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Children's Inattention and Hyperactivity, Mother's Parenting, and Risk Behaviors in Adolescence: A 10-Year Longitudinal Study of Chilean Children

Theodora Nelson, MD^a, Patricia East, PhD^a, Jorge Delva, PhD^b, Betsy Lozoff, MD^c, and Sheila Gahagan, MD^{a,c}

^aDivision of Academic General Pediatrics, Department of Pediatrics, University of California, San Diego, La Jolla, CA

^bSchool of Social Work, Boston University, Boston, MA

^cCenter for Human Growth and Development, University of Michigan, Ann Arbor, MI

Abstract

Objective: To examine how mothers' nurturant and, separately, hostile parenting mediates the effects of young children's inattentiveness and hyperactivity on risk behaviors in adolescence.

Method: Data were analyzed from 920 healthy Chilean children, studied at 5½, 10 years and adolescence. Children's hyperactivity and inattentiveness at 5½ years were assessed by mother-ratings on the Children's Adaptive Behavior Inventory. Mothers' nurturance and hostility toward the child at 10 years were assessed by maternal interview on the Home Observation for Measurement of the Environment. Youth's delinquent and aggressive behaviors in adolescence were compiled from the Youth Self-Report questionnaire and youth's substance use in adolescence was assessed by an extensive self-report substance use inventory. Structural equation modeling was used to identify direct and indirect effects.

Results: Findings supported a mediating effect, with more severe child hyperactivity at age 5½ years leading to mothers' greater hostility toward her child at age 10 which, in turn, led to greater delinquency and aggression in adolescence. Marginal mediating effects were also found from child hyperactivity and inattention at 5½ years to mothers' lower nurturance at 10 years to youth substance use in adolescence.

Conclusion: Mothers' hostile treatment of children with hyperactive or inattentive behaviors contributed to adolescent risk behaviors and are areas of intervention.

Keywords

inattention; hyperactivity; punitive parenting; adolescent substance use; adolescent delinquency

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Correspondence: Dr. Theodora Nelson, Department of Pediatrics, University of California, San Diego, 9500 Gilman Drive, Mail Code 0927, La Jolla, CA 92093-0927., Fax: 619-681-0666, tnelson@gmail.com.

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Attention deficit hyperactivity disorder (ADHD) is the most common neuro-developmental disorder of childhood, with prevalence estimates as high as 10-11%.¹ Seventy percent of school-age children with ADHD continue to have ADHD in adolescence.² * The impulsive, disinhibited and novelty-seeking nature of ADHD, especially in those with hyperactive/impulsive and combined subtypes, tends to lend itself to poor decision making and engagement in risky behaviors.^{3,4} Children with hyperactivity are at higher risk for substance use, antisocial activity, and aggression as they move into young adulthood.⁵ This risk increases with the severity of hyperactive symptoms.⁵ Adolescents with ADHD, all subtypes, have increased risk for alcohol use and substance abuse, even after controlling for symptoms associated with conduct disorder and oppositional defiant disorder.⁶

The relationship between parent and child plays an important role in the formation of child development and behavior. The ways in which a parent interacts with their child can serve as a scaffolding for child rearing including socio-emotional development. A positive, nurturant parenting style involves affectionate and engaging parental responsiveness, whereas hostile parenting is characterized by harsh punishment, loss of temper and annoyance. Parenting children and adolescents with ADHD might be expected to be different from parenting typically developing children. Children with predominantly hyperactive ADHD subtype have been shown to have associated intrusive and demanding characteristics that can have a negative impact on their parents and other family members.⁷ Parents of children with ADHD combined and inattentive subtypes, are known to feel more stress and less competence in their parenting skills than parents of non-affected children.⁸ They are also more prone to using punitive disciplinary methods, are more controlling of their child's behavior, and less responsive to their child's good behaviors.^{9, 10} Hostile parenting practices are less likely to provide emotional support or appropriate modeling and can exacerbate the child's behavior problems. Their children's challenging behaviors, in turn, can affect the way in which a parent responds, and a negative cycle is established.¹¹ Over time, such harsh parenting practices can further impair ADHD children's ability to socialize and have also been linked to poorer outcomes.¹² For example, lower levels of paternal warmth have been associated with more problematic social behavior and lower levels of peer acceptance among boys with ADHD, combined type.¹³ Conversely, nurturant parenting models more adaptive strategies, increases self-regulation and is associated with fewer risk-taking behaviors in children with ADHD.¹² Positive relationships between mothers and their children with ADHD have been shown to buffer against functional impairments, with warm and consistent parenting of ADHD children related to children's more prosocial behavior.^{14,15}

While extensive research has focused on the parenting of ADHD children, less is known about the effects of different parenting styles on community-based populations of children who have a continuum of hyperactive and inattentive symptoms. Furthermore, no longitudinal study of which we are aware has examined how parenting style might influence the outcomes of children's hyperactive and inattentive behaviors in adolescence. The current study addresses these issues using data from a relatively large community sample of healthy children followed from age 5½ years to adolescence. We tested three hypotheses. First, we

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*Studies which denoted specific ADHD subtypes will be specified. Otherwise, if not mentioned, the subtype was not specified in the referenced paper.

hypothesized that the severity of inattentive and hyperactive behaviors at age 5½ years would relate to mothers' lower nurturance and, separately, greater hostility toward the child at age 10. Second, we hypothesized that mothers' lower nurturance and higher hostility at 10 years would relate to children's risk behaviors in adolescence. Risk behaviors studied were substance use, delinquency and aggression. Third, we hypothesized that mothers' nurturance and hostility would mediate the association between children's inattention and hyperactivity in early childhood and their risk behaviors in adolescence. That is, we expected that mothers' nurturance following children's hyperactivity and inattention would lead to lower levels of risk behaviors in adolescence, whereas mothers' hostility following children's hyperactivity and inattention would lead to more problematic risk behaviors in adolescence. The analytic model that guided this study is shown in Figure 1.

METHODS

Participants and Study Design

Participants were 920 youth (53% male), studied since infancy as part of an iron-deficiency anemia preventive trial and follow-up study in Santiago, Chile.¹⁶ Table 1 displays descriptive information about the sample and the study variables. The study originally involved 1,657 infants recruited from community clinics in Santiago, Chile between 1991 and 1996. All infants were born healthy at term (birth weight ≥ 3.0 kg), had no perinatal complications or acute or chronic illnesses, and were from generally lower-middle class families. Most mothers had a 9th-grade education (9 years of schooling were compulsory in Chile at the time of the study).

Data for this study were derived from follow-ups of the children at ages 5½ years, 10 years, and adolescence ($M_{age} = 14.4$ years; range 11.9-17.8). At 5½ years, 888 children from two of the three randomized groups from the preventive trial were assessed. (Recruitment was limited due to funding constraints.) At subsequent follow-ups (age 10 and adolescence), funding allowed recruitment from the entire original sample. At 10 years, 1,127 of the study children and their mothers participated. And, at adolescence, 1,119 youth completed assessments of their aggression, delinquent behaviors, and substance use. The 920 youth who had data from at least two of the three study time points form the sample for the current analyses. These 920 participants had good coverage on all model variables (missingness 20%, see Table 1). There were no differences between the 920 children in the current analytic sample and the original sample of 1,657 regarding child sex, number of children in the household, family stress, mothers' educational level, maternal IQ, maternal age, maternal depression, or any of the model variables (severity of children's inattention or hyperactivity behaviors, mothers' nurturance or punitiveness, etc.). However, compared to children who were not part of the current analytic sample, those who were studied here were less likely to have received iron supplementation in infancy, were from somewhat lower socioeconomic families, were moderately younger at the adolescent follow-up, and slightly less likely to be iron sufficient in infancy ($p < .06$). These factors were controlled in all analyses (see Covariates section below).

Procedure

The study procedures at the 5½ -year, 10-year, and adolescent follow-ups were approved by the Human Research Protection Boards at the involved universities. Signed informed consent was obtained from parents at each time point for their and their child's participation, signed assent was obtained from children at 10 years and adolescence. At the adolescent follow-up, youth completed an interviewer-administered questionnaire in a private room, which was administered by a Chilean psychologist, trained in the administration of the questionnaire.

Measures

At all study time points, Spanish versions of the study measures were used. The measures were extensively pilot-tested with the population under investigation prior to conducting the study and had good reliability and high equivalence to the English-language versions. Measures administered at the adolescent follow-up were back-translated to verify comparability with the English version. All Cronbach's coefficient alphas (α) reported derived from the current sample.

Child inattention and hyperactivity at 5½ years.—Mothers completed the Children's Adaptive Behavior Inventory (CABI), which includes multiple questions about the frequency of children's inattentive and hyperactive behaviors.¹⁷ The CABI was developed on a normal sample of children, has good predictive validity and high correlations between parent and teacher ratings of a child. The CABI also has less pathological scales compared to other child behavior surveys and therefore, may be more sensitive to subtle behaviors.¹⁷ To form scales for hyperactivity and inattention, we included items from the CABI that corresponded to items on the Vanderbilt Attention-Deficit Hyperactivity Disorder Parent Rating Scale (VADPRS),¹⁸ which has excellent psychometric properties and has been recommended by the American Academy of Pediatrics to assess attention and hyperactivity disorders in children.¹⁹ The six inattention items that were consistent with the VADPRS and included on the CABI were: *has trouble concentrating*, *gets distracted easily*, *loses interest in activities*, *works cautiously* (reversed), *is a good listener* (reversed), and *follows directions* (reversed) ($\alpha = .70$). There were also six hyperactive items that overlapped between the CABI and the VADPRS: *is restless*, *is intrusive*, *has a hard time waiting if wants something*, *is loud/yells/talks too much*, *is calm* (reversed) and *is willing to wait their turn* (reversed) ($\alpha = .60$). Response options were *never* (coded as 1), *rarely* (2), *repeatedly* (3), and *most of the time* (4). Scores were summed to yield a possible score range of 6 - 24 for inattention and 6 - 24 for hyperactivity, with higher scores reflecting more frequent inattentive and hyperactive behaviors. This scoring of the CABI items was not intended to indicate a clinical diagnosis of ADHD, but rather to indicate the severity of inattentive and hyperactive symptoms.

Mothers' nurturance and hostility at the 10-year follow up.—Mothers were interviewed on the Home Observation for Measurement of the Environment Inventory-Elementary Age version (HOME-E) to assess their nurturance and hostility toward their child.²⁰ The HOME is one of the most widely used measures evaluating the quantity and quality of stimulation, support and nurturance of the child in the family environment. The

HOME-E is sensitive to variations in family life, including Latin American countries.²⁰ The HOME-E's 10-item emotional and verbal responsivity scale was used to index maternal nurturance (e.g., "mother has praised child at least twice during the past week," "mother's voice conveys positive feelings when speaking of child"; Cronbach alpha= .56). Three items on the HOME-E were reverse coded to indicate mother's hostility directed toward the child: "mother has lost her temper with the child more than once during the previous week," "mother reports one or more instances of physical punishment during the past month," and "mother expresses overt annoyance with or hostility toward the child (e.g., complains, describes the child as 'bad,' says child won't mind"; Cronbach alpha= .54). Each item was scored as *present* (1) or *absent* (0) and summed, with the total nurturance score ranging from 0 to 10 and the total hostility score ranging from 0 to 3. Higher scores indicate more nurturance and hostility directed toward the child, respectively.

Substance use in adolescence.—Youth completed an extensive substance use inventory derived from the Monitoring the Future study, in which they responded to questions about their use of cigarettes, alcohol, and marijuana.²¹ All youth were assured of the confidentiality of their responses. Separate scores were derived for early use, regular use, and problematic use of each substance. Early use was defined as age of onset ≤ 14 years. Regular use was defined as smoked ≥ 10 days within the last month for cigarette use, drank ≥ 3 days within the last month for alcohol use, and used/smoked ≥ 2 occasions within the last month for marijuana use. Youth also responded to 14 questions about problems resulting from each of their cigarette, alcohol, and marijuana use (e.g., "*Has your use of marijuana [cigarettes, alcohol] ... hurt your relationship with your parents; hurt your school or job performance; caused physical health problems?*"). Participants who reported at least 3 problems associated with their substance use received a score of 1 for problem use. Scores were summed within substance, resulting in a possible score range of 0 to 3, with one point for each of the following: early use, regular use, and problem use. These scores were used as latent variables indexing participants' substance use at adolescence.

Delinquent and aggressive behaviors at adolescence.—Self-report ratings on the Youth Self-Report Checklist (YSR)²² rule-breaking scale were used to assess delinquent-like behaviors (12 items; e.g., *lies, cheats, steals, cuts class*; $\alpha = .75$). Response options ranged from *not true* (coded as 0) to *very true or often true* (2). Scores were summed to yield a possible score range of 0-24. The aggressive scale on the YSR was used to index aggression (17 items; e.g., *I am mean to others*; $\alpha = .81$; range 0 - 34). The YSR rule-breaking and aggression scales were used as latent variables to index youths' deviant behaviors in adolescence.

Covariates.—Analyses examined several child, parent, and family characteristics known to be related to the study variables. Correlational results determined final covariate selection. Children's inattention and hyperactivity had the following covariates: child sex, child age at the 5½ -year assessment, infant iron status (coded as iron sufficient [0] or iron deficient [1]), whether iron supplementation was given at infancy as part of the preventive trial (yes, no), number of children in the home < 15 years, mothers' age and depressive symptoms (Center for Epidemiologic Studies-Depression Scale; 20 items; e.g. I felt sad, I felt depressed; $\alpha = .$

90),²³ family socioeconomic status (assessed by parent ratings on 13 items of the Graffar Social Classification instrument; e.g. parental occupation, education, quality of housing),²⁴ and family stress (assessed by maternal ratings on 30 items of the Social Readjustment Rating Scale; e.g. death of a family member, chronic illness of a family member and or marital separation; $\alpha = .91$).²⁵ A score of children's hostile behaviors at age 5½ was considered as a covariate on child inattention and hyperactivity (5 items by maternal report on the CABI: e.g. child is mean to others, takes things that are not his/hers, fights with other children) but was nonsignificant ($p > .60$), and subsequently excluded. Mothers' nurturant and hostile parenting had the following covariates: child sex, mothers' educational level, mothers' IQ (Wechsler Adult Intelligence Scale -III; designed to measure intelligence and cognitive ability in adults), mothers' depressive symptoms, number of children in the home, fathers' presence in the home, and family stress. Youths' drug use and deviant behaviors had the following covariates: child sex, age at the adolescent assessment, family socioeconomic status, and family stress. Breastfeeding at 6 months, father absence and number of adults in the home were also considered as covariates but did not relate to any of the study variables and were not considered further.

Analytic Strategy

Structural equation modeling (SEM) using Mplus 6.0 was used to evaluate our conceptual model (Figure 1).²⁶ Model fit was determined by reviewing indices of good model fit,²⁶ including a nonsignificant chi-square, comparative fit index (CFI) $> .90$, root mean square error of approximation (RMSEA) $< .06$, and the standardized root mean square residual (SRMR) $< .08$. Mediation was tested using the INDIRECT command within Mplus, which estimates indirect effects with the delta method standard errors.²⁶ Mplus utilizes the full information maximum likelihood (FIML) feature, which retains all cases and incorporates measures that support missing completely at random. Analyses were conducted using maximum likelihood estimators (MLR), which are robust to non-normality. We also tested whether the strength of relations in the model differed by child sex by conducting an omnibus test using multiple-group analyses, which compares a baseline model where all paths are constrained to be equal across gender to a model where all paths are allowed to vary freely. A chi-square difference test was then used to assess the equivalence of the fully constrained model to the fully unconstrained model. If significant, it can be concluded that one or more parameters are significantly different for boys and girls. Given their expected association, the within-time variables were correlated *a priori*.

RESULTS

The correlations among all model variables are shown in Table 2. Results show that children's frequent inattentive and hyperactive behaviors at age 5½ were related to mothers' low nurturance and high hostile parenting behaviors at age 10. Similarly, mothers' hostile parenting at age 10 years was related to children's aggression and delinquency in adolescence. The significant but moderate association between children's inattentive and hyperactive behaviors ($r=.36$) indicates that they are measuring distinct yet related aspects of child behavior.

The results of the SEM analysis are shown in Figure 2. The model had good fit ($\chi^2 [101] = 163.52$, $p < .001$, CFI = .963, RMSEA = .026, SRMR = .022), and the individual factor loadings for the two endogenous variables were significant (.59 - .95, $p < .001$). The omnibus chi-square difference test was nonsignificant for the multiple group analyses comparing model paths for males and females ($\chi^2 [42] = 53.84$, $p = .10$), indicating that the relations in the model did not differ by child sex.

The path coefficients shown in Figure 2 indicate that children's more severe inattention and hyperactivity at 5½ years were related to mothers' lower nurturance at 10 years, and mothers' low nurturance was related to youths' more frequent and problematic substance use and deviant behaviors at adolescence. Additionally, children's more severe hyperactivity at age 5½ was related to mothers' greater hostility at age 10 which, in turn, was related to youths' deviant behaviors at adolescence. This was a significant indirect effect (estimate = .016, S.E. = .008, $p < .05$). Results of the other indirect effects indicated that two approached statistical significance: child hyperactivity at 5½ years related to mothers' lower nurturance at 10 years, which related to youths' substance use at adolescence (estimate = .002, S.E. = .001, $p < .08$), and child's inattention at 5½ years related to mothers' lower nurturance at 10 years, which related to youths' substance use at adolescence (estimate = .003, S.E. = .002, $p < .08$).

DISCUSSION

The present study examined the relations among severity of children's inattentive and hyperactive symptoms, mothers' parenting behaviors, and children's risk behaviors in adolescence. Study findings underscore the importance of mothers' parenting for the adjustment of children with inattentive and hyperactive symptoms. The results confirmed our first hypothesis. The more severe children's hyperactivity and inattention were at 5½ years, the more hostile and less nurturant was mothers' parenting during late childhood. These findings are consistent with cross sectional studies which show that parents of children with ADHD are less affectionate and more restrictive in their parenting styles compared to parents of children without ADHD.⁷⁻⁹ The most recognized explanation for this difference in parenting is that parents of children with severe hyperactive and inattentive symptoms experience more stress, conflict, and less compliance from their children, resulting in negative parental reactions.^{8,27} Although we cannot account for the possibility that mothers' parenting at child age 5½ might have affected children's inattentive and hyperactive behaviors at age 10, the longitudinal design of our study demonstrated that children's inattentive and hyperactive behaviors were associated with mothers' non-optimal parenting 5 years later. Perpetuation of a stressful and conflict ridden mother-child relationship certainly might compound over time, with negative consequences continuing throughout the child's development. Moreover, negative parental perception of the ability to parent children with ADHD is also known to contribute to less positive parenting and might manifest as hostile and punitive parenting.²⁸ Visible, overt behaviors such as hyperactivity are more obvious contributors to parental stress, but inattentive behaviors also have been associated with less effective parenting.⁸ It is worth noting that mothers of children showing more hyperactive and inattentive behaviors in our study were less nurturant at child age 10.

Thus, the stress of parenting a child with such symptoms appears to take a toll on mothers' praise and affection toward their child.

Our second hypothesis regarding the effects of parenting on adolescent behaviors was also supported by the results. Mothers' lower nurturance at child age 10 was related to more substance use and more frequent deviant behaviors at adolescence, and mothers' high punitiveness was related to adolescents' deviant behavior, as indexed by aggression and delinquency. Mothers' harsh and punitive parenting might model aggressive behaviors to children.¹¹ Conversely, greater nurturant parenting in the presence of child behavior issues might benefit the child psychologically and be a protective factor against substance use. In both instances, children's inattentive and hyperactive behaviors as early as age 5 ½ appear to shape a mother's response, which in turn, contributes to the adjustment of the child in adolescence. In fact, results from the mediation analysis support this process as whole, with mothers' parenting a significant mediator linking children's early inattention and hyperactive symptoms with later adjustment. The fact that associations were found across two five-year intervals speaks to the pivotal role mothers' parenting can play in shaping their child's adjustment. Although some studies have found contemporaneous links between children's ADHD symptoms and mothers' parenting,^{7-9, 28} and separately, between children's ADHD symptoms and later adjustment problems,⁵ the current results provide an understanding of how mothers' parenting can help or hinder their inattentive or hyperactive child as they age into adolescence. This has important applied implications, suggesting that reducing mothers' punitive behaviors while increasing their nurturant behaviors might benefit these types of children at adolescence. Of interest, our hypothesis that maternal hostile parenting would contribute to youth substance use was not confirmed by our study. One explanation that might account for this null finding could be that the impact of maternal presence and responsiveness to their teenager, even in the form of negative parenting, supercedes mothers' critical behaviors. Harsh parenting implies attention to the adolescent, even if the attention is negative.

Limitations and Strengths

Interpretation of the results needs to be considered in light of this study's limitations. This cohort sample was part of a large iron deficiency anemia preventative trial and follow-up study. Results from initial studies found that iron deficiency was associated with poorer infant response to their physical and social environment.¹⁶ Therefore, we controlled for all iron related issues since iron deficiency was associated with inclusion in the current analytic sample. It is also important to consider that iron status at infancy and iron supplementation would relate to the etiology of the child's behaviors and not the mother's response to their children's behaviors. The results found here need to be corroborated within a nonclinical population. Furthermore, the study did not consider family history or treatment of ADHD, parental substance use, co-existing health problems in the child or certain paternal factors. In most cultures, mothers are more involved than fathers in the daily care and raising of children, but paternal factors, such as father's parenting behaviors, play an important role in the way children behave. In addition, self-report of risk behaviors in adolescence may be under reported given the sensitive nature of this information, and shared reporter bias may be present as mothers provided assessments of both their child's behaviors (at age 5½) and

their parenting behaviors (at child age 10). Moreover, this study was conducted using a sample of Chilean mothers and their children. Cultural values play a role in determining which child behaviors are acceptable or unacceptable. Results of one study examining Latina versus Anglo maternal perceptions of hyperactivity in school-aged boys found Spanish-responding mothers less accepting of hyperactive behavior than English-responders.²⁹ Thus, it is possible that the parenting behaviors studied here following children's earlier inattentiveness and hyperactivity may not reflect the reaction of mothers from other cultural backgrounds or nationalities. Another consideration is that effect sizes of the paths linking child behavior to mothers' nurturance were relatively modest. However, child hyperactivity was clearly related to mothers' hostile behaviors. In addition, parenting behaviors are most commonly classified according to the three parenting styles discussed by Baumrind: authoritative, authoritarian, and permissive.³⁰ These styles encompass parents' affection, and their behavioral and psychological control of the child. Parenting behaviors are subsumed under the broader term of parenting style. Our study examined clusters of behaviors which we term as hostile or nurturant. This study's hostile behaviors are most closely related to Baumrind's authoritarian parenting style and the nurturant behaviors are most likened to Baumrind's authoritative parenting style. An area of future research could involve studying the parenting styles of parents with children showing inattentive and hyperactive behaviors according to Baumrind's parenting typology. Finally, it is important to note that this study did not have comparable assessments of mothers' parenting at child age 5½, which would have strengthened conclusions about temporal precedence. That is, it is possible that punitive parenting tactics precede or 'evoke' children's acting-out behaviors in the form of inattention and hyperactivity. However, there is longitudinal evidence that child ADHD behaviors are more likely to precede negative parenting than the reverse.³¹

The current study had several strengths, including a relatively large sample drawn from a non-clinical, community population that was followed longitudinally throughout various developmental periods. The results, therefore, may be more generalizable than those based on clinical samples. The children within the current sample also displayed the full continuum of inattentive and hyperactive symptoms, making generalizability to a non-clinical sample feasible. Additionally, analyses included numerous controls related to the child, mother and family, such as family socioeconomic status, maternal educational level and depression, and child sex. In addition, while conduct disorder and oppositional defiant disorder are highly associated with ADHD¹⁰ and therefore could explain an increase in negative maternal parenting behavior, we included children's hostile behaviors at 5½ years in our model as a covariate and found it to be noncontributory. Thus, the results that emerged did so while controlling for these factors.

CONCLUSIONS

This study's results show that the way in which mothers respond to their children's hyperactive and inattentive behaviors has important implications for children's later adjustment. The results thus suggest that mothers' parenting is an important area of intervention for children who display hyperactive and/or inattentive behaviors. The child's early years are an important time for educating parents about how to cope with their child's behaviors and how to parent effectively so as to prevent problematic child outcomes later on.

Pediatricians have multiple opportunities in their practice to influence parental strategies regarding their child's behavior. But first, these families need to be considered and identified. While this study showed benefits of nurturing parenting for children with inattentive and hyperactive symptoms, behavior is never solely related to the children or the parents but the family as a whole. It is important to remember that parenting hyperactive and distractible children is difficult and health care professionals who care for these children need to provide support and guidance for parents, such as information on parenting classes, evidence-based positive parenting programs, and parenting support groups.

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Figure 1.

Conceptual model of the associations among child age 5 inattention and hyperactivity, mothers' parenting at child age 10, and substance use and deviant behaviors at adolescence. Direct effects between child inattention and deviant behaviors, and between child hyperactivity and substance use are hypothesized but are not shown for ease of presentation.

Figure 2.

Standardized coefficients are shown; only statistically significant paths are shown. The model had good fit ($\chi^2 [101] = 163.52$, CFI = .963, RMSEA = .026, SRMR = .022).

Table 1

Descriptive Statistics of Sample and Study Measures

	N	Min	Max	Mean or %	Standard deviation
Child characteristics					
[†] Sex (1=male)	920	0	1	53.0%	
[†] Child age					
5½ years	817	5.42	6.08	5.51	0.40
10 years	746	10	10	10.0	0.00
Adolescence	749	11.9	17.8	14.4	1.53
Breastfed at 6 months	903	0	1	63.0%	
[†] Iron status at infancy	920				
Iron sufficient	386	0	1	42.0%	
Iron deficient/ID-anemic	534	0	1	58.0%	
[†] Iron supplementation	920				
Iron supplemented	554	0	1	60.2%	
Not iron supplemented	366	0	1	39.8%	
Child hostile behavior (5½ years)	804	5	19	9.6	2.6
Mother characteristics					
[†] Mothers' age (years)	913	14.1	46.1	26.7	6.2
[†] Mothers' education (years)	920	1	17	9.5	2.6
[†] Mothers' IQ (at child's infancy)	919	51	109	83.5	9.3
[†] Mothers' depression (10 years)	743	0	53	18.3	13.1
Family characteristics					
[†] Socioeconomic status ^a	918	9	43	27.0	6.2
[†] No. children in family < 15 yrs	920	1	9	2.1	1.2
[†] Father's presence	734	0	1	86%	
[†] Family stress (infancy)	899	0	14	4.8	2.7
Child behavior					
Inattention (5½ years)	804	6	22	11.6	3.42
Hyperactivity (5½ years)	804	6	24	15.9	4.0
Mothers' parenting					
Nurturance (10 years)	741	1	10	7.6	1.8
Hostility (10 years)	741	0	3	0.6	0.8
Adolescent risk behaviors					
Cigarette use ^b	739	0	3	0.7	1.0
Alcohol use ^b	738	0	3	0.88	1.12
Marijuana use ^b	738	0	3	0.28	0.76
Delinquent behaviors	713	0	20	4.64	3.30

	N	Min	Max	Mean or %	Standard deviation
Aggression	715	0	25	8.36	4.95

^aHigher scores indicate greater poverty and lower socioeconomic status.

^bScores reflect early, frequent, and problem use (each coded as 0, 1 for absent, present).

^cIndicates a control variable.

Correlations Among Children's Inattentive and Hyperactive Symptoms, Mothers' Nurturant and Harsh Parenting, and Children's Substance Use, and Aggressive and Delinquent Behaviors at Adolescence

Table 2

Variables	1	2	3	4	5	6	7	8
1. Inattention- 5½ y	--							
2. Hyperactive- 5½ y	.36***	--						
3. Mothers' nurturance- 10y	-.15***	-.15***	--					
4. Mothers' hostility- 10y	.13**	.19***	-.36**	--				
5. Cigarette Use- adol ^a	.06	.10**	-.10*	.03	--			
6. Alcohol Use- adol ^a	.08*	.07	-.04	-.01	.56***	--		
7. Marijuana Use -adol ^a	.06	.09*	-.09*	.03	.42***	.39***	--	
8. Aggressive behaviors- adol	.08	.12**	-.08*	.12**	.29***	.25***	.15***	--
9. Delinquent behaviors- adol	.11**	.11**	-.14***	.15***	.34***	.30***	.24***	.79***

* p < .05.

** p < .01.

*** p < .001.

^a Scores reflect early, frequent, and problem use.