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Association between Adverse Life Events and Addictive Behaviors among Male and Female Adolescents

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Abstract

Background—Adverse life events have been associated with gambling and substance use as they can serve as forms of escapism. Involvement in gambling and substance use can also place individuals in adversely stressful situations.

Objectives—To explore potential male-female differences in the association between addictive behavior and adverse life events among an urban cohort of adolescents.

Methods—The study sample comprised of 515 adolescent participants in a randomized prevention trial. With self-reported data, four addictive behavior groups were created: Non-Substance Users and Non-Gamblers, Substance Users Only, Gamblers Only, and Substance Users and Gamblers. Multinomial logistic regression analyses with interaction terms of sex and adverse life events were conducted.

Results—Adverse life events and engaging in at least one addictive behavior were common for both sexes. Substance Users and Gamblers had more than twice the likelihood of Non-Substance Users and Non-Gamblers to experience any event as well as events of various domains (i.e., relationship, violence, and instability). Neither relationship nor instability events' associations with the co-occurrence of substance use and gambling significantly differed between sexes. Conversely, females exposed to violence events were significantly more likely than similarly exposed males to report the co-occurrence of substance use and gambling.

Conclusion—Findings from the current study prompt future studies to devote more attention to the development of effective programs that teach adaptive coping strategies to adolescents, particularly to females upon exposure to violence.

Introduction

A significant proportion of adolescents in the U.S. and other countries engage in addictive behaviors such as alcohol, drug, tobacco use, and gambling.^{1–4} For instance, in the U.S., 20% smoked cigarettes in the past month, and 66%, 32%, and 70–75% adolescents consumed alcohol, used marijuana, and gambled, respectively, in the past year.^{2, 4} Often youth who gambled were also involved in other addictive behaviors.⁵ The Gambling Impact

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

and Behavior Study found that among 534 adolescents aged 16–17, gamblers who also drank alcohol were more than twice as likely to use illicit drugs.⁶

According to Hirschi and Gottfredson's generality of deviance perspective,⁷ deviance is characterized by individuals who seek immediate pleasure at the risk of long-term consequences. Individuals' self-control explains the variation in the likelihood of engaging in deviant acts. Therefore, Hirschi and Gottfredson⁷ suggested that the lack of self-control explains the tendency of an individual's engagement in various types of addictive behaviors. High emotional stress had been associated with the loss of control over impulses and an inability to inhibit inappropriate behaviors and to delay gratification.⁸ Neurobiological data also indicates that stress impairs the catecholamine modulation of prefrontal circuits, which impairs executive functions such as self control.⁹ Consistent with past findings of the association between decreased self-control and the increased risk of maladaptive behaviors,⁷ adverse life events have been found to be positively associated with alcohol, tobacco, and illegal drug use, and gambling among adolescents.^{10–14}

Male-female differences in adolescent gambling and substance use are consistently found. For example, the average times gambled in the past year were five times as greater in males than females.⁵ The 2010 Monitoring the Future survey also found male 12th graders were more likely than female 12th graders to report lifetime use of marijuana, inhalants, cocaine, heroin, alcohol, and cigarettes.² However, while past studies have explored male-female differences in addictive behaviors, little is known about the potential male-female difference in these behaviors among adolescents who have recently faced adverse life events. Furthermore, "adverse life events" is an umbrella term for various types of events. The male-female differences in the relationship between substance use and adverse events appear to differ by event type.^{15–17} For instance, while the associations between substance use and both interpersonal (e.g., breakdown of friendships) and violence events (e.g., victim of violence) tend to be stronger for female than male adolescents,^{16, 17} the reverse appears to be true for instability/transition events (e.g., eviction) as they were positively associated with substance use among males and not females.¹⁵ However, none of the above studies included gambling as part of a battery of addictive behaviors. The exclusion of gambling is a serious gap because it is an important public health concern as the availability of legalized opportunities continues to expand in the US.^{18, 19} Not only can excessive gambling lead to adverse financial, interpersonal, criminal, and psychiatric outcomes,^{20–23} it also often co-occurs with substance use.^{5, 6, 24} For example, Griffiths and Sutherland²⁴ found that among the 4516 adolescents, more gamblers than nongamblers reported smoking (23% vs 18%), alcohol use (72% vs 58%), and illegal drug use (21% vs 13%).

This paper explored the potential male-female differences in the relationship between past-year adverse life events and the past-year addictive behaviors of substance use and gambling involvement. We hypothesized the following: (1) more males than females would engage in both substance use and gambling; (2) the association between addictive behaviors and adverse life events would be stronger among youth who engaged in both substance use and gambling than among those engaged in either none or only one of these behaviors; and while (3) male-female differences in the association between any experience of an adverse life event and addictive behaviors would be negligible, we would find (4) male-females difference in the magnitude of the associations by event type.

Methods

Sample

Data for this study comes from the Johns Hopkins Center for Prevention and Early Intervention Cohort 3, a study initiated as a randomized prevention trial targeting academic

achievement and aggression.²⁵ Details of the trial design and interventions are available elsewhere.²⁵ Cohort recruitment occurred in Fall 1993 at nine urban public primary schools, primarily located in western Baltimore, MD (n=678, mean age=6.2 years). The entire is tracked annually and does not exclude those who dropped out of school or incarcerated. The study used data from the 2004 interview (mean age=17.1), when gambling was first assessed.

In 2004, when most of the cohort was in 11th grade, 76% of the cohort (n=515) participated in a 60–90 minute self-administered computer interview (78% and 73% of the original cohort of males and females, respectively). As seen in Table 1, most were African American, raised by single parents, and received subsidized lunches (a proxy for family poverty). Chi-square tests showed no differences by sex, race, or subsidized lunch status between the current and original samples (p values>.05). Table 1 also demonstrates that the demographic characteristics for the male and female adolescents in the current study were similar, though females had higher levels of depressive symptoms. Study protocols were approved by institutional review boards (IRB) of Johns Hopkins University.

Measures

Past Year Adverse Life Events—The Life Events Questionnaire Adolescent Versions (LEQ-A), a 31-item checklist, asked adolescents to indicate if they or someone in their social network or family had experienced an adverse or life changing event in the year prior to the interview.²⁶ The checklist of the 31 events included a broad range of experiences relevant to adolescence and family-related stressors that had been found to be associated with worse adjustments such as poorer relationships with parents and peers, lower academic achievement, increased mental health problems, and trouble with the law.²⁷ For the current study, the life events were classified into three categories: (1) Relationship life events (e.g., family death, the loss of a friend); (2) Violence life (e.g., seeing someone else stabbed, being beaten up); and (3) Instability life events (e.g., getting evicted from home, parent losing a job).

Gambling—The South Oaks Gambling Screen-Revised for Adolescents (SOGS-RA), a 12-item adaptation of the adult orientated SOGS, assessed involvement in gambling activities (e.g., lottery, scratch tabs) in the past 12 months using wordings and response options that reflected adolescence gambling behavior at an age-appropriate reading level.²⁸ Using the self-reported responses, participants were categorized as either past-year gamblers or nongamblers.

Substance Use—Self-reports of past year use of alcohol, tobacco, and illegal drugs (i.e., marijuana, crack cocaine, cocaine, heroin, inhalants, and ecstasy) were assessed via questions from the Monitoring the Future National Survey.² This section of the interview was completed using computer-assisted personal interviewing (CAPI) to enhance truthful reporting.

Addictive Behavior Groups—Four mutually exclusive groups were created to capture different patterns of past-year addictive behaviors within the sample: (1) Non-Substance Users and Non-Gamblers reported neither substance use nor gambling; (2) Substance Users Only; (3) Gamblers Only; and (4) Substance Users and Gamblers reported both substance use and gambling

Depressive and Anxious Symptoms—The Baltimore How I Feel-Adolescent Version (BHIF-AY), a 45-item self-reported scale, assessed depressive and anxious symptoms adolescents.²⁹ Adolescents reported the frequency of symptoms over the last two weeks

using a Likert rating (1=never; 4=always/almost always). Separate depressive and anxious summary scores were created for each individual by first summing the 19 depressive-related items and the 26 anxious-related items, and dividing each by the number of items. Tertiles were created from the summary scores (i.e., “Low”, “Moderate”, and “High” symptoms). In the present sample, alphas were .82 for both the Depression and Anxiety subscales. In middle school, the Depression and Anxiety subscales were associated with major depressive disorder and generalized anxiety disorder, respectively.³⁰

Neighborhood Disadvantage—The Neighborhood Environment Scale (NES), a 10-item self-reported scale, assessed neighborhood characteristics (e.g., having safe places to walk, often see drunken people on the street).³¹ Adolescents indicated whether statements were true or false for their neighborhood using a Likert rating (1=not at all true; 4=very true). A summary score was created for each individual by first summing up the ten items then dividing by the number of items. Tertiles were created from the summary scores (i.e., “Low”, “Moderate”, and “High” disadvantage).

Demographic characteristics—Parental education and household structure were assessed at baseline when a short interview with the caregivers occurred. Sex, race, and subsidized lunch information were obtained from school sources.

Analysis

Exploratory analyses with Chi-square statistics uncovered differences in the baseline demographic characteristics. Multinomial logistic regression models, with Non-Substance Users and Non-Gamblers as the reference group, explored the associations between past-year behavior groups and past-year life events. Interaction terms for sex and life events were created to assess male-female differences. All models were adjusted for race, household structure, subsidized lunch status, parent’s highest education, neighborhood disadvantage, depressive symptoms, and anxious symptoms. To accommodate the initial sample design (clustering of students within schools), a variant of the Huber-White sandwich estimator of variance was used to obtain robust standard errors and variance estimates. A p-value less than 0.05 was considered significant. All analyses were performed using STATA 11.0.³²

Results

As Table 1 shows, while there appeared to be no sex difference in sociodemographics and neighborhood disadvantage, significantly more females than males had high depressive symptoms (43.5% vs 24.0%) and anxious symptoms (40.9% vs 25.4%). More than 80% of both sexes also reported experiencing adverse life events and engaging in at least one of the four addictive behaviors in the past year. Among males, over half had gambled (58%), used alcohol (75%), used tobacco (54%), and nearly half (47%) used illegal drugs. Substance use was more common among males who gambled than those who did not. Among females, the proportion of substance users was comparable to that found among males (79% alcohol, 49% tobacco, 42% drugs), but far less gambled (37%) and this male-female difference was statistically different at the $p < .001$ level. The estimated proportions for the four addictive behavior groups also appeared to differ by sex as more females than males were Non-Substance Users and Non-Gamblers (13% vs 17%) and Substance Users only (29% vs 47%) while more males than females were Gamblers Only (7% vs 3%) and Substance Users and Gamblers (51% vs 33%).

Table 2 shows both Substance User Only and Substance Users and Gamblers were approximately twice as likely as Non-Substance Users and Non-Gamblers to report any adverse life event. Upon sex stratification however, only the association for Substance Users

and Gamblers remained significant among males, while all associations were attenuated among females.

The types of past-year events were subclassified as Relationship, Violence, or Instability events. In the overall sample, both Substance User Only and Substance Users and Gamblers were approximately twice as likely as Non-Substance Users and Non-Gamblers to report any Relationship event. While such associations attenuated among males, they remained significant among females.

Substance User Only and Substance Users and Gamblers also exhibited increased odds of Violence events compared to Non-Substance Users and Non-Gamblers among the overall sample. Compared to Non-Substance Users and Non-Gamblers, Violence event was positively associated with Substance Users and Gamblers among both males and females. Furthermore, the interaction term for sex and Violence event was found to be significant among Substance Users and Gamblers.

Among the overall sample, both Substance User Only and Substance Users and Gamblers were more than twice as likely as Non-Substance Users and Non-Gamblers to report an Instability event. Male Substance Users and Gamblers and female Substance Users Only had more than twice the odds of Instability events.

Similar analyses using Substance Users Only as the reference group were conducted (results available upon request). With one exception, Substance Users and Gamblers were not more likely than Substance Users only to report any event, Relationship event, Violent event, or Instability event in the overall sample or among either sexes. The only instance where a significant association appeared was among males, with Substance Users and Gamblers exhibiting twice the increased odds of Violent events as Substance Users Only (aOR=2.14; 95%CI=1.21,3.78; p=.01).

Discussion

Adverse life events and engaging in at least one addictive behavior (gambling, alcohol, tobacco, and illegal drug use) in the past year were common among both male and female adolescents within the sample. The co-occurrence of substance use and gambling was significantly more prevalent among males than females (51% vs 33%). Males engaged in both substance use and gambling were more than twice as likely as those who reported neither to have experienced any adverse event, relationship, violent, or instability events. Similarly, females who used substances and gambled were more than twice as likely as those who did neither to report a relationship or violent event. Despite the differing magnitudes of associations between the two sexes, only the male-female difference in the association between violent events and the co-occurrence of substance use and gambling was significant, with females exhibiting a stronger relationship. Conversely, for the most part, those engaged in both gambling and substance use were not more likely than those with substance use only to report adverse events. While males with both addictive behaviors were more likely than males with substance use only to report violent events, such an association did not differ by sex.

The stronger association between violent events and the co-occurrence of substance use and gambling among females than males corroborates past findings. For instance, while males have been found to be more than twice as likely to be exposed to violent events, among all exposed, females were more than twice as likely to develop posttraumatic stress disorder,^{33–36} which is positively associated with substance use and gambling.^{23, 37–39} Thus, females in the current sample exposed to violent events could be engaging in addictive activities to cope with their inner turmoil. Sensation seeking, linked to addictive behaviors

and exposure to violence,^{40–41} could also explain the stronger association among females. While male adolescents have generally been found to exhibit higher levels of sensation seeking than female adolescents,^{42, 43} females who engage in similar levels of addictive behaviors as males could have higher sensation seeking, thus placing them at higher risks for violent events. The current finding prompts future studies to focus more on the prevention and intervention strategies targeting female adolescents who have faced threats of physical harm through violent events.

Conversely, while the positive associations between the co-occurrence of substance use and gambling and instability event were found among males only and the associations between the co-occurrence of addictive behaviors and relationship events were found for both sexes, such differences were insignificant. This suggests that males and females exhibit similar patterns of addictive behaviors when faced with adverse life events that did not threaten their physical wellbeing, which might seem surprising as past studies have shown males and females to express their emotions in different ways.⁴⁴ For instance, Gjerde and colleagues⁴⁴ found that male adolescents with depressive tendencies were characterized by independent observers to manifest an externalizing pattern of characteristics such as antagonistic and aggressive in thought and behavior. Because externalizing behaviors had been associated with gambling and substance use,^{45, 46} it was not surprising that male adolescents of the present sample were likely to engage in addictive behaviors when facing adverse situations. On the other hand, while the female adolescents with depressive tendencies in Gjerde and colleagues⁴⁴ sample were not observed to be aggressive or antagonistic, they viewed themselves as being so. The discrepancy between what was observed and privately expressed could indicate the internalizing nature of females when dealing with depressive feelings.⁴⁴ While internalizing behaviors have been associated with anxiety and depression,⁴⁷ many studies also found that individuals with depressive and anxiety symptoms often engaged in gambling and substance use as forms of self-medication to modify their moods and to escape.^{13, 48}

The current study finding also seemed to suggest that substance use was positively associated with adverse life events regardless of gambling status as adolescents who reported both substance use and gambling were not significantly more likely than those who reported substance use only to have increased odds of adverse events. The weak relationship between gambling and life events could be due to the small number of adolescents who engaged in gambling only (n=28) as compared to those that engaged in gambling and substance use in the past year (n=220), thus limiting the current study's power to estimate such an association as past studies have found a positive association between gambling and adverse events among adolescents.^{10, 12} On other hand, the lack of association could be because gambling is generally regarded as a social activity.⁴⁹ Furthermore, while heart rate, used as an indicator for arousal, was found to rise during gambling activities, it fell immediately after the activities.⁵⁰ Conversely, the physiological effects of substances, particularly the highly reinforcing alcohol, nicotine, marijuana, and cocaine, tend to be long-lasting and intense due to their tendencies to bind to receptors and long half-lives.^{51–53} As a result, such substances could be more effectively used as escapes from the users' realities than gambling, thus potentially explaining the current finding of a stronger association between substance use and life events than between gambling and life events.

A major strength of this study was the sample, which was selected from an epidemiologically defined population representative of students attending public schools located in one urban area. Because urban families experience high rates of marital disruption, and single-parent households tend to have lower parental-monitoring,⁵⁴ youth from such families represent a highly vulnerable population at risk for adverse outcomes. Furthermore, the current study is, to our knowledge, the first to include alcohol use, tobacco

use, illegal drug use, and gambling in examining the association between addictive behaviors and adverse life events, and whether they differed by sex. Even though gambling did not appear to be associated with life events, the high co-occurrence of gambling and substance use makes gambling's inclusion necessary so as to prevent any confounding and to better understand subgroup differences of co-occurring behaviors.

We must also note several limitations to the study. Firstly, the study's small sample size, particularly the small number of individuals who engaged in only gambling and no substance use, limited the statistical power, thus potentially attenuating the current findings. Secondly, the data on adverse events and addictive behavior were all based on self reports, which could be subject to recall and social desirability bias. Furthermore, the current study used dichotomous measures of substance use and gambling instead of frequencies of each behavior. Storr and colleagues¹² found that those who gambled at least twice a month had more than twice the odds of adverse events as nongamblers. Thus, future studies could focus on the frequencies of addictive behaviors and their various patterns and associations with adverse events. Because the data had been collected and analyzed cross-sectionally, the temporal relationship between adverse life events and addictive behaviors could not be established. As a result, it would be difficult to say whether the behaviors were means of coping with the adverse events or led to the events. Furthermore, the order of addictive behavior onset and adverse life events could differ by sex. For instance, males tend to initiate substance use and gambling earlier than females,^{55–58} and addictive behavior could precede adverse events among males due to influences such as deviant peer affiliation while the reverse could be true for females as means for self medication.^{13, 40, 48} Knowing the sequence of events would shed light onto when interventions should occur to better adolescents' wellbeing by targeting the root of the problem. On the other hand, studies have shown adverse events and addictive behaviors to be very closely associated. For instance, individuals reporting high frequencies of life events often partake in addictive activities to relieve their stress,^{10, 11, 13} and those involved in such activities could in turn face more adverse events such as arrests and victims of violence,⁵⁹ thus creating a vicious cycle. Such a cycle could diminish the importance of the order of onset. Another limitation relevant to adverse life events is that it might not be simply the exposure to events that is associated with addictive behaviors, but individuals' responses to the events. Such a distinction between exposure and response to adverse events is particularly important as studies have shown that while males were more likely to be exposed to events, females were more likely to develop PTSD,^{35, 36} which is associated with addictive behaviors.^{23, 37–39} Thus the current findings could be conservative estimates of the relationship between adverse life events and addictive behaviors, and future studies could focus on coping strategies used upon exposure to events and its association with substance use and gambling.

Conclusion

In the current sample of urban, primarily African American youth, past-year adverse life events and past-year involvement in addictive behaviors were common among adolescents. Though individuals reporting both substance use and gambling were more likely to experience adverse life events across various domains, the increased likelihood of experiencing an adverse event appeared to be largely linked with substance use. Additionally the association between violent events and the co-occurrence of substance use and gambling was stronger among females than males. Such findings prompt future studies to devote more attention to the development of effective programs that teach adaptive coping strategies to adolescent females upon exposure to violence.

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Table 1

Sociodemographic and mental health/behavioral characteristics of the 515 adolescents by sex

Characteristics	Male (n=283) n (%)	Female (n=232) n (%)	p value
Race			
African-American	244 (86.2)	208 (89.7)	.24
Caucasian	39 (13.8)	24 (10.3)	
Intervention (first grade)			
No	91 (32.2)	78 (33.6)	.73
Yes	192 (67.8)	154 (66.4)	
Subsidized lunch (first grade)			
No	82 (29.0)	71 (30.6)	.12
Yes	196 (69.3)	161 (69.4)	
Missing	5 (1.7)	0 (0)	
Single-parent household(first grade)			
No	102 (36.0)	87 (37.5)	.92
Yes	144 (50.9)	114 (49.1)	
Missing	37 (13.1)	31 (13.4)	
Parent highest education(first grade)			
<High school	48 (17.0)	34 (14.7)	.78
High school graduate	197 (69.9)	166 (71.9)	
Missing	37 (13.1)	31 (13.4)	
Past-year neighborhood disadvantage*			
Low	68 (24.0)	47 (20.3)	.30
Medium	137 (48.4)	128 (55.2)	
High	78 (27.6)	57 (24.6)	
Past-year depressive symptoms*			
Low	118 (41.7)	67 (28.9)	<.001
Medium	97 (34.3)	64 (27.6)	
High	68 (24.0)	101 (43.5)	
Past-year anxious symptoms*			
Low	150 (53.0)	87 (37.5)	<.001
Medium	61 (21.6)	50 (21.6)	
High	72 (25.4)	95 (40.9)	
Past-year adverse life event			
No	34 (12.0)	28 (12.1)	.99
Yes	249 (88.0)	204 (87.9)	
Past-year gambling			
No	120 (44.9)	147 (63.4)	<.001
Yes	163 (57.6)	85 (36.6)	
Past-year alcohol use			
No	70 (24.7)	49 (21.1)	.33
Yes	213 (75.3)	183 (78.9)	
Past-year tobacco use			
No	131 (46.3)	119 (51.3)	.26
Yes	152 (53.7)	113 (48.7)	
Past-year illegal drug⁺ use			
No	150 (53.0)	135 (58.2)	.24
Yes	133 (47.0)	97 (41.8)	

* Scale scores tertiled

⁺ Illegal drugs include: Marijuana, crack cocaine, cocaine, heroin, inhalants, or ecstasy

Table 2

Past-year adverse life event and addictive behavior group*

Past-Year Behavior Groups	Non-Substance+ Users and Non-Gamblers		Substance+ Users Only				Gamblers Only				Substance+ Users and Gamblers			
	n	aOR	n	aOR	95%CI	p	n	aOR	95%CI	p	n	aOR	95%CI	p
Any Event														
All	61	1.00	171	1.86	1.04,3.35	.04	25	1.85	0.57,5.90	.31	196	1.77	1.02,3.00	.04
Males	29	1.00	73	1.90	0.76,4.71	.17	18	2.18	0.47,10.13	.32	129	2.78	1.06,7.27	.04
Females	32	1.00	98	1.97	0.78,4.93	.15	7	1.61	0.12,21.26	.72	67	1.08	0.37,3.15	.89
Sex *Event Interaction	--	--	--	1.00	0.26,3.78	.99	--	0.90	0.07,12.27	.93	--	0.49	0.09,2.63	.41
Relationship Event														
All	45	1.00	146	2.08	1.22,3.53	.01	19	1.52	0.84,2.76	.17	167	2.15	1.27,3.64	.01
Males	22	1.00	60	1.76	0.87,3.56	.12	15	2.14	0.83,5.53	.12	106	2.10	0.97,4.51	.06
Females	23	1.00	86	2.87	1.21,6.79	.02	4	0.89	0.30,2.64	.84	61	2.52	1.26,5.04	.01
Sex *Event Interaction	--	--	--	0.80	0.33,1.91	.61	--	0.39	0.06,2.40	.31	--	1.23	0.51,2.95	.65
Violence Event														
All	21	1.00	87	2.10	1.16,3.81	.01	11	1.33	0.57,3.13	.51	135	3.70	2.10,6.54	<.001
Males	13	1.00	16	1.88	0.95,3.73	.07	27	1.18	0.49,2.86	.71	54	4.01	2.00,8.04	<.001
Females	8	1.00	44	2.48	0.99,6.23	.05	3	1.82	0.33,9.94	.49	41	3.86	1.47,10.18	.01
Sex *Event Interaction	--	--	--	2.28	0.94,5.50	.07	--	2.41	0.53,10.96	.26	--	3.62	1.42,9.22	.01
Instability Event														
All	29	1.00	117	2.18	1.30,3.67	.003	10	0.89	0.26,3.08	.85	139	2.34	1.31,4.20	.004
Males	13	1.00	49	2.21	0.93,5.31	.07	8	1.23	0.36,4.23	.74	95	3.63	1.70,7.75	.001
Females	16	1.00	68	2.21	1.00,4.88	.05	2	0.52	0.05,5.31	.58	44	1.60	0.63,4.08	.32
Sex *Event Interaction	--	--	--	1.81	0.82,3.99	.14	--	0.55	0.06,5.08	.60	--	1.40	0.57,3.46	.46

* All models adjusted for race, household structure, subsidized lunch status, parent's highest education, intervention status, neighborhood disadvantage, depressive symptoms, and anxious symptoms

+ Substance includes: Alcohol, tobacco, marijuana, crack cocaine, cocaine, heroin, inhalants, or ecstasy