# Impact of Fathers' Alcohol Problems on the Development of Effortful Control in Early Adolescence

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**ABSTRACT. Objective:** This article examines the association between fathers' alcohol problems and children's effortful control during the transition from middle childhood to early adolescence (fourth to sixth grade). Additionally, we examined the role of two potential moderators of this association, fathers' antisocial behavior and child gender. **Method:** The sample consisted of 197 families (102 nonalcoholic [NA]; 95 father alcoholic [FA], in which only the father met diagnostic criteria for alcohol abuse or dependence). The sample was recruited from New York State birth records when the children were 12 months old. This analysis focused on 12-month alcohol problem data and child effortful control data measured in the fourth and sixth grades. **Results:** Structural equation modeling revealed that FA status was associated with lower effortful control on the Stroop Color and Word and Tower of London tasks in the sixth grade, but antisocial behavior did not moderate this association. Multiple group analysis revealed that FA status was associated with higher Stroop interference scores in fourth and sixth grade and lower move scores on the Tower of London task for boys but not girls. **Conclusions:** The association between FA status and effortful control may be attenuated in middle childhood (fourth grade) but emerge again in early adolescence (sixth grade). The results indicate that sons of alcoholics may be particularly vulnerable to poor self-regulatory strategies and that early adolescence may be an important time for intervening with these families to facilitate higher self-regulation before the transition to high school. (*J. Stud. Alcohol Drugs, 74,* 674–683, 2013)

CHILDREN OF ALCOHOLIC FATHERS (COAs), especially boys, are at risk for poor self-regulation that may be apparent as early as the preschool years (Eiden et al., 2004; Puttler et al., 1998). One aspect of self-regulation, effortful control, is a crucial predictor among COAs of the development of behavior problems at school age (Eiden et al., 2007) and of substance use in adolescence (Nigg et al., 2006). This aspect of self-regulation involves the active inhibition of a dominant response and initiation of a subdominant response according to contextual demands (Kochanska and Knaack, 2003; Kochanska et al., 1996; Rothbart and Bates, 1998). It is an important dimension of self-regulation that not only has been consistently linked to the development of externalizing behavior problems and substance use among COAs (Eiden et al., 2007) but also is associated with impulsive behavior and poor decision making that may lead to early-onset alcohol use in general population samples (Giancola and Tarter, 1999; Ivanov et al., 2008; Nigg et al., 2006; Tarter et al., 2003).

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Data from previous waves of the current sample indicated that sons of alcoholic fathers displayed lower effortful control during the toddler/preschool years (Eiden et al., 2007), but it remains unclear whether these findings persist into early adolescence. This is an important question given the role of self-regulation processes in the etiology of alcohol problems (Zucker et al., 2008). To date, only one study has examined the association between fathers' alcoholism and effortful control beyond early childhood (Nigg et al., 2004). Results indicated a significant association between COA status and response inhibition, an indicator of effortful control. However, the sample consisted of 12- to 15-year-olds, an age range during which there may be significant developmental changes in effortful control (Albert and Steinberg, 2011; Best and Miller, 2010; Lengua, 2006). Although research shows that the development of effortful control extends into adolescence (Albert and Steinberg, 2011; Best and Miller, 2010), there are no existing studies of stability or change in effortful control from middle childhood to early adolescence among COAs. This is a critical gap in the literature given the association between increases in effortful control from middle childhood to adolescence and lower internalizing and externalizing behavior problems in adolescence among general population samples (Lengua, 2006). Moreover, increased knowledge of the association between fathers' alcohol problems and children's effortful control before the onset of drinking and other substance use may be critical in elucidating one pathway to problematic drinking and substance use among these high-risk children.

The literature on COAs also highlights the heterogeneity in outcomes within this high-risk group (Loukas et al., 2003). Fathers' alcohol problems often co-occur with other disorders such as antisocial behavior. Results from the Michigan Longitudinal Study (Fitzgerald et al., 2002) indicated that children from antisocial alcoholic families exhibited significantly poorer trajectories for behavior problems (Puttler et al., 1998) and poor response regulation (a concept closely linked to effortful control) in adolescence (Nigg et al., 2004) compared with non-antisocial alcoholic families. Thus, the cumulative genetic and environmental risk posed by the co-occurrence of alcohol problems and antisocial behavior may be particularly significant with regard to the development of effortful control.

Gender may also be an important consideration because there are significant gender differences in the development of self-regulation (Vohs and Baumeister, 2011). In a meta-analysis outlining gender differences in temperament, the authors found that girls were better able to regulate their behavior and inhibit their actions than boys (Else-Quest et al., 2006). Others have noted that boys were more vulnerable to biological and environmental risk compared with girls (Lewis and Kestler, 2012). Boys of alcoholic fathers displayed poor effortful control in the preschool period (Eiden et al., 2004) and have been reported to be at greater risk for a developmental trajectory toward externalizing problems and substance use compared with girls (Carbonneau et al., 1998; Loukas et al., 2003; Tarter et al., 1997; Zucker et al., 1995). No research to date has assessed whether this gender difference in effortful control extends into middle childhood or early adolescence.

The purpose of this study was to examine the association between fathers' alcohol problems and children's effortful control during the transition from middle childhood to early adolescence (fourth to sixth grade). A related goal was to examine the role of two potential moderators of this association, fathers' antisocial behavior and child gender. We hypothesized that COAs would exhibit lower levels of effortful control from fourth to sixth grade than would children of nonalcoholic fathers, and that this association would be stronger for boys compared with girls. We also expected that fathers' antisocial behavior would moderate this association such that sons of fathers with both alcohol problems and high levels of antisocial behavior would exhibit the lowest levels of effortful control from fourth to sixth grades.

## Method

### *Participants*

The initial sample consisted of 227 families (111 girls, 116 boys) with 12-month-old infants. These families were classified into two groups at the time of recruitment: the nonalcoholic group consisting of parents with no or few alcohol problems and the alcohol problem group with families in which at least one parent met a diagnosis for alcohol abuse or dependence ($n$ = 125). Within the alcoholic group at recruitment, 76% of the families had only the father ($n$ = 95) who met criteria for alcohol abuse or dependence, 6% had only the mother who met criteria for alcohol abuse or dependence ($n$ = 7), and 18% had both parents who met criteria for alcohol abuse or dependence ($n$ = 23). Given the study hypotheses regarding the potential effects of fathers' alcohol problems and antisocial behavior, families in which only the father met diagnostic criteria for alcohol abuse or dependence were included in this study. Thus, the final sample consisted of 197 families, with 102 in the nonalcoholic (NA) group and 95 in the father alcoholic (FA) group. The study was approved by the University at Buffalo Social Science Institutional Review Board.

The majority of parents in the study were White (92%), approximately 6% were Black, and 2% were Hispanic, Native American, or other. Parental education ranged from less than a high school degree to postgraduate degree, with more than half of the mothers (59%) and fathers (54%) having completed some post–high school education. Annual family income ranged from $4,000 to $100,000 (U.S. dollars), with the mean income $43,626 ($SD$ = $20,937). The mother's age at recruitment ranged from 21 to 41 years ($M$ = 30.8, $SD$ = 4.40) and the fathers' from 21 to 58 years ($M$ = 33.14, $SD$ = 5.94). All of the mothers were living with the father of the infant in the study at the initial assessment, and most parents (88%) were married to each other.

### *Procedure*

The names and addresses of families were obtained from the New York State birth records for Erie County. Parents who indicated an interest in the study were screened by telephone with regard to sociodemographic characteristics and other eligibility criteria. Parents were primary caregivers and cohabitating since the infant's birth. Women who reported drinking moderate to heavy amounts of alcohol during pregnancy were excluded from the study to control for potential fetal alcohol effects. During the telephone screen, mothers were administered the Family History Research Diagnostic Criteria for alcoholism with regard to their partners' drinking (Andreasen et al., 1987), and fathers were screened with regard to their alcohol consumption, problems, and treatment. Because we had a large pool of families potentially eligible for the nonalcoholic group, once a family was recruited into the alcohol problem group, they were matched with a nonalcoholic family on race/ethnicity, maternal education, child gender, parity, and marital status. The sample was predominantly White (informed written consents were obtained from both parents, and child assents were obtained in fourth and sixth grade).

Families were assessed at seven different child ages (12, 18, 24, and 36 months; kindergarten [5–6 years of age]; fourth grade [9–10 years of age]; and sixth grade [11–12 years of age]). Extensive observational assessments with both parents and children were conducted at each age. This article focuses on 12-month alcohol problem data and effortful control data in the fourth and sixth grades. Families were compensated for their time in the form of gift cards, toys, and monetary compensation.

*Measures*

*Parental alcohol problems.* The University of Michigan Composite International Diagnostic Interview (UM-CIDI) adapted to a self-report questionnaire (Anthony et al., 1994) was used to assess alcohol abuse and dependence at 12 months. Several questions of the UM-CIDI were reworded to evaluate "how many times" a problem was experienced instead of whether it happened "very often." For abuse criteria, recurrent alcohol problems were described as those occurring at least three to five times in the past year or one to two times in three or more problem areas. In addition to the screening criteria *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 2000), criteria for alcohol abuse and dependence diagnoses for current alcohol problems (in the past year at 12 months) were used to assign final diagnostic group status (American Psychiatric Association, 2000). Fathers were assigned to the alcohol problem group if they met one or more of the following: (a) Research Diagnostic Criteria for alcoholism according to maternal report on the screening interview (Andreasen et al., 1986); (b) acknowledged having a problem with alcohol or having been in treatment for alcohol problems, was currently drinking, and had at least one alcohol-related problem in the past year; or (c) indicated having alcohol-related problems in three or more areas in the past year or met DSM-IV criteria for abuse or dependence in the past year based on the UM-CIDI.

*Antisocial behavior.* We used a modified, 28-item version of the Antisocial Behavior Checklist (Eiden et al., 2004; Zucker and Noll, 1980) to assess paternal antisocial behavior when the infant was 12 months old. Fathers were asked to rate their frequency of involvement in aggressive and antisocial activities over the course of their lifetime with a 4-point Likert scale ranging from 1 = *never* to 4 = *often* (e.g., shoplifted, taken part in a robbery, been question by police, defaulted on a debt). The scores were summed to create a composite score for antisocial behavior. Higher scores indicate higher levels of antisocial behavior. The internal consistency of the 28-item measure in the current sample was quite high ($\alpha = .90$).

*Stroop Color and Word Test.* The Stroop (Golden, 2003) is a measure of effortful control defined as the ability to monitor response conflict by suppressing a dominant response in order to carry out an alternative response (Kochanska et al., 1996; Nigg et al., 2002; Rothbart et al., 1994). In this task, children are asked to read a list of 100 items on a page as quickly as possible. There are three pages: The first is a list of words, the second is a series of ink color blocks, and the third is a series of incongruent color-word pairings (e.g., the word *green* written in blue ink). Because reading is an automatic response, one must inhibit the desire to read the word and instead name the ink color. Interference was calculated by subtracting the color score from the color-word score (CW − C) and then converting the score to a *t* score such that higher scores reflect higher levels of interference (Golden, 2003) and lower effortful control. Low levels of interference are indicative of an ability to successfully inhibit the dominant response and reflect higher levels of effortful control.

*Tower of London.* The Tower of London (TOL; Shallice, 1982) task is designed to evaluate inhibitory response processes and planning ability in children and adults by evaluating executive planning function. In this task, the participant and examiner use identical boards with three rods of different height. The examiner sets up the goal position on the examiner board. The participant is asked to move the balls from the starting arrangement to the goal position in as few moves as possible while adhering to three restrictions: (a) move only one ball at a time, (b) do not place a ball outside of the pegs, and (c) the tallest peg can hold only three balls, the middle peg two balls, and the shortest peg one ball. The primary measure of executive planning was the total move standard score (Culbertson and Zillmer, 2001). The total move score was the difference between the number of moves required to achieve the goal position and the number of moves taken for each trial, summed across all trials. This was then converted to a standard score that considered age and/or grade such that a higher standard score reflected better planning ability and effortful response processes.

*Stop-Signal Reaction Time (SSRT).* During the SSRT, participants performed a forced-choice reaction time test in which they were instructed to respond quickly to a go signal and inhibit their response when presented with a stop signal (Logan, 1994). SSRT is calculated by subtracting the mean stop delay (the delay between the stop signal and go signal) from the mean reaction time (the average response time for the go signal). Higher SSRT scores reflect less efficient effortful control, whereas lower SSRT scores reflect better effortful control. The data were checked for three conditions to ensure that the scores were valid: (a) mean reaction time was at least 200 ms, (b) the correct key was pressed at least 70% of the time, and (c) participants failed to stop pressing the key when the stop signal was presented between 20% and 80% of the time. This resulted in exclusion of 21% of cases in the fourth grade and 9% in the sixth grade from the analysis. Slower reaction times represent higher effortful control. For a complete description of this task, see the

stop-signal paradigm manual (Logan, 1994). Comparisons between participants who were and were not omitted for poor data quality suggested no significant differences on demographic and study variables.

As would be expected of any longitudinal study involving multiple family members, there were incomplete data for some participants at one or more of the assessment points included in this study. Of the 197 participants in the final sample, all provided complete data at the time of recruitment regarding alcohol use and demographic characteristics. At the fourth-grade visit, 140 children provided usable data on the TOL task, 145 on the Stroop Color and Word (Stroop) task, and 111 on the SSRT task. There were no significant differences between those with missing versus complete data on alcohol-group status, child gender, or demographics on the TOL and SSRT tasks. Children in the FA group were significantly more likely to provide data on the Stroop task at the fourth-grade assessment, $\chi^2(1, n = 197) = 3.86$, $p = .05$. At the sixth-grade assessment, 140 participants provided data for the TOL and Stroop tasks and 123 for the SSRT. There were no significant differences in alcohol-group status, child gender, or demographics between those with missing versus complete data at sixth grade.

*Data analytic approach*

Analyses of variance (ANOVAs) and *t* tests were used to examine group differences on demographic variables and the effortful control variables. Structural equation modeling (SEM) was used to test all hypotheses. All SEM analyses were conducted using Mplus (Version 4.0; Muthén and Muthén, 1998–2006). We first tested a measurement model for effortful control with three measured indicators at each age, the Stroop, TOL, and SSRT tasks. However, the fit of this model was poor, and results indicated that these three measures of effortful control did not load on a single latent factor. Thus, all model testing was conducted using the measured indicators as the endogenous variables. Full-information maximum likelihood estimation procedures were used, and standardized parameter estimates are presented. Multiple group analyses were used to examine moderation by gender and fathers' antisocial behavior. These models were tested by comparing fully unconstrained with fully constrained models. The $\Delta\chi^2$ was used as an omnibus test of differences across groups. Given a significant $\Delta\chi^2$, we used nested models approach to locate group differences in path coefficients.

## Results

We first examined differences in descriptive and demographic information across alcohol-group status. At the sixth-grade assessment, 20% of mothers were no longer living with the child's biological father. Of these, 12% were in the FA group and 8% were in the NA group. Chi-square analysis revealed that this difference was not statistically significant ($p > .10$). There were also no group differences in the amount of time that mothers and fathers spent with their children. At the sixth-grade assessment, one mother and three (2%) fathers reported having treatment for alcohol-related problems within the past 12 months. Five percent of mothers and 6% of fathers received treatment for psychological problems, and one father had treatment for other drug-related problems. Given these very small rates of treatment, there were no significant differences across groups.

We also evaluated the alcohol and illicit drug use of children in fourth and sixth grades to ensure that the effortful control variables represented functioning before the onset of alcohol or other drug use. Overall, 31.2% of the sample had some experience with alcohol (28.6% in the FA group, 33.8% in the NA group) at the sixth-grade assessment. Approximately 11% of children reported having had more than a few sips of alcohol, but only 2% ($n = 3$) reported having had a whole glass at a special occasion. Of those who reported having had more than a few sips, only one participant reported having alcohol without a parent's permission, and one reported having had one or fewer drinks in the last 30 days. No participants reported having more than a glass, and no participants regularly used alcohol. As above, there were no significant differences in reporting having more than a few sips of alcohol by alcohol-group status or gender, possibly because of the small endorsement rates. No participants reported using other drugs in the fourth grade. One participant in the FA group and one in the NA group reported having used a drug other than marijuana in the sixth grade. Thus, these adolescents were in the early stages of substance use characterized by limited use as would be expected given the age of the sample.

ANOVA or chi-square analyses were used to examine if alcohol-group status was significantly associated with the following variables at recruitment: age, education, number of hours worked, marital status, and child gender. The analyses revealed that fathers in the FA group were less educated, $F(1, 195) = 9.68$, $p < .01$, ($M = 13.4$ and 14.4 years of education, $SD = 1.9$ and 2.4, for the FA and NA groups, respectively); worked fewer hours, $F(1, 194) = 4.85$, $p < .05$, ($M = 39.4$ and 44.1 hours, $SD = 17.2$ and 12.3 for the FA and NA groups, respectively); and were less likely to be legally married, $\chi^2(1, n = 193) = 8.266$, $p = .00$, than fathers in the NA group (84% vs. 96% in the FA and NA groups, respectively). There were no group differences on age and child gender.

Group differences in fathers' alcohol consumption, alcohol problems, and children's effortful control measures in fourth and sixth grade for boys and girls are presented in Table 1. *T* tests indicated that no significant differences were present between COAs and children of nonalcoholic fathers for the effortful control variables. Given gender differences in effortful control in this sample at earlier ages (Eiden et al., 2004), we also examined group differences

TABLE 1. Group differences in alcohol problems and antisocial behavior at 12-month assessment, and inhibitory control tasks in fourth and sixth grade

| | Nonalcoholic | | | | Alcoholic | | | |
|---|---|---|---|---|---|---|---|---|
| | Boys | | Girls | | Boys | | Girls | |
| Variable | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Paternal QFI | 0.34[a] | 0.69 | 0.22[b] | 0.3 | 1.4[a] | 1.14 | 1.54[b] | 1.26 |
| Paternal heavy drinking | 0.48[a] | 0.75 | 0.54[b] | 0.93 | 3.4[a] | 1.89 | 3.13[b] | 1.81 |
| Paternal alcohol symptoms | 0.11[a] | 0.29 | 0.19[b] | 0.49 | 14.11[a] | 22.35 | 7.52[b] | 7.98 |
| Antisocial behavior | -3.43[a] | 7.4 | -3.76[b] | 5.03 | 3.34[a] | 9.65 | 1.75[b] | 6.85 |
| Stroop interference 4th | 51.33[c] | 7.39 | 55.64[c] | 9.42 | 53.62 | 7.58 | 52.51 | 6.95 |
| Stroop interference 6th | 49.65[ac] | 6.74 | 52.93[c] | 6.79 | 55.78[ad] | 5.98 | 50.35[d] | 5.54 |
| TOL standard score 4th | 93.5 | 16.56 | 88.97 | 13.53 | 94.06 | 16.01 | 88.43 | 17.89 |
| TOL standard score 6th | 98.26 | 13.9 | 97.29 | 11.86 | 91.53 | 16.28 | 95.27 | 12.83 |
| SSRT 4th | 342.01 | 119.66 | 319.45 | 120.18 | 328.07 | 116.29 | 378.41 | 158.45 |
| SSRT 6th | 319.19 | 134.23 | 300.00 | 120.23 | 278.31 | 107.1 | 302.97 | 121.4 |

*Notes:* Means with same superscripts are significantly different. Paternal heavy drinking was defined by a five-item measure that assessed the frequency of drinking six or more drinks, getting drunk, blacking out, passing out, and getting sick (standardized). Paternal alcohol symptoms were defined by how many times a problem had been experienced. QFI = Quantity–Frequency Index for alcohol consumption (number of occasions in past 30 days in which had 7–10 drinks); TOL = Tower of London task; SSRT = stop-signal reaction time task. [a]Represents significant differences between FA and NA boys; [b]Father alcoholic (FA) and nonalcoholic (NA) girls; [c]NA boys and girls; [d]FA boys and girls.

separately for boys and girls. *T* tests showed that sons of alcoholic and nonalcoholic fathers displayed no differences on the effortful control tasks in the fourth grade, although sons of alcoholics had significantly higher interference scores on the Stroop task, $t(74) = 17.44$, $p < .001$, and marginally lower TOL standard scores, $t(74) = 1.94$, $p = .056$, in the sixth grade. Sons did not differ on the SSRT in the sixth grade, $t(74) = 1.81$, $p > .05$. There were no mean differences between daughters of alcoholic and nonalcoholic fathers on the Stroop, TOL, or SSRT task scores at either assessment. Within the NA group, girls performed better than boys on the Stroop task in the fourth grade, $t(67) = -2.12$, $p < .05$, and the sixth grade, $t(68) = -2.01$, $p < .05$. Within the FA group, girls performed better than boys on the Stroop task in sixth grade, $t(68) = 3.93$, $p < .001$. No other significant group differences were identified.

Correlations among study variables are reported in Table 2 by child gender. Among boys, paternal alcohol status was significantly associated with paternal antisocial behavior and Stroop interference scores in the sixth grade. Stroop interference scores in the fourth grade were associated with Stroop interference scores in the sixth grade. Among girls, paternal alcohol status was associated with paternal antisocial behavior. Fourth-grade Stroop scores and TOL performance were associated with sixth-grade Stroop interference scores. Fourth-grade SSRT scores were marginally associated with SSRT scores in the sixth grade ($p = .055$).

### *Structural equation modeling*

We first examined the fit of the overall conceptual model, with fathers' alcohol-group status at 12 months as the ex-

TABLE 2. Correlations between study variables

| Variables | 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|---|
| Boys | | | | | | | |
| 1. Paternal alcohol status | – | | | | | | |
| 2. Paternal antisocial behavior | .371** | – | | | | | |
| 3. Stroop interference 4th | .153 | .000 | – | | | | |
| 4. Stroop interference 6th | .437*** | -.089 | .419** | – | | | |
| 5. TOL standard score 4th | .017 | .053 | .164 | .120 | – | | |
| 6. TOL standard score 6th | -.220 | -.050 | .206 | -.007 | .140 | – | |
| 7. SSRT 4th | -.060 | -.157 | -.185 | -.010 | -.177 | -.099 | – |
| 8. SSRT 6th | -.169 | -.005 | .099 | .045 | -.042 | .051 | .058 |
| Girls | | | | | | | |
| 1. Paternal alcohol status | – | | | | | | |
| 2. Paternal antisocial behavior | .423*** | – | | | | | |
| 3. Stroop interference 4th | -.189 | -.125 | – | | | | |
| 4. Stroop interference 6th | -.208 | -.097 | .450** | – | | | |
| 5. TOL standard score 4th | -.017 | -.143 | -.018 | .302* | – | | |
| 6. TOL standard score 6th | -.083 | -.097 | .149 | .137 | -.013 | – | |
| 7. SSRT 4th | .209 | .091 | -.123 | -.114 | .123 | -.102 | – |
| 8. SSRT 6th | .012 | -.121 | .013 | .122 | .134 | .055 | .284† |

*Notes:* 4th = fourth grade; 6th = sixth grade; TOL = Tower of London task; SSRT = stop-signal reaction time task
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.

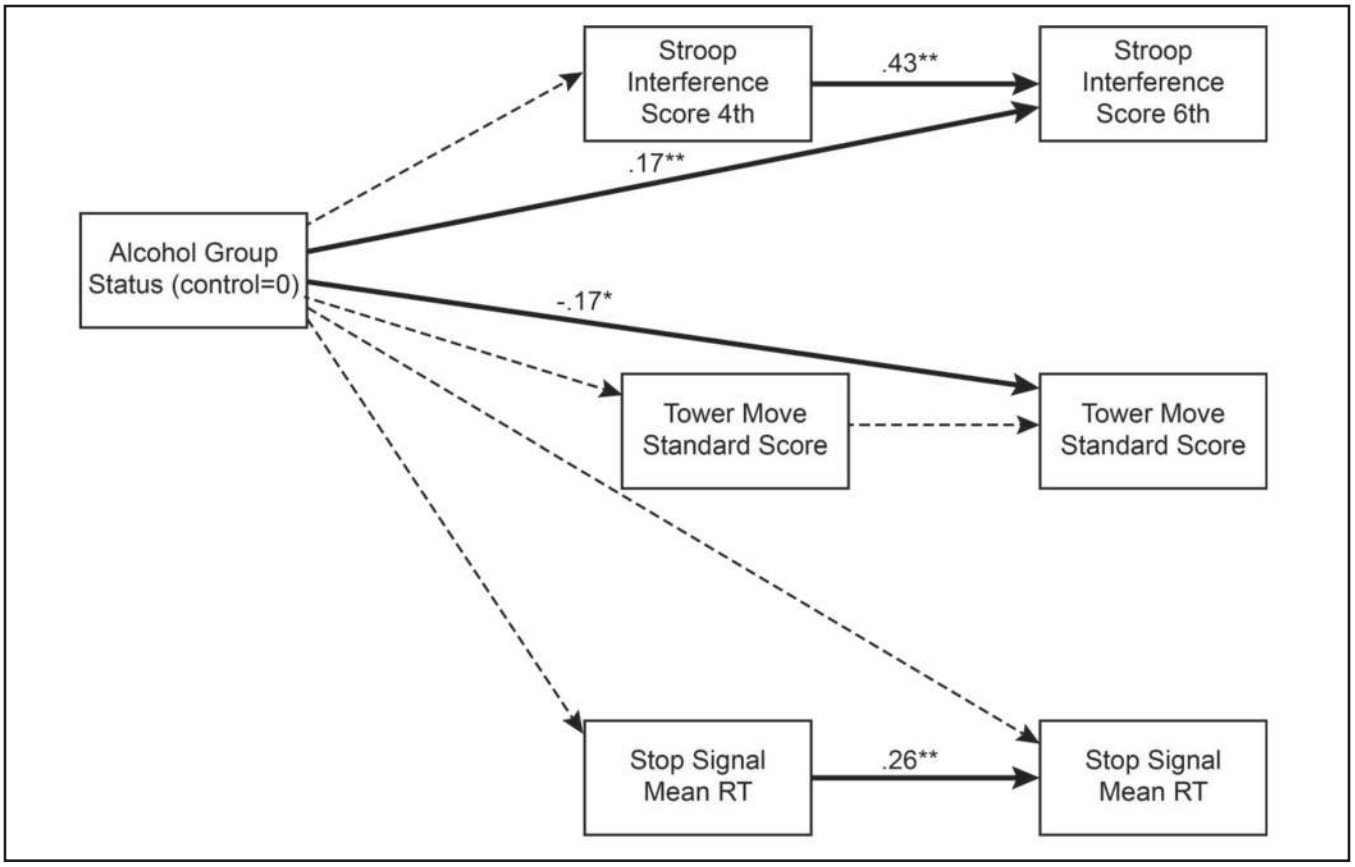


FIGURE 1. Results from structural equations modeling for the full sample. The numbers represent standardized path coefficients. Nonsignificant paths are included in the model in dashed lines. The error terms for the endogenous variables are not included in the figure. RT = reaction time.
*$p < .05$; **$p < .10$.

ogenous variable and children's effortful control measures at fourth and sixth grade as the endogenous variables. This model included a path from the exogenous variable to the fourth-grade effortful control measures and the autoregressive paths from each fourth-grade measure to the corresponding sixth-grade measure, and covariances among the within-time disturbances of the three effortful control measures. Goodness of fit indices revealed that the model did not fit the data well, $\chi^2(9, n = 197) = 19.92$, $p < .05$ (comparative fit index [CFI] = .59; root mean square error of approximation [RMSEA] = .08). None of the within-time covariances among residuals were significant. These nonsignificant covariances were trimmed in the next model, but this also did not fit the data well, $\chi^2(15, n = 197) = 23.79$, $p = .07$ (CFI = .67; RMSEA = .06). We next added direct paths from fathers' alcohol-group status to the three effortful control measures at sixth grade. Results indicated a significant improvement in model fit, $\Delta\chi^2(3, n = 197) = 9.72$, $p < .05$. This final overall model fit the data well, $\chi^2(12, n = 197) = 14.07$, $p = .30$ (CFI = .93; RMSEA = .03). Fathers' alcohol-group status was associated with higher Stroop interference scores and a lower TOL standard score in sixth grade, indicating lower effortful control among children in the FA group on these two measures (Figure 1). Father's alcohol-group status was not, however, associated with performance on the SSRT task.

In the next step, we used multiple group analysis to examine if fathers' antisocial behavior moderated the association between alcohol-group status and children's effortful control. We first examined fit indices for a fully unconstrained model for boys and girls and compared this unconstrained model with a fully constrained model. These two nested models were not significantly different from each other, $\Delta\chi^2(23, n = 197) = 17.80$, $p > .05$. Thus, fathers' antisocial behavior did not moderate the association between alcohol-group status and children's effortful control.

We then used multiple group analysis to examine whether child gender moderated the association between alcohol-group status and children's effortful control. We first examined fit indices for a fully unconstrained model for boys and girls and compared this unconstrained model with a fully constrained model. These two nested models were significantly different from each other, $\Delta\chi^2(9, n = 197) = 19.88$, $p < .05$. Chi-square difference tests indicated that the paths from alcohol-group status to Stroop interference scores in fourth and sixth grades and to the TOL standard score at

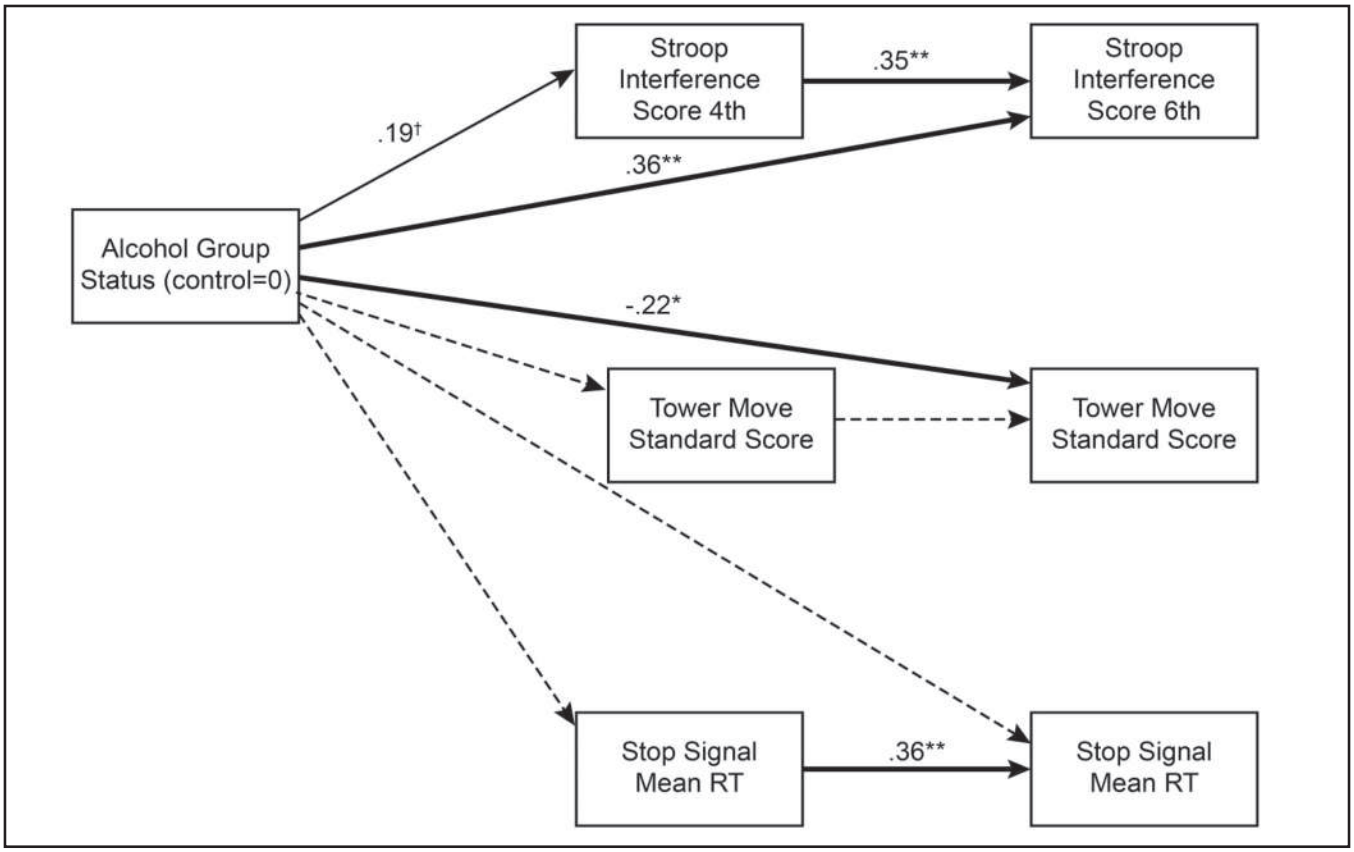


FIGURE 2. Results from structural equations modeling for boys. RT = reaction time.
†$p < .10$; *$p < .05$; **$p < .01$.

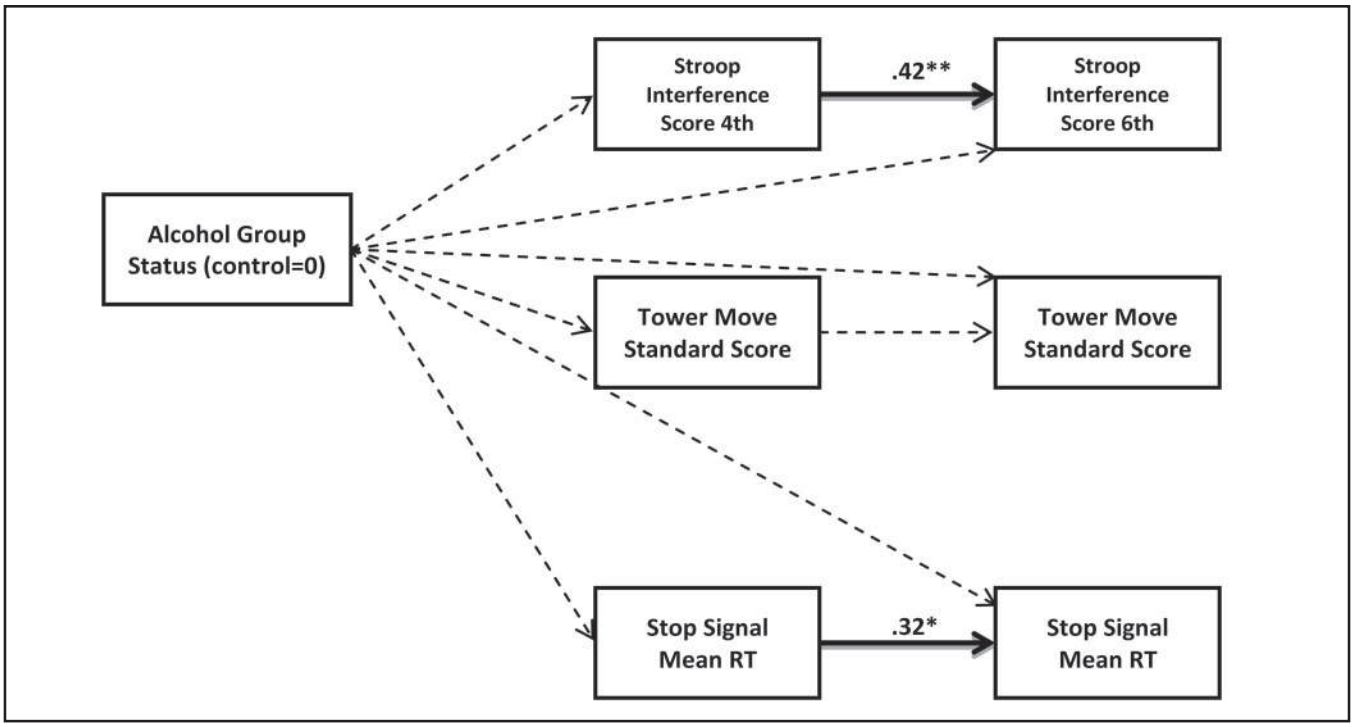


FIGURE 3. Results from structural equations modeling for girls. RT = reaction time.
*$p < .05$; **$p < .01$.

sixth grade should be freely estimated for boys and girls. In the final multiple-group model, these three paths were freely estimated and all other paths, covariances, and error variances were constrained. This model fit the data well, $\chi^2(30, n = 197) = 29.63$, $p = .49$ (CFI = .99; RMSEA = .00). The significant parameter estimates in this final model for boys are depicted in Figure 2. Fathers' alcohol-group status was associated with higher Stroop interference scores and lower standard scores on the TOL task in sixth grade, indicating lower effortful control for boys. The association between fathers' alcohol group status and Stroop interference scores in fourth grade approached significance ($p < .10$). However, alcohol-group status was not associated with boys' performance on the SSRT task. The significant parameter estimates for the final model for girls are presented in Figure 3. Fathers' alcohol-group status was not significantly associated with effortful control measures in the fourth or the sixth grade for girls.

## Discussion

We hypothesized that children in the FA group would have lower effortful control, that this association would be stronger for boys, and that fathers' antisocial behavior would moderate the association between fathers' alcohol-group status and children's effortful control. Our results were partially supportive of these hypotheses.

Boys in the FA group had significantly lower effortful control compared with boys in the control group. This result extends on findings from an earlier analysis of the preschool wave of the current sample, which indicated that 2- to 3-year-old sons in the FA group had lower effortful control than sons of controls (Eiden et al., 2004). The current results indicate that the association between father's alcohol problems and son's effortful control continues to be apparent later in childhood. Although lower effortful control seemed to be attenuated in middle childhood (fourth grade) compared with a previous assessment with this sample during the preschool period, it reemerged again in early adolescence (sixth grade), which suggests that sons of alcoholics may be particularly vulnerable to poor self-regulatory strategies. However, inconsistent with previous research, we did not find a significant relationship between FA group status and response-inhibition scores on the SSRT task at either the fourth- or the sixth-grade assessment. Results from the Michigan Longitudinal Study indicated that 3-year-old sons of alcoholics acted more impulsively on a delay-of-gratification task (Fitzgerald et al., 1993) and that 12- to 15-year-old sons of alcoholics had lower response-inhibition scores on the SSRT task compared with sons of controls (Nigg et al., 2004). It is possible that group differences as a function of FA group status will emerge in later adolescence. Examination of group differences in developmental trajectories for response inhibition and the role of these trajectories in predicting adolescent risky behaviors may be an area for future research.

Consistent with earlier findings (Eiden et al., 2004), we did not find a relationship between father's alcohol status and daughter's level of effortful control. It may be that social learning processes (e.g., modeling) are particularly strong between fathers and sons and less so for fathers and daughters. It is also possible that, whereas associations between father's alcohol status and son's effortful control may be strong, similar social learning mechanisms may operate between mothers and daughters. Future research should assess this important relationship and how social learning variables play into this process.

Contrary to expectations, fathers' antisocial behavior did not moderate the association between fathers' alcohol-group status and effortful control. Results are similar to those reported by Nigg and colleagues (2004), indicating few differences on effortful control measures at 12–15 years of age between sons of antisocial fathers with alcohol problems and those in the control group. We had also expected that our measures of effortful control would load on a single latent factor, although they did not. These measures of effortful control also reflect executive function in the cognitive domain (Nigg et al., 2004). As noted by previous researchers, executive function is not a unitary construct, and although our measures were narrow in their focus on response inhibition and regulation aspects of executive function, they need to be understood at the component level.

In the current study, there was surprisingly little stability in the TOL measure from fourth to sixth grade, and the stability coefficient (auto-correlation) between the fourth- and sixth-grade SSRTs was low. One explanation for the difference in stability coefficients may be that stability is higher when measures of effortful control are based on parent or child perceptions but lower when behavioral measures of task performance are used. For instance, in one of the few studies examining changes in effortful control across this period, Lengua (2006) reported high stability in effortful control across a 1-year period among a sample of third through fifth graders. Another explanation may be that stability is higher when the sample consists of a range of ages such as third through fifth grades, and higher across a 1-year period that does not encompass a significant developmental transition, the transition from elementary to middle school.

In evaluating the results of this study, several limitations should be considered. First, our measures of effortful control were based on task performance alone. Although this has the advantage of objectivity, the results may have been different if measures of parent and child report were included. Second, it is possible that alcohol problems and effortful control are both associated with similar genetic risk factors. However, we were unable to evaluate parental effortful control at this time, precluding a test of this possibility. Third, these results may not be generalizable to families of single mothers who

separated from or never lived with a partner who had alcohol problems. One eligibility requirement at the time of recruitment when the child was 12 months old was that biological parents had been living together since the child's birth. This was a crucial design feature that allowed us to examine the association between fathers' alcohol problems on family functioning, parenting, and child development. However, this limits generalizability of our findings to families who were intact when the child was 1 year old. This study is also limited to families in which only the father has an alcohol use problem. Therefore, the current research is not generalizable to families in which the mother has an alcohol use problem and the father does not or families in which both parents have an alcohol use problem. Indeed, it is likely that mother's alcohol use status and level of effortful control have important implications for the development of effortful control in childhood, although our research did not evaluate this association.

Despite these limitations, the study fills an important gap in the literature. Results indicate that boys of fathers with alcohol problems continue to be at greater risk for self-regulatory difficulties even following the preschool period. This raises the possibility that intervening with these families may facilitate higher self-regulation among these boys. Importantly, these results were not limited to fathers who had both alcohol problems and high antisocial behavior. Further research is needed to determine whether these aspects of self-regulation are predictive of risky health behaviors including substance use as the children transition into high school.

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