Differentiating Adolescent Suicide Attempters from Ideators: Examining the Interaction between Depression Severity and Alcohol Use

Kimberly H. McManama O'Brien, LICSW, PhD, Sara J. Becker, PhD, Anthony Spirito, PhD, Valerie Simon, PhD, and Mitchell J. Prinstein, PhD

Depressed mood, frequency of alcohol use, and their combination were examined to see if they differentiated nonsuicidal adolescents from those with suicidal ideation and adolescents with suicidal ideation from those who have made a suicide attempt. Hierarchical logistic regressions indicated that frequency of alcohol use did not differentiate nonsuicidal adolescents from those with current suicidal ideation, but severity of depressed mood did so. In contrast, alcohol use was a significant differentiating factor between adolescents who had attempted suicide compared to those with suicidal ideation only, with severity of depressed mood not being significant. However, there was also a significant interaction effect such that for adolescents with suicidal ideation and low levels of depression, increased frequency of alcohol use was associated with increased odds of a suicide attempt. These findings suggest that alcohol use may hasten the transition from suicidal ideation to suicide attempt in adolescents with low levels of depressed mood.

There is a large literature on the factors that increase risk for suicidal ideation among adolescents. Depressed mood has consistently been found to be a primary factor and substance use, especially alcohol, has often been identified as increasing risk for suicidal ideation (Evans, Hawton, & Rodham, 2004; Fuller-Thomson, Hamelin,

Kimberly H. McManama O'Brien, Sara J. Becker, and Anthony Spirito, Department of Psychiatry and Human Behavior, Center for Alcohol and Addiction Studies, Alpert Medical School of Brown University, Providence, RI, USA; Valerie Simon, Merrill Palmer Institute, Wayne State University, Detroit, MI, USA; Mitchell J. Prinstein, University of North Carolina, Chapel Hill, NC, USA.

Address correspondence to Kimberly H. McManama O'Brien, Center for Alcohol and Addiction Studies, Department of Psychiatry and Human Behavior, Alpert Medical School of Brown University, Providence, RI 02903; E-mail: kimberly_obrien@brown.edu

& Granger, 2013). Fewer studies have examined factors that differentiate adolescents with suicidal ideation from those who attempt suicide, and the studies that have examined these differences have found few, and sometimes conflicting, distinguishing factors. Factors that have been associated with attempts in suicidal adolescents include hopelessness (Negron, Piacentini, Graae, Davies, & Shaffer, 1997), elevations in suicidal ideation (Prinstein et al., 2008), higher levels of affect dysregulation, and greater numbers of self-injurious behaviors (Zlotnick, Donaldson, Spirito, & Pearlstein, 1997).

One factor that has been investigated more widely is substance abuse. Gould et al. (1998) found substance abuse disorders to independently differentiate adolescent suicide attempters ($n = 42$) from ideators ($n = 67$). Miranda et al. (2008) examined differences in psychiatric diagnosis in

adolescents with multiple attempts (n = 35), a single attempt (n = 45), and ideation only (n = 148). They found multiple attempters to have higher rates of any psychiatric disorder than ideators, with multiple attempters being five times more likely than ideators to have a substance abuse diagnosis. However, the study found no significant diagnostic differences between ideators and single attempters. D'Eramo, Prinstein, Freeman, Grapentine, and Spirito (2004) also found significantly greater percentages of substance use disorders in multiple attempters (57%) than those with ideation only (16%). Unlike Miranda et al., D'Eramo et al. also found that single attempters had significantly higher rates of substance use disorders than ideators (21% vs. 16%).

Alcohol use seems to be more consistently associated with suicidal behavior in adolescents than more general substance use. Suicidality and alcohol use are functionally interrelated (Bagge & Sher, 2008), with the relationship strengthening as the severity of each problem increases (Esposito & Spirito, 2004; Esposito-Smythers et al., 2012; Goldston, 2004). Alcohol use causes disinhibition, which can both facilitate suicidal ideation and increase the likelihood of impulsively acting on suicidal thoughts (Sher, 2006). One study in support of this theory was conducted by Schilling, Aseltine, Glanovsky, James, and Jacobs (2009), who found heavy episodic drinking to be associated with increased risk of suicide attempts for adolescents who endorsed suicidal ideation. Another function of alcohol use may be to serve as a means of self-medication for adolescents with depressive symptoms and suicidal thoughts (Kuntsche, Knibbe, Gmel, & Engels, 2005). However, for many suicidal adolescents, using alcohol to self-medicate may generate increased negative affectivity which in turn may trigger a suicide attempt. Therefore, when examining the role of alcohol use in predicting suicide attempts, it is important to investigate this relationship with respect to the presence of depressive and suicidal symptoms. In one study, after controlling for the presence of both depression and suicidal ideation, adolescents were found to be nine times more likely to attempt suicide if they had an alcohol use disorder (Wu et al., 2004).

Although a recent review demonstrates support for a synergistic relationship between suicidality, depression, and alcohol use in adolescents (Galaif, Sussman, Newcomb, & Locke, 2007), additional research is needed to further our understanding of the specific mechanisms underlying this association. The primary goal of the current study was to investigate if depression severity and frequency of alcohol use were differentially related to the risk of suicide attempts among adolescents with suicidal ideation. As a secondary question, we also explored whether depression severity and frequency of alcohol use differentiated adolescents with suicidal ideation from nonsuicidal adolescents. It was hypothesized that frequency of alcohol use, but not depression severity, would increase the odds of a suicide attempt relative to suicidal ideation, but would not increase the odds of ideation relative to nonideation. Additionally, this study examined whether or not there was an interaction effect between depression severity and frequency of alcohol use in differentiating suicidal ideators from attempters as well as nonsuicidal adolescents from ideators.

METHODS

Participants and Procedures

Participants in the current analysis participated in a longitudinal study of young adolescents (age 12–15 years) who were hospitalized in an inpatient psychiatric facility in the northeastern United States. The recruitment methods have been described in prior publications (Becker et al., 2012; Nargiso et al., 2012; Prinstein et al., 2008). During the recruitment period for this study, the modal length of stay on the inpatient unit was 5 to 7 days. To qualify for the study, adolescents had to exhibit sufficient cognitive functioning to complete a structured interview

(e.g., no active psychosis or mental retardation) and remain on the inpatient unit long enough to complete a comprehensive evaluation, typically within 2 to 4 days of admission. Consistent with institutional review board approved procedures, adolescents also needed to have a parent or legal guardian to provide written consent. Participation involved completion of a comprehensive assessment battery at baseline and up to five follow-up assessments.

The overall study included 143 young adolescents. Administration of the alcohol measure did not commence until recruitment was underway, and consequently, the first 35 adolescents did not have baseline data on this measure. The current study therefore included 108 adolescents with complete baseline data on the alcohol use, depression, and suicidality measures.

Measures

The current study used adolescent self-report measures of depression severity, frequency of alcohol use, and suicidality. This analysis focuses on data from the baseline assessment.

Depression Severity. Level of depression severity was measured using the Child Depression Inventory (CDI; Kovacs, 1992). The CDI includes 27 items that assess cognitive and behavioral symptoms of depression, consistent with diagnostic criteria contained in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM–IV-TR*; American Psychiatric Association, 2000). For each item, the adolescent was asked to select the statement that best described his or her mood over the past 2 weeks. A total CDI score was calculated across all the individual items, with the exception of the suicidal ideation item (item 9) to minimize overlap between constructs. Higher CDI scores indicated higher levels of depression severity. In the sample of 108 adolescents, 3% of the youth ($n = 3$) had missing item-level data on the CDI; two youths were missing one item and one was missing three items. Mean substitution (using each participant's mean CDI score) was used for these missing items, an approach that has been shown to be comparable to other imputation methods when missing data levels are low (Parent, 2012). Adequate reliability has been established for the CDI across gender and age groups (alphas .83–.89; Smucker, Craighead, Craighead, & Green, 1986). Cronbach's alpha in this sample was .86.

Frequency of Alcohol Use. Alcohol use frequency was assessed via the Health Risk Behaviors Questionnaire, a self-report measure based on the Youth Risk Behavior Surveillance System (YBRSS; Kann et al., 2000). A single item was used to assess the number of days the adolescent had used any alcohol over the past 30 days. Responses to this item were scored on a 6-point Likert scale, with options ranging from 0 (*never used*) to 5 (*used 10 or more of the past 30 days*). The item did not take into account the adolescent's number of drinks per drinking occasion or level of intoxication. In the 1999 YBRS survey, a categorical version of this item indicating any past 30-day use demonstrated substantial test–retest reliability (kappa = .71) in a sample of 4,619 adolescents across 20 states (Brener et al., 2002).

Suicidal Ideation. The suicide item (item 9) from the CDI (Kovacs, 1992) was used to identify adolescents with clinically significant suicidal ideation (SI). Similar to other items on the CDI, item 9 has three possible responses indicating symptom severity over the past 2 weeks. The first response (0 = *I do not think about killing myself*) indicates an absence of SI, whereas the second (1 = *I think about killing myself but I wouldn't do it*) and third (2 = *I want to kill myself*) represent SI and suicidal intent, respectively. For the purpose of the current analysis, adolescents who responded 1 or 2 to this item were identified as suicide ideators.

Recent Suicide Attempt. Adolescents admitted to the hospital for a suicide attempt per chart review were approached about participating in the study. They were then asked whether they "actually attempted suicide" (Prinstein et al., 2008). Any intentional,

nonfatal self-injury, regardless of medical lethality, was considered a suicide attempt if intent to die was indicated (O'Carroll et al., 1996). Those adolescents who were identified as having an suicide attempt (SA) as the precipitant for their inpatient treatment were coded as recent suicide attempters.

Lifetime Suicide Attempt. In addition to assessing recent SA, adolescents were asked about their lifetime history of SA (Prinstein et al., 2008). Those adolescents who responded affirmatively were coded as lifetime suicide attempters.

Analysis Plan

Prior to testing the study hypotheses, three sets of preliminary analyses were conducted to describe the study sample. First, we divided the sample into three groups based on their degree of current suicidality: (1) no current SI (nonideators), (2) current SI (current ideators), and (3) recent SA (recent attempters). Within each of these three groups, we then compared those with and without a lifetime history of an SA to determine how to treat the groups in the analysis. By definition, recent attempters all had a lifetime history of SA. Therefore, we conducted two sets of within-group comparisons: (1) nonideators with a lifetime history of SA (nonideators with history) versus nonideators without a lifetime history (pure nonideators), and (2) current ideators with a lifetime history of SA (current ideators with history) versus current ideators without a lifetime history (pure ideators).

Next, we examined associations between the study predictors and standard demographic variables (i.e., age, gender, ethnicity) to determine which demographic variables needed to be retained in the model. Tests of the associations varied based on whether the variables were continuous or categorical. Associations between two continuous variables, two categorical variables, and one continuous and one categorical variable were tested using Pearson's correlation coefficients, chi-square analyses, and point-biserial correlation coefficients,

respectively. We retained any demographic variables that had associations with study predictors at the $p < .05$ level.

Finally, we made some preliminary comparisons of the three suicide groups in line with our study hypotheses. We first compared nonideators (group 1) to youth with current SI (group 2) to determine factors associated with current SI. We then compared adolescents with current SI (group 2) to those with a recent SA (group 3) to determine factors associated with a recent SA.

Two hierarchical logistic regressions were then conducted as the main modeling procedures. The first logistic regression was conducted as a source of comparison exploring the progression from no suicidal ideation to SI. The second logistic regression included only those adolescents with recent suicidality (groups 2 and 3; $n = 73$) and had a recent SA as the dependent variable. The second logistic regression addressed the primary goal of this study by differentiating adolescents with current SI to adolescents with a recent SA. In both regression models, variables were entered in three steps. Demographic variables that demonstrated associations with the study variables were entered in Step 1. The main effects of depression severity and alcohol frequency were then entered in Step 2. In the final step (Step 3), the interaction term (e.g., depression*alcohol) was entered to determine whether there was a significant interaction effect after controlling for main effects. The main effect variables were centered before entering them in the model to reduce multicollinearity and facilitate interpretation of the regression coefficients.

Significant interactions in Step 3 were probed following the recommendations of Aiken and West (1991). Specifically, the effect of frequency of alcohol use on the dependent variable was examined at two levels of depression severity: 1 standard deviation (*SD*) below the mean and 1 *SD* above the mean. Because logistic regression predicts the likelihood of an event, the type of simple regression lines examined in standard regression analyses was not appropriate.

Predicted probability functions, depicting the probability of a suicide outcome at various levels of alcohol use frequency and depression severity, were therefore graphed to assist with the interpretation of significant findings. For presentation purposes, the centered main effect variables used in the analyses were transformed back to their original values so that the axis values in the graph would correspond to meaningful response options.

RESULTS

Sample Characteristics

Demographic and clinical characteristics of the final sample of 108 adolescents are depicted in Table 1. Similar to the 143 adolescents in the parent study (Prinstein et al.,

2008), the current sample was predominantly female (68%) and Caucasian (78%), with some representation of Hispanic American (4%) and mixed or other ethnicity (16%) groups. Average age was 13.5 years (SD = 0.74). A total of 28% of the sample reported consuming alcohol within the month prior to admission. Of those who had consumed alcohol, two-thirds (19% of the total sample) reported drinking 1 to 5 days during the past 30 days. The mean CDI score (without the suicide item) was 19.95, which is consistent with the cutoff score used to indicate clinically significant depression.

Preliminary Analyses: Within-Group Comparisons

Based on their responses to the suicide screening items, 35 adolescents were

TABLE 1
Participant Characteristics at Baseline by Suicide Group

	Nonideators		Current Ideators		Recent Attempters	Total
Variable (*M*, *SD*) or (*N*, %)	Pure (*n* = 28)	SA history (*n* = 7)	Pure (*n* = 26)	SA history (*n* = 33)	SA history (*n* = 14)	Full sample (*N* = 108)
Gender						
Female	16 (57%)	4 (57%)	17 (65%)	25 (76%)	11 (79%)	73 (68%)
Male	12 (43%)	3 (43%)	9 (35%)	8 (24%)	3 (21%)	35 (32%)
Age	13.5 (.74)	13.6 (.98)	13.7 (.75)	13.5 (.71)	13.7 (.73)	13.6 (.74)
Ethnicity						
Caucasian	21 (75%)	6 (86%)	21 (81%)	24 (73%)	13 (93%)	85 (79%)
Minority	7 (25%)	1 (14%)	5 (19%)	9 (27%)	1 (7%)	23 (21%)
Depression severity	13.5 (7.83)[a]	27.0 (10.69)[a]	20.4 (7.29)	23.1 (9.56)	21.1 (8.80)	19.95 (9.41)
Alcohol frequency						
Never used	19 (68%)	4 (57%)	12 (46%)	16 (48%)	4 (29%)	55 (51%)
Used, 0 of past 30	5 (18%)	1 (14%)	7 (27%)	7 (21%)	3 (21%)	23 (21%)
Used, 1–2 of past 30	2 (7%)	1 (14%)	4 (15%)	5 (15%)	3 (21%)	15 (14%)
Used, 3–5 of past 30	1 (4%)	1 (14%)	1 (4%)	2 (6%)	0 (0%)	5 (5%)
Used, 6–10 of past 30	1 (4%)	0 (0%)	2 (8%)	2 (6%)	1 (7%)	6 (6%)
Used, 10+ of past 30	0 (0%)	0 (0%)	0 (0%)	1 (3%)	3 (21%)	4 (4%)

Note. Percentages may not sum to 100 due to rounding.
[a]Significant within-group comparison at *p* < .05. None of the other within-group comparisons were significant.

identified as nonideators, 59 were identified as current ideators, and 14 were identified as recent suicide attempters. Of the 35 nonideators, seven had a history of a lifetime SA. Mean comparisons of the seven nonideators with a lifetime history of SA and the 28 pure nonideators did not reveal any differences on alcohol use or any of the demographic variables. However, the seven nonideators with a lifetime history of SA had significantly higher levels of depression than the pure nonideators, $M = 27.0$ vs. 13.5, $t(33) = -3.79$, $p < 05$, suggesting meaningful differences between the subgroups. Thus, in the final sample, we excluded the seven nonideators with a lifetime history and focused on the pure nonideators.

Similar comparisons were made within the current ideator group (group 2). Of the 59 current ideators, 33 had a lifetime history of SA. Mean comparisons of the 33 current ideators with a lifetime history of SA and the 26 pure current ideators did not reveal differences on any of the study variables. To maximize power within the small sample, we therefore combined current ideators with a lifetime history of SA and pure current ideators in the analysis.

Preliminary Analyses: Associations among Variables

Tests of associations among the variables were then conducted to determine which demographic variables should be retained in the models. These analyses excluded the seven nonideators with a lifetime history of SA ($n = 101$). Because the sample was predominantly Caucasian, race was coded categorically as Caucasian versus non-Caucasian. None of the demographic variables were associated with membership in the three suicide groups. However, two associations were found between the demographic variables and the putative predictors. Point-biserial correlations indicated that gender and ethnicity were related to depression severity, such that females ($r = .24$, $p < .05$) and Caucasians ($r = .28$,

$p < .01$) had higher levels of depression. Meanwhile, age was not associated with any of the variables. Thus, only gender and ethnicity were entered in Step 1 of the hierarchical regressions.

Preliminary Analyses: Across-Group Comparisons

Two sets of group comparisons were then conducted to begin to address the study hypotheses. The first set of comparisons of the 59 adolescents with current SI (group 2) versus the 28 pure nonideators (group 1) did not reveal any significant differences in demographic variables (gender, age, ethnicity) or in frequency of alcohol use. The only significant difference between the groups was in depression severity: relative to the pure nonideators, adolescents with current SI had significantly higher CDI scores, $M = 21.75$ vs. 13.50, $t(99) = 4.41$, $p < .001$.

The second set of comparisons of the 59 adolescents with current SI (group 2) versus the 14 with a recent SA also revealed only one significant difference. Relative to those with current SI, those with a recent SA had significantly higher frequency of alcohol use, $M = 2.00$ vs. 1.05, $t(71) = 2.19$, $p < 05$.

Hierarchical Logistic Regression: Odds of Current Suicidal Ideation

Results of both logistic regressions are presented in Table 2. The first hierarchical logistic regression tested factors associated with increased risk of current SI. The sample included all of the youth in the current SI group (group 2, $n = 59$) and all of the youth in the nonsuicidal group (group 1), with the exception of the seven nonideators with a lifetime SA ($n = 28$). Specifically, the logistic regression examined whether demographic variables (e.g., gender, age, ethnicity), depression severity, frequency of alcohol use, or the depression*alcohol interaction increased the risk of progression from nonsuicidality to current SI. The odds ratios indicate the odds of an adolescent with no SI belonging to the SI group.

TABLE 2

Hierarchical Logistic Regression Analyses Predicting Current Suicidal Ideation and Recent Suicide Attempts

Variables	Predictors of Nonideation vs. Current Ideation ($n = 87$)				Predictors of Current Ideation vs. Recent Attempts ($n = 73$)			
	B	SE	OR	95%CI for OR	*B*	SE	OR	95%CI for OR
Step 1								
Female	−.63	.48	.53	.21–1.37	−.42	.72	.66	.16–2.70
Caucasian	−.15	.54	.86	.30–2.48	−1.36	1.09	.26	.03–2.19
Step 2								
Depression	.12**	.04	1.13	1.05–1.21	−.05	.04	.96	.88–1.04
Alcohol	.28	.25	1.33	.81–2.17	.42*	.20	1.52	1.03–2.24
Step 3								
Dep * alc	.05	.04	1.05	.96–1.14	−.13*	.06	.88	.78–.98

Note. SE = standard error; OR = odds ratio; CI = confidence interval; Depression = depressive symptoms measured by Children's Depression Inventory; Alcohol = alcohol frequency as measured by Health Risk Behaviors Questionnaire; Dep * alc = interaction between depressive symptoms and alcohol frequency.
$*p < .05$, $**p < .01$.

In Step 1, neither of the demographic variables was significant. In Step 2, depression was associated with significantly increased risk of current SI ($B = .12$, $p < .01$, OR = 1.13, 95%CI: 1.05–1.20). Frequency of alcohol use was not associated with increased risk of current SI, consistent with our hypotheses. Finally, the depression*alcohol interaction in Step 3 was not significantly associated with the odds of current SI.

Hierarchical Logistic Regression: Odds of a Recent Suicide Attempt

The second hierarchical logistic regression included those with current suicidal ideation (group 2, $n = 59$) and those with a recent SA (group 3, $n = 14$). Specifically, the logistic regression examined whether demographic variables (gender, age, ethnicity), depression severity, frequency of alcohol use, or the depression*alcohol interaction increased the risk of differentiated adolescents with current SI from those with a recent SA. The odds ratios indicate the odds of an adolescent with current SI belonging to the recent SA group.

In Step 1, neither gender nor ethnicity was significant. In Step 2, there was a significant effect for frequency of alcohol use ($B = 0.42$, $p < .05$, OR = 1.52, 95% CI: 1.03–2.24), such that increased frequency of alcohol use was associated with increased odds of a recent SA. Depression severity was not significantly associated with odds of a recent SA ($B = −0.05$, $p > .05$, OR = 0.96, 95%CI: 0.88–1.04), supporting the study hypothesis. Finally, in Step 3, the depression*alcohol interaction was significantly associated with the odds of a recent SA ($B = −0.13$, $p < .05$, OR = 0.88, 95%CI: 0.79–0.98).

Analysis of the interaction indicated that the effects of frequency of alcohol use on the likelihood of a recent SA varied at different levels of depression severity. Among those adolescents with high levels of depression (1 *SD* above the mean), increased frequency of alcohol use was associated with decreased odds of a recent SA, although this relationship was not statistically significant ($B = −0.78$, $p > .05$, OR = 0.46, 95% CI: 0.15–1.43). By contrast, among those adolescents with low levels of depression (1 *SD* below the mean), increased frequency of alcohol use was

associated with significantly increased odds of a recent SA ($B = 1.48$, $p < .01$, OR = 4.41, 95%CI: 1.59–12.26). The interaction effect of frequency of alcohol use and depression severity on the probability of a recent SA is depicted in Figure 1.

DISCUSSION

The first notable finding of this study was that the frequency of alcohol use appears to be higher in this sample of suicidal adolescents than the general population. Of the sample, a total of 33% reported consuming alcohol within the month prior to admission. This rate is significantly higher than the 13% of community eighth-grade adolescents (the grade level which matches most closely to the mean age of the sample; 13.62) who reported past month drinking in the most recent data on alcohol use from Monitoring the Future (Johnston, O'Malley, Bachman, & Schulenberg, 2011).

The findings of the current study demonstrate that frequency of alcohol use did not differentiate nonsuicidal adolescents from those with current suicidal ideation,

but severity of depressed mood did so. This finding was consistent with prior research indicating that depression severity is among the strongest predictors of suicidal ideation. In contrast, alcohol was a significant differentiating factor between adolescents who had attempted suicide compared to those with suicidal ideation only. Importantly, alcohol use was a risk factor above and beyond depression severity, which had no significant relationship with the likelihood of a suicide attempt relative to ideation. Combined, these direct effects suggest that there are distinct pathways from nonideation to suicidal ideation and then from suicidal ideation to an attempt. Of particular clinical interest, there may be a unique mechanism by which alcohol use hastens the transition from suicidal ideation to an attempt which does not exist from nonideation to ideation.

It is possible that alcohol use increases the risk of a suicide attempt via both proximal and distal effects (Bagge & Sher, 2008). With respect to proximal effects, alcohol use may contribute to increased distress, depression, anxiety, aggressiveness, or impulsivity, which may heighten the risk for an attempt (Hufford, 2001). Additionally, heavy alcohol
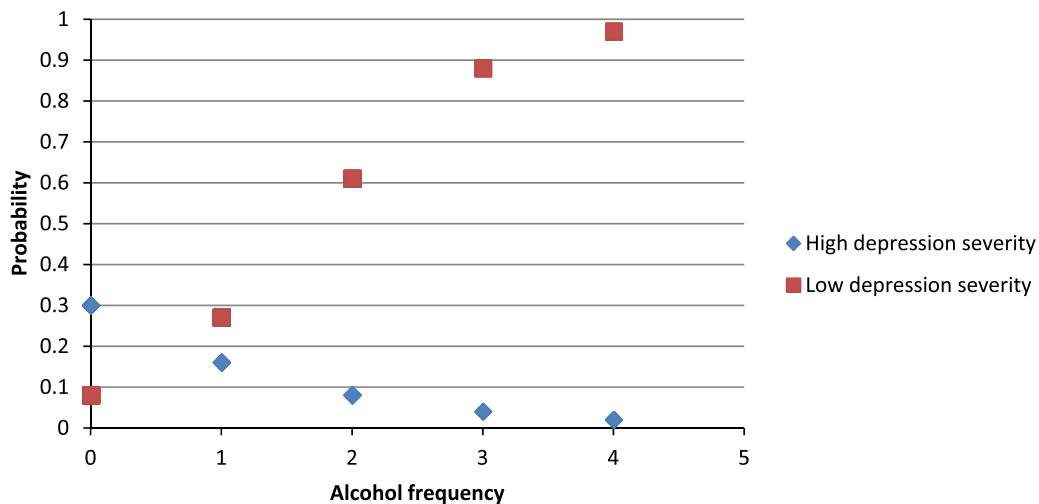

Figure 1. Interactive Effect of Depression Severity and Alcohol Frequency on Probability of a Suicide Attempt among Current Ideators (*n* = 73). *Note*: Alcohol frequency was scored on a 6-point scale ranging from 0 (*never used*) to 5 (*used 10 + of the past 30 days*). Depression severity was scored using the Children's Depression Inventory. High depression severity = 1 *SD* above the mean, low depression severity = score 1 *SD* below the mean.

use may have disinhibiting effects which in turn increase the likelihood that an adolescent will follow through with a suicide plan. Distal effects of alcohol use on suicidal behavior may provide another explanation of the relationship. For instance, alcohol use can exacerbate interpersonal problems that may increase the risk of a suicide attempt or serve as a precipitating event to an attempt. It is also possible that alcohol use and suicide attempts are spuriously related because of a third variable which serves as an antecedent to both behaviors (Bagge & Sher, 2008). For instance, adolescents with poor distress tolerance may be more likely to resort to alcohol use and suicidal behavior to cope with their problems than adolescents with adequate distress tolerance.

Findings from this study also revealed a significant interaction effect, such that for adolescents with low levels of depression severity, increased frequency of alcohol use was associated with significantly increased odds of a suicide attempt. Frequency of alcohol use did not have this effect on the odds of a suicide attempt for adolescents with high levels of depression. Why is alcohol use a greater risk factor for a suicide attempt for adolescents with lower levels of depression? On the one hand, this finding may be indicative of a ceiling effect such that adolescents with high levels of depression already experience elevated risk for a suicide attempt such that an increase in alcohol use frequency does not confer additional risk. Or adolescents with higher levels of depressed mood may use drinking as a coping mechanism for their depression (Galaif et al., 2007; Sher & Zalsman, 2005), so it dampens suicidal ideation and behavior. On the other hand, because studies (e.g., Brown, Overholser, Spirito, & Fritz, 1991; Conner, 2004) have shown that impulsive adolescent suicide attempters are less depressed than their nonimpulsive counterparts, it is possible that adolescents with low levels of depression are more susceptible to the disinhibiting effects of alcohol use which in turn puts them at higher risk for an impulsive suicide attempt.

We did not code the nature of the suicide attempts (i.e., impulsive versus planned) so cannot directly examine this suggestion.

Of additional consideration, one recent study found minimal differences in impulsivity between suicide attempters and ideators (Klonsky & May, 2010) and another study demonstrated that attempters who did not have a plan were actually less impulsive than attempters who did report having a plan prior to the attempt (Witte et al., 2008). Thus, it is unclear how much of a role impulsivity may play in adolescent suicide attempts. Perhaps alcohol use has an influence on this relationship in that alcohol may inhibit the cognitive capacity to utilize effective coping strategies to deal with suicidal thoughts, contributing to an elevated risk of attempt (Hufford, 2001; Sher, 2006), although it is unclear why this would be the case in adolescents with low levels of depressed mood versus higher levels of depressed mood. A final potential explanation for the interaction effect in this study may be that there are other more pertinent risk factors for suicide attempts among adolescents with low levels of depression, such as family history of suicide, that were not measured in this study.

There are some limitations in this study that affect our interpretation of the results. Alcohol use was measured via self-report and only days of use was assessed. Future studies should measure a broader topography of use, including frequency of heavy episodic drinking, and specific to this population, whether or not alcohol was used either before or during their suicide attempt. Additionally, the small sample size with respect to those who attempted suicide may have limited our power to detect findings in this study. Finally, because the findings apply only to younger adolescents who required psychiatric hospitalization, we do not know whether the depressed mood and alcohol use interaction effect would be found in other samples.

Suicidality, depression, and alcohol use noticeably increase during adolescence, making interventions in this developmental

period especially important (Daniel & Goldston, 2009; Galaif et al., 2007). Given the significant role alcohol use plays in suicidality, greater attention to alcohol use interventions with suicidal adolescents is indicated. Future research should work to disentangle the complex relationship among depression, alcohol use, and suicidality in adolescents to inform intervention development for this population. Such studies would potentially benefit from implement-ing ecological momentary assessment to accurately assess the temporal relationship among alcohol use, depressed mood, and suicidality. In addition, understanding spe-cific characteristics, for example impulsivity and aggression, that might underlie suicidal behavior in the context of alcohol use would be useful in developing more pre-scriptive interventions for their co-occur-rence and in turn lower the risk for suicide attempts in adolescents.

REFERENCES

AIKEN, L. S., & WEST, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park: Sage.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

BAGGE, C., & SHER, K. J. (2008). Adolescent alcohol involvement and suicide attempts: Toward the development of a conceptual framework. *Clinical Psychology Review, 28*, 1283–1296.

BECKER, S. J., NARGISO, J., WOLFF, J., UHL, K., SIMON, V., SPIRITO, A., ET AL. (2012). Temporal relationship between substance use and delinquent behavior among psychiatrically hospitalized early adolescents. *Journal of Substance Abuse Treatment, 42*, 251–259.

BRENER, N. D., KANN, L., MCMANUS, T., KINCHEN, S. A., SUNDBERG, E. C., & ROSS, J. G. (2002). Reliability of the 1999 youth risk behavior survey questionnaire. *Journal of Adolescent Health, 31*, 336–342.

BROWN, L., OVERHOLSER, J., SPIRITO, A., & FRITZ, G. (1991). The correlates of planning in adolescent suicide attempts. *Journal of the American Academy of Child and Adolescent Psychiatry, 30*, 95–99.

CONNER, K. R. (2004). A call for research on planned vs. unplanned suicidal behavior. *Suicide and Life-Threatening Behavior, 34*, 89–98.

DANIEL, S. S., & GOLDSTON, D. B. (2009). Interventions for suicidal youth: A review of the literature and developmental considerations. *Suicide and Life-Threatening Behavior, 39*, 252–268.

D'ERAMO, K. S., PRINSTEIN, M. J., FREEMAN, J., GRAPENTINE, W. L., & SPIRITO, A. (2004). Psychiatric diagnosis and comorbidity in relation to suicidal behavior among psychiatrically hospitalized adolescents. *Child Psychiatry and Human Development, 35*, 21–35.

ESPOSITO, C., & SPIRITO, A. (2004). Adolescent substance use and suicidal behavior: A review with implications for treatment research. *Alcoholism: Clinical and Experimental Research, 28*, 775–785.

ESPOSITO-SMYTHERS, C., WALSH, A., SPIRITO, A., RIZZO, C., GOLDSTON, D., & KAMINER, Y. (2012). Working with the suicidal client who also abuses substances. *Cognitive and Behavioral Practice, 19*, 244–255.

EVANS, E., HAWTON, K., & RODHAM, K. (2004). Factors associated with suicidal phenomena in adolescents: A systematic review of population-based studies. *Clinical Psychology Review, 24*, 957–979.

FULLER-THOMSON, E., HAMELIN, G., & GRANGER, S. (2013). Suicidal ideation in a population-based sample of adolescents: Implications for family medicine practice. *ISRN Family Medicine, 13*, 11 pp. Retrieved from http://dx.doi.org/10.5402/2013/282378.

GALAIF, E. R., SUSSMAN, S., NEWCOMB, M. D., & LOCKE, T. F. (2007). Suicidality, depression, and alcohol use among adolescents: A review of empirical findings. *International Journal of Adolescent Medical Health, 19*, 27–35.

GOLDSTON, D. B. (2004). Conceptual issues in understanding the relationship between suicidal behavior and substance use in adolescence. *Drug and Alcohol Dependence, 76*(Suppl), 79–91.

GOULD, M. S., KING, R., GREENWALD, S., FISHER, P., SCHWAB-STONE, M., KRAMER, R., ET AL. (1998). Psychopathology associated with suicidal ideation and attempts among children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 37*, 915–923.

HUFFORD, M. R. (2001). Alcohol and suicidal behavior. *Clinical Psychology Review, 21*, 797–811.

JOHNSTON, L. D., O'MALLEY, P. M., BACHMAN, J. G., & SCHULENBERG, J. E. (2011). *Marijuana use continues to rise among U.S. teens, while alcohol use hits historic lows*. University of

Michigan News Service: Ann Arbor, MI. Retrieved November 19, 2012, from http://www.monitoringthefuture.org.

Kann, L., Kinchen, S. A., Williams, B. I., Ross, J. G., Lowry, R., Grunbaum, J. A., et al. (2000). Youth risk behavior surveillance – United States, 1999. *Journal of School Health*, *70*, 271–285.

Klonsky, E. D., & May, A. (2010). Rethinking impulsivity in suicide. *Suicide and Life-Threatening Behavior*, *40*, 612–619.

Kovacs, M. (1992). *Children's Depression Inventory manual*. New York: Multi-Health Systems.

Kuntsche, E., Knibbe, R., Gmel, G., & Engels, R. (2005). Why do young people drink? A review of drinking motives. *Clinical Psychology Review*, *25*, 841–861.

Miranda, R., Scott, M., Hicks, R., Wilcox, H. C., Munfakh, J., & Shaffer, D. (2008). Suicide attempt characteristics, diagnoses, and future attempts: Comparing multiple attempters to single attempters and ideators. *Journal of the American Academy of Child and Adolescent Psychiatry*, *47*, 32–40.

Nargiso, J., Becker, S. J., Wolff, J., Uhl, K., Simon, V., Spirito, A., et al. (2012). Psychological, peer, and family influences on smoking among an adolescent psychiatric sample. *Journal of Substance Abuse Treatment*, *42*, 310–318.

Negron, R., Piacentini, J., Graae, F., Davies, M., & Shaffer, D. (1997). Microanalysis of adolescent suicide attempters and ideators during the acute suicidal episode. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*, 1512–1519.

O'Carroll, P. W., Berman, A. L., Maris, R. W., Moscicki, E. K., Tanney, B. L., & Silverman, M. M. (1996). Beyond the tower of Babel: A nomenclature for suicidology. *Suicide and Life-Threatening Behavior*, *26*, 237–252.

Parent, M. C. (2012). Handling item-level missing data: Simpler is just as good. *The Counseling Psychologist*, *41*, 568–600.

Prinstein, M. J., Nock, M. K., Simon, V., Aikins, J. W., Cheah, C. S., & Spirito, A. (2008). Longitudinal trajectories and predictors of adolescent suicidal ideation and attempts following inpatient hospitalization. *Journal of Consulting and Clinical Psychology*, *76*, 92–103.

Schilling, E. A., Aseltine, R. H., Glanovsky, J. L., James, A., & Jacobs, D. (2009). Adolescent alcohol use, suicidal ideation, and suicide attempts. *Journal of Adolescent Health*, *44*, 335–341.

Sher, L. (2006). Alcohol consumption and suicide. *Quarterly Journal of Medicine*, *99*, 57–61.

Sher, L., & Zalsman, G. (2005). Alcohol and adolescent suicide. *International Journal of Adolescent Medical Health*, *17*, 197–203.

Smucker, M. R., Craighead, W. E., Craighead, L. W., & Green, B. J. (1986). Normative and reliability data for the Children's Depression Inventory. *Journal of Abnormal Child Psychology*, *14*, 25–39.

Witte, T. K., Merrill, K. A., Stellrecht, N. E., Bernert, R. A., Hollar, D. L., Schatschneider, C., et al. (2008). "Impulsive" youth suicide attempters are not necessarily all that impulsive. *Journal of Affective Disorders*, *107*, 107–116.

Wu, P., Hoven, C. W., Liu, X., Cohen, P., Fuller, C. J., & Shaffer, D. (2004). Substance use, suicidal ideation and attempts in children and adolescents. *Suicide and Life-Threatening Behavior*, *34*, 408–420.

Zlotnick, C., Donaldson, D., Spirito, A., & Pearlstein, T. (1997). Affect regulation and suicide attempts in adolescent inpatients. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*, 793–798.