–157. doi:10.1016/j.lindif.2005.07.004

Mcgee R, Prior M, Williams S, Smart D, & Sanson A. (2002). The long-term significance of teacher-rated hyperactivity and reading ability in childhood: Findings from two longitudinal studies. Journal of Child Psychology and Psychiatry, 43(8), 1004–1017. doi:10.1111/1469-7610.00228

Montes G, & Montes SA (2020). Parental involvement of parents of children with ADHD: a first population study. Journal of attention disorders, doi: 10.1177/1087054720911099.

Nederhof AJ (1985). Methods of coping with social desirability bias: A review. European Journal of Social Psychology, 15(3), 263–280. doi:10.1002/ejsp.2420150303

Niggli A, Trautwein U, Schnyder I, Ludtke O, & Neumann M. (2007). Parental homework support can be beneficial, but parental intrusion is detrimental: Family background, parental homework supervision, and performance gains. Psychologie In Erziehung und Unterricht, 54, 1–14.

Olatoye R, & Ogunkola B. (2008). Parental Involvement, Interest In Schooling And Science Achievement Of Junior Secondary School Students In Ogun State, Nigeria. College Teaching Methods & Styles Journal (CTMS), 4(8), 33. doi:10.19030/ctms.v4i8.5563

Patall EA, Cooper H, & Robinson JC (2008). Parent involvement in homework: A research synthesis. Review of educational research, 78(4), 1039–1101.

Patrikakou EN (1996). Investigating the academic achievement of adolescents with learning disabilities: A structural modeling approach. Journal of Educational Psychology, 88(3), 435.

Pelham JW, Fabiano GA, & Massetti GM (2005). Evidence-Based Assessment of Attention Deficit Hyperactivity Disorder in Children and Adolescents. Journal of Clinical Child & Adolescent Psychology, 34(3), 449–476. doi:10.1207/s15374424jccp3403_5

Polanczyk GV, Willcutt EG, Salum GA, Kieling C, & Rohde LA (2014). ADHD prevalence estimates across three decades: An updated systematic review and meta-regression analysis. International Journal of Epidemiology,43(2), 434–442. doi:10.1093/ije/dyt261

Pomerantz EM, Moorman EA, & Litwack SD (2007). The how, whom, and why of parents' involvement in children's academic lives: more is not always better. Review of educational research, 77(3), 373–410.

Rapport MD, Scanlan SW, & Denney CB (1999). Attention-deficit/hyperactivity disorder and scholastic achievement: A model of dual developmental pathways. Journal of Child Psychology and Psychiatry, 40(8), 1169–1183.

Reynolds CR, & Kamphaus RW (2004). Behavior assessment system for children (2nd ed.). Circle Pines: American Guidance Service.

Reich W, Shayka T, & Taibleson C. (1991). Diagnostic Interview for Children and Adolescents-Revised. St. Louis, MO: Washington University.

Ritchie SJ, & Bates TC (2013). Enduring Links From Childhood Mathematics and Reading Achievement to Adult Socioeconomic Status. Psychological Science, 24(7), 1301–1308. doi:10.1177/0956797612466268

Rogers MA, Wiener J, Marton I, & Tannock R. (2009a). Supportive and Controlling Parental Involvement as Predictors of Children's Academic Achievement: Relations to Children's ADHD Symptoms and Parenting Stress. School Mental Health, 1(2), 89–102. doi:10.1007/s12310-009-9010-0

Rogers MA, Wiener J, Marton I, & Tannock R. (2009b). Parental involvement in children's learning: Comparing parents of children with and without Attention-Deficit/Hyperactivity Disorder (ADHD). Journal of School Psychology, 47(3), 167–185. doi:10.1016/j.jsp.2009.02.001

Sattler J, Dumont R, & Coalson D. (2016). Assessment of Children: WISC-V and WPPSI-IV. San Diego: Sattler Press.

Scholtens S. Rydell A-M & Yang-Wallentin F. (2013). ADHD symptoms, academic achievement, self-perception of academic competence and future orientation: A longitudinal study. Scandinavian Journal of Psychology 54, 205–212.

Shelleby EC, & Ogg J. (2020). Longitudinal Relationships Between Parent Involvement, Parental Warmth, ADHD Symptoms, and Reading Achievement. Journal of Attention Disorders, 24(5), 737–749. doi:10.1177/1087054719859075

Silinskas G, & Kikas E. (2017). Parental involvement in math homework: Links to children's performance and motivation. Scandinavian Journal of Educational Research, 63(1), 17–37. doi:10.1080/00313831.2017.1324901

Silinskas G, Kiuru N, Aunola K, Lerkkanen M-K, & Nurmi J-E (2015). The developmental dynamics of children's academic performance and mothers' homework-related affect and practices. Developmental Psychology, 51(4), 419–433. https://doi.org/10.1037/a0038908

Smith T, & Adams G. (2006). The effect of comorbid AD/HD and learning disabilities on parent-reported behavioral and academic outcomes of children. Learning Disability Quarterly, 29(2), 101–112.

Tam VC, & Chan RM (2009). Parental Involvement in Children's Homework in Hong Kong. School Community Journal. doi:10.1037/e705422007-001

Theule J, Wiener J, Tannock R, & Jenkins JM (2010). Parenting stress in families of children with adhd. Journal of Emotional and Behavioral Disorders, 21(1), 3–17. doi:10.1177/1063426610387433

Tung I, Li JJ, Meza JI, Jezior KL, Kianmahd JS, Hentschel PG, ONeil PM, & Lee SS (2016). Patterns of comorbidity among girls with adhd: A meta-analysis. PEDIATRICS, 138(4). https://doi.org/10.1542/peds.2016-0430

Van der Oord S, Prins P, Oosterlaan J, & Emmelkamp P. (2006). The association between parenting stress, depressed mood and informant agreement in adhd and odd. Behaviour Research and Therapy, 44(11), 1585–1595. doi:10.1016/j.brat.2005.11.011

Van de Werf GV, Creemers B, & Guldemond H. (2001). Improving Parental Involvement in Primary Education in Indonesia: Implementation, Effects and Costs. School Effectiveness and School Improvement, 12(4), 447–466. doi:10.1076/sesi.12.4.447.3444

Visser L, Linkersdörfer J, & Hasselhorn M. (2020). The role of ADHD symptoms in the relationship between academic achievement and psychopathological symptoms. Research in Developmental Disabilities, 97, 103552. https://doi.org/10.1016/j.ridd.2019.103552

Weiss M, Worling D, & Wasdell M. (2003). A chart review study of the inattentive and combined types of adhd. Journal of Attention Disorders, 7(1), 1–9. doi:10.1177/108705470300700101

Wilder S. (2014). Effects of parental involvement on academic achievement: A meta-synthesis. Educational Review,66(3), 377–397. doi:10.1080/00131911.2013.780009

Willcutt E, & Pennington B. (2000). Psychiatric Comorbidity in Children and Adolescents with Reading Disability. The Journal of Child Psychology and Psychiatry and Allied Disciplines, 41(8), 1039–1048. doi:10.1111/1469-7610.00691

Zhao X, Page TF, Altszuler AR, Pelham WE, Kipp H, Gnagy EM, … Macphee, F. L. (2019). Family Burden of Raising a Child with ADHD. Journal of Abnormal Child Psychology, 47(8), 1327–1338. doi:10.1007/s10802-019-00518-5

Highlights

- Multi-informant/multi-method assessment and objective evaluation of children's academic achievement in a relatively large, clinically evaluated sample
- Inattentive symptoms, lower IQ, younger age, and lower SES predict lower academic achievement in reading and math
- Contrary to expectations, higher parental involvement did not buffer against the academic risks conveyed by elevated ADHD symptoms
- Factors that promote positive outcomes for children in general may not exert the same benefits for children with elevated ADHD symptoms

Table 1.

Sample and Demographic Variables

	M	*SD*	*Min*	*Max*	*Skewness*	*Kurtosis*
Sex (Boys/Girls)	112/50		--	--	--	--
Age	10.29	1.49	8.21	13.25	0.49	−1.04
SES	48.10	11.73	13	66	−0.67	−0.08
FSIQ (Standard Scores)	103.96	14.09	78	138	0.04	−0.61
ADHD Medication Status (Y/N)	41/121		--	--	--	--
ADHD-RS-4/5 Inattention						
Teacher (Raw Score)	15.07	7.13	0	27	−0.29	−0.77
ADHD-RS-4/5 Hyperactivity/Impulsivity						
Teacher (Raw Score)	9.93	8.58	0	27	0.60	−0.97
PRQ – Parental Involvement						
Parent (Raw Score)	15.50	5.29	2	27	0.22	−0.60
Academic Achievement						
KTEA-3 Math (Standard Score)	98.23	15.84	57	141	0.28	0.02
KTEA-3 Reading (Standard Score)	99.88	14.88	56	144	0.14	1.20
KTEA-3 Composite (Standard Score)	98.44	15.28	45	140	−0.21	1.28
CSI-4 Oppositional Defiant						
Teacher (Raw Score)	5.06	5.59	0	24	1.38	1.65

Note: PRQ = Parenting Relationship Questionnaire, KTEA-3 = Kaufman Test of Educational Achievement, CSI-4 = Child Symptom Inventory-4, FSIQ = Full Scale Intelligence (WISC-V Short Form), SES = Hollingshead socioeconomic status.

Table 2.

Zero-order Correlations Between Demographic Variables and Academic Achievement Outcomes.

Variable	MAA	RDA	OVA	Med	Sex	Age	IQ	SES
1. MAA	—							
2. RDA	.71***	—						
3. OVA	.90***	.89***	—					
4. MED	.03	.02	.01	—				
5. Sex	−.08	.07	.02	−.16*	—			
6. Age	.04	.05	.07	.16*	−.05	—		
7. IQ	.69***	.65***	.73***	. 03	.09	−.14	—	
8. SES	.30***	.26***	.32***	.08	.02	.02	.27***	—

Note. MAA = Math Academic Achievement, RDA = Reading Academic Achievement, OVA = Overall Academic Achievement, MED = Current medication status, SES = Hollingshead socioeconomic status, IQ = Full Scale Intelligence (WISC-V Short Form).

* p < .05,

** p < .01,

*** p < .001

Table 3.

Zero-order Correlations for Between Primary Variables and Academic Achievement Outcomes.

Variable	MAA	RDA	OVA	IA	HI	PI	ODD
1. MAA	—						
2. RDA	.71***	—					
3. OVA	.90***	.89***	—				
4. IA	−.40***	−.35***	−.41***	—			
5. HI	−.11	−.10	−.15	.47***	—		
6. PI	−.24**	−.23**	−.30***	.15	.16*	—	
7. ODD	−.19*	−.16*	−.21**	.37***	.59***	.15	—

Note. MAA = Math Academic Achievement, RDA = Reading Academic Achievement, OVA = Overall Academic Achievement, IA = ADHD-RS-4/5–Inattentive symptoms, HI = ADHD-RS-4/5–Hyperactivity/Impulsivity symptoms, PI = PRQ – Parental Involvement Subscale, ODD = CSI-4 Oppositional Defiant Disorder Subscale .

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 4.

Predictors of Children's Overall Achievement

DV: Overall Scores			
	R^2_{inc}	β	*p*
Step 1:	0.57***		
Age		0.17	0.001**
FSIQ		0.72	< .001***
SES		0.13	0.02*
Step 2:	0.03*		
IA		−0.17	0.01**
HI		−0.02	0.71
Step 3:	0.02*		
Parental Involvement		−0.13	0.01*
Step 4:	0.00		
IA x Parental Involvement		0.23	0.33
HI x Parental Involvement		−0.17	0.42
Step 5:	0.01*		
ODD		−0.06	0.36
Step 6:	0.00		
ODD × Parental Involvement		−0.26	0.26

Note: N = 162. All steps are incremental, where variables in previous steps are included in the model at that step, but not presented in the table to preserve space (i.e., the table reflects the results of the final model with all predictors included). FSIQ = Full Scale Intelligence Quotient; SES = social economic status; IA = Inattention symptoms; HI = Hyperactive-impulsive symptoms; ODD = Oppositional Defiant Disorder symptoms. R^2 change effect size conventions: .01 = small, .06 = medium, .14 = large (Cohen et al., 2003).

* p < .05.

** p < .01.

*** p < .001.

Table 5.

Predictors of Children's Math Achievement

DV: Math Scores			
	R^2_{inc}	β	*p*
Step 1:	0.53***		
Sex		−0.13	0.02*
Age		0.13	0.02*
FSIQ		0.69	< .001***
SES		0.12	0.04*
Step 2:	0.04*		
IA		−0.22	< .001***
HI		−0.01	0.9’
Step 3:	0.01*		
Parental Involvement		−0.08	0.14
Step 4:	0.00		
Parental Involvement		−0.26	0.05*
IA × Parental Involvement		0.32	0.20
HI × Parental Involvement		−0.01	0.98
Step 5:	0.00		
ODD		−0.07	0.33
Step 6:	0.00		
ODD × Parental Involvement		−0.26	0.28

Note: $N = 162$. All steps are incremental, where variables in previous steps are included in the model at that step, but not presented in the table to preserve space (i.e., the table reflects the results of the final model with all predictors included). FSIQ = Full Scale Intelligence Quotient; SES = social economic status; IA = Inattention symptoms; HI = Hyperactive-impulsive symptoms; ODD = Oppositional Defiant Disorder symptoms. R^2 change effect size conventions: .01 = small, .06 = medium, .14 = large (Cohen et al., 2003).

* p < .05.

** p < .01.

*** p < .001.

Table 6.

Predictors of Children's Reading Achievement

DV: Reading Scores			
	R^2_{inc}	β	*p*
Step 1:	0.45***		
Age		0.15	0.01*
FSIQ		0.67	< .001***
Step 2:	0.02*		
IA		−0.16	0.03*
HI		0.01	0.92
Step 3:	0.01*		
Parental Involvement		−0.08	0.1'
Step 4:	0.01*		
IA × Parental Involvement		0.34	0.21
HI × Parental Involvement		−0.19	0.43
Step 5:	0.02*		
ODD		−0.04	0.59
Step 6:	0.00		
ODD × Parental Involvement		−0.27	0.31

Note: *N* = 162. All steps are incremental, where variables in previous steps are included in the model at that step, but not presented in the table to preserve space (i.e., the table reflects the results of the final model with all predictors included). FSIQ = Full Scale Intelligence Quotient; SES = social economic status; IA = Inattention symptoms; HI = Hyperactive-impulsive symptoms; ODD = Oppositional Defiant Disorder symptoms. R^2 change effect size conventions: .01 = small, .06 = medium, .14 = large (Cohen et al., 2003).

* p < .05.

** p < .01.

*** p < .001.