

Affective Self-Regulation Trajectories during Secondary School Predict Substance Use Among Urban Minority Young Adults

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This study explored the relationship between trajectories of affective self-regulation skills during secondary school and young adult substance use in a large multiethnic, urban sample ($N = 995$). During secondary school, participants completed a measure of cognitive and behavioral skills used to control negative, unpleasant emotions or perceived stress. As young adults, participants reported on the frequency and quantity of their alcohol, cigarette, and marijuana use in a telephone interview. Controlling for demographic variables, self-regulation did not significantly change over adolescence, although there was significant variation in participants' rates of growth and decline. Lower seventh-grade self-regulation and less steep increases in self-regulation were predictive of higher young adult substance use. Male participants had significantly lower initial self-regulation and higher young adult substance use. The results suggest that interventions that build affective self-regulation skills in adolescence may decrease the risk of young adult substance use.

Keywords: affect self-regulation, minority youth, substance use

INTRODUCTION

Alcohol, tobacco, and marijuana use have been associated with a host of negative social and health risk behaviors in adolescence and emerging adulthood, including poor academic and vocational performance, relationship difficulties, risky sexual behavior, aggressive and violent behavior, the abuse of illicit and prescription drugs, and other physical and mental health problems (e.g., Dogan, Stockdale, Widaman, & Conger, 2010; Griffin, Bang, & Botvin, 2010; Hermos, Winter, Heeren, & Hingson, 2008;

Newcomb, Scheier, & Bentler, 1993; Perkins, 2002; Schulenberg et al., 2005). These findings have broad implications for young people and suggest that substance use and abuse may decrease the likelihood of a healthy and successful developmental transition into young adulthood. In order to develop effective prevention and intervention programs that promote healthy development, it is important for researchers to identify key psychosocial risk and protective factors during adolescence that are associated with substance use and related problem outcomes during emerging adulthood.

One of the most popular conceptual models of substance use etiology, both from a scientific and lay perspective, is that individuals use or abuse alcohol, tobacco, or other drugs in order to regulate negative affective responses (e.g., distress, stress, or anxiety) that they experience due

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to exposure to unpleasant or threatening stimuli. This notion has been operationalized in models that emphasize substance use as a way to cope with or reduce anxiety or stress (Kushner, Abrams, & Borchardt, 2000; Vaccaro & Wills, 1998; Wagner, Myers, & McIninch, 1999) or a way to self-medicate a variety of negative affective states (e.g., Khantzian, 1997; Weiss & Mirin, 1987). There has been significant support for these conceptual models in numerous studies and multiple populations. Studies have shown that youths who struggle with psychological distress, anxiety, perceived powerlessness, meaninglessness, or other negative emotions engage in more licit and illicit drug use (Crutchfield & Gove, 1984; Labouvie, 1986; Labouvie, Pandina, White, & Johnson, 1990; Mainous, Martin, Oler, Richardson, & Haney, 1996). In a study of adolescents ages 12 to 17 who participated in the National Household Survey on Drug Abuse, findings indicated that adolescents with serious emotional problems were twice as likely to use marijuana and four times as likely to use other illicit drugs compared to youths with low levels of emotional problems (Department of Health and Human Services, 1999).

Given the existing empirical support for the self-medication and coping models of substance use and abuse, a corollary hypothesis is that individuals who are able to regulate their affective responses in adaptive ways will be less likely to use alcohol, tobacco, or illicit drugs. Of particular interest is whether such affective self-regulation skills during adolescence serve as a protective factor for substance use during the early twenties—the years when the use of alcohol, tobacco, and other drugs typically peaks in prevalence (Griffin, 2010). Scholars have focused increasingly on protective factors during the years of emerging adulthood (between ages 18 and 25). This period of life is characterized as a period of instability, exploration, and increasing responsibility (Arnett, 2000). Research has demonstrated that among college undergraduates, poor emotional self-regulation was associated with greater participation in risky behaviors such as cigarette smoking and alcohol-induced verbal and physical aggression (Magar, Phillips, & Hosie, 2008). However, no study to our knowledge has assessed whether trajectories of affective self-regulation over the course of the secondary school years prospectively predict young adult substance use.

In the current study, we aimed to fill this gap through analysis of a longitudinal cohort study of multiethnic, urban youths. Participants completed annual assessments of affective self-regulation in the seventh through twelfth grades, and reported on their alcohol, cigarette, and marijuana use 6 years later, at approximately age 24. We explored whether seventh-grade affective self-regulation and changes in self-regulation over adolescence predicted substance use in young adulthood. In addition, we investigated the impact of gender, race/ethnicity, socioeconomic status, and baseline academic achievement on affective self-regulation and young adult substance use, as previous

research has found that these predictors are associated with either one or both constructs (e.g., Bryant, Schulenberg, O'Malley, Bachman, & Johnson, 2003; Buu et al., 2009; Chen & Jacobson, 2012; Cox, Zhang, Johnson, & Bender, 2007; Griffin, Scheier, & Botvin, 2009; Nolen-Hoeksema, 2004).

METHOD

Procedures

Participants were part of a large, school-based drug abuse and violence prevention trial. Because the current study sought to investigate the relationship between trajectories of affective self-regulation and young adult substance use independent of the intervention, only control group participants were included in the analysis. Participants completed annual surveys from the seventh through twelfth grade that included demographic information, self-reported academic performance, and a measure of affective self-regulation. Questionnaires were administered in regular classroom periods by teams of three to five study personnel, and students were informed that their responses would not be made available to school personnel, teachers, or parents. Six years later, when participants were approximately age 24, they completed a telephone interview and reported their alcohol, cigarette, and marijuana use. Various tracking procedures were used to increase study retention, including annual updates on participants' contact information, and the progress of ongoing data collection was documented in a comprehensive database. The Institutional Review Board at Weill Cornell Medical College approved all study procedures.

Participants

The first wave of the study included 2,939 control group participants, 1,303 (44.3%) of whom completed the young adult survey. Of these participants, we included those who had completed at least one assessment in middle school (i.e., seventh or eighth grade), and one assessment in high school (i.e., ninth through twelfth grade). Using these inclusion criteria, an additional 308 participants were dropped from the analysis. The final sample consisted of 995 participants. Demographic and descriptive data are included in Table 1.

Independent samples *t*-tests and chi-square tests on all variables included in the study found that retained participants had higher tenth-grade self-regulation and baseline grades and were more likely to be female and from two-parent families, compared to participants who did not remain in the study. This suggests that the retained sample was at somewhat lower risk than dropouts and therefore limits our ability to generalize to high-risk samples; this is

TABLE 1
Demographic and Descriptive Data for Sample ($N=995$)

	%/M (SD)
<i>Female</i>	58.8%
<i>Race/Ethnicity</i>	
Black/African-American	51.0%
Latino/Hispanic	26.0%
Asian	5.6%
American Indian	1.2%
White	4.9%
Other Race	11.2%
<i>Two-Parent Household (baseline)</i>	50.1%
<i>Free or Reduced-Price Lunch (baseline)</i>	45.0%
<i>Grades (baseline)</i>	
Mostly As (1)	26.9%
Mostly Bs (2)	46.3%
Mostly Cs (3)	19.5%
Mostly Ds (4)	4.6%
Ds or lower (5)	2.7%
<i>Self-Regulation</i>	
7th grade	3.67 (.90)
8th grade	3.62 (.87)
9th grade	3.69 (.79)
10th grade	3.71 (.81)
11th grade	3.77 (.77)
12th grade	3.70 (.75)
<i>Young Adult Substance Use</i>	
Alcohol	1.79 (1.14)
Cigarettes	.82 (1.69)
Marijuana	.23 (.42)

commonly found in longitudinal cohort studies of adolescent risk behaviors (Fernandez-Hermida, Calafat, Becoña, Tsertsvadze, & Foxcroft, 2012). Demographic differences were controlled for in the final statistical analysis.

Measures

Demographic Variables

Dummy codes were included for male gender and race/ethnic background (Black, White, Latino, Asian, and Native American, with “other race/ethnicity” as the reference group). In addition, as proxies for socioeconomic status, we used dummy codes for whether participants were from a two-parent family, and whether they received free or reduced-priced lunch.

Grades

Participants reported on their grades at baseline, with response options ranging from “mostly As” (5) to “Ds or lower” (1).

Affective Self-Regulation

The middle and high school surveys included five items from Rosenbaum’s (1980) Self-Control Schedule,

a well-validated scale (e.g., Richards, 1985). Items used to measure affective self-regulation were “If I feel sad, I try to think about pleasant things”; “When I am worried about something, I try to keep myself busy or think about other things”; “When I have to do something that I know will make me nervous, I think about how I can get myself to feel less nervous”; “When I know I’m going to be late for something, I tell myself to stay calm”; and “If an unpleasant thought is bothering me, I try to think about something pleasant.” Items were selected by consensus among a team of research psychologists, with the goal of identifying items that were of particular relevance to the study population of secondary school students and that specifically assessed key cognitive and behavioral strategies that may be used to control negative or unpleasant emotions or perceived stress. Participants rated items on a 5-point Likert-type scale, ranging from strongly disagree (1) to strongly agree (5). Mean scores were calculated for each time point. Cronbach’s alpha in the current study ranged from .83 to .89 at different time points.

Young Adult Substance Use

Three forms of substance use were assessed in the young adult survey: alcohol, cigarette, and marijuana use. For alcohol use, we calculated the average of the three following items: frequency of (a) drinking alcohol (beer, wine, or hard liquor) and (b) drinking “until you get drunk,” both with response options ranging from “never” (0) to “more than once a day” (7); and (c) how many drinks they consumed when they drank, ranging from “I don’t drink” (0) to “more than 15 drinks” (8). For cigarette use, we calculated the average of the following two items: (a) frequency of smoking, with response options ranging from “never” (0) to “more than once a day” (7), and (b) quantity of cigarette use, from “none at all” (0) to “more than two packs a day” (7). Last, as an indicator of marijuana use, participants reported on whether they used marijuana over the past three months. By using indicators of different substances, our goal was to capture the common variance among these behaviors and measure more serious levels of substance use involvement (compared to a factor representing any one substance), an approach used in previous studies (Griffin, Scheier, Botvin, & Diaz, 2001; Griffin, Botvin, Scheier, Epstein, & Diaz, 2002).

DATA ANALYSIS

Latent growth curve modeling (LGCM) was used to model a developmental trajectory of affective self-regulation over time. LGCM is a statistical method used for repeated measures of the same observed variable over time (Duncan, Duncan, Stryker, Li, & Alpert, 1999). Latent factors representing the initial starting point (i.e., the intercept) and rate of change (i.e., the slope) are estimated for the full

sample. Variance terms for the intercept and slope, accounting for individual differences in participants' starting points and rates of change, were also included and can be predicted by other variables in the model. The top of Figure 1 illustrates the LGC model for affective self-regulation. The identical loadings for the intercept term (1, 1, 1, and 1) indicate that the intercept term was set at the first time point (seventh grade). The loadings for the slope (0, 1, 2, and 3) specify linear growth, with a constant rate of change over the course of the study.

The model in Figure 1 also specifies a covariance between intercept and slope terms. The association reflects whether there is a relationship between initial starting points and change over the course of the study. A positive association would indicate that participants who started with higher initial affective self-regulation tended to have larger increases (or smaller decreases) in affective self-regulation compared to those starting with lower initial affective self-regulation. In contrast, a negative association would indicate the participants who started with higher initial affective self-regulation tended to have smaller increases (or larger decreases) in affective self-regulation compared to those who started with lower initial affective self-regulation.

After the trajectory of affective self-regulation was established, a latent variable of young adult substance use was entered, with alcohol, cigarette, and marijuana use as its indicators (Figure 1). The intercept and slope terms of affective self-regulation were specified as predictors of young adult substance use. This permitted investigation of whether participants' initial affective self-regulation and changes in affective self-regulation over time related to

young adult substance use. Positive regression weights would indicate that participants with higher initial affective self-regulation and greater increases (or small decreases) in affective self-regulation over time tended to have higher young adult substance use. In contrast, negative regression weights would indicate that participants with higher initial affective self-regulation and small increases (or greater decreases) in affective self-regulation over time tended to have lower young adult substance use. Given aforementioned findings indicating affective self-regulation as a protective factor against substance use, we hypothesized that youths with higher initial affective self-regulation and greater increases (or smaller decreases) in affective self-regulation over time would have lower young adult substance use (i.e., negative regression weights).

Next, we examined the influence of demographic variables (gender and race/ethnicity, and baseline assessments of grades, two-parent family status, and free or reduced lunch status). Demographic variables entered as predictors of the affective self-regulation intercept and slope terms, as well as of young adult substance use. Non-significant paths were trimmed from the final model.

All LGC models were conducted in Mplus statistical software (Muthén & Muthén, 1998–2010). Full-information maximum likelihood (FIML) was used to handle missing data. Goodness of fit was assessed using three criteria: chi-square (χ^2), root mean square error of approximation (RMSEA), and comparative fit index (CFI). Following the recommendations of Hu and Bentler (1998), we set the cut-off for acceptable model fit at RMSEA < .08 and CFI > .90. Standardized values for regression paths and covariances

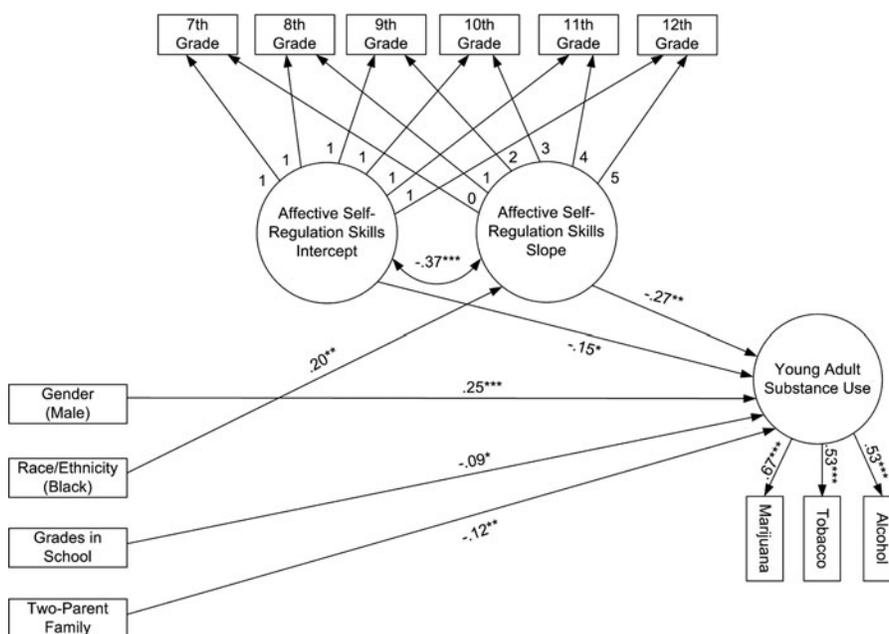


FIGURE 1 Affective self-regulation skills during adolescence and young adult substance use. * $p < .05$; ** $p < .01$; *** $p < .001$.

are presented in the results. Non-standardized results are presented for variance and residual variance terms, since standardized variances in Mplus are set at 1.00.

RESULTS

The first LCG model established trajectories of affective self-regulation from seventh to twelfth grade and had good fit with the data, $\chi^2(16) = 30.52$, $p = .02$, RMSEA = .03, CFI = .97. Self-regulation significantly increased over adolescence ($\mu S = .19$, $p = .03$), and there was significant variation in initial levels and change in self-regulation ($\psi I = .29$, $p < .001$, and $\psi S = .01$, $p < .001$). The covariance between the intercept terms was statistically significant ($r = -.38$, $p < .001$), indicating that participants who began with higher self-regulation tended to have less steep increases in self-regulation over time.

A latent variable of young adult substance use was then added, with the affective self-regulation intercept and slope as its predictors, and the model had good fit with the data, $\chi^2(32) = 56.32$, $p = .005$, RMSEA = .03, CFI = .97. The slope of self-regulation remained significant ($\mu S = .17$, $p = .04$), as did the variance of the intercept and slope ($\psi I = .29$, $p < .001$, and $\psi S = .01$, $p < .001$) and covariance between the intercept and slope ($r = -.38$, $p < .001$). The path from the self-regulation intercept to young adult substance use was significant ($\beta = -.15$, $p = .01$), indicating that participants who had higher seventh-grade affective self-regulation had lower young adult substance use. The path from the affective self-regulation slope to young adult substance use was also significant ($\beta = -.22$, $p = .04$), indicating that participants who had greater increases in affective self-regulation over adolescence tended to have lower young adult substance use as young adults.

Last, demographic variables were entered as predictors of young adult substance use and the affective self-regulation slope and intercept terms, and non-significant paths were trimmed. The final model (Figure 1) had good fit with the data, $\chi^2(63) = 126.67$, $p < .001$, RMSEA = .03, CFI = .93. With demographics entered, the slope of affective self-regulation was non-significant, whereas the variances for the self-regulation intercept and slope remained significant ($\psi I = .30$, $p < .001$, and $\psi S = .01$, $p < .001$), as did the covariance between them ($r = -.37$, $p < .001$). The paths from the affective self-regulation intercept ($\beta = -.15$, $p = .016$) and slope ($\beta = -.27$, $p = .006$) to young adult substance use remained significant. Participants who reported higher initial affective self-regulation and greater increases over time reported lower young adult substance use. None of the demographic variables was a significant predictor of the affective self-regulation intercept term. The dummy code for Black race was a significant, positive predictor of the slope in affective self-regulation ($\beta = .20$, $p = .009$), indicating that Black participants had significantly greater

increases in affective self-regulation than non-Blacks. The dummy codes for male gender and two-parent family status, as well as the baseline assessment of grades, were significant predictors of young adult substance use. Young adult substance use was significantly higher among males ($\beta = .25$, $p = .001$), and lower among those from two-parent families at baseline ($\beta = -.22$, $p = .003$) and with higher grades at baseline ($\beta = -.09$, $p = .021$).

DISCUSSION

Research on brain development has shown that the prefrontal cortex, the area of the brain that controls deductive reasoning, judgment, and affect regulation, continues to develop until approximately 26 years (O'Connell, Boat, & Warner, 2009). Because affect regulation continues to develop and strengthen for most young people during the transition from adolescence to young adulthood, it is important to investigate how this construct may be related to a variety of risk behaviors (Bell & McBride, 2010). The purpose of this study was to explore the relationship between affective self-regulation trajectories in adolescence with young adult substance use in a large sample of multiethnic, urban youths. Our final model found that, controlling for demographic variables, self-regulation did not significantly change from seventh to twelfth grade for the sample as a whole. However, there was significant variation in participants' initial levels and changes in affective self-regulation over time. Affective self-regulation skills in the seventh grade were significantly associated with less substance use for young adults, assessed at approximately age 24. Smaller increases in affective self-regulation during the secondary school years were significantly associated with higher levels of young adult substance use. In terms of demographic variables, we found that male participants had lower initial affective self-regulation skills and higher young adult substance use, Black participants had steeper increases in affective self-regulation, and participants with high academic grades and from two-parent families (at baseline) reported lower substance use levels as young adults compared with their counterparts.

The present findings have important implications for prevention. Previous research has found that skills training in affective and other types of self-regulation can benefit young people and serve an important protective role for a variety of negative outcomes. For example, programs that teach goal-setting, self-monitoring, self-reinforcement, and other skills to enhance self-regulation among early adolescents have been found to be significantly more effective in decreasing adolescent substance use than didactic programs that focus solely on the negative effects of substance use (e.g., Griffin & Botvin, 2010). The present study contributes to the literature by showing that both baseline levels and changes over time in affect self-regulation

are protective regarding young adult substance use. The implications of this finding are that interventions for adolescents and young adults that promote self-regulation skills are likely to reduce risk for substance use and other risk behaviors. Furthermore, the findings suggest that individuals at elevated risk for young adult substance use could be identified in early adolescence, and that preventive interventions targeting adolescents with low affective self-regulatory skills may have long-term protective effects. In addition, findings suggest that interventions seeking to target high-risk populations should focus on individuals with poor grades, from single-family homes, and males. Based on the present findings showing that good grades in school are protective, another general strategy for decreasing the prevalence of drug use may be to enhance academic achievement in order to both keep young people engaged in school and reduce the likelihood that academic failure would contribute to poor developmental and behavioral outcomes that can affect adolescents and young adults.

A large body of research has demonstrated the protective effects of self-regulation in general, and affective self-regulation in particular (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003; Schunk, 1989). Our findings indicate that the ability to regulate one's affective responses to actual or perceived negative circumstances or events during adolescence has important protective effects on substance use during the transition to young adulthood. Many studies examining these issues have been conducted in the United States, and a growing number of international studies have found similar protective effects. In a study of Italian youths during late adolescence, Bandura and colleagues (2003) found that high self-efficacy for affective self-regulation was associated over time with high efficacy to manage one's academic development, resist social pressures to engage in antisocial behavior, and have empathy for others. Given the fundamental role of self-regulation across a wide range of human behaviors, and the links between brain development and self-regulatory capacities, it is perhaps not surprising that such protective effects would appear in cross-cultural studies of youths (Bandura, 2002). In turn, this suggests that interventions to promote self-regulation may be similarly protective for adolescents in a variety of cultural settings.

There are several strengths and limitations to the present study. The inclusion of urban minority youths followed from early adolescence to young adulthood is a strength because few longitudinal data sets have focused on this population during this critical life transition. Limitations of the current study include the relatively high rate of attrition, which limits our ability to generalize the findings to those at highest risk. Nevertheless, the remaining sample size was still substantial and with variability on important demographic dimensions (e.g., gender, academic performance, ethnicity). Future research should test the longer-term impact of interventions that promote self-regulation

of affect and behavior, and investigate how trajectories of self-regulation and substance use over the transition to adulthood predict outcomes later in life, including attainment of adult roles (e.g., marriage, parenthood, financial independence) and mental and physical health outcomes in adulthood.

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