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Which Kindergarten Children are at Greatest Risk for Attention-deficit/Hyperactivity and Conduct Disorder Symptomatology as Adolescents?

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Abstract

Objective—We sought to identify which kindergarten children are simultaneously at risk of moderate or severe symptomatology in both attention-deficit/hyperactivity disorder (ADHD) and conduct disorder (CD) as adolescents. These risk factor estimates have not been previously available.

Method—Multinomial logistic regression analyses of multi-informant ratings by the end of middle school of a population-based, longitudinal sample of children followed from kindergarten to eighth grade (N = 7,456).

Results—Kindergarten children from low SES households, those raised by mothers with depressive symptoms or experiencing emotional problems or substance abuse, or those who were punished by spanking were significantly more likely to later display severe levels of ADHD-CD symptomatology in eighth grade. Kindergarten children frequently engaging in ADHD-CD-type behaviors were more likely to later experience both moderate (covariate adjusted OR = 2.37) and severe (covariate adjusted OR = 3.63) ADHD-CD symptomatology. Low academic achievement uniquely increased the risk of both moderate and severe symptomatology (adjusted OR range = 1.7 to 2.24).

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Conclusions—The results should guide early screening and school-based intervention efforts for ADHD-CD. Reducing children's risk for adolescent ADHD-CD symptomatology may require remediating low behavioral and academic functioning by the end of kindergarten. When these two modifiable factors occur together they increase kindergarten children's odds of experiencing severe ADHD-CD symptomatology in eighth grade by a multiplicative factor of 8.1.

Keywords

Attention-deficit/hyperactivity disorder; conduct disorder; longitudinal; kindergarten; psychopathy

Schools are preferred settings for providing mental health services to young children (National Association of School Psychologists [NASP], 2014). Yet teachers currently report a lack of training and experience in providing mental health services to schoolchildren. They instead consider this to be the responsibility of school psychologists (Reinke, Stormont, Herman, Puri, & Goel, 2011). School psychologists are therefore increasingly attempting to coordinate delivery of school-based mental health services (Friedrich, 2010; Splett, Fowler, Weist, McDaniel, & Dvorsky, 2013). Concurrently, school psychologists are also being asked to use scientifically derived evidence about the risk factors for mental health disorders in order to screen for and provide services for these disorders, including very early in children's school careers (Merrell & Buchanan, 2006; Strein, Hoagwood, & Cohn, 2003).

Children with ADHD-CD as Needing Preventative Mental Health Services by School Psychologists

Theoretical and empirical work by developmental psychopathologists indicates that children simultaneously experiencing both attention-deficit/hyperactivity (ADHD) and conduct disorder (CD) symptomatology may require school-based mental health services (Kuhne, Schachar, & Tannock, 1997). This is because children with ADHD-CD may suffer from a particularly serious type of childhood psychopathy that, over time, interferes with their school-based functioning and increases their later risk for career criminality and psychopathy.[5] Children with ADHD-CD repeatedly fail to incorporate feedback from their environments (e.g., homes, classrooms) and to appropriately regulate their goal and reward pursuits (Flory, Newcorn, Miller, Harty, & Halperin, 2007; Lynam, 1996; Zepf et al., 2008). As these children enter school and move up the grade levels, greater demands for restraint may result in increasingly inattentive and overactive classroom behaviors, as well as progressively greater aggression and hostility towards teachers and peers (Lynam, 1996; Moffitt, 1990, 1993), necessitating intervention by school psychologists and other mental health professionals.

Elementary schoolchildren with comorbid ADHD-CD are much more likely to be rejected by peers and to fail academically as their symptomatology becomes increasingly generalized

[5]Generally, childhood psychopathy is a set of maladaptive personality traits theorized to result from one or more etiologies (for a recent review, see da Silva, Rijo, & Salekin, 2012). These include genetic variability (Larsson, Andershed, & Lichtenstein, 2006), neurological symptomatologys (Blair, 2006), callous-unemotional traits (Frick, Stickle, Dandreaux, Farrell & Kimonis, 2005; Munoz & Frick, 2012), gestational (Galera et al., 2011) and environmental risk factors (Farrington, Ullrich, & Salekin, 2010), and underlying personality disorders (Caspi, Roberts, & Shiner, 2005; Widiger, De Clerq, & De Fruyt, 2009).

(Gresham, MacMillan, Bocian, Ward, & Forness, 1998; Harpin, 2005). Waschbush's (2002) meta-analysis indicated that, in contrast to children with non-ADHD-CD, ADHD-only, or CD-only, children with comorbid ADHD-CD engage in a wider range of antisocial behaviors and more severe and inappropriate types of antisocial behaviors. Children with ADHD-CD display greater delinquency across multiple measures of severity, variety, and age of initiation of offending (Sibley et al., 2011). Adolescents with ADHD-CD display heightened aggression and anger towards peers and teachers (Harty, Miller, Newcorn, & Halperin, 2009), and have behavioral profiles similar to adult psychopaths (Lynam, 1997, 1998; Michonski & Sharp, 2010). Adolescents with ADHD-CD are more likely to be suspended or expelled from school, and to experience alcohol and drug abuse (Schubiner et al., 2000). They are highly likely to engage in antisocial behavior throughout their entire life course (Satterfield & Schell, 1997; Zepf et al., 2008). As they become adults, children with ADHD-CD are much more likely to (a) display persistent psychopathy (DeLisi, Vaughn, Beaver, Barth, & Fletcher, 2007; Moffitt, Caspi, Harrington, & Milne, 2002) and psychosis (Dalteg, Zandelin, Tuninger, & Levander, 2014) as well as to (b) engage in violent crimes (Satterfield et al., 2007) and career criminality (Lynam, 1996; Vaughn & DeLisi, 2008). Incarcerated adult criminals with psychopathy diagnoses are four times more likely than chance to have had ADHD-CD as children (Johansson, Kerr, & Andershed, 2005).

A Limited Knowledge Base about Earliest Risk Factors for Adolescent ADHD-CD

Currently, however, school psychologists lack scientifically derived evidence as to which young children are likely to enter school already at risk for experiencing ADHD-CD as adolescents, and so likely require school-based mental health services. Changing the developmental trajectories of children with ADHD-CD likely requires providing these services by or shortly after school entry (Satterfield & Schell, 1997). To date, existing longitudinal studies have instead investigated risk factors for ADHD (e.g., Larsson, Dilshad, Lichtenstein, & Barker, 2011; Riddle et al., 2013), or CD (Boden, Fergusson, & Horwood, 2010; Trentacosta, Hyde, Goodlett, & Shaw, 2013), but not comorbid ADHD-CD (Biederman et al., 2008).[6] Yet ADHD-CD is distinct from ADHD in its (a) genetic etiology (Thapar, Harrington, & McGuffin, 2001), (b) family history markers (Faraone, Biederman, Jetton, & Tsuang, 1997), and (c) neurological impairments (Rothenberger et al., 2000), suggesting a unique subtype (Lynam, 1996). Consequently, children displaying this type of comorbid disorder likely require more intensive clinical and school-based treatments (Sourander et al., 2007).

The few studies specifically designed to investigate risk factors for comorbid ADHD-CD have used cross-sectional designs and samples of older children (Lynam, 1998). The one study using a longitudinal design and a sample of elementary school-aged children displaying ADHD-CD symptomatology was limited to one or two year time periods, small

[6]Many longitudinal studies have been conducted examining ADHD, CD, and/or their inter-relation (e.g., the Dunedin Multidisciplinary Health and Development Study, Pittsburgh Youth Study; see Murray & Farrington [2010] for a recent review). However, very few studies have specifically investigated early risk factors for later, comorbid ADHD-CD symptomatology, despite ADHD-CD constituting a theorized syndrome of psychopathic traits (Lynam, 1996).

sample sizes, and data collection that began only in third grade (Gresham et al., 2008). To date, no studies have investigated the relative stability of comorbid ADHD-CD as a syndrome of traits across early-to-middle childhood (Andershed, 2010). No study of ADHD-CD has attempted to identify the syndrome's risk factors as early as kindergarten, when intervention may be most effective. Intervention at later grade levels is likely to be more costly to individual children and their families, schools, and communities (Lynam, 1996).

Factors that might be included in school-based screening efforts for ADHD-CD include those exacerbating children's neurological impairments such as chaotic or impoverished home or community environments, harsh parenting including spanking and other physical discipline, and maternal mental health or substance abuse problems (Lynam, 1996). Young children raised in lower socioeconomic status (SES) families and/or communities may experience greater adversity and trauma, thereby increasing their risk for socio-emotional maladjustment and psychiatric disorders over time (Bøe et al., 2014; Morgan, Farkas, & Wu, 2009;). Children parented by depressed or emotionally troubled mothers may experience more negative, distant, and hostile parenting, and so begin to more frequently engage in disruptive, avoidant, and defiant behavior (Callender, Olson, Choe, & Sameroff, 2012; Chronis et al., 2007), as may those children experiencing spanking or other types of physical punishment (Bøe et al., 2014). Attending Head Start may increase children's risk for CD due to lower-quality social interactions with peers and teachers than with parents (Lee et al., 2014). Racial/ethnic minority children may be more likely to be exposed to the risk factors for ADHD-CD including being born with low birthweight (Goldenberg et al., 1996) and being raised in economically disadvantaged families and communities (U.S. Census Bureau, 2012). Boys may be more likely to experience ADHD-CD as they more often engage in provocative interactions with parents and teachers when engaging in externalizing-type problem behaviors (Sevecke, Lebmkuhl, & Krischer, 2009).

Additional risk factors might constitute potentially malleable targets of school-based intervention efforts to prevent or reduce ADHD-CD symptomatology. For example, children experiencing early academic failure following school entry should begin to display socio-emotional maladjustment (Morgan, Farkas, & Wu, 2009), thereby increasing their risk for ADHD-CD (Loeber et al., 2001; Lynam, 1996; Moffitt, 1993). However, the relation between early academic failure and later maladjustment has also been characterized as spurious (Wang & Algozzine, 2011), resulting in ambiguity as to whether low academic functioning should constitute a potential target of school-based mental health interventions. Although prior behavioral symptomatology is predictive of clinically significant behavior problems as early as kindergarten (Nelson, Stage, Duppong-Hurley, Synhorst, & Epstein, 2007), whether school psychologists should consider ADHD-CD-type behaviors by kindergarten as a specific risk factor for adolescent ADHD-CD symptomatology and so again a potential target of school-based early intervention efforts has yet to be established (Andershed, 2010).

Study's Purpose

We sought to provide rigorous estimates of a diverse range of socio-demographic, birth, school, community, and additional characteristics measured by kindergarten that predicted

comorbid ADHD-CD symptomatology by the end of middle school. We did so in part by including an autoregressive statistical control of attention-related and externalizing problem behavior in kindergarten. This control allowed us to indirectly evaluate the stability of ADHD-CD from school entry to the end of middle school, as well as to better control for unmeasured but temporally stable confounds themselves resulting in the early onset of ADHD-CD-type behaviors. We estimated these risk factors in a population-based longitudinal sample of U.S. schoolchildren prospectively followed from kindergarten to the end of eighth grade. These analyses should help identify which kindergarten-aged schoolchildren in the U.S. are most likely to experience comorbid ADHD-CD symptomatology as adolescents, and so in turn might benefit from early mental health screening and service delivery efforts by school psychologists. We examined the risk factors for severe and moderate levels of ADHD-CD symptomatology separately. Doing so should help identify factors consistently increasing young children's risk for both types of ADHD-CD, and so better inform screening and intervention efforts to assist this highly vulnerable school-aged population (Christiansen et al., 2008).

Method

Database, Analytical Sample

We analyzed unweighted data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999 (ECLS-K), a nationally representative longitudinal survey of children, their parents, teachers, and school administrators maintained by the National Center for Education Statistics (NCES), U.S. Department of Education. The analytical sample consisted of those kindergarten children still participating in the ECLS-K at the end of eighth grade with data available on the study's eighth grade ADHD and CD scales (N=7,456). This enabled identification of three sub-samples using criteria specified below. These sub-samples consisted of children classified based on severity of symptomatology in eighth grade. Specifically, the three sub-samples were (a) Group 1, those not displaying ADHD-CD symptomatology, (b) Group 2, those displaying moderate symptomatology, and (c) Group 3, those displaying severe symptomatology. The sub-sample sizes for the Group 1, 2, and 3 were 6,682, 449, and 325, respectively, or 89.62%, 6.02% and 4.36% of the analytical sample. Table 1 displays descriptive statistics for both the kindergarten and eighth grade data. The sample followed from kindergarten to eighth grade includes children from a diverse range of SES, racial/ethnic, linguistic, and other backgrounds.[7]

Criterion variables, eighth grade—We classified children's symptom levels using multi-informant ratings of ADHD and CD symptoms. Both the ADHD and CD measures included items completed independently by the children's teachers and parents. Although parent and teacher ratings can differ, this is likely the result of observing distinct, context-specific behaviors (Korsch & Petermann, 2013; Servera, Lorenzo-Seva, Cardo, Rodriguez-Fornells, & Burns, 2010). Consequently, our study's use of multiple informants should have

[7]This analytical sample is of higher average SES than the original full sample of children and families. Because the results indicated that children from lower SES households are more likely than children from higher SES households to manifest ADHD-CD symptomatology, our estimates of the incidence and correlates of this symptomatology from the data likely err, if at all, in a conservative direction.

minimized single-source reporting bias (de Los Reyes, Alfano, & Beidel, 2010). Using both parent and teacher ratings satisfies the need for observing symptoms in at least two settings, increases overall diagnostic accuracy (O'Neill, Schneiderman, Rajendran, Marks, & Halperin, 2014; Power et al., 1998), and provides greater sensitivity to both ADHD and CD than use of single informant ratings (Johnson, Hollis, Marlow, Simms, & Wolke, 2014). Teacher ratings of behavioral symptomatology consistently correlate with direct observation including for minority students (Hosterman, DuPaul, & Jitendra, 2008). In eighth grade, the children's English teacher rated their behavioral functioning, as did either their Mathematics or Science teacher. Consequently, two teachers independently completed each item from the teacher questionnaires. Table 1 of the supplementary Appendix details each item, its response scale, and frequency of responses.

ADHD: The study's ADHD symptoms scale included six items. Two of the student's teachers independently rated "How often is this student attentive in your class?" The student's parent completed four additional items. Parents rated the extent to which their child was (a) "restless, overactive, cannot stay still for long"; (b) "constantly fidgeting or squirming"; (c) "easily distracted, concentration wanders"; and, alternatively, (d) "has a good attention span, sees work through to the end" (reverse coded, thereby indicating inattention). We coded these responses (e.g., 1 = "not true") and reverse coded item "d." These items are very similar to DSM-5 diagnostic criteria for ADHD, which includes symptoms of inattention, "on the go" acting as if "driven by a motor," fidgeting, and distractibility (American Psychiatric Association, 2013; Centers for Disease Control, 2014). The ADHD symptoms scale's Cronbach alpha was .75.[8] Cronbach's alphas of .70 are acceptable for group comparisons (Bland, 1997), as they indicate that 50% or more of the variance is common between the items (Trobia, 2008). The biserial correlation between the ADHD scale ratings and parent-reported ADHD diagnosis was .82.

CD: The CD scale consisted of nine items. Teachers completed four of these items; parents completed five. The four items completed by teachers were two questions again answered by two different teachers. The first teacher-rated question asked "How often was the student disruptive in the class?" The second teacher-rated question asked "Have you spoken to a guidance counselor or other member of the school staff this year about the student's disruptive behavior in class?" We again coded the responses (e.g., 1 = "never"). Parents independently rated their children on the frequency with which they (a) "lose his/her temper"; (b) "fight with other youth or bullied them"; (c) "lie or cheat"; or (d) "steal from home, school, or elsewhere." Parents also responded to whether the child "ever had an in- or out-of-school suspension" and, if so, "how many times was the child suspended?" For the item about suspension, we coded this variable using the number of parent-reported suspensions that the child received. These CD scale items are very similar to DSM-5 diagnostic criteria for CD, which includes symptoms of fighting, lying, stealing, and bullying, as well as threatening or intimidating others (although they do not include the recently added DSM-5 callous-unemotional specifier). The CD scale's Cronbach alpha was .

[8]Although use of both teacher and parent informants helps to minimize single-source bias, but may also result in lower Cronbach's alpha due to the distinct contexts in which they are observing children (de Los Reyes et al., 2009).

73. The biserial correlation for the CD scale ratings and parent-reported serious emotional problem (i.e., a more general disability condition) was .65. It is possible that those children identified as displaying moderate CD symptomatology might have been displaying symptomatology more consistent with ODD. The two disorders are comorbid (Maughan, Rowe, Messer, Goodman, & Meltzer, 2004), with ODD possibly constituting a developmental antecedent of CD (Rowe, Maughan, Pickles, Costello, & Angold, 2002). However, most children with CD do not display prior histories of ODD. For example, Rowe, Costello, Angold, Copeland, and Maughan (2010) reported that 52% and 72% of 11 and 13 year olds with CD in their community samples, respectively, had not previously met diagnostic criteria for ODD. Additionally, ODD rarely manifests beyond early adolescence and does not include behaviors relating to aggression and theft or deceit (American Psychiatric Association, 2013). Our own supplementary analyses indicated that those children in Group 3 scored higher on each CD scale item than children in Group 2.

We then coded and scored these teacher- and parent-rated items for the ADHD and CD scales to identify problematic levels of that specific behavior indicator. We standardized each item to have *M* of 0 and *SD* of 1. We summed the resulting scores from the ADHD and CD scale items respectively, so that higher total scores indicated greater levels of symptomatology. Children classified as belonging to Group 1, and so not displaying ADHD-CD symptomatology, had scores on the scales that were at or below the 80th percentile. Children in Group 2 were classified as displaying moderate symptomatology if their scores on both scales were above 80th percentile, but not both above 90th percentile. Children were classified as being in Group 3 and so of displaying severe levels of symptomatology if their scores on both the ADHD and CD scales were at or above the 90th percentile. Our percentiles to identify ADHD-CD symptomatology approximate or are somewhat more conservative than prior studies (Gresham et al., 2000; Lynam, 1998). For example, Lynam (1998) used the 84th percentile to identify severe ADHD-CD symptomatology.

Predictor variables, kindergarten

Prior behavioral functioning: NCES modified the Social Skills Rating System (SSRS; Gresham & Elliot, 1990) to measure kindergarten children's behavior. We hypothesized that (a) inattention and other learning-related problem behaviors and (b) externalizing problem behaviors would predict ADHD-CD symptomatology in eighth grade. Both behaviors were rated by the children's teachers in the spring of kindergarten. Specifically, attention-related behavioral functioning was rated using the Approaches to Learning scale consisting of six items (i.e., attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization); and the Externalizing Problem Behaviors has its own scale consisting of six items (i.e., arguing, fighting, getting angry, acting impulsively, disturbing ongoing activities, and talking during quiet study time). The split-half reliabilities for the Approaches to Learning and Externalizing Problem Behaviors scales were .89 and .90, respectively. To identify those kindergarten children at risk for ADHD-CD, we used a dummy variable coded 1 if children's scores were both in the bottom 10% of the Approaches to Learning and top 10% of the Externalizing Problem Behaviors scales. Those with scores in either the top 90% of the Approaches to Learning or the bottom 90% of the Externalizing Problem Behaviors scales constituted the reference group. A 10% cut off is

conservative (e.g., Morgan et al., 2009) and should identify those displaying behavioral disorder symptomatology (Feil et al., 2005; Nelson et al., 2007).

Reading, mathematics achievement: Psychometrically-sound, untimed, item response theory (IRT)-scaled measures of reading and mathematics achievement were individually administered to the children in the spring of kindergarten (Rock, Pollock, Atkins-Burnett, Meisels, & Hausken, 2002). Respective theta reliabilities for the mathematics and reading achievement measures were .95 and .94. We used data from the kindergarten spring semester to evaluate whether low academic achievement by kindergarten increased children's risk for ADHD-CD in eighth grade using a dummy variable coded as 1 if children's scores were in the bottom 10% of the distribution of averaged scores from the reading and mathematics achievement measures following *z*-score standardization (Geary, 2011). Those in the top 90% of the averaged scores constituted the reference group. Use of a 10% is a conservative criterion should indicate clinically significant academic difficulties (e.g., Catts et al., 2001; Geary, 2011).

Socio-demographic, language use, marital status, residence: A household's SES was calculated by NCES using information about each parent's education level and occupation, as well as the family's overall household income from the spring of kindergarten survey. We divided SES into quintiles. Doing so allowed for examination of a possible non-linear relation between earlier SES and later ADHD-CD. Households in the highest SES quintile were used as the reference group. Parents identified their child's race using one of the following categories: White, non-Hispanic; Black, non-Hispanic; Hispanic; Asian; and Other. White, non-Hispanic was used as the reference group. Whether a language other than English was used at home was indicated by whether the parent completed the spring of kindergarten field interviews in another language. A mother's marital status indicated whether the child's biological mother was married when giving birth to the child, with those mothers who were married constituting the reference group. We coded for children's community type (e.g., urban) and regional (e.g., Midwest) location, using Northeast as the reference group.

Risky neighborhood, attended Head Start: Parents were asked questions about whether they lived in a risky neighborhood. Example questions included "How safe is it for children to play outside during the day in your neighborhood?" and "How much of a problem are the following in the block or area around your house or apartment," with follow-up items asking about "Garbage, litter, or broken glass in the street or road, on the sidewalks, or in yards," "Selling or using drugs or excessive drinking in public," and "violent crimes like drive-by shooting," We assigned scores and then standardized each item with *M* of 0 and *SD* of 1, summed the items, and conservatively considered total scores in the top 10% as indicating living in a risky neighborhood and those in the bottom 90% constituting the reference group (Broyles et al., 2012). In the fall of kindergarten, parents were also asked whether or not their child had attended Head Start in the year before kindergarten, with those not attending Head Start serving as the reference group.

Birth, maternal characteristics: We included birth weight as a risk factor, coded as follows: (a) normal birth weight (greater than or equal to 5 lbs. 8 oz.); (b) low birth weight, (greater than or equal to 3 lbs. but less than 5 lbs. 8 oz.); and (c) very low birth weight (less than 3 lbs.). Those born with normal birth weight were used as the reference group. Maternal characteristics included mother's age when her first child was born, whether she experienced depressive symptoms, and whether she self-reported emotional problems or drug or alcohol abuse. For mother's age, we estimated two risk factors: (a) being less than 18 when giving birth to the first child; and (b) being 35 years or older when first giving birth. Mothers who gave birth from 18 to 34 were used as the reference group. These data were collected in the fall of kindergarten. Mothers were asked 11 depression-related questions. Examples included "How often during the past week have you felt depressed?" "How often during the past week have you felt that you could not shake off the blues even with help from your family or friends?" and "How often during the past week have you felt sad?" We scored the answers (e.g., 1= "never"; 4 = "most of the time") and then standardized each item with *M* of 0 and *SD* of 1, summed scores on these items, and considered those in the top 10% of the distribution as experiencing depressive symptoms and those in the bottom 10% as not experiencing these symptoms (e.g., Betts, Williams, Najman, & Alati, 2014; Dubois-Comtois, Moss, Cyr, & Pascuzzo, 2013). To measure maternal emotional health and potential substance abuse, mothers were asked, "During the past 12 months, have you felt or has anyone suggested that you needed professional help for any emotional problem or for drug or alcohol abuse?" We coded "yes" as 1, indicating that the mother was at risk for emotional problems or drug/alcohol abuse. We also included whether the parent reported using spanking to discipline misbehavior as a risk factor. Specifically, during the spring of kindergarten, parents were asked, "Sometimes, kids mind pretty well and sometimes they don't. About how many times, if any, have you spanked (child) in the past week?" Parents who have never spanked their children served as the reference group.

Lack of routine: In the spring of kindergarten, parents were asked about consistency and routine building for their children, including number of days per week eating breakfast together, number of days child eats breakfast at regular time, number of days eating dinner together, number of days child eats dinner at regular time, and whether the child goes to bed at the same time each night. Responses to all but the last item ranged from 0 to 7. Responses to the last item were either "Has usual bedtime," or "Bedtime varies." We used the answers as scores for all but the last question, and assigned 2 for "Has usual bedtime" and 1 for "Bedtime varies." We then standardized each item with *M* of 0 and *SD* of 1, summed the scores, and considered those scores in the bottom 10% of the distribution as indicating a lack of consistent home routines. Those in the top 90% were considered to have more consistent home routines (Deater-Deckard et al., 2009) and serve as the reference group.

Missing data

Because of the ECLS-K's very large sample size and unusually long timeframe, there was some missing data from kindergarten through eighth grade. However, the ECLS-K also provided extensive information on children, their families, and their schools, including those variables that likely contributed to the missing data (e.g., SES, gender, race/ethnicity,

academic achievement). Controlling these variables (that is, treating missingness as conditional on these covariates) allowed for a reasonable assumption of missing at random (MAR), which in turn allowed the use of multiple imputation (MI) procedures to retain the largest possible number of cases in our analytical sample. Use of MI integrates uncertainty into the standard errors of imputed values by incorporating variance between imputed solutions (Acock, 2005; Allision, 2001; Rubin, 1996). Across the predictors used in these analysis, missingness ranged from 0% to 17.5%. We imputed the missing data five times to create five complete data sets, with each data set used to estimate the model parameters of interest. Second, we combined these five sets of estimates into one set of estimated values utilizing standard formulas (Rubin, 1977).

Design and data analysis

We analyzed the data using multinomial logistic regression. We used SAS Version 9.3 to do so. We report findings using conventional alpha levels (i.e., $p < .05$, .01, and .001). Table 2 displays the results of these regression analyses using odds ratios, separately by moderate (i.e., Group 2) and severe (i.e., Group 3) level of ADHD-CD symptomatology. Group 1 functioned as the regression's reference group (i.e., the reported odds ratios contrast Group 2 or Group 3 to Group 1). Each factor's odds ratio is adjusted for the other factors included in the multinomial logistic regression model and so provides a covariate-adjusted estimate of the risk uniquely attributable to each factor.

Results

Table 2 indicates that children who displayed elevated levels of attention-related and externalizing problem behaviors in kindergarten displayed greater ADHD-CD symptomatology at the end of their eighth grade year. These covariate-adjusted odds ratios for ADHD-CD syndrome are 2.37 and 3.63 for Groups 2 and 3, respectively. The observed odds ratios are higher for Group 3 than for Group 2 and so indicate that displaying high levels of attention-related and externalizing problem behaviors in kindergarten was more predictive of severe rather than moderate ADHD-CD symptomology. ADHD-CD-type symptoms by the spring of kindergarten predicted both moderate and severe levels of ADHD-CD symptomatology 8 years later at the end of middle school.

Low academic achievement in kindergarten uniquely predicted both moderate and severe levels of ADHD-CD symptomatology (covariate-adjusted *OR*s = 1.7, 2.24, respectively) by the end of middle school. This relation was evident despite statistical control for kindergarten ADHD-CD-type symptoms, as well as the study's many other predictors including the very strong risk associated with lower SES. The odds that a kindergarten child who experienced both low behavioral and academic functioning displayed severe ADHD-CD symptomatology in eighth grade were eight times greater ($3.63 \times 2.24 = 8.13$) than for an otherwise similar kindergartener who did not experience either risk factor.

Household SES displayed both a very strong and consistent predictive relation for severe ADHD-CD symptomatology. Being from the lowest SES quintile increased kindergarten-aged children's odds for otherwise similar children of being in the most severe symptom group by a factor of almost five (covariate-adjusted *OR* = 4.51). Less strong, but still

evident, was an increased risk for the most severe level of symptomatology attributable to being from any of the non-highest SES quintiles (adjusted *OR* range = 2.22 to 2.18), with increasing SES consistently predictive of decreasing risk. Being from the lowest SES quintile was also predictive of displaying moderate levels of ADHD-CD symptomatology (covariate-adjusted *OR* = 1.8).

Additional factors also increased young children's risk. Being male strongly increased the risk of both moderate and severe ADHD-CD symptom levels (covariate-adjusted *OR* = 2.98 and 3.58, respectively). Being raised by a single mother increased the risk of moderate ADHD-CD symptomatology. Being raised by a mother experiencing depressive symptoms or emotional problems or substance abuse increased the risk for severe ADHD-CD (covariate-adjusted *OR*s = 1.44, 2.07, respectively). Being spanked uniquely increased the risk of both moderate and serve ADHD symptomatology (covariate-adjusted *OR*s = 1.25 and 1.6, respectively).

Discussion

Children with ADHD-CD are at elevated risk for lower school-based functioning, including greater aggression and anger (Harty et al., 2009), delinquency (Sibley et al., 2011), antisocial behavior and psychopathy (DeLisi et al., 2007; Satterfield et al., 2007) and criminal offending (Lynam, 1996). Consequently, children with ADHD-CD likely require specialized interventions introduced by the primary grades (Satterfield et al., 2007; Sourander et al., 2007). Yet very little is currently known about which risk factors by the primary grades predict later ADHD-CD, particularly by adolescence when the relations between ADHD-CD and adulthood psychopathy and career criminality become firmly established (Farrington et al., 1990; Lynam, Miller, Vachon, Loeber, & Stouthamer-Loeber, 2009). To better inform early screening and intervention efforts by school psychologists, we identified factors measured by the end of children's kindergarten year that predicted an increased risk for moderate and severe ADHD-CD symptomatology by the end of eighth grade. Factors predictive of displaying the severest level of ADHD-CD symptoms included (a) being raised in a low SES family, (b) being male, (c) being raised by a mother experiencing depressive symptoms or emotional problems or substance abuse, (d) being spanked, and (e) experiencing both low academic and behavioral functioning. Early screening instruments for ADHD-CD should assess for these risk factors.

Also, by statistically controlling for these aforementioned risk factors, our analyses identify modifiable factors that might be directly targeted by school psychologists. The display of ADHD-CD-type symptoms and low academic achievement during kindergarten each predicted both moderate and severe levels of ADHD-CD symptomatology by the end of eighth grade, indicating that these modifiable factors constitute potential targets for school-based mental health interventions by school psychologists to lower kindergarten children's risk of experiencing adolescent ADHD-CD symptomatology. Multi-faceted interventions delivered during children's kindergarten school year that remediate both low academic and behavioral functioning may substantially lessen at-risk children's likelihood of subsequently experiencing ADHD-CD symptomatology.

Limitations

This study has several limitations. The ECLS-K data did not allow us to independently establish to what extent children met diagnostic criteria for ADHD and CD. Neither teachers nor parents were surveyed about the age of onset for the measured behaviors. The ADHD and CD scales were not designed to yield diagnoses specifically for disorder. The CD scale includes items that may index other types of disorders (e.g., “losses his or temper” for Oppositional Defiant Disorder [ODD]). However, the eighth grade ECLS-K teacher and parent behavioral rating scales do include many of the same behaviors used in DSM-5 to diagnose ADHD and CD (e.g., inattentive, easily distracted, disorganized for ADHD; bullies, fights, steals, lies for CD; American Academy of Adolescent and Child Psychiatry, 2013; American Psychiatric Association, 2013), including those used in adolescent psychopathology instruments (for a review see da Silva, Rijo, & Salekin, 2012), as well as specific psychopathic profiles (e.g., Factor 4 or Antisocial on the Psychopathy Checklist-Revised; Neumann, Hare, & Newman, 2007), and so should constitute valid indicators of ADHD and CD symptomatology.

The ECLS-K does not include a formal measure of IQ. Low IQ might explain the relation observed here for low academic achievement. However, studies of older children indicate that low academic achievement but not low IQ is a characteristic of ADHD-CD (DeLisi et al., 2007). The ECLS-K’s data collection ended once children completed eighth grade. We are therefore unable to report on the extent to which those adolescents with ADHD-CD syndrome subsequently experienced psychopathy or engaged in criminality as adults, although these relations have again been previously reported (Lynam et al., 2009; Satterfield et al., 2007).

We are also unable to report on the degree to which ADHD or CD may be most predictive of later psychopathy. Whether ADHD or CD is more predictive of psychopathy and criminality is currently unclear (Bernardi et al., 2012; Smith & Hung, 2012). It may be that CD but not ADHD increases this risk (Gudjonsson, Sigurdsson, Sigfusdottir, & Young, 2014; Lahey, Loeber, Burke, & Applegate, 2005; Mordre, Groholt, Kjelsberg, Sandstad, & Myhre, 2011), although other research reports that ADHD predicts criminality controlling for CD (de Sanctis, Nomura, Newcorn, & Halperin, 2012), and lower ADHD symptomatology is also associated with improved long-term functioning by children with CD (Lahey, Loeber, Burke, & Rathouz, 2002). The ECLS-K data are non-experimental. The data allow for scientifically derived risk factor estimates but not for unambiguous causal inferences.

Theoretical and Practical Contributions and Implications

This study contributes to the very limited knowledge base about early risk factors for later ADHD-CD symptomatology. To date, no studies have examined the relative stability of the set of traits of ADHD-CD from early-to-middle childhood (Andershed, 2010), although theoretically this might be expected to occur (Lynam et al., 2009). Our analyses suggest substantial stability in ADHD-CD syndrome, at least as indicated by the display of ADHD-CD-type symptoms by the end of kindergarten. Thus, our findings provide empirical support for early efforts to screen for and help children at risk for ADHD-CD syndrome. Our study

supports findings from other research indicating that early adverse experiences (e.g., being spanked, being parented by a depressed mother, growing up in economically disadvantaged circumstances) increases children's later risk for socio-emotional maladjustment (e.g., Bøe et al., 2014; Sevecke et al., 2009). Our study extends prior work by indicating that this relation extends to ADHD-CD symptomatology, and so might be included in early screening instruments. This is because the increased risk is evident as early as kindergarten. In contrast,, and although attending Head Start has been found to increase children's risk for lower behavioral functioning generally (Lee et al., 2014), we find no evidence that Head Start attendance increases children's long-term risk for AHDC-CD symptomatology specifically. Although racial/ethnic minorities are sometimes reported to be more likely to be identified as having behavioral disorders (e.g., Zhang, Katsiyannis, Ju, & Roberts, 2012), factors other than minority status may explain these disparities (Sullivan & Bal, 2013). Our study yields no evidence that minority children are more likely than otherwise similar White children to display ADHD-CD symptomatology, at least by eighth grade.

Our findings also help to identify potential targets of school-based mental health efforts to prevent or reduce adolescent ADHD-CD symptomatology. These factors include the onset by kindergarten of behavioral and academic difficulties. Our finding that children experiencing the early onset of both behavioral and academic difficulties are at elevated risk for psychopathy by eighth grade supports and extends prior work reporting that children experiencing both types of difficulties are more likely to be identified as disabled, drop out of high school, and to receive mental health services by 12^{th} grade (Darney, Reinke, Herman, Stormont, & Ialongo, 2013). Low academic achievement has previously been theorized to increase young children's risk for ADHD-CD (Lynam, 1996; Moffitt, 1993). A co-occurrence between ADHD-CD and lower academic achievement has been observed in adolescents (DeLisi et al., 2007). However, the relation between early low academic achievement and later maladaptive behavioral functioning has recently been characterized as spurious (Wang & Algozzine, 2011), resulting in ambiguity as to whether low academic functioning should be considered an additional risk factor as well as a potential target of early mental health intervention by school psychologists. We find low academic achievement both (a) temporally precedes ADHD-CD symptomatology and (b) remains predictive despite extensive covariate adjustment including for autoregressive-type ADHD-CD-related behaviors, thereby providing preliminary empirical support for the theorized causal relation. A mechanism thought to explain why early academic failure contributes to socio-emotional maladjustment is children's increasing use of peer social comparisons to evaluate their own academic skill level, which can result in "feelings of inferiority, lack of motivation, and interpersonal hostility" (Chapman, 1988, p. 350), and, over time, increasingly generalized feelings of anger, distractibility, peer rejection (Morgan, Farkas, & Wu, 2012), and avoidance and aggression (Morgan, Farkas, Tufis, & Sperling, 2008). That the onset of adolescent ADHD-CD symptomatology may be influenced by a socio-normative developmental mechanism despite the children's assumed impaired sensitivity to external feedback, with the aforementioned relation evident even very early in children's school careers, merits further investigation.

Conclusions

Results from our 8-year longitudinal study of a population-based sample indicate that schoolchildren who are at elevated risk for adolescent ADHD-CD can be identified as early as the kindergarten year. School-based screening, monitoring, and intervention efforts may need to target the onset of ADHD-CD-type behaviors and low academic achievement shortly after school entry. These two modifiable factors uniquely increase kindergarten children's risk of both moderate and severe ADHD-CD symptomatology in adolescence. Additional factors that are less modifiable by school psychologists but that also increase children's risk for adolescent ADHD-CD and so might be included in early screening efforts include lower SES, gender, being raised by a single mother, and being spanked. Our results provide school psychologists with previously unavailable risk factor estimates for adolescent ADHD-CD symptomatology and so inform screening and intervention efforts during a time when these efforts may most help a highly vulnerable population of children.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

Acock AC. Working with missing values. Journal of Marriage and Family. 2005; 67:1012–1028.

Allison, PD. Missing data. Thousand Oaks, CA: Sage Publications; 2001.

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5. Washington, D.C: Author; 2013.

American Academy of Child and Adolescent Psychiatry. Conduct disorder. Electronically retrieved on March. 2013; 23:2014. at http://www.aacap.org/aacap/Families_and_Youth/Facts_for_Families/Facts_for_Families_Pages/Conduct_Disorder_33.aspx.

Andershed, H. Stability and change of psychopathic traits: What do we know?. In: Salekin, RT.; Lynam, DR., editors. Handbook of child and adolescent. New York: Guilford; 2010.

Arpi E, Ferrari F. Preterm birth and behaviour problems in infants and preschool-age children: A review of the recent literature. Developmental Medicine & Child Neurology. 2013; 55:788–796. http://dx.doi.org/10.1111/dmcn.12142. [PubMed: 23521214]

Betts KS, Williams GM, Najman JM, Alati R. Maternal depressive, anxious, and stress symptoms during pregnancy predict internalizing problems in adolescence. Depression and Anxiety. 2014; 31:9–18. http://dx.doi.org/10.1002/da.22210. [PubMed: 24395339]

Biederman J, Petty CR, Dolan C, Hughes S, Mick E, Monuteaux MC, Faraone SV. The long-term longitudinal course of oppositional defiant disorder and conduct disorder in ADHD boys: Findings from a controlled 10-year prospective longitudinal follow-up study. Psychological Medicine. 2008; 38:1027–1036. http://dx.doi.org/10.1017/S0033291707002668. [PubMed: 18205967]

Blair, RJ. Subcortical brain system in psychopathy. In: Patrick, C., editor. Handbook of psychopathy. New York: Guilford; 2006. p. 296-312.

Bland JM. Statistics notes: Cronbach's alpha. BMJ. 1997; 314:572. http://dx.doi.org/10.1136/bmj.314.7080.572. [PubMed: 9055718]

Boden JM, Fergusson DM, Horwood LJ. Risk factors for conduct disorder and Oppositional/Defiant disorder: Evidence from a New Zealand birth cohort. American Academy of Child and Adolescent Psychiatry Journal. 2010; 49:1125–1133.

Bøe T, Sivertsen B, Heiervang E, Goodman R, Lundervold AJ, Hysing M. Socioeconomic status and child mental health: The role of parental emotional well-being and parenting practices. Journal of Abnormal Child Psychology. 2014; 42:705–715. http://dx.doi.org/10.1007/s10802-013-9818-9. [PubMed: 24150864]

Broyles ST, Staiano AE, Drazba KT, Gupta AK, Sothern M, Katzmarzyk PT. Elevated C-reactive protein in children from risky neighborhoods: Evidence for a stress pathway linking neighborhoods and inflammation in children. PLoS ONE. 2012; 7 http://dx.doi.org/10.1371/journal.pone.0045419.

Callender KA, Olson SL, Choe DE, Sameroff AJ. The effects of parental depressive symptoms, appraisals, and physical punishment on later child externalizing behavior. Journal of Abnormal Child Psychology. 2012; 40:471–483. http://dx.doi.org/10.1007/s10802-011-9572-9. [PubMed: 21947616]

Caspi A, Roberts BW, Shiner RL. Personality Development: Stability and Change. Annual Review of Psychology. 2005; 56:453–484.

Catts HW, Fey ME, Zhang X, Tomblin JB. Estimating the risk of future reading difficulties in kindergarten children: A research-based model and its clinical implementation. Language, Speech & Hearing Services in Schools. 2001; 32:38–50.

Centers for Disease Control. Attention-Deficit/Hyperactivity Disorder (ADHD): Symptoms and diagnosis. 2014. Retrieved from: http://www.cdc.gov/ncbddd/adhd/diagnosis.html

Chapman JW. Learning disabled children's self-concepts. Review of Educational Research. 1988; 58:347–371.

Christiansen H, Chen RD, Oades P, Asherson EA, Taylor J, et al. Co-transmission of conduct problems with attention-deficit/hyperactivity disorder: familial evidence for a distinct disorder. Journal of Neural Transmission. 2008; 115:163–175. [PubMed: 18200434]

Chronis AM, Lahey BB, Pelham J, William E, Williams SH, Baumann BL, Kipp H, Rathouz PJ. Maternal depression and early positive parenting predict future conduct problems in young children with attention-deficit/hyperactivity disorder. Developmental Psychology. 2007; 43:70–82. http://dx.doi.org/10.1037/0012-1649.43.1.70. [PubMed: 17201509]

da Silva RD, Rijo D, Salekin RT. Child and adolescent psychopathy: A state of the art reflection on the construct and etiological theories. Journal of Criminal Justice. 2012; 40:269–277.

Dalteg A, Zandelin A, Tuninger E, Levander S. Psychosis in adulthood is associated with high rates of ADHD and CD problems during childhood. Nordic Journal of Psychiatry. 2014; 68:560–566. http://dx.doi.org/10.3109/08039488.2014.892151. [PubMed: 24620816]

Darney D, Reinke WM, Herman KC, Stormont M, Ialongo NS. Children with co-occurring academic and behavior problems in first grade: Distal outcomes in twelfth grade. Journal of School Psychology. 2013; 51:117–128. http://dx.doi.org/10.1016/j.jsp.2012.09.005. [PubMed: 23375176]

de Los Reyes Alfano CA, Beidel DC. The relations among measurements of informant discrepancies within a multisite trial of treatments for childhood social phobia. Journal of Abnormal Child Psychology. 2010; 38:395–404. [PubMed: 20013046]

Deater-Deckard K, Mullineaux PY, Beekman C, Petrill SA, Schatschneider C, Thompson LA. Conduct problems, IQ, and household chaos: A longitudinal multi-informant study. Journal of Child Psychology and Psychiatry. 2009; 50:1301–1308. http://dx.doi.org/10.1111/j.1469-7610.2009.02108.x. [PubMed: 19527431]

DeLisi M, Vaughn M, Beaver KM, Barth AE, Fletcher JM. Fledgling psychopathy in the classroom: ADHD subtypes, psychopathy, and reading comprehension in a community sample of adolescents. Youth Violence and JuvenileJustice. 2007; 9:43–58.

De Sanctis VA, Nomura Y, Newcorn JH, Halperin JM. Childhood maltreatment and conduct disorder: Independent predictors of criminal outcomes in ADHD youth. Child Abuse & Neglect. 2012; 36:782–789. http://dx.doi.org/10.1016/j.chiabu.2012.08.003. [PubMed: 23146580]

Dubois-Comtois K, Moss E, Cyr C, Pascuzzo K. Behavior problems in middle childhood: The predictive role of maternal distress, child attachment, and mother-child interactions. Journal of

Abnormal Child Psychology. 2013; 41:1311–1324. http://dx.doi.org/10.1007/s10802-013-9764-6. [PubMed: 23748336]

Faraone SV, Biederman J, Jetton JG, Tsuang MT. Attention deficit disorder and conduct disorder: Longitudinal evidence for a familial subtype. Psychological Medicine. 1997; 27:291–300.10.1017/S0033291796004515 [PubMed: 9089822]

Farrington, DP.; Loeber, R.; Van Kammen, WB., et al. Long-term criminal outcomes of hyperactivity-impulsivity-attention deficit and conduct problems in childhood. In: Robins, L.; Rutter, M., editors. Straight and Devious Pathways from Childhood to Adulthood. New York: Cambridge University Press; 1990. p. 62-81.

Farrington, DP.; Ullrich, S.; Salekin, RT. Environmental influences on child and adolescent psychopath. In: Salekin, RT.; Lynam, DR., editors. Handbook of child and adolescent psychopathy. New York: Guilford; 2010. p. 202-230.

Feil EG, Small JW, Forness SR, Serna LA, et al. Using different measures, informants, and clinical cut-off points to estimate prevalence of emotional or behavioral disorders in preschoolers: Effects on age, gender, and ethnicity. Behavioral Disorders. 2005; 30:375–391.

Flory JD, Newcorn JH, Miller C, Harty S, Halperin JM. Serotonergic function in children with attention-deficit hyperactivity disorder: relationship to later antisocial personality disorder. Journal of Psychiatry. 2007; 190:410–414.

Frick PJ, Dickens C. Current perspectives on conduct disorder. Current Psychiatry Reports. 2006; 8:59–72. [PubMed: 16513044]

Frick PJ, Stickle TR, Dandreaux DM, Farrell JM, Kimonis ER. Callous-unemotional traits in predicting the severity and stability of conduct problems and delinquency. Journal of Abnormal Psychology. 2005; 33:471–487.

Friedrich, A. ProQuest Dissertations and Theses. University of South Florida; 2010. School-based mental health services: A national survey of school psychologists' practices and perceptions; p. 235Order No. 3425627

Galéra C, Côté SM, Bouvard MP, Pingault JB, Melchior M, et al. Early risk factors for hyperactivity-impulsivity and inattention trajectories from age 17 months to 8 years. Archives of General Psychiatry. 2011; 68:1267–1275. [PubMed: 22147844]

Geary DC. Consequences, characteristics, and causes of mathematical learning disabilities and persistent low achievement in mathematics. Journal of Developmental and Behavioral Pediatrics. 2011; 32:250–263.10.1097/DBP.0b013e318209edef [PubMed: 21285895]

Goldenberg RL, Cliver SP, Mulvihill FX, Hickey CA, Hoffman HJ, et al. Medical, psychosocial, and behavioral risk factors do not explain the increased risk for low birth weight among black women. American Journal of Obstetrics and Gynecology. 1996; 175:1317–1324.10.1016/S0002-9378(96)70048-0 [PubMed: 8942508]

Gresham, PM.; Elliot, SN. Social Skills Rating System. Circle Pines, MN: American Guidance Service; 1990.

Gresham FM, MacMillan DL, Bocian KM, Ward SL, Forness SR. Comorbidity of hyperactivity-impulsivity-inattention and conduct problems: Risk factors in social, affective, and academic domains. Journal of Abnormal Psychology. 1998; 26:393–406.

Gudjonsson GH, Sigurdsson JF, Sigfusdottir ID, Young S. A national epidemiological study of offending and its relationship with ADHD symptoms and associated risk factors. Journal of Attention Disorders. 2014; 18:3–13. http://dx.doi.org/10.1177/1087054712437584. [PubMed: 22522573]

Harpin VA. The effect of ADHD on the life of an individual, their family, and community from preschool to adult life. Archives of Disease in Childhood. 2005; 90:i2–i7. [PubMed: 15665153]

Harty SC, Miller CJ, Newcorn JH, Halperin JM. Adolescents with childhood ADHD and comorbid disruptive behavior disorders: Aggression, anger, and hostility. Child Psychiatry and Human Development. 2009; 40:85–97. [PubMed: 18597170]

Hosterman SJ, DuPaul GJ, Jitendra AK. Teacher ratings of ADHD symptoms in ethnic minority students: Bias or behavioral difference? School Psychology Quarterly. 2008; 23:418–435. http://dx.doi.org/10.1037/a0012668.

Johansson P, Kerr M, Andershed H. Linking adult psychopathy with childhood hyperactivity-impulsivity- attention problems and conduct problems through retrospective self-reports. Journal of Personality Disorders. 2005; 19:94–101. [PubMed: 15899723]

Johnson S, Hollis C, Marlow N, Simms V, Wolke D. Screening for childhood mental health disorders using the Strengths and Difficulties Questionnaire: the validity of multi-informant reports. Developmental Medicine and Child Neurology. 2010; 56:453–459.10.1111/dmcn.12360 [PubMed: 24410039]

Korsch F, Petermann F. Agreement between parents and teachers on preschool children's behavior in a clinical sample with externalizing behavioral problems. Child Psychiatry and Human Development. 2013; 45:617–647. http://dx.doi.org/10.1007/s10578-013-0430-6. [PubMed: 24363143]

Kuhne M, Schachar R, Tannock R. Impact of comorbid oppositional or conduct problems on attention-deficit hyperactivity disorder. Journal of the American Academy of Child and Adolescent Psychiatry. 1997; 36:1715–1725. [PubMed: 9401333]

Lahey BB, Loeber R, Burke JD, Applegate B. Predicting future antisocial personality disorder in males from a clinical assessment in childhood. Journal of Consulting Clinical Psychology. 2005; 73:389–399. [PubMed: 15982137]

Lahey BB, Loeber R, Burke J, Rathouz PJ. Adolescent outcomes of childhood conduct disorder among clinic-referred boys: predictors of improvement. Journal of Abnormal Child Psychology. 2002; 30:333–348. [PubMed: 12108765]

Langley K, Holmans PA, van den Bree Marianne BM, Thapar A. Effects of low birth weight, maternal smoking in pregnancy and social class on the phenotypic manifestation of Attention Deficit Hyperactivity Disorder and associated antisocial behaviour: Investigation in a clinical sample. BMC Psychiatry. 2007; 7:26–34. [PubMed: 17584500]

Larsson H, Andershed H, Lichtenstein P. A genetic factor explains most of the variation in the psychopathic personality. Journal of Abnormal Psychology. 2006; 115:221–230. [PubMed: 16737387]

Larsson H, Dilshad R, Lichtenstein P, Barker ED. Developmental trajectories of DSM-IV symptoms of attention-deficit/hyperactivity disorder: Genetic effects, family risk and associated psychopathology. Journal of Child Psychology and Psychiatry and Allied Disciplines. 2011; 52:954–963. http://dx.doi.org/10.1111/j.1469-7610.2011.02379.x.

Lee R, Zhai F, Brooks-Gunn J, Han W, Waldfogel J. Head Start participation and school readiness: Evidence from the Early Childhood Longitudinal Study–Birth Cohort. Developmental Psychology. 2014; 50:202–215. http://dx.doi.org/10.1037/a0032280. [PubMed: 23527496]

Lynam DR. Early identification of chronic offenders: Who is the fledgling psychopath? Psychological Bulletin. 1996; 120:209–234. [PubMed: 8831297]

Lynam DR. Pursuing the psychopath: Capturing the fledgling psychopath in a nomological net. Journal of Abnormal Psychology. 1997; 106:425–438. [PubMed: 9241944]

Lynam DR. Early identification of the fledgling psychopath: Locating the psychopathic child in the current nomenclature. Journal of Abnormal Psychology. 1998; 107:566–575. [PubMed: 9830244]

Lynam DR, Charnigo R, Moffitt TE, Raine A, Loeber R, Stouthamer-Loeber M. The stability of psychopathy across adolescence. Development and Psychopathology. 2009; 21:1133–1153. http://dx.doi.org/10.1017/S0954579409990083. [PubMed: 19825261]

Lynam DR, Miller DJ, Vachon D, Loeber R, Stouthamer-Loeber M. Psychopathy in adolescence predicts official reports of offending in adulthood. Youth Violence and Juvenile Justice. 2009; 7:189–2007. [PubMed: 22661910]

Maughan B, Rowe R, Messer J, Goodman R, Meltzer H. Conduct Disorder and Oppositional Defiant Disorder in a national sample: Developmental epidemiology. Journal of Child Psychology and Psychiatry. 2004; 45:609–621. [PubMed: 15055379]

Merrell KW, Buchanan R. Intervention selection in school-based practice: Using public health models to enhance systems capacity of schools. School Psychology Review. 2006; 35:167–180.

Michonski JD, Sharp C. Revisiting Lynam's notion of the "fledgling psychopath": are HIA-CP children truly psychopathic-like? Child and Adolescent Psychiatry and Mental Health. 2010; 4:4–24. [PubMed: 20205823]

Moffitt TE. The neuropsychology of juvenile delinquency: A critical review. Crime and Justice. 1990; 12:99–170.

Moffitt TE. The neuropsychology of conduct disorder. Development and Psychopathology. 1993; 5:135.

Moffitt TE, Caspi A, Harrington H, Milne BJ. Males on the life-course-persistent and adolescence-limited antisocial pathways: Follow-up at age 26 years. Development & Psychopathology. 2002; 14:179–207. [PubMed: 11893092]

Mordre M, Groholt B, Kjelsberg E, Sandstad B, Myhre AM. The impact of ADHD and conduct disorder in childhood on adult delinquency: A 30 years follow-up study using official crime records. BMC Psychiatry. 2011; 11 http://dx.doi.org/10.1186/1471-244X-11-57.

Morgan PL, Farkas G, Tufis PA, Sperling RA. Are reading and behavior problems risk factors for each other? Journal of Learning Disabilities. 2008; 41:417–436. [PubMed: 18768774]

Morgan PL, Farkas G, Wu Q. Kindergarten predictors of recurring externalizing and internalizing psychopathology in 3rd and 5th grade. Journal of Emotional and Behavioral Disorders. 2009; 17:67–79. [PubMed: 26273183]

Morgan PL, Farkas G, Wu Q. Do poor readers feel angry, sad, and unpopular? Scientific Studies of Reading. 2012; 16:360–381. [PubMed: 26180489]

Munoz LC, Frick PJ. Callous-unemotional traits and their implication for understanding and treating aggressive and violent youths. Criminal Justice and Behavior. 2012; 39:794–813.

Murray J, Farrington DP. Risk factors for conduct disorder and delinquency: Key findings from longitudinal studies. Canadian Journal of Psychiatry. 2010; 55:633–642. [PubMed: 20964942]

National Association of School Psychologists. School psychologists: Providing mental health services to improve the lives and learning of children and youth. 2014. Retrieved from: http://www.nasponline.org/advocacy/mhbrochure.aspx

Nelson JR, Stage S, Duppong-Hurley K, Synhorst L, Epstein MH. Risk factors predictive of the problem behavior of children at risk for emotional and behavioral disorders. Exceptional Children. 2007; 73:367–379.

Neumann CS, Hare RD, Newman JP. The super-ordinate nature of the psychopathy checklist-revised. Journal of Personality Disorders. 2007; 21:102–117. [PubMed: 17492916]

O'Neill S, Schneiderman RL, Rajendran K, Marks DJ, Halperin JM. Reliable ratings or reading tea leaves: Can parent, teacher, and clinician behavioral ratings of preschoolers predict ADHD at age six? Journal of Abnormal Child Psychology. 2014; 42:623–634. http://dx.doi.org/10.1007/s10802-013-9802-4. [PubMed: 24085388]

Power TJ, Andrews TJ, Eiraldi RB, Doherty BJ, Ikeda MJ, DuPaul GJ, Landau S. Evaluating attention deficit hyperactivity disorder using multiple informants: The incremental utility of combining teacher with parent reports. Psychological Assessment. 1998; 10:250–260. http://dx.doi.org/10.1037/1040-3590.10.3.250.

Reinke WM, Stormont M, Herman KC, Puri R, Goel N. Supporting children's mental health in schools: Teacher perceptions of needs, roles, and barriers. School Psychology Quarterly. 2011; 26(1):1–13. http://dx.doi.org/10.1037/a0022714.

Riddle MA, Yershova K, Lazzaretto D, Paykina N, Yenokyan G, Greenhill L, Posner K. The preschool attention-Deficit/Hyperactivity disorder treatment study (PATS) 6-year follow-up. Journal of the American Academy of Child & Adolescent Psychiatry. 2013; 52:264–278. e2.10.1016/j.jaac.2012.12.007 [PubMed: 23452683]

Rock, DA.; Pollack, JM.; Atkins-Burnett, S.; Meisels, SJ.; Hausken, EG. Early Childhood Longitudinal Study-Kindergarten Class of 1998–99 (ECLS-K), Psychometric Report for Kindergarten Through First Grade. U.S. Department of Education, Office of Educational Research and Improvement; 2002.

Rothenberger A, Banaschewski T, Heinrich H, Moll GH, Schmidt MH, van't Klooster B. Comorbidity in ADHD-children: Effects of coexisting conduct disorder or tic disorder on event-related brain potentials in an auditory selective-attention task. European Archives of Psychiatry and Clinical Neuroscience. 2000; 250:101–110.10.1007/s004060070042 [PubMed: 10853926]

Rowe R, Costello EJ, Angold A, Copeland WE, Maughan B. Developmental pathways in Oppositional Defiant Disorder and Conduct Disorder. Journal of Abnormal Psychology. 2010; 119:726–738.10.1037/a0020798 [PubMed: 21090876]

Rowe R, Maughan B, Pickles A, Costello EJ, Angold A. The relationship between DSM-IV oppositional defiant disorder and conduct disorder: Findings from the Great Smoky Mountains Study. Journal of Child Psychology and Psychiatry and Allied Disciplines. 2002; 43:365–373.10.1111/1469-7610.00027

Rubin DB. Formalizing subjective notions about the effect of nonrespondents in sample surveys. Journal of the American Statistical Association. 1977; 72:538–543.

Rubin DB. Multiple imputation after 181 years. Journal of the American Statistical Association. 1996; 91:473–489.

Satterfield JH, Faller KJ, Crinella FM, Schell AM, Swanson JM, Homer LD. 30-year prospective follow-up study of hyperactive boys with conduct problems: Adult criminality. Journal of the American Academy of Child and Adolescent Psychiatry. 2007; 46:601–610. [PubMed: 17450051]

Satterfield JH, Schell A. A prospective study of hyperactive boys with conduct problems and normal boys: Adolescent and adult criminality. Journal of the American Academy of Child and Adolescent Psychiatry. 1997; 36:1726–1735. [PubMed: 9401334]

Schubiner H, Tzelepis A, Milberger S, Lockhart N, Kruger M, Kelley BJ, Schoener EP. Prevalence of attention-deficit/hyperactivity disorder and conduct disorder among substance abusers. Journal of Clinical Psychiatry. 2000; 61:244–251.10.4088/JCP.v61n0402 [PubMed: 10830144]

Sevecke K MD, Lehmkuhl G, Krischer MK. Examining relations between psychopathology and psychopathy dimensions among adolescent female and male offenders. European Child & Adolescent Psychiatry. 2009; 18:85–95. http://dx.doi.org/10.1007/s00787-008-0707-7. [PubMed: 18807112]

Servera M, Lorenzo-Seva U, Cardo E, Rodriguez-Fornells A, Burns GL. Understanding trait and sources effects in attention deficit hyperactivity disorder and oppositional defiant disorder rating scales: Mothers', fathers', and teachers' ratings of children from the Balearic islands. Journal of Clinical Child and Adolescent Psychology. 2010; 39:1–11.10.1080/15374410903401187 [PubMed: 20390794]

Sibley MH, Pelham WE, Molina BSG, Gnagy EM, Waschbusch DA, Biswas A, Karch KM. The delinquency outcomes of boys with ADHD with and without comorbidity. Journal of Abnormal Child Psychology. 2011; 39:21–32. http://dx.doi.org/10.1007/s10802-010-9443-9. [PubMed: 20697799]

Smith CS, Hung LC. The relative influence of conduct problems and attention-deficit hyperactivity disorder in the development of adolescent psychopathy. Aggression and Violent Behavior. 2012; 17:575–580.

Sourander A, Jensen P, Davies M, Niemelae S, Elonheimer H, et al. Who is at greatest risk of adverse long-term outcomes? The Finnish from a Boy to a Man Study. Journal of the American Academy of Child and Adolescent Psychiatry. 2007; 46:1148–1161. [PubMed: 17712238]

Splett JW, Fowler J, Weist MD, McDaniel H, Dvorsky M. The critical role of school psychology in the school mental health movement. Psychology in the Schools. 2013; 50:245–258.

Strein W, Hoagwood K, Cohn A. School psychology: A public health perspective I. prevention, populations, and, systems change. Journal of School Psychology. 2003; 41:23–38. http://dx.doi.org/10.1016/S0022-4405(02)00142-5.

Sullivan AL, Bal A. Disproportionality in special education: Effects of individual and school variables on disability risk. Exceptional Children. 2013; 79:475–494.

Thapar A, Harrington R, McGuffin P. Examining the comorbidity of ADHD-related behaviours and conduct problems using a twin study design. British Journal of Psychiatry. 2001; 179:224–229. [PubMed: 11532799]

Trentacosta CJ, Hyde LW, Goodlett BD, Shaw DS. Longitudinal prediction of disruptive behavior disorders in adolescent males from multiple risk domains. Child Psychiatry and Human Development. 2013; 44:561–72. http://dx.doi.org/10.1007/s10578-012-0349-3. [PubMed: 23239427]

Trobia, A. Cronbach's alpha. In: Lavrakas, P., editor. Encyclopedia of survey research Methods. Thousand Oaks, California: SAGE Publications; 2008. p. 169-171.

Vaughn MG, DeLisi M. Were Wolfgang's chronic offenders psychopaths? On the convergent validity between psychopathy and career criminality. Journal of Criminal Justice. 2008; 36:33–42.

Wang C, Algozzine B. Rethinking the relationship between reading and behavior in early elementary school. The Journal of Educational Research. 2011; 104:100–109.

Waschbusch DA. A meta-analytic examination of comorbid hyperactive-impulsive-attention problems and conduct problems. Psychological Bulletin. 2002; 128:118–150. [PubMed: 11843545]

Widiger TA, De Clerq B, De Fruyt F. Childhood antecedents of personality disorder: An alternative perspective. Development and Psychopathology. 2009; 21:771–791. [PubMed: 19583883]

Zepf FD, Holtmann M, Stadler C, Demisch L, Schmitt M, et al. Diminished serotonergic functioning in hostile children with ADHD: tryptophan depletion increases behavioural inhibition. Pharmacopsychiatry. 2008; 41:60–65. [PubMed: 18311686]

Zhang D, Katsiyannis A, Ju S, Roberts E. Minority representation in special education: 5-year trends. Journal of Child and Family Studies. 2014; 23:118–127.

Table 1

Descriptive statistics of the study's kindergarten and eighth grade samples

	Children Participating, Spring Kindergarten (N = 21,409)	Children Participating, the End of Eighth Grade (N = 7,456)
	Percentage	**Percentage**
Attention-related and Externalizing Problem Behaviors	3.83%	2.52%
Male	51.18%	50.39%
SES		
Lowest Quintile	18.76%	13.24%
Second Lowest Quintile	19.38%	17.16%
Middle Quintile	19.78%	19.07%
Second Highest Quintile	20.52%	23.20%
Highest Quintile	21.57%	27.33%
Race		
White, non-Hispanic	55.21%	65.89%
Black, non-Hispanic	15.09%	9.00%
Hispanic	17.91%	15.53%
Asian	6.39%	4.74%
Other race/ethnicity	5.40%	4.84%
Marital Status		
Single	33.07%	22.84%
Location Type		
Central city	41.02%	34.52%
Urban fringe and large town	38.27%	38.80%
Small town and rural	20.01%	26.11%
Region		
Northeast	18.29%	19.30%
Midwest	24.58%	29.67%
South	33.14%	31.67%
West	23.30%	18.80%
Risky Area	15.20%	13.25%
Attended Head Start	16.76%	12.43%
Birth Characteristics		
Very low birth weight	0.78%	0.74%
Low birth weight	6.65%	5.92%
Maternal Characteristics		
Mother's age < 18	13.86%	9.46%
Mother's age >= 35	3.84%	4.72%
Depressive Symptoms	10.00%	8.64%
Emotional Problem or Drug/Alcohol abuse	5.16%	4.70%
Parenting Style		
Lack of routine	9.96%	9.19%

	Children Participating, Spring Kindergarten (N = 21,409)	Children Participating, the End of Eighth Grade (N = 7,456)
	Percentage	**Percentage**
Spanking	27.09%	25.31%
Interview Language		
English	92.25%	93.13%
Language other than English	7.75%	6.87%

Table 2

Multinomial logit analysis of spring of eighth grade ADHD-CD, spring of kindergarten predictors

	Group 2[a]	Group 3[a]
	Moderate Comorbid ADHD-CD Symptomatology	**Severe Comorbid ADHD-CD Symptomatology**
Frequent Attention-Related and Externalizing Problem Behaviors	2.37 ***	3.63 ***
Low Academic Achievement	1.7 ***	2.24 ***
Male	2.98 ***	3.58 ***
SES		
Lowest Quintile	1.8 **	4.51 ***
Second Lowest Quintile	1.21	2.81 ***
Middle Quintile	1.3	2.56 ***
Second Highest Quintile	1.05	2.22 ***
Race		
Black, non-Hispanic	0.94	1.08
Hispanic	1.17	0.93
Asian	0.4 *	0.07 **
Others	0.83	0.97
Marital Status		
Single	1.53 ***	1.64
Location Type		
Urban fringe and large town	0.93	0.9
Small town and rural	1.08	0.83
Region		
Midwest	1.05	1.26
South	1.12	1.34
West	0.87	1.15
Risky Area	0.96	1.03
Attended Head Start	1.1	0.99
Birth Characteristics		
Very low birth weight	1.45	2.45
Low birth weight	0.96	1.18
Maternal Characteristics		
Mother’s age < 18	1.1	1.45
Mother’s age >= 35	1.25	1.15
Depressive Symptoms	1.37	1.44 *
Emotional problem or drug/alcohol abuse	1.43	2.07 **
Parenting Style		
Lack of routine	1.32	1.2

	Group 2[a]	Group 3[a]
	Moderate Comorbid ADHD-CD Symptomatology	**Severe Comorbid ADHD-CD Symptomatology**
Spanking	1.25 *	1.6 ***
Interview Language Other than English	0.89	0.61

Note.

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$.

[a] Results shown in reference to Group 1, or those Eighth grade children rated as not being in both the "worst" 80% or above in the distribution of scores on the ADHD and CD subscales.