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Alcohol and Marijuana Use in Middle School: Comparing Solitary and Social-Only Users

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Abstract

Objective—Middle school students with a history of solitary substance use are at elevated risk for substance problems by young adulthood. Understanding how these students differ from social-only users on substance use behaviors and consequences, normative beliefs, social influences and attitudes can inform efforts to reduce solitary use and its related negative consequences.

Method—6th–7th grade students completed an in-school survey. We compared those with a history of solitary vs. social-only alcohol use (*n*=202 and *n*=616, respectively) and marijuana use (*n*=92 and *n*=208, respectively) on a range of substance use-related characteristics.

Results—Any solitary use was reported by 25% of lifetime alcohol users and 31% of lifetime marijuana users. Those with a history of solitary use of either substance were more likely to hold positive expectancies about their use, but also reported more negative consequences during the past year. Solitary users tended to have greater exposure to substance using peers and more difficulty resisting offers to use. Compared to social-only drinkers, those with a history of solitary drinking perceived that more of their peers were alcohol users. Significant group differences were not found on negative outcome expectancies or attempts to cut down on substance use.

Discussion—Solitary use is an important, yet overlooked problem among middle school students who have just begun drinking or using marijuana. Results suggest that positive expectancies, peer influences, resistance self-efficacy, and normative beliefs may be important areas to target in reducing solitary use and the risk it poses for problematic use in young adulthood.

Alcohol and marijuana use during adolescence is often driven by social motives (e.g., 4, 5, 6) and typically occurs in social settings with peers. Yet national data on middle school-aged youth finds that 1 in 10 current drinkers report that their most recent use of alcohol was by themselves (1). Similarly, in a West Coast cohort of 8th grade students, 17% of past year drinkers and 4% of past year marijuana users reported using these substances when alone (2). Initiating substance use at a young age is a well-established risk factor for later problematic use (e.g., 7, 8–12); however, only two studies have compared, among early

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initiates, adolescents who engage in solitary use and those who use exclusively in social settings. The first study found that 8th grade solitary users were more likely than social-only users to report having a substance abuse problem by age 23 (2). The second study did not focus exclusively on middle school students, but compared 12–18 year olds who reported drinking alone with those who only drank with others; by age 25, the initial solitary drinkers had more past year alcohol-use disorder symptoms compared to the initial social-only drinkers (13). Even among adolescents who are already involved in substance use, engaging in solitary use puts them at even higher risk for problematic substance use years later in young adulthood.

There is some evidence that solitary users may be at higher risk than social-only users for later substance abuse because they are more likely to self-medicate to cope with negative affect. Two studies of 8th grade students found that solitary drinking is more common among depressed than non-depressed students with high alcohol expectancies (14), and that both solitary drinkers and marijuana users have stronger expectancies about the positive affect-regulating consequences of using these substances compared to social-only users (2). Solitary drinking among 12–18 year olds has been associated with drinking in situations involving negative emotions (e.g., feeling lonely), but not with situations involving positive emotions (e.g., feeling like celebrating something good that happened) (13). Finally, studies of college students indicate that those who drink heavily while alone are more likely than heavy social drinkers to report greater depressive symptoms, suicidal ideation, loneliness, coping reasons for drinking, and a belief that alcohol will alleviate negative affect (15, 16).

Self-medicating to cope with negative affect may be only part of the reason why early solitary users are more prone to substance problems in young adulthood. For example, middle school students with a history of solitary use tend to spend more time than social-only users going to parties and hanging out with friends (2). This raises the possibility that those with a history of solitary use also have greater exposure to substance-using peers and, due to this exposure, perceive that a greater percentage of students in their grade engage in substance use. It might also be the case that solitary users have more difficulty resisting offers at parties and in other social situations, which would be consistent with their higher rates of use. Greater exposure to substance-using peers, higher perceived prevalence of peer use, and low resistance self-efficacy have each been associated with escalated substance use over time among adolescents (17–20) and will be examined as correlates of solitary use status in the present study. Along the same lines, adolescents with a history of solitary use may have more exposure to substance-using older siblings and important adults, which may both provide easy access to substances (see 21) and normalize their use. There is also some evidence that middle school students with a history of solitary use are less likely than social-only users to believe that substance use has negative consequences, such as making you do things you later regret (2). If these solitary users feel less vulnerable to the potential negative effects of substance use, they may tend to engage in greater use and be less likely to attempt to cut down or stop their use compared to social-only users.

This study extends the very limited literature on solitary use during early adolescence in four important respects. First, it examines history of solitary use among 6th–7th grade students, a younger age group than any previous study, to better understand the prevalence and

correlates of this behavior among younger adolescents and thus better inform early prevention efforts. Second, it compares students with a history of solitary vs. social-only use on substance use-related behaviors and consequences, normative beliefs, social influences and attitudes that have received little or no attention in previous studies of solitary use, but may help explain why solitary users are at heightened risk for substance abuse as they transition from adolescence to emerging adulthood. Third, it examines both alcohol and marijuana use, whereas previous studies have almost exclusively focused on drinking. The inclusion of marijuana in this study is timely given the increasing acceptability and use of marijuana among adolescents (22), as well as the increased media exposure of the drug due to its legalization in some states. Finally, this is the first study to examine solitary use in a primarily non-white adolescent sample, which is important given that results from the few existing studies (e.g., 2, 13) may not generalize to minority youth.

Method

Participants

Participants were part of the CHOICE field trial conducted in the greater Los Angeles area, designed to evaluate this substance use prevention program (23). Students in 6^{th}–8^{th} grades from 16 middle schools were enrolled in the study during Fall 2008 (*N*=8,932) and completed in-school scantron surveys. Solitary substance use was assessed at Wave 2 (Spring 2009). The analytic samples, which focused separately on alcohol and marijuana, include students who at Wave 2: (a) were in 6^{th} or 7^{th} grade; (b) reported lifetime use of the substance; and (c) provided information on their solitary use. We combined 6^{th} and 7^{th} graders to increase the number of solitary users for the analyses. This resulted in *N*=818 for the alcohol analyses and *N*=300 for the marijuana analyses. The analytic sample at Wave 2 is 50% male and 69% Hispanic (13% non-Hispanic white, 6% Asian, 3% African American, and 9% Other), with a mean age of 12.38 years. A Certificate of Confidentiality was obtained, and all study materials and procedures were approved by the individual schools, the school districts, and the institution's review board.

Measures

Socio-demographic characteristics—These included gender, educational attainment of mother and father, race/ethnicity, and family structure. When used as a covariate in analyses, race/ethnicity was dichotomized as 0=*non-Hispanic* vs. 1=*Hispanic*. Nuclear family structure was defined as living with both the biological mother and father.

Alcohol and marijuana use and consequences—Substance use was assessed using well-established measures (e.g., CHKS (24), Project ALERT (8)). Lifetime use was assessed with the item: "During your life, how many times have you used or tried marijuana [one full drink of alcohol]?" Past month use was assessed with the item: "During the past month (30 days), how many days did you use marijuana [at least one full drink of alcohol]?" On average, adolescents reported infrequent past month use regardless of whether they had a history of solitary use (social-only users: 0–1 days for alcohol, 1 day for marijuana; solitary users: 1–2 days for alcohol, 2 days for marijuana). Due to rare responses at higher levels of use, we dichotomized these measures to *any use* (=1) versus *no use*. Solitary use was

assessed with the following item (2): "Do you ever use marijuana [drink] when you're by yourself?" Lifetime users of each substance were classified as a solitary user if they reported using the substance by themselves "sometimes" or "often" and as a social-only user if they reported using it by themselves "never." Adolescents rated the number of times they had tried to cut down or stop using alcohol and marijuana over the past 3 months (1=*never* to 6=*over 10 times*) (25). They also rated how often they experienced negative consequences from drinking (6 items; feeling sick, getting into trouble, doing something they regretted, not studying, fighting, missing school) and marijuana use (4 items; getting into trouble, doing something they regretted, missing school, having trouble concentrating) over the past year (0=*never* to 6=*20 or more times*; 26). Items were averaged for each substance (αs>0.77).

Normative beliefs and social influences—Normative beliefs were assessed by asking adolescents to think about a group of 100 students (the size of about 3 classrooms) in their grade and how many of these students had ever tried marijuana [drank alcohol at least once a month] (24). Responses were recorded on a scale of 1 to 11 where 0 or no students out of 100 was coded as "1", 10 students out of 100 was coded as "2", and so forth. These responses were rescaled to a 0 to 100 scale. Peer influence was assessed in terms of how much they are with kids who are using marijuana [drinking] (0=*never* to 3=*often*). Family influence was assessed by asking adolescents whether they had an older brother or sister who used marijuana [alcohol] sometimes (0=*no*, 1=*yes*), as well as how often the adult who is most important to them used marijuana [alcohol] (0=*never* to 3=*4–7 days per week*). Adult use was dichotomized (0=*never*, 1=*ever)* for each substance.

Attitudes—We assessed positive outcome expectancies (PE), negative outcome expectancies (NE), and resistance self-efficacy (RSE) using scales developed in Project ALERT (8). PE and NE questions asked, for example, whether students think that using [marijuana; alcohol] relaxes you, lets you have more fun or makes you do things you might regret. The three PE items and the three NE items for each substance were rated on a scale from 1=*strongly agree* to 4=*strongly disagree*, and scores were averaged such that higher scores indicated stronger expectancies (αs>0.79) (27). RSE focused on what students would do if they were offered substances in different situations (e.g., all your friends at a party are [using marijuana; alcohol]) and did not want to use. Three items were rated on a scale from 1=*I would definitely use* to 4=*I would definitely not use*, and scores were averaged such that higher scores indicated higher resistance self-efficacy (αs>0.94).

Analytic Approach

First we compared solitary and social-only users of each substance on the variables described above. These analyses controlled for CHOICE group membership (intervention vs. control). Group differences that were significant at $p < 0.10$ were subsequently evaluated using multivariable models (28). The first set of multivariable models adjusted for CHOICE group membership and the socio-demographic characteristics on which differences between solitary and social-only users were found. The second set of multivariable models additionally adjusted for whether the student was a current (past month) user of the substance. Dichotomous and categorical outcomes were modeled using the LOGISTIC

procedure in SAS Software Version 9.2. The GLM procedure was used for continuous outcomes.

Results

Prevalence of Solitary Use History

Any solitary drinking was reported by 24.6% of students who reported lifetime alcohol use, and any solitary marijuana use was reported by 30.7% of students who had ever tried marijuana. Among those who had engaged in solitary drinking, 58.5% had never used marijuana, 18.5% used marijuana in social settings only, and 23% had engaged in solitary marijuana use. For solitary marijuana users, 23.3% had never used alcohol, 25.6% used alcohol in social settings only, and 51.1% had engaged in solitary drinking. McNemar's test of marginal frequencies indicated that solitary marijuana users were more likely to also report solitary drinking than vice versa (S=61.1; $p < 0.001$).

Comparisons of Solitary and Social-Only Users

Table 1 compares those with a history of solitary vs. social-only use on socio-demographic characteristics, substance use behaviors and consequences, normative beliefs, social influences and attitudes. Compared to social-only users, adolescents with a history of solitary alcohol or marijuana use were significantly more likely to have fathers with less education, and solitary marijuana users were significantly less likely than social-only users to be male (38% vs. 50%, respectively). There were no significant group differences on the other socio-demographic variables and thus the first set of multivariable models adjusted for gender and father's education only.

Considering substance use behaviors, adolescents with a history of solitary alcohol or marijuana use were significantly more likely than social-only users to report having used the substance in the past 30 days (alcohol: 59% vs. 28%; marijuana: 62% vs. 45%, respectively), and were also more likely than social-only users to report experiencing negative consequences from their use during the past year. However, solitary and social-only users did not significantly differ on the number of times they tried to cut down or stop their use during the past 3 months.

In examining normative beliefs and social influences, solitary users tended to estimate that more students in their grade were drinkers and marijuana users, although this difference was marginally significant in the case of marijuana ($p < .10$). Solitary alcohol and marijuana users reported being with substance-using kids more frequently than did social-only users. Solitary drinkers were also significantly more likely than social-only drinkers to have an older sibling who drank alcohol (60% vs. 48%, respectively), and solitary users were more likely than social-only users to report that the adult most important to them used alcohol (68% vs. 59%, respectively) and marijuana (30% vs. 18%, respectively), although this difference was marginally significant in the case of alcohol ($p < .10$).

Finally, in terms of substance use-related attitudes, solitary alcohol and marijuana users reported significantly higher positive expectancies for use of these substances, as well as

lower resistance self-efficacy, compared to social-only users. Solitary and social-only users did not significantly differ on their negative expectancies for use.

Even after controlling for socio-demographic characteristics (gender, father's education) associated with solitary use, as well as past month use (see Table 2), adolescents with a history of solitary use reported significantly more negative consequences from use, greater perceived use among their peers (alcohol only), stronger positive expectancies for use, lower resistance self-efficacy, and greater exposure to substance-using peers compared to those who used exclusively in social settings. Associations between solitary drinking and older sibling drinking was reduced to marginal significance after controlling for socio-demographic characteristics, and non-significance after additionally controlling for the adolescent's past month alcohol use. Solitary use was significantly associated with important adult use after controlling for socio-demographic characteristics; however, it was reduced to marginal significance in the case of marijuana, and non-significance in the case of alcohol, after controlling for the adolescent's past month use.

Discussion

Although substance use during middle school is primarily a social activity, 1 in 4 lifetime drinkers and nearly 1 in 3 lifetime marijuana users in our sample had used these substances when alone. Those 6^{th}–7^{th} grade lifetime substance users with a history of solitary use were about twice as likely to be current drinkers, and nearly 1.5 times more likely to be current marijuana users, compared to social-only users. Further, solitary users were already experiencing significantly more negative consequences from their use. This indicates that students with a history of solitary use were more actively engaged in substance use, even if their frequency of use still tended to be at relatively low levels. In comparing these two groups on their current substance use-related behaviors and attitudes, we sought to isolate the effect of having engaged in solitary use as much as possible; as such, these analyses adjusted for group differences in relevant demographic characteristics and whether they were current users. With the few exceptions noted below, the differences we found between solitary and social-only users in 6^{th}–7^{th} grade remained even after accounting for these factors.

An important finding from this study is that students reporting solitary vs. social-only use differed in their positive expectancies for substance use, with solitary users being more likely to believe that alcohol and marijuana would help them to relax, get away from their problems, and have more fun. These types of positive expectancies are typically associated with escalated substance use over time (e.g., 29, 30) and may help explain the higher risk of problematic use among solitary users as they transition to young adulthood. The difference between solitary and social-only users in their positive expectancies is consistent with a few prior studies (e.g., 13, 14). suggesting that solitary drinkers may be prone to negative affect, and that their substance use may be motivated by a need to alleviate or cope with these feelings (i.e., a self-medication explanation; 31). However, this is likely not the entire story. Substance use expectancies are socially-shared and transmitted beliefs (32) which can be developed vicariously through observing others' behavior (33, 34). Solitary users are more likely to be exposed to substance-using older siblings, important adults, and peers; as a

result, they may be more likely to adapt the positive expectancies being endorsed by these significant others. It is worth noting that solitary users were not more likely to discount the potential pitfalls that might happen from using alcohol or marijuana, contrary to findings from a prior study (2). This discrepancy across studies may be due less to measurement differences (given overlap in the sets of items that were used in these two studies) than other factors. For example, differences in the negative expectancies of solitary and social-only users may emerge only at older ages or be more pronounced among white adolescents. These may be potentially interesting directions to explore in future research.

As just mentioned, this study found greater exposure to substance-using older siblings and important adults (e.g., parents) among those with a history of solitary user compared to social-only users. Access to substances in the home is associated with increased substance use over time among adolescents (35), which may put them on an upward trajectory toward problematic use. It may also help explain the circumstances that facilitate engagement in solitary use during 6^{th}–7^{th} grade. Adolescents often gain access to substances through older siblings and parents (21). This access in the home may result in adolescents being less reliant on social gatherings with peers to obtain these substances. For young adolescents who are inclined to engage in solitary use, it may be easier to act on these impulses if they are able to easily access these substances through family members at home. Although it was beyond the scope of this study to ask youth about their motivations for solitary use or the circumstances that facilitated this behavior, better understanding the role of substance-using family members will undoubtedly be informative for prevention efforts aimed at reducing solitary use during middle school.

Finally, our results provide some important insights into the role of peers in the lives of solitary users. Although the stereotype of a solitary user may be of a teen who is socially isolated and lonely, there is some evidence that they spend more time going to parties and dating than social-only users (2). Although these social activities are not inherently risky, it may be the case that solitary users are more likely to be attending unsupervised events where young people are drinking and using drugs. This would help explain why solitary users in the present study reported greater exposure to substance-using peers and tended to have higher estimates of alcohol and marijuana use rates for teens their age. Further, solitary users felt less confident in their ability to resist offers of alcohol or marijuana. Thus, solitary users appear to be faced with a double challenge that must be addressed in efforts to assist these youth: greater exposure to peer use combined with less confidence in their ability to resist offers in social situations where their peers are using. But it may not simply be the case that solitary users are passive recipients of peer influence. There is also growing evidence that adolescents, through their selection of friends, actively shape their social environment in ways that affect their substance use (36–38). In further understanding differences between solitary and social-only users, an important direction for future research is to examine influence *and* selection mechanisms to determine if solitary users are both more likely to be influenced by peer behavior and to seek out friends who are similar to them in terms of substance use (39).

Solitary alcohol and marijuana use is an important, yet overlooked problem facing many middle school students who have initiated substance use. Although limited by its cross-

sectional design and lack of data on the context for solitary use, this study provides insights into the possible reasons why solitary users engage in this behavior and the mechanisms through which it puts them at risk for subsequent substance abuse. An important direction for future research is to better understand the factors that trigger or facilitate solitary use for middle school students. In addition, it is important to understand the extent to which existing universal drug prevention programs are efficacious for this higher-risk group of users. Results from this study suggest that solitary users may need additional assistance in addressing the challenges posed by their stronger positive expectancies for use, lower resistance self-efficacy, and greater exposure to substance-using family members and friends.

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Implications and Contributions

This is the first study to compare 6th–7th grade students with a history of solitary versus social-only use of alcohol and marijuana. Results suggest that programs to reduce solitary use of these substances during middle school should target positive expectancies about use, peer influences, resistance self-efficacy, and normative beliefs.

Table 1

Comparison of Social-only vs. Solitary Users on Demographics and Substance Use Variables

	Alcohol users			Marijuana users		
	Social-only (*n* = 616)	Solitary (*n* = 202)		Social-only (*n* = 208)	Solitary (*n* = 92)	
Variable	**%**	**%**		**%**	**%**	
Male	47.56	51.98		50.00	38.04	*
Race/ethnicity						
White	14.45	9.45		12.50	13.04	
African American	3.73	1.00		4.81	1.09	
Hispanic	65.58	76.12		73.56	76.09	
Asian	6.82	6.97		3.85	2.17	
American Indian	0.97	0.00		0.00	0.00	
Native Hawaiian	0.81	0.50		0.48	0.00	
Multi-ethnic	7.63	5.97		4.82	7.61	
Nuclear family	48.03	43.07		39.42	32.97	
Father's education			*			*
< high school	27.49	41.32		35.12	46.48	
High school graduate	26.12	26.35		29.76	19.72	
> high school	46.40	32.34		35.12	33.80	
Mother's education						
< high school	25.23	30.29		22.35	35.90	
High school graduate	26.87	28.00		30.17	30.77	
> high school	47.90	41.72		47.49	33.34	
Past month use	27.82	59.20	‡	45.32	61.54	†
Older sibling use	47.84	59.48	*	46.56	50.98	
Adult use	59.28	67.47	#	17.49	29.87	*
	Mean (SE)	Mean (SE)		Mean (SE)	Mean (SE)	
Try to cut down/stop	2.28 (0.12)	2.38 (0.14)		1.32 (0.16)	1.57 (0.22)	
Negative consequences	0.17 (0.03)	0.52 (0.05)	‡	0.30 (0.07)	0.61 (0.10)	†
Normative beliefs	19.94 (1.43)	30.18 (2.18)	‡	27.23 (2.53)	34.69 (3.63)	#

	Alcohol users			Marijuana users		
	Social-only (*n* = 616)	Solitary (*n* = 202)		Social-only (*n* = 208)	Solitary (*n* = 92)	
Variable	**%**	**%**		**%**	**%**	
With kids that use	0.96 (0.06)	1.55 (0.09)	‡	1.48 (0.10)	2.10 (0.14)	‡
Positive expectancies	2.00 (0.05)	2.62 (0.07)	‡	2.51 (0.08)	3.08 (0.12)	‡
Negative expectancies	2.85 (0.05)	2.74 (0.08)		2.44 (0.09)	2.62 (0.12)	
Resistance self-efficacy	2.98 (0.05)	2.13 (0.07)	‡	2.73 (0.08)	1.75 (0.12)	‡

Note. Means and percentages were adjusted for CHOICE group membership (intervention vs. control). Solitary and social-only drinkers were compared on alcohol-related behaviors, norms and attitudes; solitary and social-only marijuana users were compared on marijuana-related behaviors, norms and attitudes.

$^{\#}p < .10$.

$^{*}p < .05$.

$^{\dagger}p < .01$.

$^{\ddagger}p < .001$.

Table 2

Comparison of Social-Only vs. Solitary Users on Substance Use Variables, Adjusting for Socio-demographic Characteristics (Model A) and Past Month Use (Model B)

	Alcohol				Marijuana			
Variable	**OR**	***95% CI***			**OR**	***95% CI***		
Older sibling use								
Model A	1.61	1.00	2.62	#				
Model B	1.02	0.60	1.72					
Adult use								
Model A	1.57	1.04	2.39	*	2.26	1.05	4.86	*
Model B	1.25	0.81	1.92		2.07	0.98	4.36	#
	beta	*95% CI*			beta	*95% CI*		
Normative beliefs								
Model A	12.55	7.68	17.42	‡	2.37	−6.07	10.81	
Model B	2.81	0.67	4.94	†	2.35	−0.51	5.21	
Negative consequences								
Model A	0.35	0.22	0.48	‡	0.48	0.21	0.76	‡
Model B	0.24	0.12	0.36	‡	0.37	0.15	0.60	†
With kids that use								
Model A	0.17	0.11	0.23	‡	0.20	0.06	0.33	†
Model B	0.03	0.01	0.05	‡	0.03	0.01	0.05	†
Positive expectancies								
Model A	0.54	0.37	0.71	‡	0.65	0.38	0.91	‡
Model B	0.35	0.24	0.46	‡	0.35	0.20	0.51	‡
Resistance self-efficacy								
Model A	−0.79	−0.95	−0.63	‡	−0.87	−1.14	−0.67	‡
Model B	−0.40	−0.49	−0.31	‡	−0.37	−0.47	−0.26	‡

Note. Model A adjusts for CHOICE group membership (intervention vs. control) and demographics (gender, father's education), whereas Model B additionally adjusts for any past month use. Odds ratios are reported for older sibling and important adult use; otherwise, unstandardized regression coefficients are reported. Multivariable analyses were conducted only if bivariate associations were significant at $p < .10$.

# $p < .10$.

* $p < .05$.

† $p < .01$.

‡ $p < .001$.