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## Correlates of Suicidal Ideation in College Women with Eating Disorders

Neha J. Goel, BA<sup>1,2,3,\*</sup>, Shiri Sadeh-Sharvit, PhD<sup>1,2,4</sup>, Rachael E. Flatt, BS<sup>1,2</sup>, Mickey Trockel, MD, PhD<sup>1</sup>, Katherine N. Balantekin, PhD, RD<sup>5,6</sup>, Ellen E. Fitzsimmons-Craft, PhD<sup>5</sup>, Grace E. Monterubio, BA<sup>5</sup>, Marie-Laure Firebaugh, MSW<sup>5</sup>, Corinna Jacobi, PhD<sup>7</sup>, Denise E. Wilfley, PhD<sup>5</sup>, and C. Barr Taylor, MD<sup>1,2</sup>

<sup>1</sup>Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, Stanford, CA, USA

<sup>2</sup>Center for m<sup>2</sup>Health, Palo Alto University, Palo Alto, CA, USA

<sup>3</sup>Department of Psychology, Virginia Commonwealth University, Richmond, VA, USA

<sup>4</sup>School of Psychology, Interdisciplinary Center, Herzliya, Israel

<sup>5</sup>Department of Psychiatry, Washington University School of Medicine, St. Louis, MO, USA

<sup>6</sup>Department of Exercise and Nutrition Sciences, University at Buffalo, Buffalo, NY, USA

<sup>7</sup>Technische Universität, Dresden, Germany

### Abstract

**Objective**—To identify the correlates of suicidal ideation (SI) in a large sample of college women with eating disorders (EDs).

**Methods**—690 female college students from 28 U.S. colleges who screened positive for an ED, with the exception of anorexia nervosa, were assessed for SI. Univariate logistic regression analyses were performed to determine independent correlates of SI. Measures included: ED psychopathology, ED behaviors (i.e., binge eating, vomiting, laxatives, compulsive exercise), current co-morbid psychopathology (i.e., depression, anxiety, insomnia), weight/shape concerns, ED-related clinical impairment, and body mass index (BMI). All significant variables were included in a backward binary multivariate logistic regression model to determine which variables were most strongly associated with SI.

**Results**—25.6% of the sample reported SI. All variables examined were significantly independently associated with SI, with the exception of compulsive exercise. Depression, anxiety, and vomiting remained as significant correlates of SI in the multivariate logistic regression model.

**Discussion**—ED screening on college campuses should assess for suicidality, and prevention and treatment efforts should target vomiting and co-morbid depression and anxiety symptoms to reduce risk of SI for high-risk individuals.

<sup>a</sup>Correspondence concerning this article should be addressed to Neha J. Goel, Department of Psychology, Virginia Commonwealth University, PO Box 842018, Richmond, VA 23284. Phone: 602-578-8777. goelnj@mymail.vcu.edu.

<sup>\*</sup>Present address: Department of Psychology, Virginia Commonwealth University, PO Box 842018, Richmond, VA 23284

## Keywords

suicidal ideation; eating disorders; college students; treatment; prevention

Suicidal ideation (SI), defined as thoughts or preoccupations about suicide, is common across persons with eating disorder (ED) diagnoses, with almost half reporting SI (Portzsky, van Heeringen, & Vervaet, 2014). In adolescents, binge eating and body mass index (BMI) percentile are correlates of SI (Mayes et al., 2014). For adults with EDs, data suggest that purging behaviors, rather than ED diagnosis (Franko & Keel, 2006; Pisetsky, Thornton, Lichtenstein, Pedersen, & Bulik, 2013) are strongly associated with suicidality. Co-occurring psychiatric illnesses (predominantly depression) are consistently linked to suicidality for adults with EDs (Franko & Keel, 2006; Milos et al., 2004; Pisetsky et al., 2013). For both suicidality and EDs, it has been suggested that abnormalities in amygdala activity might mediate a negative interpretation of emotional stimuli and predispose individuals to act more impulsively (Monkul et al., 2007; Frank, Bailer, Henry, Wagner, & Kaye, 2004).

In contrast to the large body of literature documenting suicidality among adolescents and adults with EDs, less is known about the distinct developmental group that falls in between these two populations: college students. For many, college marks the first time in which individuals are learning how to simultaneously adapt to a new social and academic climate that poses its own rules, expectations, and norms, while adjusting to newfound independence away from home. As such, given the unique set of circumstances, stressors, and challenges associated with college life, college students are particularly susceptible to developing psychiatric disorders, including both EDs and SI (Eisenberg, Nicklett, Roeder, & Kirz, 2011; Tupler, Hong, Gibori, Blitchington, & Krishnan, 2015).

Despite this, only three studies to date have investigated the relationship between EDs and SI among college students. However, each study had either a small sample size and/or participants were at high risk of developing an ED and did not exhibit full-threshold symptoms (Aspen et al., 2014; Eichen et al., 2016; Smith et al., 2013).

The current study aims to extend the literature by identifying correlates of SI in a sample of college women with EDs. We hypothesized that: (1) ED psychopathology and behaviors, co-morbid psychopathology (i.e., depression, anxiety, insomnia), ED-related clinical impairment, weight/shape concerns, and BMI would be independently associated with SI, and (2) since depression, anxiety, and insomnia have been confirmed as traditional risk factors of suicidality in other psychiatric populations (Nock, Hwang, Sampson, & Kessler, 2010; Pigeon, Pinquart, & Conner, 2012), that each of these co-morbid symptoms would be the strongest contributors of SI in multivariate analyses.

## Method

### Participants

This study utilized baseline data from 690 participants of the Healthy Body Image (HBI) Program study, a large-scale, randomized controlled trial examining the efficacy of an

internet-based, guided self-help intervention for EDs in college-age women at 28 U.S. universities. Participants were recruited through a variety of methods, including email, fliers, and referrals from student health centers. Participants were eligible if they identified as female, were 18 years old, were currently enrolled as students, and screened positive for a *DSM-5* clinical or subclinical ED (with the exception of anorexia nervosa). The Stanford-Washington University Eating Disorder Screen (SWED; described below) categorized individuals as having a possible ED if they reported at least six episodes of binge eating, vomiting, and/or laxative use in the three months prior to screening. After respondents completed the initial screening questionnaire, they were given access to a baseline survey, which included outcome variables of interest (e.g., global ED psychopathology, co-morbid pathology). Informed consent was obtained prior to assessment completion, and all study procedures were reviewed and approved by the Institutional Review Boards at the principal investigators' universities.

## Measures

All measures were completed online, as part of the screening process.

**Screening**—The SWED is a self-report tool designed to assess ED risk and pathology. Items are derived from the Weight Concerns Scale (WCS; Killen et al., 1994), the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn, 2008), the Eating Disorder Diagnostic Scale (Stice, Telch, & Rizvi, 2000) and the Clinical Impairment Assessment (CIA; Bohn & Fairburn, 2008). The SWED screening algorithm has been validated as an ED diagnostic screen and used in past research (Graham et al., 2018). For the current study, the SWED was used to identify participants with possible EDs and collect socio-demographic data (e.g., age, race/ethnicity, year in school).

**ED pathology**—The EDE-Q Global score and subscales (i.e., eating concern, weight concern, shape concern, restraint) measured ED psychopathology and symptoms (i.e. binge eating, vomiting, laxative use, compulsive exercise) over the 28 days prior to screening. The EDE-Q demonstrates excellent internal consistency and test-retest reliability (Luce & Crowther, 1999).

**Other ED-related constructs**—Weight/shape concerns were measured by the total WCS score (Killen et al., 1994). ED-related clinical impairment was measured using the CIA (Bohn & Fairburn, 2008). BMI was calculated using self-reported height and weight.

**Suicidal ideation**—SI was assessed using item nine of the Patient Health Questionnaire (PHQ-9; Kroenke & Spitzer, 2002). Each item on the PHQ-9 is scored on a 4-point Likert scale, ranging from 0 (“not at all”) to 3 (“nearly every day”). Participants were asked to rate how often they experienced the following over the past two weeks: “thoughts that you would be better off dead, or of hurting yourself in some way.” Similar to Eichen et al. (2016), participants who selected a response greater than 0 (“not at all”) were categorized as “endorsing SI.”

**Co-morbid psychopathology**—Participants' current sleep problems were assessed using a seven-item questionnaire known as the Insomnia Severity Index (ISI; Bastien, Vallieres, & Morin, 2001). Items are rated on a 5-point Likert scale and are summed to form a total score ranging from 0–28, with higher scores indicating greater insomnia severity. The ISI demonstrates good face validity and internal consistency (Smith & Wegener, 2003).

Co-occurring depression was assessed via the PHQ-9 (Kroenke & Spitzer, 2002). Items are summed to form a total score, ranging from 0–27, with higher scores corresponding to greater severity of depressive symptoms. The PHQ-9 is considered to be a valid and reliable measure of depression severity (Kroenke, Spitzer, & Williams, 2001). Since item nine of the PHQ-9 was used to measure SI and we wanted to assess how depression independent of SI and sleep disturbance contributes to suicidality for the sample, we removed two items (i.e., items nine and three) and modified the PHQ-9 scores by multiplying the average item score for the remaining seven items by nine—a method used in previous research (Troekel et al., 2015). Hereafter, this measure is referred to as the “modified PHQ-9.” Anxiety was assessed using the Patient-Reported Outcomes Measurement Information System (PROMIS) Short Form v1.0 – Anxiety4a questionnaire (Pilkonis, Choi, Reise, Stover, Riley, & Cella, 2011). The PROMIS is rated on a 5-point Likert scale, ranging from 0 (“never”) to 4 (“always”). Items are summed to form a total score ranging from 4–20, with higher scores corresponding to greater anxiety. The PROMIS demonstrates good precision, efficiency, and internal reliability (Cella et al., 2010).

## Data Analysis

Due to missing data on the SI item, seven participants were excluded from the main data analyses, resulting in a total sample size of  $N=683$ . Due to the low frequency of compensatory behaviors (i.e., 73.8% of participants reported 0 episodes of vomiting; 82.6% reported 0 episodes of laxative use; 45.8% reported 0 episodes of compulsive exercise), these variables were transformed into categorical variables. Vomiting and laxative use were dichotomized as either being present (i.e., 1 episode) or absent, while three categories were established for compulsive exercise: those who reported 0 episodes, 1–7 episodes, and 8 or more episodes. The frequency threshold was divided at seven episodes to separate those who reported a low versus high frequency of compulsive exercise at a cutoff that is nearly an even split. Multicollinearity was assessed using Pearson correlation coefficients. Given that the total weight/shape concerns and EDE-Q-Global scores were highly and significantly correlated with one another ( $r=.69$ ,  $p=.01$ ), the weight/shape concerns score was not included in the multivariate analysis. For univariate analyses, separate logistic regression models were performed to identify correlates of SI. A multivariate logistic regression analysis using all variables identified as significant correlates in the univariate analyses was performed to ascertain the strongest correlates of SI. A backwards elimination procedure was employed, such that each variable with the lowest Wald statistic was successively eliminated from the model until all remaining variables demonstrated unique significant effects on SI. Continuous variable scale scores were converted to Z-scores to facilitate comparability of effects of each of these hypothesized risk factors on odds of SI.

## Results

### Sample characteristics

Participants ( $N=690$ ) ranged in age from 18 to 58 years, with a mean age of 22.10 years ( $SD=4.83$ ). Participants identified themselves as White (60.1%), 5.4% as Black or African American, 17.1% as Asian or South Asian, 0.4% as American Indian or Alaska Native, 0.1% as Native Hawaiian or Pacific Islander, 7.7% as multi-racial, and 6.7% as other. Regarding ethnicity, 17.4% identified as Hispanic. Most participants were undergraduate (74.5%) or graduate students (24.7%). Mean BMI was 25.71 kg/m<sup>2</sup> ( $SD=6.01$ ). Of the 683 participants who completed the SI item, a quarter (25.6%) reported SI.

### Independent correlates of suicidal ideation

EDE-Q Global and all subscales, binge eating, vomiting, laxative use, all co-morbid psychopathology indices, and all other ED-related constructs were significant correlates of SI (See Table 1). The only exceptions were that, compared to no compulsive exercise in the previous 28 days, neither category of compulsive exercise (i.e., 1–7 or 8 episodes) was significantly associated with greater risk of SI.

### Strongest correlates of suicidal ideation

After all independently significant variables (with the exception of the weight/shape concerns score) were entered into the multivariate regression model, only depression, anxiety, and vomiting remained as significant correlates of SI (See Table 2). Controlling for other variables in the final model, each one standard deviation ( $SD$ ) increase in the modified PHQ-9 score was associated with a 153% increase in odds of SI (OR=2.53; 95% CI [1.90–3.39]), and each one  $SD$  increase in the PROMIS anxiety scale score was associated with a 65% increase in odds of SI (OR=1.65; 95% CI [1.23–2.23]). Participants who vomited one or more times in the last month had 99% greater odds of SI (OR=1.99; 95% CI [1.30–3.06]).

## Discussion

This study identified correlates of SI in a large sample of college women with EDs. Nearly all psychosocial variables that were tested, with the exception of compulsive exercise, were associated with SI. Although this latter finding is in direct contrast with Smith et al. (2013), in which the authors found that over-exercising was associated with disordered eating among college students (not exclusively female), this discrepancy may be attributed to the fact that the current study and Smith et al. (2013) assessed compulsive exercise using different versions of the EDE-Q. The items assessing exercise are worded differently between the two versions, and thus, may have been interpreted differently by participants. Furthermore, Smith and colleagues (2013) also used a multi-item measure exclusively designed to assess compulsive exercise, which may have strengthened their overall findings. Future studies should aim to clarify the relationship between compulsive exercise and suicidality among college students both at-risk of and with EDs.

The multivariate model identified depression, anxiety, and vomiting as being the strongest correlates of SI for the sample. Contrary to our expectations informed by previous research

(Mayes et al., 2014; Pigeon, Piquart, & Conner, 2012), insomnia was not significantly associated with SI after accounting for the effects of depression and anxiety. While depression has been consistently found to be a driver of suicidality among those with EDs (Franko & Keel, 2006; Milos et al., 2004), the present study extended these findings by demonstrating that depression, uninfluenced by sleep disturbance, is still strongly associated with SI.

Additionally, few studies have analyzed the relationship between anxiety and SI within ED populations. While Mayes and colleagues (2014) found that anxiety alone was not correlated with SI for children with EDs, Milos and colleagues (2004) discovered a strong association between current SI and anxiety disorders among their clinical sample of German women with EDs. Thus, our results both confirm and extend the findings of Milos et al. (2004) by demonstrating that the relationship between SI and anxiety is maintained for college women with EDs, even after controlling for other factors in a multivariate analysis. Given that EDs and anxiety disorders are highly co-morbid (Klump, Bulik, Kaye, Treasure, & Tyson, 2009), reducing co-occurring anxiety among college women with EDs may also have the added benefit of reducing SI as well.

Last, although binge eating, vomiting, and laxative use were independently associated with SI, the presence of vomiting remained as the only ED-specific contributor to SI in the multivariate model. While purging behaviors have been linked with suicidal attempts in adult women with EDs (Franko & Keel, 2006; Pisetsky et al., 2013), few studies (Favaro & Santonastaso, 1996; Laasko, Hakko, Rasanen, Riala, & STUDY-70 Workgroup, 2013) have isolated vomiting as a unique correlate of suicidality in this population. It is possible that in college women with binge-spectrum presentations, vomiting may be triggered by greater impulsivity, a trait associated with greater suicidal behaviors (Nock et al., 2010).

The current study had a number of limitations. First, although single items have been used to assess SI in past work (Eichen et al., 2016), the measurement of this variable is less comprehensive than if we had used an instrument singularly designed to assess SI. Next, the cross-sectional design of this study restricts our understanding of longitudinal predictors of SI in college women with EDs. Thus, future studies should be designed to help clarify the nature of these relationships over time. Additionally, future research should replicate this study with individuals across diverse gender backgrounds.

To the best of our knowledge, this is the first study to identify correlates of SI in a large sample of college women with EDs. Findings point to new directions for SI detection, prevention, and treatment among college populations. Given that SI is a robust risk factor for suicidal behaviors and functional impairment, early targeting of SI may serve as an important public health benefit for this vulnerable population. Since patients do not always report SI (Schulberg, Bruce, Lee, Williams, & Dietrich, 2004), findings suggest that depression, anxiety, and vomiting should be assessed and addressed in college women with EDs to reduce risk of SI.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**Table 1**  
Univariate analyses: logistic regression models to identify independent correlates of suicidal ideation.

Variable	$\beta$ (SE <sup>†</sup> )	Wald	OR <sup>‡</sup>	p	95% CI <sup>§</sup> [lower, upper]
ED Psychopathology					
EDE-Q Global	.84 (.12)	60.37	2.32	<.001	[1.88, 2.87]
EDE-Q Weight Concern	.79 (.11)	50.39	2.20	<.001	[1.77, 2.73]
EDE-Q Shape Concern	.82 (.12)	48.05	2.26	<.001	[1.80, 2.85]
EDE-Q Eating Concern	.74 (.10)	54.70	2.10	<.001	[1.73, 2.56]
EDE-Q Restraint	.46 (.09)	24.16	1.58	<.001	[1.32, 1.90]
ED Behaviors <sup>¶</sup>					
Binge Eating	.20 (.09)	5.63	1.22	.018	[1.04, 1.44]
Vomiting	.82 (.19)	18.95	2.27	<.001	[1.57, 3.29]
Laxative Use	.48 (.22)	4.77	1.61	.029	[1.05, 2.47]
Compulsive Exercise					
1–7 episodes	.03 (.21)	.02	1.03	.893	[-.68, 1.55]
8 episodes	.39 (.22)	3.22	1.47	.073	[-.97, 2.24]
Other ED-Related Constructs					
Weight/Shape Concerns	.42 (.10)	18.76	1.52	<.001	[1.26, 1.84]
Clinical Impairment (CIA)	.90 (.11)	74.30	2.46	<.001	[2.01, 3.03]
BMI	.20 (.08)	5.63	1.22	.018	[1.04, 1.43]
Comorbid Psychopathology					
Depression (modified PHQ-9)	1.27 (.12)	120.46	3.54	<.001	[2.83, 4.44]
Anxiety (PROMIS)	1.16 (.12)	98.01	3.18	<.001	[2.53, 4.00]
Insomnia (ISI)	.61 (.09)	45.54	1.85	<.001	[1.55, 2.21]

Note.

<sup>†</sup> SE = standard error;

<sup>‡</sup> OR = odds ratios;

<sup>§</sup> CI = confidence intervals; EDE-Q = Eating Disorder Examination-Questionnaire; BMI = body mass index;

<sup>¶</sup> Binge eating is reported in terms of frequency while vomiting, laxative use, and compulsive exercise are categorical variables; Continuous variables scale scores were converted to Z-scores before being entered into the logistic regression analyses to facilitate comparability of effects of each of these hypothesized risk factors on odds of suicidal ideation.

**Table 2**

Multivariate analyses: backward binary logistic regression analysis to identify the strongest correlates of suicidal ideation.

Variable	$\beta$ (SE <sup>†</sup> )	Wald	OR <sup>‡</sup>	p	95% CI <sup>§</sup> [lower, upper]
Final Model					
(Constant)	-1.64 (.14)	140.00	.195	<.001	
Depression (modified PHQ-9)	.93 (.15)	38.69	2.53	<.001	[1.89, 3.39]
Anxiety (PROMIS)	.50 (.15)	10.98	1.65	.001	[1.23, 2.23]
Vomiting	.69 (.22)	9.86	1.99	.002	[1.30, 3.06]

Note.

<sup>†</sup>SE = standard error;

<sup>‡</sup>OR = odds ratios;

<sup>§</sup>CI = confidence intervals; Continuous variables scale scores were converted to Z-scores before being entered into the logistic regression analyses to facilitate comparability of effects of each of these hypothesized risk factors on odds of suicidal ideation.