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## Psychological Impairment as a Predictor of Suicidal Ideation in Individuals with Anorexia Nervosa

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### Abstract

Anorexia nervosa (AN) is an eating disorder characterized by severe food restriction resulting in low body weight and an intense fear of gaining weight. This disorder has one of the highest suicide rates of any psychiatric illness; however, few studies have investigated prospective predictors of suicidal ideation (SI) in this population. Quality-of-life impairment may be particularly relevant for understanding suicide risk in AN, given associations with SI in other psychiatric disorders and associations with chronicity and severity in AN. The current study explored associations between eating-disorder related impairment and SI in individuals with AN (n=113) who completed assessments at treatment discharge and 3, 6, and 12 months after discharge. Greater psychological impairment predicted future occurrence of SI controlling for age, depression, history of SI, and eating-disorder variables. Associations were specific to psychological impairment as other domains of impairment did not predict SI over time. Findings highlight the potential importance of targeting interpersonal-psychological consequences of AN to decrease future suicide risk.

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Anorexia nervosa (AN) is an eating disorder characterized by severe food restriction resulting in low body weight, an intense fear of gaining weight, and overvaluation of shape/weight for one's self-evaluation (American Psychiatric Association, 2013). This disorder is among the deadliest of any psychiatric illness with increased mortality due to both medical complications and suicide (Arcelus, Mitchell, Wales, & Nielsen, 2011; Preti, Rocchi, Sisti, Camboni, & Miotto, 2011). Despite high prevalence of suicidal ideation (SI) and behaviors (i.e., suicidality) (Bulik et al., 2008; Franko & Keel, 2006; Preti et al., 2011) in individuals with AN, few prospective studies have examined predictors of suicidality in this population (Franko & Keel, 2006) with none focused on SI.

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One factor that has received attention in the eating disorders field and may be relevant to SI in AN is poor quality-of-life. It is well-documented that individuals with eating disorders have difficulties in a variety of domains of functioning (e.g., psychological, social, physical, work) and that eating disorder behaviors contribute directly to these impairments (Engel et al., 2006). Furthermore, poor quality-of-life has been proposed as an important indicator of severity in eating disorders (Wildes et al., 2017; Wonderlich et al., 2012), and evidence suggests that severity and chronicity of AN play a role in increased suicide risk in this population (Favaro & Santonastaso, 1997; Fennig & Hadas, 2010). Poorer quality-of-life may contribute to feelings of hopelessness, burdensomeness, and desires to escape reality, and thus, represent one mechanism through which eating disorder severity and chronicity may foster increases in SI (Ribeiro, Bodell, Hames, Hagan, & Joiner, 2013).

In support of the potential role of quality-of-life-impairment in the prediction of SI in individuals with AN, research has found a more general link between quality-of-life impairment and suicidality in other populations. For example, in a community sample of adults, greater dissatisfaction with life predicted a 3-fold increase in suicide risk across a 20-year period (Koivumaa-Honkanen, Honkanen, Viinamaki, Heikkila, Kaprio, & Kosenvuo, 2001). Furthermore, poorer quality-of-life has been associated with suicide attempts and ideation in individuals with schizophrenia, depression, or bipolar disorder (Berlim, Mattevi, Pavanello, Caldieraro, Fleck, 2003; Kasckow et al., 2007; Nabuco de Abreu et al., 2012), but the majority of these studies have been cross-sectional. Little is known about the temporal relationship between quality-of-life impairment and SI in clinical samples or whether impairment in different facets of quality-of-life is differentially related to suicide risk. Understanding the relative importance of specific facets of quality-of-life impairment has potential implications for guiding targeted interventions for individuals with SI.

No studies have examined associations between quality-of-life impairment and SI in individuals with AN, including whether or not specific facets of impairment are more or less important in the prediction of SI. Given general associations found in prior studies of psychiatric illnesses, we hypothesized that greater quality-of-life impairment in all domains would be associated with onset of SI in a sample of patients with AN.

## Method

### Participants

Participants were enrolled in a longitudinal study of patients receiving inpatient or day hospital treatment for AN (Wildes, Forbush, & Markon, 2013; Wildes et al., 2011). In order to focus on the prospective prediction of SI, only participants who denied SI at admission and had follow-up data were included (N= 113/194).<sup>1</sup> The average age of the sample was 26.3 years (range = 16–61) and 93.8% were female. Approximately 95.6% were Non-Hispanic White, 1.8% Asian, 0.9% Black, and 1.8% multi-racial. Five participants identified as Hispanic. Fifty participants met criteria for the binge-eating/purging subtype. The mean

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<sup>1</sup>As described in the measures, SI at admission was assessed by the Beck Depression Inventory-II Suicidal Thoughts and Wishes item. Individuals who indicated having thoughts of suicide (i.e., score of 1 or higher on this item) were excluded.

duration of AN was 7.9 years (range = 0–39). Although none of the participants endorsed SI at admission, 24.8% (n = 28) reported lifetime history of suicidality.

## Procedures and Measures

The local Institutional Review Board approved all procedures, and informed consent (or assent for participants under 18 years) was obtained prior to any research participation. Participants completed questionnaire and interview assessments within two weeks of admission and discharge and at 3-, 6-, and 12-months post-discharge (Racine & Wildes, 2015; Wildes et al., 2013). Participants received monetary compensation for their research participation.

**Suicidal Ideation**—SI at treatment admission, discharge, and 3-, 6-, and 12-months post-discharge was assessed using the Suicidal Thoughts and Wishes item from the Beck Depression Inventory-II (item nine; Beck, Steer, & Brown, 1996). This item asks participants to indicate which of the following four statements best describes how they have been feeling over the past two weeks: 0) I don't have any thoughts of killing myself; 1) I have thoughts of killing myself but I would not carry them out; 2) I would like to kill myself; and 3) I would kill myself if I had the chance. This item was dichotomized as absent (i.e., I don't have any thoughts of killing myself) or present (i.e., the three latter responses [1–3]) to assess the presence of SI at each assessment point.

Lifetime SI was assessed using a dichotomous single item from the Mood Spectrum Self-Report Questionnaire (i.e., “In the course of your life...have you wanted to die or hurt yourself”) (Cassano et al., 1999). Responses to this item were included as a covariate in analyses to control for history of SI.

**Eating Disorder Diagnosis and Symptom Severity**—The Eating Disorder Examination (EDE) (Fairburn, Cooper, & O'Connor, 2008) is a semi-structured interview frequently used to assess eating disorder symptoms. It comprises a global severity score as well as four subscale scores (i.e., dietary restraint, shape, weight, and eating concerns). Both the EDE and the Structured Clinical Interview for DSM-IV-TR Axis-I Disorders (SCID) (First, Spitzer, Gibbon, & Williams, 2007) were used to confirm AN diagnosis and subtype. The SCID also assessed age of onset, which was used to calculate illness duration. EDE Global scores (Fairburn et al., 2008) indexed ED symptom severity. Psychometric properties for the EDE Global score were excellent (Cronbach's alphas across assessments = .94).

**Quality-of-Life Impairment**—Eating Disorder Quality of Life (EDQOL) (Engel et al., 2006) is a 25-item measure designed to assess eating-disorder specific health-related quality-of-life across four domains: psychological, physical/cognitive, financial, and work/school. The psychological subscale includes nine items related to how the eating disorder has impacted thoughts and feelings about oneself (e.g., “how often has your eating/weight...” “...made you not want to be with people,” “...made you feel lonely,” “...resulted in your feeling embarrassed or different”). The six-item physical/cognitive subscale assesses perceived impact of the eating disorder on physical symptoms and cognitive capacity (e.g., “how often has your eating/weight...” “...reduced your ability to concentrate,” “...caused

weakness”). Both the financial and school/work subscales consist of five items that assess how the eating disorder has impacted one’s financial situation or performance at work or school, respectively (e.g., “how often has your eating/weight...” “...led to you having difficulty paying monthly bills,” “...resulted in significant financial debt,” “...led to a leave of absence from work,” “...led to low grades”). All items were scored on a five-point scale, with higher scores indicating greater quality-of-life impairment. Associations between SI and all subscales were examined to evaluate specificity of impairment in relation to SI. The EDQOL has demonstrated good psychometric properties in prior studies (Engel et al., 2006) and in the current study ( $\alpha=.74-.95$  across subscales and assessments).

**Body Mass Index (BMI)**—BMI was calculated at each assessment using objectively measured height and weight ( $\text{kg}/\text{m}^2$ ). For participants who completed follow-up assessments by telephone and mail, height and weight were obtained from a health professional or self-report (Wildes et al., 2013).

**Depression**—The presence of current major depressive disorder (MDD) was assessed by the SCID (First et al., 1995), which is a semi-structured clinical interview that determines DSM-IV-TR diagnostic criteria for a range of psychiatric illnesses. MDD at admission (0=absent; 1=present) was included as a covariate in analyses to control for the influence of depression on SI.

### Statistical Analysis

Generalized linear mixed-effect (GLM) models with logit link (PROC GLIMMIX SAS 9.4) determined the influence of quality-of-life impairment on probability of SI across treatment and in the year following treatment discharge. Two distinct models examined concurrent or prospective associations between impairment and SI. In the first model, scores at each assessment were used to predict SI at the concurrent assessment (e.g., impairment at discharge predicting SI at discharge). In the second model, scores at each previous assessment were used to predict SI at the subsequent assessment (e.g., impairment at discharge predicting SI at 3-month follow-up). AN subtype, age, illness duration, history of SI, and MDD at admission were included as fixed-covariates; ED severity and BMI were included as time-varying covariates. Analyses were repeated for each EDQOL subscale to assess the specificity of facets of quality-of-life impairment in predicting SI. Alternative mixed-effect models also were conducted to explore whether SI was associated with quality-of-life impairment over time. The Benjamini-Hochberg procedure was used to control for Type I error (Benjamini & Hochberg, 1995).<sup>2</sup> Power calculations for logistic regression indicated that with a probability of SI between 10–20%, our sample size ( $n=113$ ) would enable detection of odds ratios between 1.90 and 2.4 with power 0.80 at a significance level of .05.

Response rates were high across follow-up assessments (range 79–90%). Individuals with missing data had lower baseline EDE global scores compared to individuals with complete data (2.9 vs. 2.3;  $p=.04$ ) but no other differences were found. Furthermore, Little’s MCAR

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<sup>2</sup>Results were unchanged with or without the Benjamini-Hochberg adjustment for Type-I error.

test indicated that data were missing at random ( $\chi^2 = 31.8, p > .38$ ), and pseudo likelihood maximization or restricted maximum likelihood approaches were used to account for missing data in analyses.

## Results

Table 1 provides descriptive statistics for time-varying variables. Approximately 30% ( $n=24$ ) of participants endorsed SI during treatment or in the year following treatment discharge. Among individuals who endorsed SI during the study period, 17 were new onset cases (i.e., denied lifetime SI at admission).

In the concurrent analysis, psychological impairment was associated with SI across time (Table 2), with a 3-fold increased odds of SI with every unit increase in impairment (odds ratio[OR] = 3.37 [1.85–6.12]). In the prospective analysis, there was a significant interaction between impairment and time, indicating that the influence of impairment on SI depended on the time point assessed ( $F = 3.65; p = .01$ ); psychological impairment at 3- and 6-months increased probability of SI at the subsequent assessment ( $OR = 2.70$  [1.09–6.66];  $OR = 3.89$  [1.35–11.19]) (Table 2).

In addition to the psychological subscale, the physical/cognitive subscale significantly correlated with SI ( $\beta = 0.71, SE = .18, p < .001$ ), but no additional subscales correlated with or predicted SI.

Given the potential influence of SI on subsequent impairment, alternative models were conducted in which SI and psychological impairment were switched as the predictor and outcome variables. SI was concurrently associated with psychological impairment ( $\beta = .39, p = 0.0002$ ); however, it did not predict impairment in the time-lagged analysis ( $\beta = -0.10, p = .29$ ).

## Discussion

This study was the first to examine associations between quality-of-life impairment and future occurrence of SI in individuals with AN. The use of a cross-lagged design to understand risk factors for SI in this population is a novel contribution to the literature. Psychological impairment predicted SI between three and six months and six and 12 months after discharge. Physical/cognitive impairment also was correlated significantly with SI; however, psychological impairment was the only domain that predicted future SI. Finally, the occurrence of SI did not predict future impairment, providing evidence for the temporal nature of this relationship.

Impairment in the psychological domain in relation to suicide risk is consistent with several theories of suicide and posited links between psychopathology and suicide risk. For example, the interpersonal theory of suicide (IPTS) (Joiner, 2007; Van Orden et al., 2010) posits that interpersonal-psychological factors, namely perceived burdensomeness and thwarted belongingness (e.g., loneliness), are potent predictors of SI, and eating disorder symptoms themselves may contribute to impairment in these psychological domains (Bodell, Joiner, & Keel, 2013; Engel et al., 2006). Indeed, several studies have noted cross-

sectional associations among eating disorder symptoms, perceived burdensomeness, thwarted belongingness, and suicide risk in college-based and clinical eating disorder samples (Dodd, Smith, & Bodell, 2014; Forrest et al., 2016; Kwan, Gordon, Carter, Minnich, & Grossman, 2016). Items on the psychological subscale of the EDQOL reflect both inner- and interpersonal factors impacted by the eating disorder including loneliness, embarrassment, and hopelessness that may, in turn, influence SI. It is possible that social isolation associated with extreme dietary restriction directly impacts loneliness or that the stigma surrounding EDs and the public nature of AN once recognized may increase perceptions of embarrassment or burdensomeness. Lengthy illness duration and multiple treatment admissions can influence caregivers' distress (Ohara et al., 2016; Raenker et al., 2013), which also may increase patients' perceptions of burdensomeness and overall psychological impairment. Thus, consequences of AN may leave individuals vulnerable to increased psychological impairment and subsequent SI.

The current study suggests that treatments that specifically target psychological impairment including behavioral activation, provider outreach, and cognitive restructuring (Ribeiro, Bodell, Hames, Hagan, & Joiner, 2013) may be beneficial for individuals with AN and SI. Additionally, inclusion of adjunctive support or treatment for caregivers may decrease caregivers' and patients' own psychological impairment. Research suggests positive effects of caregiver skills training interventions on AN treatment outcome, (Macdonald et al., 2014; Magill et al., 2016; Salerno et al., 2016) and future studies examining whether such interventions influence patient suicide risk may be fruitful.

The current study had notable strengths, including a relatively large clinical sample and longitudinal design, which allowed for examination of temporal associations. Although the short-term longitudinal design fills a significant gap in the literature, the duration between follow-up time points may limit generalizability for clinicians who need tools to improve prediction of suicide risk within weeks, days, or hours. Still, these data provide novel information on potential targets for decreasing future SI. Despite these strengths, this study was limited by the use of a single-item assessment of current SI (Hom, Joiner, & Bernert, 2016), and our assessment of lifetime SI could have included ideation episodes related to both suicidal and non-suicidal self-injury. Additionally, correlates of SI onset across inpatient or day hospital treatment may not generalize to outpatient samples. Furthermore, although we controlled for MDD at admission, depression was not associated significantly with onset of SI in the current study. This finding is surprising given the robust relationship between depression and SI and may reflect the dichotomous measurement of depression or severity of this particular sample. Indeed, changes in symptoms of depression across time may be among the most important correlates of suicidal ideation. If so, thorough assessment and treatment of ongoing depression may be a key target for reducing suicidal ideation in individuals with AN. Future longitudinal studies should include assessments of both depression and psychological impairment to improve understanding of their unique roles in predicting suicidal ideation in this population.

Furthermore, future research is needed to inform proximal prediction of suicide risk. Among psychiatric populations, suicide risk increases significantly after hospital discharge, (Olfson et al., 2016) and this time period also may be vulnerable for individuals with AN as they



transition from a treatment setting to “real life.” Indeed, of the participants who developed SI in the current study (n=34), the majority (n=21; 62%) endorsed SI either at the discharge or 3-month post-discharge assessment. Thus, replication and extension of risk factors associated with suicidality shortly after treatment discharge is imperative. Additionally, future research should examine whether risk factors differ across EDs and whether changes in such factors predict change in suicidality risk over time. Finally, chronic SI is commonplace among individuals with EDs; gaining knowledge about factors that increase risk among this sub-sample of high-risk individuals may be critical to preventing suicide.

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**Table 1**

Means and Standard Deviations of Study Variables at Each Assessment Point

	Admission			Discharge			3-month			6-month			12-month		
	M (range)	SD		M (range)	SD		M (range)	SD		M (range)	SD		M (range)	SD	
EDE Global	2.7 (0-5.4)	1.5		2.1 (0-4.8)	1.4		2.3 (0-5.0)	1.5		2.1 (0-5.4)	1.4		1.9 (0-4.9)	1.4	
EDQOL Psychological	2.6 (0-4.0)	0.9		2.2 (0-3.9)	1.0		2.2 (0-3.9)	1.0		2.2 (0-4.0)	1.0		2.0 (0-4.9)	1.0	
EDQOL Physical/Cognitive	2.3 (0.17-4)	0.9		1.5 (0-4.0)	1.0		1.5 (0-4.0)	1.1		1.4 (0-4.0)	1.0		1.4 (0-3.5)	1.1	
EDQOL Financial	0.9 (0-3.8)	1.1		0.7 (0-4.0)	0.9		0.8 (0-3.8)	1.0		0.7 (0-4.0)	1.0		0.5 (0-3.6)	0.9	
EDQOL Work/School	1.2 (0-4.0)	1.0		0.9 (0-4.0)	1.0		0.8 (0-4.0)	1.1		0.7 (0-4.0)	1.0		0.6 (0-4.0)	1.0	
Body Mass Index	15.4 (9.4-18.4)	1.9		18.1 (12.1-22.4)	1.6		17.7 (11.3-23.4)	2.3		17.6 (9.6-23.7)	2.6		17.9 (11.6-24.6)	2.8	
Suicidal Ideation*	0 (0%)			15 (14.9%)			16 (16.7%)			16 (16.3%)			12 (13.6%)		

Notes. EDE=Eating Disorder Examination; EDQOL= Eating Disorder Quality of Life Questionnaire; M=mean; SD=standard deviation;

\* represents number of participants who endorsed suicidal ideation (% of participants with complete data)

**Table 2**

Results from Generalized Linear Mixed Effect Models of Concurrent and Prospective Associations between Psychological Impairment and Suicidal Ideation

Variable	Estimate ( $\beta$ )	SE	<i>p</i>	
Concurrent Associations				
Age	-0.01	0.03	0.68	
Illness Duration	-0.04	0.03	0.25	
AN Subtype	0.10	0.35	0.78	
History of Suicidal Ideation	0.37	0.39	0.35	
Baseline Major Depressive Disorder (MDD)	0.23	0.37	0.52	
Eating Disorder Severity (EDE Global)	0.28	0.16	0.08	
Body Mass Index	0.09	0.09	0.27	
<b>Psychological Impairment (EDQOL)</b>	<b>1.21</b>	<b>0.30</b>	<b>&lt;.001</b>	
Prospective Associations <sup>**</sup>				
	Estimate ( $\beta$ )	SE	<i>p</i>	CI
Psychological Subscale at Admission on SI at Discharge	-0.14	0.38	0.72	-0.89-.62
Psychological Subscale at Discharge on SI at 3-months	-0.18	0.32	0.57	-0.81-.44
<b>Psychological Subscale at 3-months on SI at 6-months</b>	<b>0.99</b>	<b>0.46</b>	<b>0.03</b>	<b>0.09-1.90</b>
<b>Psychological Subscale at 6-months on SI at 12-months</b>	<b>1.36</b>	<b>0.54</b>	<b>0.01</b>	<b>0.30-2.42</b>

Note: EDE= Eating Disorder Examination Interview, Global Subscale; EDQOL=Eating Disorder Quality of Life Questionnaire Psychological Subscale; SE= Standard Error; SI= Suicidal Ideation; MDD coded as 0=absent 1=present;

<sup>\*\*</sup> covariates were included in the prospective analysis but not included in the table for simplicity—none of the covariates were statistically significant, and results were similar to those in concurrent analysis.