Coping Skills and Parent Support Mediate the Association Between Childhood Attention-Deficit/Hyperactivity Disorder and Adolescent Cigarette Use

Brooke S. G. Molina, PHD[1], **Michael P. Marshal, PHD**[2], **William E. Pelham Jr., PHD**[3], and **R. J. Wirth**[4]

[1]Departments of Psychiatry and Psychology, University of Pittsburgh School of Medicine, State University of New York at Buffalo

[2]Department of Psychiatry, University of Pittsburgh School of Medicine, State University of New York at Buffalo

[3]Departments of Psychology, Pediatrics, and Psychiatry, State University of New York at Buffalo

[4]Department of Psychology, University of North Carolina at Chapel Hill

Abstract

Objective—To examine mediators of the association between childhood attention-deficit/ hyperactivity disorder (ADHD) and adolescent cigarette use.

Method—Participants were 142 adolescents diagnosed with ADHD in childhood and 100 adolescents without ADHD.

Results—Among probands, cigarette smoking was more frequent, adaptive coping skills (behavioral and cognitive) were fewer, and parental support was lower. Coping and support partially mediated the ADHD association with smoking. Persistence of ADHD and adolescent conduct disorder were also important.

Conclusions—Vulnerability to smoking among probands may be partly due to fewer problem-solving resources. Coping skill deficits and parent–child communication may be important treatment targets for smoking prevention.

Keywords

smoking; cigarettes; ADHD; attention deficit; adolescence

Attention-deficit/hyperactivity disorder (ADHD) is among the most common mental health disorders of childhood, occurring in 3% to 5% of the population and more often diagnosed among boys than among girls (for review, see Barkley, 1998). Children with ADHD are characterized by developmentally inappropriate levels of inattentiveness and/or impulsivity and hyperactivity that cause significant impairment in behavioral, academic, and social functioning. These difficulties begin early in life, with kindergarten or first-grade teachers often alerting parents to problems in the classroom, thereby triggering an evaluation. The disorder is now known to persist well beyond the elementary school-age years, with the

All correspondence should be sent to Brooke S. G. Molina, PhD, Associate Professor of Psychiatry and Psychology, Departments of Psychiatry and Psychology, University of Pittsburgh School of Medicine, Western Psychiatric Institute and Clinic, 3811 O'Hara Street, Pittsburgh, PA 15213. E-mail: molinab@upmc.edu.

majority (about two thirds) of children continuing to exhibit problems into their adolescent (Bagwell, Molina, Pelham, & Hoza, 2001; Gittelman, Mannuzza, Shenker, & Bonagura, 1985) and adulthood years (Barkley, Fischer, Smallish, & Fletcher, 2002; Mannuzza, Klein, Bessier, Malloy, & LaPadula, 1993).

For a number of reasons, children with ADHD have become a target of research inquiry among substance abuse researchers (Flory & Lynam, 2003; Lynskey & Hall, 2001; Smith, Molina, & Pelham, 2002). Although there are some inconsistencies across study reports, with some studies reporting group differences in substance disorder (Gittelman et al., 1985) and others not (Biederman et al., 1997), the most recent report on this topic (Molina & Pelham, 2003) comes from our program of longitudinal research on ADHD conducted at the University of Pittsburgh Medical Center ADD (Attention Deficit Disorder) Program. In Molina and Pelham (2003), 142 children diagnosed with ADHD at the ADD Program (per the *Diagnostic and Statistical Manual of Mental Disorders*, third edition, revised [*DSM–III–R*], or fourth edition [*DSM–IV*]) were reinterviewed as adolescents. Detailed assessments of their substance use (age of initial use, frequency, quantity, etc.) and abuse/dependence were collected for comparison to use and abuse in a newly recruited sample of 100 adolescents from the community who were demographically similar to the probands. In an effort to address previous inconsistencies in the literature, the assessment included a broader range of substance use behaviors than had been reported in previous studies. We found that, compared to adolescents without childhood ADHD, probands were more likely to have been drunk in the previous 6 months, to have used an illicit drug or marijuana, and to have had alcohol-related problems (e.g., fight with parents over drinking alcohol). Of particular relevance to the current study were the findings regarding cigarette use by the probands. As adolescents, the children with ADHD were three times more likely than the comparison adolescents to report daily cigarette smoking, and probands reported first smoking cigarettes and becoming daily smokers at significantly younger ages than did adolescents without childhood ADHD. Among probands, severity of childhood inattention symptoms and persistence of ADHD were associated with quantity and frequency of cigarette use in adolescence, even after controlling for childhood oppositional defiant disorder (ODD) symptoms, childhood conduct disorder (CD) symptoms, and adolescent CD. This finding indicated a unique risk for nicotine addiction attributable to ADHD and its persistence over and above a tendency toward problem behavior in general (which is also a known risk factor for cigarette use).

Our findings of elevated risk for regular cigarette use among children with ADHD are not without precedent. Milberger and colleagues reported a statistically significant elevation in daily cigarette smoking by adolescence among clinic-referred children with ADHD compared to children without ADHD (19% vs. 10%, respectively; Milberger, Biederman, Faraone, Chen, & Jones, 1997). More days of tobacco use by the ages of 13 to 15 was predicted by childhood ADHD, but not by childhood CD without ADHD, in another clinic sample followed longitudinally (Burke, Loeber, & Lahey, 2001). Finally, in a sample of middle school students, ADHD based on symptom ratings by teachers was concurrently associated with student self-report of cigarette and smoke-less tobacco use (Molina, Smith, & Pelham, 1999). All of these studies indicated contributions of ADHD diagnosis or symptomatology to risk for tobacco use above and beyond associations with antisocial behavior (i.e., CD diagnosis, delinquency score). Taken together, these findings are important given the high prevalence of ADHD in children and the well-established difficulty of quitting smoking once habitual use is initiated. Indeed, most daily adult smokers begin their smoking careers in adolescence, illustrating the potential public health importance of preventing nicotine addiction among youth (U.S. Department of Health and Human Services, 1994). In the Molina and Pelham study (2003), adolescents who reported daily smoking also reported having done so for an average of 2 years. Thus, childhood ADHD

appears to set the stage for early exposure to cigarette smoking, habitual use, and perhaps intractable addiction (although the latter supposition remains to be tested empirically). The data also indicate that not all children with ADHD develop cigarette-smoking habits, which creates an opportunity for researchers to examine characteristics of children with ADHD that decrease or increase risk for cigarette smoking uptake in adolescence.

The study of coping skills forms an area of substance use research in which findings have generated significant implications for intervention and in which there is heuristic appeal for research on adolescent ADHD. Stress and coping models of adolescent substance use have much empirical support in general adolescent populations (for reviews, see Wills & Cleary, 1995; Wills & Hirky, 1996). Certain types of coping skills are particularly important for reducing the adverse impact of life stress and are generally associated with decreased vulnerability for substance use that includes tobacco. One active coping strategy, behavioral coping (e.g., doing something to solve the problem), has repeatedly been found to be inversely related to adolescent smoking cross-sectionally (Pederson, Koval, & O'Connor, 1997) and longitudinally (Wills, 1986; Wills, Sandy, Yaeger, Cleary, & Shinar, 2001). Cognitive coping (e.g., trying to see the problem in a different light) is also associated with decreased vulnerability to smoking, although findings have been less robust (Wills, 1986; Wills, Sandy, et al., 2001). Use of less effective coping strategies associated with increased risk for smoking among adolescents include anger coping, hangout coping, helplessness (giving up), and distraction or avoidance (Pederson et al., 1997; Sussman et al., 1993; Wills, 1986; Wills, Sandy, et al., 2001). Social support from parents, discussed by Wills (1986) as an additional strategy for coping with problems, has also enjoyed widespread empirical support as a protective factor for adolescent smoking (e.g., Chassin, Presson, Sherman, & Edwards, 1992; Fleming, Kim, Harachi, & Catalano, 2002.)

For several reasons, the elevated risk for cigarette smoking among children with ADHD that we and others have found might be partly explained by coping skill deficiencies in this population, especially among children with persistent ADHD. Such a hypothesis is supported by correlations found in the general adolescent population between coping skills and temperament dimensions onto which the core symptoms and associated features of ADHD can be directly mapped. These results are best illustrated in the research findings of Wills and colleagues (Wills, Windle, & Cleary, 1998), who report significant associations between temperament and self-control dimensions that include activity level (e.g., never seem to stop moving), task attentional orientation (e.g., once involved, can't distract), and impulsivity with coping skills such as behavioral coping and anger coping. Indeed, it is widely recognized that adolescents with ADHD have large skill deficits and poor coping strategies in a variety of academic and interpersonal settings (Robin, 1998). Thus, one reason that children with ADHD might have elevated risk for regular cigarette smoking is a maladaptive style of coping with the academic, behavioral, and social impairments common to children with ADHD. As such, we hypothesized that adolescents with a childhood history of ADHD would have fewer adaptive (i.e., behavioral and cognitive) and more maladaptive (i.e., avoidant) coping skills than would adolescents without a childhood history of ADHD and that this deficiency would mediate the association between childhood ADHD and later cigarette use. To this end, the current study tested this mediational model for adolescents as an extension of the findings reported by Molina and Pelham (2003).

Methods

Participants

Participants were 142 adolescents with childhood ADHD (probands) and 100 demographically similar adolescents without childhood ADHD (controls). The probands were first diagnosed in childhood and subsequently recruited to participate in this follow-up

study. The controls were newly recruited as adolescents and were interviewed only once. This sample is also described in Molina and Pelham (2003). Mean age for the total sample was 15.2 years (SD = 1.4, range = 13–18 years). Most participants were Caucasian (87%), 10% were African American, and 3% had other ethnic backgrounds. Most were male (94%), and most lived in two-parent households (71%). All mothers and 96% of fathers had graduated from high school or received their high school equivalency degree; 43% of mothers and 46% of fathers had graduated from college. Median family income was $48,000. By study design, there were no statistically significant group differences on adolescent age, gender, ethnicity, parent education, and proportion of single-parent households.

Adolescents with childhood ADHD—Probands were recruited as adolescents from the ADD Program records at Western Psychiatric Institute and Clinic, University of Pittsburgh Medical Center, for services they received as children between 1987 and 1995. These children had received a *DSM–III–R* or *DSM–IV* diagnosis of ADHD. In childhood, parents and teachers completed a packet of intake measures that included the Disruptive Behavior Disorders scale (DBD; Pelham, Evans, Gnagy, & Greenslade, 1992), the IOWA/ Abbreviated Conners (Goyette, Conners, & Ulrich, 1978; Loney & Milich, 1982), and the Swanson, Nolan, and Pelham scale (SNAP; Atkins, Pelham, & Licht, 1985), which are norm-referenced, standardized paper-and-pencil measures of *DSM–III–R* and *DSM–IV* ADHD symptoms and additional behaviors. In addition, a semi-structured diagnostic interview was conducted with parents of the children by clinicians to confirm presence of *DSM–III–R* or *DSM–IV* ADHD symptoms, assess comorbid problems, and rule out alternative diagnoses. Children were excluded from this follow-up study if their IQ was less than 80; if they had a seizure disorder or other neurological problems; or if they had a history of pervasive developmental, psychotic, sexual, or organic mental disorders.

Probands who participated in the adolescent follow-up were between 5 and 17 years old at their childhood assessment, although most (88.7% of 142) were between 5 and 12 years old. An average of 5.26 years elapsed between the childhood and adolescent follow-up assessments (SD = 2.22 years). Of the contacted eligible adolescents, 56.5% participated in the follow-up study. Recruitment was stopped when 142 probands were accumulated for the study. Despite the modest rate of participation, comparisons between nonparticipants and 111 of the participants indicated no statistically significant differences in ADHD/ODD/CD symptoms or IQ/achievement scores (all Cohen's ds < .20). Sixty-two participants (43.7%) were being treated with psychoactive medications at the time of their follow-up: n = 50 (35.2%) with psychostimulants, n = 12 (8.5%) with other medications. Cumulative history of medication data were not available.

Adolescents without childhood ADHD—Controls were recruited as adolescents from the Greater Pittsburgh area using newspaper advertisements (54%), flyers in schools attended by probands (9%), advertisements in the university hospital voice mail system or newsletter that reaches a large network of hospital staff (26%), or other (e.g., word of mouth, 11%). A phone screening questionnaire was used with parents to ascertain demographic characteristics and exclusionary criteria (e.g., low IQ) and to rule out history of diagnosis and treatment for ADHD or symptoms of ADHD consistent with a *DSM–III–R* diagnosis. Participants were also ruled out for ADHD after direct interview based on parent and teacher DBD reports and by the Diagnostic Interview Schedule for Children (DISC 2.3; Shaffer et al., 1996) completed by the adolescents' mothers. Controls were selected to ensure similarity between groups on age, gender, race, parent education, and one- vs. two-parent households.

Procedure

For this study, probands, controls, and their parents participated in a one-time office-based interview. Following collection of informed consent, participants were interviewed separately. Paper-and-pencil questions and interview questions were read aloud to adolescents, who followed along on their own copy of most measures. Confidentiality was supported with a certificate of confidentiality from the Department of Health and Human Services with certain exceptions (e.g., suicidality, child abuse), and the protocol was approved by the University of Pittsburgh institutional review board. At least three teachers of primary academic subjects completed ratings of behavior and academic performance. Additional details regarding recruitment and procedures are in Molina and Pelham (2003).

Measures

All measures described were collected at the adolescent interview (follow-up for the probands; one-time interview for the controls).

Cigarette use was assessed as part of a large questionnaire about lifetime and current substance use. For this study, cigarette use in the past 6 months was coded as 0 (*did not smoke cigarettes*), 1 (*smoked less than one cigarette a day*), and 2 (*smoked one or more cigarettes per day*). Prevalence rates may be found in Table I. Prevalence of daily use (*smoked one or more cigarettes per day*) was high for probands and slightly low for controls compared to prevalence of regular use reported by 7th through 12th graders (9.2%) completing in-home interviews in the National Longitudinal Study of Adolescent Health (Lloyd-Richardson, Papandonatos, Kazura, Stanton, & Niaura, 2002).

Behavioral, cognitive, and avoidant coping skills were assessed using mother report (father report if mother report was missing) of items such as "My child gets information that is necessary to deal with the problem" (behavioral coping scale, 6 items, $\alpha = .78$), "My child reminds himself/herself that it could be worse" (cognitive coping scale, 4 items, $\alpha = .76$), and "Waits and hopes things will get better" (avoidant coping scale, 3 items, $\alpha = .66$). Items were from Wills's (1986) response-based inventory of things that "your son or daughter does when he/she has a problem." Although most research on adolescent coping uses self-report, we chose to use parent report because of the well-established tendency for children with ADHD to overestimate competence in a variety of performance domains (Hoza, Pelham, Dobbs, Owens, & Pillow, 2002). Correlations among the scale means were $r = .65$, $p < .00$, for behavioral and cognitive; $r = .05$, $p = .47$, for behavioral and avoidant; and $r = .19$, $p < .00$, for cognitive and avoidant, $n = 233$.

Parental social support was assessed with seven items adapted from the Network of Relationships Inventory indicating the amount of social support provided to the child by each parent in the last 3 months (Furman & Buhrmester, 1985). A sample item is "How much can you count on your mother to be there when you need her, no matter what?" with responses from 1 (*a little or none*)? to 5 (*the most possible*). The highest of the averaged mother and father support scores was used (mother's $\alpha = .84$, father's $\alpha = .88$). Correlations with the coping variables were $r = .19$, $p < .00$, for behavioral coping; $r = .19$, $p < .00$, for cognitive coping; and $r = -.12$, $p = .07$, for avoidant coping, $n = 233$.

ADHD and CD in adolescence—In adolescence, *DSM–III–R* diagnosis of ADHD was based on the DBD (parent and teacher report) and DISC 2.3 (parent report; Shaffer et al., 1996). *DSM–III–R* diagnosis of CD was based on the DBD (parent and teacher report) and DISC 2.3 or DISC 3.0 (parent and adolescent report) for CD.

Results

Descriptive Statistics

As planned, probands and controls were similar in age, level of parent education, and proportion of single parent families. Probands had significantly lower IQ scores than their non-ADHD counterparts did (see Table I). Probands were characterized by lower levels of behavioral coping, cognitive coping, and parent social support than were controls. Effect sizes ranged from moderate to large (small, medium, and large effects correspond to $d = .20, .50,$ and $.80$; Cohen, 1988).

Mediation Results

Mediation is evaluated by examining three pathways: the relation between the independent variable and the dependent variable (Path C) before controlling for the variance accounted for by the mediator; the relation between the independent variable and mediator (Path A), and the relation between the mediator and the dependent variable (Path B; see Baron & Kenny, 1986). These paths, illustrated in Figure 1, were tested using path analyses based on polyserial (correlations between continuous and categorical variables) and polychoric (correlations between categorical variables) correlations using a weighted least squares procedure (Browne, 1984) in Mplus Version 2.14 (Muthén & Muthén, 1998). A total of four models were estimated to examine these paths, which are discussed in detail in the following sections. In all models the effects of ADHD and the mediators were estimated controlling for the effects of four covariates: the participants' age, their IQ, their parents' education level, and family composition (percentage of single-parent households). These covariates were measured at the adolescent interview.

The first model examined Path C, the relation between ADHD and adolescent smoking before controlling for the mediators. Childhood ADHD was positively associated with adolescent smoking (unstandardized $b = .78$, $z = 3.51$, $p < .0001$). This result is consistent with the chi-square test reported in Table I and is also consistent with the results reported in Molina and Pelham (2003) when covariates were not included. Adolescent age was positively associated with adolescent smoking (unstandardized $b = .27$, $z = 3.06$, $p < .01$). None of the other covariates were significantly related to adolescent smoking. The total variance in adolescent smoking accounted for by ADHD and the covariates was .27. The remaining models were estimated to examine Paths A and B, which were used to estimate the mediated effect of each of three proposed mediators regarding the relation between ADHD and smoking: behavioral coping, cognitive coping, and parent's social support. Results from each of these models are described in the following paragraphs. Because ADHD was not significantly associated with avoidant coping, even when the covariates were controlled, it was not tested as a mediator.

Behavioral coping—The behavioral coping model showed that ADHD was associated with a significant decrease in behavioral coping skills (Path A; $z = -5.21$, $p < .0001$) and that behavioral coping was associated with a significant decrease in smoking (Path B; $z = -2.34$, $p < .05$). The relation between ADHD and adolescent smoking after controlling for the mediator (Path C′) remained significant ($z = 2.77$, $p < .01$). The unstandardized betas and associated standard errors for Paths A, B (solid lines), and C′ (dotted lines) are presented in Figure 2. Results from this mediator model and all subsequent models showed a similar pattern of covariate effects to what was described earlier, that age was associated with a significant increase in smoking and that none of the other covariates was associated with smoking (all p values for the other covariates in all models were greater than .10). In this model, the total variance in behavioral coping accounted for by ADHD and the

covariates was .16, and the total variance in smoking accounted for by all of the predictors and the mediator was .30.

The mediated effect for this model and all subsequent mediator models was tested by calculating the product of the unstandardized betas that represent Path A and Path B ($a \times b$). Approximate z scores for each mediated effect were estimated by dividing the product by its standard error, $SE(AB)$, where $SE(AB)^2 = SE(A)^2 \times (B)^2 + SE(B)^2 \times (A)^2$. For a review of these procedures, see MacKinnon and Dwyer (1993), and for technical discussions of the topic see Goodman (1960) and Sobel (1982).[1] The corresponding z score for the behavioral coping mediated effect was significant ($z' = 2.14$, $p < .001$).

Cognitive coping—The cognitive coping model showed that ADHD was associated with a significant decrease in cognitive coping skills (Path A; $z = -4.85$, $p < .0001$) and that cognitive coping was associated with a significant decrease in adolescent smoking (Path B; $z = -2.55$, $p < .05$). The relation between ADHD and adolescent smoking after controlling for the mediator (Path C') remained significant ($z = 2.71$, $p < .01$). In this model, the total variance in cognitive coping accounted for by ADHD and the covariates was .16, and the total variance in smoking accounted for by all of the predictors and the mediator was .31. The corresponding z score for the cognitive coping mediated effect was significant ($z' = 2.26$, $p < .001$).

Parents' social support—The social support model showed that ADHD was associated with a significant decrease in parents' social support (Path A; $z = -2.50$, $p < .05$) and that parents' social support was associated with a significant decrease in smoking (Path B; $z = -2.319$, $p < .05$). The relation between ADHD and adolescent smoking after controlling for the mediator (Path C') remained significant ($z = 3.15$, $p < .01$). In this model, the total variance in social support accounted for by ADHD and the covariates was .06, and the total variance in smoking accounted for by all of the predictors and the mediator was .30. The corresponding z score for the mediated effect of parents' social support was also significant ($z' = 1.70$, $p < .01$).

Full mediational model—When the three statistically significant mediating variables were tested simultaneously in one model, not one was a statistically significant predictor of cigarette use, $z = -.86$ ($p = .39$), -1.32 ($p = .19$), and -1.60 ($p = .11$), for behavioral, cognitive, and parent support, respectively. The total variance in smoking accounted for by the model, .33, was not appreciably increased over the R^2's from the single mediator models. This result is consistent with the statistically significant zero-order correlations among the mediators (see the Measures section).

Adolescent ADHD and CD

We examined whether persistence of ADHD and development of CD were associated with coping skills and parent support. As in Molina and Pelham (2003), probands were divided into three groups: probands without ADHD or CD in adolescence ($n = 38$), probands with ADHD but not CD in adolescence ($n = 64$), and probands with both ADHD and CD in

---

[1]The test statistic for mediating effects has long been treated as a traditional z score and compared with the z distribution for p-value estimates. However, it has recently been demonstrated that the sampling distribution of this test is skewed and highly kurtotic (MacKinnon, Lockwood, & Hoffman, 1998; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Thus, treating this test statistic as a traditional z score can lead to severely deflated Type 1 error rates and exceptionally low power. Using a series of simulations, MacKinnon and colleagues developed a group of empirically derived distributions for this product test that are slightly different from the traditional z distribution. When using this distribution, the test is referred to as z'. Tables of these distributions are available at http:// www.public.asu.edu/?davidpm/ripl/methods.htm. By comparing our mediated effects to these new distributions, we regained accurate Type 1 error rates and sufficient power.

adolescence ($n = 35$).[2] Univariate ANCOVAs and simple contrasts for each of the four coping/support variables were used to test whether group membership (non-ADHD vs. each of the proband subgroups) was associated with coping/support above and beyond the covariates. The results in Table II show that, compared to coping by controls, behavioral coping was significantly lower for probands with persistent ADHD ($d = .98$) or persistent ADHD and development of CD ($d = 1.27$). Cognitive coping was lower for all probands compared to controls ($d = .56$–1.01); it was lowest for probands with persistent ADHD and development of CD ($d = 1.01$). Parental support was significantly lower for probands with persistent ADHD ($d = .37$) and lowest for probands with persistent ADHD and development of CD ($d = .98$). Helmert contrasts were conducted to test whether the means differed between the ADHD persisters with and without CD. Coping skills did not differ between the groups ($p = .15$ and $p = .98$ for behavioral and cognitive mean differences), but parental support did ($p = .03$). Diagnosis at follow-up was not associated with avoidant coping, $F(3, 212) = 1.38$, $p = .25$.

Discussion

Studies are converging on the finding that children with ADHD are at increased risk for regular cigarette use and especially for cigarette use at a young age. The results from this study are important as one step toward explaining this vulnerability. We found that diminished skills for actively coping with problems, either behaviorally or cognitively, partially mediated the association between ADHD diagnosed in childhood and cigarette use in adolescence. Less social support from parents also mediated this association, indicating that intrapersonal (coping) and interpersonal (parental support) resources for solving problems are less available to adolescents with childhood ADHD than they are to adolescents without ADHD. These problem-solving deficits in children with diagnosed ADHD may partially explain their vulnerability to early smoking in adolescence.

Our findings are consistent with research by Wills and colleagues (see Wills & Filer, 1996, for review) showing significant associations between coping skills in adolescence and temperament or self-control variables. Children with ADHD, who are by definition underregulated cognitively and behaviorally, should experience difficulty in the development and application of effective problem-solving skills. In fact, our group differences were large (about a one standard-deviation difference), indicating substantial deficits in this area of functioning. These findings have potentially significant implications for cigarette use vulnerability, given current etiological models in the literature. Wills's research finds support for an epigenetic model of substance use that includes early adolescent cigarette use. In this model, self-control (which includes coping skill) follows from temperament vulnerabilities (such as those that describe children with ADHD). These self-control deficits in turn lead to early substance use through proximal risk factors such as academic problems, negative life events, and deviant peer affiliations (Wills, Cleary, et al., 2001; Wills, Sandy, & Shinar, 1999). Aspects of these pathways have been empirically supported for early cigarette use among youth (Ellickson, Tucker, & Klein, 2001; Lloyd-Richardson et al., 2002), although coping skills were not specifically studied. Notably, the results of this study reveal the potential implications in adolescence of coping skill deficits among a group of children with documented dispositional vulnerabilities in childhood. Importantly, the findings suggest that it is the persistence of ADHD that accounts for most of the deficits in coping in contrast to the small group differences present between the probands with and without CD.

---

[2]There were only five probands with CD and "desistence" of ADHD, reflecting the high degree of ADHD persistence in the probands who developed CD. These five probands were excluded from the current analysis.

In contrast, the findings for parental support suggest a different pathway to cigarette use for probands with CD. Consistent with our previous findings in this sample that probands with CD had the highest rates of cigarette use (Molina & Pelham, 2003), in the current study probands with CD reported the lowest levels of parental support. For many reasons this finding is not surprising. It has long been known that weaknesses in parent–child communication (e.g., low support and high conflict) and ineffective parenting (including poor monitoring of a child's whereabouts and harsh or inconsistent discipline) predict the development of delinquency among children with behavior problems (Patterson & Yoeger, 2002). Some of these problems have been found in families with an ADHD adolescent and in particular for adolescents with ADHD and other externalizing symptoms. Barkley and colleagues reported higher levels of conflict and lower levels of supportive interactions in lab-based and self-reported interactions between mothers and their adolescents with ADHD (Barkley, Fischer, Edelbrock, & Smallish, 1991; Fletcher, Fischer, Barkley, & Smallish, 1996). These group differences were principally attributable to ODD, a well-known precursor of CD (Lahey, Miller, Gordon, & Riley, 1999). More research is needed to characterize other dimensions of parenting and the parent–child relationship for teenagers with ADHD, especially as they relate to cigarette smoking, other forms of substance use, and CD. These factors are likely to be associated with a deviance-proneness pathway for some probands that lead to a variety of problem behavior outcomes including early cigarette use. This pathway is well established in the substance use literature (e.g., Jessor & Jessor, 1977; Sher, 1991) and for cigarette use among adolescents (Andrews & Duncan, 1997; Ellickson et al., 2001). Our recent findings with this sample—that affiliation with deviant peers (i.e., substance-using and substance-tolerant peers) mediated the association between childhood ADHD, conduct disorder symptoms, and a range of substance use outcomes that included cigarette use—also supports the likelihood of this pathway occurring for some of our probands (Marshal, Molina, & Pelham, 2003).

These findings have important implications for treatments that might have an impact on the development of coping skills and improved parent–child communication. A small but growing number of studies have targeted these domains among adolescents with ADHD. Barkley and colleagues have reported some improvement in parent and teen ratings of conflict for behaviorally based family therapy (behavioral parent training followed by behaviorally oriented family therapy), although reliable and clinically significant change was found for only 23% of the families (Barkley, Edwards, Laneri, Fletcher, & Metevia, 2001). These findings led Barkley to suggest that novel forms of multimodal treatment be tested. Consistent with this proposition, an after-school treatment program for middle schoolers with ADHD has been developed by Evans that includes not only parent training sessions but academic competence enhancement and social competence components (Evans, Axelrod, & Langberg, 2003). The substance use prevention trials literature also reveals that school-based interventions designed to improve social competence (including problem-solving skills and interpersonal communication) can lead to lower rates of substance use, including cigarette use, among students at risk for substance use (Griffin, Botvin, Nichols, & Doyle, 2003). Lochman and Wells have found success with indicated prevention interventions targeting aggressive children's social–cognitive skills and parenting effectiveness near the time of transition to middle school. Their Coping Power Program effects on delinquency, substance use, and school behavior (Lochman & Wells, 2002b) are partially mediated through improvements in these variables (Lochman & Wells, 2002a). The success of these programs for at-risk students suggests that more research is needed to determine whether adolescents with ADHD may benefit from similar interventions and ultimately have a decreased risk for a range of problem behaviors that includes cigarette use.

There is some evidence that psychoactive medications can improve academic and social performance of adolescents with ADHD (Evans et al., 2001; Smith et al., 1998), a finding

that has implications for stress and coping (Wills, Sandy, & Yaeger, 2002) as well as deviance-proneness pathways to cigarette use. However, whether this treatment is sufficiently effective and palatable to adolescents to reduce risk for smoking is unclear (Smith, Waschbusch, Willoughby, & Evans, 2000). As children with ADHD age through adolescence, they are extremely unlikely to continue with medication regimens at exactly the time when they are most at risk for smoking uptake (Meichenbaum, Gnagy, Flammer, Molina, & Pelham, 2001). A self-medication hypothesis has been proposed regarding the use of nicotine to manage attentional deficits based on increases in dopamine availability associated with nicotine and stimulant medications (Milberger et al., 1997), which would suggest protective effects of medication management on smoking uptake. However, results testing this hypothesis are conflicting and controversial (Lambert, 2002; Loney, Kramer, & Salisbury, 2002; Milberger et al., 1997; Whalen, Jamner, Henker, Gehricke, & King, 2003). The growing literature on potentially lasting neurobiological effects of exposure to methylphenidate in animal models (Volkow & Insel, 2003), such as decreased sensitivity to natural rewards and increased sensitivity to stressful situations associated with chronic exposure to methylphenidate during development (Bolanos, Barrot, Berton, Wallace-Black, & Nestler, 2003), suggests that there may be long-term sequelae of medication management for ADHD. Even if psychoactive stimulants are eventually found to be helpful for diminishing risk for cigarette and other drug use, the development of alternative treatments are likely to be necessary to improve coping and parenting skills for this population.

Accordingly, one limitation of this study was that we were unable to include a cumulative history of medication management in our models of cigarette use; the data were not collected as part of this one-time adolescent follow-up. However, we are currently studying this question in our larger study of children with ADHD, the Pittsburgh ADHD Longitudinal Study (PALS). PALS is a repeated-measures observational study in which we follow a larger sample of children with ADHD and controls through adolescence and into adulthood. Another limitation of the current study was the exclusion of strategies such as religious coping, physical exercise, and other coping skills described in the stress and coping literature (Wills, Sandy, et al., 2001). Other coping strategies may be useful for the prevention of habitual smoking and may have prevention and intervention implications. However, as we found, there may be a significant degree of overlap among all of these coping strategies such that adaptive individuals are likely to choose among a menu of methods for coping. Furthermore, in this population (children diagnosed with ADHD), a number of parent-related vulnerability factors are also known to be present (Johnston & Mash, 2001), which would be expected to contribute to weakened parent–child communication and transfer of ineffective coping skills. For example, parental psychopathology is more common among parents of children with ADHD (Faraone et al., 1993; Faraone, Biederman, Mennin, Russell, & Tsuang, 1998) and is likely to affect the parent–child relationship. In addition, parental smoking is a well-established risk factor for child smoking (Chassin, Presson, Rose, Sherman, & Prost, 2002), and Milberger reported this association among children diagnosed with ADHD (Milberger et al., 1997). Our models accounted for about 30% of the variance in cigarette smoking; addition of constructs such as these should improve prediction. As the goal of the current study was circumscribed (i.e., testing coping resource mediational models), in the future we shall consider more comprehensive models that include these variables. In the PALS, children are followed through adolescence into adulthood, and we will be able to go beyond the admittedly limited concurrent measurement of mediator and outcome to more comprehensively test developmental models of cigarette smoking uptake. These goals notwithstanding, the current study highlights the importance of continued research on childhood ADHD as a risk factor for later intrapersonal and interpersonal competency deficits and ultimately for early and regular cigarette use in this population.

Acknowledgments

## References

Andrews JA, Duncan SC. Examining the reciprocal relation between academic motivation and substance use: Effects of family relationships, self-esteem, and general deviance. Journal of Behavioral Medicine. 1997; 20(6):523–549. [PubMed: 9429987]

Atkins MS, Pelham WE, Licht MH. A comparision of objective classroom measures and teacher ratings of attention deficit disorder. Journal of Abnormal Child Psychology. 1985; 13(1):155–167. [PubMed: 3973249]

Bagwell CL, Molina BSG, Pelham WE, Hoza B. Attention-deficit hyperactivity disorder and problems in peer relations: Predictions from childhood to adolescence. Journal of the American Academy of Child and Adolescent Psychiatry. 2001; 40:1285–1292. [PubMed: 11699802]

Barkley, RA. Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment. New York: Guilford Press; 1998.

Barkley RA, Edwards G, Laneri M, Fletcher KE, Metevia L. The efficacy of problem-solving communication training alone, behavior management training alone, and their combination for parent-adolescent conflict in teenagers with ADHD and ODD. Journal of Consulting and Clinical Psychology. 2001; 69(6):926–941. [PubMed: 11777120]

Barkley RA, Fischer M, Edelbrock C, Smallish L. The adolescent outcome of hyperactive children diagnosed by research criteria: III. Mother-child interactions, family conflicts and maternal psychopathology. Journal of Child Psychology and Psychiatry and Allied Disciplines. 1991; 32(2): 233–255.

Barkley RA, Fischer M, Smallish L, Fletcher KE. The persistence of attention-deficit/hyperactivity disorder into young adulthood as a function of reporting source and definition of disorder. Journal of Abnormal Psychology. 2002; 111(2):279–289. [PubMed: 12003449]

Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology. 1986; 51(6):1173–1182. [PubMed: 3806354]

Biederman J, Wilens T, Mick E, Faraone SV, Weber W, Curtis S, et al. Is ADHD a risk factor for psychoactive substance use disorders? Findings from a four-year prospective follow-up study. Journal of the American Academy of Child and Adolescent Psychiatry. 1997; 36:21–29. [PubMed: 9000777]

Bolanos CA, Barrot M, Berton O, Wallace-Black D, Nestler EJ. Methylphenidate treatment during pre- and periadolescence alters behavioral responses to emotional stimuli at adulthood. Biological Psychiatry. 2003; 54:1317–1329. [PubMed: 14675795]

Browne MW. Asymptotic distribution free methods for the analysis of covariance structures. British Journal of Mathematical and Statistical Psychology. 1984; 37:62–83. [PubMed: 6733054]

Burke JD, Loeber R, Lahey BB. Which aspects of ADHD are associated with tobacco use in early adolescence? Journal of Child Psychology and Psychiatry and Allied Disciplines. 2001; 42(4): 493–502.

Chassin L, Presson CC, Rose JE, Sherman SJ, Prost J. Parental smoking cessation and adolescent smoking. Journal of Pediatric Psychology. 2002; 27(6):485–496. [PubMed: 12177249]

Chassin L, Presson CC, Sherman SJ, Edwards D. The natural history of cigarette smoking and young adult social roles. Journal of Health and Social Behavior. 1992; 33:328–347. [PubMed: 1464718]

Cohen, J. Statistical power analysis for the behavioral sciences. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.

Ellickson PL, Tucker JS, Klein DJ. High-risk behaviors associated with early smoking: Results from a 5-year follow-up. Journal of Adolescent Health. 2001; 28:465–473. [PubMed: 11377990]

Evans SW, Axelrod JL, Langberg J. Efficacy of a school-based treatment program for middle school youth with ADHD: Pilot data. Behavior Modification. 2003; 28(4):528–547. [PubMed: 15186514]

Evans SW, Pelham WE, Smith BH, Bukstein OG, Gnagy EM, Greiner AR, et al. Dose-response effects of methylphenidate on ecologically valid measures of academic performance and classroom behavior in adolescents with ADHD. Experimental and Clinical Psychopharmacology. 2001; 9(2):163–175. [PubMed: 11518092]

Faraone SV, Biederman J, Lehman BK, Keenan K, Norman D, Seidman LJ, et al. Evidence for the independent familial transmission of attention deficit hyperactivity disorder and learning disabilities: Results from a family genetic study. American Journal of Psychiatry. 1993; 150(6): 891–895. [PubMed: 8494064]

Faraone SV, Biederman J, Mennin D, Russell R, Tsuang MT. Familial subtypes of attention deficit hyperactivity disorder: A 4-year follow-up study of children from antisocial-ADHD families. Journal of Child Psychology and Psychiatry. 1998; 39(7):1045–1053. [PubMed: 9804037]

Fleming CB, Kim H, Harachi TW, Catalano RF. Family processes for children in early elementary school as predictors of smoking. Journal of Adolescent Health. 2002; 30(3):184–189. [PubMed: 11869925]

Fletcher KE, Fischer M, Barkley RA, Smallish L. A sequential analysis of the mother-adolescent interactions of ADHD, ADHD/ODD, and normal teenagers during neutral and conflict discussions. Journal of Abnormal Child Psychology. 1996; 24(3):271–297. [PubMed: 8836802]

Flory K, Lynam DR. The relation between attention deficit hyperactivity disorder and substance abuse: What role does conduct disorder play? Clinical Child and Family Psychology Review. 2003; 6:1–16. [PubMed: 12659448]

Furman W, Buhrmester D. Children's perceptions of the personal relationships in their social network. Developmental Psychology. 1985; 21(6):1016–1024.

Gittelman R, Mannuzza S, Shenker R, Bonagura N. Hyperactive boys almost grown up: I. Psychiatric status. Archives of General Psychiatry. 1985; 42:937–947. [PubMed: 4037987]

Goodman LA. On the exact variance of products. Journal of the American Statistical Association. 1960; 55:708–713.

Goyette CH, Conners CK, Ulrich RF. Normative data on revised Conners Parent and Teacher Rating Scales. Journal of Abnormal Child Psychology. 1978; 6:221–236. [PubMed: 670589]

Griffin KW, Botvin GJ, Nichols TR, Doyle MM. Effectiveness of a universal drug abuse prevention approach for youth at high risk for substance use initiation. Preventive Medicine. 2003; 36(1):1–7. [PubMed: 12473419]

Hoza B, Pelham WE, Dobbs J, Owens JS, Pillow DR. Do boys with attention-deficit/hyperactivity disorder have positive illusory self-concepts? Journal of Abnormal Psychology. 2002; 111(2):268–278. [PubMed: 12004833]

Jessor, R.; Jessor, SL. Problem behavior and psychosocial development: A longitudinal study of youth. New York: Academic Press; 1977.

Johnston C, Mash EJ. Families of children with attention-deficit/hyperactivity disorder: Review and recommendations. Clinical Child and Family Psychology Review. 2001; 4(3):183–207. [PubMed: 11783738]

Lahey, BB.; Miller, TL.; Gordon, RA.; Riley, AW. Developmental epidemiology of the disruptive behavior disorders. In: Quay, HC.; Hogan, AE., editors. Handbook of disruptive behavior disorders. Dordrecht, Netherlands: Kluwer Academic Publishers; 1999. p. 23-48.

Lambert, NL. Stimulant treatment as a risk factor for nicotine use and substance abuse. In: Jensen, PS.; Cooper, JR., editors. Attention deficit hyperactivity disorder: State of the science. Best practices. Kingston, NJ: Civic Research Institute; 2002. p. 18-11-18-24.

Lloyd-Richardson EE, Papandonatos G, Kazura A, Stanton C, Niaura R. Differentiating stages of smoking intensity among adolescents: Stage-specific psychological and social influences. Journal of Consulting and Clinical Psychology. 2002; 70(4):998–1009. [PubMed: 12182283]

Lochman JE, Wells KC. Contextual social-cognitive mediators and child outcome: A test of the theoretical model in the Coping Power Program. Development and Psychopathology. 2002a; 14:945–967. [PubMed: 12549711]

Lochman JE, Wells KC. The Coping Power Program at the middle school transition: Universal and indicated prevention effects. Psychology of Addictive Behaviors. 2002b; 16(Suppl. 4):S40–S54. [PubMed: 12502276]

Loney, J.; Kramer, JR.; Salisbury, H. Medicated vs. unmedicated ADHD children: Adult involvement with legal and illegal drugs. In: Jensen, PS.; Cooper, JR., editors. Attention deficit hyperactivity disorder: State of the science. Best practices. Kingston, NJ: Civic Research Institute; 2002. p. 17-1-17-16.

Loney, J.; Milich, R. Hyperactivity, inattention, and aggression in clinical practice. In: Wolraich, M.; Routh, DK., editors. Advances in developmental and behavioral pediatrics. Vol. Vol. 3. Greenwich, CT: JAI; 1982. p. 113-147.

Lynskey MT, Hall W. Attention deficit hyperactivity disorder and substance use disorders: Is there a causal link? Addiction. 2001; 96:815–822. [PubMed: 11399213]

MacKinnon DP, Dwyer JH. Estimating mediated effects in prevention studies. Evaluation Review. 1993; 17(2):144–158.

MacKinnon, DP.; Lockwood, CM.; Hoffman, JM. A new method to test for mediation. Paper presented at the annual meeting of the Society for Prevention Research; Park City, UT. 1998.

MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. Psychological Methods. 2002; 7(1):83–104. [PubMed: 11928892]

Mannuzza S, Klein RG, Bessier A, Malloy P, LaPadula M. Adult outcome of hyperactive boys: Educational achievement, occupational rank, and psychiatric status. Archives of General Psychiatry. 1993; 50:565–576. [PubMed: 8317950]

Marshal MP, Molina BSG, Pelham WE. Childhood ADHD and adolescent substance use: An examination of deviant peer group affiliation as a risk factor. Psychology of Addictive Behaviors. 2003; 17(4):293–302. [PubMed: 14640825]

Meichenbaum, D.; Gnagy, EM.; Flammer, L.; Molina, BSG.; Pelham, WE. Why stop success? Exploration of longterm use of medication in a clinical ADHD sample from childhood through young adulthood. Paper presented at the Eighth Florida Conference on Child Health Psychology; Gainesville, Florida. 2001 Apr.

Milberger S, Biederman J, Faraone SV, Chen L, Jones J. ADHD is associated with early initiation of cigarette smoking in children and adolescents. Journal of the American Academy of Child and Adolescent Psychiatry. 1997; 36(1):37–44. [PubMed: 9000779]

Molina BSG, Pelham WE. Childhood predictors of adolescent substance use in a longitudinal study of children with ADHD. Journal of Abnormal Psychology. 2003; 112(3):497–507. [PubMed: 12943028]

Molina BSG, Smith BH, Pelham WE. Interactive effects of attention-defict/hyperactivity disorder and conduct disorder on early adolescent substance use. Psychology of Addictive Behaviors. 1999; 13(4):348–358.

Muthén, LK.; Muthén, BO. Mplus user's guide. Los Angeles: Muthén & Muthén; 1998.

Patterson, GR.; Yoeger, K. A developmental model for early- and late-onset delinquency. In: Reid, JB.; Patterson, GR.; Snyder, J., editors. Antisocial behavior in children and adolescents: A developmental analysis and model for intervention. Washington, DC: American Psychological Association; 2002. p. 147-172.

Pederson LL, Koval JJ, O'Connor K. Are psychosocial factors related to smoking in grade-6 students? Addictive Behaviors. 1997; 22:169–181. [PubMed: 9113212]

Pelham WE, Evans SW, Gnagy EM, Greenslade KE. Teacher ratings of *DSM-III-R* symptoms for the disruptive behavior disorders: Prevalence, factor analyses, and conditonal probabilities in a special educaiton sample. School Psychology Review. 1992; 21(2):285–299.

Robin, AL. ADHD in adolescents: Diagnosis and treatment. New York: Guilford Press; 1998.

Shaffer D, Fisher P, Dulcan M, Davies M, Piacentini J, Schwab-Stone ME, et al. The NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3): Description, acceptability,

prevalence rates, and performance in the MECA study. Journal of the American Academy of Child and Adolescent Psychiatry. 1996; 35(7):865–877. [PubMed: 8768346]

Sher, KJ. Models of vulnerability. In: Sher, KJ., editor. Children of alcoholics. A critical appraisal of theory and research. Chicago: University of Chicago Press; 1991. p. 134-139.

Smith BH, Molina BSG, Pelham WE. The clinically meaningful link between alcohol and attention-deficit/hyperactivity disorder. Alcohol, Health, and Research World. 2002; 26(2):122–129.

Smith BH, Pelham WE, Evans SW, Gnagy EM, Molina BSG, Bukstein OG, et al. Dosage effects of methylphenidate on the social behavior of adolescents diagnosed with attention-deficit hyperactivity disorder. Experimental and Clinical Psychopharmacology. 1998; 6:187–204. [PubMed: 9608351]

Smith BH, Waschbusch DA, Willoughby MT, Evans SW. The efficacy, safety, and practicality of treatments for adolescents with attention-deficit/hyperactivity disorder (ADHD). Clinical Child and Family Psychology Review. 2000; 3:243–268. [PubMed: 11225739]

Sobel, ME. Asymptotic intervals for indirect effects in structural equation models. In: Leinhart, S., editor. Sociological methodology 1982. San Francisco: Jossey-Bass; 1982. p. 290-312.

Sussman S, Brannon BR, Dent CW, Hansen WB, Johnson CA, Flay B. Relations of coping effort, perceived stress, and cigarette smoking among adolescents. International Journal of the Addictions. 1993; 28:599–612. [PubMed: 8500923]

U.S. Department of Health and Human Services. Preventing tobacco use among young people: A report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1994.

Volkow ND, Insel TR. What are the long-term effects of methylphenidate treatment? Biological Psychiatry. 2003; 54(12):1307–1309. [PubMed: 14675792]

Whalen CK, Jamner LD, Henker B, Gehricke JG, King PS. Is there a link between adolescent cigarette smoking and pharmacotherapy for ADHD? Psychology of Addictive Behaviors. 2003; 17(4):332–335. [PubMed: 14640830]

Wills TA. Stress and coping in early adolescence: Relationships to substance use in urban school samples. Health Psychology. 1986; 5(6):50–529.

Wills, TA.; Cleary, SD. Stress-coping model for alcohol-tobacco interactions in adolescence. In: Fertig, J.; Allen, J., editors. Alcohol and tobacco: From basic science to clinical practice. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 1995. p. 107-128.

Wills TA, Cleary SD, Filer M, Shinar O, Mariani J, Spera K. Temperament related to early-onset substance use: Test of a developmental model. Prevention Science. 2001; 2(3):145–163. [PubMed: 11678291]

Wills, TA.; Filer, M. Stress-coping model of adolescent substance use. In: Ollendick, TH.; Prinz, RJ., editors. Advances in clinical child psychology. Vol. Vol. 18. New York: Plenum Press; 1996. p. 91-132.

Wills, TA.; Hirky, AE. Coping and substance use: A theoretical model and review of the evidence. In: Zeidner, M.; Endler, N., editors. Handbook of coping: Theory, research, applications. New York: Wiley; 1996. p. 279-302.

Wills TA, Sandy JM, Shinar O. Cloninger's constructs related to substance use level and problems in late adolescence: A mediational model based on self-control and coping motives. Experimental and Clinical Psychopharmacology. 1999; 7:122–134. [PubMed: 10340152]

Wills TA, Sandy JM, Yaeger AM. Stress and smoking in adolescence: A test of directional hypotheses. Health Psychology. 2002; 21(2):122–130. [PubMed: 11950102]

Wills TA, Sandy JM, Yaeger AM, Cleary SD, Shinar O. Coping dimensions, life stress, and adolescent substance use: A latent growth analysis. Journal of Abnormal Psychology. 2001; 110(2):309–323. [PubMed: 11358025]

Wills TA, Windle M, Cleary SD. Temperament and novelty seeking in adolescent substance use: Convergence of dimensions of temperament with constructs from Cloninger's theory. Journal of Personality and Social Psychology. 1998; 74(2):387–406. [PubMed: 9491584]
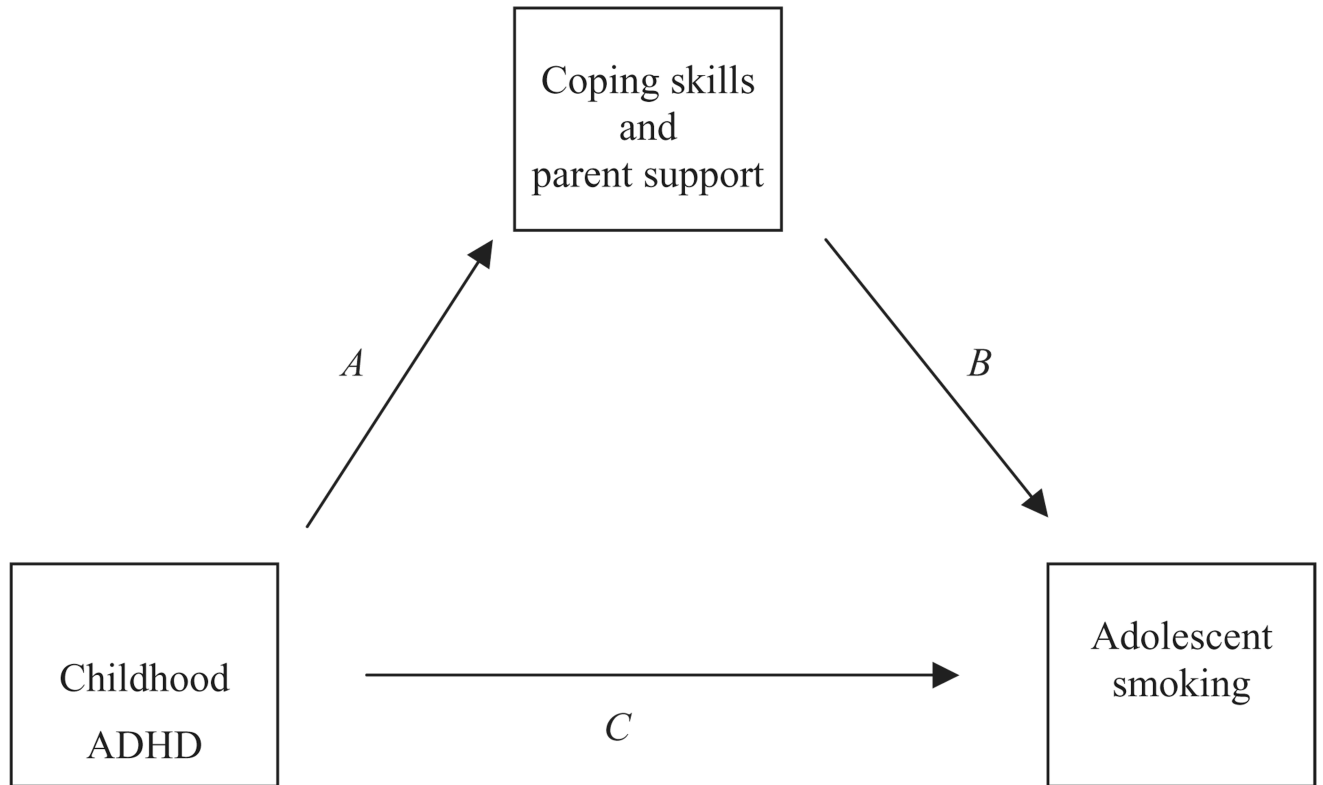
Figure 1.
An illustration of the mediating effects of coping skills and parental support in the relation
between childhood ADHD and adolescent smoking.
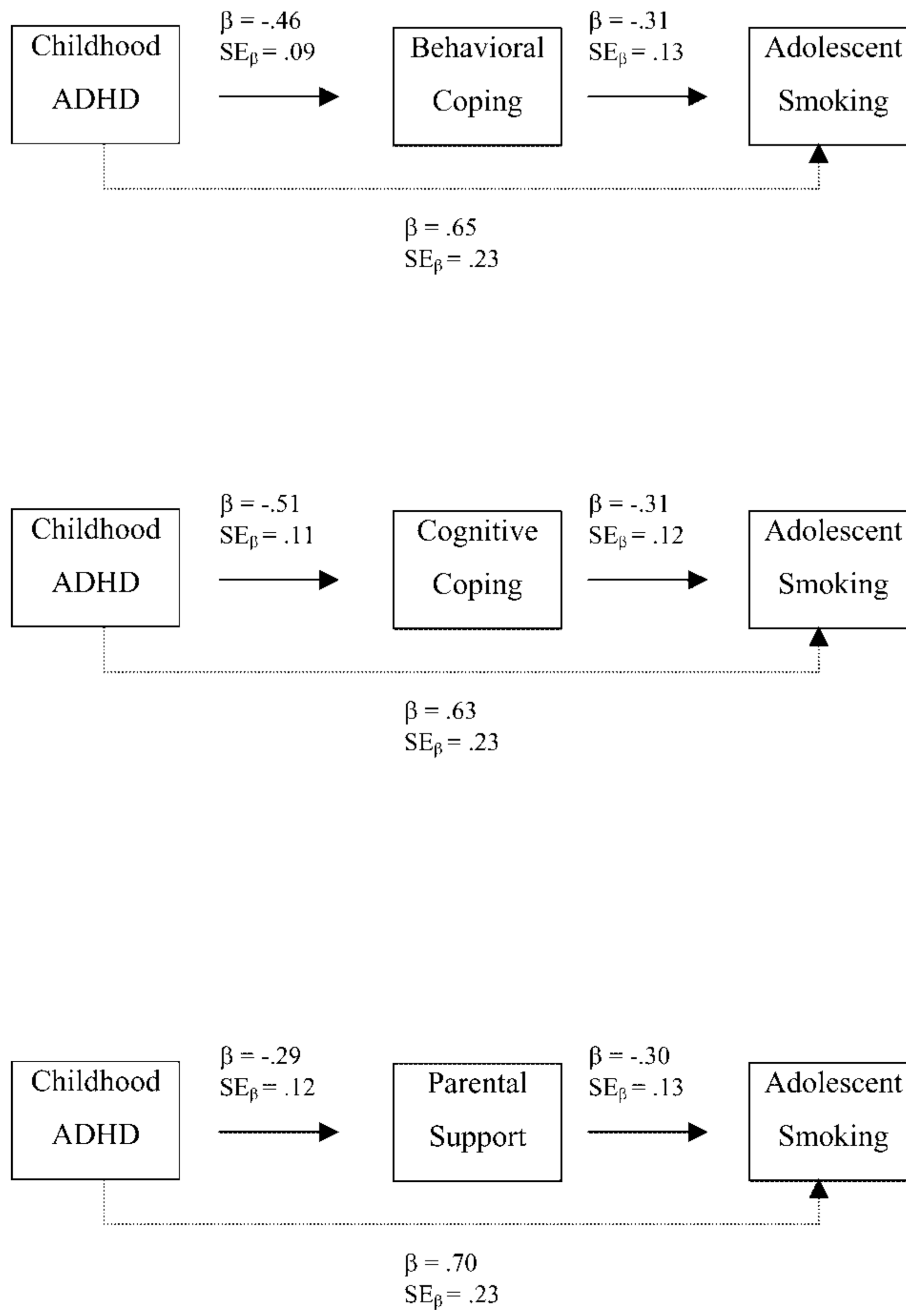
Figure 2.
Final models of coping skills and parental support as mediators of the association between childhood ADHD and adolescent cigarette use. All betas are unstandardized parameter estimates, and all paths are statistically significant at $p < .05$.

Table I

Attention-Deficit/Hyperactivity Disorder (ADHD) Versus Non-ADHD Group Differences in the Predictors and Covariates

	ADHD *M (SD)*	non-ADHD *M (SD)*	Cohen's *d*	*t* or χ2 (*p* value)
Covariates				
Age	15.18 (1.44)	15.18 (1.42)	.00	0.02 (*ns*)
Adolescent IQ	94.83 (16.45)	104.55 (15.69)	.62	4.55 (.0001)
Parent education[a]	5.70 (1.03)	5.87 (.96)	.18	1.27 (*ns*)
Single parent (n, %)	43 (30.28)	27 (27.00)	—	0.31 (*ns*)
Coping				
Behavioral	2.90 (.58)	3.42 (.64)	.81	6.52 (.0001)
Cognitive	2.72 (.68)	3.29 (.70)	.81	6.32 (.0001)
Avoidant	3.08 (.69)	3.01 (.82)	.09	−0.71 (*ns*)
Parent social support	3.52 (.81)	3.84 (.61)	.52	2.62 (.009)
	n (%)	*n* (%)		
Cigarette use			—	11.51 (.003)
Never smoked	95 (70.37)	88 (88.89)	—	
Less than daily	17 (12.59)	5 (5.05)	—	
Daily	23 (17.04)	6 (6.06)	—	

*n*s across variables range from 233 to 242 because of missing data.

[a]Response scale for parent education ranged from 1 (< *seventh-grade education*) to 7 (*graduate professional training*), with 4 = *high school graduate or GED*; 5 = *partial college or specialized training*; 6 = *standard college or university graduation*.

Table II

Coping and Parent Support Means (SDs) by Diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) and Conduct Disorder (CD) in Adolescence

	Controls	ADHD desisters, no CD	ADHD persisters, no CD	ADHD persisters, with CD	$F(3, 212)$
Behavioral coping	3.45 (.63)	3.28 (.49)	2.83 *** (.62)	2.65 *** (.44)	19.18, $p = .000$
Cognitive coping	3.31 (.70)	2.92 ** (.70)	2.64 *** (.71)	2.60 *** (.56)	14.19, $p = .000$
Parent social support	3.85 (.59)	3.77 (.70)	3.63 * (.81)	3.27 *** (.90)	6.59, $p = .000$

Means are presented irrespective of covariates because estimated marginal means (calculated at the means of the covariates) were similar (e.g., $M = 3.44, 3.30, 2.84$, and 2.65 for behavioral coping across the four groups). Means with asterisks (*) are significantly different from the control group means. Final Ns: 93 = controls (cases with CD removed); 32 = ADHD desisters, no CD; 63 = ADHD persisters, no CD; and 32 = ADHD persisters with CD.

*
$p < .05$.

**
$p < .01$.

***
$p < .001$