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Dialectical behavior therapy and domains of functioning over two years

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Abstract

Individuals diagnosed with borderline personality disorder (BPD) tend to have a significant degree of functional impairment across a range of social and occupational spheres including difficulty finding and maintaining satisfying employment, housing, or relationships. Understanding what factors are associated with functional impairment will enable treatment providers to move those diagnosed with BPD beyond symptomatic recovery and toward a life worth living. This paper investigated the trajectories and predictors of functional outcomes for suicidal women with BPD (N=99) during a treatment outcome study of Dialectical Behavior Therapy (DBT). Results revealed that participants had statistical and clinical improvements in functioning. Individuals with high emotion dysregulation displayed poorer psychosocial functioning at the subsequent assessment period and slower rates of change, which was also seen in reverse for one psychosocial functioning variable. Skills use was not related to individual trajectories in functioning. This study highlights the relationship of emotion dysregulation to functioning within a sample of suicidal women with BPD as well as the importance researching multiple domains in functioning.

Keywords

Dialectical Behavior Therapy; Borderline Personality Disorder; Functional Impairment; Interpersonal Dysfunction

Introduction

Borderline personality disorder (BPD) is a serious mental disorder characterized by instability in affect, behavior, and relationships (American Psychological Association, 2013). Often, individuals diagnosed with BPD exhibit severe impairment in psychosocial functioning. Functional or psychosocial impairment refers to the inability to fulfill societal and/or social roles (World Health Organization, 2001), and can include deficiencies in work, school, and interpersonal relationships that is related to or exacerbated by the disorder

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(Uestuen & Kennedy, 2009). Indeed, it is the presence of this severe functional impairment that is characteristic of BPD (Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004). Research indicates that individuals with BPD are more functionally impaired than individuals without a personality disorder (PD) (Skodol, et al., 2002) and those with other PD diagnoses (Zanarini, Frankenburg, Hennen, Reich, & Silk, 2005). Psychosocial impairment, particularly interpersonal dysfunction, appears to be stable over time (Skodol, et al., 2005) and can persist after treatment has ended (McMain et al., 2012; Stepp, Hallquist, Morse, Pilkonis, 2011). Understanding what contributes to the tenacity of this impairment will enable treatment providers to move those diagnosed with BPD beyond symptomatic recovery and toward a life worth living inclusive of satisfying relationships, employment, and goals.

Etiological theories of BPD provide a compelling account of the origin and persistence of functional impairment among those with the disorder. Specifically, Linehan's (1993) biosocial theory conceptualizes BPD as a disorder of pervasive emotion dysregulation that is theorized to result from an increased vulnerability to high emotionality combined with an inability to regulate intense emotional responses (Linehan, Bohus, & Lynch, 2007). Much of the dysfunctional or impulsive behavior found within individuals with BPD (e.g. suicide attempts, non-suicidal self-injury [NSSI], substance use) has been conceptualized as attempts to regulate emotions and/or consequences of intense emotional states (Brown, Comtois, & Linehan, 2002; Linehan, 1993; Trull, Sher, Minks-Brown, Durbin, & Burr, 2000). Along these lines, impulsive behaviors offer an immediate distraction or relief from emotional distress (Lawrence, Allen, & Chanen, 2010) and thus may play a key role in the functional impairment observed in this population.

Dialectical Behavior Therapy (DBT; Linehan 1993; Linehan 2014) is a cognitive behavioral treatment initially designed to treat highly suicidal and multidisruptive individuals. The treatment integrates cognitive-behavioral change oriented strategies with acceptance and validation by using a dialectical framework to balance the two. Central to biosocial theory is the role of emotion dysregulation; thus, treatment includes a focus on improving emotion regulation capacities. However, there is limited research on the specific mechanisms of change in DBT (Kliem, Kroger, and Kosfelder, 2010), and whether the treatment exerts its effects through hypothesized mechanisms such as improvements in emotion regulation. Clarifying the mechanisms of change in DBT could lead to more focused and effective treatment, including improved functional outcomes.

One component of DBT is weekly behavioral skills training in which clients are taught skills to regulate emotions, tolerate distress, and interact effectively with others while simultaneously increasing behavioral control. A growing body of research on individuals with BPD supports the DBT skills deficit model, which suggests that the absence of or inability to use critical skills leads to and/or maintains dysfunctional behavior. This model has been supported in research that has identified DBT skills use as a mediator for improvements in suicidal behavior, expression of anger, and interpersonal problems in BPD (Neacsiu, Rizvi, & Linehan, 2010). However, the skills deficit model has yet to be tested in relation to other broader domains such as social, occupational and interpersonal functioning.

Two key elements may play a role in functional impairment in those with BPD: absence of engaging in skillful behavior to overcome interpersonal and functional difficulties and the inability to regulate subsequent emotions. Lack of skillful behavior may result from a lack of necessary skills and/or the inability to emit skills in all relevant contexts. In this way, a poor performance review for someone with BPD could engender high emotional dysregulation, and the lack of necessary skills to regulate the ensuing emotions could lead to an impulsive decision to quit a job in absence of a viable backup plan. Although various aspects of functioning have been examined in individuals with BPD naturalistically (e.g. Gunderson et al., 2011; Skodal et al., 2002; Skodal et al., 2005; Stepp et al., 2012), and in the context of clinical trials (e.g. Bateman & Fonagy, 2008; Bohus et al., 2004; Linehan, Tutek, Heard, & Armstrong, 1994; Linehan, et al; 1999; McMain et al., 2012; Nadort et al., 2009), predictors of functioning have yet to be explored. Accordingly, we tested three principal hypotheses and one exploratory hypothesis: (1) functional outcomes will improve during the course of a treatment outcome study of DBT for suicidal women who meet criteria for BPD, (2) improvements in emotion dysregulation will be related to improved functioning, (3) increased skills use will be related to improved functioning, and (4) we will examine the possible bi-directionality of both emotion dysregulation and skills use on functional impairment.

Method

This is a secondary data analysis from a single-blind randomized controlled trial (RCT) evaluating the importance of the skills training component of DBT by comparing the efficacy of DBT Skills training to DBT individual therapy and standard DBT, which includes both components. Methodological details describing the participants, procedure, and intervention have been reported elsewhere (Linehan et al., 2015)[†], but are summarized here. All study procedures were conducted in accord with Internal Review Board approved procedures and were carried out at the University of Washington Behavioral Research and Therapy Clinics and community settings in Seattle, WA.

Participants were 99 women between the ages of 18 and 60 who met criteria for BPD on the Structured Clinical Interview for DSM-IV, Axis II (SCID-II; First, Spitzer, Gibbon, & Williams, 1996) and had at least two episodes of intentional self-injury (suicide attempts and/or NSSI) in the last 5 years, at least one episode in the 8-week period before entering the study and at least one suicide attempt in the past year. Individuals were excluded if they had an IQ of less than 70 on the Peabody Picture Vocabulary Test - Revised (PPVT-R; Dunn & Dunn, 1981), met criteria for current psychotic or bipolar disorders on the Structured Clinical Interview for DSM-IV, Axis I (SCID-I; First, Spitzer, Gibbon, & Williams, 1995), had a seizure disorder requiring medication, or required primary treatment for another debilitating condition. Recruitment occurred via outreach to healthcare providers.

A computerized adaptive randomization procedure (White & Freedman, 1978) matched participants on five variables: age, number of suicide attempts, number of NSSI episodes,

[†]This is a secondary data analysis of a previously published study. For further detail on participant recruitment, characteristics, and treatment conditions, please see Linehan et al., 2015).

psychiatric hospitalizations in the last year, and depression scores. All participants were assessed at pre-treatment and every four months during one year of treatment and one year of follow-up totaling seven assessment waves.

Study Design

This study investigated the functional outcomes for participants enrolled in the described dismantling study of DBT (Linehan, et al., 2015). Data obtained from the following measures were used for analysis.

Outcome Measures

All assessments were conducted by blinded independent clinical assessors trained by instrument developers or approved trainers and evaluated as reliable for each instrument.

Global Assessment Scale—(GAS; Weissman & Bothwell, 1976) Interviewers made ratings (0–100 scale) for the worst week of the last month of the assessment period. Previous examinations using the GAS have found moderate to high interrater reliability (.61 to .91; Endicott, Spitzer, Fliess, and Cohen, 1976). GAS scores have the same ratings as the Global Assessment of Functioning (GAF) scale, where higher scores indicate better functioning.

Global Social Adjustment—(GSA; Keller et al., 1987) Ratings are derived from the Longitudinal Interview Follow-Up Evaluation base schedule (LIFE). The GSA has between rater agreements ranging from .57 to .81 and adequate construct validity (Warshaw, Keller, & Stout, 1994). At each assessment, interviewers made GSA ratings (1–5 scale) for the worst week of the last month of the assessment period and for the best week overall. Lower scores on the GSA indicate lower impairment.

The Inventory of Interpersonal Problems-Short Version—(IIP-PD-25; Kim & Pilkonis, 1999). The IIP is a 25 item self-report questionnaire. Responses are presented on a 5-point Likert-type scale ranging from 0 (not at all) to 4 (extremely) where higher scores indicate more interpersonal problems. The IIP-PD-25 has high internal consistency with Cronbach's $\alpha=.93$ (Kim & Pilkonis, 1999).

Predictor Measures

Difficulties in Emotion Regulation Scale—(DERS; Gratz & Roemer, 2004). The DERS is a 39-item self-report measure of individuals' characteristic levels of emotion dysregulation. Participants answer on a 5-point Likert-type scale ranging from 1 (almost never) to 5 (almost always), and higher scores indicate higher emotion dysregulation. The DERS has high internal consistency (Cronbach's $\alpha = .93$), good test-retest reliability ($\rho I = .88$, $p < .01$), and adequate construct and predictive validity.

DBT Ways of Coping Checklist (DBT-WCCL)—The DBT-WCCL is adapted from the Revised Ways of Coping Checklist (RWCC; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985) and includes additional items intended to represent DBT skills (Neacsiu, Rizvi, Vitaliano, Lynch, & Linehan, 2010). The DBT-WCCL is a self-report questionnaire including 38 items that measure the frequency of DBT skills use over the previous month.

All items are rated from 0 to 3 (“never use” to “always use”). The DBT skills use index is computed by averaging across all items in the scale. Previous examination of the psychometric properties of the DBT-WCCL in BPD individuals revealed that the DBT Skills Subscale of the DBT-WCCL (DSS) has high internal consistency (Cronbach $\alpha=0.92$ to 0.96). Test-retest reliability at 4 months for 119 BPD individuals treated without access to skills training was acceptable, ($\rho_T = 0.71$, $p < 0.001$).

Analytic Strategy

Hypothesis 1: Hierarchical linear modeling (e.g. HLM; Bryk & Raudenbush, 1992) also known as mixed effects or multilevel modeling (Pinheiro & Bates, 2000) with restricted maximum likelihood estimator (REML) was the primary data analytic tool for the sample. Compared to other methods, HLM is more flexible as it treats time as a continuous factor, allowing for variability in the actual time of assessment for each participant. HLM can model incomplete data across time, which increases power due to inclusion of more data points. Finally, HLM allows for time-lagged prediction as a method of exploring cross-time association and change from previous time points. Assumptions of HLM are homoscedasticity, normality, and independence of the error terms. All assumptions were met unless otherwise noted.

In order to investigate the growth trajectories of each outcome variable, we built a series of growth models for each functioning variable: GAS, GSA, and IIP. Parameters were systematically added to each model one at a time, and deviance statistics were analytically compared (Verbeke & Molenberghs, 1997). For GAS, GSA, and IIP, the effects of time were estimated as linear, quadratic, and cubic. The time variable was centered at the mid-point of the study (e.g. 12 month) to reduce collinearity between the linear and higher order components. We estimated the intercept as random (i.e. varying between individuals), and tested whether the linear and quadratic slopes of time varied between individuals using deviance testing. We used the unstructured covariance to allow the covariance between slopes and intercepts to be estimated independently.

We calculated reliable and clinically significant change to better understand the treatment effects on the outcome variables. Reliable and clinically significant change were calculated according to the criteria recommended by Jacobson and Truax (1991). Reliable change (RC) was calculated as $RC = x_2 - x_1 / S_{diff}$ and clinically significant change (CSC) was defined as reaching a level of functioning after treatment that is closer to the mean of the non-patient population than to the patient population. For measures without non-patient normative data (GSA), CSC was defined as reaching a level of functioning that was greater than two standard deviations below the pre-treatment sample mean. Clients attaining both reliable and clinically significant improvement are considered recovered. Normative data were obtained from standardized norms or studies using large samples. The RC indices, CSC cut-offs, and sources of normative data were as follows: GAS (RC = ± 6.6 , CSC = 50.5; Endicott, Spitzer, Fleiss, & Cohen, 1976; Keller et al., 1987); GSA (RC = ± 0.6 , CSC = 3.4; Weissman & Bothwell, 1976); IIP (RC = $\pm .6$, CSC = 1.5; Kim & Pilkonis, 1999; Stern, Kim, Trull, Scarpa, & Pilkonis, 2000).

Hypotheses 2 & 3: To examine the time-ordered association of emotion dysregulation and skills use to functioning, self-report assessment of emotion dysregulation and skills use at baseline were lagged to test for an association with functioning at 4 months, emotion dysregulation and skills use at 4 months was potentially associated with functioning at 8 months, etc. All participants were assessed at equal intervals allowing for such an analysis. Variables were centered at the individual level, thus removing all between individual variation and yielding a clean estimate of the pooled within-cluster regression coefficient. Centering within cluster is conducted by subtracting the participant-level mean across observations from each participant's score at each time point. Observations at each time point become a deviation score, representing the person's deviation from her own average at that time point. Participants' mean score was also grand-mean centered (GMC) by subtracting each participant's mean from the sample average of all participant means. This reflects their average level of the time-lagged predictor (TLP) across all observations, representing deviations from the sample average (Enders & Tofighi, 2007). The multilevel equation for the functioning growth model with TLP was as follows:

$$\text{Level 1: } \text{Functioning}_{ij} = b_{0j} + b_{1j}\text{Time}_i + b_{2j}\text{Time}_i^2 + b_{3j} \left(\text{TLP}_{ij} - \bar{x} \text{TLP}_j \right) + r_{ij} \quad (1)$$

$$\text{Level 2: } b_{0j} = \gamma_{00} + \gamma_{01} \left(\bar{\mathbf{X}} \text{TLP}_j \right) + u_{0j} \quad (2)$$

$$b_{1j} = \gamma_{10} + \gamma_{11} \left(\bar{\mathbf{X}} \text{TLP}_j \right) + u_{1j} \quad (3)$$

$$b_{2j} = \gamma_{20} + \gamma_{21} \left(\bar{\mathbf{X}} \text{TLP}_j \right) + u_{2j} \quad (4)$$

At Level 1, functioning at any given time point is predicted by b_{0j} = the individual's level of functioning when all predictors are at zero (i.e. 12 months in these models); the effects of the linear (b_{1j}) and quadratic slopes (b_{2j}); and (b_{3j}) the effects of deviations ($\text{TLP}_{ij} - \bar{x} \text{TLP}_j$) from an individual's average levels of emotion dysregulation or skills use at that assessment wave. At Level 2, the linear slope and quadratic slopes of functioning b_{0j} are predicted from the grand mean γ_{00} plus individual differences ($\bar{\mathbf{X}} \text{TLP}_j$) in average of the TLP over time, γ_{01} .

Exploratory hypothesis 4: To examine the possible bi-directional effect of both skills use and emotion dysregulation on functioning variables, a series of models were developed such that each functioning variable was lagged to examine whether functioning at baseline was related to emotion dysregulation or skills use at the 4 month assessment and so on. Six multilevel models evaluated either DERS or skills use as the outcome with GSA, GAS, and IIP as the time-lagged predictor respectively. The unconditional growth models were built, and cluster-centered and grand mean centered functioning variables were added separately.

All analyses were conducted using SPSS 19.0 (IBM Corp.).

Results

Preliminary Analyses

Descriptives of functioning, difficulties in emotion regulation, and interpersonal effectiveness over the treatment year and the follow-up year can be seen in Table 1. As the data were drawn from a dismantling study of DBT (Linehan et al., 2015), we sought to determine whether treatment condition had differential effects on functioning, emotion dysregulation, and skills use, or whether we could combine them into one group. We conducted HLM analyses assessing the interaction between time and each condition in predicting the dependent variables. For GAS, the analysis revealed a non-significant effect for condition ($F(1, 45.85)=0.02, p=0.89$) and a non-significant interaction between condition and time ($F(1, 56.62)=0.28, p=0.60$). For GSA, there was a non-significant effect for condition ($F(1, 78.66)=0.11, p=0.74$) and a non-significant interaction between condition and time ($F(1, 68.71)=0.00, p=0.99$). For IIP, there was a non-significant effect for condition, ($F(1, 89.72)=0.85, p=0.39$) and a non-significant interaction between condition and time ($F(1, 71.58)=0.00, p=0.99$). For DERS, there was also a non-significant effect for condition, ($F(1, 88.71)=0.78, p=0.38$) and a non-significant interaction between condition and time ($F(1, 66.82)=0.40, p=0.53$). Finally, skills use revealed a similar pattern; a non-significant effect for condition ($F(1, 88.05)=0.13, p=0.72$) and a non-significant interaction between condition and time ($F(1, 68.97)=0.05, p=0.83$). Each condition had similar effects on variations of each variable of interest over time and therefore was combined into one group for subsequent analyses.

Hypothesis 1: Functioning will improve over time

To test the first hypothesis, we developed separate unconditional growth curve models for all variables from baseline to 24-month follow-up.

Based on the observed sample means that show an initial improvement in functioning which levels off as time progressed, we fitted a growth model with intercept, slope, and quadratic effects capturing variation at baseline, the linear change over time, the subsequent improvement of functioning, and the flattening of the overall trend, respectively. For GAS, GSA, and IIP, likelihood ratio testing indicated that quadratic effects of time provided a significant improvement in model fit over including time as a cubic effect. We tested for random effects for the linear and quadratic components, which reflect individual differences in how people change over time. Allowing for both linear and quadratic components to be random improved model fit, suggesting that participants varied in their trajectory and rate of change. We also built unconditional growth models for DERS and skills use. For skill use, results from deviance testing indicated that a cubic effect improved the model, which indicates that skills use scores had an initial increase, followed by a plateau, and an eventual acceleration toward the end of the follow-up year. See table 2 for growth models of GSA, IIP, DERS, and skills use.

RC and CSC for outcome variables are displayed on Table 3.

Hypothesis 2 & 3: DERS and skills use will be associated with functioning

Six models were developed to test whether emotion regulation and skills use from the previous assessment period were related to scores in individual trajectories in functioning variables (GAS, GSA, and IIP). We tested for the effect of both between (level 2) and within (level 1) person DERS and skills use on each functioning variable. For GAS, adding DERS from the previous period was related to between person variance both at the previous time point $\beta = -.22$ $p < .001$, and over time, $\beta = -.03$ $p < .05$, indicating that individuals with higher emotion dysregulation at the beginning of treatment exhibited poorer functioning than individuals with lower emotion dysregulation at the subsequent time point, and displayed significantly slower improvement. Within person variance of DERS (level 1) was not significantly associated with GAS, $\beta = -.03$, $p = .26$, which indicates that time specific decreases in DERS within an individual relative to that individual's average DERS score were not associated with increases in GAS.

We built a separate model with skills use from the previous period as a TLP testing for both within and between person variance on functioning. Neither skills use at level 1 or 2 were associated with variance of GAS at the subsequent time period; however, the GMC skills use (level 2) was trending ($\beta = 4.19$ $p = .058$), indicating that individuals exhibiting higher level of skills use at the previous period had better functioning than individuals with less skillful behavior. For GSA, DERS from the previous period was related to GSA at the intercept ($\beta = .02$ $p < .001$), and slope, ($\beta = .002$ $p < .05$) but not within person variance ($\beta < .001$ $p = .97$, reflecting a similar pattern as time-lagged DERS to GAS. When we added skills use from the previous period, there was a significant between person effect of time-lagged skills use at the intercept, ($\beta = -.35$ $p < .05$) but not over time ($\beta = -.05$ $p = .21$). There was a significant within person effect of time-lagged skills use on GSA ($\beta = .19$ $p < .05$), which indicates that time specific increases in skills use within an individual relative to that individual's average skills use score was associated with higher GSA scores.

Finally, we investigated the time-lagged effects of DERS and skills use on interpersonal functioning. Only between person variance of both DERS and skills use were related to significant differences at the intercept, suggesting that, at the 8-month mark, individuals with higher emotion dysregulation ($\beta = .02$ $p < .001$) and lower skills use ($\beta = -.45$ $p < .05$), had higher IIP scores at the end of treatment (12 month). There were no significant associations of either time-lagged DERS or skills use at the slope or at the individual level. See Table 4 for models with time-lagged DERS and skills use and their associations to each functioning variable.

Exploratory hypothesis 4: Examining bi-directionality

To examine the possibility of bi-directionality, six models were developed with GAS, GSA, and IIP as the time-lagged predictors and DERS and skills use as the outcome variables (see Table 5). GAS from the previous period was associated with between person variance in emotion dysregulation at the intercept ($\beta = -2.20$ $p < .001$) and over time, ($\beta = -.26$ $p < .01$) indicating that individuals with poorer functioning had higher emotion dysregulation and slower rates of improvement. When we entered GSA from the previous assessment period, between person variation in GSA was related variance of DERS at the previous time point (β

= 29.10 $p < .001$), but not over time ($\beta = 1.88$ $p = .18$), nor was time-lagged GSA related to within person variance ($\beta = 2.78$ $p = .12$). Similar to GAS, entering IIP from the previous assessment period was related to between person variance at the intercept, ($\beta = 24.44$, $p < .001$) and slope ($\beta = 2.62$ $p < .05$) to DERS, indicating that individuals with more interpersonal problems displayed higher emotion dysregulation and slower rates of improvement. However, there was no association of any of the functioning variables on the within person variance of DERS, which suggests that neither functioning variable was associated with time specific variation in emotion dysregulation within individuals.

For skills use, GAS from the previous period was associated with between person variance at the intercept ($\beta = .01$ $p < .05$) but not over time, nor was it associated with within person variance, indicating that individuals with higher GAS scores at the 8-month time period reported more skills use at the end of treatment (12 months). A similar pattern was seen when we added GSA from the previous period with skills use as the dependent variable, where between person variation of GSA was related to variance in skills use at the previous time point, but not over time. Finally, when we added IIP from the previous time point to skills use as the dependent variable, there was a significant relationship at the intercept ($\beta = -.26$ $p < .01$), but not over time ($\beta = -.01$ $p = .52$), and not within persons ($\beta = .04$ $p = .29$). See Table 5 for reverse time-lagged models.

Discussion

Several notable findings emerged from the current study. For one, to our knowledge, this is the only study that has examined clinically significant change for various indices of psychosocial functioning on a sample of suicidal women with BPD. Also, results revealed that participants' functioning improved over two years. Regarding our hypotheses that emotion regulation and skills use would be related to functioning, we observed some mixed, but interesting results. For the most part, emotion dysregulation and skills use were prospectively associated with between person variations in psychosocial functioning; such that individuals who have lower emotion dysregulation at the previous assessment period displayed better functioning at a subsequent time point. Further, between person variation in emotion regulation was related to individual trajectories in GAS and GSA, suggesting that individuals with poorer emotion regulation capabilities had slower rates of improvement in psychosocial functioning; and the relationship was bi-directional for GAS. Surprisingly, skillful behavior was not associated with the rate of change of any functioning variable. Finally, for the most part, neither emotion regulation or skills use was related to within person variance of any functional variable over time.

Our results provide additional support that DBT has the capacity to improve functioning over time (Bohus et al., 2004; Linehan, Schmidt, Dimeff, Craft, Kanter, & Comtois, 1999; Linehan, Tutek, Heard, & Armstrong, 1994). GAS, GSA, and IIP showed quadratic relationships, indicating accelerated improvement that plateaued once treatment ended (e.g. 12 month assessment). This indicates that functional gains were maintained in the follow-up year, however more time in treatment may be necessary as functioning did not increase once treatment ended. To note, GAS is a measure of overall functional impairment, which broadly reflects how adaptively one is responding to various life stressors. When we

examined clinically significant change, more individuals displayed clinical significant change in GAS than in GSA or IIP. However, ratings of GAS are influenced by the presence of a suicide attempt, and thus a relatively well-functioning individual could receive a low GAS score due to a suicide attempt. As this population was recruited primarily for the presence of high suicidality, interpretations of GAS should be examined with caution. GSA, in comparison, is a measure of impairment that specifically refers to the clients' impairment in work, school, housing, and relationships. Only 38.8% of participants were considered recovered at follow-up as measured by the GSA. Participants showed the least amount of clinical significant change on the IIP. Only 24.6% of individuals were considered recovered at follow-up compared to 55.5% of individuals on GAS. These results are consistent with previous research that highlights the temporal stability of interpersonal functioning in individuals with BPD (e.g. Stepp, et al., 2011).

Previous research has noted the relatively enduring presence of functional impairment for those with BPD (McMain et al., 2012; Skodol et al., 2002; Skodol et al., 2005; Zanarini et al., 2005). For example, Skodol and colleagues (2005) found that despite receiving extensive psychotherapy and/or pharmacotherapy only 55% are globally satisfied and only 47% have adequate overall functioning. In a trial of DBT, McMain and colleagues (2012) found that after 36 months after treatment, among participants in both conditions, 52% remained unemployed, which was only a negligible improvement from 65% unemployment at baseline. In an eight-year follow-up study of Mentalization Based Treatment, participants in the treatment condition showed reductions in diagnostic status, suicidal behaviors, and unemployment. However, functioning scores continued to show deficits in both conditions (Bateman & Fonagy, 2008). It should be noted that our samples' mean GAS score was 38.91 at the beginning of treatment, indicating "major impairment in several areas." At the end of treatment, our sample's mean GAS scores reached 52.5, which, while a statistically significant improvement, nevertheless suggests room for improvement.

There are several possible explanations that could elucidate the slow rate of improvement in participants' functional impairment. For one, the entire DBT model was not applied for all clients, and while there were no statistically significant differences between groups for any variable, we assume that more clients could see clinically significant outcomes in functioning had all clients received the full DBT package. Further, the presence of suicidal behavior would be targeted before problems with employment or relationships (see Linehan 1993), and there may not have been enough time in treatment to target functioning. Notably, 84% of the sample met criteria for a current anxiety disorder (Linehan et al., 2015), which is important to highlight for two reasons: for one, the avoidance that is characteristic in anxiety disorders may have interfered with clients' ability to engage in goal oriented behavior (i.e. attend school). Second, DBT has limited effectiveness in reducing rates of anxiety disorders in comparison to addictive or mood disorders (Harned, Chapman, Dexter-Mazza, Murray, Comtois, & Linehan; 2008); thus, DBT may benefit from formal exposure to target ineffective avoidance from functional behavior. Also, 89% of the sample made less than \$30,000 at baseline (Linehan et al., 2015), and there may be too many logistical and structural barriers (i.e. poverty) that interfere with rates of improvement in functioning. Nonetheless, DBT and other major treatments for BPD may benefit from adjunctive components such as integrative case management to supplement individual therapy that

specifically focus on addressing client functioning. Finally, more time in treatment may be necessary for those evidencing severe functional impairment in order to move clients beyond symptom recovery and toward meaningful goals.

In general, individuals with lower levels of emotion dysregulation have higher levels of psychosocial functioning and accelerated rates of improvement and vice versa. In this way, perhaps individuals with an increased capability to modulate their emotions were more likely to acquire and maintain stable employment and housing which in turn could lead to reduced emotion dysregulation. However, the bi-directional relation between emotion regulation and psychosocial functioning could simply be a product of a correlation. Unexpectedly, individuals exhibiting less interpersonal problems exhibited faster deceleration of emotion dysregulation; perhaps among those with more interpersonal problems, there are more situations to experience periods of high emotion dysregulation. It is important to note that all these relationships were only seen between individuals and not within individuals, specifically, this is a factor of individual differences rather than within person change from one time point to another. Nonetheless, increased focus on emotion regulation strategies and interpersonal effectiveness may be necessary for individuals exhibiting high functional impairment.

Finally, individuals who endorsed more skillful behavior had higher levels of functioning, and individuals who had higher levels of functioning reported more skillful behavior. Further, within person variance in skillful behavior was prospectively related to the level of functioning, as defined by the GSA. This could be due to an association between skillful behavior and psychosocial functioning, or the presence of a type 1 error. Surprisingly, skills use was not related to the rate of change in any functioning variable between individuals. Since only two-thirds of the sample received DBT skills training, replication of these results with a larger sample is warranted. Future research should test other models to examine the relationship between emotion dysregulation and skillful behavior as it relates to functioning, as well as identify other variables that could be related to within subject variability in functioning.

Surprisingly, with the exception of skills use to GSA, emotion regulation and skills use were not related to within person change to psychosocial or interpersonal functioning. Given that no tests for multiple corrections were used, it is likely that the one significant relationship is a chance finding; thus, our hypotheses that emotion regulation and skills use would be related functioning were largely unfounded. As a result, research is needed to investigate what factors are related to within person differences in functioning. For example, mindfulness as a treatment or an adjunct is effective for numerous problem behaviors and disorders (see Khoury et al., 2013); for example, individuals who engage in mindfulness-based psychotherapy have increased grey matter, an area in the brain associated with emotion regulation and memory (Hötzel et al., 2011). As a result, mindfulness may be the process through which other skills are successfully used, thus it may be vital to the improvement of functioning within individuals diagnosed with BPD. Finally, given individuals with BPD are likely to avoid negative emotion (Bijttebier & Vertommen, 1999; Linehan, 1993), and developing new friendships or obtaining better employment may elicit emotions of anxiety or fear, improvements in experiential avoidance or anxiety sensitivity

could be another process through which DBT improves functioning. Though, research is needed to investigate the processes involved in within person change in functioning.

While this is the first study to examine clinical indices that may be associated with functional impairment in suicidal women with BPD, there are several limitations. These data were drawn from an RCT aimed to analyze the different components of DBT. This means that some participants did not receive the complete DBT package. Further, numerous other factors could be associated with treatment improvement (e.g. regression to the mean) and this is particularly difficult to determine given the lack of a distinct control condition. Also, while assessors were blind to treatment condition, they were not blind to clients' time in treatment, and thus could inadvertently impact responses regarding improvement in treatment outcome. In addition, the number of analyses that examined the order of change in emotion regulation, skills use, and functioning did not correct for a possible increase in Type I error, thus, any significant findings herein should be interpreted with caution.

Despite these limitations, the current study adds to the literature about the course of functional impairment among women with BPD. Specifically, these findings highlight the complexity of functional impairment, and indicate the importance of researching multiple domains as well as associated theorized variables.

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Highlights

- Clients in DBT had statistical and clinical improvements in functioning.
- Individuals with low emotion dysregulation had better prospective functioning.
- Individuals with more skills had better prospective functioning.
- Individuals with higher functioning had lower emotion dysregulation more skills.

Table 1

Descriptives of GAS, GSA, IIP, DERS, and Skills Use over treatment year and follow-up.

Variable	Baseline <i>M</i> (<i>SD</i>)	4-month <i>M</i> (<i>SD</i>)	8-month <i>M</i> (<i>SD</i>)	12- month <i>M</i> (<i>SD</i>)	16- month <i>M</i> (<i>SD</i>)	20- month <i>M</i> (<i>SD</i>)	24- month <i>M</i> (<i>SD</i>)
GAS	38.91 (4.89)	46.77 (7.13)	48.64 (9.83)	49.69 (11.23)	51.39 (9.46)	53.41 (10.27)	52.79 (12.33)
GSA	4.38 (.51)	4.05 (.54)	3.86 (.63)	3.72 (.68)	3.75 (.78)	3.59 (.83)	3.58 (.80)
IIP	2.29 (.63)	1.95 (.71)	1.85 (.72)	1.65 (.80)	1.63 (.76)	1.54 (.79)	1.62 (.77)
DERS	127.04 (21.14)	106.57 (25.87)	101.36 (26.93)	88.86 (25.66)	90.77 (29.42)	88.27 (27.36)	87.25 (27.87)
Skills Use	1.45 (.51)	1.91 (.50)	1.99 (.55)	2.09 (.44)	2.03 (.52)	2.04 (.53)	2.04 (.49)

Table 2

Unconditional growth models of outcome and predictor variables

Factor	Estimate	SE	<i>t</i>	95% CI	p-value
GAS Worst Week					
Intercept	50.31	1.10	45.69	48.11–52.50	<.001
Linear	1.97	.21	9.37	1.55–2.40	<.001
Quadratic	–.48	.13	–3.72	–.74–.22	<.001
GSA Worst Week					
Intercept	3.77	.07	53.72	3.63–3.91	<.001
Linear	–.12	.02	–7.23	–.15–.08	<.001
Quadratic	.02	.01	3.98	.01–.04	<.001
IIP					
Intercept	1.66	.08	20.33	1.50–1.82	<.001
Linear	–.11	.01	–8.20	–.14–.09	<.001
Quadratic	.03	.01	4.15	.02–.04	<.001
DERS					
Intercept	92.79	3.01	30.87	86.80–98.77	<.001
Linear	–5.90	.52	–11.37	–6.94–4.86	<.001
Quadratic	1.62	.28	5.68	1.05–2.18	<.001
Skills Use					
Intercept	2.04	.05	37.57	1.93–2.15	<.001
Linear	–.03	.02	–1.28	–.07–.01	.20
Quadratic	–.03	.004	–6.80	–.04–.02	<.001
Cubic	.01	.002	5.47	.01–.02	<.001

Table 3

Clinical Significance for GAS, GSA, and IIP at post and follow-up

	Reliable Change <i>N</i> (%)	Normal Functioning <i>N</i> (%)	Both Criteria <i>N</i> (%)
GAS			
Post-treatment	40 (56.3)	30 (42.3)	28 (39.4)
Follow-up	48 (71.6)	38 (56.7)	37 (55.2)
GSA			
Post-treatment	40 (56.3)	23 (32.4)	23 (32.4)
Follow-up	37 (55.2)	27 (40.3)	26 (38.8)
IIP			
Post-treatment	21 (32.8)	26 (40.6)	15 (23.4)
Follow-up	22 (33.8)	28 (43.1)	16 (24.6)

Table 4

Time-lagged DERS and skills use and their associations to each functioning variable

GAS Predicted by Time Lagged DERS										GAS Predicted by Time Lagged Skills Use									
Parameter	b	SE	t	95% CI	p	b	SE	t	95% CI	p	b	SE	t	95% CI	p				
Intercept	50.35	0.91	55.06	48.52–52.17	<.001	49.86	1.12	44.45	47.62–52.09	<.001									
Between Individual Effects																			
Linear Growth	1.53	0.34	4.52	0.86–2.10	<.001	1.26	0.32	3.91	.62–1.90	.001									
Quadratic Growth	–0.19	0.21	–0.93	–0.60–0.21	.28	–0.08	0.22	–.38	–.50–.34	.71									
GMC TLP	–0.22	0.03	–6.70	–0.29–0.16	<.001	4.19	2.16	1.95	–.14–8.53	.058									
TLP * Linear Growth	–0.03	0.01	–2.63	–0.06–0.01	.011	0.68	0.70	0.98	–3.04–1.68	.57									
Within Individual Effects																			
CWC TLP	–0.03	0.02	–1.13	–0.07–0.02	.26	–0.68	1.19	–0.57	–3.04–1.68	.33									

GSA Predicted by Time Lagged DERS										GSA Predicted by Time Lagged Skills Use									
Parameter	b	SE	t	95% CI	p	b	SE	t	95% CI	p	b	SE	t	95% CI	p				
Intercept	3.75	0.06	62.21	3.63–3.87	<.001	3.78	0.07	54.41	3.65–3.92	<.001									
Between Individual Effects																			
Linear Growth	–0.09	0.02	–3.92	–0.14–0.05	<.001	–0.07	0.02	–3.24	–0.12–0.03	.002									
Quadratic Growth	0.02	0.01	1.66	–0.003–0.04	.09	0.009	0.01	0.84	–0.01–0.03	.40									
GMC TLP	0.02	0.002	6.48	0.01–0.02	<.001	–0.35	0.14	–2.51	–0.63–0.07	.014									
TLP * Linear Growth	0.002	0.001	2.37	<0.002–0.003	.021	–0.05	0.04	–1.27	–0.13–0.03	.209									
Within Individual Effects																			
CWC TLP	6.26E–5	.001	0.04	–0.003–0.003	.97	0.19	0.08	2.31	0.03–.35	.022									

IIP Predicted by Time Lagged DERS										IIP Predicted by Time Lagged Skills Use									
Parameter	b	SE	t	95% CI	p	b	SE	t	95% CI	p	b	SE	t	95% CI	p				
Intercept	1.71	0.06	26.63	1.58–1.84	<.001	1.71	0.08	21.61	1.552–1.868	<.001									
Between Individual Effects																			
Linear Growth	–0.07	0.02	–2.88	–0.113–0.021	.005	–0.08	0.02	–3.41	–0.12–0.03	.001									
Quadratic Growth	0.01	0.01	1.15	–0.01–0.03	.254	0.01	0.01	1.33	–0.01–0.03	.19									
GMC TLP	0.02	0.003	6.98	0.01–0.03	<.001	–0.45	0.17	–2.63	–0.79–0.11	.01									

Parameter	IIP Predicted by Time Lagged DERS					IIP Predicted by Time Lagged Skills Use				
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>95% CI</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>95% CI</i>	<i>p</i>
TLP * Linear Growth	0.001	0.001	0.99	−0.001−0.002	.325	0.02	0.04	0.44	−0.08−0.10	.66
<i>Within Individual Effects</i>										
CWC TLP	−0.002	0.001	−1.31	−0.01−0.001	.190	0.10	0.07	1.33	−0.05−0.24	.19

Note. GMC= grand mean centered; CWC = centered by cluster; TLP = time lagged predictor. Bold indicates sig at < .05

Table 5

Time-lagged GAS, GSA, & IIP and their associations to DERS and skills use.

Parameter	DERS Predicted by Time Lagged GAS					DERS Predicted by Time Lagged GSA					DERS Predicted by Time Lagged IIP				
	<i>b</i>	<i>SE</i>	<i>t</i>	95% <i>CI</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>t</i>	95% <i>CI</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>t</i>	95% <i>CI</i>	<i>p</i>
Intercept	95.85	2.35	40.84	1.17–100.54	<.001	95.52	2.497	38.26	90.54–100.50	<.001	94.40	2.50	37.80	89.42–99.40	<.001
<i>Between Individual Effects</i>															
Linear Growth	–4.28	0.81	–5.31	–5.87–2.68	<.001	–3.82	0.77	–4.97	–5.35–2.29	<.001	–4.01	0.81	–4.97	–5.61–2.4	<.001
Quadratic Growth	0.81	0.39	2.10	0.04–1.57	.039	0.72	0.37	1.92	–0.03–1.46	.059	0.86	0.39	2.21	0.08–1.643	.030
GMC TLP	–2.20	0.30	–7.47	–2.79–1.62	<.001	29.10	4.58	6.36	19.99–38.22	<.001	24.44	3.43	7.14	17.62–31.27	<.001
TLP * Linear Growth	–.262	0.08	–2.70	–0.46–0.07	.008	1.88	1.39	1.36	–0.88–4.64	.18	2.62	1.04	2.51	0.54–4.71	.014
<i>Within Individual Effects</i>															
CWC TLP	0.06	0.13	0.44	–0.20–0.32	.66	2.78	1.80	1.54	–0.77–6.31	.124	1.67	2.06	0.81	–2.38–5.71	.42
<i>Skills Use Predicted by Time Lagged GAS</i>															
Intercept	2.037	0.06	36.12	1.93–2.15	<.001	2.04	0.06	36.37	1.93–2.15	<.001	2.05	0.06	37.38	1.94–2.16	<.001
<i>Between Individual Effects</i>															
Linear Growth	–0.02	0.02	–.73	–0.06–0.03	.47	–0.02	0.02	–0.74	–0.06–0.03	.459	–0.02	0.03	–0.71	–0.07–0.03	.476
Quadratic Growth	–0.03	0.01	–2.80	–0.04–0.01	.006	–0.03	0.01	–2.80	–0.04–0.01	.006	–0.03	0.01	–3.00	–0.05–0.01	.003
Cubic Growth	0.01	0.01	2.17	0.001–0.02	.03	0.01	0.004	2.14	<.001–0.02	.034	0.01	0.01	2.47	0.002–0.02	.015
GMC TLP	0.02	0.01	2.09	0.001–0.03	.04	–0.23	0.11	–2.14	–.44–.02	.036	–0.26	0.08	–3.30	–0.41–0.10	.002
TLP * Linear Growth	0.001	0.002	0.36	–0.003–0.004	.72	–0.0004	0.02	–0.02	–0.05–0.05	.985	–0.01	0.02	–0.64	–0.05–0.03	.52
<i>Within Individual Effects</i>															
CWC TLP	–0.001	0.003	–0.18	–0.01–0.004	.86	–0.01	0.04	–0.18	–0.08–0.06	.861	0.04	0.04	1.09	–0.04–0.13	.29

Note. GMC = grand mean centered; CWC = centered by cluster; TLP = time lagged predictor; Bold indicates sig at > .05.