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Delinquency as a Mediator of the Relation between Negative Affectivity and Adolescent Alcohol Use Disorder

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Abstract

This investigation examined mediators of the longitudinal relation between negative affectivity and the development of problematic drinking behavior in adolescent boys and girls. In the present study, 499 early adolescents completed inventories of negative affectivity, attitudes toward delinquency, personal delinquency, and affiliation with delinquent peers. Positive attitudes toward delinquency emerged as the most consistent mediator and strongly predicted drinking frequency in various situations. Compared with personal delinquency, both attitudes toward delinquency and peer delinquency were superior predictors of affect-related drinking. Our results also demonstrated that positive attitudes toward delinquency mediated the relation between negative affectivity and later development of an alcohol use disorder. These findings suggest that a proneness to unpleasant affect impacts adolescent drinking by heightening risk for general rejection of normative behavior, rather than by increasing drinking as a means of managing affect. The importance and implications of testing delinquency variables together in the same model are discussed.

Keywords

adolescent; alcohol; delinquency; negative affectivity

1. Introduction

Numerous studies have linked the personality variable of negative affectivity, defined as the predisposition to aversive emotional states, to greater amounts of drug and alcohol use in adolescents (e.g. Colder & Chassin, 1993; Krueger, Caspi, Moffitt, White, & Stouthamer, 1996; Labouvie, Pandina, White, & Johnson, 1990; Shoal & Giancola, 2003). However, efforts to apply traditional negative affect regulation models (Conger, 1956) to adolescent drinking have yielded mixed results (see Shoal & Giancola, 2003 for review). A more powerful and empirically validated predictor of substance use is delinquent behavior. Delinquency has manifested a strong association with substance use across a variety of studies (Brook, Whiteman, Finch, & Cohen, 1996; Giancola & Parker, 2001; Kingery, Pruitt, & Hurley, 1992). As such, some researchers argue that delinquency, peer delinquency (Chassin, Pillow, Curran, Molina, & Barrera, 1993), or simply positive attitudes toward delinquency (Kaplan,

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1980) may be more important proximal predictors of adolescent alcohol use, compared with the potentially more distal effects such as negative affectivity.

Kaplan (1980) proposed a specific model of adolescent substance use in which individuals who repeatedly experience negative affect in a given social environment will begin to experience substantial frustration with the parameters of that environment. One response to this frustration might be to reject culturally prescribed values and increasingly embrace more “deviant” attitudes and behaviors in the effort to increase positive reinforcement. Kaplan emphasized that the development of positive attitudes toward deviancy occurs primarily in individuals who lack the instrumental resources (i.e. coping ability) to manage affect in a constructive way within the normative environment. In the final step of the Kaplan's basic model, positive attitudes toward deviance lead to substance use as the individual drinks alcohol or uses other drugs as an expression of a more general deviancy.

Models from the criminology literature suggest that attitudes toward delinquency and association with delinquent peers are intimately linked as proximal precursors of adolescent substance use. Differential association theory (Akers, 1977; Sutherland, 1939) contends that delinquent behavior is learned from close peer groups. According to this theory, the developing individual's exposure to attitudes and motives that promote non-normative behavior are weighed against exposure to factors encouraging more lawful behavior. Moreover, Cairns and Cairns (1994) found that friendships among adolescents are most likely to form between individuals similar on the dimensions of social class, popularity, aggression, and achievement. Once individuals who are already similar in personality and attitudes group together, a type of contagious reciprocity may take effect whereby similarities in behaviors become even more pronounced. As this would predict, one adolescent being in the presence of other adolescents who drink has been shown to escalate both the drinking behavior of the individual and that of the group (Curran, Stice, & Chassin, 1997).

As these arguments demonstrate, the effects of peer association and attitudes toward delinquency upon adolescent drinking are multifaceted. Most social scientists believe that the behavioral similarities of group members are a result of a combination between socialization and group selection processes (Reed & Rountree, 1997). What these conceptualizations have in common with Kaplan's (1980) theory is that attitudes favorable toward delinquency and association with delinquent peers are highly influential in determining the extent to which the adolescent becomes involved in alcohol use. As such, attitudes toward delinquency and association with delinquent peers merit examination in models of affect-related adolescent drinking.

1.1. Empirical Evidence: Personal Delinquency and Attitudes toward Delinquency as Mediators

Underage alcohol use represents a form of delinquency. As such, tests of negative affect regulation models should address the possibility that drinking is simply one facet of an overall syndrome of non-normative or problematic behaviors. Caspi and colleagues (1997) demonstrated that adolescents high in negative affectivity are significantly more likely than controls to engage in a broad array of high-risk behaviors including violent offending, sexual risk-taking, dangerous driving, and problematic alcohol use. They found these behaviors to covary significantly, indicating that adolescents high in negative affectivity are prone to engage in clusters of dangerous and antisocial activities as detailed in Jessor and Jessor's (1977) problem behavior theory. Evidence from other longitudinal studies indicates that the experience of negative affect is mediated in its relation to later drug use by general delinquency (Shoal & Giancola, 2003). Likewise, “difficult temperament,” which includes irritability, intense reactions to stimuli, and general negative mood (Thomas & Chess, 1977) appears to be mediated in its relation to later drug use by general antisocial behavior (Giancola & Parker,

2001). Cooper and colleagues (2003) recently extended this trend of linking problem behaviors as a general syndrome of delinquency by showing covariation between educational underachievement, substance abuse, and risky sexual behavior. Given this evidence, it is important for negative affect regulation investigations to examine the possibility that drinking simply represents one aspect of personal delinquency.

An additional possibility that must be considered is that this clustering of delinquent behavior is driven by an underlying acceptance of delinquency. Tolerance of deviant behavior has been shown to be related to quantity and frequency of drinking (Jessor, Graves, Hanson, & Jessor, 1968), and positive attitudes toward delinquency have been shown to mediate the relation between some forms of negative affect (self-derogation) and adolescent substance use (Kaplan, Johnson, & Bailey, 1988). Together, these findings raise the possibility that high negative affectivity simply predisposes the adolescent to be more accepting of delinquency, and this greater acceptance leads to a number of potentially harmful actions, including underage drinking.

1.2. Empirical Evidence: Affiliation with Delinquent Peers as a Mediator

Several studies have revealed that being a part of a delinquent peer group may mediate the relation between personality and adolescent drug use. Affiliation with drug using peers has been shown to mediate the relation between negative affect and adolescent substance use in both cross-sectional (Chassin et al., 1993) and longitudinal investigations (Chassin et al., 1996). In a more specific investigation of the effects of anxiety and anger on drug use among high school students, Swaim, Oetting, Edwards, and Beauvais (1989) found that association with drug using peers fully mediated the relation between affect and drug use. They interpreted their findings as evidence that peer influence is a much more important risk factor for drinking than emotional distress.

Interestingly, there is some evidence that affiliating with generally delinquent peers, not just specifically drug using peers, may serve the mediating function in question. For example, Giancola and Parker (2001) found that peer delinquency mediates the relation between difficult temperament (which includes negative mood and intense reactions to stimuli) and drug use later in adolescence. Additionally, Shoal and Giancola (2003) showed that affiliation with delinquent peers mediates the relation between negative affectivity and overall substance use two years later. A significant limitation of this research, however, is that it has not pitted different delinquency variables against one another in order to determine which aspects of delinquency are most strongly related to affect and drinking. Including these other delinquency variables in a model would allow a more specific discrimination of which factors are the most influential in adolescent drinking and which serve the most meaningful mediating function for negative affectivity.

1.3. The Present Investigation

The current study had 2 aims. First, we explored the extent to which positive attitudes toward delinquency, involvement in overall delinquent behavior, and affiliation with delinquent peers mediate the predictive relationship between negative affectivity in early adolescence and drinking in late adolescence (see Figure 1). It was hypothesized that the group of three delinquency variables would mediate the relation between negative affectivity and drinking. Additionally, because drinking is most directly conceptually related to personal delinquency, it was hypothesized that this variable would exhibit a stronger mediating effect, compared with attitudes toward delinquency and peer delinquency.

Next, we examined the degree to which the variables illustrated in Figure 1 were related to the actual development of an alcohol use disorder (abuse or dependence) in late adolescence (see

Figure 2). Although drinking quantity and frequency are important indicators of potential problems, they alone do not indicate the degree to which the adolescent is suffering immediate difficulties as a result of drinking. While the incidence of alcohol use disorders in adolescents is low, diagnosis by this age is associated with significant neurocognitive and social problems that extend into adulthood (Brown & Tapert, 2004;Chung, Martin, & Winters, 2005). As such, from a clinical and practical standpoint, diagnosis of alcohol use disorders is where the most important prediction lies.

2. Method

2.1. Participants

The participants in this study were drawn from the *Center for Education and Drug Abuse Research (CEDAR)* project, an ongoing longitudinal investigation aimed at determining the etiology of drug abuse in adolescence and early adulthood. Families were recruited for participation in the project from various sources including drug abuse treatment programs, public advertisements, and through a professional recruitment agency that randomly selected families according to telephone listings. Adolescent participants in the CEDAR project are first assessed when they are 10-12 years old (T1) and followed-up at ages 12-14 (T2), ages 15-17 (T3), ages 17-20 (T4), and approximately every three years thereafter until they reach 30 years of age. Participants in the present study consisted of those who took part in the second, third, and fourth waves of the CEDAR project.

At the time of the present investigation fewer participants had completed T4 measures (N = 282), compared with those completing T3 (N = 499). The smaller number of participants was accounted for largely because participants were not yet of sufficient age to complete T4 assessments (N = 144; 29%); however, some participants could not be contacted or declined participation in this wave (N = 73; 14.6%). Decliners showed a statistical trend toward greater likelihood of positive family history of a substance use disorder (p = .07) but were not significantly different from participants in terms of T2 drinking, T2 negative affectivity, T3 overall drinking, or the T3 delinquency variables. Participants received $50, $150, and $100 for taking part in the second, third, and fourth assessment waves, respectively.

2.2. Measures at T2 (12-14 Years Old)

2.2.1. Negative Affectivity—Negative affectivity was measured during T2 using the 40-item *Emotional Susceptibility Scale* (Caprara, 1983). Items assess vulnerability to worries (e.g. “fear of failure worries me more than necessary”), feelings of inadequacy (e.g. “I often feel inadequate”), irritability (e.g. “I often lose my temper”), anxiety (e.g. “I often feel nervous or tense”), and depression (e.g. “when I feel low I cry for no reason”). An overall emotional susceptibility score was calculated for each patient by summing the 30 non-control items and then subtracting this value from a constant so that higher final scores would represent greater negative affectivity. The Emotional susceptibility scale has been shown to have strong psychometric properties (Caprara, 1983; Caprara et al., 1985). This scale is strongly related to the widely known “Neuroticism” personality variable (Caprara, Barbaranelli, Pastorelli, & Perugini, 1994), and correlates highly with the Trait scale of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The Emotional Susceptibility Scale has also been demonstrated to predict antisocial behavior in laboratory settings (Caprara et al., 1994). In the present sample this scale demonstrated an internal consistency of α = .93 and a mean inter-item correlation of .30.

2.2.2. Alcohol Use Frequency—Drinking frequency was measured using the drug preference section of the *Drug Use Screening Inventory* (*DUSI*; Tarter, 1990). This scale measures the average monthly frequency of drug use for 20 different substances (e.g. alcohol,

amphetamines, opiates) over the past year. For the alcohol item, participants responded to the question: "Ordinarily how many times each month have you used [alcohol] in the past year?" Possible responses were 0 (0 times), 1 (1-2 times), 2 (3-9 times), 3 (10-20 times), and 4 (more than 20 times).

2.3. Measures at T3 (15-17 Years Old)

2.3.1. Attitudes toward delinquency—Attitudes toward delinquency were assessed through administration of the *Perceptions of Problem Behaviors Inventory* (Loeber, 1989). This inventory contains 20 items, each of which presents a specific delinquent behavior in a given scenario. For each, the participant rates his or her acceptance/approval of the behavior on a scale of 1 to 4 ("not at all acceptable" to "very acceptable"). The sum of all items yields an overall acceptance score that served as the independent variable in this study. The overall scale demonstrated an internal consistency of $\alpha = .86$ and a mean inter-item correlation of .24. A 3-item subscale for attitudes toward substance use was also created, consisting of items which asked "Is it alright for you to drink?", "Is it alright for you to smoke?", and "Is it alright for you to experiment with drugs?" This scale demonstrated inter-item correlations ranging from .42 to .71.

2.3.2. Delinquency—Delinquency was measured using the Delinquent Behavior subscale of the *Youth Self-Report (YSR*; Achenbach, 1991) inventory. The YSR is a self-report version of the well-validated Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983), which measures a variety of psychiatric and behavior problems in children. The Delinquent Behavior scale of the YSR has been shown to have an internal consistency index of .76 and a 1 week test-retest coefficient of .88 in a sample of 15-18 year old boys and girls (Achenbach, 1991).

2.3.3. Affiliation with Delinquent Peers—Affiliation with delinquent peers was measured using the *Peer Delinquency Scale (PDS*; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998) administered as an interview. It consists of 15 items designed to assess the extent to which the participant associates with delinquent peers. For each item, the participant was instructed to "Think of your friends during the past six months" and answer how many of them engaged in a given behavior (e.g. vandalism, theft, assault with a weapon) during the past 6 months. Possible responses ranged from 0 ("none of them") to 4 ("all of them"). Participants who reported that they had no friends or didn't know about their friends' behaviors received a score of 0 on that item. This scale has been found to have an internal consistency index of .84 in adolescent boys (Loeber et al., 1991) and yielded an internal consistency of .92 in the current sample. A three item scale of peer's substance use ("Used alcohol", "Used marijuana or hashish", and "Used hard drugs such as heroin, cocaine, or LSD") was also generated and resulted in inter-item correlations ranging from .45 to .79.

2.4. Measures at T4 (Ages 17-20 Years Old)

2.4.1. Alcohol Use Frequency—Alcohol use frequency was measured in the same manner (using the DUSI) as described in T2.

2.4.2. Alcohol Use in the Context of Negative Emotions—As previously described, participants completed the Drug Use Screening Inventory (DUSI; Tarter, 1990), on which they indicated how frequently they used each of 20 different "substances of abuse" during the last year. In part, the DUSI was used as a screen for each participant to determine whether or not situations in which drinking occurred should be assessed. Those who reported any alcohol use on the DUSI, completed the *Inventory of Drinking Situations* (IDS; Annis, Graham, & Davis, 1987). On the IDS, participants indicated how often they drank in each of 100 different situations (e.g. "when I felt anxious or tense about something"; "when someone in the same room was drinking") over the past year. Possible responses for each situation ranged from 0

("Never") to 3 ("Almost always"). The IDS includes a 60-point Unpleasant Emotions Scale comprised of 20 items that reflect drinking in the context of negative affect (e.g. "When I was depressed about things in general"). Participants who reported no drug use on the DUSI were assigned a score of 0 on this scale. Internal consistency of the items in this scale for participants in this wave was α = .98 (inter-item correlations ranging from .57-.94). Correlations between drinking in the context of unpleasant emotions and the other scales of the IDS ranged from *r* = .66 to *r* = .70. Internal consistency of the items in this scale for participants in this wave was α = .97 (inter-item correlations ranging from .53-.90).

2.4.3. Alcohol Use Disorder Diagnosis—Alcohol use disorder diagnoses was made in accordance with diagnostic criteria put forth in the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition- Revised (DSM-III-R:* APA, 1987), which was the most recent version of the DSM available at the beginning of CEDAR data collection. Information regarding diagnostic criteria was gathered through a semi-structured interview developed for use with the CEDAR project, which includes questions from the *Structured Clinical Interview for Diagnosis (SCID*: Spitzer, Williams, & Gibbon, 1987) and the *Lifetime Alcohol Use Interview* (Skinner & Sheu, 1982). Individuals who met criteria for either lifetime history of alcohol abuse or alcohol dependence were coded as having an alcohol use disorder.

3. Results

3.1. Aim 1: Mediating Role of Delinquency on Adolescent Drinking

3.1.1. Descriptive Statistics and Variable Distributions—Prior to testing the hypothesis that attitudes toward delinquency, actual delinquent behavior, and peer delinquency would mediate the relation between negative affectivity and drinking, the distributions of these variables were examined. All independent variables were found to be within acceptable ranges for skew and kurtosis, and scores on these variables within this sample were similar to those reported elsewhere (Caprara et al., 1985; Ivarsson, Gillberg, Arvidsson, & Broberg, 2002; Loeber, 1989; Loeber et al., 1998). As with the assessment at T3, drinking in the context of unpleasant emotions was somewhat positively skewed, but in this case a square root transformation was successful in reducing this skew to a tolerable level.

At T3, 155 (55.1%) of the 282 participants in this study reported at that it is alright to drink alcohol at least sometimes. Two hundred and one (71.5%) reported that at least a few of their friends had consumed alcohol in the last 6 months, with 61 (21.7%) reporting that most or all of their friends drank in the last 6 months. With regard to T4 alcohol use, 178 (63.3%) of the 282 participants reported drinking at least once a month on average in the previous year, and 31 (11.0%) reported drinking on at least 10 occasions in the average month. One hundred and three (36.7%) reported having consumed alcohol in the context of negative emotions. Additional descriptive statistics are presented in Table 1.

3.1.2. Correlations—In order to more thoroughly describe the data, a correlation matrix was computed for all of the variables included in this study. The relations between the variables of interest can be seen in Table 2.

3.1.3. Mediation Analysis—The aim of this study was to determine whether attitudes toward delinquency, personal delinquency, or affiliation with delinquent peers at T3 (ages 15-17 years) would mediate the relation between negative affectivity at T2 (ages 12-14 years) and drinking at T4 (ages 17-20 years). Barron and Kenny (1986) and Holmbeck (1997) have argued that mediation is demonstrated by identifying significant relations between a) the predictor (negative affectivity) and the proposed mediators (attitudes toward delinquency, peer delinquency, and personal delinquency), b) the predictor and the dependent variable (overall

drinking frequency or drinking in the context of unpleasant emotions), and c) the proposed mediators and the dependent variable. Finally, the relation between the predictor and the dependent variable should be substantially decreased following the inclusion of the proposed mediators in the model.

Regarding the attitudes toward delinquency mediator, satisfaction of the first condition for mediation was demonstrated by regressing attitudes toward delinquency on negative affectivity (β = .16, p < .01), T2 drinking frequency (p = n.s.), and the demographic variables (p = n.s.). Similarly, personal delinquency was regressed on negative affectivity (β = .23, p < .01), T2 drinking frequency (β = .13, p < .05), and the demographic variables (p = n.s.). Finally, affiliation with delinquent peers was regressed on negative affectivity (β = .20, p < .01), T2 drinking frequency (β = .13, p <.05), and the demographic variables (age: β = .16, p < .01; SES: β = -.14, p < .05). These regression procedures demonstrated that negative affectivity was significantly positively related to attitudes toward delinquency, actual delinquent behavior, and peer delinquency. This approach demonstrated that these relations were not an artifact of the correlation between negative affectivity and T2 drinking.

The other three conditions for mediation were tested via separate hierarchical multiple regression analyses using T4 overall drinking and T4 drinking in the context of unpleasant emotions criterion variables. For the equation estimating T4 overall drinking, the demographic variables, T2 negative affectivity, and T2 drinking were entered first. This step demonstrated a significant positive relation between T2 negative affectivity and T4 overall drinking (β = .12, p < .05), above and beyond the variance accounted for by T2 overall drinking (β = .16, p < .01). In the second step, attitudes toward delinquency, personal delinquency, and affiliation with delinquent peers were added simultaneously. Examination of the β estimates indicated that attitudes toward delinquency (β = .14, p < .05) and personal delinquency (β = .16, p < .05) accounted for significant amounts of unique variance in T4 overall drinking. This addition of the delinquency variables to the equation reduced the relation between T2 negative affectivity and T4 overall drinking by 83% and rendered it nonsignificant (β = .02, p = n.s.). These results are presented in Table 3 and depicted in Figure 3. It should be noted that numbers in parentheses represent associations between variables prior to the inclusion of the delinquency mediators.

Similarly, for the equation estimating T4 drinking in the context of unpleasant emotions, the demographic variables, T2 negative affectivity, and T2 drinking were entered first. This step demonstrated a significant positive relation between T2 negative affectivity and T4 drinking in the context of unpleasant emotions (β = .18, p < .01), above and beyond the variance accounted for by T2 drinking (β = .14, p < .05). In the second step, attitudes toward delinquency, personal delinquency, and affiliation with delinquent peers were added simultaneously. Examination of the β estimates indicated that attitudes toward delinquency (β = .23, p < .001) and peer delinquency (β = .25, p < .01) accounted for significant amounts of unique variance in T4 drinking in the context of unpleasant emotions. Adding the delinquency variables to the equation reduced the relation between T2 negative affectivity and T4 drinking in the context of negative emotions by 61% and rendered it nonsignificant (β = .07, p = n.s.). These results are presented in Table 4 and depicted in Figure 4. Again, the numbers in parentheses represent associations between variables prior to the inclusion of the delinquency mediators.

It should be noted that the mediation effects noted above pertain to general delinquency T3 variables rather than delinquency variables more specific to substance use. The possibility that T3 attitudes specific to substance use or T3 peer substance use would better mediate the relation between T2 negative affectivity and T4 drinking behavior was also investigated. The first step in testing this possibility was an examination of the correlation table from the previous set of analyses. Because T2 negative affectivity showed no zero-order correlation with T3 attitudes toward substance use, attitudes specifically toward substance use were removed from

consideration as a possible mediator between negative affectivity and drinking. However, the significant zero-order correlation between T2 negative affectivity and T3 peer substance use prompted a further analysis. T3 peer substance use was simultaneously regressed on T2 peer substance use (β = .37, p < .01), T2 participant drinking (β = .14, p < .05), the demographic variables (p's = n.s.), and negative affectivity (β = .14, p < .05). This demonstrated a significant relation between T2 negative affectivity and T3 peer substance use, even when accounting for prior peer and participant substance use.

The hierarchical analyses to test the mediating effect of T3 peer substance use on the relationships between T2 negative affectivity and T4 Drinking Frequency and between T2 negative affectivity and T4 Drinking in the Context of Unpleasant Emotions were the same as previously described. The only difference was that T2 peer substance use was included as a control in step one and T3 peer substance use was entered alone in the second step instead of the previously examined more general delinquency variables. For the equation estimating T4 Drinking Frequency, examination of the β estimates after this second step indicated that T3 peer substance use accounted for a significant amount of unique variance in T4 drinking frequency (β = .32, p < .01) and reduced the relation between T2 negative affectivity by 58% (from β = .12, p < .05 to β = .05, p = n.s.), rendering it nonsignificant. Likewise, for the equation estimating T4 Drinking in the context of unpleasant emotions, examination of the β estimates after this second step indicated that T3 peer substance use accounted for a significant amount of unique variance in T4 drinking in the context of unpleasant emotions (β = .35, p < .01) and reduced the relation between T2 negative affectivity by 35% (from β = .17, p < .01 to β = .11, p = .049), which approached nonsignificance. The results for the peer drinking specific mediation models are presented in Tables 5 and 6.

3.2. Aim 2: Mediating Role of Delinquency on the Development of Alcohol Use Disorder

3.2.1. Descriptive Statistics—Inasmuch as the sample utilized to address Aim 2 was the same as the sample for Aim 1, section 3.1.1 can be reviewed for descriptive information regarding the independent variables. The difference for the present aim was that the dependent variable of interest was diagnosis of having an alcohol use disorder by age 17 to 19 years. By this age, 27 (9.5%) of the participants met criteria for alcohol abuse and another 20 (7.1%) met criteria for alcohol dependence. Thus, 47 participants (16.6%) met DSM-III-R criteria for an alcohol use disorder. Although this percentage is in the same range as reported in other studies of individuals in late adolescents using the same set of criteria (Cohen, Cohen et al., 1993), it is slightly higher. This is most likely due to the fact that individuals with family history of a substance use disorder were oversampled in the CEDAR project.

3.2.2. Logistic Regression Analyses—Binomial logistic regression allows examination of how well a set of independent variables predict the presence or absence of particular characteristic, in this case a diagnosis of alcohol abuse or dependence by age 17-20. This is done by examining the extent to which an equation containing a set of independent variables correctly classifies individuals who will manifest the disorder and distinguishes them from those who will not. Because it is not realistic to expect a model to predict a high proportion of individuals with a disorder that is manifest in under ten percent of the sample, rates of alcohol abuse and alcohol dependence were combined into a single alcohol use disorder variable. This resulted in a dichotomous dependent variable that was “affirmative” for 16.6% of the sample. Unlike Ordinary Least Square regression, logistic regression does not assume linearity of relationship between the independent variables and the dependent, does not require normally distributed variables, does not assume homoscedasticity, and in general has less stringent requirements. Examination of the chi-square statistic functions as an indicator of the model's fit or appropriateness; Nagelkerke's R^2 roughly indicates amount of variance in the dependent variable that is accounted for by the independent variables currently in the model; and odds

ratios and the Wald statistic reveal the significance of individual independent variables in predicting the dichotomous dependent variable. Examination of a classification table reveals the percent of cases correctly and incorrectly classified by the variables included in each equation.

Independent variables for inclusion in the regression procedure were selected based upon whether they were found to be associated with drinking in the previous analyses for Aim 1. These variables were included in a stepwise fashion based upon the previously forwarded and supported hypothesis that delinquency variables will mediate the relation between negative affectivity and drinking. In the first step, the demographic variables of age, education, and SES were entered. Examination of the chi-square and Negelkerke's R^2 values after this first step indicated a poor fit and a weak association between demographic variables and alcohol use disorder diagnosis. None of the 47 cases of alcohol use disorder were correctly classified after this step.

In the second step, T2 alcohol use frequency, negative affectivity, and constructive coping were entered to determine whether or not they enhance prediction of an alcohol use disorder. The chi-square value for the model improved substantially (from 3.99 to 21.76, $p < .001$) and became significant ($p < .01$). After this step, 85% of the cases were correctly classified, with 12 (25.9%) of the observed positives (individuals diagnosed with alcohol use disorder) predicted as such. At this point, odds ratios were examined to determine the extent to which individual independent variables contribute to the ability of the model to classify cases. The odds ratio represents the factor by which the odds of being diagnosed with an alcohol use disorder changes (i.e. is multiplied by) with a 1 unit change in the predictor variable. Examination of Table 7 reveals that T2 drinking frequency and negative affectivity were positively associated with alcohol use disorder diagnosis, while constructive coping ability was negatively associated with alcohol use disorder diagnosis.

In the third and final step, T3 attitudes toward delinquency, personal delinquency, and peer delinquency were entered to examine their impact as mediators. This step resulted in another substantial increase in Chi-square (from 27.2 to 62.1, $p < .001$) indicating an improvement in goodness of fit. Overall correct classification was 87%, with 17 (36%) of the 47 observed positives predicted as such. Only 10 (4%) of the 235 individuals who were not diagnosed as having an alcohol use disorder where predicted to have one. Examination of final odds ratios with all variables in the model revealed that T2 drinking frequency remained a strong predictor of T4 alcohol use disorder ($OR = 2.44$; $p < .001$). T3 attitudes toward delinquency was also a significant predictor of T4 alcohol use disorder diagnosis ($OR = 1.12$; $p < .001$), but T3 personal delinquency and T3 peer delinquency were not. It is noteworthy that with the T3 delinquency variables included in the model, the association between negative affectivity and alcohol use disorder and between constructive coping and alcohol use disorder became insignificant. These results are presented in Table 7.

4. Discussion

A pattern of results emerged from these analyses that clarified the important roles that various aspects of delinquency play in the relation between early adolescent negative affectivity and drinking in late adolescence. In the prediction of drinking frequency, inclusion of the delinquency variables almost entirely mediated the longitudinal effect of negative affectivity upon drinking. The effects of attitudes toward delinquency, personal delinquency, and peer delinquency were all very similar, with the effects of attitudes toward delinquency and personal delinquency registering as significant predictors of drinking frequency. Although previous studies have shown that affiliation with substance using peers plays a mediating role when predicting adolescent substance use (e.g. Chassin et al., 1993), this study is believed to be the

first to pit various aspects of delinquency against one anther in competition to serve this mediating function. Doing this was important because it allowed an examination of how different aspects of delinquency are important as more proximal predictors of drinking. In support of this approach, the models that included only peer drinking as a mediator did not account for variance in drinking (or for the effect of NA on drinking) as well as the models that also included attitudes toward delinquency and personal delinquency.

The importance of testing the delinquency variables together in the same model was particularly salient in the examination of drinking in the context of negative emotions. This analysis revealed that attitudes toward delinquency and peer delinquency actually predicted drinking better than did personal delinquency. This finding suggests that whether or not a teenager will drink in affectively charged situations depends not so much upon his or her past record of unlawful behavior as upon his or her general perceptions of such behavior and the extent to which friends have modeled such behavior. It also accentuates the importance of social and cognitive processes in their relation to affect-related drinking, and poses some challenge to the convention wisdom that previous problem behaviors are the best predictors of later drinking.

That attitudes toward delinquency were just as important in terms of predicting drinking as peer delinquency was a surprising and somewhat novel finding. In one of the few other studies to longitudinally examine peer substance use and adolescent attitudes toward substance use in the same model, Reed and Rountree (1997) demonstrated that attitudes toward substance use remain predictive of later substance use, even with aspects of peer influence included as predictors. In fact, contrary to expectation, they found that peer pressure had no effect upon substance use when the individual's personal attitudes were included in the model. These findings, coupled with the present study's finding that attitudes account for substantial unique variance in drinking, accentuate the vital importance of the adolescent's individual perceptions and personal beliefs regarding the decision of whether or not to drink. The present study extends upon that of Reed and Rountree by revealing that attitudes toward delinquency in general are as strongly related to drinking as are attitudes specific to substance use.

This study addresses a void in the literature by demonstrating that attitudes toward delinquency mediate the relation between negative affectivity and later drinking. One interpretation of this finding is that when it comes time to choose whether or not to drink, the adolescent bases the decision not upon their perceptions of the acceptability of alcohol use specifically, but rather upon whether or not they feel that it is acceptable to defy society's normative standards in general. The observed mediating effect suggests that developing positive attitudes toward breaking rules occurs more frequently in adolescents who are high in negative affectivity.

While the relation between negative affectivity and attitudes toward delinquency may be bidirectional, some evidence suggests that high negative affectivity is most likely a precursor of positive attitudes toward delinquency. From a theoretical standpoint the emergence of relatively stable temperament or trait markers developmentally precedes the emergence of much more plastic attitudes about behavior. More empirically, after controlling for other common risk factors in urban males, depressed mood in early adolescence has been shown to have a more robust effect upon delinquency trajectories than delinquency has upon depressed mood trajectories (Beyers & Loeber, 2003). Further, this study revealed that time-averaged depressed mood significantly predicts a positive rate of change in delinquency variety across time.

While our first aim was designed to examine the relation between negative affectivity and overall drinking frequency or drinking in the context of unpleasant emotions, our second set of analyses were designed to address the development of alcohol use disorders.

Epidemiological studies frequently highlight the comorbidity of alcohol use disorders and disorders associated with high negative affect (e.g. depressive disorders and anxiety disorders; National Epidemiologic Survey on Alcohol and Related Conditions, (Grant et al., 2004). However, it is difficult to say that negative affect leads to alcohol use based simply upon the fact that the disorders co-occur. For example, frequent alcohol intoxication and withdrawal are often antecedents of mood disorders, and mood problems often resolve after a period of abstinence from drinking (see Raimo & Schuckit, 1998). This might be interpreted to suggest that many people experience negative affect that is triggered by drinking, rather than vice versa.

To elucidate this issue, the second aspect of our study allowed a direct test of the hypothesis that negative affectivity in early adolescence is associated with alcohol use disorders by late adolescence. This hypothesis was supported despite the inclusion of early adolescent drinking as a covariate, suggesting that high levels of negative affectivity were not associated with later drinking merely as a result of their association with earlier drinking. The predictive importance of negative affectivity is also supported by findings from another study, which indicated that adolescents who are treated for an alcohol use disorder are much quicker to relapse if they are suffering from major depressive disorder (Cornelius et al., 2004). Together, these data suggest that chronic negative affect is an important risk factor for development of, and relapse into, alcohol use disorders among adolescents.

As in the previous results, there was evidence to suggest that delinquency variables play an important role in the development of drinking behavior. The chi-square for the model increased substantially with the inclusion of these variables, and these indicators largely accounted for the observed relation between negative affectivity and alcohol use disorders. In the complete model, positive attitudes toward delinquency was the only variable other than prior drinking that was significantly associated with diagnosis of an alcohol use disorder. This suggests that, while the delinquency variables likely share in the ability to predict alcohol use problems, it is the personal values of the adolescent that carry the most substantial individual weight. Only one other study is known to have shown the ability of attitudes to outperform other key variables in the prediction of drinking, and that was among college students who might be expected to have developed greater independence in thought and action (Burden & Maisto, 2000). As such, these findings call for replication, especially in a sample with a greater number of female participants. If the finding is supported in future studies, treatment of alcohol use disorders might be better informed with the knowledge that many chronically upset adolescents defy norms and societal rules (and end up drinking) because they do not perceive following rules to be associated with positive emotional outcomes.

It should be noted that with all variables included, the model accurately classified 87% of all adolescents and predicted 36% of those observed to have an alcohol use disorder. Importantly, the rate of false-positives was low (only 4% of those without the disorder were classified as having it). Post-hoc analyses revealed that including only attitudes toward delinquency and prior drinking allowed the correct prediction of 30% of those found to have the disorder, while prior drinking considered alone did less well (correctly classifying 15% of those with the disorder). Although knowing the adolescent's status with regard to other risk factors (e.g. family history of alcohol use disorder) would likely improve prediction of the development of the disorder, these findings suggest a brief assessment of an adolescent's drinking history and current attitudes regarding delinquency might allow for a quick estimation of risk. Importantly, such a screen would not require adolescents to implicate themselves or their friends in delinquent behavior other than drinking and would not require them to share potentially sensitive information about their home lives. Furthermore, this screen would be specific enough that it would be unlikely to prescribe intervention for adolescents at low risk for the disorder.

In light of the broad scope of this investigation, it is important to consider some of its potential limitations. One issue that warrants consideration was the utilization of a general negative affectivity measure rather than more specific assessments of subfactors (e.g. frustration or anger). Other studies have demonstrated that disaggregating negative affect into components may demonstrate more specific mediation of the relation between stress and substance use (Hussong & Chassin, 1994)) in adolescence. Negative affectivity was not subdivided in this investigation because all aspects of the trait were of theoretical interest and because there has been little empirical support for the subdivision of the Emotional Susceptibility into subfactors. Another possible limitation is that splitting “delinquency” into components such as attitudes toward delinquency, association with delinquent friends, and actual engagement in delinquent behavior might be dividing a single construct too finely. However, it can be argued that these variables are theoretically different to the extent that they represent behaviors, social selection, and general cognition to differing degrees. Additionally, the significant but not overwhelming correlations between these aspects of delinquency (no one delinquency variable accounted for more than half of the variance of another) support their conceptualization as related but somewhat differing phenomena.

In summary, what emerged from these analyses was evidence that some chronically upset early adolescent boys or girls drink because high negative affect has led to an acceptance of breaking societal rules. Moreover, this mechanism is relevant not only to increased drinking and drinking in the context of negative emotions, but also to the development of an actual alcohol use disorder by late adolescence. Focusing upon individual difference variables such as negative affectivity and attitudes toward delinquency might facilitate the development of prevention efforts to assist those adolescents who are at risk for, or already displaying, a pattern of affect-related drinking. Although evidence regarding the effectiveness of changing attitudes toward delinquency is somewhat sparse, at least one meta-analysis indicates that various treatment modalities can be effective in altering adolescents' beliefs regarding such behavior (Cooper, Lutenbacher, & Faccia, 2000). Together these studies suggest that adolescents who are recurrently angry, frustrated, or anxious should be monitored for deviation from prosocial standards and behavior. Such signs may indicate that the individual is failing to emotionally thrive and may be in need of increased support or reinforcement for prosocial behavior. These individuals might also benefit from education regarding the potentially harmful consequences of drinking, as well as identification of sources of emotional stress.

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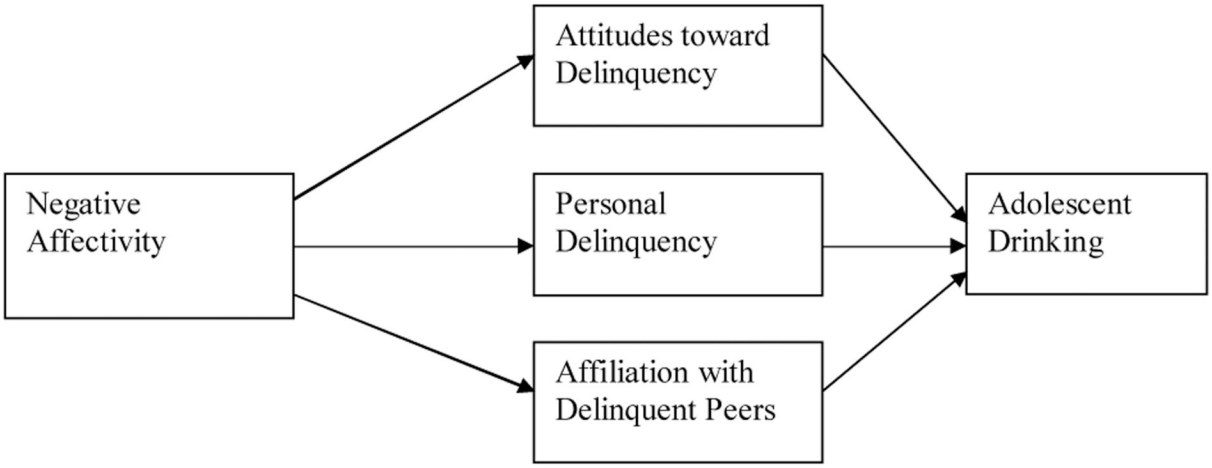

Figure 1.
Mediating role of delinquency on adolescent drinking.

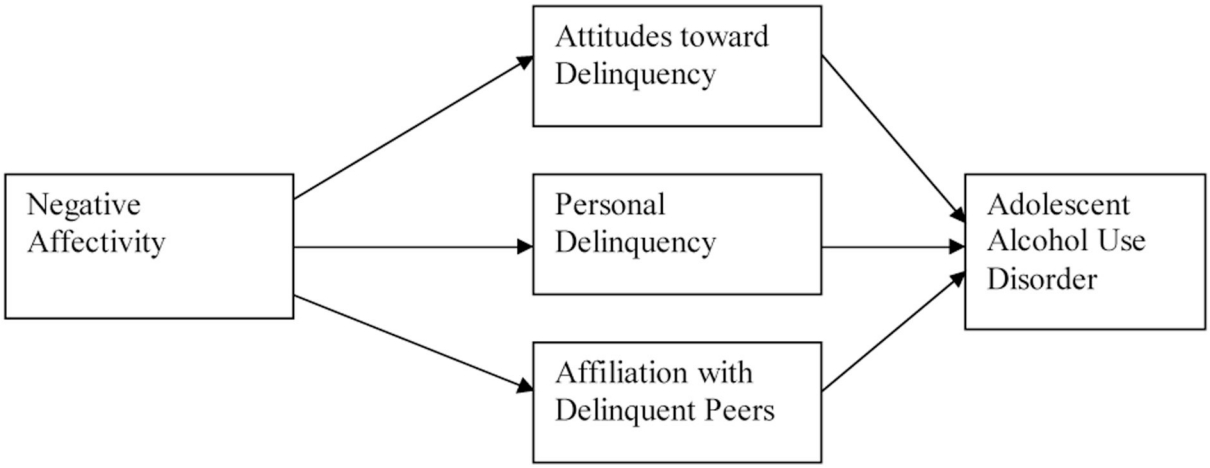

Figure 2.
Mediating role of delinquency on adolescent alcohol use disorder.

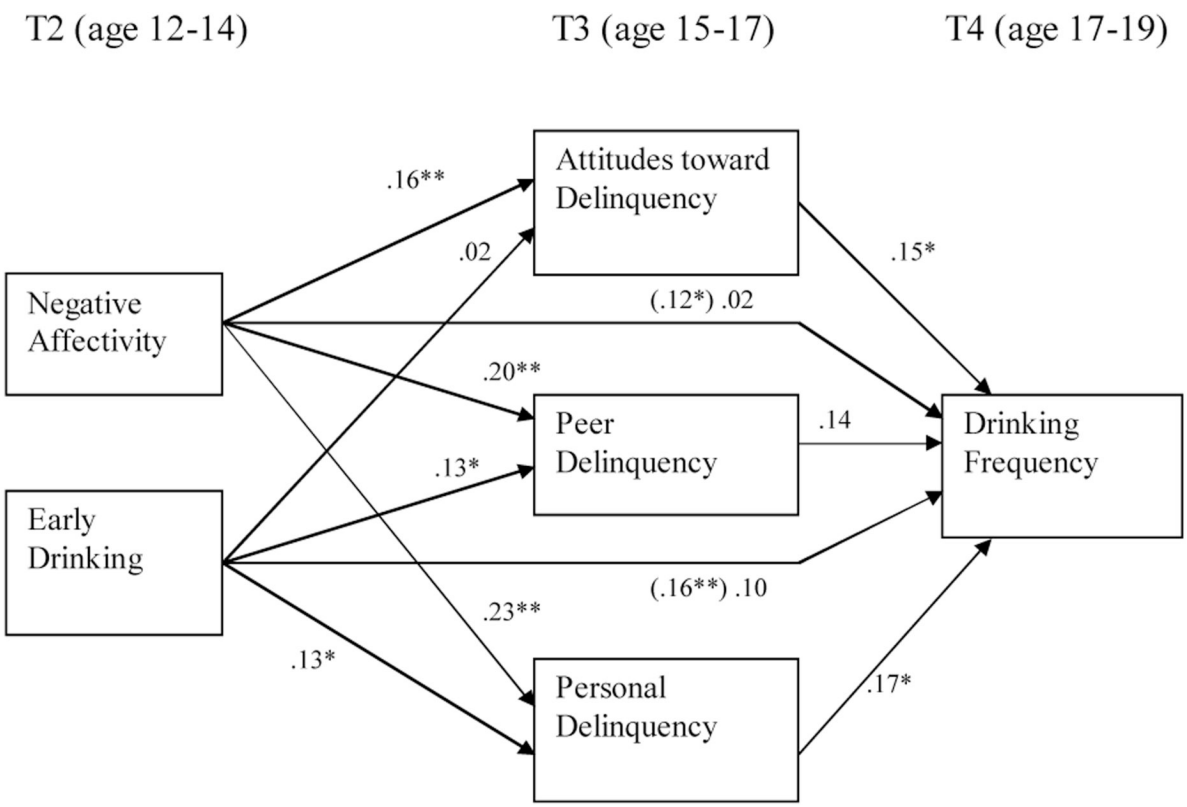

Figure 3.
Delinquency variables as mediators of the relation between negative affectivity and overall drinking frequency, with prior drinking included in the model.

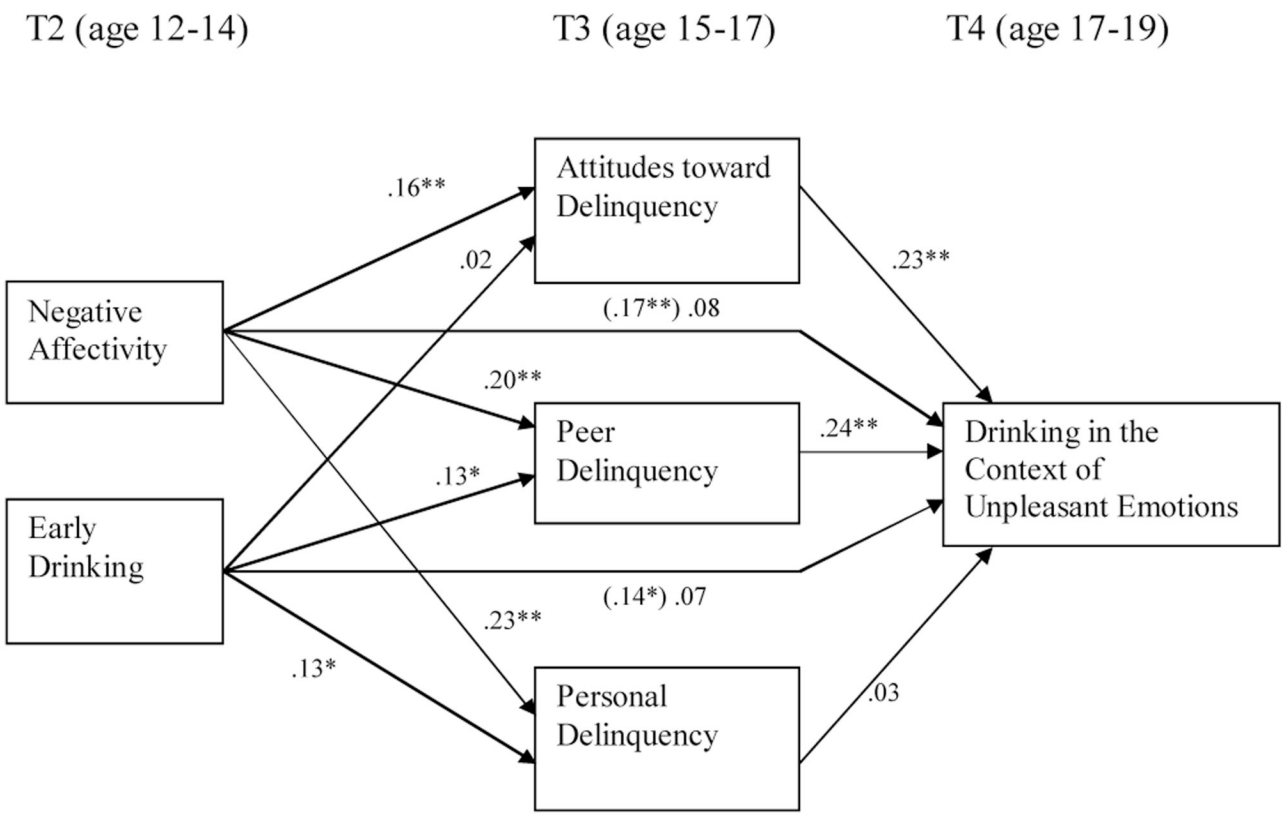

Figure 4.
Delinquency variables as mediators of the relation between negative affectivity and drinking in the context of unpleasant emotions, with prior drinking included in the model.

Table 1

Descriptive Data for Independent and Dependent Variables (N = 282)

Measure	*M*	*SD*
Age (T2)	13.11	.94
Education (T2)	6.85	1.23
SES (T2)	42.16	13.65
Negative Affectivity (T2)	45.55	24.51
Attitudes toward Delinquency (T3)	31.14	6.14
--Attitudes toward Substance Use (T3)	1.63	.63
Peer Delinquency (T3)	9.09	8.08
--Peer Substance Use (T3)	1.39	1.25
Personal delinquency (T3)	3.68	2.99
Drinking Frequency (T4)	1.12	1.14
Drinking in the Context of Negative Emotions (T4)	23.91	9.20

* $p < .05$.

** $p < .01$.

Table 2

Pearson-Product Moment Correlations (N = 282)

Measure	2	3	4	5	6	7	8	9
1) Negative Affectivity (T2)	.12*	.17**	.04	.23**	.20**	.25**	.18**	.20**
2) Drinking Frequency (T2)		.16**	.25**	.18**	.28**	.17**	.17**	.16**
3) Attitudes toward Delinquency (T3)			.60**	.59**	.55**	.56**	.34**	.41**
4) Attitudes toward Substance Use (T3)				.35**	.49**	.33**	.27**	.26**
5) Peer Delinquency (T3)					.77**	.67**	.36**	.42**
6) Peer Substance Use (T3)						.58**	.36**	.38**
7) Delinquent Behavior (T3)							.36**	.34**
8) Drinking Frequency (T4)								.45**
9) Drinking in the Context of Unpleasant Emotions (T4)								

* $p < .05$.

** $p < .01$.

Table 3

Mediation Analyses for T4 Drinking Frequency Regressed on T2 and T3 Variables

Model and Measure	β	Df	R^2	ΔR^2	F for ΔR^2
Model 1 (all vars. at T2)		5, 276	.05	.05*	2.65
Age	.02				
Education	.06				
SES	-.03				
Drinking Frequency	.16**				
Negative Affectivity	.12*				
Model 2:		8, 273	.18	.13**	14.94
Age	.05				
Education	.06				
SES	-.02				
Drinking Frequency (T2)	.10				
Negative Affectivity (T2)	.02				
Attitudes toward Delinquency (T3)	.15*				
Peer Delinquency (T3)	.14				
Personal delinquency (T3)	.17*				

* $p < .05$.

** $p < .01$.

Table 4

Mediation Analyses for T4 Drinking in the Context of Unpleasant Emotions Regressed on T2 and T3 Variables

Model and Measure	β	Df	R^2	ΔR^2	F for ΔR^2
Model 1 (all variables at T2)		5, 276	.07	.07**	3.89
Age	.05				
Education	-.11				
SES	-.02				
Drinking Frequency	.14*				
Negative Affectivity	.17**				
Model 2:		8, 273	.24	.17**	20.46
Age	.01				
Education	-.12				
SES	.00				
Drinking Frequency (T2)	.07				
Negative Affectivity (T2)	.08				
Attitudes toward Delinquency (T3)	.23**				
Peer Delinquency (T3)	.24**				
Personal delinquency (T3)	.03				

* $p < .05$

** $p < .01$.

Table 5

Mediation Analyses for T4 Drinking Frequency Regressed on T2 and T3 Variables

Model and Measure	β	Df	R^2	ΔR^2	F for ΔR^2
Model 1 (all variables at T2)		5, 276	.05	.05*	2.58
Age	.05				
Education	.07				
SES	-.04				
Drinking Frequency	.13*				
Negative Affectivity	.12*				
Peer Substance Use	.10				
Model 2:		6, 275	.14	.09**	26.86
Age	.05				
Education	.06				
SES	-.02				
Drinking Frequency	.09				
Negative Affectivity	.05				
Peer Substance Use (T2)	-.03				
Peer Substance Use (T3)	.33**				

* $p < .05$.

** $p < .01$.

All variables measured at T2 unless otherwise indicated.

Table 6

Mediation Analyses for T4 Drinking in the context of unpleasant emotions Regressed on T2 and T3 Variables

Model and Measure	β	Df	R^2	ΔR^2	F for ΔR^2
Model 1 (all variables at T2)		5, 276	.07	.07**	3.45
Age	.03				
Education	-.11				
SES	-.02				
Drinking Frequency	.12*				
Negative Affectivity	.17**				
Peer Substance Use	.08				
Model 2:		6, 275	.18	.11**	35.12
Age	.08				
Education	-.13				
SES	.00				
Drinking Frequency	.06				
Negative Affectivity	.11*				
Peer Substance Use (T2)	.06				
Peer Substance Use (T3)	.35**				

* $p < .05$.

** $p < .01$.

All variables measured at T2 unless otherwise indicated.

Table 7

Logistic Regression on T4 Alcohol Use Disorder

Model and Measure	χ^2	$\Delta\chi^2$	N. R^2	% correct	Exp (B)
Model 1: (all variables at T2)	.377	.377	.00	81.21	
Age					.95
Education					1.05
SES					.99
Model 2: (all variables at T2)	27.24**	26.86**	.16	85.00	
Age					.89
Education					1.12
SES					1.00
Drinking Frequency					2.92**
Negative affectivity					1.05*
Constructive Coping					.96**
Model 3: (including T3 variables)	62.06**	34.81**	.33	86.66	
Age					.68
Education					1.14
SES					1.00
Drinking Frequency					2.44**
Negative affectivity					1.01
Constructive Coping					.97
Attitudes toward Del. (T3)					1.12**
Peer Delinquency (T3)					1.02
Personal delinquency (T3)					1.13

* $p < .05$.

** $p < .01$.

N. R^2 = Negelkerke's R^2