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Directionality Between Tolerance of Deviance and Deviant Behavior is Age-Moderated in Chronically Stressed Youth

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Abstract

Problem behavior theory posits that tolerance of deviance is an antecedent to antisocial behavior and substance use. In contrast, cognitive dissonance theory implies that acceptability of a behavior may increase after experiencing the behavior. Using structural equation modeling, this investigation tested whether changes in tolerance of deviance precede changes in conduct disorder criteria or substance use or vice versa, or if they change concomitantly. Two-year longitudinal data from 246 8- to 16-year-olds suggested that tolerance of deviance increases after conduct disorder criteria or substance use in 8-to-10- and 11-to-12-year-olds. These results were consistent with cognitive dissonance theory. In 13-to-16- year-olds, no directionality was suggested, consistent with neither theory. These results were replicated in boys and girls and for different types of conduct disorder criteria aggression (covert behavior), deceitfulness and vandalism (overt behavior), and serious rule-breaking (authority conflict). The age-specific directionality between tolerance of deviance and conduct disorder criteria or substance use is consistent with unique etiologies between early onset versus adolescent-onset subtypes of behavior problems.

Keywords

adolescents; children; conduct disorder criteria; substance use; tolerance of deviance

INTRODUCTION

For four decades, tolerance of deviance (TOD) has been researched as an etiological risk factor of antisocial behavior and substance use under the assumptions of problem behavior theory (Donovan, Jessor, & Costa, 1999; Jessor, Graves, Hanson, & Jessor, 1968). Conversely, cognitive dissonance theory suggests that TOD may increase following antisocial behavior or substance use (Festinger, 1957; Wicklund & Brehm, 1976). Related to the directionality of these constructs is that prepubertal antisocial behavior is distinct from adolescent-onset antisocial behavior (Caspi, Moffitt, Newman, & Silva, 1996; Moffitt, 1993; Ridenour et al., 2002) with the latter age group being the focus of problem behavior theory.

Moreover, compared to later adolescent onset of substance use, earlier onset substance initiation forecasts greater prevalence of, and disabling effects from, substance abuse (Brook, Brook, Zhang, Cohen, & Whiteman, 2002; DeWitt, Adlaf, Offord, & Ogborne, 2000; Hingson, Heeren, Jamanka, & Howland, 2000). The present investigation was conducted to shed light on directionality of TOD and antisocial behavior or substance use between the ages of 8 and 16 years.

Theories Regarding TOD and Deviant Behavior

Problem behavior theory posits that TOD is due to personality characteristics and indicative of willingness to engage in norm-violating behavior (Donovan et al., 1999; Jessor et al., 1968). TOD correlates with and predicts a range of risky behaviors including antisocial behavior and substance use (Benjamin & Wulfert, 2005; Dielman, Butchart, Shope, & Miller, 1990–1991; Loveland-Cherry, Ross, & Kaufman, 1999; Webb, Baer, & McKelvey, 1995; Wills et al., 2001). An assumption of problem behavior theory is that TOD precedes antisocial behavior or substance use, suggesting that alterations in TOD could subsequently reduce deviant behavior. However, this assumption largely has gone untested (Huesmann & Guerra, 1997; Zhang, Loeber, & Stouthamer-Loeber, 1997).

Alternatively, cognitive dissonance theory suggests that antisocial behavior and substance use can increase TOD because psychological discomfort arises from cognitions about one's self or principles that conflict with one's behavior (e.g., one believes that stealing is wrong but has stolen; Bern, 1972; Cooper & Fazio, 1984; Festinger, 1957; Van Overwalle & Jordens, 2002; Wicklund & Brehm, 1976). A strategy many people use to reduce cognitive dissonance is to alter cognitions to be consistent with their behavior, subsequently increasing the perceived acceptability of the behavior. Two examples of altering cognitions are to (1) reframe the behavior to be more normative (e.g., most people steal; Jensen, Arnett, Feldman, & Cauffman, 2002; Makela, 1997) or (2) alter cognitive evaluation of the behavior (e.g., stealing is not so wrong; Van Overwalle & Jordens, 2002). Using cross-lagged models, Zhang and colleagues (1997) reported that among 6- to 18-year-olds, the prediction of future TOD based on delinquent behavior was generally equal to (or at times larger than) the converse prediction. However, delinquent behavior and TOD were dichotomized, potentially losing information from the full continuum of these variables.

Early Onset Antisocial Behavior and Substance Use

Nearly all research on problem behavior theory and cognitive dissonance theory has sampled older adolescents or adults. Testing how well these theories apply to younger populations could provide insight to the etiology of and intervention with early onset antisocial behavior or substance use (Guerra, Huesmann, & Spindler, 2003). Substantial evidence exists for distinct early or prepubertal onset versus adolescent-onset subtypes of antisocial behavior, which are also mediated by distinct developmental processes (Caspi et al., 1996; Moffitt, 1993; Ridenour et al., 2002). One distinction between the subtypes is that early onset antisocial behavior presages persistence of such behavior, even into adulthood, whereas adolescent-onset antisocial behavior usually is more transitory (Caspi et al., 1996; Ridenour et al., 2002). If different patterns of risk factors exist at different ages, then optimizing prevention may require adapting intervention according to age-specific development.

Earlier substance use also can interfere with youth development. Earlier use presages heavier use, again even into adulthood, as well as substance use-related problems such as blackouts, addiction, and driving under the influence (Brook et al., 2002; DeWitt et al., 2000; Hingson et al., 2000). Of particular relevance to this study is substance use before high school, which is not rare. In the 2007 U.S. *Monitoring the Future* survey, 16% of

eighth graders had consumed a standard drink or more alcohol within the preceding 30 days (www.monitoringthefuture.org/, September 15, 2007). More than 42% of the 2007 U.S. *Youth Risk Behavior Surveillance Survey* sample had smoked tobacco during or before ninth grade (www.cdc.gov/mmwr/preview/mmwrhtml/ss5704a1.htm?s_cid=ss5704a1_e).

Developmental Perspective and Implications

Developmentally, the sequential nature of risks provides important etiological insights. Non-linear human developmental models (e.g., Lerner & Castellino, 2002) point out that relationship(s) between variables at one point in the life span may differ at another developmental period (Pardini, Loeber, & Stouthamer-Loeber, 2005). For example, a risk factor may have a strong causal relationship with an outcome at one developmental period but more of an escalating or maintenance role at a different period (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001; Tracy, Josiassen, & Bellack, 1995). Understanding different patterns of relations between risks and outcomes can be particularly important during periods of rapid maturation, when the potential for altering developmental trajectories may be heightened.

Late childhood and early adolescence are characterized by significant physical, social, and cognitive changes that are germane to socially deviant behavior. For example, transitions into middle and high school occur. Cognitive maturation during these ages includes development of abstraction and envisioning the future, which allows for greater comprehension of *potential* consequences and societal ramifications of behavior. These cognitive capacities correlate with antisocial behavior and substance use during adolescence (Robbins & Bryan, 2004), but the correlation may differ in preadolescents. In sum, testing whether sequential relationships are age-moderated can shed light on maturational processes that are specific to age groups.

Understanding the directionality between TOD and antisocial behavior might be further complicated by the existence of types of antisocial behaviors. Some evidence suggests three dimensions of antisocial behavior exist (authority conflict, covert, overt) and that during adolescence, an individual's behavior tends to escalate along one or more of these dimensions (Loeber, Keenan, & Zhang, 1997). These dimensions roughly correspond to *Diagnostic and Statistic Manual of Mental Disorders* (DSM) conduct disorder nomenclature (CON): authority conflict resembles DSM-IV serious rule-breaking, covert antisocial behavior resembles DSM-IV deceitfulness and vandalism, and overt antisocial behavior resembles DSM-IV aggression. Specifically, directionality between TOD and CON may be mediated not only by type of antisocial behavior but also by an interaction between type of behavior and age.

Present Study

This study is one of the first to examine differences in directionality and reciprocities of TOD and antisocial behavior or substance use between children, young adolescents, and middle adolescents. Participants were experiencing chronic stress, which increases risk for antisocial behavior and substance involvement (Brady & Sonne, 1999; DiFranza et al., 2004; Kassel, Stroud, & Paronis, 2003; Wills, Vaccaro, & McNamara, 1992). One-year longitudinal data were analyzed using structural equations models designed for clarifying directionality between psychological characteristics (Sher & Wood, 1997). Analyses were replicated in genders and three age groups to learn if gender or age moderated the results. Analyses also were replicated using different subtypes of antisocial behaviors because TOD may play different roles in the etiology of specific types of antisocial behavior (Loeber & Stouthamer-Loeber, 1998).

METHODS

Procedures

In accordance with the university IRB-approved protocol, data were collected during a week-long summer camp for youths experiencing chronic stress by the camp staff as part of an annual program evaluation. Prior to attending camp, participants and their parents were informed of the program evaluation, research using their data, and their option to withdrawal at any time, for any reason, with no consequence to their camp program service. Immediately prior to data collection, participants were reminded of the (1) purpose of the evaluation, (2) option to withdraw, and (3) “Don’t know” and “Refuse to answer” response options, thereby avoiding possible undue parental pressure to participate.

To qualify for the camp, an adult sponsor applied on behalf of a candidate and described the source(s) of his or her stress. Camp staff rated the severity of stressors and whether they merited camp attendance. To illustrate using levels of the social stressor scale, the seven levels of socially based stress were research based with the most severe level described as “few, if any, friendships and child is actively disliked by peer group.” About 60% of applications annually result in camp attendance. Based on summer camp agency records, source(s) of camper stress were as follow: 45.3% familial problems (e.g., parent with an addiction or incarceration), 37.7% social problems, 36.8% poor academic performance, 32.0% low family income, 31.2% mental or emotional problems (e.g., major depression, although psychiatric diagnoses were not made as part of this study), and 7.3% miscellaneous. Specific stressors (e.g., parental substance addiction) were not available for analysis.

Sample

Of the 2004 campers, 69.7% attended the 2005 camp and $N = 246$. All campers who attended in 2004 and 2005 completed the Assessment of Liability and Exposure to Substance use and Antisocial behavior (ALEXSA®; Ridenour, 2003) at both times (100% participation rate). We found no evidence of sample bias from attrition; study participants did not differ from campers who completed only the 2004 survey in terms of modal academic grade, repeating a school grade, receiving free school lunches, gender, or age ($p > .05$). In 2004, participants were 8 to 16 years old (mean = 11.7 years, $SD = 1.7$); 61 were ages 8 to 10, 103 were ages 11 to 12, and 82 were ages 13 to 16. These age groups were analyzed separately because they attended separate summer camps (and may have had different experiences, such as peer influences); these age partitions also approximate U.S. school levels (elementary versus middle versus high school) and age-related differences were expected in terms of the variables studied (e.g., Moffitt, 1993). Inclusion of teenagers in this study permitted us to compare results from children and preteens to results from a population on which more research on the study topic has occurred.

The sample composition was 52.1% girls, 45.7% receiving free school meals (a proxy for low economic status), 80.7% Caucasian, 6.3% African American, and 7.9% from another ethnicity or mixed ethnicities. Participants were from urban, suburban, and rural settings throughout western and central Pennsylvania, although urban versus rural location per se was not measured.

To clarify how the sample compared to a more normative sample, mean scores on ALEXSA subscales that are putatively associated with stress (Wills, Resko, Ainette, & Mendoza, 2004; Wills, Sandy, Yaeger, Cleary, & Shinar, 2001) were compared to 126 students from an elementary school district in the same region (see Ridenour & Fienberg, 2007). Only 9- to 12-year-olds were compared because this was the age range of the student sample. As hypothesized, campers had greater mean scores than students on the following: *Irritability*

(1.24, $SD = 0.56$ versus 0.91, $SD = 0.51$; $F = 16.9$), *Depression* (1.12, $SD = 0.58$ versus 0.71, $SD = 0.47$; $F = 25.2$) and *Distractibility* (1.18, $SD = 0.73$ versus 0.72, $SD = 0.70$; $F = 19.3$). Also as hypothesized, campers had lesser mean scores than students on the following: *Academic Competency* (3.03, $SD = 0.54$ versus 3.41, 0.49; $F = 26.3$), *Social Support* (2.17, $SD = 0.57$ versus 2.51, $SD = 0.40$; $F = 20.1$), *Problem Solving* (1.58, $SD = 0.79$ versus 2.06, $SD = 0.69$; $F = 18.5$), and *Planning and Concentration* (1.84, $SD = 0.54$ versus 2.26, $SD = 0.51$; $F = 28.5$). Each of these differences is medium to large (Cohen, 1988) and statistically robust ($p < .001$).

Assessment

Data were collected at both time points using ALEXSA (Ridenour, 2003). The ALEXSA is an illustration-based, audio, computer-assisted self-interview to assess antisocial behavior, substance involvement, and predictors of these behaviors (Ridenour, Clark, & Cottier, 2009; Ridenour & Feinberg, 2007). Several written, standardized self-report instruments are available to measure aspects of problem behaviors including conduct disorder. The ALEXSA was used because its format does not require reading and it is computerized. About 40% of U.S. fourth graders cannot read at even basic levels (Lutkus, Rampey, & Donahue, 2005). Many at-risk youths are poor readers or illiterate, and these children are the most likely to not complete a written survey due to reading frustration, inattention, or fatigue (Bennett, Brown, Boyle, Racine, & Offord, 2003). Notably, reading deficits presage antisocial behavior and substance use (Barkley, Fischer Smallish, & Fletcher, 2004; Costello, Angold, & Keeler, 1999), making data from poor readers especially informative. In addition, computer self-report instruments increase the perception of confidentiality compared to paper surveys (Mukoma et al., 2004). Adequate to excellent psychometrics have been found for all nine ALEXSA factors and nearly all 39 subscales (Minnes, Singer, Ridenour, Satayathum, & Miller, 2005; Ridenour & Feinberg, 2007; Ridenour et al., 2009). For the present study, the same subscales were used at both time points.

Conduct Disorder Criteria items were derived from DSM-IV criteria, used “yes” versus “no” response options, and scale scores were criteria counts (APA, 1994; Elliott, Huizinga, & Menard, 1989; see Figure 1). Any use of alcohol, tobacco, and inhalants were queried because they are the most prevalently used substances during the ages being studied (monitoringthefuture.org/, September 15, 2008); legal substances (albeit not for the ages studied); and generally accessible to youths. Also, most research conducted on this age population involves any use (e.g., Donovan, 2007; Donovan & Molina, 2008). Cannabis use was queried but not analyzed because only 6 participants admitted using cannabis and 5 of them were 13 to 16 years old.

Tolerance of Deviance items were derived from recent versions of Jessor and colleagues’ Tolerance of Deviance scale (Loveland-Cherry et al., 1999; Wills et al., 2001). The full ALEXSA Tolerance of Deviance subscale consists of seven items which had adequate to good internal consistency in the aforementioned school students ($\alpha = 0.91$). However, because of time constraints, the summer camp agency selected the four items that (1) provided greater variability in other samples and (2) referred to school contexts which are common to the range of ages studied (Table 1). In the student sample, the four-item Tolerance of Deviance subscale correlated .97 with the seven-item version; virtually no information was lost using the four-item version. Response options consisted of four-point Likert scales ranging from “very wrong” to “not at all wrong” and the scale score was a mean of item scores. In the present sample, alpha internal consistencies for Conduct Disorder Criteria and Tolerance of Deviance were .76 and .82, respectively.

Validities of Conduct Disorder Criteria and Tolerance of Deviance were demonstrated by Ridenour and colleagues (2009). In a school sample ranging from average to above-average

risk for substance use, test-retest reliabilities were adequate to good for Conduct Disorder Criteria (intraclass correlation = .69) and Ever Used Tobacco (intraclass correlation = .65) and were good to excellent for Tolerance of Deviance (intraclass correlation = .76) and Ever Used Alcohol (intraclass correlation = .83). In the same sample, Tolerance of Deviance, Conduct Disorder Criteria, Ever Used Tobacco, and Ever Used Alcohol, respectively, correlated with the sensation-seeking factor (.37, .56, .28, and .17), behavioral disinhibition factor (null, .47, null, and .17) and social contagion (for risky behavior) factor (null, .75, .31, and .22). As the latter null correlations for Tolerance of Deviance supported its discriminant validity, the convergent validity of this subscale was supported by its larger correlations with social factors that putatively influence attitudes that stem from family and school (e.g., Pardini et al., 2005); its correlation with Family Discord = .21, Parent Fortification = -.20, and School Protection = -.31.

A second validity study was conducted in nine-year-olds from poor economic backgrounds who were exposed to addictive substances in utero (Ridenour et al., 2005). Conduct Disorder Criteria significantly correlated with other self-report instruments (e.g., Dominic and Trauma Symptom Checklist for Children), parental ratings (e.g., Child Behavior Checklist) and research interviewer ratings of antisocial behavior (e.g., Conner's Rating Scales). One basis for the present study was an observation in these child samples. Specifically, while the validity of Tolerance of Deviance was evident, it tended to correlate less with problem behaviors and other related characteristics (e.g., disinhibition) than might be expected based on findings with older adolescents. Samples in the two validity studies included sizable proportions of both genders, Caucasians, Hispanics, and African Americans.

ALEXSA administrations for the present study required an average of 35 minutes. Except for sources of chronic stress, all data were self-reports. To shed light on how results may differ between types of antisocial behavior, Conduct Disorder Criteria items were configured to fit the four DSM-IV categories of conduct disorder criteria (Table 1), which also correspond to Loeber and colleagues' (1997) types of antisocial behavior: aggression to people and animals (aggression or overt behavior), deceitfulness or theft (deceitfulness or covert behavior), serious violations of rules (serious rule-breaking or authority conflict), and destruction of property (vandalism or covert behavior).

Analyses

Cross-correlations can be used to investigate directionality between two psychological constructs at two time points (Chatfield, 2004; Dierker et al., 2006; Fuller et al., 2003). For the present study, a similar but more rigorous structural equations model was used (Sher & Wood, 1997). As shown in Figure 2, conduct disorder criteria (CON) or substance use in 2004 was correlated with TOD in 2005 (controlling for 2004 TOD). TOD in 2004 was correlated with 2005 CON or substance use (controlling for 2004 CON or substance use, respectively). Importantly, paths x, y, and z ruled out many alternative explanations for directionalities between CON and TOD, including autocorrelation in CON or substance use (path x) and TOD (path z) as well as the correlation between 2004 CON or substance use and 2004 TOD (path y).

Results involving paths c and t were of most interest. If path c (CON or substance use preceding TOD) was large enough that $p < .05$ and path t (the reverse directionality) was not, the result would be consistent with cognitive dissonance theory because CON or substance use leads to increased TOD. Alternatively, if path t was large enough that $p < .05$ and path c was not, the result is consistent with problem behavior theory because TOD leads to increased CON or substance use.

For each CON or substance use, two maximum likelihood models were estimated using AMOS, version 6.0 (Arbuckle, 2005). In the constrained model, path coefficients were forced to be equal across age (gender) groups. In the freed model, all path coefficients were estimated separately for each age (gender) group lest statistical control inaccurately lower autocorrelation or correlation between 2004 characteristics. Path coefficients were tested for being greater than zero at $p < .05$ using the Wald test. In both models, estimates of means, variances, residuals, and intercepts were free to vary between age groups. Model fit was estimated using three fit statistics: likelihood ratio χ^2 (a statistical test for model differences); Akaike's information criterion (χ^2 fit penalized by number of model parameters, smaller values indicate better fit); and the comparative fit index (favors more parsimonious models; greater values indicate better fit).

RESULTS

Descriptive statistics appear in Table 1. In each age group, from 2004 to 2005, CON and substances used both increased and mean TOD tended to decrease. Means of CON and substance use for 2004 (and many for 2005) are statistically greater in 13- to 16-year-olds than 8- to 10-year-olds, with means for 11- and 12-year-olds usually falling between the other age groups. Standard deviations of CON and substances used generally increased with age. Alcohol, tobacco and inhalant use were reported by 17.7%, 3.2% and 9.7% of 8- to 10-year-olds in 2004; 26.2%, 5.8%, and 10.7% of 11- to 12-year-olds; and 46.3%, 9.8%, and 29.3% of 13- to 16-year-olds. In 2005, these respective frequencies were 22.6%, 3.2%, and 9.7% in the youngest subgroup; 37.9%, 5.8%, and 17.5% in the middle-age subgroup; and 68.3%, 6.1%, and 35.4% in the oldest subgroup. Correlations between study variables appear in Table 2.

Model Testing

Path analyses of the Figure 2 model using the entire sample resulted in c paths (and not t paths) for all CON and substance use attaining $p < .05$ (Table 3). Hence, results of analyses for the whole sample are consistent with cognitive dissonance theory. Freeing path coefficients for genders does not improve fit to the data ($p > .05$).

In contrast to gender, freeing path coefficients between age groups improves fit to the data ($p < .05$) (Table 4). Age-related changes in path coefficients are similar across different CON and substance use (Table 5). Coefficients of paths depicting that CON or substance use precedes TOD (path c) gradually decrease in size from younger to older participants.

In 8- to 10-year-olds, paths c and x are nearly all significant, consistent with cognitive dissonance theory, although these paths are relatively small for number of drugs used and serious rule-breaking. The null y and z paths in 8- to 10-year-olds suggest that annual TOD changes are large in children and not unidirectional, consistent with Huesmann and Guerra's report (1997).

In 11- to 12-year-olds, c and x path coefficients are generally smaller than the corresponding paths in 8- to 10-year-olds, except for number of drugs used, which is unique perhaps because of more prevalent substance use in older youths. Also in contrast to the youngest group, nearly all y and z paths are significant, and z paths are sizable. Results for 11- to 12-year-olds are consistent with cognitive dissonance theory.

In 13- to 16-year-olds, all c paths are null, one t path qualified for $p < .05$, and nearly all x, y, and z paths are significant. These results are inconsistent with both cognitive dissonance and problem behavior theories. Overall, results in Table 5 suggest that for the constructs of

this study, cognitive dissonance theory is more applicable to children and young adolescents than to middle adolescents.

DISCUSSION

Statistical models were highly predictive of CON, substance use, and TOD at all ages. However, the specific pathways providing the greatest predictive accuracy varied by age group. Results suggested that between ages 8 and 13, experiencing CON or substance use generally precedes TOD, consistent with cognitive dissonance theory. Between ages 13 and 16, results were inconsistent with both cognitive dissonance theory and problem behavior theory. Results also differed between age groups in that the autocorrelation in TOD increased with age, suggesting that TOD solidifies with age. The findings for the *c* path did not generalize to serious rule-breaking, which appears to represent a unique form of CON, at least in how it is associated with TOD. No statistical differences were observed between genders.

Theoretical and Developmental Implications

The age-moderated relationship between CON or substance use and TOD is interesting in the context of other lines of research on the etiology of behavior problems. Regarding childhood CON and substance use, Moffitt's (1993) literature review concluded that in boys, early onset (prepubertal) antisocial behavior is qualitatively and etiologically distinct from postpubertal antisocial behavior. Studies subsequent to Moffitt's (1993) review have been consistent with her hypotheses and extended some elements to girls (Caspi et al., 1996; Moffitt, Caspi, Belsky, & Silva, 1992; Ridenour et al., 2002; Silverthorn & Frick, 1999). Collectively, these studies suggest that childhood CON and substance use would be exhibited prior to the cognitive capacity to evaluate the tolerability of such behaviors due to factors such as intelligence or disinhibition (Koenen, Caspi, Moffitt, Rijdsdijk, & Taylor, 2006; Tarter et al., 2003).

As a result, at least some children and preteens may experience antisocial behavior or substance use while having weak notions regarding their unacceptability or within settings where the consequences of such behaviors are reinforcing (e.g., bullying results in social control or acquisition of material rewards). Tolerance of antisocial behavior and substance use in children and preteens likely arises partly from subsequent consequences, instruction, monitoring, and modeling. This idea is consistent with the well-researched principles of behaviorism and positive child outcomes associated with the authoritative parenting style (Eiden, Edwards, & Leonard, 2007). Results from at least one other study are consistent with the notion that TOD follows substance use in children and preteens. Longitudinal investigation of urban middle-school students also documented that the correlation between TOD and later substance use that was only small or entirely accounted for by other risks (Wills & Cleary, 1999; Wills et al., 2001).

Preventive Intervention Implications

Theoretical links between cognitive dissonance theory and motivational interviewing have been noted previously (Draycott & Dabbs, 1998; Miller, 1983; Miller & Rollnick, 2002). As mentioned earlier, one maturational process during the age range of this sample is development of capacities for abstraction, envisioning the future, and comprehension of potential consequences (e.g., societal ramifications) of behavior—cognitive abilities which negatively correlate with antisocial behavior and substance use (Robbins & Bryan, 2004). During motivational interviewing, clients examine their own behavior and explicitly evaluate whether a change would be preferable (Miller & Rollnick, 2002); perhaps this process could increase cognitive dissonance in youths and provide motivation for change.

As motivational interviewing has grounding in the stages of change model, a clinical trial study also could shed light on how changes in readiness for change (e.g., from the precontemplation stage to the contemplation stage) are associated with types of antisocial behavior in different age groups. Several clinical trials studies have demonstrated that brief motivational interventions impact adolescent behaviors including alcohol use (Monti et al., 1999), smoking cessation (Colby et al., 1998), diet (Berg-Smith et al., 1999), diabetes control (Channon, Huws-Thomas, Gregory, & Rollnick, 2005), and marijuana use (Dennis et al., 2004). However, little research has examined how well motivational interviewing generalizes to children and early teens.

Perhaps motivational interviewing could serve as a selective/indicated intervention to help reduce early onset CON or substance use before tolerance for such behaviors solidifies. Indeed, Guerra and colleagues (2003) point out the importance in social cognitive schemas in developing and maintaining antisocial behavior. As an adjunct to universal programs that reduce or prevent childhood problem behaviors (Bierman et al., 2007; Kellam et al., 2008), motivational interviewing might help increase the impact of such programs in children who exhibit problem behaviors but do not appreciably benefit from these programs.

Certain developmental factors may preclude use of motivational interviewing with children and preteens. A child's ability to anticipate the consequences of behavior is inferior to an adolescent's; this skill also may require techniques specifically designed for children. Compared to their peers, youths at risk for early onset CON or substance use tend to exhibit greater cognitive deficits including disinhibition, decision making and planning (Caspi et al., 1996; Tarter et al., 2003). Moreover, youths at risk for early onset CON often experience poor emotional regulation (Eiden et al., 2007), which can interfere with behavior change, especially during emotionally charged situations. Nevertheless, older populations for whom motivational interviewing has demonstrated efficacy and effectiveness experienced similar deficits compared to their same-age peers. Hence, motivational interviewing adapted to be developmentally appropriate for children may help deter early onset CON or substance use.

Study Limitations

Results ought to be considered in light of study limitations. Findings may not generalize to children not experiencing chronic stress, non-Caucasian ethnicities, or in other settings. With larger samples, testing differences between genders within age groups may further clarify results. Analyses controlled for autocorrelation; baseline levels of TOD, CON, and substance use as well as correlations between these variables at baseline. Nevertheless, it is possible that an unstudied third characteristic effects the change that occurs in TOD, CON, or substance use above and beyond what was statistically controlled (Guerra et al., 2003; Pardini et al., 2005). As some results suggested, different mechanisms may mediate or moderate these results, including at different developmental stages. Results also may differ for other levels of substance involvement (e.g., monthly use) or TOD outside of school. Replicating this study with three or more time points would further strengthen implications drawn from the results.

Study Strengths

Two strengths of this study were its longitudinal data and inclusion of a broad age range. The sample also was at heightened risk for CON and substance use and both genders were well-represented. Results were replicated across types of CON. It is important to understand the etiology of the earliest exposure to substances. Nearly all other alcohol etiology research has investigated consumption of standard drinks or larger volumes whereas the greatest prevalence of experience with alcohol in children is in sips (Donovan, 2007). The study sample will continue to be followed annually, affording the opportunity to expand and refine

analyses, test additional factors that may contribute to the association between TOD and CON or substance use, and add the number of time points in the longitudinal modeling.

CONCLUSION

In sum, results were consistent with the cognitive dissonance theory implication that TOD increases after CON or substance use, but only prior to middle adolescence. Results for middle adolescents were consistent with neither problem behavior theory nor cognitive dissonance theory, suggesting that an age-related shift may occur in how CON and substance use are longitudinally associated with TOD. At minimum, the results support further investigation of cognitive dissonance theory as a model for understanding the development as well as the curbing of early onset CON or substance use.

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REFERENCES

- American Psychiatric Association (APA). Diagnostic and statistical manual of mental disorders. 4th ed.. Washington, DC: Author; 1994.
- Arbuckle, JL. Amos 6.0. Spring House, PA: Amos Development Corp.; 2005.
- Barkley RA, Fischer M, Smallish L, Fletcher K. Young adult follow-up of hyperactive children: Antisocial activities and drug use. *Journal of Child Psychology and Psychiatry*. 2004; 45:195–211. [PubMed: 14982236]
- Bern, DJ. Self-perception theory. In: Berkowitz, L., editor. *Advances in experimental social psychology*. Vol. vol. 6. New York: Academic; 1972. p. 1-62.
- Benjamin L, Wulfert E. Dispositional correlates of addictive behaviors in college women: Binge eating and heavy drinking. *Eating Behaviors*. 2005; 6:197–209. [PubMed: 15854866]
- Bennett KJ, Brown KS, Boyle M, Racine Y, Offord D. Does low reading achievement at school entry cause conduct problems? *Social Science and Medicine*. 2003; 56:2443–2448. [PubMed: 12742607]
- Berg-Smith SM, Stevens VJ, Brown KM, Van Horn L, Gemhofer N, Peters E, et al. A brief motivational intervention to improve dietary adherence in adolescents. *Health Education Research*. 1999; 14:399–410. [PubMed: 10539230]
- Bierman KL, Coie JD, Dodge KA, Foster EM, Greenberg MT, Lochman JE, et al. Fast track randomized controlled trial to prevent externalizing psychiatric disorders: Findings from grades 3 to 9. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2007; 46:1250–1262. [PubMed: 17885566]
- Brady KT, Sonne SC. The role of stress in alcohol use, alcoholism treatment, and relapse. *Alcohol Research and Health*. 1999; 23:263–271. [PubMed: 10890823]
- Brook DW, Brook JS, Zhang C, Cohen P, Whiteman M. Drug use and the risk of major depressive disorder, alcohol dependence and substance use disorders. *Archives of General Psychiatry*. 2002; 59:1039–1044. [PubMed: 12418937]
- Caspi A, Moffitt TE, Newman DL, Silva PA. Behavioral observations at age 3 years predict adult psychiatric disorders. *Archives of General Psychiatry*. 1996; 53:1033–1039. [PubMed: 8911226]
- Channon S, Huws-Thomas MV, Gregory JW, Rollnick S. Motivational interviewing with teenagers with diabetes. *Clinical Child Psychology and Psychiatry*. 2005; 10:43–51.
- Chatfield, C. *The analysis of time series: An introduction*. 6th ed.. Boca Raton, FL: Chapman and Hall; 2004. Multivariate time series modeling; p. 241-254.
- Cicchetti DV. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment*. 1994; 6:284–290.
- Cohen, J. *Statistical power analysis for the behavioral sciences*. 2nd ed.. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.

- Colby SM, Monti PM, Barnett NP, Rohsenow DJ, Weissman K, Spirito A, et al. Brief Motivational Interviewing in a hospital setting for adolescent smoking: A preliminary study. *Journal of Consulting and Clinical Psychology*. 1998; 66:574–578. [PubMed: 9642898]
- Cooper, J.; Fazio, RH. A new look at dissonance theory. In: Berkowitz, L., editor. *Advances in experimental social psychology*. Vol. vol. 17. New York: Academic; 1984. p. 229-266.
- Costello EJ, Angold A, Keeler GP. Adolescent outcomes of childhood disorders: The consequences of severity and impairment. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1999; 38:121–128. [PubMed: 9951210]
- Dennis M, Godley SH, Diamond G, Tims FM, Babor T, Donaldson J, et al. The Cannabis Youth Treatment (CYT) Study: Main findings from two randomized trials. *Journal of Substance Abuse Treatment*. 2004; 27:197–213. [PubMed: 15501373]
- DeWitt DJ, Adlaf EM, Offord DR, Ogborne AC. Age at first alcohol use: A risk factor for the development of alcohol disorders. *American Journal of Psychiatry*. 2000; 157:745–750. [PubMed: 10784467]
- Dielman TE, Butchart AT, Shope JT, Miller M. Environmental correlates of adolescent substance use and misuse: Implications for prevention programs. *International Journal of the Addictions*. 1990–1991; 25:855–880.
- Dierker L, Lloyd-Richardson E, Stolar M, Flay B, Tiffany S, Collins L, et al. The proximal association between smoking and alcohol use among first year college students. *Drug and Alcohol Dependence*. 2006; 81:1–9. [PubMed: 16006056]
- DiFranza JR, Savageau JA, Rigotti NA, Ockene JK, McNeill AD, Coleman M, et al. Trait anxiety and nicotine dependence in adolescents: A report from the DANDY study. *Addictive Behaviors*. 2004; 29:911–919. [PubMed: 15219335]
- Donovan JE. Really underage drinkers: The epidemiology of children's alcohol use in the United States. *Prevention Science*. 2007; 8:192–205. [PubMed: 17629790]
- Donovan JE, Jessor RC, Costa FM. Adolescent problem drinking: Stability of psychosocial and behavioral correlates across a generation. *Journal of Studies on Alcohol*. 1999; 60:352–361. [PubMed: 10371263]
- Donovan JE, Molina BS. Children's introduction to alcohol use: Sips and tastes. *Alcohol: Clinical and Experimental Research*. 2008; 32:108–119.
- Draycott S, Dabbs A. Cognitive dissonance 2: A theoretical grounding of motivational interviewing. *British Journal of Clinical Psychology*. 1998; 37:355–364. [PubMed: 9784889]
- Eiden RD, Edwards EP, Leonard KE. A conceptual model for the development of externalizing behavior problems among kindergarten children of alcoholic families: Role of parenting and children's self regulation. *Developmental Psychology*. 2007; 43:1187–1201. [PubMed: 17723044]
- Elliott, DS.; Huizinga, D.; Menard, S. *Multiple problem youth: Delinquency substance use, and mental health problems*. New York: Springer Verlag; 1989.
- Festinger, L. *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press; 1957.
- Fuller JA, Stanton JM, Fisher GG, Spitzmuller C, Russell SS, Smith PC. A lengthy look at the daily grind: Time series analysis of events, mood, stress, and satisfaction. *Journal of Applied Psychology*. 2003; 88:1019–1033. [PubMed: 14640813]
- Guerra NG, Huesmann LR, Spindler A. Community violence exposure, social cognition, and aggression among urban elementary school children. *Child Development*. 2003; 74:1561–1576. [PubMed: 14552414]
- Hingson RW, Heeren T, Jamanka A, Howland J. Age of drinking onset and unintentional injury involvement after drinking. *Journal of the American Medical Association*. 2000; 284:1527–1533. [PubMed: 11000646]
- Huesmann LR, Guerra NG. Children's normative beliefs about aggression and aggressive behavior. *Journal of Personality and Social Psychology*. 1997; 72:408–419. [PubMed: 9107008]
- Jensen LA, Arnett JJ, Feldman SS, Cauffman E. It's wrong, but everybody does it: Academic dishonesty among high school and college students. *Contemporary Educational Psychology*. 2002; 27:209–228.
- Jessor, R.; Graves, TD.; Hanson, RC.; Jessor, SL. *Society, personality and deviant behavior: A study of a tri-ethnic community*. New York: Holt, Rinehart, & Winston; 1968.

- Kassel JD, Stroud LR, Paronis CA. Smoking, stress, and negative affect: Correlation, causation, and context across stages of smoking. *Psychological Bulletin*. 2003; 129:270–304. [PubMed: 12696841]
- Kellam SG, Brown CH, Poduska JM, Ialongo NS, Wang W, Toyinbo P, et al. Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug and Alcohol Dependence*. 2008; 95:S5–S28. [PubMed: 18343607]
- Koenen KC, Caspi A, Moffitt TE, Rijdsdijk F, Taylor A. Genetic influences on the overlap between low IQ and antisocial behavior in young children. *Journal of Abnormal Psychology*. 2006; 115:787–797. [PubMed: 17100536]
- Kraemer HC, Stice E, Kazdin A, Offord D, Kupfer D. How do risk factors work together? Mediators, moderators, and independent, overlapping, and proxy risk factors. *American Journal of Psychiatry*. 2001; 158:848–856. [PubMed: 11384888]
- Lerner RM, Castellino DR. Contemporary developmental theory and adolescence: Developmental systems and applied developmental science. *Journal of Adolescent Health*. 2002; 31:122–135. [PubMed: 12470909]
- Loeber R, Keenan K, Zhang Q. Boys' experimentation and persistence in developmental pathways toward serious delinquency. *Journal of Child & Family Studies*. 1997; 6:321–357.
- Loeber R, Stouthamer-Loeber M. Development of juvenile aggression and violence: Some common misconceptions and controversies. *American Psychologist*. 1998; 53:242–259. [PubMed: 9491750]
- Loveland-Cherry CJ, Ross LT, Kaufman SR. Effects of a home-based family intervention on adolescent alcohol use and misuse. *Journal of Studies on Alcohol*. 1999; 13(Special issue):94–102.
- Lutkus, AD.; Rampey, BD.; Donahue, P. The nation's report card: Trial urban district assessment reading 2005 (NCES 2006-455). US Dept. of Education, NCES. Washington, DC: Government Printing Office; 2005.
- Makela K. Drinking, the majority fallacy, cognitive dissonance and social pressure. *Addiction*. 1997; 92:729–736. [PubMed: 9246800]
- Miller W. Motivational interviewing with problem drinkers. *Behavioural Psychotherapy*. 1983; 11:147–172.
- Miller, WR.; Rollnick, S. Motivational interviewing. 2nd ed.. New York: Guilford; 2002.
- Minnes, S.; Singer, LT.; Ridenour, TA.; Satayathum, S.; Miller, A. Assessment of substance use risk factors in 9 year old prenatally drug exposed children using the ALEXSA; Presented at the Annual Meeting of the College on Problems of Drug Dependence; 2005-June; Orlando, FL..
- Moffitt TE. Adolescent-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*. 1993; 100:674–701. [PubMed: 8255953]
- Moffitt TE, Caspi A, Belsky J, Silva PA. Childhood experience and the onset of menarche: A test of a sociobiological model. *Child Development*. 1992; 63:47–58. [PubMed: 1551329]
- Monti PM, Colby SM, Barnett NP, Spirito A, Rohsenow DJ, Myers M, et al. Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *Journal of Consulting and Clinical Psychology*. 1999; 67:987–994.
- Mukoma, W.; Mathews, C.; Flisher, AJ.; Seebregts, C.; Jansen, S.; Ahmed, N. Use of electronic questionnaires on handheld devices to evaluate the effects of a school-based HIV prevention programme on adolescent sexual behaviour; Paper presented at the XV International AIDS Conference; 2004, July; Bangkok, Thailand.
- Pardini DA, Loeber R, Stouthamer-Loeber M. Developmental shifts in parent and peer influences on boys' beliefs about delinquent behavior. *Journal of Research on Adolescence*. 2005; 15:299–323.
- Ridenour, TA. Assessment of Liability and Exposure to Substance use and Antisocial behavior© (ALEXSA©), CORE Measures. Allison Park, PA: 2003. Assessments Illustrated
- Ridenour TA, Clark DB, Cottler LB. Reliability and validity of the Assessment of Liability and Exposure to Substance use and Antisocial behavior© (ALEXSA©) in 9 to 12 year old students. *American Journal of Drug and Alcohol Abuse*. 2009; 35:242–252. [PubMed: 20180677]

- Ridenour TA, Cottier LB, Robins LN, Compton WM, Spitznagel EL, Cunningham-Williams RM. Test of the plausibility of adolescent substance use playing a causal role in developing adulthood antisocial behavior. *Journal of Abnormal Psychology*. 2002; 111:144–155. [PubMed: 11866167]
- Ridenour TA, Feinberg ME. Using correlational analyses to improve prevention strategies based on survey data from youth. *Evaluation and Program Planning*. 2007; 30:36–44. [PubMed: 17410278]
- Ridenour, TA.; Minnes, S.; Singer, LT.; Miller, A.; Gottschall, A.; Satayathum, S. Validity of and Substance Use Correlates with the ALEXSA (Assessment of Liability and Exposure to Substance use and Antisocial behavior) in a high-risk sample of urban, mostly African-American, nine year olds; Poster presented at the Annual Meeting of the College on Problems of Drug Dependence; 2005, June; Orlando, FL.
- Robbins RN, Bryan A. Relationships between future orientation, impulsive sensation seeking, and risk behavior among adjudicated adolescents. *Journal of Adolescent Research*. 2004; 19:428–445. [PubMed: 16429605]
- Sher, KJ.; Wood, PK. Methodological issues in conducting prospective research on alcohol-related behavior: A report from the field. In: Bryant, KJ.; Windle, M.; West, SG., editors. *The science of prevention: Methodological advances from alcohol and substance abuse research*. Washington, DC: American Psychological Association; 1997. p. 3–41.
- Silverthorn P, Frick PJ. Developmental pathways to antisocial behavior: The delayed-onset pathway in girls. *Development and Psychopathology*. 1999; 11:101–126. [PubMed: 10208358]
- Tarter RE, Kirisci L, Mezzich A, Cornelius J, Pajer K, Vanyukov M, et al. Neurobehavioral disinhibition in childhood predicts early age at onset of substance use disorder. *American Journal of Psychiatry*. 2003; 160:1078–1085. [PubMed: 12777265]
- Tracy JI, Josiassen RC, Bellack AS. Neuropsychology of dual diagnosis: Understanding the combined effects of schizophrenia and substance use disorders. *Clinical Psychology Review*. 1995; 15:67–97.
- Van Overwalle F, Jordens K. An adaptive connectionist model of cognitive dissonance. *Personality and Social Psychology Review*. 2002; 6:204–231.
- Webb JA, Baer PE, Getz JG, McKelvey RS. Do fifth graders' attitudes and intentions toward alcohol use predict seventh-grade use? *Journal of the American Academy of Child and Adolescent Psychiatry*. 1995; 35:1611–1617. [PubMed: 8973067]
- Wicklund, RA.; Brehm, JW. *Perspectives on cognitive dissonance*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1976.
- Wills TA, Cleary S. Peer and adolescent substance use among 6th–9th graders: Latent growth analyses of influence versus selection mechanisms. *Health Psychology*. 1999; 18:453–463. [PubMed: 10519461]
- Wills TA, Cleary S, Filer M, Shinar O, Mariani J, Spera K. Temperament related to early-onset substance use: Test of a developmental model. *Prevention Science*. 2001; 2:145–163. [PubMed: 11678291]
- Wills TA, Resko JA, Ainette MG, Mendoza D. Role of parent support and peer support in adolescent substance use: A test of mediated effects. *Psychology of Addictive Behaviors*. 2004; 18:122–134. [PubMed: 15238054]
- 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; 110:309–323. [PubMed: 11358025]
- Wills TA, Vaccaro D, McNamara G. The role of life events, family support, and competence in adolescent substance use: A test of vulnerability and protective factors. *American Journal of Community Psychology*. 1992; 20:349–374. [PubMed: 1415032]
- Zhang Q, Loeber R, Stouthamer Lober M. Developmental trends of delinquency attitudes and delinquency: Replication and synthesis across time and samples. *Journal of Quantitative Criminology*. 1997; 13:181–216.

Conduct Disorder Criteria (response options: 1 = yes, 0 = no),

$\alpha = .76$, test-retest ICC = .68 or good

RB: Have you stayed out at night much later than you were allowed to 3 times or more?

RB: Have you ever skipped school?

V: Have you ever damaged someone else's property?

D: Have you lied to try to get out of doing something that you were supposed to do 3 or more times?

D: Have you ever taken something worth more than \$10 from someone outside of your family without asking?

D: Have you ever broken into someone else's house or building?

D: Have you ever broken into someone else's car?

Agg: Have you ever started a fight?

Agg: Have you ever scared someone to get them to do what you wanted?

Number of Drugs Used (response options: 1 = yes, 0 = no), $\alpha = .62$,

test-retest ICC = .54 or fair

Have you ever used alcohol, even just a sip?

Have you ever used tobacco, even just to try it?

Have you ever used inhalants, even just to try?

Tolerance of Deviance (response options: 3 = not at all, 2 = a little bit, 1 = quite a bit, 0 = very much),

$\alpha = .82$,

test-retest ICC = .77 or excellent

How wrong is it to cheat on a test?

How wrong is it to clown around in class?

How wrong is it to skip school?

How wrong is it to lie to a teacher?

FIGURE 1.

Conduct disorder criteria, substance use, and tolerance of deviance questions. *Notes:* α = Cronbach's alpha, computed using data from 2004. Test-retest reliability estimates from Ridenour et al. (2009); qualitative evaluation of ICCs from Cichetti (1994). RB = Serious Rule-Breaking. V = Vandalism. D = Deceitfulness. Agg = Aggression.

FIGURE 2.

Path model used to test directionality between tolerance of deviance and either conduct disorder criteria or substance use. *Notes:* Path c tests whether CON or substance use precedes TOD. Path t tests whether TOD precedes CON or substance use. Path x accounts for autocorrelation in CON or substance use. Path y models the correlation between 2004 CON or substance use and 2004 TOD. Path z accounts for autocorrelation in TOD. ErrC and ErrT estimate the variance in 2005 CON or substance use and 2005 TOD, respectively, not accounted for by the model.

TABLE 1

Means (Standard Deviations) for Variables in 2004 and 2005

	2004			2005		
	Young (ages 8–10)	Middle (ages 11–12)	Old (ages 13–16)	Young (ages 8–10)	Middle (ages 11–12)	Old (ages 13–16)
<i>Tolerance of Deviance</i>	.50 (.84)	.45 ^b (.51)	.80 ^b (.79)	.25 ^a (.45)	.50 (.61)	.70 ^a (.70)
<i>Number of Drugs Used</i>	.31 ^{1a} (.65)	.43 ^b (.77)	.85 ^{ab} (.90)	.33 ^a (.63)	.55 ^b (.71)	1.10 ^{ab} (.87)
<i>Conduct Disorder Criteria</i>	1.22 ^a (1.60)	1.67 ^b (1.85)	2.60 ^{ab} (2.30)	1.54 ^a (1.89)	1.94 ^b (1.87)	2.70 ^{ab} (2.16)
<i>Aggression</i>	.18 ^a (.31)	.31 (.37)	.36 ^a (.43)	.25 (.35)	.23 ^b (.32)	.38 ^b (.43)
<i>Deceitfulness</i>	.06 ^a (.12)	.11 ^b (.16)	.22 ^{ab} (.27)	.09 (.17)	.14 (.19)	.17 (.21)
<i>Serious Rule-Breaking</i>	.15 ^a (.30)	.21 ^b (.31)	.39 ^{ab} (.40)	.22 (.28)	.24 (.36)	.36 (.41)
<i>Vandalism</i>	.02 ^a (.13)	.09 ^b (.29)	.25 ^{ab} (.44)	.38 (.49)	.34 (.48)	.47 (.50)
<i>% Having 3+ Conduct Disorder Criteria</i>	14.8% ^a	26.2% ^b	59.8% ^{ab}	25.8% ^a	29.1% ^b	43.9% ^{ab}

Notes: N = 246. In separate age groups, N = 61 for ages 8 to 10, N = 103 for ages 11 to 12, and N = 82 for ages 13 to 16. Matching superscripts in two cells in the same row and same year differed at $p < .01$. Number of Drugs Used ranged from 0 to 3 for use of alcohol, tobacco, and inhalants.

TABLE 2

Correlations between Variables in 2004

	1.	2.	3.	4.	5.	6.
1. Aggression						
2. Deceitfulness	.50					
3. Serious Rule-Breaking	.42	.50				
4. Vandalism	.43	.48	.33			
5. All Conduct Disorder Criteria	.76	.78	.54	.59		
6. Tolerance of Deviance	.28	.37	.45	.26	.36	
7. Number of Drugs Used	.22	.36	.30	.33	.26	.20

Note: Table entries are Pearson correlations, all of which attained $p < .001$.

TABLE 3

Unstandardized Path Coefficients Testing Directionality between Conduct Disorder Criteria or Substance Use and Tolerance of Deviance

Coefficients from Figure 2						
Directionality paths		Statistical control paths				
c	t	x	y	z		
<i>Conduct Disorder Criteria</i>						
.55**	-.04*	.55**	.05**	.24**		
.25*	-.02	.35**	.06**	.31**		
.67**	-.02	.48**	.03**	.27**		
.24*	-.02	.49**	.10**	.30**		
.39**	.05	.22*	.02*	.30**		
.12*	.05	.43**	.08*	.33**		

* $p < .05$;

** $p < .001$.

TABLE 4**Model Fit Statistics for Age-Moderated Parameters**

	LR χ^2 ($df = 10$)	AIC	CFI
<i>Conduct Disorder Criteria</i>	58.321**	120.30 (158.6)	.82 (.61)
Aggression	45.286**	99.49 (124.78)	.86 (.58)
Deceitfulness	64.044**	98.34 (142.38)	.90 (.59)
Serious Rule-Breaking	57.488**	98.80 (136.28)	.90 (.63)
Vandalism	66.036**	93.25 (139.29)	.89 (.38)
<i>Number of Drugs Used</i>	33.516**	82.93 (96.45)	.99 (.81)

Note: $N = 246$. Parenthetical values are fit statistics when parameters are constrained across age groups. LR χ^2 provides a χ^2 test for model differences. AIC = Akaike's Information Criterion (smaller values indicate better fit). CFI = comparative fit index (greater values indicate better fit).

**
 $p < .01$.

Unstandardized Path Coefficients Testing Cross-Correlations between Antisocial Behavior or Substance Use and Tolerance of Deviance in Three Age Groups

TABLE 5

	Path coefficients from Figure 2					
	Directionality paths			Statistical control paths		
	c	t	x	y	z	
Ages 8 to 10						
<i>Conduct Disorder Criteria</i>	1.34**	-.04	.95**	.02	.02	
Aggression	.40*	.01	.68**	.04	.04	
Deceitfulness	1.69**	-.03	.95**	.01	.04	
Serious Rule-Breaking	.11	-.06	.30*	.06	.06	
Vandalism	1.78**	-.08	.62	-.01	.09	
<i>Number of Drugs Used</i>	.06	.01	.43**	.00	.07	
Ages 11 and 12						
<i>Conduct Disorder Criteria</i>	.56*	-.04	.36**	.04**	.56**	
Aggression	.09	-.04	.13	.06*	.62**	
Deceitfulness	.72**	-.00	.36**	.02*	.57**	
Serious Rule-Breaking	.19	-.07	.33*	.05**	.60**	
Vandalism	.46*	-.01	.23	.03*	.59**	
<i>Number of Drugs Used</i>	.20**	.20	.42**	.09*	.57**	
Ages 13 to 16						
<i>Conduct Disorder Criteria</i>	-.02	-.05	.55**	.13**	.50**	
Aggression	.15	-.07	.48**	.11*	.47**	
Deceitfulness	-.21	-.00	.37**	.11**	.53**	
Serious Rule-Breaking	.13	.03	.68**	.20**	.46**	
Vandalism	-.10	.23**	.07	.14**	.52**	

Path coefficients from Figure 2					
Directionality paths		Statistical control paths			
	c	t	x	y	z
<i>Number of Drugs Used</i>	-.02	-.02	.43**	.14	.50**

* $p < .05$;
** $p < .001$.