Examining Anger as a Predictor of Drug Use Among Multiethnic Middle School Students

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Abstract:

Background: Anger, a component of negative affect, has previously been associated with increased drug use primarily among white high school–aged students. However, few studies have examined these associations over time, and fewer have examined them among younger adolescents and students of color. Affective factors may play a greater role in drug use for girls relative to boys; yet, little is known regarding differences in associations between affect and drug use by gender.

Methods: The current study used data from the control condition (N = 2025) of a drug and violence preventive intervention trial to examine the association between self-reported anger levels among multiethnic urban adolescents in the sixth grade and their use of cigarettes, alcohol, and marijuana use 1 year later. Potential gender differences were examined as well.

Results: Multivariate generalized estimating equations models found anger to be significantly associated with increases in smoking, drinking, and marijuana use. There were no significant gender differences found for any of the drug use outcomes.

Conclusions: Results are consistent with studies conducted on primarily white high school youth, where anger had a small but significant effect on drug use over time. The findings also suggest that drug prevention programs should include emotion regulation skills, such as anger management, in addition to drug resistance skills.

Keywords: emotional health | alcohol | drugs | smoking and tobacco

Article:

Entry into middle school is a challenging time for adolescents. In addition to the pubertal changes that occur during this developmental period, middle school students are exposed to more diverse and unique social situations that require generation of new, as yet untried, solutions. Rates of problem behaviors, such as drug use, delinquency, and risky sexual behaviors, have been noted to increase during the middle school years,[1,2] thereby making it a critical point for implementing preventive interventions.[3] The most recent national data show higher prevalence for drug use among 14- to 15-year-olds (eighth and ninth grades) as compared to 12- to 13-year-olds (sixth and seventh grades).[1] These differences hold for current (past month) use of cigarettes (2.4% vs 9.2%), alcohol (4.2% vs 15.1%), and marijuana use (0.9% vs 5.9%) (12- to 13-year-olds vs 14- to 15-year-olds, respectively). Likewise, the Centers for Disease Control and Prevention's Middle School Youth Risk Behavior Survey[2] shows similar trends, with drug use rates increasing across the sixth, seventh, and eighth grades. While the middle school period is not the only problematic transitional phase during the adolescent stage,[4] rates of lifetime drug use are relatively low at entry to middle school, thereby making it a critical setting for primary prevention efforts.[3]

It has been suggested that one of the characteristics of the entry into adolescence is an increase in moodiness and intensity of moods,[5-7] and some evidence suggests that moods may be more intense during the young adolescent period.[7] Furthermore, studies have shown associations between negative affect and drug use;[8,9] however, the majority of these studies have focused on depression and self-esteem[10-12] with few studies addressing other mood states, such as anger.

Anger and Drug Use

Anger, a component of negative affect, has been less well studied among adolescents, and few studies have examined its association with engagement in problem behaviors other than aggression and violence.[13] A study by Swaim et al[14] conducted with 563 high school–aged white youth examined the link between emotional distress and adolescent drug use. The findings led the authors to question whether self-esteem, anxiety, and depression are direct causative agents of drug use, although they noted that anger played a small but key role on adolescent drug use that needed further exploration. Another study conducted with 371 primarily white high school students found contrary results. In this study, there were no associations found between anger and drug use in either cross-sectional or longitudinal analyses; however, the cross-sectional analyses did find a sex × anger interaction term, showing high levels of anger to be associated with high levels of drug use for girls only.[15]

Other studies have shown anger and aggressive behavior to be associated with early alcohol use;[16-19] however, few studies have examined the role of anger in smoking and marijuana use among adolescents in general, and these issues are particularly absent in studies among urban youth of color. Of the existing research literature, 1 study (N = 1062) found anger and irritability to be associated with both smoking initiation and maintenance among black youth and with smoking initiation only among white youth.[20] A study of Native American adolescents (N = 513)

found that teenagers who externalized their anger (eg, physical fighting or arguing) had an elevated rate of tobacco use.[21]

The majority of studies on anger and drug use have been conducted with white high school students and have used cross-sectional designs. It is possible that continued engagement in drug use/delinquency may affect anger levels among high school students. Without longitudinal studies conducted with younger age-groups, it is not possible to fully explain the association between anger and drug use in high school–aged populations. It is also important to look at associations between anger and drug use at early stages of drug use to assist with the refinement of primary prevention strategies among this age-group. Drug prevention programs that use a broad-based competency approach[3] often include emotion regulation skills, typically in the form of anxiety reduction[22] that may not be applicable to students experiencing high levels of anger. Other drug prevention approaches, such as the social influence approach, do not usually include emotion regulation skills as part of the curriculum.[3] Programs that target other deviant behaviors, including violence and aggression, have begun to include anger management skills as part of teaching emotion regulation; however, the benefit of anger management for drug prevention has not been clearly identified.

Gender Differences in Anger and Drug Use

While drug use and abuse has been a major national concern for many years, there is still relatively little known about its etiology among females relative to males. Many studies have examined pathways to drug use among adolescents with attention to psychological factors (ie, beliefs and expectancies), peer context, and social skills and have included gender in analyses; however, few report on gender-specific pathways.[23] While some evidence is accruing, it is still not clear the extent to which girls and boys initiate drug use via the same pathways or if there are unique risk and protective factors in the etiology of drug use by gender.

Studies that have addressed gender differences in drug use indicate that affective factors may play a greater role in drug use for girls relative to boys. Evidence shows that girls are more likely to initiate substance use in response to emotional difficulties, such as anxiety or depression and problems in relationships and family disharmony.[24-26] Girls are also more likely to report that smoking helps them to cope with a variety of negative feelings, including stress, sadness, anxiety, and anger.[27-29] Other studies[13,30] have found associations between anger-coping styles and substance use among adolescents but have been conducted with boys only. Since the majority of these studies have retrospective designs and/or are conducted as within-gender studies, it is important to examine potential gender interactions with prospective designs. As noted above, a study by Colder and Stice[15] found anger to be associated with greater drug use among girls, but no such relationship was found among boys. However, this interaction occurred in the cross-sectional analyses only. In an earlier study conducted with the same population as the current study,[31] anger was found to be associated with aggression and non–substance using

delinquency for both girls and boys. However, girls reported increases in their anger levels after 1 year, while boys' levels remained stable.

The current study extends the findings from the previous study to examine the role anger plays as a predictor of drug use during the early middle school years among urban multiethnic youth. Associations between self-reported anger levels of urban middle school students in the first year of their transition to middle school and their drug use 1 year later were examined. Given previous findings predicting drug use primarily among white high school populations and previous findings between anger and non–drug using delinquency, we hypothesized that students reporting higher levels of anger in sixth grade would report greater drug use by the end of the seventh grade. A secondary aim of the study was to examine potential gender differences in the association between anger and substance use. Since previous studies have shown negative affect to play a greater role in substance use among girls, we hypothesized that the association between anger levels in the sixth grade and drug use in the seventh grade would be stronger for girls relative to boys.

METHODS

Research Design

The current study was part of a larger randomized clinical trial designed to expand and test the effectiveness of an already proven drug prevention strategy on violent and aggressive behavior.[32] A total of 42 public and parochial middle schools in New York City participated in the intervention study from 1998 to 2000. All schools participated in annual surveys with the cohort of students who entered sixth grade in 1998 through their completion of eighth grade in 2000; half the schools received prevention programming for 3 years.

Participants

The current study used data from the larger study collected at baseline (sixth grade) and 1-year follow-up (seventh grade). Only participants assigned to the control condition at baseline (20 schools; N = 2961) were included in order to avoid contamination with potential intervention effects. In addition, 1 school refused data collection in the seventh grade and was therefore dropped from this study. In the remaining 19 control schools, 2647 students completed the survey during the sixth grade and 2025 (77%) during the seventh grade.

Differences were examined by both school and school type (public vs parochial). Parochial schools were smaller than public schools, with an average of 32 sixth-grade students per school as compared to approximately 236 sixth-grade students in the public schools. Parochial schools also differed from public schools in demographics, with greater proportions of white, Asian, and Hispanic students and fewer black students, $\chi^2(4) = 28.42$, p < .0001, as well as greater proportions of students living in 2-parent families, $\chi^2(3) = 33.59$, p < .0001. Differences were also found for some drug use variables, with greater levels of smoking, $\chi^2(1) = 4.29$, p < .05, and

marijuana use, $\chi^2(1) = 6.82$, p < .001, in public schools, but no difference was found among drinking rates.

Across all schools, differences existed by racial/ethnic background of students, $\chi^2(84) = 1614.98$, p < .001, and by household structure, $\chi^2(63) = 212.90$, p < .000; schools also differed by drinking, $\chi^2(21) = 45.93$, p < .01. Marginal differences were found for smoking, and no differences were found for marijuana use, but rates were too low for the findings to be conclusive. Given these differences, it is important to control for school-level effects when examining individual effects of anger on drug use.

Attrition analyses were performed to compare the baseline characteristics of students who responded to the questionnaire at both times with those who responded only at baseline. Chi-square tests and *t* tests were used where appropriate to determine differences between participants and those lost to attrition. Boys were more likely to drop out than girls (26% vs 19%; p < .0001). There was a difference in dropout rates among races, with 32% of Hispanic students, 31% of Asian students, 26% of white students, 18% of black students, and 19% of students of other races dropping out (p < .0001). Those who reported ever smoking a cigarette at baseline were more likely to drop out (36% vs 22%; p < .0001) as were those who reported ever using marijuana at baseline (42% vs 23%; p = .003). Students who dropped out were less likely to have high anger levels at baseline (mean = 2.49, SD = 0.78 vs mean = 2.57, SD = 0.74, p = .04).

Procedure

A passive consent procedure approved by the Weill Cornell Medical College Institutional Review Board was used to inform parents about the nature of the study and to provide them with an opportunity to disallow their child's participation. A consent form describing the focus of the larger study and the self-report survey was distributed in the schools for students to take home to their parents, as well as mailed directly to students' homes. Students (5%) whose parents indicated they did not want them to participate in the self-report survey did not complete any of the data collection activities.

The survey was divided into 2 separate booklets, and data collection was conducted on 2 separate days during regular 40-minute class periods. A multiethnic team of 3-5 data collectors administered the questionnaire following a standardized protocol similar to those used in previous research.[33] Steps were taken to ensure the quality of self-report data. Identification codes rather than names were used to emphasize the confidential nature of the questionnaire, and students were assured about the confidentiality of their responses. Carbon monoxide (CO) breath samples were also collected at both surveys as a bogus pipeline procedure, which has been shown to increase the validity of self-report data.[34] This procedure involved informing students that they would be individually tested for smoking by assessing the level of CO in their expired air. The protocol specified that students should be informed prior to administration of the self-report survey and that the procedure should be demonstrated to the entire group. Students were

then individually summoned to a semiprivate location as the self-report survey was being administered. While this measure was used to increase the validity of questions pertaining to cigarette smoking, studies have shown that bogus pipeline procedures can also increase the validity of other problem behaviors.[35]

Measures

Demographic Data Data on participant characteristics were collected using standard survey items assessing gender (dichotomous variable), household structure (4 group variable: 2-parent families, single-parent families, blended families, and other families), and race/ethnicity (5 group variable, black/African American, Latino, white/Caucasian, Asian, and other).

Substance Use The frequency of cigarette, alcohol, and marijuana use was assessed using items with response categories ranging from "never" (1) to "more than once a day" (9). As expected, given the age of the respondents, drug use rates were low; therefore, all drug use variables were dichotomized as ever versus never use.

Anger Anger was assessed with the 7-item anger subscale (α= .74 in the current study) from the Buss and Perry[36] Aggression Questionnaire. Students were asked to rate how well a series of statements fit them. Items included "I sometimes feel like a powder keg ready to explode,""I have trouble controlling my temper," and "When frustrated, I let my irritation show." Response categories ranged from "really not true for me" (1) to "really true for me" (5). Scores from items were averaged such that higher scores indicate greater anger.

Data Analysis

Multivariate generalized estimating equations (GEE) models for the dichotomous outcomes (cigarette smoking, alcohol, and marijuana use) were used to determine the effect of baseline anger on drug use, controlling for the covariates. Interaction effects between gender and anger were examined to determine any differences in the association between anger and drug use. Because the surveys were administered at the school level, it was necessary to control for intracluster correlations (ICCs) among students within schools. In the present context, ICCs quantify the degree of similarity of students' questionnaire responses within schools and how anger and drug use rates vary at the school level. Furthermore, we have found in our previous work that prevalence rates of drug and alcohol use are often lower among African American youth compared to other racial-ethnic groups, and therefore, these behaviors may cluster among small intact groups of high-risk youth within some schools, underscoring the need to control for the ICCs.[37] Therefore, each analysis was run using the GEE approach in SAS PROC GENMOD in order to adjust the estimated standard error to account for the within-cluster correlation. This approach generally provides for a more conservative test of the hypothesis when a positive ICC is present.[38]

RESULTS

Demographics

The mean baseline age for the current sample was 11.7 years, with a range of 10-14 years. Eighty-eight percent of students sampled attended 1 of the 10 public schools; the remaining 12% attended 1 of the 9 parochial schools. Approximately 48% of the sample was male, 24% Hispanic, 52% black, 5% Asian, 7% white, and 13% other. Approximately half (47%) of the students lived with both natural parents; 33% lived with a single parent; 11% lived with 1 natural parent and 1 stepparent; and 9% lived with other relatives, guardians, friends, or alone.

Table 1 shows the mean rates of drug use as well as anger levels at baseline and follow-up by gender. As noted previously, the girls in this sample showed greater increases in anger levels from sixth to seventh grade relative to boys. As expected, drug use increased from sixth to seventh grade for both boys and girls.

Table 1. Self-Reported Drug Use and Anger Levels in Sixth and Seventh Grade by Gender[†]

	Sixth Grade		Seventh Grade		t Score
	Mean	SE	Mean	SE	
Total					
Smoking	1.13	0.01	1.28	0.02	8.94***
Drinking	1.28	0.02	1.47	0.02	8.60***
Marijuana use	1.03	0.01	1.15	0.02	7.54***
Anger	2.55	0.02	2.71	0.02	6.74***
Girls					
Smoking	1.11	0.02	1.32	0.03	4.53***
Drinking	1.22	0.02	1.47	0.03	7.81***
Marijuana use	1.02	0.01	1.13	0.02	7.58***
Anger	2.55	0.02	2.77	0.02	5.60***
Boys					
Smoking	1.14	0.02	1.23	0.03	4.53***
Drinking	1.33	0.02	1.46	0.03	4.17***

Marijuana use	1.04	0.01	1.17	0.02	5.09***
Anger	2.53	0.02	2.62	0.03	2.30*

*p < .05; ***p < .001. † Range for drug use variables 1-9; range for anger variables 1-5.

The univariate analyses showed anger to be a significant predictor of all 3 dependent variables. Specifically, after controlling for school clustering effects, for every 1-point increase in anger levels (on a 5-point scale), a student is 1.54 (95% CI = 1.26-1.89) times more likely to report smoking, 1.32 (95% CI = 1.11-1.57) times more likely to report drinking, and 1.57 (95% CI = 1.19-2.08) times more likely to report using marijuana in the seventh grade.

Table 2 displays the parameter estimates for multivariate analyses for all dependent variables (smoking, drinking, and marijuana use) for the independent variable, anger. Anger continues to be a significant predictor of smoking, drinking, and marijuana use after controlling for gender, race, household structure, school type, and baseline levels of each substance in the multivariate analyses. The multivariate odds ratios show that as anger levels increased the likelihood of reporting having ever used cigarettes, alcohol or marijuana also increased. Specifically, for every 1-point increase in anger levels (on a 5-point scale, a student is 1.43 (95% CI = 1.13-1.8) times more likely to report smoking, 1.28 (95% CI = 1.07-1.52) times more likely to report drinking, and 1.44 (95% CI = 1.06-1.95) times more likely to report using marijuana in the seventh grade.

Table 2. GEE Parameter Estimates for Multivariate Models of Drug Use*

Parameter	Estimate	SE	95% Confidence Limits	Z score	p Value
Smoking					
Baseline use (never used)	2.56	0.20	2.18 to 2.94	13.07	<.0001
Male (female)	−0.27	0.19	−0.64 to 0.11	−1.37	.17
Asian (white)	−0.43	0.51	−1.42 to 0.57	−0.84	.40
Black (white)	−0.42	0.47	−1.34 to 0.49	−0.91	.36
Hispanic (white)	−0.11	0.42	−0.93 to 0.71	−0.27	.79
Other (white)	−0.21	0.34	−0.87 to 0.46	−0.60	.55
Single (2-parent family)	0.33	0.14	0.05 to 0.60	2.35	.01
Blended (2-parent family)	0.27	0.25	−0.23 to 0.77	1.04	.30
Other (2-parent family)	0.48	0.21	0.07 to 0.89	2.29	.02

Parochial (public)	0.06	0.32	−0.56 to 0.68	0.19	.85
Anger	0.35	0.12	0.12 to 0.59	2.96	.003
Drinking					
Baseline use (never used)	1.63	0.16	1.32 to 1.95	10.15	<.0001
Male (female)	−0.10	0.10	−0.30 to 0.11	−0.93	.36
Asian (white)	−0.27	0.40	−1.05 to 0.51	−0.68	.50
Black (white)	0.09	0.32	−0.55 to 0.72	0.27	.79
Hispanic (white)	0.25	0.31	−0.36 to 0.87	0.81	.42
Other (white)	−0.03	0.38	−0.77 to 0.72	−0.07	.94
Single (2-parent family)	−0.07	0.15	−0.36 to 0.23	−0.47	.64
Blended (2-parent family)	0.08	0.13	−0.17 to 0.33	0.63	.53
Other (2-parent family)	−0.18	0.29	−0.74 to 0.38	−0.63	.53
Parochial (public)	0.47	0.17	0.14 to 0.80	2.78	.005
Anger	0.24	0.09	0.07 to 0.42	2.71	.007
Marijuana use					
Baseline use (never used)	2.18	0.66	0.90 to 3.47	3.33	.001
Male (female)	0.55	0.15	0.25 to 0.84	3.65	.0003
Asian (white)	−0.02	0.87	−1.72 to 1.67	−0.03	.98
Black (white)	0.89	0.79	−0.66 to 2.45	1.13	.26
Hispanic (white)	0.50	0.85	−1.15 to 2.16	0.59	.55
Other (white)	0.58	0.76	−0.91 to 2.06	0.76	.45
Single (2-parent family)	−0.39	0.19	−0.76 to −0.02	−2.07	.04
Blended (2-parent family)					
Other (2-parent family)	0.02	0.23	−0.44 to 0.47	0.07	.94

| Parochial (public) | −0.40 | 0.57 | −1.53 to 0.72 | −0.70 | .48 |
| Anger | 0.36 | 0.16 | 0.05 to 0.67 | 2.30 | .02 |

*Reference variables indicated in parentheses.

None of the anger × gender interactions in the multivariate analyses were significant. However, a trend was found for both smoking and marijuana use. Specifically, boys are 1.1 (95% CI = 0.5-2.4) times more likely to report smoking in the seventh grade than girls at the lowest level of anger. At the highest level of anger, boys are half (95% CI = 0.2-1.3) as likely to report smoking as are girls. Similarly for marijuana use, at the lowest levels of anger, boys are 4.2 (95% CI = 1.4-12.7) times more likely to use marijuana than girls, whereas at the highest anger level, boys are less likely (OR = 0.6, 95% CI = 0.1-2.1) than girls. This trend was marginally significant at p = .08. No such trends were found for anger and drinking by gender.

DISCUSSION

The findings support the hypothesis that anger levels experienced by adolescents in the sixth grade are predictive of gateway drug use (smoking, alcohol use, and marijuana use) in the seventh grade among multiethnic urban youth. This was true even after controlling for a number of background variables that are often associated with drug use, such as race and household structure, and sixth-grade rates of drug use. Although anger was a significant predictor of all 3 drug use variables, the strength of the association was only moderate. The findings from this study are consistent with the findings from Swaim et al's[14] study with primarily white high school youth, where anger had a small but significant effect on drug use over time.

In adults, drug use has long been established as a coping mechanism for dealing with anger. Recent studies show that adolescents also use cigarettes, alcohol, and marijuana in order to cope with feelings of aggression and anger. A study by Tarter et al[30] examining the association between irritability and substance use in boys at risk for substance use found that drug and alcohol use were coping responses to problems in early adolescence. While it was not a goal of the current study to determine whether drug use was used as a coping mechanism to deal with anger, it is a possible explanation for the relationship between anger and drug use in adolescents.

The hypothesis that anger levels would be a stronger predictor of subsequent drug use for girls relative to boys was not supported. There were no significant gender × anger interactions for any of the substances measured. However, there was a trend for increasing drug use, specifically for marijuana use, among girls as anger levels increased. No such trend existed for boys. An examination of the distribution of the anger scale shows responses to be truncated, and it is possible that there was not enough power in the higher levels of anger to show a significant effect.

The study has several other limitations that should be noted. Differential attrition was found by drug use, with more students who reported trying cigarettes and marijuana at baseline dropping out of the study. Since problem behaviors cluster,[39] it is not surprising that students at greater risk for drug use would be lost to the study due to truancy or dropout. Differential attrition was also found by anger level with students who reported lower anger levels at baseline dropping out of the study by seventh grade. This finding is contrary to expectations and difficult to interpret. Differential attrition limits the generalizability of the results to students who remain in school and may also limit the ability to demonstrate potential gender differences in drug use by anger. Future studies should include more outreach and tracking at follow-up to maintain a more representative sample. As a secondary analysis study, the analyses were also limited by the variables included in the parent study. Specifically, anger is measured with a single scale of self-reported feelings of anger. Other anger scales, such as expressed and suppressed anger, should be tested in future studies.

Although this study was not able to show significant gender differences in the association between anger levels and subsequent drug use, the study does indicate that this relationship warrants further exploration. This study has shed some light on anger as a predictor of drug use; however, it is apparent that the role of anger related to drug use in adolescents needs to be looked at more thoroughly in future research, possibly by targeting samples that provide greater variation in anger levels.

In spite of its limitations, the current study has several notable strengths. It examines negative affect as a predictor of drug use among a population that is often underrepresented in drug prevention, urban multiethnic youth. It is also one of the first studies to examine associations between anger and drug use during the middle school years. This age is particularly important due to increases in drug use and delinquency and therefore is often the target for drug prevention programs. The majority of drug prevention programs use a social influence approach, such as altering normative expectations and teaching resistance skills. A study by Hansen et al[22] demonstrated that approximately one quarter of drug prevention programs include emotion regulation skills. Of those programs, it is not known how many include anger management and how many focus solely on anxiety reduction. This study suggests that including anger management, along with anxiety reduction and other emotion regulation skills, in comprehensive drug prevention programs may help reduce the incidence of drug use among middle school students.

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