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Changes in emotions over the course of dialectical behavior therapy and the moderating role of

depression, anxiety, and posttraumatic stress disorder

Skye Fitzpatrick[1] , Katharine Bailey[2], & Shireen L. Rizvi[2]

[1]York University, Department of Psychology, 4700 Keele St., Toronto, ON, Canada

[2]Rutgers University, Graduate School of Applied and Professional Psychology, 152

Frelinghuysen Rd., Piscataway, NJ, 08854

Author note:
Correspondence regarding this article should be directed to:
Skye Fitzpatrick,
Assistant Professor,
Department of Psychology,
York University,
4700 Keele St.,
Toronto, ON, Canada
Email: skyefitz@yorku.ca

Abstract

Evidence-based borderline personality disorder (BPD) treatments such as dialectical behavior therapy (DBT) emphasize the acquisition and use of strategies to downregulate negative emotion. However, little research examines whether specific emotions change during DBT. Further, it is unclear if BPD-relevant comorbidities that involve heightened emotion, namely depression, anxiety disorders, and posttraumatic stress disorder (PTSD), moderate these outcomes. This study investigated which specific emotions (hostility/anger, fear, shame/guilt, and sadness) decrease during DBT, and whether comorbid depression, anxiety disorders, and PTSD moderate these outcomes. Individuals with BPD ($N = 101$) completed six months of standard DBT and provided measurements of specific emotions at every session and at pre-, mid-, and post-treatment. Generalized estimating equations revealed moderate effect-sized reductions in anger at major assessment time points. Anxiety disorders and PTSD moderated the effect of time on fear, shame, and guilt. PTSD also moderated the effect of time on sadness. For all moderating effects, individuals with the comorbidity exhibited greater reductions than those without. These findings corroborate that DBT reduces several specific emotions, and comorbid PTSD and anxiety disorders may facilitate this effect for fear, shame/guilt, and sadness (clinical trial registration number = NCT03123198).

Keywords: Dialectical behavior therapy; borderline personality disorder; shame; anger; emotion dysregulation

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Borderline personality disorder (BPD) involves pervasive instability in emotion, identity, behavior, relationships, and cognition (American Psychiatric Association, 2013). BPD is associated with serious and potentially lethal outcomes, with up to 84% of individuals with BPD having engaged in self-harming or suicidal behavior (Soloff, Lynch, & Kelley, 2002). A large body of research supports the efficacy of dialectical behavior therapy (DBT; Linehan, 1993) for BPD (e.g., De Cou, Comtois, & Landes, 2019; Kliem, Kroger, Kosfelder, 2010; Linehan et al., 2006; Stoffers-Winterling et al., 2012; Verheul et al., 2003). DBT is predicated upon the theory that emotion dysregulation, as in disruptions in emotion processes (e.g., heightened sensitivity, intense emotional reactions, prolonged emotion duration) and the ability to modulate them, is the core of BPD (Linehan, 1993). Therefore, teaching clients adaptive emotion regulation strategies (i.e., strategies to modulate emotion; Gross & Thompson, 2007) is central in DBT (Linehan, 1993; Linehan, 2015). Indeed, research demonstrates that global emotion dysregulation decreases, and the use of emotion regulation strategies increases, over the course of DBT (Neacsiu, Eberle, Kramer, Wisemann, & Linehan, 2014). Accordingly, increased use of DBT skills, including emotion regulation strategies, mediates improvements in suicidality, depression, and anger control in DBT (Neacsiu, Rizvi, & Linehan, 2010). Although the importance of addressing emotion regulation in DBT is clear, it is less clear whether DBT differentially impacts the specific emotions that it aims to regulate. Given that problems with emotion are theoretically the core of BPD (Linehan, 1993), identifying which specific emotions change in DBT is pertinent to understanding which elements of these difficulties are effectively addressed by DBT, and which ones require treatment refinement.

The Impact of DBT on Specific Emotions

Studies examining the impact of DBT or DBT-informed interventions (henceforth referred to collectively as DBT) on specific emotions are sparse, mixed in their findings, and predominantly focused on anger and fear/anxiety. Some studies show that DBT does not result in changes in anger from pre- to post-treatment (Prendergast & McCausland, 2007; Shelton et al., 2009), or has comparable (Bohus et al., 2004; Feigenbaum, Fonagy, Pilling, Jones, Wildgoose, & Bebbington, 2012; McMain et al., 2009) or inferior (Clarkin, Levy, Lezenweger, & Kernberg, 2007) anger outcomes to control conditions. Conversely, other studies suggest that DBT results in significant reductions in pre- to post-treatment anger (Bohus et al., 2000; Linehan, McDavid, Brown, Sayrs, & Gallop, 2008; Long, Fulton, Dolley, & Hollin, 2011; Woodberry & Popenoe, 2008; Yen, Johnson, Costello, & Simpson, 2009), superior reductions compared to control conditions (Evershed et al., 2003; McMain, Guimond, Barnhart, Habinski, & Streiner, 2017; Soler et al., 2009), or mixed findings depending on the measure of anger used (Gutteling, Montagne, Nij, & van den Bosch, 2012; Koons et al., 2006; Neacsiu, Lungu, Harned, Rizvi, & Linehan, 2014; Neacsiu, Rompogren, Eberle, & McMahon, 2018). Thus, the impact of DBT on the experience of anger is unclear and impeded by measurement inconsistencies.

Unlike with anger, research more clearly supports the beneficial impact of DBT on fear/anxiety. Several studies suggest that DBT results in significant reductions in state or trait anxiety from pre- to post-treatment (Bohus et al., 2000; Bohus et al., 2004; Gutteling et al., 2012; Harned, Korslund, & Linehan, 2014; Long et al., 2011; Rizvi & Steffel, 2014; Soler et al., 2009), or equivalent reductions to community treatment by experts (Neacsiu et al., 2014). However, several other emotions (e.g., shame, guilt, and sadness) have received considerably less empirical attention in DBT research. Some research shows that individuals with BPD and posttraumatic

stress disorder (PTSD) show reductions in shame, guilt, fear, and disgust when receiving DBT with or without focused PTSD treatment (Harned et al., 2014; Harned, Ruork, Liu, & Tkachuck, 2015). However, these works were exclusively conducted in a comorbid BPD and PTSD sample, and it is therefore unclear whether these emotion changes are specific to those with PTSD or generalize to BPD groups more broadly. Only one other study has examined the impact of DBT on specific emotions in BPD, and it showed significant but comparable reductions in guilt and shame in both DBT and community treatment by experts (Neacsiu et al., 2014). To our knowledge, no studies have examined DBT's impact on the emotion of sadness specifically.

This diffuse pattern of findings suggests that it is unclear which specific emotions are reduced in DBT, if any. This literature is also hampered by a heavy reliance on the measurement of emotions at few timepoints (e.g., pre- and post-treatment), rather than continuously throughout DBT. Such infrequent measurement limits statistical power, which may account for the proliferation of null effects in the literature. Further, infrequent measurements diminish accuracy by being more likely to produce results that reflect participant's emotional states in the moment that they completed their questionnaire, rather than their overall trajectories. More frequent measurement would allow for a clearer and better-powered illustration of potential within-treatment changes in emotions. In addition, it is unclear whether individual characteristics moderate emotion outcomes in DBT. Indeed, it is possible that the mixed anger findings can be attributed to meaningful heterogeneity in treatment response, rather than measurement discrepancies. Identifying such characteristics is thus pertinent to clarifying mixed findings and understanding who experiences emotional benefits from DBT, and who may require additional clinical attention. One important individual difference is comorbidity.

The Moderating Role of Comorbid Diagnoses on Emotion Change in DBT

Comorbidity is the norm rather than the exception in BPD, with a particularly high prevalence of depression (87%), anxiety disorders (89%), and PTSD (i.e., 58%) in BPD samples (Zanarini, Frankenburg, Hennen, Reich, & Silk, 2004). These comorbidities may be a key moderator of emotional outcomes in DBT because inherent to them are elevations in specific emotion states. Sadness, fear/anxiety, and several specific negative emotions (e.g., anger, guilt, shame) are diagnostic criteria for depression, anxiety disorders, and PTSD, respectively (American Psychiatric Association, 2013). Prominent transdiagnostic and disorder-specific theories suggest that the problematic beliefs and avoidance behaviors that typify these disorders can maintain and promote the specific emotions that characterize them (e.g., Barlow et al., 2011; Beck, 2008; Foa & Kozak, 1986; Foa, Huppert, & Cahill, 2006; Martell, Dimidjian, & Herman-Dunn, 2010; Resick, Monson, & Chard, 2017). Such comorbidities which are particularly common in BPD may thus obstruct the influence of DBT on the specific emotions that they elicit. Alternatively, given that PTSD, depression, and anxiety are associated with emotion dysregulation (Dixon-Gordon et al., 2015; Marshall-Berenz, Morrison, Schumacher, & Coffey, 2011; Mennin, Heimberg, Turk, & Fresco, 2005), and that DBT primarily targets emotion dysregulation, individuals with these comorbidities may have more intense emotions that are more amenable to treatment. The presence of comorbid depression, anxiety, or PTSD may thus facilitate, rather than obstruct, specific emotion change.

Given these gaps in knowledge, the present study had two aims. First, it aimed to replicate and extend the literature examining the impact of DBT on several specific emotions with frequent and intermittent measurement: anger, fear, shame, guilt, and sadness. Second, it aimed to examine whether comorbid depression, anxiety disorders, or PTSD moderate specific emotion outcomes in DBT. Based on extant literature, we hypothesized that DBT would result in

reductions in all specific emotions. Given a dearth of literature examining whether comorbidities moderate these effects, we considered these analyses exploratory.

Material and methods

Participants

Study participants were individuals with BPD ($N = 101$) who underwent six months of standard DBT in a university DBT training clinic (see Rizvi, Hughes, Hittman, & Oliveira, 2017, for more details). Inclusion criteria required that study participants: 1) be age 18 or older, 2) agree to take part in research assessments and videorecording of therapy and assessments, 3) agree to pay for treatment sessions, 4) maintain residence within commuting distance of the clinic (<45mins), 5) agree to discontinue other forms of therapy, and 6) meet diagnostic criteria for BPD. A subgroup of participants ($n=16$) were recruited for a smaller substudy and required to meet additional inclusion criteria: two or more instances of nonsuicidal self-injury or attempted suicide within the last 5 years with once instance occurring in the last six months; and willingness to utilize a mobile device installed with the DBT-based application (see Rizvi & Steffel, 2014). Exclusion criteria for the current study were as follows: 1) clients requiring mental health services not available through this clinic (e.g. schizophrenia, life-threatening anorexia nervosa), 2) non-English speaking, 3) IQ score of less than 70, 4) inability to understand research consent forms, and 5) being court-ordered to participate in treatment. All participants provided written informed consent for inclusion in the study.

Participants' average age was 29.54 (SD = 9.87) and 76.2% were female. Participants identified their race/ethnicity as Caucasian (77.2%), mixed race (12.9%), Asian (5.9%), or Black/African American (4.0%). Participants reported some college (46.5%), college (28.7%), a Masters degree (6.9%), some graduate or professional school beyond college (5.9%), business or

technical training beyond high school (1.0%), high school (7.9%), some high school (2.0%), and graduate education diploma (1.0%) as their highest education levels. Approximately 71.9% of the sample reported being prescribed psychotropic medications. On average, participants reported 3.15 ($SD = 2.12$) and 3.87 ($SD = 2.26$) current and lifetime comorbid disorders, respectively, as measured by the SCID-IV-TR or SCID-5 (see Table 1).

Measures

A battery of measures examining a range of mood, emotional, behavioural, and social difficulties was administered to participants at major assessment points in the larger parent study (Rizvi et al., 2017). The subset of these measures included in the present study are listed below.

Diagnostic interviews. At the pre-treatment assessment timepoint, *Diagnostic and Statistical Manual of Mental Disorders-4th edition* (text revision) or *5th edition* (DSM-IV-TR or DSM-5; American Psychiatric Association, 2000; 2013) psychological diagnoses were determined using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I-TR; First, Spitzer, Gibbon & Williams, 2002) or the Structured Clinical Interview for DSM-5 (SCID-5; First, Williams, Karg & Spitzer, 2015). Additionally, BPD diagnoses were determined using the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II; First, Gibbon, Spitzer, Williams & Benjamin, 1997). Graduate-level assessors administered all diagnostic interviews under the supervision of a licensed clinical psychologist. They had weekly meetings with the clinic director and licensed clinical psychologist to provide assessment supervision and prevent assessor drift. The psychometric properties for the SCID are considered to be excellent (First & Gibbon, 2004). Participants who met diagnostic criteria for current major depressive disorder or dysthymia (SCID-I-TR) or persistent depressive disorder (SCID-5) were grouped into one dichotomous category reflecting the presence or absence of a current depression. Participants

who met diagnostic criteria for current panic disorder, agoraphobia, social anxiety disorder, specific phobia, or generalized anxiety disorder were grouped into one dichotomous category reflecting the presence or absence of a current anxiety disorder. Approximately 62% of the sample (n = 62) had a current depression disorder, 71.3% (n = 72) had a current anxiety disorder, and 13.9% (n = 14) had current PTSD. Participant comorbidities are presented in Table 1.

Emotion Assessment. Measurements of specific emotions at major assessment points were collected using the Positive and Negative Affect Schedule – Expanded Form (PANAS-X; Watson & Clark, 1994). The PANAS-X presents participants with a list of 60 emotions and asks them to rate the extent to which individuals have felt them in the past few weeks on a scale from 1 ("very slightly or not at all") to 5 ("extremely"). These emotions are summed to yield 11 specific emotion subscales, which vary in their range. For the present study, we utilized the hostility/anger (angry, hostile, irritable, scornful, disgusted, loathing), fear (afraid, scared, frightened, nervous, jittery, shaky), shame/guilt (guilty, ashamed, blameworthy, angry at self, disgusted with self, dissatisfied with self), and sadness (sad, blue, downhearted, alone, lonely) subscales. The hostility/anger, fear, and shame/guilt subscales range from 6 to 30, and the sadness scale ranges from 5 to 25, with higher levels indicating more intense emotion. Notably, shame and guilt are collapsed in this measure. The convergent and discriminant validity of the PANAS-X scales are well established (Watson & Clark, 1994) and correlate highly with other emotion measures such as the Profile of Mood States (McNair, Lorr, & Droppleman, 1992; Watson & Clark, 1994). Previous research suggests that these scales can be used to validly measure long-term individual differences in affect (Watson & Clark, 1994). Cronbach alphas for the subscales used in the present study ranged from .81 to .94 across time points.

Measurements of session-by-session specific emotions were collected using the Positive Affect and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988). The PANAS provides participants with a list of 20 emotions and asks participants to indicate the extent to which they feel them "right now" on a scale from 1 ("very slightly or not at all") to 5 ("extremely"). The scales are considered to be a reliable and valid measurement for emotional states (Crawford & Henry, 2004). They have high internal consistency with evidence of convergent and discriminant validity (Watson et al., 1988). For the present study, the session-to-session intensity of hostile (i.e., anger), afraid, ashamed, and guilty were examined. Notably, sadness is not assessed using this scale, and was thus only examined at major assessment points.

Procedure

Recruitment and assessment. Procedures received approval from the university institutional research board. Participants self-referred to the clinic and were screened via telephone for initial eligibility. Interested and eligible clients underwent psychodiagnostic assessments to further assess eligibility. During the assessment, potential participants provided informed consent, underwent psychodiagnostic interviews, and completed the PANAS-X. If the client was eligible for the study and interested in participation, they began DBT, completing the PANAS-X again at mid- (i.e., three months) and post-treatment (i.e., six months). They completed session-to-session PANAS measurements at the beginning of individual therapy sessions throughout treatment.

Treatment. Treatment providers were clinical psychology graduate students who were supervised by the senior author and completed graduate courses taught by the senior author on cognitive behavioral therapy and dialectical behavior therapy. They were also enrolled in an ongoing weekly dialectical behavior therapy course, taught by the senior author. Supervision was

conducted with individual clinicians or in pairs weekly, and all clinicians also attended weekly DBT consultation team. Due to financial and resource barriers, DBT adherence coding was not conducted. However, the senior author and supervisor was a DBT expert who utilized the DBT adherence scale (Linehan & Korslund, 2003) to inform feedback. Previous research also shows that outcomes from this clinic are comparable to benchmarked effect sizes in gold-standard DBT intervention research (Rizvi et al., 2017). Clients completed six months of comprehensive DBT including weekly individual therapy, weekly group skills training, and intersession skills coaching (i.e., 24/7 availability with assigned clinician). Group skills training was conducted in a psychoeducational format and taught participants skills from all DBT modules (i.e., mindfulness, emotion regulation, interpersonal effectiveness, and distress tolerance). Individual psychotherapy sessions addressed treatment targets in alignment with DBT principles (Linehan, 1993) in the following order: life-threatening behavior (e.g., suicidal behavior), therapy-interfering behavior (e.g., homework noncompliance), and quality of life interfering behavior (e.g., treatment of other comorbidities). Clients who missed four consecutive individual therapy appointments or group skills training sessions were considered treatment dropouts. Fees for services were assigned on a sliding scale determined by household income ranging from $10 to $100 per week.

Data Analytic Strategy

We utilized G*Power to identify the sample size required to detect changes in specific emotions over time. Assuming a correlation among repeated measures of .5, power analyses suggested that 73 individuals would be required to detect a conservatively-estimated small to moderate effect size ($f = .15$) with three repeated measures and 80% power, suggesting that the present sample size ($N = 101$) provided adequate statistical power even with ~28% attrition. We did not examine power for our moderation analyses given their exploratory nature.

In order to examine whether there were differences between individuals with and without depression, anxiety disorders, and PTSD in each emotion at baseline, we conducted a multivariable analyses of variance (MANOVA) with each specific emotion at baseline as outcomes and depression, anxiety disorder, and PTSD (present or absent) as between-subjects factors. We applied generalized estimating equations (GEE; Burton, Gurrin, & Sly, 1998; Diggle, Heagerty, Liang, & Zeger, 2002; Hubbard et al., 2010) using SPSS Version 26 to examine repeated measures data. GEE uses a semi-parametric approach robust to misspecification of the covariance structure, produces parameters based on residual within-cluster similarity, and retains participants with missing data. For data collected at the major assessment points (pre, mid-, and post-treatment), four analyses were run with anger, fear, shame/guilt, and sadness as outcomes. For session-to-session data, four analyses were run with hostility (i.e., anger), fear, shame, and guilt as outcomes. In all models, time point was entered as continuous predictor and depression, anxiety disorder, and PTSD symptom status at baseline (i.e., currently present or absent) were categorical, time-invariant predictors. Interactions between time point and each diagnostic comorbidity was then entered to examine whether they moderate change in specific emotions over time. Exchangeable, autoregressive, and unstructured covariance structures were considered for each analysis, retaining the results from the structure with the lowest Quasilikelihood under the Independence Model Criterion (QIC) value. In line with cautions against the use of statistical corrections for multiple tests in psychological research where effects tend to be small or moderate (Cabin & Mitchell, 2000; Moran, 2003; O'Keefe, 2003; Rossi, 1990), we refrained from applying corrections for multiple tests.

We computed repeated measures Cohen's *d* effect size values of change in specific emotions from pre- to post-DBT using Wiseheart's (2014) calculator, which accounts for the

correlation between repeated measures based on Morris and DeShon (2002). We considered effect sizes of $d = .20$ as small, $d = .50$ as moderate, and $d = .80$ as large (Cohen, 1977).

Results

Means and standard deviations for emotions at major assessment points and their respective repeated measures Cohen's d statistics are in Table 2. Participants reported low to moderate levels of session-to-session hostility ($M = 1.40$, SD = .81), fear ($M = 2.19$, $SD = 1.27$), shame ($M = 2.09$, $SD = 1.21$), and guilt ($M = 2.06$, $SD = 1.17$). A MANOVA examining group differences in baseline PANAS-X emotion across depression, anxiety disorder, and PTSD groups revealed non-significant multivariate effects for depression, $F (4, 93) = 2.16$, $p = .08$, and PTSD, $F (4, 93) = 1.32$, $p = .27$, on specific emotions. However, there was a main effect of anxiety group (*Wilk's λ = .81*), $F (4, 93) = 5.45$, $p = .001$, such that individuals with an anxiety disorder had higher fear ($\eta_p^2 = .18$), $F (1, 96) = 20.78$, $p < .001$, anger ($\eta_p^2 = .07$), $F (1, 96) = 6.95$, $p = .01$, shame/guilt ($\eta_p^2 = .09$), $F (1, 96) = 9.68$, $p = .002$, and sadness ($\eta_p^2 = .11$), $F (1, 96) = 11.55$, $p = .001$, than those without. A MANOVA examining group differences in session-to-session emotion at the first session across groups revealed non-significant multivariate effects for the main effect of depression, $F (4, 93) = 1.08$, $p = .37$, and PTSD, $F (4, 93) = .92$, $p = .46$, on specific emotions. However, there was a main effect to anxiety group (*Wilk's λ = .85*), $F (4, 93) = 3.96$, $p = .01$, such that individuals with an anxiety disorder had elevated fear ($\eta_p^2 = .11$), $F (1, 96) = 11.32$, $p = .001$, but not anger $F (1, 96) = .67$, $p = .42$, shame, $F (1, 96) = 1.95$, $p = .17$, or guilt, $F (1, 96) = .09$, $p = .77$, compared to those without.

Generalized estimating equations analyses examining changes in emotions at major assessment time points are presented in Table 3, and at session-to-session time points in Table 4. Pre- to post-treatment Cohen's d values for reductions in PANAS-X emotions were moderate for

anger ($d = .7$) and fear ($d = .5$), and large for shame/guilt ($d = .8$) and sadness ($d = .8$). Main effects of time point were only interpreted in instances where there were not statistically significant comorbidity × time point interactions. There were statistically significant reductions in anger at the major assessment, but not session-to-session timepoints. There were no statistically significant interactions between any disorder and time point predicting anger at either major assessment or session-to-session time points. There was a statistically significant anxiety disorder × time point interaction for fear at major assessment points, and a PTSD × time point interaction for it at session-to-session time points, such that individuals with these disorders had greater reductions in fear. There were also statistically significant PTSD × time point and anxiety disorder × time point interactions predicting changes in shame/guilt at the major assessment points, and statistically significant PTSD × time point interactions predicting both session-to-session shame and guilt. In all cases, the presence of PTSD predicted greater reductions in these emotions, as did the presence of an anxiety disorder for the major assessment points. Finally, there was a statistically significant PTSD × time point interaction predicting changes in sadness, such that individuals with PTSD exhibited greater reductions in sadness.

Discussion

The present study aimed to examine which specific emotions, if any, decrease over the course of DBT and whether this effect is moderated by comorbid depression, anxiety disorders, or PTSD. We hypothesized that all emotions would decrease over the course of DBT, and considered analyses regarding the moderating effect of comorbidities to be exploratory. Consistent with our hypotheses, there were significant reductions in anger at the major assessment time points, with a moderate pre to post-treatment effect size. Comorbid anxiety disorders moderated the magnitude of reduction in fear and shame/guilt at major assessment

points. Comorbid PTSD moderated the magnitude of reduction in fear at session-to-session time points, sadness at major assessment points, and shame and guilt at both major assessment and session-to-session time points. In all cases, the presence of the anxiety disorder or PTSD comorbidity resulted in greater reductions in these emotions.

That anger decreased over DBT aligns with prior research (e.g., Bohus et al., 2000; Linehan et al., 2008; Long et al., 2011). Given that DBT teaches skills to downregulate anger, it is logical that it is attenuated over treatment. However, it is unclear why there were reductions in anger at the major assessment, but not session-to-session time points. It is possible that the measures used at these distinct time points examined different constructs. At the major assessment points, the anger measure was a composite of anger-related feelings such as angry, hostile, irritable, scornful, disgusted, and loathing, whereas the session-to-session measure only asked participants to rate the extent to which they felt hostile in the moment. Participant's state experience of hostility, as one specific facet of anger, may not change over DBT, but their experience of global anger may. Indeed, while our results with respect to anger align with one body of literature, they conflict with another that does not support the efficacy of DBT for anger (e.g., Bohus et al., 2004; Feigenbaum et al., 2012; McMain et al., 2009). The majority of studies that did not find evidence for an effect of DBT on anger (Bohus et al., 2004; Feigenbaum et al., 2012; McMain et al., 2009) utilized the State Trait Anger Expression Inventory (STAXI; Spielberger, 1988) to measure anger. This measure emphasizes various emotion regulatory behaviors in relation to anger, such as its suppression, expression, and one's ability to control it (Spielberger, 1988). It may thus be more aligned with actions associated with anger, rather than anger itself. Hostility may similarly be an action-oriented facet of anger, one that does not change as readily over DBT as the emotional experience of anger might. Alternatively, hostility

may simply be generally low unless briefly and discretely elicited by a specific stressor such as social rejection (e.g., see Chapman, Dixon-Gordon, Butler, & Walters, 2015; Chapman, Walters, & Gordon, 2014) resulting in less capacity for its general change over time.

The Moderating Impact of Diagnostic Comorbidities

Our results suggest that anxiety disorders and/or PTSD may facilitate reductions in specific emotions. Notably, individuals with an anxiety disorder experienced higher levels of all specific emotions at baseline at the major assessment points and fear at the session-to-session time points. Thus, individuals with an anxiety disorder may exhibit greater reductions in specific emotions because they are more dysregulated to begin with, thus allowing more "room" for improvement. However, although all emotions were elevated in anxiety disorders at baseline, the presence of an anxiety disorder only facilitated improvement in fear and shame/guilt. Fear is a central component of several anxiety disorders (American Psychiatric Association, 2013). Additionally, high levels of worry and social anxiety correlate with shame- and guilt-proneness after controlling for depression in patients with anxiety disorders. However, depression does not correlate with shame- and guilt-proneness after controlling for anxiety (Fergus, Valentiner, McGrath, Jencius, 2010). Fear and shame/guilt may thus be particularly characteristic of anxiety disorders. DBT is efficacious in improving comorbid anxiety disorders, which may elicit change in its central emotional correlates (i.e., fear, shame/guilt; Pasieczny & Connor, 2011). An important next step for this research would therefore be to examine whether improvements in diagnostic comorbidities mediate improvements in specific emotions over time.

In addition, individuals with BPD and PTSD exhibited greater reductions in fear, shame, guilt, and sadness than those with BPD alone. Unlike with the anxiety disorder comorbidity, there were no differences at baseline between individuals with and without PTSD in any specific

emotions, suggesting that higher starting negative emotions in PTSD do not account for these effects. Although fear, shame, guilt, and sadness levels are similar across those with and without PTSD, the qualitative nature of these emotions may differ based on whether they are or are not trauma-based (e.g., feeling fear or shame related to trauma reminders). Perhaps the emotion regulatory skills offered in DBT, which emphasize approaching emotion-provoking stimuli and correcting distorted beliefs (Linehan, 2014), are uniquely efficacious for trauma-related fear, shame, guilt, and sadness. It is also possible that trauma-related fear, shame, guilt, and sadness developed more recently following traumatic event exposure than global fear, shame, guilt, and sadness, which may be more longstanding. If these trauma-related emotions are less chronic, they may be more responsive to treatment efforts, although the source of the emotions were not assessed in this study. Examining the different qualitative experiences of fear, shame, guilt, and sadness in individuals with BPD with and without PTSD is important to disentangling such idiosyncratic effects. Importantly, given the small number of individuals with PTSD, these findings should be viewed as preliminary and interpreted with caution.

Finally, unlike comorbid anxiety disorders and PTSD, depression did not moderate any changes in emotions. Inherent to both anxiety disorders and PTSD are problems with frequent and intense specific negative emotions and their modulation. However, while this may be characteristic of some individuals with depression (e.g., sadness), many others may experience overly restricted or blunted affect (American Psychiatric Association, 2013). The emphasis of downregulation of emotion in DBT may thus be particularly well-suited for individuals who have comorbidities that contribute towards emotional excess, rather than deficits.

Limitations

This study has several limitations that must be considered when interpreting results and planning future research. Although graduate-level assessors were closely supervised, interrater reliability was not measured and it therefore remains unclear whether the diagnosed comorbidities are accurate. As well, this study lacked a control condition and therefore it is not possible to ascertain whether DBT alters specific emotions above and beyond the passage of time or nonspecific effects of therapy in general. Future researchers are advised to extend this work by examining the impact of DBT on specific emotions relative to strong comparators. However, the focus of this study was not on the efficacy of DBT in reducing emotion, but rather on the identification of whether specific emotions change and are moderated by comorbidities, which does not necessitate a randomized controlled trial design. Additionally, the number of individuals with current PTSD in this sample was small. Such a low base rate of PTSD is atypical of BPD samples (Zanarini et al., 2004), and may reflect meaningful differences between the present study sample and those typically reported in BPD treatment studies. It is therefore possible that some PTSD $\times$ time point interactions were not statistically significant for reasons pertaining to low statistical power, and replication efforts in larger PTSD samples are needed. Related, we did not examine whether specific forms of trauma that lead to PTSD (e.g., single or repeated, interpersonal versus not, distal versus recent) differentially influence treatment responses, and future researchers are advised to disentangle such effects. Moreover, the analyses examining changes in specific emotions relied on subjective ratings of emotion. Emotion is multifaceted with independent physiological, behavioral, and subjective domains (Berntson, Cacioppo, Quigley, & Fabro, 1994; Gross & Thompson, 2007). Understanding if DBT also influences objective emotion domains is a key directive for future research. The PANAS-X measure used at major assessment time points also collapses fear and anxiety, despite the fact that these are two

distinct emotional states with distinct cognitive and physiological correlates (e.g., Craske et al., 2009). Based on the major assessment point data, it remains unclear whether anxiety, fear, or both improve over the course of DBT, and which comorbidities moderate this change, if any, which is important to examine more precisely in future work. Finally, the current study did not assess variables of interest after treatment completion. Given the serious and enduring nature of BPD, future research may consider monitoring the presence of specific emotions post-treatment to examine whether reductions in distressing emotions are sustained over time.

Clinical Implications and Conclusions

Although there are notable limitations to the present study, it also offers several clinical implications. First, results provide additional evidence that DBT effectively reduces specific emotions among individuals with BPD, including and potentially especially for those with comorbid anxiety disorders and PTSD. These findings are consistent with DBT's emphasis on helping patients identify, express, and cope with emotion. Results also suggest that comorbid anxiety disorders and PTSD may bolster potential gains with respect to fear, shame, guilt, and sadness in DBT. Clinicians are thus advised to utilize DBT for clients with BPD with these comorbidities, if they are struggling with specific emotions. However, the present findings additionally suggest that individuals without comorbid PTSD and anxiety disorders may not experience as much emotional change as others in DBT, perhaps because they do not have comorbid disorders that involve an excess of negative emotion. Clinicians are thus also advised to seek additional ways to facilitate emotional improvement in these individuals beyond skills that are explicitly focused on downregulating negative emotion such as ones focused on emotion literacy or the upregulation of positive emotion.

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., Text Revision). Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.

Barlow, D. H., Farchione, T. J., Fairholme, C. P., Ellard, K. K., Boisseau, C. L., Allen, L. B., & Ehrenreich-May, J. T. (2011). *Unified protocol for transdiagnostic treatment of emotional disorders: Therapist guide.* New York, NY: Oxford University Press.

Beck, A. T. (2008). The evolution of the cognitive model of depression and its neurobiological correlates. *The American Journal of Psychiatry, 165*, 969-977. https://doi.org/10.1176/appi.ajp.2008.08050721

Berntson, G. G., Cacioppo, J. T., Quigley, K. S., & Fabro, V. T. (1994). Autonomic space and psychophysiological response. *Psychophysiology, 31*, 44-61. https://doi.org/10.1111/j.1469-8986.1994.tb01024.x

Bohus, M., Haaf, B., Simms, T., Limberger, M. F., Schmahl, C., Unckel, C., … Linehan, M. M. (2004). Effectiveness of inpatient dialectical behavioral therapy for borderline personality disorder : a controlled trial, *42*, 487–499. https://doi.org/10.1016/S0005-7967(03)00174-8

Bohus, M., Haaf, B., Stiglmayr, C., Pohl, U., Bohme, R., & Linehan, M. (2000). Evaluation of inpatient dialectical-behavioral therapy for borderline personality disorder- a prospective study. *Behavior Research and Therapy, 38,* 875-887. https://doi.org/10.1016/S0005-7967(99)00103-5

Burton, P., Gurrin, L., & Sly, P. (1998). Extending the simple linear regression model to account for correlated responses: An introduction to generalized estimating equations and multi-

level mixed modelling. *Statistics in Medicine, 17,* 1261-1291. Retrieved from

http://www.stat.ucdavis.edu/~azari/sta225/paper2.pdf

Cabin, R. J., & Mitchell, R. J. (2000). To Bonferroni or not to Bonferroni: When and how are the

questions. *Bulletin of the Ecological Society of America, 81,* 246-248.

https://doi.org/10.2307/20168454

Chapman, A. L., Dixon-Gordon, K., Butler, S. M., & Walters, K. N. (2015). Emotional reactivity

to social rejection versus a frustration induction among persons with borderline

personality features. *Personality Disorders: Theory, Research, and Treatment, 6*, 88-96.

https://doi.org/10.1037/per0000101

Chapman, A. L., Walters, K. N., & Gordon, K. L. D. (2014). Emotional reactivity to social

rejection and negative evaluation among persons with borderline personality

features. *Journal of Personality Disorders, 28*, 720-733.

https://doi.org/10.1521/pedi_2012_26_068

Clarkin, J. F., Levy, K. N., Lenzenweger, M. F., & Kernberg, O. F. (2007). Evaluating three

treatments for borderline personality disorder: a multiwave study. *American Journal of

Psychiatry, 164*, 922-928. https://doi.org/10.1176/ajp.2007.164.6.922

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences (Rev. Ed.).* Hillsdale, NJ,

US: Lawrence Erlbaum Associates, Inc.

Craske, M. G., Rauch, S. L., Ursano, R., Prenoveau, J., Pine, D. S., & Zinbarg, R. E. (2009).

What is anxiety disorder? *Depression and Anxiety, 26*, 1066-1085.

http://doi.org/10.1002/da.20633

Crawford, J. R., & Henry, J. D. (2004). The positive and negative affect schedule (PANAS):

Construct validity, measurement properties and normative data in a large non-clinical

sample. *British Journal of Clinical Psychology, 43*, 245-265.

https://doi.org/10.1348/0144665031752934

DeCou, C. R., Comtois, K. A., & Landes, S. J. (2019). Dialectical behavior therapy is effective

for the treatment of suicidal behavior: A meta-analysis. *Behavior Therapy, 50*, 60-72.

https://doi.org/10.1016/j.beth.2018.03.009

Diggle, P., Heagerty, P., Liang, K., & Zeger, S. (2013). *Analysis of Longitudinal Data (2nd ed.).*

Oxford, UK: Oxford University Press.

Dixon-Gordon, K., Weiss, N. H., Tull, M. T., DiLillo, D., Messman-Moore, T., & Gratz, K. L.

(2015). Characterizing emotional dysfunction in borderline personality, major depression,

and their co-occurrence. *Comprehensive Psychiatry, 62*, 187-203.

https://doi.org/10.1016/j.comppsych.2015.07.014

Evershed, S. U. E., Tennant, A., & Boomer, D., Rees, A., Barkham, M., & Watson, A. (2003).

Practice-based outcomes of dialectical behaviour therapy (DBT) targeting anger and

violence, with male forensic patients: A pragmatic and non-contemporaneous

comparison. *Criminal Behaviour and Mental Health, 13,* 198-213.

https://doi.org/10.1002/cbm.542

Feigenbaum, J. D., Fonagy, P., Pilling, S., Jones, A., Wildgoose, A., & Bebbington, P. E. (2012).

A real-world study of the effectiveness of DBT in the UK National Health Service, 121–

141. https://doi.org/10.1111/j.2044-8260.2011.02017.x

Fergus, T. A., Valentiner, D. P., McGrath, P. B., & Jencius, S. (2010). Shame- and guilt-

proneness: Relationships with anxiety disorder symptoms in a clinical sample. *Journal of

Anxiety Disorders, 24*(8), 811-815. doi:http://dx.doi.org/10.1016/j.janxdis.2010.06.002

First, M. B., & Gibbon, M. (2004). The Structured Clinical Interview for DSM-IV Axis-I

Disorders (SCID-I) and the Structured Clinical Interview for DSM-IV Axis-II Disorders (SCID-II). In Hilsenroth M. J., Segal D. L. (Eds.), *Comprehensive handbook of psychological assessment, Vol. 2: Personality Assessment.* Hoboken, NJ: John Wiley & Sons Inc.

First, M. B., Gibbon, M., Spitzer, R. L., Williams, J. B. W., & Benjamin, L. S. (1997). *Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II).* Washington, DC: American Psychiatric Press.

First, M., Spitzer, R., Gibbon, M., & Williams, J. (1995). *Structured Clinical Interview for Axis I DSM-IV Disorders - Patient Edition (SCIDI/P)*. New York, NY: Biometrics Research Department, New York State Psychiatric Institute.

First, M. B., Williams, J. B. W., Karg, R. S., & Spitzer, R. L. (2016). *User's guide for the SCID-5-CV structured clinical interview for DSM-5® disorders: Clinical version.* Arlington, VA: American Psychiatric Publishing, Inc.

Foa, E. B., Huppert, J. D., & Cahill, S. P. (2006). Emotional processing theory: An update. In B. O. Rothbaum (Ed.), *Pathological anxiety: Emotional processing in etiology and treatment* (pp. 3-24). New York, NY: The Guilford Press.

Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, *99*, 20–35. http://dx.doi.org/10.1037/0033-2909.99.1.20

Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: Conceptual foundations. In J. J. Gross (Ed.), *Handbook of Emotion Regulation* (3-26). New York, NY: Guilford Press.

Gutteling, B. M., Montagne, B., Nijs, M., & Van Den Bosch, L. M. C. (2012). Dialectical behavior therapy: Is outpatient group psychotherapy an effective alternative to individual

psychotherapy? Preliminary conclusions. *Comprehensive Psychiatry*, *53*, 1161–1168.

https://doi.org/10.1016/j.comppsych.2012.03.017

Harned, M. S., Korslund, K. E., & Linehan, M. M. (2014). A pilot randomized controlled trial of

Dialectical Behavior Therapy with and without the Dialectical Behavior Therapy

Prolonged Exposure protocol for suicidal and self-injuring women with borderline

personality disorder and PTSD. *Behaviour Research and Therapy*, *55*, 7–17.

https://doi.org/10.1016/j.brat.2014.01.008

Harned, M. S., Ruork, A. K., Liu, J., & Tkachuck, M. A. (2015). Emotional activation and

habituation during imaginal Eexposure for PTSD among women with borderline

personality disorder. *Journal of Traumatic Stress, 28,* 253–257.

https://doi.org/10.1002/jts.

Hubbard, A. E., Ahern, J., Fleischer, N. L., Van, d. L., Lippman, S. A., Jewell, N., . . . Satariano,

W. A. (2010). To GEE or not to GEE: Comparing population average and mixed models

for estimating the associations between neighborhood risk factors and

health. *Epidemiology, 21*, 467-474. doi:10.1097/EDE.0b013e3181caeb90

Kliem, S., Kröger, C., & Kosfelder, J. (2010). Dialectical behavior therapy for borderline

personality disorder: A meta-analysis using mixed-effects modeling. *Journal of*

Consulting and Clinical Psychology, 78, 936-951. https://doi.org/10.1037/a0021015

Koons, C. R., Chapman, A. L., Betts, B. B., O'Rourke, B., Morse, N., & Robins, C. J. (2006).

Dialectical behavior therapy adapted for the vocational rehabiltiyation of significantly

disabled mentally ill adults. *Cognitive and Behavioral Practice, 13,* 146-156.

https://doi.org/10.1016/j.cbpra.2005.04.003

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New

York, NY: Guilford Press.

Linehan, M. M. (2015). *DBT® skills training manual* (2nd ed.). New York, NY: Guilford Press.

Linehan, M.M., Comtois, K.A., Murray, A.M., Brown, M.Z., Gallop, R.J., et al. (2006). Two-
   year randomized controlled trial and follow-up of DBT vs therapy by experts for suicidal
   behaviors and BPD. *JAMA Psychiatry, 63*, 757-766.
   http://doi.org/10.1001/archpsyc.63.7.757

Linehan, M. M., & Korslund, K. E. (2003). Dialectical behavior therapy adherence manual.
   Unpublished manuscript, University of Washington, Seattle.

Linehan, M. M., McDavid, J. D., Brown, M. Z., Sayrs, J. H. R., & Gallop, R. J. (2008).
   Olanzapine plus dialectical behavior therapy for women with high irritability who meet
   criteria for borderline personality disorder: A double-blind, placebo-controlled pilot
   study. *Journal of Clinical Psychiatry, 69,* 999-1005.
   https://doi.org/10.4088/JCP.v69n0617

Long, C. G., Fulton, B., Dolley, O., & Hollin, C. R. (2011). Dealing with feelings: The
   effectiveness of cognitive behavioural group treatment for women in secure
   settings. *Behavioural and Cognitive Psychotherapy, 39*, 243-247.
   https://doi.org/10.1017/S1352465810000573

Marshall-Berenz, E., Morrison, J. A., Schumacher, J. A., & Coffey, S. F. (2011). Affect intensity
   and lability: The role of posttraumatic stress disorder symptoms in borderline personality
   disorder. *Depression and Anxiety, 28*(5), 393-399. https://doi.org/10.1002/da.20798

Martell, C. R., Dimidjian, S., & Herman-Dunn, R. (2010). B*ehavioral activation for depression:
   A clinician's guide*. New York, NY: Guildford Press.

McMain, S. F., Links, P. S., Gnam, W. H., Guimond, T., Cardish, R. J., Korman, L., & Streiner,

D. L. (2009). A randomized trial of dialectical behavior therapy versus general

psychiatric management for borderline personality disorder. *American Journal of Psychiatry, 166,* 1365-1374. https://doi.org/10.1176/appi.ajp.2009.09010039.

McMain, S., Guimond, T., Barnhart, R., Habinski, L., & Streiner, D. L. (2017). A randomized

trial of brief dialectical behaviour therapy skills training in suicidal patients suffering

from borderline disorder. *Acta Psychiatrica Scandinavica, 135,* 138–148.

https://doi.org/10.1111/acps.12664

McNair, D. M., Lorr, M., & Droppleman, L. F. (1992). *Revised manual for the Profile of Mood States*. San Diego, CA: Educational and Industrial Testing Services.

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for

an emotion dysregulation model of generalized anxiety disorder.*Behaviour Research and Therapy, 43*, 1281-1310. https://doi.org/10.1016/j.brat.2004.08.008

Moran, M. D. (2003). Arguments for rejecting the sequential bonferroni in ecological

studies. *Oikos, 100*, 403-405. https://doi.org/10.1034/j.1600-0706.2003.12010.x

Morris, S. B., & DeShon, R. P. (2002). Combining effect size estimates in meta-analysis with

repeated measures and independent-groups designs. *Psychological Methods*, *7*, 105-125.

https://doi.org/10.1037/1082-989X.7.1.105

Neacsiu, A. D., Eberle, J. W., Kramer, R., Wiesmann, T., & Linehan, M. M. (2014). Dialectical

behavior therapy skills for transdiagnostic emotion dysregulation: A pilot randomized

controlled trial. *Behaviour Research and Therapy, 59,* 40-51.

https://doi.org/10.1016/j.brat.2014.05.005

Neacsiu, A. D., Lungu, A., Harned, M. S., Rizvi, S. L., & Linehan, M. M. (2014). Impact of

dialectical behavior therapy versus community treatment by experts on emotional

experience, expression, and acceptance in borderline personality disorder. *Behaviour Research and Therapy*, *53*, 47–54. https://doi.org/10.1016/j.brat.2013.12.004

Neacsiu, A. D., Rizvi, S. L., & Linehan, M. M. (2010). Dialectical behavior therapy skills use as a mediator and outcome of treatment for borderline personality disorder. *Behaviour Research and Therapy, 48*, 832-839. https://doi.org/10.1016/j.brat.2010.05.017

Neacsiu, A. D., Rompogren, J., Eberle, J. W., & McMahon, K. (2018). Changes in problematic anger, shame, and disgust in anxious and depressed adults undergoing treatment for emotion dysregulation. *Behavior Therapy, 49,* 344-359. https://doi.org/10.1016/j.beth.2017.10.004

O'Keefe, D. J. (2003). Colloquy: Should familywise alpha be adjusted? Against familywise alpha adjustment. *Human Communication Research, 29*, 431-447. https://doi.org/10.1111/j.1468-2958.2003.tb00846.x

Pasieczny, N., & Connor, J. (2011). The effectiveness of dialectical behaviour therapy in routine public mental health settings: An australian controlled trial.*Behaviour Research and Therapy, 49*, 4-10. doi:http://dx.doi.org/10.1016/j.brat.2010.09.006

Prendergast, N., & McCausland, J. (2007). Dialectical behaviour therapy: A 12-month collaborative program in a local community setting. *Behaviour Change, 24,* 24-35. https://doi.org/10.1375/bech.24.1.25

Resick, P. A., Monson, C. M., & Chard, K. M. (2017). *Cognitive processing therapy for PTSD: A comprehensive manual*. New York, NY: Guilford Press.

Rizvi, S. L., Hughes, C. D., Hittman, A. D., & Oliveira, P. V. (2017). Can trainees effectively deliver dialectical behavior therapy for individuals with borderline personality disorder? Outcomes from a training clinic. *Journal of Clinical Psychology, 73*, 1599-1611.

https://doi.org/10.1002/jclp.22467

Rizvi, S. L., & Steffel, L. M. (2014). A pilot study of 2 brief forms of dialectical behavior

therapy skills training for emotion dysregulation in college students. *Journal of American*

College Health, 62, 434-439. https://doi.org/10.1080/07448481.201

Rossi, J. S. (1990). Statistical power of psychological research: What have we gained in 20

years? *Journal of Consulting and Clinical Psychology, 58*, 646-656.

https://doi.org/10.1037/0022-006X.58.5.646

Shelton, D., Sampl, S., Kesten, K. L., Zhang, W., & Trestman, R. L. (2009). Treatment of

impulsive aggression in correctional settings. *Behavioral Sciences & the Law, 27*, 787-

800. https://doi.org/10.1002/bsl.889

Soler, J., Pascual, J. C., Tiana, T., Cebrià, A., Barrachina, J., Campins, M. J., … Pérez, V.

(2009). Dialectical behaviour therapy skills training compared to standard group therapy

in borderline personality disorder: A 3-month randomised controlled clinical trial.

Behaviour Research and Therapy, *47*, 353–358.

https://doi.org/10.1016/j.brat.2009.01.013

Soloff, P. H., Lynch, K. G., & Kelly, T. M. (2002). Childhood abuse as a risk factor for suicidal

behavior in borderline personality disorder. *Journal of Personality Disorders, 16*, 201-

214. https://doi.org/10.1521/pedi.16.3.201.22542

Spielberger, C. D. (1988). *Manual for the State-Trait Anger Expression Inventory.* Odessa, FL:

Psychological Assessment Resources.

Stoffers, J. M., Völlm, B. A., Rücker, G., Timmer, A., Huband, N., & Lieb, K. (2012).

Psychological therapies for people with borderline personality disorder. *The Cochrane*

database of systematic reviews, *2012*, CD005652.

http://doi.org/10.1002/14651858.CD005652.pub2

Verheul, R., van den Bosch, L. M., Koeter, M. W., De Ridder, M. A., Stijnen T. et al. (2003). Dialectical behaviour therapy for women with borderline personality disorder: 12-month, randomized clinical trial in the Netherlands. *British Journal of Psychiatry, 182*, 135-140. http://doi.org/10.1192/bjp.182.2.135

Watson, D., & Clark, L. A. (1994). *The PANAS-X: Manual for the Positive and Negative Affect Schedule-Expanded Form.* Iowa City, IA: The University of Iowa.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063-1070. https://doi.org/10.1037/0022-3514.54.6.1063

Wiseheart, M. (2014, December). Effect size calculator. Retrieved from https://www.yorku.ca/ncepeda/effectsize.html.

Woodberry, K. A., & Popenoe, E. J. (2008). Implementing dialectical behavior therapy with adolescents and their families in a community outpatient clinic. *Cognitive and Behavioral Practice, 15*, 277–286. https://doi.org/10.1016/j.cbpra.2007.08.004

Yen, S., Johnson, J., Costello, E., & Simpson, E. B. (2009). A 5-day dialectical behavior therapy partial hospital program for women with borderline personality disorder: Predictors of outcome from a 3-month follow-up study. *Journal of Psychiatric Practice, 15*, 173-182. https://doi.org/10.1097/01.pra.0000351877.45260.70

Zanarini, M. C., Frankenburg, F. R., Hennen, J., Reich, D. B., Silk, K. R. (2004). Axis I comorbidity in patients with borderline personality disorder: 6-year follow-up and prediction of time to remision. *American Journal of Psychiatry, 161,* 2108-2114. https://doi.org/10.1176/appi.ajp.161.11.2108

Table 1

Diagnostic comorbidities in the sample (N = 101)

	Lifetime	Current
Posttraumatic stress disorder	26.3%	13.9%
Bipolar I Disorder	9%	4%
Bipolar II Disorder	5%	1%
Major depressive disorder	80.2%	54.5%
Persistent depressive disorder or dysthymic disorder	--	21.2%
Alcohol use disorder	34%	13.9%
Substance use disorder	37.6%	11.9%
Psychotic disorder	1%	0%
Panic disorder	26.3%	16%
Agoraphobia	6.1%	5.1%
Social anxiety disorder	46.5%	44.6%
Specific phobia	18.8%	17.8%
Generalized anxiety disorder	--	54%
Obsessive compulsive disorder	11.2%	9.1%
Anorexia nervosa	8%	1%
Bulimia nervosa	3%	2%
Binge eating disorder	11.9%	7.9%

Note. 71 participants received the SCID-IV-TR (First, Spitzer, Gibbon & Williams, 2002) and 30 received the SCID-5 (First, Williams, Karg & Spitzer, 2015). Estimates for disorders are combined.

Table 2

Means (standard deviations) for PANAS-X scores across treatment time points, and repeated

measures Cohen's d values of changes in each emotion from pre- to post-treatment

	Baseline	Mid-treatment (3 months)	Post-treatment (6 months)	Cohen's *d*
Anger	17.87 (5.49)	14.82 (5.62)	12.87 (5.25)	.72
Fear	17.36 (5.98)	16.07 (5.98)	14.59 (6.18)	.48
Shame/guilt	20.81 (6.86)	18.29 (6.12)	14.35 (6.89)	.75
Sadness	17.61 (4.92)	15.40 (5.01)	13.14 (5.48)	.77

Table 3

Generalized estimating equations examining changes in specific emotions during DBT as measured at major assessment points and the moderating impact of PTSD

	B	*SE*	χ^2	*df*	*p*-value
Anger					
Intercept	**15.89**	**1.73**	**326.54**	**1**	**<.001**
Time point	**-1.25**	**.92**	**29.93**	**1**	**<.001**
PTSD[a]	2.20	2.03	1.18	1	.28
Depression[a]	1.55	1.56	.99	1	.32
Anxiety disorder[a]	**4.32**	**1.81**	**5.70**	**1**	**.02**
PTSD × time point	-1.60	.90	3.19	1	.07
Depression × time point	-.07	.70	.01	1	.92
Anxiety disorder × time point	-1.41	.83	2.87	1	.09
Fear					
Intercept	**14.34**	**1.58**	**328.07**	**1**	**<.001**
Time point	**-.34**	**.65**	**10.65**	**1**	**.001**
PTSD[a]	1.00	1.74	.33	1	.56
Depression[a]	-1.02	1.43	.51	1	.47
Anxiety disorder[a]	6.95	1.46	22.68	1	<.001
PTSD × time point	-1.16	.82	2.01	1	.16
Depression × time point	.41	.61	.44	1	.51
Anxiety disorder × time point	-1.70	.64	7.18	1	.01
Shame/Guilt					

Intercept	**17.37**	**2.28**	**329.16**	**1**	**<.001**
Time point	**-1.30**	**1.04**	**50.48**	**1**	**<.001**
PTSD[a]	**6.29**	**2.32**	**7.33**	**1**	**.01**
Depression[a]	1.44	1.87	.59	1	.44
Anxiety disorder[a]	**7.28**	**2.11**	**11.93**	**1**	**.001**
PTSD × time point	**-3.42**	**.98**	**12.18**	**1**	**<.001**
Depression × time point	.28	.82	.11	1	.74
Anxiety disorder × time point	**-2.35**	**.96**	**6.07**	**1**	**.01**
Sadness					
Intercept	**15.93**	**1.48**	**575.67**	**1**	**<.001**
Time point	**-1.22**	**.73**	**83.86**	**1**	**<.001**
PTSD[a]	**3.00**	**1.43**	**4.41**	**1**	**.04**
Depression[a]	1.06	1.31	.65	1	.42
Anxiety disorder[a]	**3.90**	**1.42**	**7.58**	**1**	**.01**
PTSD × time point	**-2.65**	**.54**	**23.86**	**1**	**<.001**
Depression × time point	.33	.57	.33	1	.57
Anxiety disorder × time point	-1.21	.63	3.61	1	.06

Note. Significant effects are bolded; PTSD = Posttraumatic stress disorder.

[a] Absence of current disorder = the reference category.

Table 4

Generalized estimating equations examining changes in session-to-session specific emotions during DBT and the moderating impact of PTSD

	B	SE	χ^2	df	p-value
Hostility/Anger					
Intercept	**1.48**	**.12**	**311.51**	**1**	**<.001**
Time point	-.001	.01	2.99	1	.08
PTSD[a]	-.09	.16	.37	1	.54
Depression[a]	.09	.12	.61	1	.44
Anxiety disorder[a]	-.07	.14	.24	1	.62
PTSD × time point	-.01	.01	2.93	1	.09
Depression × time point	.003	.01	.19	1	.67
Anxiety disorder × time point	-.001	.01	.02	1	.89
Fear					
Intercept	**1.74**	**.19**	**267.07**	**1**	**<.001**
Time point	**.01**	**.01**	**5.42**	**1**	**.02**
PTSD[a]	.26	.26	1.03	1	.31
Depression[a]	.02	.20	.01	1	.92
Anxiety disorder[a]	**.65**	**.21**	**10.02**	**1**	**.002**
PTSD × time point	**-.03**	**.01**	**9.02**	**1**	**.003**
Depression × time point	.003	.01	.12	1	.73
Anxiety disorder × time point	-.02	.01	3.10	1	.08
Shame					

Intercept	**1.87**	**.16**	**285.28**	**1**	**<.001**
Time point	**-.01**	**.01**	**14.52**	**1**	**<.001**
PTSD[a]	.10	.26	.16	1	.67
Depression[a]	.17	.17	.99	1	.32
Anxiety disorder[a]	.33	.21	2.45	1	.12
PTSD × time point	**-.04**	**.01**	**7.09**	**1**	**.01**
Depression × time point	.00	.01	.002	1	.97
Anxiety disorder × time point	.00	.01	.001	1	.97
Guilt					
Intercept	**1.84**	**.17**	**412.56**	**1**	**<.001**
Time point	**-.01**	**.01**	**10.07**	**1**	**.002**
PTSD[a]	.33	.24	1.92	1	.17
Depression[a]	.12	.17	.48	1	.49
Anxiety disorder[a]	**.40**	**.20**	**4.17**	**1**	**.04**
PTSD × time point	**-.04**	**.02**	**4.61**	**1**	**.03**
Depression × time point	.01	.01	.78	1	.38
Anxiety disorder × time point	-.01	.01	.51	1	.48

Note. Significant effects are bolded; PTSD = Posttraumatic stress disorder.

[a] Absence of current disorder = the reference category.