Effects of Dialectical Behaviour Therapy-Mindfulness Training on Emotional Reactivity in Borderline Personality Disorder: Preliminary Results

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Emotional dysregulation has been proposed as a hallmark of borderline personality disorder (BPD). Mindfulness techniques taught in dialectical behaviour therapy (DBT) appear to be effective in reducing affective symptoms and may enhance emotion regulation in BPD patients. In the present study, we assessed whether 10 weeks of DBT-mindfulness (DBT-M) training added to general psychiatric management (GPM) could improve emotion regulation in BPD patients. A total of 35 patients with BPD were included and sequentially assigned to GPM (n = 17) or GPM plus DBT-M (n = 18). Participants underwent a negative emotion induction procedure (presentation of standardized unpleasant images) both pre-intervention and post-intervention. Clinical evaluation was also performed before and after treatment. No differences were observed in emotional response at the post-treatment session. However, patients in the DBT-M group showed greater improvement in clinical symptoms. Formal mindfulness practice was positively correlated with clinical improvements and lower self-reported emotional reactivity. Our preliminary results suggest that mindfulness training reduces some psychiatric symptoms but may not have a clear effect on how patients respond to emotional stimuli in an experimental setting. Copyright © 2013 John Wiley & Sons, Ltd.

Key Practitioner Message:
- No clear effect of mindfulness training was observed on emotional response to a negative emotion induction procedure.
- Application of the DBT-M module jointly to GPM induced better clinical outcomes than GPM alone.
- Formal mindfulness practice showed a positive impact on emotion regulation and clinical improvement.

Keywords: Borderline Personality Disorder, Emotion Regulation, Mindfulness, Dialectical Behaviour Therapy, Emotional Induction

INTRODUCTION

Emotion dysregulation is the core characteristic of borderline personality disorder (BPD) according to Linehan’s biosocial model (Linehan, 1993a). Dialectical behavioural therapy (DBT) is one of the psychosocial interventions developed specifically for the treatment of BPD and several well-controlled clinical studies have proven its efficacy (NICE, 2009). In addition, some evidence suggests that this treatment could be associated with changes in the activation of brain areas involved in emotion regulation (anterior, temporal and posterior cingulate, left insula and amygdala, and both hippocampi; Schnell & Herpertz, 2007).
The standard procedure of DBT (Linehan, 1993a, 1993b) consists of several types of interventions, including the skills training group. Some studies have reported that this intervention alone entailed positive clinical benefits in BPD patients (Soler et al., 2001, 2005, 2009). Skills training is performed in 2-hour weekly sessions of group therapy, teaching four distinct modules addressing deficits in control and emotion regulation. One of them, which is the focus of the current study, is the mindfulness module (DBT-mindfulness; DBT-M), considered a nuclear intervention in DBT (Linehan, 1993b). This module has been reported as the most frequently used by patients with BPD (Lindenboim, Comtois, & Linehan, 2007; Stepp, Epler, Jahng, & Trull, 2008). A recent review suggests that the benefits of mindfulness practice may be mediated by different mechanisms—including emotion regulation, attention regulation, body awareness and changes in perspective of the self—that would work together synergistically (Hölzel et al., 2011). In this regard, Soler and colleagues (2012) have reported improvements in attention and impulsivity after DBT-M training in a sample of patients with BPD.

Cortisol is a hormone secreted by the hypothalamus–pituitary–adrenal axis (HPAA), which exerts ubiquitous effects on mediating, preparing or suppressing the stress response (Sapolsky, Romero, & Munck, 2000). Relatively few studies, however, have evaluated the HPAA response to psychological stressors in BPD, yielding mixed results (for review, Wingenfeld, Spitzer, Rullkötter, & Löwe, 2010). The salivary enzyme alpha-amylase (sAA) is a biomarker that is considered a promising, valid and reliable indicator of sympathetic nervous system activity (van Stegeren, Rohleder, Everaer, & Wolf, 2006; Nater & Rohleder, 2009). To our knowledge, only one study has used both biomarkers at the same time to evaluate stress response in BPD, finding hyporreactivity to a standardized psychosocial stressor in both parameters compared with healthy controls (Nater et al., 2010), but the effect of mindfulness on these biomarkers was not investigated.

The aim of the present study was to examine whether 10 weeks of DBT-M training added to general psychiatric management (GPM) could improve both emotional responses to a negative emotional induction procedure and clinical symptomatology compared with GPM alone in BPD patients. As secondary aims we assessed changes in stress-related biological parameters (i.e., salivary cortisol and alpha-amylase) related to the emotional induction procedure, and we determined if the amount of mindfulness formal practice could be positively related to improvements in emotion regulation. We expected to find that mindfulness training could reduce emotional reactivity (i.e., self-reported and biological) to the procedure and have a beneficial effect on clinical variables.

MATERIALS AND METHODS

Participants

Fifty patients from the BPD Unit of Hospital de la Santa Creu i Sant Pau were invited to voluntarily join this study; finally, a total of 35 participants accepted and were included. Inclusion criteria consisted of 1) a BPD diagnosis determined by a psychiatric evaluation and two semi-structured diagnostic interviews: the Structural Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Axis II (Spanish validated version; Gómez-Beneyto et al., 1994) and the Diagnostic Interview for Borderlines-Revised (Spanish validated version; Barrachina et al., 2004); 2) ages between 18 and 45 years; and 3) Clinical Global Impression Scale for Borderline Personality Disorder (Perez et al., 2007) scores ≥4. Exclusion criteria were 1) comorbidity (according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition criteria) with schizophrenia, organic brain syndrome, drug-induced psychosis, bipolar disorder, mental retardation, current major depressive episode, post-traumatic stress disorder, or current substance or alcohol abuse or dependence; 2) major medical illness according to medical history and physical examination; 3) current structured psychotherapy; or 4) participation in any other study with similar characteristics.

All patients were receiving pharmacological treatment on inclusion. The type and dose of medication were not modified during the study or in the prior month. This study was approved by the Clinical Research Ethics Committee at the Hospital de la Santa Creu i Sant Pau, and it was carried-out in accordance with the Declaration of Helsinki. Written informed consent was also obtained from all participants.

Study Design

Treatment Arms

This was a single-centre, non-randomized controlled trial. Patients were assigned to one of two treatment arms—either GPM alone (GPM group) or GPM plus DBT-M training (DBT-M group)—on the basis of consecutive referral. Of the 35 participants, 17 were assigned to the GPM group and 18 to the DBT-M group.

Characteristics of the Interventions

Mindfulness training consisted of the DBT-M module (10 weekly group psychotherapy sessions of 120 minutes each). All sessions were led by two cognitive behavioural psychotherapists (therapist and co-therapist) with prior experience in DBT and trained by the ‘Behavioural Technology Transfer Group’. Patients were taught the following mindfulness practices: 1) simply observe and then describe events, thoughts, emotions and body sensations; 2)
fully participate in actions and experiences in a non-evaluative manner; and 3) focus on one thing at a time, and reorient attention when distracted (Dimidjian & Linehan, 2003; Linehan, 1993b). Some additional mindfulness exercises, taken from the DBT distress tolerance module, such as ‘observing the breath’, ‘half smiling’, ‘awareness’ and basic principles of accepting reality (‘radical acceptance’, ‘turning the mind’ and ‘willingness over wilfulness’) were also taught. Patients were encouraged to practice formal exercises at home. Scheduled formal exercises were reviewed and reinforced during the group sessions, as it is common practice in all DBT skills training modules.

General psychiatric management consisted of four case management visits (every 2–3 weeks) to give support to patients and their families. The structure of these visits was based on the clinical guidelines for BPD treatment, which emphasize psychoeducation about BPD and focus on here-and-now problem solutions, empathy and helping relationships (NICE, 2009). All GPM sessions were conducted by a psychiatrist with experience in this disorder and were carried out concurrently with mindfulness training in the DBT-M group.

Study Measures

Clinical Rating Scales

To assess changes in clinical symptomatology, a blinded experienced evaluator administered the following instruments: 1) the Hamilton Depression Rating Scale (HDRS; Hamilton, 1960), a 17-item scale widely used by clinicians to assess depressive symptoms; and 2) the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1988) that is an 18-item rating scale that is widely used to measure psychopathology.

Assessment of Mindfulness Skills and Practice

We used the Experiences Questionnaire (EQ; Fresco et al., 2007), a scale composed of 11 items and measures the decentering ability, a key mindfulness skill related to a person’s capacity to observe one’s own thoughts and feelings as temporary and objective events of the mind.

The DBT-M group was told to complete weekly records of their mindfulness practice at home (in minutes per exercise type). Therapists collected the completed form before each therapy session.

Emotional Induction Outcomes

To assess changes in self-reported emotional state during the experimental procedure, the Self-Assessment Manikin questionnaire (SAM; Lang, 1980) was used. SAM is a non-verbal, pictorial instrument devised as an affective rating system that uses graphic figures to depict values along the dimensions of valence, activation and dominance associated with a subject’s affective reaction to a variety of stimuli. Each dimension has a 9-point rating scale ranging from 1 (lowest) to 9 (highest).

Biological response to the procedure was assessed by means of salivary cortisol (sCORT) and sAA; sCORT is a marker of HPAA activation and has been used to measure the free fraction of blood cortisol. Levels of sCORT (in µg/dl) were analyzed by a commercial enzyme-linked immunosorbert assay, which has intra-assay coefficients of variation below 4% and inter-assay coefficients no higher than 6.5% (Salimetrics®, Salimetrics Inc., State College, PA, USA). Levels of sAA (in units of activity per millilitre) were determined by means of a commercial enzymatic activity assay that uses a substrate that changes colour in response to amylase activity. Intra-assay coefficients of variation for this assay kits were below 8% and inter-assay, no higher than 6% (Salimetrics®).

Experimental Emotion Induction Procedure

All participants underwent the emotion induction procedure before and after treatment. Every patient was greeted by the same investigator, and the experiment took place in a hospital room used for this purpose, with steady temperature and lighting. All sessions were conducted between 15.00 and 18.00 hours to minimize the effects of circadian rhythm on biological variables. Participants were asked to refrain from drinking anything but water, smoking or eating 2 hours before the procedure took place. Additionally, participants were asked not to do strenuous physical exercise or consume illegal drugs or alcohol during the 24-hour period before the study. An exhaustive register of other biological data was also recorded according to previous studies (Granger, Kivlighan, el-Sheikh, Gordis, & Stroud, 2007; Kudielka, Buske-Kirschbaum, Hellhammer, & Kirschbaum, 2004). Fulfilment of these recommendations was checked via a computerized questionnaire. To minimize pharmacological immediate effects on emotional reactivity, participants were asked not to take their prescribed psychotropic medication on the 2 days of experiment. Afterwards, they could continue the treatment as usual.

The whole procedure took approximately 45 minutes and was divided into three phases: baseline, emotion induction and post-induction (Figure 1). Before starting the procedure, participants rinsed their mouths with water to reduce possible food contamination of the saliva samples (Navazesh, 1993). During the baseline phase participants completed a computerized sociodemographic questionnaire and other emotional variables (data not shown). Instructions for completing the SAM and also collecting the saliva with Salimetrics Oral Swabs (Salimetrics®) were also given, and the baseline SAM and saliva sample were obtained. The negative emotion induction phase was designed to produce significant sAA (Granger, Kivlighan,
el-Sheikh, Gordis & Stroud, 2007) and sCORT responses (Codispoti et al., 2003) and consisted of 24 international affective picture system images with high arousal, low valence and low dominance scores such as mutilated bodies, plane crashes or scenes of war (Lang & Vaitl, 1988). Each picture was shown for 30 seconds, with a 3-second interval between images as the study of Codispoti et al., (2003). This phase was divided into two blocks (induction 1 and induction 2) with equivalent images. After each block, one SAM and saliva sample were collected. The same pack of images was used for day 1 and day 2 of the study. In the post-induction phase (15 minutes) participants completed a computerized questionnaire on compliance with instructions given before the day of the study and the EQ scale. Last, SAM and saliva sample were obtained after completion of this phase. All saliva samples were immediately frozen at −20°C until laboratory analyses.

Statistical Analyses

All analyses were performed with the SPSS (SPSS Inc, Chicago, Illinois, USA) 18.0 software package for Windows, and all hypotheses were tested with a two-sided significance level of 0.05. Demographic data and descriptive variables were compared using the χ² test for categorical variables and a t-test for continuous variables. SAM, sCORT and sAA mean scores of the induction phase (induction 1 and induction 2) were calculated for the 2 days of experiment. To assess the efficacy of emotion induction on inducing changes in both groups and to assure comparability of both groups to procedure variables, repeated measures multivariate analyses of variance (MANOVAs) were carried-out on day 1 for SAM subscales and for biological variables. The same analysis was performed to evaluate changes in mean SAM induction scores and biological values at day 1 and at day 2. Finally, repeated measures MANOVAs were carried-out with clinical and mindfulness-related scores. Bivariate correlation analyses between mean minutes of mindfulness practice and delta (Δ) scores (mean induction score minus baseline score) for valence, activation and dominance were performed to determine whether the amount of daily mindfulness practice was related to emotional response in the DBT-M group at day 2. Changes in clinical variables from day 1 to day 2 for clinical scales were also calculated and were then correlated with mindfulness practice.

RESULTS

Subject Characteristics and Effect of Emotion Induction at Day 1

There were no significant differences between the DBT-M and GPM groups in terms of demographic variables, clinical severity, pharmacological treatment and other recorded descriptive variables at baseline comparison (Table 1). Repeated measures MANOVA at day 1 showed a significant effect of the procedure [F(6,28) = 4.86; p = 0.002] on SAM variables response, but no group or time × group effects were observed (p > 0.2 and p > 0.6, respectively). The results for biological variables at day 1 did not show any significant effect of the procedure on these (p > 0.2) (for specific data, please see Table 2).

Effects of DBT-M versus GPM on Emotional Reactivity, Clinical Variables and Mindfulness Skills

No significant effect of treatment condition on mean induction scores for SAM or biological variables was observed in the repeated measures MANOVAs (p > 0.18, and p > 0.19, respectively). While post-intervention clinical status improved in both groups (see Figure 2), a significantly greater improvement was observed in the DBT-M group compared with the GPM group [F(2,32) = 6.74; p = 0.004]. A significant interaction time × group was found in HDRS rates from day 1 to day 2 [F(1,33) = 10.75, p = 0.002] and also in BPRS [F(1,33) = 13.37, p = 0.001]. No significant effect of condition was observed in the EQ scores (p = 0.16) (more details in Table 3).

Relationship of Mindfulness Practice with Emotional Response and Clinical Variables

The mean formal mindfulness practice was 19.52 minutes per day (standard deviation: 6.63), with a wide range of
practice periods (7 to 31 minutes). Strong correlations between mean duration of daily mindfulness practice and Δactivation scores \( r = -0.7, p = 0.012 \) and Δdominance scores \( r = 0.68, p = 0.015 \) at day 2 were found, being higher times of practice related to less activation and to more dominance (Figure 3). No significant correlation between minutes of mindfulness practice and Δvalence \( p = 0.13 \) was detected. Regarding associations with clinical variables, a high correlation between the improvement of HDRS scores and the mean duration of daily mindfulness practice was observed \( r = -0.68, p = 0.015 \). Correlations with BPRS change scores did not reach statistical significance \( p = 0.31 \).

### Table 1. Summary of demographic and clinical variables of the two groups

<table>
<thead>
<tr>
<th></th>
<th>DBT-M (n = 18)</th>
<th>GPM (n = 17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (% females)</td>
<td>88.88</td>
<td>88.23</td>
</tr>
<tr>
<td>Age</td>
<td>30.11 (5.86)</td>
<td>30.29 (8.59)</td>
</tr>
<tr>
<td>BMI</td>
<td>24.53 (5.94)</td>
<td>24.44 (5.85)</td>
</tr>
<tr>
<td>Years of education</td>
<td>10.61 (2.25)</td>
<td>11.76 (2.49)</td>
</tr>
<tr>
<td>Marital status (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/stable couple</td>
<td>23.53</td>
<td>38.88</td>
</tr>
<tr>
<td>Single</td>
<td>47.06</td>
<td>38.88</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>35.29</td>
<td>16.67</td>
</tr>
<tr>
<td>DIB-R score</td>
<td>7.39 (1.04)</td>
<td>7.67 (1.50)</td>
</tr>
<tr>
<td>Attendance to intervention* (%)</td>
<td>65.56 (1.04)</td>
<td>72.06 (0.86)</td>
</tr>
<tr>
<td>Drop out (%)</td>
<td>27.78</td>
<td>29.41</td>
</tr>
<tr>
<td>Pharmacological treatment (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antidepressant</td>
<td>72.22</td>
<td>76.47</td>
</tr>
<tr>
<td>Benzodiazepine</td>
<td>50.00</td>
<td>52.94</td>
</tr>
<tr>
<td>Stabilizer</td>
<td>55.56</td>
<td>52.94</td>
</tr>
<tr>
<td>Antipsychotic</td>
<td>50.00</td>
<td>47.06</td>
</tr>
</tbody>
</table>

Values represent mean scores (standard deviation between brackets) or otherwise specified.

No significant differences between groups were observed neither in \( z^2 \) test for categorical variables \( p > 0.3 \) nor in \( t \)-test for quantitative ones \( p > 0.3 \).

BMI = body mass index. DIB-R = Diagnostic Interview for Borderlines-Revised. HDRS = Hamilton Depression Rating Scale. BPRS = Brief Psychiatric Rating Scale. DBT-M = dialectical behaviour therapy-mindfulness. GPM = general psychiatric management.

*Number of maximal sessions attended (DBT-M = 10; GPM = 4)

### Table 2. Summary of results for task-related variables (according to group by day of experimental procedure)

<table>
<thead>
<tr>
<th></th>
<th>GPM</th>
<th>DBT-M</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Induction*</td>
</tr>
<tr>
<td>Self-assessment manikin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valence day 1</td>
<td>4.76 (2.17)</td>
<td>2.71 (1.10)</td>
</tr>
<tr>
<td>Valence day 2</td>
<td>4.20 (1.80)</td>
<td>2.75 (1.34)</td>
</tr>
<tr>
<td>Activation day 1</td>
<td>5.24 (2.39)</td>
<td>6.32 (2.13)</td>
</tr>
<tr>
<td>Activation day 2</td>
<td>3.7 (1.89)</td>
<td>5.1 (2.25)</td>
</tr>
<tr>
<td>Dominance day 1</td>
<td>4.65 (2.21)</td>
<td>3.97 (2.14)</td>
</tr>
<tr>
<td>Dominance day 2</td>
<td>5.9 (2.33)</td>
<td>5.05 (2.24)</td>
</tr>
<tr>
<td>Biological variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sCORT day 1</td>
<td>0.11 (0.06)</td>
<td>0.13 (0.34)</td>
</tr>
<tr>
<td>sCORT day 2</td>
<td>0.17 (0.13)</td>
<td>0.22 (0.12)</td>
</tr>
<tr>
<td>sAA day 1</td>
<td>19.68 (14.21)</td>
<td>25.3 (14.86)</td>
</tr>
<tr>
<td>sAA day 2</td>
<td>34.31 (33.38)</td>
<td>44.8 (50.52)</td>
</tr>
</tbody>
</table>

Values represent mean scores (standard deviation between brackets). Valence, activation and dominance are subscales from Self-Assessment Manikin. Levels of salivary cortisol and alpha-amylase are expressed in \( \mu g/dL \) and in \( U/mL \), respectively. No significant effect was found in multivariate analyses \( p > 0.09 \).

GPM = general psychiatric management. DBT-M = dialectical behaviour therapy-mindfulness. sCORT = salivary cortisol. sAA = salivary alpha-amylase.

*Induction score represents the mean between Induction1 and Induction2.
DISCUSSION

The findings of this study show that patients had similar emotional responses to the emotion induction procedure regardless of the treatment (DBT-M and GPM) as none of the self-reported or biological variables could detect differences. By contrast, depressive symptomatology and psychiatric severity were more improved after DBT-M intervention. So, either the observed improvements were not associated to emotion regulation changes or our design and procedure failed to detect it. Looking at the correlation results, the more practice reported by patients the better outcomes in self-reported emotional reactivity, as patients appeared to be more calm and with greater sense of control during the induction phase. Additionally, better outcomes in depressive symptoms were also related to practice. These findings are suggestive of a real relation between mindfulness practice and emotion regulation.

The practice of mindfulness seems to improve emotion regulation (Hölzel et al., 2011), which could result in clinical improvements in psychiatric conditions such as BPD. Most of the research supporting this hypothesis is based on self-reported measurements of emotional depression, anxiety, rumination or attention measured pre-post mindfulness treatment (Baer, 2003; Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006; Bohreimeier, Prenger, Taal, & Cuijpers, 2010; Hofmann, Sawyer, Witt & Oh, 2010; Chiesa, Calati, & Serreti, 2011). Nevertheless, few studies have assessed mindfulness effects in an experimental setting using emotion-induction procedures (Hölzel et al., 2011; Britton, Shahar, Szepsenwol & Jacobs, 2012), and no study has been previously performed with BPD individuals. Our results add further data that partially agree with these previous studies.

Mindfulness training has already been associated with clinical improvements in other psychiatric samples (e.g., Kingston, Dooley, Bates, Lawlor, & Malone, 2007; Teasdale, Segal, & Williams, 1995). Those studies mainly reported changes in affective domain that could be caused by an enhancement of cognitive control, reducing depressogenic ruminative processes (De Lissnyder et al., 2012; Segal, Williams, & Teasdale, 2001). As BPD is also accompanied with depressive thoughts, the amelioration of such
psychiatric symptoms would be due to mindfulness intervention. Since mindfulness in DBT is trained as a behavioural skill (Linehan, 1993b) it would seem reasonable that higher levels of home mindfulness practice were related to better outcomes in terms of mindfulness skills and clinical symptoms, as well as improved emotion regulation. In this regard, previous studies have also highlighted the central role of skills practice on subsequent clinical improvement in patients with BPD (Lindenboim et al., 2007; Stepp et al., 2008). Although the specific role of mindfulness formal practice on the overall benefits of this technique is an ongoing debate (Carmody & Baer, 2008), our findings provide evidence for the involvement of the amount of mindfulness practice. In fact, merely attending weekly group sessions seemed not sufficient to induce observable changes in emotional reactivity under laboratory assessment.

It could be hypothesized that our inconsistent outcomes regarding effects of mindfulness on emotion regulation may be related to the absence of mindfulness practice during, or just prior to, the laboratory session as other studies did (e.g., Feldman, Greeson, & Senville, 2010), or because patients did not practice enough according to mindfulness training standards (45 minutes per day; Kabat-Zinn, 1990). Historically congruent or conditioned cue emotions that could lead to non-adaptive reactions would be more adequate since mindfulness training may be useful in regulating emotional reactions especially related to them. There are some weaknesses of this study that have to be stressed. First and foremost, the relatively small sample size and the non-randomized study design may have compromised hypotheses testing. Second, all participants were under pharmacological treatment, which could have influenced emotional reaction to the procedure. Third, the two groups were not completely comparable in terms of variables such as the amount of mindfulness practice. In fact, merely attending weekly group sessions seemed not sufficient to induce observable changes in emotional reactivity under laboratory assessment.

There are some weaknesses of this study that have to be stressed. First and foremost, the relatively small sample size and the non-randomized study design may have compromised hypotheses testing. Second, all participants were under pharmacological treatment, which could have influenced emotional reaction to the procedure. Third, the two groups were not completely comparable in terms of psychotherapeutic interventions, since only one of the groups received group therapy. Finally, the lack of response of sCORT and sAA could be related to limitations of the procedure to induce sufficiently intense emotions. So, further studies should consider to better use personal congruent cues or psychosocial stressors (e.g., Trier Social Stress Test) instead of emotional images to assess relevant responses.

CONCLUSIONS

To our knowledge, this is the first study to assess the effect of ‘core mindfulness skills’ from DBT on emotion regulation in patients with BPD. Our preliminary findings seem to indicate that the DBT-M module added to GPM is not able to improve emotion regulation in an image-based emotional induction in BPD. However, the DBT-M group showed higher improvements in clinical symptomatology and a strong association between average minutes of formal mindfulness practice and emotion regulation along with clinical amelioration was observed, suggesting an effect of mindfulness practice on these variables. That is to say, more mindfulness practice meant better outcomes in emotion regulation and depressive symptomatology. These observations contribute to the literature of the effects of mindfulness training on emotion regulation and psychiatric symptoms and give support to its utility in treating core symptoms of BPD.

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