ORIGINAL ARTICLE

Early Versus Later Improvements in Dialectical Behavior Therapy Skills Use and Treatment Outcome in Eating Disorders

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Abstract

Dialectical behavior therapy (DBT) has demonstrated initial efficacy for the treatment of eating disorders (EDs). However, no study has examined potential processes that may contribute to observed improvements in DBT for EDs. The present study sought to investigate changes in DBT skills use throughout treatment as a predictor of symptom change in a DBT-based partial hospital program (PHP) for adults with EDs. Adults [n = 135; M(SD) age = 25.08 (7.88)] with EDs completed self-report measures at treatment admission, one-month post-admission, and discharge from PHP. DBT skills use, as measured by the DBT Ways of Coping Checklist, increased by 12.65% from admission to one-month post-admission and increased by 24.10% from admission to discharge. Early (admission to month 1) and later (month 1 to discharge) improvements in DBT skills use predicted greater improvements in ED, depressive, and emotion dysregulation symptoms from treatment admission to discharge. Notably, early versus later change in skills use was a stronger predictor of outcome. Results are consistent with the theoretical model of DBT and add to a growing literature on DBT for EDs.

Keywords Dialectical behavior therapy · Eating disorders · Skills use · Predictors · Partial hospital program

Introduction

Dialectical Behavior Therapy (DBT), an intervention originally developed for patients with Borderline Personality Disorder (BPD; Linehan 1993), posits that maladaptive, impulsive behaviors function as misguided attempts to regulate unwanted emotions (Linehan 1993). Accordingly, DBT aids patients in developing alternative, adaptive behavioral skills to help improve effective self-regulation. Given well-documented associations between depression, difficulties with emotion regulation, and eating disorder (ED) symptoms (Lavender et al. 2015), recent research has examined the efficacy of DBT for EDs (Bankoff et al. 2012). There is a growing body of evidence to support the use of outpatient DBT for EDs, with studies demonstrating efficacy for the intervention compared with waitlist (Safer et al. 2001; Telch et al. 2001) and active control conditions (Chen et al. 2017; Safer et al. 2010). Additionally, per APA practice guidelines, DBT

has demonstrated efficacy for the behavioral and psychological symptoms of binge eating disorder and has demonstrated initial efficacy in the treatment of bulimia nervosa (Yager et al. 2005). In addition to these outpatient adaptations for binge eating and bulimia nervosa, DBT has been adapted for the treatment of severe, complex, and treatment-resistant EDs in higher levels of care, and initial results appear promising in improving eating disorder, mood, and affect regulation symptoms (Ben-Porath et al. 2010; Brown et al. 2018).

Although the preliminary evidence supporting DBT for EDs is encouraging, investigating *how* DBT may contribute to improved outcomes is essential to maximize target engagement and treatment efficacy. When considering processes or factors that may contribute to the success of an intervention, it is prudent to consider the theoretical model that guides the selection of intervention strategies. In DBT, the skills deficit model (Linehan 1993) provides a trans-diagnostic model for the how emotion dysregulation may maintain a broad range of psychopathology. This model suggests that a limited repertoire of adaptive response strategies promotes engagement in a wide variety of maladaptive behaviors (e.g., binge eating, restriction, purging self-harm) in an attempt to cope with negative emotional states (e.g.,

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depression). Thus, a major focus of DBT involves teaching patients new coping skills (mindfulness, distress tolerance, emotion regulation, and interpersonal effectiveness) to help effectively regulate strong emotions. Applying this framework within the context of eating pathology, building a repertoire of adaptive coping skills should enhance emotion regulation abilities and decrease depressive symptoms, which in turn, should decrease the use of ED behaviors. Therefore, although DBT is a complex and multifaceted treatment, increases in adaptive skills use represent one theoretically-informed factor that may contribute to the efficacy of DBT in the treatment of EDs and comorbid symptoms (e.g., Lynch et al. 2006).

Consistent with the proposal that skill acquisition represents an important process of change in DBT, several studies in BPD samples support skills use as a key component of symptom improvement within DBT (Linehan and Wilks 2015; Neacsiu et al. 2010a,b). Additionally, DBT skills training has demonstrated efficacy for a variety of clinical populations, even when used independently of the full DBT package (Valentine et al. 2015). Highlighting the critical nature of skill acquisition within DBT, a component analysis study demonstrated that versions of DBT that included skills training produced greater reductions in non-suicidal self-injury, depression, anxiety, and rates of hospitalization in BPD patients compared to an individual DBT condition without skills training (Linehan et al. 2015). Further, Neacsiu et al. (2010a, b) demonstrated that the frequency of DBT skills use, measured by the DBT Ways of Coping Checklist, mediated reductions in suicide attempts, depression, non-suicidal self-injury, and anger for women with BPD receiving standard DBT. Thus, DBT skills acquisition appears to be a critical component contributing to the efficacy of DBT in BPD samples.

In addition to more generally exploring the role of adaptive skill acquisition as a therapeutic change process, it is also important to consider the timing of when skills are acquired over the course of treatment, and how the timing of skills acquisition may affect treatment outcome. The DBT skills deficit model does not provide direct hypotheses regarding the impact of the timing of skills acquisition. However, it is possible that those who acquire skills and use them more frequently earlier in treatment will improve their ability to cope with emotional distress earlier, and thus make greater improvements in overall outcomes in eating disorder, mood, and emotion regulation symptoms at the end of treatment. In line with this proposition, previous research in eating disorders and mental health treatment more broadly has demonstrated the importance of rapid response in predicting improved outcomes in eating disorder and depressive symptoms (Fairburn et al. 2004; Hilbert et al. 2015; Ilardi and Craighead 1994; Safer and Joyce 2011; Wilson 1999). Alternatively, timing of skills acquisition may not impact

outcome, and improvements in the frequency of skills use at any stage of treatment may be equally as important in predicting outcomes. To our knowledge, no studies have examined the impact of improvements in the frequency of DBT skills use in early versus later stages of DBT-focused treatment for eating disorders. Providing a more nuanced understanding of how timing of skills acquisition impacts treatment outcome may help improve identification of those most likely to respond to DBT-based treatment.

Thus, research supports that DBT skills use acquisition is an important factor that contributes to improvements in a variety of clinical symptoms during DBT. However, no study has empirically characterized changes in DBT skills use in ED patients or examined in the impact of early versus later change in the frequency of DBT skills use on improving outcome in EDs. Therefore, the present study examined the impact of both early (admission to month 1) and later (month 1 to discharge) change in the frequency of DBT skills use as a predictor of improvements in ED and emotion dysregulation from admission to discharge within a DBT-based partial hospital program (PHP) for adults with EDs. Our hypotheses were as follows: (1) participants would exhibit significant improvements in skills use frequency from admission to one-month post-admission and through discharge; (2) early (vs. later) improvements in DBT skills use frequency would predict greater improvements in ED symptoms from admission to discharge; and (3) early (vs. later) improvements in DBT skills use would predict improvements in depression and emotion dysregulation symptoms from admission to discharge.

Methods

Participants and Procedures

Participants for the present study were 135 adult patients with primary ED diagnoses (n = 126 females, n = 9 males) who were admitted for at least one month to a university-based PHP between 2011 and 2016 and completed self-reported measures of DBT skills use frequency. Criteria for admission to PHP conformed to the American Psychiatric Association's medical, psychiatric, and behavioral criteria guidelines for the treatment of EDs (Yager et al. 2014). If patients were medically unstable or acutely suicidal at the time of assessment, they were referred to a higher level of care. Consistent with an intent-to-treat approach, analyses included data from patients who completed at least admission assessments. To facilitate generalizability of the findings, no other exclusion criteria were applied to the current study sample. For patients who had multiple treatment admissions, data from their most recent admission to program were used, consistent with previous research (Brown

et al. 2018). ED and comorbid diagnoses were made by staff psychiatrists at admission using an unstandardized semi-structured interview based on the 2010 draft criteria for the *Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition* (DSM-5; American Psychiatric Association 2013). Given the unstandardized nature of this interview, reliability and validity were not able to be established. The diagnostic breakdown of the sample was as follows: anorexia nervosa - restricting subtype (n = 40), anorexia nervosa binge-purge subtype (n = 16), bulimia nervosa (n = 58), binge eating disorder (n = 4), and other specified feeding or eating disorder (n = 17). Given the limited number of participants in each diagnostic category alongside the fact that the DBT skills deficit model has been proposed as a framework for understanding transdiagnostic eating pathology, analyses for the present study were conducted transdiagnostically.

Informed consent was obtained from all individual participants includes in the study before completing online self-report surveys within 14 days of admission [M (SD) = 3.81 (5.26) days], 1-month post-admission [M (SD) = 36.77 (4.73) days post-admission], and discharge [M (SD) = 94.49 (48.53) days post-admission]. All participants (n = 135) completed admission assessments, 61.5% (n = 83) completed one-month assessments, and 74.8% (n = 101) completed discharge assessments. In total, 52.2% (n = 70) of the sample completed data at all three assessments. All study procedures were approved by the University of California, San Diego's Institutional Review Board.

Brief Program Overview

Consistent with APA guidelines, the ED program includes individual, family, and group therapy, medication management, meal support, and dietary consultation. Upon admission to PHP, patients attend treatment for 10 h per day, 6 days per week. As symptoms improve, patients step down to intensive outpatient programming before discharging to regular outpatient care. The emphasis of PHP is on weight restoration (as needed) and eliminating problematic behaviors. Programming was designed based on the DBT model and guidelines for severe and complex EDs (Wisniewski et al. 2007) and offered all elements of standard DBT, including DBT skills groups, individual therapy, phone coaching, and DBT consultation teams. Patients received a minimum of 5 h of DBT-based groups each week, including a standard DBT skills group, applied DBT skills groups, and a rotation of other groups that focus on specific DBT skills modules. Notably, as patients are admitted to the PHP on a rolling basis, the timing of which skills modules they receive in the first month of treatment is variable (e.g., one person may start treatment at week 2 of emotion regulation, while another may start at week 1 of mindfulness). As such, the present study is not able to examine the impact of the specific skills training modules on timing or outcome. Due to the intensive schedule, patients learned all four DBT skills modules in 3 months, rather than the 6-month timeframe of traditional outpatient DBT. In addition to DBT-based programming, patients ate three meals and two snacks per day in program, and participated in two to three other ED-related groups per day. For more details regarding patient programming, please see Brown et al. (2018). The average length of stay in treatment in the present study was 97.07 days (SD = 53.16; range 28–322).

Measures

DBT Ways of Coping Checklist—DBT Skills Subscale (DBT-WCCL DSS; Neacsiu et al. 2010a, b)

The DBT-WCCL is a 59-item measure that includes 38 items assessing the self-reported frequency of DBT skills use (DBT Skills Subscale) and 21 items assessing dysfunctional coping strategies (Dysfunctional Coping Subscale) over the last month. Consistent with previous research (Neacsiu et al. 2010a), the present study used the DBT Skills Subscale as a proxy for DBT-consistent skillful behavior. Items are rated from 0 (never use) to 3 (always use) and averaged to form a total score. Items assess the frequency of using effective coping skills taught as part of DBT skills training (e.g., "I have tried to get centered before taking any action," "I have accepted my strong feelings, but not let them interfere with things too much," "I have listened to or played music that I found relaxing," "I have tried not to act too hastily or follow my own hunch"). To avoid potential response bias, items on the scale do not use DBT-related language and terms. Previous research supports that the DBT-WCCL demonstrates adequate test–retest reliability, excellent internal consistency, and sensitivity to changes following DBT skills training (Neacsiu et al. 2010a, b). Internal consistency in the present study was excellent across time ($\alpha = 0.92$–0.94).

Eating Disorder Examination—Questionnaire (EDE-Q; Fairburn and Beglin 1994)

The EDE-Q is a widely used and well-validated 31-item self-report questionnaire used to evaluate the presence and severity of ED symptoms during the previous 28 days. Items are rated from 0 to 6, with varying scale anchors. The EDE-Q Global score, which reflects the average of the four subscales (Restraint, Eating Concern, Shape Concern, Weight Concern), was used within the present study as the primary measure of ED symptoms. Previous research has demonstrated strong psychometric properties of the EDE-Q, including internal consistency, construct validity, and 2-week test–retest reliability (Berg et al. 2011). Internal

consistency in the present study was excellent across time ($\alpha = 0.96$–0.97).

Beck Depression Inventory-II (BDI-II; Beck et al. 1996)

The BDI-II is a 21-item, well-validated self-report questionnaire used to evaluate the severity of depressive symptoms. Items are rated from 0 to 3. Internal consistency within the present sample was excellent across time ($\alpha = 0.91$–0.94).

Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004)

The DERS is a 36-item self-report measure that assesses emotion dysregulation. The DERS Total score assesses global emotion dysregulation across six domains: non-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. Higher scores on the DERS indicate greater difficulties with emotion regulation. The DERS has demonstrated solid psychometric properties (Gratz and Roemer 2004) and the internal consistency across subscales over time in this sample was excellent ($\alpha = 0.95$–0.96).

Data Analyses

Data were examined and conformed to assumptions of normality. Data were determined to be not missing completely at random and were imputed in SPSS 24.0 using expectation-maximization (EM) to prevent biases due to missing data (Schafer and Graham 2002) and to allow for intent-to-treat analyses for participants who did not complete all assessments. Within-subjects repeated measures analyses of variance (ANOVA) were conducted in IBM Statistical Packages for the Social Sciences (SPSS, Version 24) to evaluate changes in DBT skills use and ED, depressive, and emotion dysregulation symptoms over time. To evaluate whether participants exhibited clinically significant improvements in skills use over time (DBT-WCCL DSS), we calculated percentage improvement on the DBT-WCCL DSS to allow for comparability across other studies (Neacsiu et al. 2010a, b) and reliable change index (RCI) scores to assess clinically meaningful change over time (Jacobson and Traux 1991).

Separate linear regression models were run to determine whether "early" change in DBT skills use (e.g., change score in skills use from treatment admission to month 1) and "later" change in DBT skills use (e.g., change score in skills use from month 1 to discharge) predicted outcomes at discharge (EDE-Q Global, BDI-II, DERS Total). All analyses controlled for admission DBT skills use to account for pretreatment differences in skills use when using change scores

(Hayes and Rockwood 2017). Analyses also controlled for relevant covariates, including age (a proxy for length of illness, which could impact outcome), gender (given potential differences in eating disorder outcome between males and females), length of stay in treatment (to account for amount of DBT skills training patients were exposed to), and admission levels of the outcome variable. Admission levels of the outcome variable, along with relevant covariates, were included in Step 1, and admission DBT skills use and "early" and "later" DBT skills use were included in Step 2 (see Table 2). Of note, we also examined regression models covarying for admission BMI, comorbid depressive disorder and comorbid anxiety disorder at admission, as well as presence of admission antidepressant medications, mood stabilizer, and anxiety medication. Results of these models were comparable to those presented. Because we controlled for baseline levels of the outcome variables, the models within the present study estimated change in the outcome variables over admission to discharge. Predictor variables were centered prior to inclusion in the regression models and tolerance values were acceptable (all values > 0.40), minimizing concerns regarding multicollinearity among predictors.

To determine the relative importance of "early" versus "later" DBT skills use change in predicting eating disorder, depression, and emotion regulation outcomes, we also completed relative weights analyses (RWA; Braun and Oswald 2011; Tonidandel and LeBreton 2011). RWA generates a "relative importance weight" for each variable in the model, which allows for direct comparison of the total amount of variance accounted for by variables in the model, after accounting for multicollinearity between all independent variables. Relative importance weight statistics can be interpreted as the variable's overall importance, or relative contribution, to the outcome variable, with larger values indicating greater variance in the outcome explained, independent from other independent variables within the RWA model. All variables included in the regression equations noted above were entered to determine the final relative importance weights of early versus later change.

Results

Patient Characteristics

On average, participants were 25.08 years old (SD = 7.88) and had been ill for 6.94 years (SD = 7.35; range 0.5–35.0). The sample was 72.6% Caucasian, 9.6% Asian, 1.5% African American, and 16.2% Other racial background. Overall, 17.6% of the sample identified as Hispanic. Per psychiatrist interview at admission, 70.4% of the sample had a co-occurring mood disorder, 68.9% had an anxiety disorder, 3.7% had an alcohol use disorder,

and 4.4% had a substance use disorder. At the time of admission, 85.2% of the sample were prescribed a current antidepressant medication, 28.9% an atypical antipsychotic, 20.7% a mood stabilizer, and 5.2% an anxiolytic medication.

Changes in DBT Skills Use, ED, Depressive, and Emotion Dysregulation Symptoms OVER Time

Table 1 presents results from repeated-measures ANOVA for self-reported DBT skills use, ED, depressive, and emotion dysregulation symptoms from admission to discharge. DBT-WCCL, EDE-Q Global, BDI-II, and DERS scores all demonstrated statistically significant improvements over time. Self-reported mean DBT-WCCL scores increased from 1.66 at admission to 1.87 at month 1, representing a 12.65% increase. RCI analyses indicated that by month 1, 30.4% (41/135) of patients demonstrated clinically meaningful change on the DBT-WCCL. By discharge, mean DBT-WCCL scores increased by 24.10% compared to admission, and 50.4% (68/135) of patients made clinically meaningful change. Self-reported EDE-Q Global scores at admission and month 1 decreased from two standard deviations above the mean of a community sample of women [M (SD) = 1.52 (1.25); Mond et al. 2006] to within one standard deviation of the community mean at discharge. Regarding depressive symptoms, self-reported BDI-II scores decreased from the moderate range at admission and month 1 to the lower end of the mild range by discharge (0–13 = minimal, 14–19 = mild, 20–28 = moderate, 29–63 = severe; Beck et al. 1996). Self-reported DERS scores at admission and month 1 decreased from approximately two standard deviations above the mean of a community sample [M (SD) = 77.99 (20.72); Gratz and Roemer 2004] to approximately one standard deviation above the mean at discharge.

DBT Skills Use Predicting ED Symptoms

Table 2 presents results from regression analyses predicting change in self-reported ED, depression, and emotion dysregulation symptoms over time. Regarding ED symptoms, the overall regression model significantly predicted decreases in EDE-Q Global scores over time ($R^2 = 0.503$, $F(7,127) = 18.36$, $p < .001$; see Table 2). After controlling for admission DBT skills use, admission ED symptoms, gender, age, and length of stay, both higher "early" DBT skills use (e.g., 1 month into treatment) and higher "later" DBT skills use (e.g., from month 1 to discharge), predicted lower ED symptoms at discharge. No other variables significantly predicted ED symptoms at discharge. Direct comparison of relative importance weights indicated that "early" DBT skills use (beta = 0.052, variance in overall model explained = 9.9%) accounted for 7.43 times more variance in EDE-Q Global scores compared to "later" DBT skills use change (beta = 0.007, variance in overall model explained = 2.5%).

DBT Skills Use Predicting Depressive Symptoms

Results were comparable for self-reported depressive symptoms, with the overall regression model significantly predicting decreases in BDI-II scores over time ($R^2 = 0.480$, $F(7,127) = 16.78$, $p < .001$; see Table 2). There was a main effect of "early" and "later" change in DBT-WCCL scores, with higher DBT-WCCL scores predicting lower BDI-II scores at discharge, controlling for admission DBT-WCCL scores, admission BDI-II scores, gender, age, and length of stay. Similar to above, direct comparison of relative importance weights indicated that "early" DBT skills use (beta = 0.081, variance in overall model explained = 16.0%) accounted for 1.58 times more variance in BDI-II scores compared to "later" DBT skills use change (beta = 0.051, variance in overall model explained = 10.1%).

Table 1 Means and repeated measures ANOVA results from admission to discharge

	Admission M (SD)	Month 1 M (SD)	Discharge M (SD)	F (1.44, 198.05)*	p	Partial η^2
DBT-WCCL DSS	1.66 (0.48)[a]	1.87 (0.38)[b]	2.06 (0.39)[c]	88.85	<0.001	0.40
EDE-Q Global	3.94 (1.52)[a]	3.21 (1.43)[b]	2.57 (1.48)[c]	114.94	<0.001	0.46
BDI-II	24.78 (11.44)[a]	20.15 (10.66)[b]	14.44 (10.63)[c]	89.81	<0.001	0.40
DERS Total	114.85 (28.65)[a]	109.98 (23.38)[b]	96.97 (23.87)[c]	56.77	<0.001	0.30

*Greenhouse-Geisser tests of within-subject effects were used due to significant Mauchly's tests of sphericity. Degrees of freedom ranged from 1.44, 198.05 to 1.65, 220.91 across tests. Superscripts of differing value indicate significant difference at $p < .05$

BDI-II Beck Depression Inventory-II; *DBT-WCCL DSS* Dialectical Behavior Therapy Ways of Coping Checklist—DBT Skills Subscale; *DERS Total* Difficulties with Emotion Regulation Scale—Total Score; *EDE-Q Global* Eating Disorder Examination Questionnaire—Global Score

For comparison purposes, M (SD) for community samples of women on the EDE-Q = 1.52 (1.25; Mond et al. 2006) and for the DERS = 77.99 (20.72; Gratz and Roemer 2004). BDI-II scores of 0–13 = minimal, 14–19 = mild, 20–28 = moderate, 29–63 = severe (Beck et al. 1996)

Table 2 Regression analyses of predictors of change in self-reported eating disorder, depression, and emotion dysregulation symptoms from treatment admission to discharge

Variable	ΔR²	Discharge EDE-Q global				Discharge BDI-II				Discharge DERS total			
		Beta	t (7, 127)	p	Partial r	ΔR²	Beta	t (7, 127)	p	Partial r	ΔR²	Beta	t (7, 127)	p	Partial r
Step 1	0.40***					0.27***					0.31***				
Admission levels of DV		0.59	8.65	<0.001	0.60		0.52	6.85	<0.001	0.51		0.55	7.49	<0.001	0.55
Gender		0.09	1.24	0.22	0.11		−0.01	−0.16	0.87	−0.01		0.01	0.18	0.86	0.02
Age		0.12	1.75	0.08	0.15		0.09	1.14	0.26	0.10		0.13	1.83	0.07	0.16
Length of stay		0.04	0.62	0.53	0.05		0.00	−0.05	0.96	0.00		−0.01	−0.07	0.94	−0.01
Step 2	0.11***					0.21***									
Admission levels of DV		0.59	8.51	<0.001	0.60		0.52	6.43	<0.001	0.50		0.48	5.68	<0.001	0.45
Gender		0.13	1.99	0.05	0.17		0.05	0.78	0.43	0.07		0.09	1.41	0.16	0.12
Age		0.09	1.48	0.14	0.13		0.04	0.61	0.54	0.05		0.09	1.45	0.15	0.13
Length of stay		0.03	0.52	0.61	0.05		0.00	0.03	0.97	0.00		0.00	−0.04	0.97	0.00
Admission WCCL-DSS		−0.31	−3.49	<0.001	−0.30		−0.40	−4.02	<0.001	−0.34		−0.49	−4.72	<0.001	−0.39
Early WCCL-DSS change		−0.42	−5.02	<0.001	−0.41		−0.54	−6.26	<0.001	−0.49		−0.56	−6.74	<0.001	−0.51
Later WCCL-DSS change		−0.17	−2.54	0.01	−0.22		−0.34	−4.97	<0.001	−0.40		−0.33	−5.01	<0.001	−0.41
Total adjusted R²	0.48					0.45					0.50				

*p < .05, **p < .01, ***p < .001

Early WCCL-DSS change change on WCCL-DSS from admission to month 1, *later WCCL-DSS change* change on WCCL-DSS from month 1 to discharge, *BDI-II* Beck Depression Inventory-II, *DBT-WCCL DSS* Dialectical Behavior Therapy Ways of Coping Checklist—DBT Skills Subscale, *DERS total* Difficulties with Emotion Regulation Scale—Total Score, *DV* dependent variable, *EDE-Q Global* Eating Disorder Examination Questionnaire—Global Score

DBT Skills Use Predicting Emotion Dysregulation Symptoms

Results for self-reported emotion dysregulation symptoms were also comparable, with the overall regression model significantly predicting discharge DERS Total scores ($R^2 = 0.527$, $F(7,127) = 20.21$, $p < .001$; see Table 2). Higher DBT-WCCL scores at month 1 ("early" change) and from month 1 to discharge ("later" change) predicted lower DERS Total scores at discharge, controlling for admission DBT-WCCL scores, admission DERS Total scores, gender, age, diagnosis and length of stay. Finally, direct comparison of relative importance weights indicated that "early" DBT skills use (beta = 0.082, variance in overall model explained = 16.9%) accounted for 1.86 times more variance in DERS Total scores compared to "later" DBT skills use change (beta = 0.044, variance in overall model explained = 9.3%).

Discussion

Results from the present study demonstrated significant improvements in self-reported DBT skills use across the course of a DBT-based PHP for a transdiagnostic sample of ED patients. Self-reported skills use increased by nearly 25% and approximately 50% of patients demonstrated clinically-meaningful improvements in skills use from admission to discharge. Further, greater increases in self-reported DBT skills use both early (from admission to month 1) and later (from month 1 to discharge) in treatment predicted greater improvements in self-reported ED, depressive, and emotion dysregulation symptoms from admission to discharge. Importantly, early change in DBT skills use accounted for greater variance in outcomes compared to later change in DBT skills use. Overall, results are consistent with the DBT skills deficit model and provide support for the relevance of change in DBT skill use at all stages of ED treatment, although relatively more so in the first 4 weeks of treatment. Further, results support the rationale for the use of DBT for EDs (Bankoff et al. 2012) by suggesting that improvements in skillful behavior predict treatment outcome in an ED sample at the PHP level of care.

Emotion regulation models of ED symptoms (Gratz and Roemer 2004; Haynos and Fruzzetti 2011; Linehan and Chen 2005) suggest that ED behaviors result from maladaptive attempts to cope with strong emotions; thus, adaptive skills acquisition, particularly early on in treatment, may disrupt these patterns of behavior that maintain EDs. Results from the present study are consistent with this premise. Although self-reported assessment of skills use has not been examined in ED samples previously, improvements exhibited by patients from admission to discharge appear generally comparable to studies using the DBT-WCCL to assess skills use within other disorders. For instance, the improvements in skills use observed within the present study over approximately 3 months were comparable to those reported in a year-long outpatient treatment for BPD (Neacsiu et al. 2010a), a 2-week PHP for depression (Webb et al. 2016), and slightly lower than those observed in a 12-week intensive outpatient program for veterans with BPD and posttraumatic stress disorder (Meyers et al. 2017).

The present study is also the first, to our knowledge, to examine the relative contribution of early versus later change in self-reported DBT skills use on outcome. Results imply that while change in DBT skills use both early and later in treatment account for variability in discharge symptoms, early change accounted for a larger proportion of variance in depressive symptoms, emotion dysregulation, and in particular, ED symptoms. Consistent with research on rapid response to treatment in EDs and other disorders (Fairburn et al. 2004; Hilbert et al. 2015; Safer and Joyce 2011; Wilson 1999), nearly half of the increase in self-reported skills use within the present study occurred during the first 4 weeks following admission. While most studies using the DBT-WCCL have not specifically examined early change in skills use, the relatively high intensity of skills instruction and the higher level of care within the present PHP program may have helped facilitate early change.

Results also support that DBT skills use predicts improved depressive and emotion dysregulation symptoms in an ED sample. In the context of DBT, learning to apply adaptive skills to regulate emotional distress should result in improvements in eating pathology, as well as comorbid psychopathology (e.g., depressive symptoms) and emotion dysregulation more broadly. Depression results are consistent with prior findings demonstrating improved comorbid depressive symptoms and mood stability after DBT (Iverson et al. 2009; Neacsiu et al. 2010a; Soler et al. 2009; Webb et al. 2016) and extend these results by demonstrating that improvements in DBT skills use predict improvements in depressive symptoms. Further, results for emotion dysregulation are also consistent with previous research demonstrating improvements in emotion regulation following DBT (Del Conte et al. 2016; Rizvi et al. 2017), including those in ED samples (Ben-Porath et al. 2014; Safer et al. 2010). Our results also support prior findings outside of the ED field, which indicated that improvements in DBT skills use mediated improvements in emotion regulation over the course of DBT for a sample of individuals with transdiagnostic emotion dysregulation difficulties (Neacsiu et al. 2014), and further suggest that early improvements in skills use may be particularly important.

The current study benefited from several strengths, including the longitudinal, prospective design and the use of measures with strong psychometric properties.

Additionally, the broad inclusion criteria and naturalistic setting increase the external validity and generalizability of these results to populations with severe EDs with comorbid psychopathology. Although the results are generally supportive of the DBT model for EDs, several potential limitations should be noted. First, the current study included a relatively small sample size, which limited our ability to examine differences across specific ED diagnoses. Relatedly, ED diagnoses were based on an unstandardized psychiatrist interview, for which the reliability has not been previously established. Second, we do not have data on prevalence of personality disorder diagnoses relative to DBT outcome, including BPD, in the sample. Third, the current study relied on self-report measures; therefore, it is possible that participants' reports of skillful behavior were biased. Although all existing investigations on skills use in DBT have employed the WCCL, future work might consider using other assessment modalities, such as the frequency of specific skillful behaviors. Fourth, the WCCL assesses only overall skills use and has not been validated for examining different categories of skills. Further, due to the rolling admission to DBT groups in this study, it was not possible to determine if certain skills modules were associated with greater improvements in skills use or outcome. Future longitudinal research in larger samples should investigate which DBT skills (e.g., mindfulness, emotion regulation, distress tolerance, interpersonal effectiveness) are most important in enhancing ED treatment outcomes. Fifth, the present study did not have data on psychotropic medication over the course of treatment, which limits the ability to understand how medication may have impacted outcomes; however, results remained unchanged controlling for admission levels of psychopharmacological medications. Finally, although it is valuable to examine skills use in a naturalistic sample, the lack of a control condition prevents investigation of the degree to which the DBT skills instruction in the program specifically contributed to symptom improvement, as opposed to other mechanisms. Indeed, there are many other factors in the PHP context that could contribute to symptom improvements, including the structure inherent in a PHP setting, medication changes, nutrition and weight restoration, and non-DBT-oriented group therapy. Future studies would benefit from including an active non-DBT control group to account for the specificity of DBT skills use and examining whether skills use mediates DBT treatment outcomes for EDs. Additionally, although outside the scope for the present study, given the relevancy for rapid response in eating disorder treatment, future research should examine the extent to which rapid response to ED treatment is a correlate of early use of DBT skills.

Conclusions

In conclusion, the current findings indicate that improvements in DBT skills use both early and later in treatment predict improvements in ED, depression, and emotion dysregulation symptoms from PHP admission to discharge in a transdiagnostic ED sample, with early change demonstrating stronger predictive value. Given the limited literature examining theoretically-relevant predictors of ED treatment outcome in the context of higher levels of care, these results offer an important contribution to the literature and reaffirm the need to focus on provision of adaptive regulation skills for individuals struggling with eating pathology. Results also highlight the importance of regularly assessing skills use early on and throughout treatment to identify individuals who may be unlikely to respond long-term and may need more intensive intervention. These findings provide initial empirical support for the application of the DBT skills deficit model to ED populations and highlight the important role of early DBT skills use in improving ED symptoms throughout DBT-focused treatment. Further, these results bolster support for the use of DBT for EDs and support continued investigation of processes and factors that contribute to treatment outcome in EDs.

Compliance with Ethical Standards

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