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Associations of suicide risk with emotional reactivity, dysregulation, and eating disorder treatment outcomes

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Abstract

Introduction: Emotional processes play a role in both suicide risk and eating disorders (EDs), which are often comorbid. However, limited research has explored how emotional processes relate to suicide risk in EDs and the prognostic value of suicide risk for ED treatment. Thus, the current study examined associations between emotion dysregulation and reactivity with suicide risk in patients with EDs, and determined if suicide risk predicts ED treatment outcomes.

Methods: Participants (n = 201) were adults in an ED partial hospitalization program who completed measures at admission, 1-month post-admission, and discharge.

Results: When controlling for depressive symptoms, limited access to adaptive emotion regulation strategies, difficulties engaging in goal-oriented behaviors, and engaging in impulsive behavior when experiencing negative emotions (i.e., emotion dysregulation) were associated with suicide attempt frequency. Depressive symptoms were associated with suicide risk severity, while emotion dysregulation and reactivity were not. Importantly, patients with elevated suicide risk at admission improved comparably to other risk categories across treatment, despite presenting with greater ED symptoms at admission.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

ETHICS STATEMENT

All study procedures were approved by the IRB at University of California San Diego.

PATIENT CONSENT STATEMENT

All study participants completed informed consent prior to engaging in any study activities.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Conclusion: Emotion dysregulation and depression are salient factors when examining suicide risk in patients with EDs. Suicide risk and attempt history may not negatively impact ED treatment outcomes when using emotion-focused treatment.

Keywords

eating disorders; emotional reactivity; emotion regulation

INTRODUCTION

Suicide is the 10th leading cause of death in the United States (Centers for Disease Control and Prevention, n.d.) and is common across transdiagnostic forms of psychopathology (Bolton et al., 2015). Suicidal ideation, nonfatal attempts, and fatal attempts are particularly common among individuals with eating disorders (EDs; Arcelus et al., 2011; Crow et al., 2009; Smink et al., 2012; Smith et al., 2019), and people with EDs are 7 to 18 times more likely to die by suicide compared to the general population (Smith, Zuromski, et al., 2018). Despite increased risk for suicidality in EDs, emotional processes that may contribute to the co-occurrence of these phenomena, and the prognostic value of suicide risk in predicting treatment outcomes for EDs remain poorly understood. Transdiagnostic emotional factors, such as emotional reactivity and emotion dysregulation, could be associated with increased risk for suicide (i.e., suicidal ideation, thoughts, plans, and attempts) in EDs. Indeed, difficulties in emotion regulation have been observed across EDs (Anderson et al., 2018; Brown et al., 2020; Lavender & Anderson, 2010), and individuals with histories of suicidal thoughts and behaviors (Law et al., 2015; Rajappa et al., 2012). Critically, identifying transdiagnostic factors associated with both suicidality and disordered eating would provide treatment targets that could reduce both sets of symptoms and increase psychosocial functioning.

Emotion, EDS, and suicide

Linehan's biosocial model of severe emotion dysregulation provides a theoretical context for the relationship between emotion, suicidal thoughts/behaviors, and ED behaviors. This model posits that vulnerability factors (e.g., emotional reactivity and temperament) transact with negative environmental/social interactions (i.e., emotional invalidation—patterns of rejection or dismissal of another's emotions) to confer risk for difficulties regulating emotions (Linehan, 2014). Oftentimes, unskillful efforts to inhibit emotional expressions result in maladaptive escape behaviors such as suicide attempts (Crowell et al., 2009; Linehan, 2014) and ED behaviors (Linehan & Chen, 2005). Work stemming from theoretical models for suicide (Anestis et al., 2011) and EDs (Rieger et al., 2010) propound that social/interpersonal processes (e.g., negative evaluation, perceived burdensomeness, and thwarted belongingness) are associated with experiences of negative emotions and when coupled with difficulties in regulating emotions, are associated with suicidal desire and EDs (see Anestis et al., 2011; Rieger et al., 2010). Thus, theoretical models and empirical evidence suggest that emotion dysregulation may be related to both suicidality and EDs, which may contribute to their disproportionate comorbidity. Though difficulties in emotion regulation have been well documented in people with EDs (Anderson et al., 2018), people engaging in multiple self-damaging behaviors (e.g., suicide attempts and disordered eating) may

experience greater difficulties modulating negative emotions than people only engaging in disordered eating.

To our knowledge, four studies have examined the relationship between emotion dysregulation and suicide attempts in EDs, with only one examining suicidal ideation. Pisetsky et al. (2017) found in a sample of adults-seeking treatment for a range of EDs that there were no differences across various facets of emotion dysregulation between individuals who had previously attempted suicide compared to those who had not. Conversely, among patients with bulimia nervosa, Gómez-Expósito et al. (2016) found that patients with histories of suicide attempts presented with elevated facets of emotion regulation difficulties compared to those without, with the exception of emotional awareness. Finally, in two studies of patients with EDs, individuals with a history of suicide attempts (Rania et al., 2021; Smith, Forrest, et al., 2018) and past-year suicidal ideation (Rania et al., 2021) reported low access to adaptive emotion regulation strategies compared to those without. Heterogeneity across previous research designs, as well as differences in assessments of EDs and suicidality may account for the mixed findings in previous literature. Importantly, prior research dichotomized suicidal ideation and attempt histories without consideration for other nuances in suicidality (e.g., frequency of suicide attempts, suicide plan, and stressors), which factor into suicide risk severity on a continuum and may be related to greater emotional dysfunction and/or ED symptoms. Accounting for these nuances is critical to further research on the role of emotion regulation in the link between EDs and suicidality.

One factor that has been neglected in previous research on the relationship between suicidality and EDs is emotional reactivity. Emotional reactivity refers to the predisposition to be sensitive to broad ranges of emotional stimuli, respond intensely to stimuli, and experience a slow return to baseline following emotional arousal (Davidson, 1998; Klonsky et al., 2019; Nock et al., 2008). Extant literature has shown greater subjective emotional reactivity among individuals with a history of suicidality as well as in patients with EDs (Nock et al., 2008). Emotional reactivity has been theorized to confer risk for emotion regulation difficulties (Linehan, 2014), and thus may also influence emotion dysregulation and suicidality in individuals with EDs.

Suicidality and treatment prognosis

Given that patients with EDs and suicidal ideation present with significantly greater ED symptom severity compared to patients without suicidal ideation (Gómez-Expósito et al., 2016; Perry et al., 2021), it is imperative to identify treatments that provide advantageous outcomes for both EDs and suicidality. Treatments that target emotion regulation, such as dialectical behavior therapy (DBT) have been hypothesized to reduce suicide risk and ED symptoms. Both EDs and suicide are negatively reinforced and are often characterized by skills deficits related to emotion regulation, which can result in self-damaging behaviors (Rania et al., 2021). One aspect of evidence-based practice requires assessment of psychiatric symptoms. As such, level of suicide risk (e.g., low, moderate, and high) is often assessed as part of routine clinical practice; however, the utility of the suicide risk classification system is rarely used to predict treatment response/outcomes in different treatment populations, including in EDs. One finding suggests that pre-treatment

suicidal ideation is predictive of poor treatment prognosis in cognitive behavioral therapy (CBT) for unipolar depression (Von Brachel et al., 2019). However, DBT is a third-wave CBT developed on the foundation of the biosocial model, which targets suicidality by enhancing emotion regulation skills, and has improved treatment outcomes for people engaging in life-threatening behaviors (Linehan, 2014; Linehan et al., 1991) and EDs (Ben-Porath et al., 2020). Given that emotion regulation and eliminating self-damaging behaviors are core treatment targets in DBT, pretreatment suicide risk might not be predictive of poorer treatment outcomes for patients with EDs as it is in CBT for unipolar depression. Preliminary results from a case series of DBT for women diagnosed with bulimia nervosa or binge ED indicated moderate effect sizes for reductions in suicidal behavior and large effect sizes for ED symptoms, suggesting that DBT dually addresses these concerns in patients with EDs (Chen et al., 2008). The efficacy of DBT in reducing these symptoms may be attributable to changes in emotion regulation abilities. To our knowledge, no studies have examined whether differing suicide risk levels (e.g., low, moderate, and high) are predictive of ED treatment outcomes. It is important to understand whether this commonly used categorical system for indexing suicide risk provides prognostic value, especially in high-risk groups such as those with EDs.

The current study had two goals. First, we aimed to examine the relationships between emotion dysregulation and emotional reactivity (within a subset of our sample) with suicide risk severity and the frequency of lifetime suicide attempts. Given the theoretical support from the biosocial model for severe emotion dysregulation we hypothesize that emotion dysregulation and reactivity will be associated with suicide risk severity and the frequency of lifetime suicide attempts in patients with EDs. Similar to previous findings, we hypothesize that the DERS Strategies subscale would be associated with higher continuous suicide risk and more frequent suicide attempts in a sample of patients with EDs. However, given the mixed findings from previous studies, we did not have additional a priori hypotheses as to how the other DERS subscales, excluding DERS Strategies, would be associated with continuous suicide risk and attempt frequency. We also hypothesized that emotional reactivity may be associated with higher suicide risk and greater suicide attempts in patients with EDs, given that previous research has demonstrated that emotional reactivity is associated with greater suicide risk and disordered eating (Nock et al., 2008). Consistent with our first aim, in our second aim, we sought to determine whether pre-treatment suicide risk severity and attempts predicted ED symptom outcomes in a DBT-based treatment program. We hypothesized that suicide risk severity at treatment admission would not be associated with poor treatment prognosis in our transdiagnostic ED sample, given the specialized targets of DBT (emotion regulation and life-threatening behaviors).

METHODS

Participants & procedures

Participants were adults (n = 201) with EDs receiving treatment in a DBT-based partial hospitalization program (PHP) at an academic medical center between October 2016 and January 2021. A majority of the current sample (n = 133, 66.2%) reported some degree of suicide risk (i.e., ideation, planning, and prior suicide attempts).

All study procedures were approved by the Institutional Review Board at University of California San Diego. Within 14 days of admission, participants were provided with written and informed consent and completed clinical interviews and self-report questionnaires. The present study used data from three time points: admission, within 30 days of admission (i.e., 1-month in treatment), and within 14 days of discharge from treatment. Patients admitted to the DBT-based PHP program received individual, family, and group therapy for 6–10 h/day, up to 6 days/week depending on illness acuity. As patients improved, they stepped down to intensive outpatient (4 h/week) before being discharged to outpatient care. For more information regarding the PHP program, please see Brown et al. (2018).

Measures

Diagnostic interview—At admission, ED diagnoses were determined using the Structured Clinical Interview for the DSM-5 (SCID-5-RV; First et al., 2015) or the Mini Neuropsychiatric Interview 7.0 (MINI; Sheehan et al., 1998). Diagnostic assessments were conducted by bachelor's-level research assistants or doctoral-level students. All interviewers completed an intensive training protocol and were supervised by two clinical psychologists with expertise in diagnostic assessment. Weekly 1-h group supervision was held by a licensed clinical psychologist where consensus for all diagnoses was determined.

Suicidality—To assess suicide risk for the month prior to admission, the MINI suicidality module was administered to patients (Sheehan et al., 1998). The MINI assesses suicidal ideations, plans, and intent within the past month, as well as lifetime suicide attempts. Each response is given a point value, and the total is used to classify participants into three clinical risk categories: low risk (1–8 points), moderate risk (9–16 points), and high risk (≥17). Participants for the current study that scored zero were categorized as "no reported risk". Total scores from the interview can range from 0 to 160 (higher scores indicating greater suicide risk), and previous studies support the use of continuous total scores as a measure of suicide risk severity (see Roaldset et al., 2012). In addition to indexing suicide risk severity, the MINI also assesses the presence and frequency of lifetime suicide attempts.

Emotion dysregulation—The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire to measure emotion regulation across six dimensions: acceptance of emotional responses, difficulties engaging in goal-directed behavior, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity. Items are rated from 1 (almost never) to 5 (almost always), with higher scores indicating greater difficulties in emotion regulation. Internal consistency for the current study was good to excellent (α = 0.85–0.95) across subscales.

Emotional reactivity—The Emotional Reactivity Scale (ERS; Nock et al., 2008) is a 21-item self-report measure that assesses components of emotional reactivity: emotional responding to broad stimuli (sensitivity), strength of emotional responses (arousal), and duration of arousal (persistence). Items are rated on a scale from 0 (not at all like me) to 4 (completely like me). Combined scores range from 0 to 84, with higher scores indicating greater emotional reactivity. The ERS total score had excellent internal consistency (α =

0.95) for the current study. The ERS was completed by a subsample of participants (n = 109).

Depressive symptoms—The Patient Health Questionnaire (PHQ-9) is a 9-item self-report measure that assess the severity of depressive symptoms over the 2 weeks prior to assessment (Kroenke et al., 2001). Items on the PHQ-9 are scored from 0 (not at all) to 3 (nearly every day) and total scores range from 0 to 27 with higher scores indicating greater depressive symptoms. The Beck Depression Inventory-II (BDI-II: Beck et al., 1996) is a 21-item self-report questionnaire that assess the severity of depressive symptoms over the past 2 weeks. Items are rated from 0 to 3, with higher scores indicating greater depressive symptoms. Since suicidality is a symptom of depression and is measured separately in the current study, item 9 was removed from both the BDI-II and PHQ-9 for analyses due to item overlap, an approach which has been used in previous studies (Razykov et al., 2012; Weinstock & Whisman, 2007). Internal consistency for the BDI-II (α = 0.93) and PHQ-9 (α = 0.87) was good after removing suicide items. Some participants completed the BDI-II (n = 109), while others completed the PHQ-9 (n = 90) due to changes in the measures used by the clinic starting in 2019. To account for measure differences used to assess depressive symptoms, participant scores were standardized by converting the raw scores to z scores for each measure.

ED symptoms—The Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 2008) is a 31-item self-report questionnaire that is made up of four subscales (Restraint, Eating Concerns, Shape Concerns, and Weight Concerns) assessing for ED psychopathology over the past 28 days. Items are rated from 0 (no days) to 6 (28 days). The four subscales make up a Global score, with higher scores indicating greater disordered eating. Internal consistency for the current study was good to excellent across time points (α = 0.81–0.93).

Statistical analyses

Data were first examined using Little's missing completely at random (MCAR) test. Data were MCAR across time points (p = 0.541). Participants with missing data did not differ based on diagnosis, suicide risk category, or demographic characteristics compared to patients with complete data (ps > 0.052); thus, data were assumed to be missing at random. A small number of participants were missing data at treatment admission across measures (EDE-Q, DERS, depression symptoms, MINI suicide risk, suicide attempts, and ERS; 0% −2%); thus, list-wise deletion was used for Aim 1.

To address Aim 1, descriptive statistics, correlations, and hierarchical linear regression models were generated in IBM SPSS (version 28) and used to examine the cross-sectional relationships among emotion dysregulation and emotional reactivity with continuous suicide risk severity at admission. ERS Total scores were modeled in Step 1; DERS subscales that demonstrated zero-order correlations were added in Step 2; and depression symptoms were added in Step 3. Zero-inflated Poisson regressions were used to test the relationship between difficulties in emotion regulation and emotional reactivity with the frequency of lifetime suicide attempts using Rstudio *pscl* and *AER* packages (Kleiber & Zeileis,

2008; Zeileis et al., 2008). Zero-inflated Poisson regression models are mixture models suited to address count variables that are zero-inflated by generating a separate logistic regression predicting zero-count observations (i.e., predicting lack of engagement in the behavior due to zero-inflation) and a second Poisson model to predict the non-zero counts (i.e., only those engaging in a behavior; Lambert, 1992). Age and depressive symptoms were evaluated as covariates given the previously established relationships between these variables and suicidality (Smith et al., 2019); however, age was excluded as a covariate due to its non-significant relationship with suicidality in our sample. Correlational coefficients, tolerance, and variance inflation factors were examined for multicollinearity diagnosis and were determined to be adequate (rs < 0.74, VIFs < 3.46, Tolerance > 0.29; Kim, 2019).

Multilevel models (MLM) tested whether MINI suicide risk categories and frequency of lifetime suicide attempts predicted differences in outcome on EDE-Q Global scores from admission to discharge. The MINI "no reported risk group" served as the reference group. Repeated measurements of outcome variables nested within patients were included at Level 1, with suicide risk category or suicide attempt and the interaction between suicide risk category and time modeled at Level 2. Full information maximum likelihood was used to account for missing data (Schafer & Graham, 2002). Effect sizes and reliable change indexes from admission to discharge (RCI; Jacobson & Truax, 1991) were calculated and compared across MINI suicide risk categories and attempt history to examine disparities in the magnitude of change and clinically meaningful change. Results from Rose et al. (2013) were used to calculate RCI and clinical cutoffs for the EDE-Q Global score (ρ_I = 0.92, M = 1.27, SD = 1.05). Treatment duration (measured in days) and length of illness (measured in years) were entered as covariates in the model as previous research supports that longer duration of illness is associated with greater ED symptoms severity (Vall & Wade, 2015) and greater doses of treatment may also result in greater symptom improvements. Additional information regarding model fitting is presented in the Appendix S1.

RESULTS

Preliminary analyses

Table 1 presents analyses comparing participant characteristics across suicide risk categories at admission. Analyses revealed no significant demographic differences in gender identity, age, ethnicity, and race (ps > 0.14) based on suicide risk category at admission. However, patients diagnosed with avoidant restrictive food intake disorder (ARFID) were less likely (p = 0.02) to be in the moderate or high suicide risk category, and patients in the high suicide risk category were more likely to be prescribed an atypical antipsychotic at admission (p < 0.001). Histories of suicide attempts were common among patients (n = 52; 26.1%; range = 0–15 attempts; two participants were missing data on attempt history). Of those with attempt histories, 55.8% (n = 29) had a single attempt and 44.2% (n = 23) had a history of multiple attempts.

Reasons for discharge from treatment were as follows: in accordance with clinical recommendation (n = 141; 70.1%); against clinical advice (n = 23; 11.44%); insurance reasons (n = 8; 4%); returned to school or home out of state (n = 8; 4%); transferred to a higher level of care (n = 6; 3%); failed contract/therapeutic discharge (n = 14; 7%); and

transferred to another PHP program (n = 1; 0.5%). There were no differences in reason for discharge across suicide risk category, $\chi^2(18) = 18.61$, $p = 0.42$. However, six patients were discharged to a higher level of care, five of whom were classified as high risk for suicide at admission to treatment.

Associations of emotional reactivity and emotion dysregulation with suicide risk

Prior to analysis, the correlational relations between variables of interest were examined. Table 2 displays results from correlational analyses between DERS subscales, ERS total score, depression symptoms, and age with continuous suicide risk severity and the frequency of lifetime suicide attempts. All DERS subscales were significantly associated with continuous suicide risk severity and the frequency of lifetime suicide attempts, except for DERS awareness, which was therefore not included in the regression models. The ERS total score was significantly associated with continuous suicide risk severity, but not frequency of lifetime suicide attempts. Age was not significantly associated with either continuous suicide risk severity or frequency of lifetime suicide attempts, and therefore was not included as a covariate in regression models.

Table 3 presents results from hierarchical linear regression analyses predicting continuous suicide risk severity. The model at Step 1 was significant ($p < 0.001$) and ERS Total score ($p < 0.001$) explained 12.6% of the variance in continuous suicide risk severity. The model at Step 2 remained significant ($p < 0.001$) and explained 20.8% of the variance, with only the DERS Strategies subscale as a significant predictor ($p = 0.031$) of continuous suicide risk severity. The model at Step 3 was also significant and explained 24.1% of the variance in continuous suicide risk severity. Depression symptoms were the only significant predictor ($p = 0.022$) of continuous suicide risk severity above and beyond ERS total and DERS subscales.

Table 4 presents results from a zero-inflated Poisson regression with DERS as a predictor of lifetime suicide attempt frequency. A second regression model was not created for emotional reactivity because the correlation between the ERS total score and frequency of lifetime suicide attempts was not significant at the bivariate level. Results from zero-inflated Poisson regression demonstrate that individuals with higher DERS Goals (i.e., greater difficulty engaging in goal-directed behavior) and lower depressive symptoms had increased odds of not having a lifetime suicide attempt (ORs > 1.46, ps < 0.028). In patients that reported a history of lifetime suicide attempts, for every one-unit increase in DERS Strategies, there was a 12.8% increase in the frequency of lifetime suicide attempts. For every one-unit increase in DERS Goals, there was a 15% increase in frequency of lifetime suicide attempts. Lastly, for each one-unit increase in DERS Impulsivity, the frequency of lifetime suicide attempts decreased by 8.6%.

Group differences across treatment

Descriptive statistics, effect sizes, and clinically meaningful change on EDE-Q scores one-month into treatment and at discharge are presented in Table S1 (see Appendix S1). Across risk categories and suicide attempt histories, there were moderate to large improvements in EDE-Q Global scores from admit to 1-month and large improvements in EDE-Q Global

scores from admit to discharge. These findings are also reflected by our RCI analyses, which yielded comparable proportions of clinically meaningful improvement in ED symptoms over the course of treatment regardless of MINI suicide risk category (32.7%−61.5%) and lifetime suicide attempts (35.7%−52.6%) at treatment admission.

Table 5 presents results from MLMs comparing ED outcomes across suicide risk categories and lifetime suicide attempt frequency during treatment. Results support that there were significant effects of time for EDE-Q scores, suggesting that regardless of continuous suicide risk and lifetime suicide attempt frequency, eating pathology decreased from admission through discharge. There was a main effect of suicide risk category, such that all suicide risk categories presented with significantly higher ED symptoms at admission ($ps < 0.003$) compared to the no reported risk category. Post hoc analyses revealed that there were no other significant differences between the low, moderate, or high suicide risk categories at admission ($ps > 0.06$). Lifetime suicide attempt frequency was not associated with ED symptom severity at admission. There were no significant suicide risk category by time interactions for EDE-Q scores, nor any lifetime suicide attempt frequency by time interaction, suggesting no significant differences in the pattern of change over time based on suicide risk category or lifetime suicide attempt frequency.

DISCUSSION

The present study examined the associations between emotion dysregulation and reactivity with continuous suicide risk and lifetime suicide attempts in a sample of individuals with EDs. Furthermore, this study also aimed to determine whether suicide risk categories were predictive of ED treatment outcome. Depressive symptoms demonstrated the strongest relationship with continuous suicide risk severity, while no facets of emotion regulation nor emotional reactivity significantly predicted suicide risk above and beyond depressive symptoms. However, facets of emotion dysregulation were significantly associated with frequency of lifetime suicide attempts. Furthermore, though suicide risk groups differed in ED symptom severity at admission, they did not differ on treatment outcome.

Our findings suggest that difficulties in emotion regulation and emotional reactivity are associated with continuous suicide risk in patients with EDs. However, when controlling for depressive symptoms, the association between facets of emotion dysregulation and emotional reactivity with continuous suicide risk were no longer significant. Taken together these findings support the biosocial theory, which indicates that emotional vulnerability such as emotional reactivity, depressive symptoms (i.e., negative affectivity), and emotion dysregulation are related to suicidality (Linehan, 2014); however, among treatment-seeking adults with EDs, it appears that depressed mood plays a salient role in suicidality. Furthermore, the MINI continuous suicide risk score is weighted towards cognitive features of suicide; therefore, our findings may reflect that depressive symptoms may be related suicidal desire rather than attempts, which has been found in previous studies on mood disorders (Nock et al., 2010). Psychological factors like anhedonia and hopelessness are common symptoms and phenomena in patients with depression (Abramson et al., 1989; APA, 2013) and have been associated with suicide attempts and ideation (Nock et al., 2010).

Thus, future studies should examine whether these factors are associated with suicidal desire in patients with EDs.

In line with previous findings regarding emotion dysregulation and suicide attempts in people with EDs (Gómez-Expósito et al., 2016; Rania et al., 2021; Smith, Forrest, et al., 2018), we found that several facets of emotion dysregulation were associated with the frequency of lifetime suicide attempts; however, emotional reactivity was not associated with lifetime suicide attempt frequency. We found that lower depressive symptoms and greater difficulties engaging in goal-oriented behaviors when experiencing negative emotions were associated with lower odds of having made a lifetime suicide attempt. However, in patients with suicide attempt histories, greater difficulties engaging in goal-oriented behavior were associated with increased frequency of suicide attempts. These seemingly contrary findings suggest that while difficulties engaging in goal-oriented behaviors may differentiate patients with and without histories of suicide attempts, it may also differentiate patients with frequent attempt histories from patients with lower attempt frequencies. This disparate finding suggests that there may be differences in how difficulties with goal-directed behavior influence the likelihood of initiating any suicide attempts, compared to the likelihood of making multiple subsequent attempts. Given the exploratory nature of our analyses, future research is needed to replicate these results and identify a potential explanation for this dysfunctional similarity between patients with and without histories of suicide attempts. We also found that lower ability to access adaptive emotion regulation strategies, as well as less tendency to engage in impulsive behaviors when experiencing negative emotions, were both associated with greater frequency of suicide attempts. In a regression analysis, we found a counterintuitive result: there was not a significant association between the tendency to engage in impulsive behaviors in response to emotions and MINI-rated suicide risk. These findings, however, are consistent with previous studies, which indicate that similar constructs like negative urgency (i.e., a disposition to engage in rash behavior when experiencing heightened negative affect) are associated with higher suicidal desire, but lower capability for suicide (Anestis et al., 2011). Anestis et al. (2011) hypothesize that people with elevated negative urgency may use distraction methods to avoid negative emotions and therefore may not habituate to painful or provoking experiences that are associated with elevated capability for suicide. Indeed, as patients with EDs may already possess higher capability for suicide resulting from painful patterns of disordered eating (Joiner, 2005), it is possible that negative urgency/DERS impulsivity may attenuate the relationship between acquired capability for suicide in patients with EDs. This may explain the relationship between DERS impulsivity and suicide attempt frequency in the current study; however, future studies are needed to evaluate whether there is an interactive effect between DERS impulsivity and nonacceptance on suicide attempt frequency.

Our finding that limited access to adaptive emotion regulation strategies was associated with higher frequencies of suicide attempts extends previous findings suggesting that this construct differentiated patients with EDs and histories of suicide attempts from those without (Rania et al., 2021; Smith, Forrest, et al., 2018). Furthermore, these findings provide support for the biosocial model of emotion dysregulation, which posits that limited access to adaptive emotion regulation skills (i.e., skills deficits) may result in escape or avoidance

behaviors, such as suicide attempts and disordered eating (Crowell et al., 2009; Linehan, 2014). Thus, increasing access to emotion regulation skills through interventions (e.g., DBT) may reduce maladaptive behaviors in this population.

Treatment findings suggest that patients presenting with low, moderate, or high suicide risk at admission had more severe ED symptoms compared to those with no reported suicide risk, but that lifetime suicide attempt frequency was not significantly associated with ED symptom severity. Regardless of suicide risk category at admission, patients showed comparable improvement across treatment, even when controlling for covariates (e.g., treatment duration and length of illness). This is also reflected by the comparable rates of reliable change (RCI) across suicide risk categories and between patients with and without a history of suicide attempt. Though some of our findings suggest that the moderate suicide risk group was more likely to make clinically significant changes by treatment discharge, this finding is likely the result of attrition in the moderate suicide risk category over time, potentially biasing results. Taken together these findings indicate that suicide risk categorization and lifetime suicide attempt frequency may not be prognostically salient when considering ED treatment outcomes in patients receiving multimodal interventions like DBT that dually address suicidality and ED pathology. However, these findings will need to be replicated prior to forming definitive conclusions. Furthermore, because patients presenting with EDs and histories of frequent suicide attempts reported diminished access to emotion regulation skills, future studies should evaluate whether increasing emotion regulation skills use is associated with decreases in suicidal behaviors and ED symptomology in patients with EDs.

The current study benefited from several strengths including a sizable, naturalistic, transdiagnostic ED sample, the use of both interview and self-report measures, and multilevel modeling to evaluate treatment efficacy in patients with EDs and varying suicide severity, which, to our knowledge, has not been done yet. However, our findings should be considered in light of several limitations. First, patients were only assessed for suicide risk at treatment admission, which did not allow us to temporally evaluate the relationship between facets of emotion regulation and emotional reactivity with changes in suicide risk during treatment. Second, group size disparities, specifically for the moderate suicide risk group, make our findings potentially vulnerable to bias from outliers. Furthermore, only a subset of our sample completed a measure related to subjective emotional reactivity and thus analyses using this variable may have lower power to detect effect. Third, the naturalistic design of the study did not allow for us to control for dosing effects during partial hospitalization. Therefore, it is unknown whether our clinical findings are directly the result of the unique techniques incorporated in DBT that dually address concerns related to suicide and EDs, or rather the result of patients with elevated suicide risk receiving more treatment time. Randomized controlled trials for suicidal patients with EDs are needed to determine the efficacy of DBT for patients with EDs at various levels of suicide risk. Fourth, the MINI suicidality module aggregate score is weighted towards features related to suicidal thoughts and planning with only one question asking about non-fatal lifetime suicide attempts, without regard for severity of attempt (e.g., need for medical care following attempt, etc.), and therefore may not fully measure the full spectrum of suicide severity. Finally, our

sample was composed of primarily young, white women, thus limiting the generalizability of our findings to other demographics.

CONCLUSIONS

In sum, the present study demonstrates that in patients with EDs, depressive symptoms are robustly associated with elevated continuous suicide risk, though suicidality is not an epiphenomenon of depression as some facets of emotion dysregulation were associated with the frequency of lifetime suicide attempts. Importantly, suicide risk and the frequency of lifetime suicide attempts at admission do not appear to be predictive of treatment prognosis for partial hospitalization programs that utilize multimodal, emotion-focused interventions like DBT that target suicidality. This promising finding points to the importance of directly addressing suicidality in treatment, regardless of the primary diagnosis.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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TABLE 1

Sample characteristics across suicide risk level.

	No reported risk (*n* = 68)	**Low risk (*n* = 48)**	**Moderate risk (*n* = 17)**	**High risk (*n* = 68)**	**Full sample (*n* = 201)**		
	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	**χ^2/F**	***p***
Race						8.35	0.76
White	54 (79.4)	38 (79.2)	13 (76.5)	51 (75.0)	156 (77.6)		
Asian	5 (7.4)	1 (2.1)	2 (11.8)	4 (5.9)	12 (6.0)		
Pacific Islander/Native Hawaiian	1 (1.5)	-	-	-	1 (1.0)		
Black/African American	-	-	-	1 (1.5)	1 (1.0)		
Other	8 (11.8)	9 (18.8)	2 (11.8)	12 (17.7)	31 (15.4)		
Ethnicity						5.41	0.14
Hispanic/Latinx	10 (14.7)	8 (16.7)	-	9 (13.2)	27 (13.4)		
Non-Hispanic/Latinx	58 (85.3)	40 (83.3)	17 (100.0)	59 (86.8)	174 (86.6)		
Gender						1.00	0.99
Male	6 (8.8)	4 (8.3)	2 (11.8)	6 (8.8)	18 (9.0)		
Female	58 (85.3)	42 (87.5)	14 (82.4)	60 (88.2)	174 (86.6)		
Gender diverse[a]	4 (5.9)	2 (4.2)	1 (5.9)	2 (2.9)	9 (4.5)		
ED Diagnosis						19.39	0.02
Anorexia Nervosa	35 (51.5)	27 (56.3)	5 (29.4)	29 (42.7)	96 (47.8)		
Bulimia Nervosa	14 (20.6)	8 (16.7)	6 (35.3)	21 (30.9)	49 (24.4)		
ARFID	6 (8.8)	4 (8.3)	-	-	10 (5.0)		
OSFED	13 (19.1)	9 (18.8)	6 (35.3)	18 (26.5)	46 (22.9)		
Medications							
Antidepressant	39 (57.4)	31 (64.6)	15 (88.2)	45 (66.2)	130 (64.7)	4.88	0.18
Atypical Antipsychotic	9 (13.2)	7 (14.6)	4 (23.5)	26 (38.2)	46 (22.9)	15.32	0.002
Mood Stabilizer	11 (16.2)	11 (22.9)	4 (23.5)	24 (35.3)	50 (24.9)	7.19	0.07
Anxiolytic	14 (20.6)	7 (14.6)	3 (17.7)	12 (17.7)	36 (17.9)	0.88	0.83
Age (*M*[SD])	25.9 (9.0)	25.2 (8.4)	25.7 (5.4)	25.9 (9.3)	25.7 (8.7)	0.07	0.98

Abbreviations: ARFID, Avoidant Restrictive Food Intake Disorder; OSFED, Other Specified Feeding or Eating Disorder.

[a]Gender diverse denotes individuals who identify as transgender or gender expansive (i.e., outside the binary).

TABLE 2

Correlations and descriptive statistics for study variables at admission.

	Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	DERS Nonaccept	-										
2.	DERS Goals	0.43***	-									
3.	DERS Impulse	0.41***	0.61***	-								
4.	DERS Awareness	0.28***	0.05	0.12	-							
5.	DERS Strategies	0.54***	0.68***	0.73***	0.22**	-						
6.	DERS Clarity	0.44***	0.33***	0.30***	0.62***	0.43***	-					
7.	ERS Total	0.38***	0.54***	0.68***	−0.05	0.67***	0.21*	-				
8.	Depression Symptoms[a]	0.44***	0.58***	0.50***	0.39***	0.66***	0.51***	0.45***	-			
9.	Age	0.12	−0.01	,03	0.09	0.08	0.12	0.06	0.06	-		
10.	MINI Continuous Suicide Risk[b]	0.34***	0 33***	0.42***	0.04	0.44***	0.19*	0.37***	0.40***	0.01	-	
11.	Lifetime Suicide Attempt Frequency	0.21**	0.17*	0.19*	0.10	0.30***	0.17*	0.16	0.20**	0.08	0.31***	-
n		155	155	155	157	155	157	109	198	201	201	199
Mean		20.32	18.89	17.74	20.16	25.48	15.86	47.28	-	25.7	16.16	0.56
Standard Deviation		6.94	4.57	6.80	5.80	8.25	4.70	19.45	-	8.7	22.45	1.56

Abbreviations: DERS, Difficulties in Emotion Regulation Scale; ERS, Emotional Reactivity Scale; MINI, Mini Neuropsychiatric Interview.

[a]Standardized scores from the Patient Health Questionnaire-9 and Beck Depression Inventory-II (PHQ-9 [$n = 86$, $M = 14.52$, $SD = 5.95$], BDI-II [$n = 112$, $M = 31.82$, $SD = 12.84$]).

[b]Raw scores from the MINI suicide module.

*$p < 0.05$,

**$p < 0.01$,

***$p < 0.001$.

TABLE 3

Regression analysis exploring associations between emotion regulation, reactivity, and depression symptoms with continuous suicide risk.

	Adj. R^2	*B*	*SE*	*t*	*P*
Step 1	0.126	$F(1,107) = 16.633$, $p < 0.001$			
ERS Total		**0.460**	**0.113**	**4.078**	**<0.001**
Step 2	0.208	$F(6,102) = 5.725$, $p < 0.001$			
ERS Total		0.015	0.158	0.095	0.925
DERS Nonaccept		0.039	0.369	0.106	0.916
DERS Goals		−0.093	0.629	−0.147	0.883
DERS Impulse		0.753	0.496	1.520	0.132
DERS Strategies		**1.003**	**0.458**	**2.191**	**0.031**
DERS Clarity		0.019	0.504	0.038	0.970
Step 3	0.241	$F(7,101) = 5.888$, $p < 0.001$			
ERS Total		0.022	0.154	0.141	0.889
DERS Nonaccept		0.038	0.361	0.104	0.917
DERS Goals		−0.401	0.630	−0.636	0.526
DERS Impulse		0.716	0.486	1.475	0.143
DERS Strategies		0.638	0.475	1.343	0.182
DERS Clarity		−0.335	0.517	−0.648	0.518
Depression Symptoms		**7.133**	**3.073**	**2.321**	**0.022**

Note: Depression Symptoms (via Beck Depression Inventory-II and Patient Health Questionnaire-9) were covaried in both models. Bolded items represent significant *p*−values.

Abbreviations: ERS = Emotional Reactivity Scale; DERS = Difficulties in Emotion Regulation Scale.

TABLE 4

Zero-inflated Poisson regression model for frequency of lifetime suicide attempts.

DV = no history of suicide attempts

Zero-inflated model	***B***	***SE***	***z***	***P***	**Exp(*B*)**	**95% CI exp(*B*)**
Intercept	−2.51	3.20	−0.79	0.432	12.35	<0.001, 42.86
DERS Nonaccept	−0.02	0.06	−0.28	0.78	0.98	0.88, 1.11
DERS Goals	**0.38**	**0.17**	**2.22**	**0.027**	**1.47**	**1.05, 2.05**
DERS Impulsivity	−0.10	0.07	−1.40	0.162	0.91	0.79, 1.04
DERS Strategies	−0.05	0.07	−0.69	0.493	0.95	0.83, 1.10
DERS Clarity	−0.06	0.08	−0.72	0.469	0.94	0.80, 1.11
Depression Symptoms	**−0.95**	**0.41**	**−2.30**	**0.022**	**0.39**	**0.17, 0.87**

DV = Frequency of Lifetime Suicide Attempts

Count model	***B***	***SE***	***z***	***P***	**Exp(*B*)**	**95% CI Exp(*B*)**
Intercept	−4.36	1.13	−3.86	<0.001	0.013	0.001, 0.12
DERS Nonaccept	0.05	0.03	1.65	0.10	1.05	0.99, 1.10
DERS Goals	**0.14**	**0.05**	**2.80**	**0.005**	**1.15**	**1.04, 1.27**
DERS Impulsivity	**−0.09**	**0.03**	**−2.91**	**0.004**	**0.91**	**0.86, 0.97**
DERS Strategies	**0.12**	**0.04**	**3.36**	**<0.001**	**1.13**	**1.05, 1.21**
DERS Clarity	−0.05	0.04	−1.21	0.23	0.95	0.88, 1.03
Depression Symptoms	−0.14	0.16	−0.88	0.38	0.87	0.64, 1.19

Note: Log-likelihood = -138, *df* = 14. Depressive symptoms (via Beck Depression Inventory-II and Patient Health Questionnaire-9) were covaried in both models. Bolded items represent significant *p*-values.

Abbreviations: DERS = Difficulties in Emotion Regulation Scale; CI = Confidence Interval; DV = Dependent Variable.

TABLE 5

Estimates from multilevel models examining the impact of (1) admission suicide risk category and (2) attempt frequency on change in EDE-Q score during treatment.

	Model 1: Suicide risk category predicting EDE-Q global score				**Model 2: Suicide attempt frequency predicting EDE-Q global score**			
Predictors	**Est.**	***SE***	***p***	**95% CI**	**Est.**	***SE***	***p***	**95% CI**
Intercept	**103.07**	**5.85**	**<0.001**	**91.54, 114.60**	**4.75**	**0.25**	**<0.001**	**4.25, 5.24**
Low Risk	**23.37**	**7.15**	**0.001**	**9.24, 37.50**	-	-	-	-
Moderate Risk	**41.66**	**13.49**	**0.002**	**15.05, 68.27**	-	-	-	-
High Risk	**37.58**	**6.36**	**<0.001**	**25.02, 50.13**	-	-	-	-
Suicide Attempt Frequency	-	-	-	-	0.18	0.09	0.06	−0.01, 0.37
Time	**−9.36**	**2.14**	**<0.001**	**−13.60, -5.13**	**−0.92**	**0.06**	**<0.001**	**−1.04, -0.80**
Treatment Duration	0.04	0.03	0.20	−0.02, 0.11	−0.001	0.002	0.54	−0.005, 0.003
Length of Illness	0.30	0.17	0.08	−0.04, 0.64	0.02	0.01	0.14	−0.005, 0.04
Low Risk × Time	−4.32	3.22	0.18	−10.69, 2.06	-	-	-	-
Moderate Risk × Time	−12.09	6.90	0.08	−25.71, 1.53	-	-	-	-
High Risk × Time	−4.40	2.95	0.14	−10.25, 1.44	-	-	-	-
Suicide Attempt Frequency × Time	-	-	-	-	−0.06	0.04	0.09	−0.14, 0.01

Note: Referent group is the No Reported Risk category. EDE-Q, Eating Disorder Examination-Questionnaire. Repeated measurements of outcome variables nested within patients were included at Level 1, with suicide risk category or suicide attempt and the interaction between suicide risk category and time modeled at Level 2. Bolded items represent significant *p*-values.