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The Relationship between ADHD Symptom Dimensions, Clinical Correlates and Functional Impairments

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Abstract

Objective—To better understand how heterogeneity in ADHD symptoms relates to heterogeneity in functional impairment domains in children with ADHD after accounting for demographic variables and comorbidities, in particular oppositionality and internalizing symptoms.

Method—Parents and teachers (n=5,663) rated child/adolescent impairments across impairment domains in the International Classification of Functioning, Disability and Health as well as symptoms of ADHD and comorbidities. Hierarchical regressions were conducted to assess the relationship between parent- and teacher-ratings of ADHD symptom domains and functional impairments after accounting for personal factors and comorbid disorders.

Results—Symptoms of inattention were the strongest predictor of ratings of academic (math, writing, etc.) functioning, while hyperactivity/impulsivity symptoms were the strongest predictor of classroom disruption even after accounting for the presence of learning disorders and oppositional symptoms. Symptoms of ADHD accounted for minimal variance in interpersonal functioning or participation in organized activities after controlling oppositional symptoms.

Conclusion—The ADHD symptom domains demonstrate domain-specific relations with various ADHD-related functional impairments. In addition, the results highlight the role of oppositionality in interpersonal relationship difficulties and participation in organized activities.

Keywords

inattention; hyperactivity/impulsivity; comorbidities; ICF

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR, 4th Edition Text-Revised), in order to meet diagnostic criteria for Attention-Deficit/ Hyperactivity Disorder (ADHD), ADHD symptoms must cause significant functional impairment. To define impairment, the International Classification of Functioning,

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Disability and Health (ICF) describes four functional domains potentially impacted by mental health conditions: body functions (e.g., impulse control), body structures (e.g., brain anatomy), activity limitations (e.g., learning/applying knowledge), and participation restrictions (e.g., organized sports). Further, it acknowledges that impairments can be either alleviated or exacerbated by environmental factors (e.g., special services in the school) and personal factors (e.g., comorbidities). Impairments in activities (academics and relationships) and participation restrictions (participation in recreation/leisure activities) are of particular interest since they often lead families of children with ADHD to seek treatment.[1]

In comparison with their peers, children with ADHD experience a variety of activity limitations across academic,[2] interpersonal,[3] and recreational functioning[4] domains. Specifically, children with ADHD are more likely to have poorer grades, lower academic achievement, increased utilization of special education services, and increased rates of grade retention, suspension, and expulsion.[2] Children with ADHD also have more social difficulties than typically-developing peers including being actively rejected, less well-liked, and having fewer reciprocated friendships.[5–7] In the family functioning domain, parents report high levels of stress and family conflict.[3] With regards to participation restrictions, children with ADHD engage in team sports for shorter periods of time and exhibit greater levels of aggression, emotional reactivity and disqualification from team sports.[4]

Although ADHD is associated with multiple functional impairments, the pattern of impairments in individual patients with ADHD is quite heterogeneous. This heterogeneity may in part be associated with heterogeneity in the presentation of ADHD symptom domains (i.e., inattention and hyperactivity/impulsivity) across patients. The DSM-IV-TR subtypes of ADHD (i.e., Predominantly Inattentive (ADHD-I), Predominantly Hyperactive-Impulsive (ADHD-H), and Combined (ADHD-C) are used to capture some of that heterogeneity. Thus, many studies have examined functional impairments across these subtypes.

Functional Impairments and ADHD Subtypes

A recent meta-analysis examined subtype differences in domains of functional impairment.[8] While the ADHD-H subtype was the least impaired across all measures of academic functioning, there was considerable variability depending on the measure of academic functioning used.[5,9] When achievement scores were used there were no subtype differences.[8] However, when rating scales querying school impairment are used, children with ADHD-C are more impaired than children with ADHD-I or ADHD-H subtypes.[6,10] Whereas, when impairment is based upon services received (e.g., school placement, tutoring), the ADHD-I subtype is most impaired.[9] In the social domain children with the ADHD-C subtype have more impaired social skills and are less liked by their peers than the ADHD-I and ADHD-H subtypes.[8] However, the ADHD-I subtype is more likely to be ignored by peers and is more passive/shy than the other subtypes.[8]

Subtype differences in family functioning were not assessed in the aforementioned meta-analysis but have been assessed in other studies with inconsistent findings. While several

studies have found no differences in terms of family functioning between subtypes,[5,11] others have found that parents of children with ADHD-C experienced greater negative impact on their personal time,[6] levels of parenting stress and difficulty fulfilling parenting roles[12] in comparison to parents of children with ADHD-I. No studies were found examining subtype differences in participation in organized activities.

Functional Impairments and ADHD Symptom Dimensions

Even within the ADHD subtypes, there is considerable heterogeneity in ADHD symptom presentation. Moreover, across time, the DSM-IV-TR subtypes can be unstable with children "shifting" between subtypes, calling into question the validity of the subtypes. In fact, it has been suggested that heterogeneity in ADHD symptom presentation may be best captured by incorporating dimensional descriptors into the DSM-V to reflect the number of inattention and hyperactivity/impulsivity symptoms. [8] Using a dimensional approach may better elucidate the true contribution of each ADHD symptom domain on the manifestation of functional impairment.

In fact, associations between dimensional ADHD symptoms and ADHD-related functional impairments reveal that both symptom domains are moderately to strongly correlated with impairment.[8] Further, each symptom domain shows a specific pattern of relationships with functional impairment domains. Inattention is most strongly associated with academic impairments as measured by rating scales or achievement tests. In contrast, symptoms of hyperactivity/impulsivity are more associated with social difficulties. One study assessed the relationship between ADHD symptom dimensions and participation in organized sports activities, and reported both symptom dimensions are moderately related to aggression, emotional reactivity and injury, with inattention having a stronger association.[13]

Limitations of Current Literature

A limitation in the literature examining the relationship between the ADHD symptom domains and areas of impairment is that despite significant covariation between inattention and hyperactivity/impulsivity domains (i.e., average r=.67)[8], nearly all studies rely on bivariate correlations to assess the relationships between ADHD symptom dimensions and functional impairments. In the few studies that have accounted for covariation across symptom domains, only symptoms of inattention predict academic impairment [8] and only symptoms of hyperactivity/impulsivity predict social impairment.[14] In addition, though several clinical covariates, such as comorbid disorders[15], age, [16] gender,[17] and medication status[18] are related to both ADHD symptom presentation and impairment, they have not been accounted for in most studies examining ADHD symptom-impairment relations.

Finally, there is significant variability in methodology with studies focusing only on academic/school behavioral outcomes or only on aspects of social outcomes (e.g., only peers or only family functioning). Also, studies assessing academic functioning are often limited to assessing only one aspect of functioning (e.g., academic achievement or global impairment) which could reflect academic difficulties or behavioral problems. Thus, it is important to more closely assess the relationship between ADHD symptom dimensions,

comorbidities, and clinically relevant correlates with various functional impairments in a single study.

Present Study

The purpose of this study was to evaluate the relationship between ADHD symptom domains and related functional impairment in a large sample of children who presented in the community for evaluation and treatment of ADHD. We assessed impairment in peer, sibling and parent relationships, school functioning including ratings of performance in academic subjects and classroom behavioral functioning, and participation restrictions for organized activities. We accounted for personal factors including psychiatric comorbidities and learning disabilities. Based on the results from previous studies, we hypothesized that symptoms of inattention would predict academic, organization, and productivity impairments, while symptoms of hyperactivity/impulsivity would predict impairments in classroom behavior and social impairments.

Method

Participants

Participants were patients registered on an internet-based ADHD portal (myADHDportal.com) registry being utilized by 344 professionals who self-identified as primary care (86.3%), mental health professionals (12.8%), and other (0.9%) throughout the US (including CA, GA, IL, KY, MA, MO, NY, OH, TX, & WI with 74% of patients from OH) to collect parent- and teacher-rating scales as part of diagnostic assessments and routine clinical care. These professionals registered 7,770 families on the portal. Parents and teachers completed the Vanderbilt ADHD rating scales online. In order to increase the representativeness of our sample and to increase generalizability of our findings, we selected patients within a wide age range of 3 and 17 years old who had both parent and teacher ratings (n=5,663). Exclusionary criteria included parent report of Intellectual Disability or Pervasive Developmental Disorder. The final dataset included 5,456 children (68.1% male; mean age=9.38±3.07). Most were unmedicated (85.5%) and had no parent-reported history of learning disability (85.9%).

Measures

Vanderbilt ADHD Rating Scales.[19]—The DSM-IV-TR-based Vanderbilt ADHD Rating Scales include parent (VADPRS) and teacher (VADTRS) report forms assessing symptoms of ADHD (18 items), oppositional defiant disorder (ODD; 8 items on the VDAPRS and 4 items on the VADTRS) and internalizing (7 items) comorbidity screening scales, rated on a 4 point scale ranging from *never* (0) to *very often* (3). Of note, the ODD and internalizing items are for screening purposes only and are not to be used in isolation as a diagnostic tool.[21] Impairment is assessed by an additional eight items on a 5-point scale from *excellent* (1) to *problematic* (5). For the present investigation, we utilized all eight from the VADPRS and five from the VADTRS. Note that items assessing organizational and productivity impairments were not used given their overlap with symptoms of inattention (correlations as high as .71).

Mean scores for inattention (Cronbach's alpha [α] =.88 & .93), hyperactivity/impulsivity (α = .92 & .95), oppositionality (α =.92 & .91) and internalizing (α =.87 & .86) scales were calculated for parents and teachers respectively by averaging the items within each scale (See Table 1 for descriptive statistics). These dimensions have been identified as valid factors.[19] (Wolrach)Parent- and teacher-rated impairments were examined at the item level. In cases of patients with more than one VADTRS (n=1355), ratings were averaged across teachers. Only one parent was able to complete the VADPRS, although it is possible that parents jointly completed the measure.

Demographic Questionnaire—Parents completed a brief questionnaire describing the child's developmental, diagnostic, and treatment history. Variables of interest include gender and parent report of previous diagnosis of a learning disability (dichotomous; see Table 1).

Procedures

The ADHD portal is a platform where parents, teachers, and health care providers input information about the patient, which is scored and interpreted in a report that is helpful to the health care provider in the assessment and treatment of ADHD. Parents and teachers indicate whether ratings are based on the child's behavior on or off medication. All measures were collected for clinical purposes. This project was approved by the local Institutional Review Board.

Statistical Analyses—To determine the relationship between ADHD symptom dimensions and functional impairments, separate 2-step hierarchical multiple regressions were conducted for each domain of functioning assessed. Though there was overlap in parent and teacher report for 4 of the 8 domains of functioning, we conducted separate analyses for parent-report (8 domains) and teacher-report (5 domains) of domains of impairment (8 rated by the parent and 5 rated by teachers) In order to keep our methods consistent across domains of impairment.

We considered several personal factors discussed in the literature as potentially contributing significantly to functional impairment including comorbidities such as oppositionality and internalizing difficulties.[20] Correlations between variables of interest (age, gender, parent report of child learning disability, medication status, as well as parent- and teacher-rated oppositionality and internalizing summary scores) were calculated to identify potential covariates. Those with significant ($p<.05$) correlations were retained for entry in the first step (Table 1). Parent and teacher ratings for inattention and hyperactivity/impulsivity were entered in Step 2. We tested whether all assumptions of regression were met including effects of influential outliers, multicollinearity, linearity between predictors and dependent variables, constant error variance, and normality of error variance. No violations were detected.

Given the large sample size and resulting high power to detect effects, we focused our interpretation on steps that explained at least 5% of the variance in the functional outcome (i.e., incremental change in $R^2>5\%$). In addition, we used false discovery rate correction to correct for family-wise error due to the large number of analyses conducted. However, in

order to avoid Type II error, we only corrected p-levels for the contribution of inattention and hyperactivity/impulsivity on impairment since these were our primary hypotheses.

Results

Impairment in Learning and Applying Knowledge

In Step 1 of hierarchical regressions of parent ratings of academic functioning (i.e., prior to entering the ADHD symptom domains), the presence of a learning disability was the largest predictor of parent-rated academic impairments in reading and writing, whereas medication status was the largest predictor of math impairment (Table 2). However, the combined effects of personal factors (Step 1) on academic impairments was rather small (R^2 range: .06–.07) across the three academic domain ratings. Parent- and teacher-rated symptoms of ADHD explained an additional 5–9% of variance on parent ratings of reading, writing, and math impairment. Parent-and teacher-rated symptoms of inattention were most highly predictive of parent ratings in academic functioning. Additionally, teacher ratings of higher hyperactivity/impulsivity significantly predicted less impairment in parent-rated academic functioning across all academic domains.

On teacher ratings of academic functioning (Table 2), personal factors explained between 8–13% of the variance in each academic domain. Specifically younger age, being unmedicated and having a learning disorder significantly predicted academic impairment. Adding parent- and teacher-rated symptoms of ADHD to the model explained an additional 8 to 16% of variance in academic difficulties. Among ADHD symptom domains, teacher ratings of ADHD symptoms were stronger predictors of teacher-rated academic impairment than parent ratings. Among the teacher-rated ADHD symptom domains, teacher ratings of inattention were positively and highly predictive of teacher ratings of academic impairment. Teacher ratings of hyperactivity/impulsivity also significantly predicted teacher ratings of academic impairment though these were negatively related. Parent ratings of inattention significantly predicted teacher ratings of writing and math but not reading impairment, though the magnitude of these relations was rather small ($\beta = .04$).

Of note, teacher-rated symptoms of hyperactivity/impulsivity were negatively associated with academic impairments in the models predicting parent and teacher-rated academic impairments. These findings indicate that hyperactivity/impulsivity is associated with better academic functioning. This is the reverse direction of what we found in the bivariate analyses. To determine whether the presence of a suppressor variable may have resulted in this counterintuitive finding, we re-ran the hierarchical regressions with academic impairment as the dependent variable, while systematically excluding each independent variable (except for hyperactivity/impulsivity) one at a time. The suppressor variable was expected to be identified by its effect on the direction of the beta coefficient when it was left out [21]. That is, without the suppressor variable in the model the direction of the beta coefficient for hyperactivity/impulsivity was expected to become positive, consistent with the correlation. Inattention was the only variable identified as having such an effect on the hyperactivity/impulsivity beta coefficient for teacher report of academic problems. The identification of a suppression effect suggests that the negative beta value for hyperactivity/

impulsivity in the regressions predicting teacher-rated academic problems should not be interpreted as reflecting a true negative relationship. [21]

Interpersonal Interactions and Relationships

Results of analyses predicting parent-rated and teacher-rated interpersonal impairments are presented in Table 3. Personal factors explained 25 to 33% of the variance in parent-reported impairments in parent-child relationship, sibling and peer relationships. Parent-reported ODD symptoms were the most significant predictor of difficulties across all areas of interpersonal functioning. ADHD symptoms (Step 2) predicted less than 1% of incremental variance across interpersonal impairments.

Analyses of teacher-rated peer impairments replicated results of the parent analyses. In Step 1, personal factors explained 33% of the variance in peer difficulties with teacher-rated ODD symptoms being the strongest predictor. Although parent-rated ODD also significantly predicted peer impairments, the strength of the association was much lower than teacher-report of oppositionality. ADHD symptoms explained only an incremental 4% of the variance in teacher ratings of peer difficulties in Step 2.

Major Life Areas

Table 4 depicts results of analyses assessing impairments in major life areas as rated by parents (overall school) and teachers (classroom disruption). Personal factors in Step 1 explained 5% of the variance in overall school functioning as rated by parents. The presence of a learning disability was the strongest predictor of parent-rated school impairment followed closely by parent-rated oppositionality. ADHD symptoms (Step 2) explained an additional 14% of the variance in school functioning with symptoms of parent and teacher-rated inattention being the strongest predictor of school impairment. Teacher ratings of hyperactivity/impulsivity also significantly predicted parent ratings of school impairment ($\beta = -.15$). As with academic impairments, symptoms of hyperactivity/impulsivity were negatively associated with school functioning, despite the fact that the bivariate relationship was positive. Following the strategy previously described, symptoms of inattention were identified as the suppressor variable.

Personal factors explained 35% of the variance in teacher ratings of classroom disruption (Step 1). In particular, teacher report of oppositionality symptoms followed by younger age and male gender were the strongest predictors of disrupting the class. ADHD symptoms in Step 2 explained an additional 31% in classroom disruption. Teacher ratings of hyperactivity/impulsivity were a strong predictor of classroom behavioral impairment.

Participation Restrictions

Parent-rated impairments in child participation in organized activities (Table 4) were predicted primarily by personal factors in Step 1 ($R^2=.16$). Parent- and teacher-ratings of ODD symptoms were the most consistent personal factor to predict impairments in participation in organized activities. Parent ratings of internalizing difficulties also predicted impairment in participation in organized activities. Symptoms of ADHD in Step 2 predicted only an incremental 2% of the variance.

Discussion

Our findings suggest a differential pattern of relationships between the two ADHD symptom domains (i.e., inattention and hyperactivity/impulsivity) and various domains of functioning. Specifically, symptoms of inattention are the strongest predictor of impairments in learning and applying knowledge as measured by ratings of academic functioning, whereas symptoms of hyperactivity/impulsivity predicted difficulties in a major life area: classroom disruption. In addition, we found certain domains of functioning are better accounted for by personal factors and correlates of ADHD as opposed to ADHD symptoms themselves. In particular, ODD symptoms were a much stronger predictor of impairments in interpersonal relationships than ADHD symptoms. In addition, symptoms of ODD were the strongest predictor of impairments in participation in organized activities. The pattern of findings was generally consistent across parent- and teacher-ratings. Importantly, several of the cross-rater analyses (e.g., teacher-ratings of ADHD predicting parent-ratings of impairment) were consistent with same-rater findings suggesting our findings are not due to shared-method variance.

The strong relationship between inattention and academic impairment is consistent with previous work in this area. Previous studies have reported strong correlations between inattention and academic functioning as indicated by rating scales and achievement tests, [8] and moderate correlations between hyperactivity/impulsivity and school competence. [22] However, our findings suggested weaker correlations between hyperactivity/impulsivity and impairment across academic subjects which may be due to differences in measurement. Previous studies used academic measures that included not only performance in academic subjects but also utilization of special education services and reports of school problems.[22] These indicators of academic impairment could be due to behavioral difficulties as opposed to academic concerns. In contrast, the present study used separate items to assess academic performance versus classroom behavioral functioning (e.g., classroom disruption). This bifurcation of academic performance and school behavior elucidated a differential pattern of relationships between ADHD symptom dimensions and school-related impairments. Namely, symptoms of hyperactivity/impulsivity are more strongly associated with and predictive of classroom behavioral functioning (even after accounting for oppositional symptoms), while symptoms of inattention are more strongly associated with and predictive of performance in academic subjects. These findings are also consistent with subtype studies in which the ADHD-I subtype was most impaired in indices of academic ability.[6,9] It should be noted that the variance in academic impairments accounted for by clinical covariates, personal factors and symptoms of ADHD was rather small (range .06–.07% for parent and .08–.13% for teacher report), highlighting that many influences could contribute to academic performance including variables not assessed in this investigation (e.g., socioeconomic status).[23]

A primary contribution of the present study is the examination of the relationship between ADHD symptom domains and impairment controlling for the overlap between symptom dimensions as well as personal factors that can influence functioning. Interestingly, symptoms of inattention predicted academic impairment even after accounting for comorbid diagnosis of learning disability. Although the presence of a learning disability continued to

be a significant predictor of academic functioning, it was not as strong of a predictor of academic functioning as inattention symptoms. Among children with ADHD, academic impairments may be driven by difficulties in attention regulation and not necessarily by learning problems. Thus, for children who present with inattention symptoms, interventions that mitigate these difficulties, including medication[18] as well as psychosocial interventions designed specifically for children with primarily attention regulation difficulties,[24] should have a large impact on academic functioning.

The finding that oppositional symptoms accounted for significant variance in peer problems suggests that oppositionality may mediate the relationship between ADHD and peer difficulties among children with ADHD, which is not surprising given research demonstrating that a diagnosis of ODD alone is associated with problematic social relationships and less engagement in positive social activities.[25] Studies investigating social functioning among children with ADHD do not typically control for symptoms of ODD [26] which has led to the possibly erroneous conclusion that ADHD symptoms alone cause social impairments. When the role of comorbid ODD on social functioning has been considered, children with ADHD and ODD are shown to experience greater social impairments than children with ADHD alone.[27] Although ADHD symptoms contribute some variance to peer difficulties, it seems ODD symptoms more directly impair social interactions among children with ADHD.

Symptoms of oppositionality, especially by parent report, were also the most significant predictor of impairments in familial relationships. This is consistent with literature reporting that children with comorbid ADHD and ODD experience worse family functioning than children with ADHD alone, who experience worse family functioning than typically developing children.[28] However, because studies have primarily taken a categorical approach in their examination of the role of ODD as a comorbid diagnosis on the family functioning of children with ADHD, little is known about the relative contribution of each of these symptom domains (inattention, hyperactivity/impulsivity and oppositionality) to impairments in family relationships. In fact, when examining the differential relationship between symptoms of inattention, hyperactivity/impulsivity, oppositional/conduct symptoms and caregiver strain, oppositional/conduct symptoms and not symptoms of ADHD were predictive of greater caregiver strain.[29]

Our findings suggest that the negative impact of oppositional symptoms on impairment extends to participation in organized activities, which in turn may negatively impact peer relationships. Participation in extracurricular activities as an area of impairment has received very little attention in the ADHD literature. Although studies have documented that children with ADHD are more likely to be impaired in their sports activities[4] only one study examined the relationship between ADHD symptom dimensions and symptoms of ODD with sports-related impairments.[13] That study also found symptoms of ODD were more strongly correlated with sports-related impairments than ADHD symptoms.[13] We build upon their findings by demonstrating that oppositional symptoms are the most significant predictor of such impairments when symptoms of oppositionality and ADHD dimensions are included in a single model.

Our findings have important treatment implications. When a child presents with social impairments, interventions targeting ADHD symptom reduction alone may not improve social functioning since social impairments may be driven primarily by the presence of oppositional symptoms. While psychostimulants may reduce oppositionality in ADHD populations,[30] more targeted interventions geared specifically toward oppositionality, or even social relationships, should be recommended when children present with oppositional symptoms and social impairments. Interventions focusing on building a positive parent-child relationship and/or include a family problem solving/communication training component in addition to parent behavior management training, are appropriate treatment approaches for targeting impaired family functioning for oppositional children.

One notable limitation of this study is the limited patient demographic data collected using the web portal thus limiting our knowledge about the representativeness of the sample. In addition, the portal does not include information on the role of the parent rater (e.g., mother or father) so we could not investigate whether maternal versus paternal ratings impacted the findings. The same is true regarding the subject area taught by teachers. Another limitation is our reliance on a single measure of ADHD symptoms and impairment. Although endorsed by the American Academy of Pediatrics for use in evidence-based assessments ADHD[31], the Vanderbilt rating scales have inherent weaknesses when used in isolation for research purposes including reliance on single items for measuring functional impairment domains. Also, screening items, rather than the full complement of symptoms, are used to assess internalizing problems and oppositionality. We also rely on parent report for assessing the presence of a learning disability instead of psychoeductional testing results. In addition, objective measures of functional impairment such as grades for assessing academic impairment or classroom behavioral observations for assessing classroom behavioral impairments were not available. Future research should examine whether the observed findings can be replicated using more comprehensive and objective measures of functional impairment.

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Table 1

Descriptive Statistics for Various Impairments and Bivariate Correlations with Predictor Variables

	Learning and Applying Knowledge						Interpersonal Interactions				Major Life Areas					
	Reading, P	**Reading, T**	**Writing, P**	**Writing, T**	**Math, P**	**Math, T**	**Parent, P**	**Sibling, P**	**Peer, P**	**Peer, T**	**Organized Activities, P**	**Overall School, P**	**Class Disruption, T**	***Mean***	***Standard Deviation***	***N***
Age	−.01	−.15[b]	−.04[a]	−.20[b]	.12[b]	−.05[a]	.12[b]	.07[b]	−.10[b]	−.27[b]	−.16[b]	.07[b]	−.37[b]	9.38	3.07	5456
Gender (1=F, 2=M)	.00	−.01	.12[b]	.11[b]	−.14[b]	−.14[b]	−.04[a]	−.02	.04[a]	.12[b]	.04[a]	.05[b]	.21[b]	-	-	-
LD (0= N, 1 = Y)	.20[b]	.20[b]	.17[b]	.18[b]	.18[b]	.19[b]	.01	−.01	−.01	.00	.01	.14[b]	−.06	-	-	-
Medicated (0=N, 1=Y)	−.05[b]	.07[b]	−.02	−.04[a]	−.03[a]	−.03[a]	.07[b]	.06[b]	.07[b]	.03[a]	.03[a]	−.05[b]	−.05[b]	-	-	-
IA, P	.21[b]	.08[b]	.25[b]	.10[b]	.25[b]	.12[b]	.22[b]	.19[b]	.18[b]	.03[a]	.20[b]	.33[b]	.04[a]	2.07	0.60	5455
IA, T	.14[b]	.31[b]	.20[b]	.46[b]	.12[b]	.32[b]	−.07[b]	−.08[b]	.05[a]	.37[b]	.09[b]	.26[b]	.47[b]	1.81	0.71	5453
HI, P	.04[a]	.03	.05[b]	.03[a]	−.04[a]	−.03[a]	.25[b]	.26[b]	.33[b]	.27[b]	.30[b]	.09[b]	.44[b]	1.53	0.83	5456
HI, T	−.04[a]	.06[b]	−.02	.14[b]	−.14[b]	−.02	.03[a]	.02	.18[b]	.44[b]	.14[b]	.04[a]	.80[b]	1.21	0.88	5453
Oppositional, P	.04[a]	−.02	.03	−.03[a]	.02	−.04[a]	.54[b]	.53[b]	.43[b]	.18[b]	.32[b]	.13[b]	.20[b]	1.34	0.81	5454
Oppositional, T	−.04[a]	−.02	−.03[a]	.05[b]	−.07[b]	−.03[a]	.15[b]	.15[b]	.31[b]	.53[b]	.23[b]	.10[b]	.50[b]	0.51	0.70	5451
Internalizing, P	.05[b]	−.02	.06[b]	−.05[a]	.10[b]	.01	.30[b]	.26[b]	.27[b]	−.01	.24[b]	.08[b]	−.20[b]	0.91	0.66	5454
Internalizing, T	.09[b]	.12[b]	.07[b]	.17[b]	.08[b]	.14[b]	.03[a]	.02	.09[b]	.10[b]	.10[b]	.08[b]	.03[a]	0.52	0.50	5452
Mean	3.33	3.42	3.59	3.80	3.35	3.43	2.46	2.75	2.88	3.27	3.50	3.52	3.50	-	-	-
Standard Deviation	1.23	1.14	1.04	0.97	1.14	1.06	1.18	1.16	1.04	0.92	1.23	1.07	1.23	-	-	-
N	5284	5241	5347	5246	5277	5065	5432	4915	5430	5419	5126	5383	5256	-	-	-

[a] $p<.05$;

[b] $p<.000$.

Table 2

Results of Two-Step Hierarchical Regression Analysis Examining Personal factors and ADHD Symptom Domains as Predictors of Functional Impairment in Learning and Applying Knowledge

	Parent Report						Teacher Report					
	Reading		Writing		Math		Reading		Writing		Math	
	Step 1 β	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**
Age	-	-	−.08^{c}	−.11^{c}	.09^{c}	.05^{b}	−.17^{c}	−.17^{c}	−.22^{c}	−.19^{c}	−.08^{c}	−.07^{c}
Gender	-	-	.14^{c}	.13^{c}	−.13^{c}	−.14^{c}	-	-	−.04^{b}	.00	−.13^{c}	−.17^{c}
LD	.20^{c}	.19^{c}	.17^{c}	.15^{c}	−.04^{b}	−.01	.22^{c}	.20^{c}	.12^{c}	.07^{c}	.19^{c}	.00
Med Status	−.07^{c}	−.04^{b}	-	-	.16^{c}	.14^{c}	−.07^{b}	−.04^{b}	.20^{c}	.18^{c}	−.04^{b}	.17^{c}
ODD, P	.07^{c}	.02	.02	−.02	-	-	-	-	−.02	.03	−.03	.02
ODD, T	−.09^{c}	−.06^{b}	−.09^{c}	−.04^{a}	−.06^{c}	−.001	-	-	−.05^{b}	−.05^{b}	−.07^{c}	−.05^{b}
INT, P	−.00	−.03	.05^{b}	.01	.04^{b}	−.002	-	-	−.05^{b}	−.04^{b}	-	-
INT, T	.10^{c}	.07^{b}	.08^{c}	.03	.08^{c}	.02	.10^{c}	.04^{b}	.18^{c}	.08^{c}	.14^{c}	.05^{b}
IA, P		.15^{c}		.23^{c}		.21^{c}		.02		.04^{a}		.04^{a}
IA, T		.15^{c}		.20^{c}		.22^{c}		.35^{c}		.47^{c}		.43^{c}
HI, P		.03		−.01		−.04		.01		−.03		−.02
HI, T		−.10^{c}		−.16^{c}		−.18^{c}		−.20^{c}		−.18^{c}		−.20^{c}
R^2	**.06**		**.06**		**.07**		**.09**		**.13**		**.08**	
F	49.18^{c}		47.38^{c}		54.00^{c}		108.65^{c}		83.76^{c}		57.37^{c}	
ΔR^2		**.05**		**.09**		**.09**		**.08**		**.16**		**.13**
ΔF		60.44^{c}		132.88^{c}		119.16^{c}		116.29^{c}		254.09^{c}		185.71^{c}

Note. IA = Inattention, HI = Hyperactive/Impulsive, LD = Learning Disability, ODD = Oppositional Defiant, INT = Internalizing, P = parent report, T = teacher report. **Bold** indicates that the step predicts at least 5% of the variance in the model. Dashes indicate that the variable was not included in the model because the bivariate relationship was non-significant. P-values for IA, P; IA, T; HI, P; HI, T in step 2 for all analyses were corrected for multiple comparisons using false discovery rate.

^{a}p<.05;

^{b}p<.01;

^{c}p<.000.

Table 3

Results of Two-Step Hierarchical Regression Analysis Examining Personal Factors and ADHD Symptom Domains as Predictors of Impairments in Interpersonal Interactions

	Parent Report						Teacher Report	
	Parents		Siblings		Peers		Peers	
	Step 1 β	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**
Age	.15[c]	.15[c]	.10[c]	.08[c]	−.06[c]	−.03	−.17[c]	−.10[c]
Gender	−.06[c]	−.06[c]	-	-	.02	.02	.06[c]	.02
LD	-	-	-	-	-	-	-	-
Med Status	.05[c]	.06[c]	.05[c]	.05[c]	.07[c]	.07[c]	.05[c]	.07[c]
ODD, P	.52[c]	.52[c]	.52[c]	.51[c]	.30[c]	.24[c]	.03[a]	.02
ODD, T	.03[a]	.02	−.01	.01	.20[c]	.20[c]	.44[c]	.37[c]
INT, P	.07[c]	.07[c]	.04[b]	.04[a]	.17[c]	.16[c]	-	-
INT, T	−.02	−.01	-	-	−.01	−.00	.14[c]	.11[c]
IA, P		.02		.02		.02		.00
IA, T		−.03[a]		−.04[a]		−.02		.17[c]
HI, P		−.02		−.00		.09[c]		.04[a]
HI, T		.04		−.01		.01		.08[c]
R^2	**.33**		**.29**		**.25**		**.33**	
F	361.90[c]		381.79[c]		238.44	*c*	418.98[c]	
ΔR^2		.00		.00		.01		**.04**
ΔF		1.81		3.10[a]		9.78[c]		77.71[c]

Note. IA = Inattention, HI = Hyperactive/Impulsive, LD = Learning Disability, ODD = Oppositional Defiant, INT = Internalizing, P = parent report, T = teacher report. Bold indicates that the step predicts at least 5% of the variance in the model. Dashes indicate that the variable was not included in the model because the bivariate relationship was non-significant. P-values for IA, P; IA, T; HI, P; HI, T in step 2 for all analyses were corrected for multiple comparisons using false discovery rate.

[a] p<.05;

[b] p<.01;

[c] p<.000.

Table 4

Results of Two-Step Hierarchical Regression Analysis Examining Personal Factors and ADHD Symptom Domains as Predictors of Impairments in Major Life Areas and Participation Restrictions

	Major Life Areas				Participation Restrictions	
	Parent Rated Overall School		Teacher Rated Disrupting Class		Parent Rated Organized Activities	
	Step 1 β	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**
Age	.08^{c}	.07^{c}	−.24^{c}	.00	−.14^{c}	−.13^{c}
Gender	.05^{b}	.02	.14^{c}	.05^{c}	.02	.02
LD	.14^{c}	.12^{c}	−.02	−.01	−	-
Med Status	-	-	−.03^{a}	.01	.04^{b}	.05^{c}
ODD, P	.11^{c}	.06^{a}	.08^{c}	.02	.20^{c}	.12^{c}
ODD, T	.06^{c}	.11^{b}	.42^{c}	.13^{c}	.12^{c}	.15^{c}
INT, P	.01	−.03^{a}	−.10^{c}	−.03^{a}	.18^{c}	.16^{c}
INT, T	.05^{b}	−.02	−.07^{c}	−.07^{c}	.02	.02
IA, P	-	.26^{b}		.02		.08^{c}
IA, T	-	.28^{b}		.09^{c}		.04^{a}
HI, P	-	−.02		.05^{b}		.11^{c}
HI, T	-	−.15^{b}		.66^{c}		−.08^{c}
R^2	**.05**		**.35**		**.16**	
F	38.14	^{c}	318.57^{c}		131.62^{c}	
ΔR^2		**.14**		**.31**		.02
ΔF		219.70	^{c}	1076.53^{c}		24.57^{c}

Note. IA = Inattention, HI = Hyperactive/Impulsive, LD = Learning Disability, ODD = Oppositional Defiant, INT = Internalizing, P = parent report, T = teacher report. **Bold** indicates that the step predicts at least 5% of the variance in the model. Dashes indicate that the variable was not included in the model because the bivariate relationship was non-significant. P-values for IA, P; IA, T; HI, P; HI, T in step 2 for all analyses were corrected for multiple comparisons using false discovery rate.

^{a}p<.05;

^{b}p<.01;

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[c] p<.000.