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Suicide ideation among college students: A multivariate analysis

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Abstract

Objectives—To develop a multi-dimensional model that might explain college suicide ideation.

Methods—Face-to-face interviews were conducted with 1,249 first-year college students.

Results—An estimated 6%_{wt} of first-year students at this university had current suicide ideation. Depressive symptoms, low social support, affective dysregulation, and father-child conflict were each independently associated with suicide ideation. Only 40%_{wt} of individuals with suicide ideation were classified as depressed according to standard criteria. In the group who reported low levels of depressive symptoms, low social support and affective dysregulation were important predictors of suicide ideation. Alcohol use disorder was also independently associated with suicide ideation, while parental conflict was not.

Conclusions—Results highlight potential targets for early intervention among college students.

Keywords

college students; suicide; depression; social support; parent-child conflict; affective dysregulation

INTRODUCTION

Suicide is the third leading cause of death among 15-to-24 year olds (Anderson & Smith, 2005) and the second leading cause of death among college students (Schwartz, 2006). In a large suicide in Midwestern University Campuses, Silverman et al. (1997), found an overall suicide rate of 7.5 per 100,000 among college students as compared to 15 per 100,000 in a national sample matched for age, sex, and ethnicity. Although the rate of completed suicide is lower among college students than their non-student peers (Schwartz, 1990), it is a major cause of premature death (Brener, Hassan, & Barrios, 1999; Silverman et al., 1997), accounting for approximately 1,100 student deaths annually (American Association of Suicidality, 2006).

Suicide ideation is considered to be an important precursor to later attempted and completed suicide (Brent, Johnson, Bartle et al., 1993; Gili-Planas, Roca-Bennasar, Ferrer-Perez et al., 2001; Lewinsohn, Rohde, & Seeley, 1996; Reinherz, Giaconia, Silverman et al., 1995) and is of major public health significance. National surveys estimate that 11.4% of college students seriously considered attempting suicide in the past year, 7.9% made a suicide plan, and 1.7% attempted suicide (Barrios, Everett, Simon et al., 2000). Suicide ideation has been associated with poor psychosocial functioning (Reinherz, Tanner, Berger et al., 2006), future depressive

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disorders (Fergusson, Horwood, Ridder et al., 2005; Steinhausen & Metzke, 2004), school dropout (Daniel, Walsh, Goldston et al., 2006), risky sexual behavior (Burge, Felts, Chenier et al., 1995), aggressive behavior (Garrison, McKeown, Valois et al., 1993) and adult substance use disorders (Fergusson et al., 2005).

New initiatives have directed much-needed resources toward the development of campus suicide prevention programs (Substance Abuse and Mental Health Services Administration, 2006). These programs are in need of information on which to base suicide prevention strategies. Many suicide prevention programs aim to identify early signs of depression and encourage depression screening and early intervention. Although depression is clearly an important part of the picture (Brown, Beck, Steer et al., 2000; Kessler, Borges, & Walters, 1999; Petronis, Samuels, Moscicki et al., 1990; Sokero, Melartin, Rytala et al., 2005), suicide ideation among college students may have a unique etiology because of developmental transitions that occur in college and young adulthood, including changes in family relationships, peer contexts, and increased opportunities for alcohol and drug use. Moreover, studies suggest that suicidal behavior runs in families independent of psychiatric diagnoses, such as mood disorders (Brent, Bridge, Johnson et al., 1996; Brent, Oquendo, Birmaher et al., 2002; Runeson & Asberg, 2003). Other heritable factors such as a tendency toward impulsive aggression appear to influence suicidal behaviors. For example, in one sample of 424 healthy college students, nearly half of the suicide attempters failed to meet lifetime criteria for depression (Levy & Deykin, 1989). This finding was consistent with an earlier study of adults showing that half the men and one-third of the women who admitted having suicidal thoughts did not report depression (Vandivort & Locke, 1979). Therefore, programs that focus solely on depression might be missing other important targets for intervention. Studies are needed that identify risk and protective factors among the subgroup of non-depressed individuals with suicide ideation.

In addition to depression, substance use disorders are regarded as major risk factors for suicidal behavior in both clinical and community populations (Bukstein, Brent, Perper et al., 1993; Dhossche, Meloukheia, & Chakravorty, 2000; Wu, Hoven, Liu et al., 2004). In college students, drug and alcohol abuse has been linked to both suicide ideation and suicide attempts (Brenner et al., 1999; Levy & Deykin, 1989), especially for men. While both drug abuse and suicide ideation might be components of a larger cluster of risk-taking behaviors (Barrios et al., 2000; Jessor, Donovan, & Costa, 1991; Rivinus, 1990), others have suggested that the link between drug use and suicidal behavior is more direct, hypothesizing that the intoxicating effects of drug use might lead to impairments in judgment or changes in mood which then increase risk for suicide ideation and attempt (Bukstein et al., 1993). Additional alcohol-specific effects have been implicated in suicidal behavior include disinhibition and emotional problems such as dysphoria, impulsivity, and aggression (O'Connell & Lawlor, 2005).

Lack of social support from family and friends is an important correlate of suicide ideation for adolescents, adults, and college students (D'Attilio, Campbell, Lubold et al., 1992; Harris & Molock, 2000; Harter, Marold, & Whitesell, 1992; Marion & Range, 2003; Mireault & de Man, 1996; Prinstein, Boergers, Spirito et al., 2000; Stravynski & Boyer, 2001). In college students, higher levels of social support appear to exert a protective effect against suicidal behaviors by increasing self-efficacy (Thompson, Eggert, & Herting, 2000) or by reducing stress (Clum & Febraro, 1994; Schutt, Meschede, & Rierdan, 1994; Yang & Clum, 1994). On the other hand, social disconnection and isolation, or "failed belongingness," might be critical influences on suicide behavior (Joiner, 2005). Nevertheless, considering the well-known linkages of suicide ideation with both social support and depression, surprisingly few studies have focused on the interrelationships of these three issues (Reifman & Windle, 1995; Stoelb & Chiriboga, 1998). To our knowledge, no studies have examined the extent to which suicide ideation, in the absence of depression, might be associated with low social support.

Conflict in parent-child relationships and a number of other family-level constructs are associated with suicide ideation. Reinherz et al. (1995) reported that problematic family functioning during childhood predicted suicide ideation in young adulthood. Although it is clear that many aspects of parent-child relations—including conflict—play a role in suicide risk, the possible interaction of conflict with parents and depression in college students is poorly understood.

Another potential contributory factor for suicide ideation among college students is affective dysregulation (Plattner, Karnik, Jo et al., 2007). Affective dysregulation is marked by an inability to regulate emotions appropriately and susceptibility to irritability and negative affect (Mezzich, Tarter, Giancola et al., 2001). This construct has been linked to a number of externalizing behaviors in youth, such as drug and alcohol abuse (Tarter, Kirisci, Habeych et al., 2004), delinquency (Plattner et al., 2007), risky sexual behaviors, and violence (Mezzich, Giancola, Tarter et al., 1997). According to Plattner et al. (2007), in stressful situations, affectively dysregulated individuals experience a confluence of negative emotions (i.e., fear, sadness and anger) in a way that causes them to react in an overly aggressive manner. A few prior studies suggest an association between affective dysregulation and suicide risk (Mezzich et al., 1997; Tarter, Kirisci, Reynolds et al., 2004). However, most prior research on affective dysregulation has focused on adolescents, especially delinquent and clinical populations, and therefore little is known about the correlates of affective dysregulation among college students or young adults in general.

The goal of the present study was to estimate the predictive ability of several suspected risk factors and their interactions on suicide ideation among college students. Namely, we aimed to: 1) estimate the prevalence of suicide ideation in a large sample of incoming first-year college students; 2) estimate the proportion of students with suicide ideation who meet criteria for clinically significant depression; 3) develop a multidimensional explanatory model that might explain college suicide ideation, including an evaluation of such factors as depressive symptoms, affective dysregulation, parent-child conflict, perceived social support, alcohol use disorders and cannabis use disorders; 4) examine suicide ideation among those students without depression in order to address the question of whether a distinct set of factors might predict suicide ideation in non-depressed students.

METHOD

Study Design

Data were gathered as part of the College Life Study, a large ongoing prospective, longitudinal cohort study of college student health behaviors. A two-stage sampling design was employed. First, a screening questionnaire was administered during new-student orientation in the summer of 2004 to the incoming class of first-year students at a single large, public university in the mid-Atlantic region of the U.S. To focus the study on traditional students, only first-time undergraduate students ages 17 to 19 were eligible for the study. The resulting screened sample ($N=3,401$) represented 89% of the entire eligible incoming first-year class. The second stage of sampling employed purposive strategies to recruit a sample with disproportionately high risk for drug use, in accordance with the aims of the parent grant to study substance use. Thus, students with a prior history of illicit drug involvement were oversampled with 100% probability, and students without a history of illicit drug use were randomly sampled with 40% probability, regardless of alcohol use history, after stratifying the sampling frame by race and sex to optimize demographic representativeness. These students were invited to participate in the longitudinal study, beginning with a 2-hour face-to-face interviewer-administered “baseline” assessment, which took place during their first year of college and included several self-report questionnaires. The response rate was 86% for the baseline assessment, yielding a sample size of 1,253 students. Students were offered a \$5 incentive for participating in the

screening survey and \$50 for the baseline assessment. Additional details on the methods of recruitment and sampling of this longitudinal cohort can be found elsewhere (Arria, Caldeira, O'Grady et al., 2008). Informed consent was obtained according to protocols approved by the university's Institutional Review Board. A Federal Certificate of Confidentiality was also obtained.

Participants

The sample for the present study was 1,249 first-year college students ages 17 to 19 who completed the baseline interview as described above. An additional four individuals were excluded due to missing data on suicide ideation or depressive symptoms. The demographic characteristics of the sample did not differ appreciably from the overall freshman class with respect to race, gender, and mother's education: 71% were White, 48% were male, and 74% reported their mother had attained a four-year college degree or more.

Measures

Demographic Characteristics—Gender was coded as observed by the interviewer during the interview. Data on race was gathered from the University's administrative databases, as allowed by participants' informed consent. For the present study, race was dichotomized as White vs. non-White. Mother's education, which was self-reported by incoming first-year students, was used as a proxy indicator of socioeconomic status.

Depressive Symptoms—The Beck Depression Inventory (BDI) is a self-administered scale comprised of 21 items assessing cognitive, emotional, and physical symptoms of depression (Beck, Rush, Shaw et al., 1979). In each item the respondent selects one of four statements that best describe how he/she has been feeling over the past few days. Each statement receives a score of 0 to 3, with 3 indicating the highest level of severity for each item. The scale score is computed as the sum of the 21 items. Scores range from 0 to 63, with zero indicating no depressive symptoms and 63 indicating the highest level of depressive symptoms possible. The BDI demonstrated high internal consistency in this sample (Cronbach's $\alpha=.882$). For the present study, only 20 items were included in the BDI scale score; because one item pertaining to suicide ideation was analyzed separately (see below). For analytic purposes, a binary variable was constructed representing high or low risk for depression, based on the total BDI scale score (excluding the suicide ideation item). Although a clinical diagnosis of depression could not be made from our assessment, students were considered to have high depressive symptoms if their BDI score was 16 or higher (Beck, Steer, & Garbin, 1988). Scores of 0 to 15 were coded as having low depressive symptoms.

Suicide Ideation—Item 9 of the BDI pertains to suicidal thoughts, and was recoded into a binary variable to denote the presence or absence of suicide ideation in the past few days. Based on the wording of the questionnaire item, our definition of suicide ideation includes having thoughts of killing oneself, even if one would not carry them out, or having the desire to kill oneself. Respondents who had no thoughts of killing themselves were coded for the absence of suicide ideation.

Parent-child Conflict—Students' perception of conflict with their parents was measured via the 12-item conflict subscale of the Quality of Relationship Inventory (QRI). This self-administered questionnaire assesses the quality of their current relationships with their mother and father, or with the corresponding parental figures (Pierce, Sarason, & Sarason, 1991). Responses were scored from 1 to 4, and subscale scores for conflict were computed as a mean for mother (QRI-MC) and father (QRI-FC) separately. Both subscales had good reliability in this sample (Cronbach's $\alpha=0.904$ and 0.897 for mother and father, respectively).

Perceived Social Support—The Social Support Appraisals Scale (SSAS) is a 23-item self-administered assessment designed to measure subjective perceptions of the social support one currently receives, such as feeling loved and esteemed, and feeling involved with family, friends, and others (Vaux, 1986). Items are scored on a four-point Likert scale and summed (after reverse-coding five items) to derive a total score (Cronbach's $\alpha=0.916$). Scores range from 23 to 92, with lower scores indicating stronger perceived social support.

Affective Dysregulation—Affective dysregulation was assessed using the subscale from the Dysregulation Inventory (DI). The DI measures several temperament characteristics associated with increased risk for developing substance use disorders (Mezzich et al., 2001). Respondents are asked to indicate how often each statement is true in describing their behavior. Responses are scored from 0 for “never true” to 3 for “always true.” Items were summed for the 28 items comprising the affective dysregulation subscale (Cronbach's $\alpha=.884$, range 0 to 84). Higher scores on the affective dysregulation subscale (DI-A) indicate high emotional reactivity and low control over one's emotional state, which we hypothesized would be a risk factor for suicide ideation.

Cannabis Use Disorders (Abuse or Dependence)—Students who had used cannabis five or more times in the past year were assessed for cannabis use disorder (CUD), using questions based in part on the National Household Survey on Drug Use and Health (NSDUH) interview (Substance Abuse and Mental Health Services Administration, 2003). To minimize the burden on respondents in this lengthy interview, students who used cannabis less than five times in the past year skipped out of this series, similar to procedures used in the NSDUH. Items in this series correspond to the DSM-IV criteria (American Psychiatric Association, 1994) for abuse and dependence occurring within the past year. Dependence cases were defined by the endorsement of three or more of the following six criteria as a result of their cannabis use: tolerance, using more than intended, being unable to cut down, spending a lot of time obtaining or using, giving up important activities, or continuing to use despite problems with physical or mental health. Abuse cases were defined as non-dependent individuals who endorsed one or more of the following four problems resulting from their cannabis use: having serious problems at home, work, or school; regularly putting oneself in physical danger; repeatedly getting into trouble with the law; or continuing use despite problems with family or friends. Individuals who used cannabis less than five times in the past year were automatically coded for the absence of CUD.

Alcohol Use Disorders (Abuse or Dependence)—Students who had used alcohol five or more times in the past year were assessed for alcohol use disorders (AUD), using questions based in part on the NSDUH interview (SAMHSA, 2003). As described above for CUD, students who used alcohol less than five times in the past year skipped out of this series and dependence and abuse were defined similarly, with the exception that withdrawal symptoms constituted a seventh possible criterion for alcohol dependence.

Statistical Analyses

To permit computation of prevalence estimates, case weights were calculated to yield a weighted sample size ($N=3,285$) that is representative of the screened population of first-year students. Sampling weights were computed on the basis of race, gender, and illicit drug use prior to college. Details of this procedure are presented elsewhere (Arria et al., 2008).

Statistical analyses were conducted to address each aim of the study using SAS version 9.1. First, to estimate the prevalence of suicide ideation, weighted crosstabulations were computed for suicide ideation, by gender and high and low depressive symptoms, based on data from the entire sample of 1,249 participants. For all subsequent analyses, the sample was restricted to

the 912 individuals who provided complete data on all measures under study. Pearson correlation coefficients were computed for suicide ideation and its hypothesized correlates. Next, a series of logistic regression models were developed to understand the association between the binary dependent variable of suicide ideation and seven independent variables, including five scale scores (BDI, SSAS, QRI-MC, QRI-FC, and DI-A) and two binary variables (AUD and CUD). The effects of race, sex, and mother's education were also held constant in these analyses. The first model simultaneously tested all hypothesized main effects and several hypothesized first-order interaction effects. We hypothesized that depressive symptoms would have first-order interaction effects with social support, parent-child conflict, and affective dysregulation, and one second-order interaction with parent-child conflict and gender. To derive a more parsimonious model, non-significant effects were eliminated from the model one at a time using a backwards elimination approach. The final reduced model retained all hypothesized effects that remained significant at $p < 0.05$. Lastly, the logistic regression models were examined among the subset of individuals whose BDI scores fell within the lowest three quartiles of the sample (0–7) in order to observe any possible differential effects of the other explanatory variables.

RESULTS

Prevalence of Suicide Ideation and Depressive Symptoms

Characteristics of the 1,249 students in the sample are presented in Table 1. Based on their responses on the BDI, 75 individuals endorsed current thoughts of suicide, and 55 met our criteria for high depressive symptoms (BDI score of 16 or greater). After statistically weighting the data to adjust for sampling bias, weighted prevalence estimates representing the entire class of first-year students were as follows. An estimated 6%_{wt} of all first-year students had current suicide ideation, and 6%_{wt} had high depressive symptoms. Suicide ideation was somewhat more prevalent among women (7%_{wt}) than men (5%_{wt}), as were high depressive symptoms (8%_{wt} of women, 3%_{wt} of men). Interestingly, among individuals with suicide ideation, only a minority (40%_{wt}) also had high depressive symptoms, and this proportion was even lower for men (25%_{wt}) than women (47%_{wt}). In the subset of 912 individuals with complete data for all subsequent analyses, the proportion with suicide ideation was comparable (6%; $n=51$).

Correlates of Suicide Ideation

The bivariate correlation coefficients between suicide ideation and the hypothesized risk factors are presented in Table 2. The BDI score correlated moderately with suicide ideation ($r=.35$), DI-A ($r=.49$), and SSAS ($r=.36$). A similarly strong correlation was observed between QRI-MC and QRI-FC ($r=.38$). It is important to note that higher SSAS scores represent lower levels of perceived social support, such that SSAS has a positive correlation with suicide ideation ($r=.26$). Although moderate intercorrelations were observed between several of the explanatory variables, results were consistent with an acceptable degree of discriminant validity (all $r < .5$), sufficient to justify simultaneous inclusion of these explanatory variables in the logistic regression models.

Multivariate Models of Suicide Ideation

The results of the logistic regression analyses predicting suicide ideation are presented in Table 3. In light of substantial scaling differences amongst the explanatory variables, χ^2 values are also reported in order to provide a more uniform basis for comparison of effects. Odds ratios and confidence intervals are not reported for the interaction terms, as statistically significant interactions were subjected to additional testing to facilitate interpretation of effects. In the full model, several of the hypothesized main effects were statistically significant, by conventional standards, at $p < 0.05$ (SSAS, BDI, QRI-FC, and DI-A), although QRI-MC, AUD and CUD were null (all $ps > 0.05$). The model reduction process resulted in two versions of the reduced

model, labeled as A and B. In reduced model A, the main effects of SSAS, BDI, QRI-MC, QRI-FC, and DI-A were retained, and BDI demonstrated a significant interaction effect with SSAS [$\chi^2(1)=12.8$] and QRI-FC [$\chi^2(1)=4.1$]. Reduced model B was nearly identical, except that the BDI*QRI-MC interaction was substituted for the BDI*QRI-FC interaction. The main effect of QRI-MC was non-significant [$\chi^2(1)=0.5$] when its interaction with the BDI was held constant. In both of the reduced models, the SSAS, BDI, QRI-FC, and DI-A were all significantly and independently associated with suicide ideation.

The Nagelkerke R^2 values indicate that the amount of variance explained by either of the reduced models is reasonably high ($R^2=0.45$), and this amount is only slightly reduced if the interaction terms are eliminated from the model ($R^2=0.43$). Nevertheless, we conducted further tests to interpret the three observed interaction effects. The SSAS score demonstrated a synergistic effect with the BDI, such that the relationship between low perceived social support and suicide ideation increased at higher levels of depressive symptoms, but was less strong at lower levels of depressive symptoms. A similar synergistic effect was observed between the BDI and QRI-FC, such that the relationship between father-child conflict and suicide ideation became stronger as the level of depressive symptoms increased. By contrast, in the interaction of the BDI with QRI-MC, mother-child conflict was positively associated with suicide ideation at higher levels of depressive symptoms, but inversely associated at lower levels of depressive symptoms. This interaction appears to explain the inconsistencies observed in the main effect of QRI-MC across the three models, with odds ratios ranging from 0.7 to 1.2. Each interaction was examined by observing how the regression coefficient of the variable of interest (i.e., SSAS, QRI-FC, and QRI-MC) changed when the BDI score was re-scaled, first around a “high” mean (original mean plus one standard deviation) and then around a “low” mean (original mean minus one standard deviation).

In light of the finding that many students experienced suicide ideation in the absence of high depressive symptoms as measured on the BDI, an additional analysis was performed to determine whether the correlates of suicide ideation would be different among non-depressed individuals. Because so few students (6% of the sample) met our criteria for clinically significant depressive symptoms ($BDI \geq 16$), a more conservative threshold was needed for distinguishing students with lower levels of depressive symptoms. We therefore restricted the post-hoc analysis to the subset of 696 individuals whose BDI score fell within the lowest three quartiles for this sample; their BDI scores ranged from 0 to 7. The logistic regression models were then replicated in this “non-depressed” subset, as described above. Results are presented in Table 4. Even among this subset with low levels of depressive symptoms, the BDI score significantly predicted suicide ideation. As in the larger sample, social support and affective dysregulation were significantly associated with suicide ideation. However, unlike in the original models, AUD was strongly associated with suicide ideation, but the relationships between mother-child and father-child conflict and suicide ideation were non-existent (both $ps > .05$).

Because of the significant association that was observed between affective dysregulation and suicide ideation, a descriptive post-hoc item-level analysis was performed. Table 5 compares students with and without suicide ideation on each item of the Affective Dysregulation subscale. Interestingly, all but three items are significantly different between the groups ($p > .05$), and some items exhibit particular large differences. In general, it appears that items relating to an inability to control one’s anger or depressed mood are observed much more frequently in students with suicide ideation. In contrast the three items that were not significantly different between the groups (“I get easily excited,” “I can’t stop laughing and giggling when I hear or see something funny,” and “I lay awake at night if I hear a sound”) are not necessarily related to mood regulation.

DISCUSSION

The results from this study contribute to our knowledge regarding the correlates of suicide ideation among college students. The main findings are as follows. First, although depression is clearly a risk factor for suicide ideation, a majority of individuals with suicide ideation (60%_{wt}) did not meet our criteria for high depressive symptoms. This finding that suicide ideation occurs frequently in the absence of clinically significant depressive symptoms among first-year college students is consistent with the work of Levy and Deykin (1989) and suggests that campus health center personnel should not rely solely on depression screening tools to identify students at risk for suicide.

Second, in the present study, a lack of social support was a prominent risk factor for suicide ideation at this developmental stage of young adulthood, irrespective of the presence of high depressive symptoms. The notion that belongingness could protect against suicide is supported by evidence that college students who were members of a sorority or fraternity were less likely to report suicide ideation (Brener et al., 1999). It is also possible, as suggested by Van Orden and colleagues (2008), that the changes observed in suicide ideation across semesters (i.e., higher in the summer term) might be attributable to concomitant changes in the social composition of the college campuses and belongingness. Third, consistent with prior evidence (Harris & Molock, 2000), parent-student relationships were a particularly important correlate of suicide ideation. Higher levels of conflict with either parent increased the likelihood of suicide ideation, although conflict with a mother figure has a statistically significant influence only in the context of higher depressive symptoms. Family cohesion, spending time together with family, and parental supervision have been identified as protective factors for youth suicidal behavior (Borowsky, Resnick, Irelans et al., 1999; McKeown, Garrison, Cuffe et al., 1998) whereas poor communication between parents and children (Gould, Fisher, Parides et al., 1996), low perceived support (Fergusson & Lynskey, 1995), low parental approval (Harter et al., 1992) and family dysfunction (Adams, Overholser, & Lehnert, 1994) have been identified as risk factors for suicide ideation. At least two large population-based studies of adolescents have observed that higher parent-child conflict is related to increased suicide ideation independent of depression (Tomori, Kienhorst, de Wilde et al., 2001), especially for girls (Stewart, Lam, Betson et al., 1999). In college student samples, aside from higher family conflict, suicide ideation has been linked to lower security in students' current attachments to parents, higher emotional unavailability of their mother and father (de Jong, 1992), and lower family cohesion (Yama, Tovey, Fogas et al., 1995). Fourth, suicide ideation among college students is associated with affective dysregulation, independent of depressive symptoms, social support, and other factors. These findings have important implications for designing more comprehensive screening and assessment tools for suicide risk. Whereas suicidality is commonly associated with internalizing symptoms such as depression, affective dysregulation is usually marked by externalizing symptoms such as aggression and anger. Therefore, the finding that both high depressive symptoms and dysregulation are both associated with suicide ideation may reflect heterogeneity in the mechanisms that lead to suicide ideation.

Finally, suicide ideation was associated with AUD, independent of affective dysregulation and social support, but only in the absence of high levels of depressive symptoms. This finding is intriguing in light of prior evidence supporting subtypes of suicide attempters: those who are primarily impulsive and aggressive, and those who are primarily depressed. Although measures of impulsivity and aggression were not part of this study, the present finding raises the possibility that AUD might be another indicator of a non-depressed subtype of suicide attempters. Moreover, this study provides further evidence that AUD in college students might be an important target for intervention in suicide prevention.

Limitations

The findings of this study should be interpreted in light of several limitations. Although the sample size was large, the subsets of students with suicide ideation and high depressive symptoms were fairly small, limiting the ability of our analyses to detect statistically significant differences between groups. Because our sample is limited to students from a single, public university, the results may not be generalizable to students located at institutions in other areas of the country, or to students attending smaller, private universities. Suicide rates differ by geographic location, and it is unclear whether rates of suicide ideation may vary as well (Centers for Disease Control and Prevention, 1997).

Although we attempted to create a multidimensional model with a comprehensive array of predictors, we did not include a number of other variables that might help to better explain suicide ideation. For example, we did not take into account stressful life events such as troubled relationships, family problems (other than conflict with parents), financial struggles, and other personal, professional, and academic events that have previously been linked to suicide ideation and depression (Waelde, Silvern, & Hodges, 1994; Westefeld, Homaifar, Spotts et al., 2005). We also did not account for the presence of psychological disorders other than depression, such as anxiety, which has been associated with suicide (Boden, Fergusson, & Horwood, 2007). Moreover, in this study we measured current depressive symptoms but not lifetime depression, and therefore may have underestimated the full extent of depression in the sample.

The associations reported herein are from cross-sectional analyses. Our measures of social support and parent-child conflict were subjective and reflect the student's perceptions; it is possible that suicidal thoughts might cause students to view their social support structures in a more negative light, or to exaggerate their perception of conflict in their parental relationships. Moreover, in some cases, mental health problems might aggravate conflict in the student's relationships with parents and/or peers. Future prospective studies with this cohort will examine the persistence of suicide ideation over time, and important events salient to college life (e.g., graduation, academic failure) will be examined for their possible influence on suicide ideation and depression. Another important line of inquiry will be to construct path models depicting the mediating and moderating relationships between the various risk factors.

Lastly, our measure of suicide ideation was based on a single item pertaining to the past few days. It is possible, therefore, that some students categorized as "non-suicidal" in our sample actually did experience suicidal thoughts in recent weeks or months. We cannot say how this possible bias might have affected the present findings; however, we are optimistic that future studies with this cohort will provide opportunities to investigate suicide ideation more thoroughly.

Conclusions

This study identified several potential targets for suicide prevention initiatives directed at college students. Many of the risk factors identified here—especially perceived social support and parent-child conflict—represent possible areas for intervention, but additional research is needed to determine whether these risk factors can be effectively modified to reduce suicide ideation. Suicidal thoughts and behavior during college present unique challenges to both researchers and clinicians. The transition between late adolescence and young adulthood is typically characterized by high levels of stress associated with adjusting to a new social environment and increased academic demands. Moreover, social support networks undergo radical changes during college. While parents and family may remain a part of a student's social support network, the physical separation from parents can be stressful for some students. For other students, leaving home can initially be a welcomed experience, but stressful in other ways as they struggle with issues of financial stability and independence. The present findings

draw attention to the complex interrelationships of stress, depression, social support and parent-child conflict with suicide ideation, and highlight a number of possible intervention targets for the earliest stage of suicidal behavior.

If replicated, these findings may point to promising new strategies for suicide prevention. Rather than focusing primarily on students who are depressed, campus suicide prevention initiatives could include programs aimed at enhancing student social support networks, increasing students' awareness about the possible signs of suicide ideation (including AUD), and educating parents about effective ways of supporting students who might be at risk for suicidal behavior. Prior research indicates that college students are largely unaware of campus services for suicide prevention and are interested in both didactic information about suicide and individual treatment (Westefeld et al., 2005).

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TABLE 1Sample characteristics ($N=1,249$)^a

	% (n)
Sex (% Male)	48.4 (605)
Race (% White)	70.8 (882)
Mother's education	
High school or less	16.3 (188)
Some college or technical schooling	10.0 (116)
Four-year college degree	38.0 (438)
Graduate degree	35.7 (412)
Suicide ideation (BDI item #9)	
I do not have thoughts of killing myself.	94.0 (1174)
I have thoughts of killing myself, but I would not carry them out.	5.8 (72)
I would like to kill myself.	0.2 (3)
I would kill myself if I had the chance.	0.0 (0)
High depressive symptoms (BDI \geq 16)	4.4 (55)
AUD in the past year	26.8 (331)
CUD in the past year	14.7 (180)

^aResults for each variable were computed based on the number of individuals with non-missing data for that variable. Data were missing on mother's education for 95 individuals, on AUD for 14 individuals, and CUD for 27 individuals.

TABLE 2
Intercorrelations among suicide ideation and its hypothesized risk factors ($n=912$)

	Pearson Correlation Coefficient r^a						
	Suicide Ideation	SSAS	BDI	QRI-MC	QRI-FC	DI-A	AUD
Social Support (SSAS)	.26						
Depressive Symptoms (BDI)	.35	.36					
Mother-Child Conflict (QRI-MC)	.10	.24	.25				
Father-Child Conflict (QRI-FC)	.12	.21	.21	.38			
Affective Dysregulation (DI-A)	.24	.18	.49	.22	.20		
Alcohol Use Disorder (AUD)	.01	-.04	.10	.13	.07	.12	
Cannabis Use Disorder (CUD)	.02	.01	.07	.10	.09	.09	.28

^aCorrelation coefficients depicted in **bold** are statistically significant at $p < .05$. Coefficients with absolute values greater than or equal to .18 are statistically significant at $p < .0001$.

TABLE 3
Results of multivariate logistic regression models predicting suicide ideation ($n=912$).

	χ^2	Full Model AOR (95% CI)	χ^2	Reduced Model "A" AOR (95% CI)	χ^2	Reduced Model "B" AOR (95% CI)
Hypothesized Main Effects						
Social Support (SSAS)	43.9 ^{***}	1.2 (1.1, 1.2)	49.4 ^{***}	1.2 (1.1, 1.2)	44.2 ^{***}	1.2 (1.1, 1.2)
Depressive Symptoms (BDI)	20.8 ^{***}	1.7 (1.3, 2.1)	26.6 ^{***}	1.7 (1.4, 2.0)	28.9 ^{***}	1.6 (1.4, 2.0)
Mother-Child Conflict (QRI-MC)	<0.1	1.1 (0.6, 2.1)	5.6 [*]	0.7 (0.5, 0.9)	0.5	1.2 (0.7, 2.2)
Father-Child Conflict (QRI-FC)	4.7 [*]	2.0 (1.1, 3.6)	8.6 ^{**}	2.3 (1.3, 4.0)	4.8 [*]	1.4 (1.0, 1.9)
Affective Dysregulation (DI-A)	5.7 [*]	1.0 (1.0, 1.1)	27.1 ^{***}	1.0 (1.0, 1.1)	30.4 ^{***}	1.1 (1.0, 1.1)
Alcohol Use Disorder	<0.1	0.9 (0.6, 1.5)				
Cannabis Use Disorder	0.5	0.8 (0.5, 1.4)				
Hypothesized Interaction Effects						
SSAS*BDI	9.6 ^{**}		12.8 ^{***}		9.1 ^{**}	
BDI*QRI-MC	2.3				5.9 [*]	
BDI*QRI-FC	1.3		4.1 [*]			
BDI*DI-A	0.6					
BDI*QRI-MC*Sex	0.1					
BDI*QRI-FC*Sex	<0.1					
Model R^2		.46		.45		.45

* $p < .05$.

** $p < .01$.

*** $p < .001$.

AOR=A adjusted odds ratios controlling for sex, race, mother's education, and all other effects shown. All χ^2 shown have 1 degree of freedom.

TABLE 4

Results of multivariate logistic regression models for suicide ideation, among 696 individuals without high levels of depressive symptoms (BDI score of 0–7)

	Full Model		Reduced Model	
	χ^2	AOR (95% CI)	χ^2	AOR (95% CI)
Depressive Symptoms (BDI)	37.9***	1.4 (1.3, 1.6)	38.8***	1.5 (1.3, 1.6)
Social Support (SSAS)	48.7***	1.1 (1.1, 1.2)	50.4***	1.1 (1.1, 1.2)
Mother-Child Conflict (QRI-MC)	1.3	0.8 (0.5, 1.2)		
Father-Child Conflict (QRI-FC)	1.3	1.3 (0.9, 1.9)		
Affective Dysregulation (DI-A)	18.6***	1.1 (1.0, 1.1)	20.1***	1.1 (1.0, 1.1)
Alcohol Use Disorder	7.9**	2.0 (1.2, 3.3)	7.9**	2.0 (1.2, 3.1)
Cannabis Use Disorder	0.1	0.9 (0.5, 1.7)		

* $p < .05$

** $p < .01$

*** $p < .001$

AOR=Adjusted odds ratios controlling for sex, race, mother's education, and all other effects shown. All χ^2 shown have 1 degree of freedom.

TABLE 5

Comparison of mean scores for affective dysregulation items, by absence or presence of suicide ideation ($n=912$). Items are ascending order for “absent” group.

	Suicide Ideation		p^*
	Absent ($n=861$)	Present ($n=51$)	
I fly off the handle for no good reason.	0.221	0.549	0.0004
I can't stop crying for a long time if I hear or see a sad story.	0.240	0.529	0.0121
I have temper tantrums.	0.331	0.686	0.0013
I have trouble controlling my temper.	0.372	0.725	0.0050
Often I am afraid I will lose control of my feelings.	0.376	0.941	0.0001
I get so frustrated that I often feel like a bomb ready to explode.	0.466	1.216	<0.0001
I lay awake at night if I hear a sound.	0.490	0.686	0.1348
I find it difficult to quiet down after being scared.	0.495	0.765	0.0168
I just cannot calm down faster than most people.	0.549	1.137	<0.0001
Watching an action show gets me so excited that I remain excited long after the show is over.	0.557	0.863	0.0296
I get scared easily.	0.619	0.980	0.0049
My mood goes up and down without a reason.	0.641	1.529	<0.0001
I am touchy and get easily annoyed.	0.724	1.039	0.0098
I lose sleep because I worry.	0.726	1.314	0.0001
Sometimes I get emotional over nothing.	0.789	1.451	<0.0001
I slam doors when I am mad.	0.812	1.196	0.0042
Little things set me off.	0.820	1.216	0.0009
There are days when I am on edge all the time.	0.875	1.549	<0.0001
When I am emotionally upset, it lasts for 1 to 2 hrs even if problem is gone.	0.915	1.510	0.0001
When I get stirred up, my heart beats for a long time.	0.923	1.412	0.0004
I easily become emotionally upset when I am tired.	1.087	1.725	<0.0001
Sometimes people bug me just by being around.	1.203	1.529	0.0068
It is very hard for me to get over bad experiences very quickly.	1.206	1.745	0.0002
A bad incident early in the day changes my mood for the whole day.	1.236	1.490	0.0331
It makes me really angry when somebody makes fun of me.	1.280	1.569	0.0415
I get easily excited.	1.303	1.451	0.1683
I can't stop laughing and giggling when I hear or see something funny.	1.474	1.706	0.0657
It is very difficult for me not to think about my fears and worries.	1.957	1.098	<0.0001

* Significance testing represents the results of t -tests for equality of means. Equal variances were not assumed.