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EMPIRICALLY GROUNDED CLINICAL INTERVENTIONS

Imagery-based cognitive therapy to reduce emotional dysregulation and mood instability in bipolar disorder: a case-series study

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Abstract

Introduction: Bipolar disorder (BD) has a significant impact on functioning in the absence of acute mood episodes. This has been associated with subsyndromal symptoms, co-morbidities, and emotional dysregulation. The present study aims to evaluate the acceptability and preliminary efficacy of imagery-based cognitive therapy (ImCT) in a French community setting. We were particularly interested in the link between mental imagery and emotional dysregulation as this may clarify the mechanisms involved in the potential efficacy of the therapy and ultimately improve its relevance.
Method: Ten participants underwent ImCT, with weekly assessments of mood fluctuations, anxiety, and emotional dysregulation conducted over 1 month (i.e. pre-therapy, post-therapy and 1-month follow-up). Recovery, post-traumatic stress symptoms and self-compassion were measured at baseline and post-therapy. Attrition rates and satisfaction were measured.
Results: All participants who completed therapy ($n = 8$) reported high levels of satisfaction. Five of them showed reliable individual improvement on emotion dysregulation scores. At the group level, a significant decrease in mood fluctuation with a large effect size was found post-therapy.
Conclusion: ImCT showed good acceptability among participants who completed the study. Importantly, our study is the first to provide an indication that ImCT may alleviate subsyndromal mood symptoms but also emotional dysregulation in individuals with BD. This latter finding is particularly relevant given the scarcity of validated psychosocial interventions targeting emotional dysregulation in BD.

Keywords: anxiety; bipolar disorder; emotion dysregulation; imagery-based cognitive therapy

Introduction

Bipolar disorder (BD) is characterized by an alternation between depression, (hypo)mania and mixed states but also euthymic periods (American Psychiatric Association, 2013). In terms of lifetime prevalence, BD affects between 1 and 4% of the population (Merikangas *et al.* 2007; Merikangas *et al.*, 2011). The care and support of people affected by BD is a major public health issue. BD has the highest suicide rates among psychiatric disorders, with 10–20% of individuals with BD dying by suicide, and 20–60% attempting suicide during the course of their illness (Hawton *et al.*, 2005; Plans *et al.*, 2019; Rihmer *et al.*, 2017). The World Health Organization (WHO) ranks BD as one of the top 10 causes of disability worldwide (World Health Organization, 2008). Moreover, BD can also have a significant impact on social, family and occupational functioning (e.g. Rosa *et al.*, 2010) as well as on overall quality of life, which is significantly impaired even when individuals are in a euthymic state (Abraham *et al.*, 2014; Michalak *et al.*, 2005; Sylvia *et al.*, 2017). In particular,

poor quality of life and functioning are linked to the co-morbidities (Krishnan, 2005) as well as the presence of persistent subsyndromal mood instability during euthymia (Birmaher *et al.*, 2014; Strejilevich *et al.*, 2019). More than 95% of patients with BD suffer from psychiatric co-morbidities, such as anxiety disorders (75–89%) and substance abuse disorder (40–60%) (Merikangas *et al.*, 2007). Importantly, co-morbidities and subsyndromal mood instability are known to worsen the prognosis and increase the risk of relapse (Faurholt-Jepsen *et al.*, 2019; Judd *et al.*, 2002; Kilbane *et al.*, 2009; Marangell et al., 2009; Perlis *et al.*, 2006).

Despite being prevalent, subsyndromal mood instability and its treatment remain under-studied in BD. Nevertheless, it has been suggested that subsyndromal mood instability could be related to emotional dysregulation (ED) in people with BD (Townsend and Altshuler, 2012; Oliva *et al.*, 2023). ED refers to difficulties employing emotion regulation strategies to modulate emotions (Beauchaine, 2015). People with BD show difficulties in implementing emotional regulation strategies (Gruber *et al.*, 2012; Oliva *et al.*, 2023), which may contribute to long-term mood instability (i.e. recurrence of mood episodes and symptoms) (Henry *et al.*, 2012; Van Rheenen *et al.*, 2015; Wolkenstein *et al.*, 2014). Because ED has been under-studied in BD, it is still unknown whether it is a trait or a state process. However, results from a recent systematic review and meta-analysis suggest that ED is heightened during acute mood episodes, especially depression (Oliva *et al.*, 2023). Furthermore, the severity of ED is linked to a poorer prognosis associated with a poorer psychosocial functioning (Muhtadie *et al.*, 2014), more psychiatric co-morbidities, particularly with cluster b personality disorders, as well as an increased suicidality (Apfelbaum *et al.*, 2013; Eskander *et al.*, 2020; Janiri *et al.*, 2021). ED could thus be a core mechanism of the disorder that persists during remission and in euthymic phases resulting in an unfavourable impact on prognosis and recovery (Green *et al.*, 2007; Miola *et al.*, 2022).

While pharmacotherapy is central to the care of people with BD, pharmacological treatment alone does not lead to satisfactory outcomes in a significant number of people, with 37% relapsing within 1 year and 73% within 5 years of the initial episode (Gitlin *et al.*, 1995; Simhandl *et al.*, 2014), due to compliance problems and/or ineffectiveness. In terms of psychosocial interventions, several studies show favourable results of psychotherapies such as cognitive behavioral therapy (CBT) and psychoeducation combined with pharmacotherapy, with reduced relapse rates and improved psychosocial functioning (Chiang *et al.*, 2017; Miklowitz *et al.*, 2021). Despite these encouraging results, the mechanisms involved in the effectiveness of psychological treatments are still insufficiently identified (Miklowitz *et al.*, 2021). Moreover, the aforementioned psychotherapies do not target co-morbidities or ED specifically, which are thought to contribute to the risk of relapse and the functional impact of the disorder (Dodd *et al.*, 2019; Eskander *et al.*, 2020; Janiri *et al.*, 2021). It is therefore crucial to pursue research and innovation in psychological treatments for BD, especially those targeting ED and subsyndromal symptoms that persist during euthymia.

As part of this effort, a growing number of studies has focused on mental imagery as a potential target, given its relationship with ED in BD but also in other disorders (D'Argembeau and Van der Linden, 2006; Holmes and Mathews, 2010; Moscovitch *et al.*, 2013; Schaitz *et al.*, 2020). Mental imagery refers to the perceptual experience of sensory information from memory in the absence of direct sensory stimulation (Kosslyn *et al.*, 2001). Therefore, mental imagery is often described as the phenomenon of 'seeing with the mind's eye' and 'hearing with the mind's ears'. Mental images thus involve all sensory systems, can be ephemeral or persistent, stable or animated, vivid or evanescent, ranging from a fleeting single-sensory impression to a detailed sequence of multi-sensory events accurately represented (Kosslyn *et al.*, 2001; Ji *et al.*, 2019). Mental images allow us to remember the past, anticipate the future and contribute to decision-making and learning (Ji *et al.*, 2019). Neuroscientific evidence suggests that the brain structures engaged in mental imagery are akin to those underlying true perception (Kosslyn *et al.*, 2001; Pearson *et al.*, 2015), which contributes to a near-real experience leading to similar physiological responses (Ji *et al.*, 2016; Lang, 1979). This explains why research has shown that they have a more powerful emotional

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impact than verbal thoughts with the same content, whether negative or positive in valence (Holmes *et al*., 2008; Holmes *et al*., 2009; Holmes and Mathews, 2005; Nelis *et al*., 2015). Mental imagery seems to play a role in the development and/or maintenance of many psychiatric disorders such as anxiety disorders, post-traumatic stress disorder (PTSD), psychotic disorders, substance use disorder, obsessive-compulsive disorder or eating disorders (Brewin *et al*., 2010; Hirsch and Holmes, 2007).

In the context of BD, several studies have found that people with BD experience more vivid, frequent, intrusive and upsetting mental imagery compared with healthy subjects or subjects with unipolar depression (Di Simplicio *et al*., 2016; Holmes *et al*., 2011; Ivins *et al*., 2014; Petit *et al*., 2021). The content of mental images is also known to be congruent with the valence of mood fluctuations, and images are more numerous during acute episodes (Gregory *et al*., 2010). Given these findings, Holmes *et al*. (2008) suggested that mental imagery acts as an 'emotional amplifier' for anxiety, depression and mania and thus contributes to the exacerbation of mood fluctuations. Therefore, targeting emotional mental images could potentially reduce anxiety and, more generally, emotional arousal, which play a major role in mood instability in BD.

Four studies testing the feasibility and preliminary efficacy of a mental imagery-based therapy (ImCT) protocol for people with BD have found promising results (Hales *et al*., 2018; Holmes *et al*., 2016; Steel *et al*., 2020; Van der Berg *et al*., 2023; Steel *et al*., 2023). These studies specifically targeted the reduction of anxiety and mood instability, considering that distressing mental imagery exacerbated and sustained anxiety which, in turn, caused mood instability. In the first study, 11 out of 14 participants demonstrated an improvement in mood stability, as well as a decrease in depression and anxiety scores over a short follow-up period (Holmes *et al*., 2016). In the second study, a significant reduction in the duration of depressive relapse, a modest reduction in the severity of depressive episodes ($d = 0.3$), and a significant reduction in anxiety symptoms were reported (Hales *et al*., 2018). A recent randomized controlled trial conducted by Van der Berg *et al*. (2023) reported greater improvements in depression, mania, and anxiety symptoms in the ImCT group compared with a psychoeducation group. Another recent randomized controlled trial comparing ImCT with treatment as usual (TAU) found that ImCT was feasible, even though effect size outcomes for all clinical measures were either small or negative (Steel *et al*., 2020; Steel *et al*., 2023). These findings suggest that ImCT is feasible and might be a promising addition to existing psychotherapies for BD. However, despite these promising results, the number of studies investigating the feasibility and clinical relevance of ImCT in BD remains scarce. Further research is needed to identify the underlying mechanisms and optimize the effectiveness of this therapy. Moreover, three of the four published studies were conducted in a specific English healthcare setting, which raises questions about the therapy's feasibility and acceptability in other settings. Therefore, it seems essential to replicate these studies in different institutional settings to reduce the likelihood of study design effects (case series study) or context-specific effects. In addition, current research on ImCT has primarily focused on treating anxiety and mood symptoms, but not on ED. Investigating the effectiveness of ImCT in treating ED in BD and examining the links between distressing mental images, ED, and mood instability is crucial. This will help gain a better understanding of the mechanisms involved in the potential efficacy of the therapy, and ultimately improve its relevance.

The present study aims to assess the acceptability (i.e. participants' satisfaction and retention; Cruwys *et al*., 2022) and preliminary efficacy of ImCT in reducing ED, anxiety, and mood instability in individuals with BD. Specifically, we will examine the effects of ImCT (Holmes *et al*., 2019) through a multiple case quasi-experimental study in a French institutional context devoid of any links with researchers previously involved in this research field. Furthermore, this study seeks to further investigate under-studied links between mental imagery, mood instability, and ED in people with BD. Given that mental images have a strong emotional impact, they are thought to contribute to the emotional hyper-reactivity found in people with BD (M'bailara *et al*., 2009; Petit *et al*., 2021; Holmes *et al*., 2008) and be associated with maladaptive ED strategies, such as

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Table 1. Baseline characteristics of the study sample ($n = 10$) including demographic data and clinical characteristics

Demographic data	
Age (mean/*SD*)	31.83 (4.82)
Gender (*n*, %)	
Man	2 (20%)
Woman	8 (80%)
Clinical features	
BD type (*n*, %)	
BD-I	4 (40%)
BD-II	3 (30%)
NOS	3 (30%)
Number of hospitalizations (mean/*SD*)	3.6 (2.8)
0 (*n*, %)	2 (20%)
1-3 (*n*, %)	4 (40%)
4-6 (*n*, %)	3 (30%)
>6 (*n*, %)	1 (10%)
Pharmacological treatments	
Lithium	6 (60%)
Anti-epileptics	5 (50%)
Anti-psychotics	6 (60%)
Anti-depressants	0 (0%)
Anxiolytics	7 (70%)
Co-morbidities	
Borderline personality disorder (*n*, %)	3 (30%)
Severe anxiety (BAI>26) (*n*, %)	7 (70%)
Emotional dysregulation (DERS-16) (mean/*SD*)	52 (8)

BAI, Beck Anxiety Inventory; DERS-16, Difficulties in Emotion Regulation Scale.

suppression and rumination, that are involved in ED and overall mood instability (Henry *et al.*, 2012; Koenders *et al.*, 2020; Van Rheenen *et al.*, 2015). We therefore hypothesize that ImCT is acceptable; that is, low attrition, good adherence to treatment and high satisfaction are expected. Second, given that through its focus on mental imagery, ImCT has been found to improve anxiety, post-traumatic symptoms, mood instability, but also self-compassion and self-reported recovery (e.g. Krentzman *et al.*, 2015), we hypothesize that ImCT will lead to decreased depression, mania, post-traumatic and anxiety symptoms and increased self-reported recovery and self-compassion (Holmes *et al.*, 2019) in people with BD along with a significant reduction in weekly mood instability. Importantly, we also expect ImCT to lead to a decrease in ED.

Method

Participants

Ten participants were recruited following the referral of their psychiatrist, psychologist, or nurse at the University Hospital of Strasbourg. To participate in the study, subjects had to: (1) be 18 or older, (2) have a *DSM-5* diagnosis of bipolar disorder (BD-I, BD-II, NOS), (3) have a high level of self-reported ED (DERS-16>57), anxiety (BAI>26) or significant complaints of mood instability, and (4) be fluent in French. Exclusion criteria were: (1) participation in another psychotherapeutic treatment for BD, (2) the presence of an acute manic or depressive episode, (3) current hospitalization, (4) reluctance to work with mental imagery, (5) aphantasia and (6) the presence of an ongoing substance abuse disorder. The ImCT was therefore an add-on intervention delivered in addition to treatment as usual. For a detailed representation of the baseline characteristics of the study sample, see Table 1.

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Treatment

The ImCT consists of a 10-session weekly individual intervention delivered by one or two therapists (Holmes *et al.*, 2019). Each session lasts 1 hour. In this study, the therapy was administered by T.P., a CBT trained graduate-level clinical psychologist, and L.W., professor of clinical psychology. The ImCT is divided into three distinct phases (see Fig. S1 in Supplementary material). (I) The first four sessions refer to a first phase labelled 'mapping', which aims at identifying a target for the intervention involved in the maintenance of mood instability. During this phase, the individual's current concerns, priorities, compliance with pharmacological treatments, history of mood fluctuations in relation to BD, ability to identify the prodromes of (hypo)mania and depression, and functional and dysfunctional adaptation strategies are assessed. Finally, one or more treatment targets (image/co-morbidity) are conceptualized based on the associated distress and their impact on mood instability. Furthermore, targets were defined according to the subjects' priorities and the clinicians' assessment of their relevance to the therapy, which was limited in time (10 sessions). The most frequent difficulties with mental imagery are the presence of one image (or a small number of images) directly affecting mood stability, the presence of numerous images holding a significant impact on mood stability, or a scarcity of positive images contributing to the presence of more unpleasant affect (Holmes *et al.*, 2019). In addition, during this phase, psychoeducation on mental images is provided, linking them to the specific difficulties encountered by each individual patient. The second phase, called treatment phase (II), consists of four sessions, and aims at applying imagery techniques to address the previously formulated target(s). If necessary, four types of techniques are used: (1) metacognitive techniques for managing mental images, that is, strategies aiming at reducing the emotional impact of an image by modifying the person's relationship to that image. Metacognitive strategies reinforce the idea that the image is just an image and as such it can be managed or that the subject does not need to pay attention to it. (2) Rewriting a mental image, which aims to modify an image to change how the image makes the person feel and/or how they react to it (e.g. an image of defenestration which tends to exacerbate their pre-existing low mood). (3) The promotion of positive mental imagery with the aim of self-soothing or bringing about a sense of safety in difficult times (safe place), to enhance self-compassion. (4) The use of visuo-spatial tasks competing with mental images to deal in the short term with distressing and intrusive images contributing to intense distress (Hackmann *et al.*, 2011; Holmes *et al.*, 2019; Stopa and Beck, 2021). The third and final phase, called consolidation (III), consisted of two sessions. This phase had two major goals: (1) to consolidate the participants' achievements and in particular the strategies they had learned to help them manage their emotions, to set up action plans in case of future difficulties and to prepare for the future (e.g. *What can I do to continue to be kind to myself?*). In addition, it was important to get the participants to create a visual blueprint (2) with the notable points seen in therapy that they could use in the future. The aim was to consolidate learning and increase the sustainability of effects over time. For this purpose, the subjects were invited to produce a creative visual support of their choice (video, comic strip, visual card, power-point, notebook, drawings, painting, etc.). This support was discussed with the participants during the last session to reinforce the strategies they deemed relevant to maintain or consolidate in the future.

Outcomes measures

Acceptability

Intervention acceptability was assessed by recording the attrition rate (percentage of drop-outs), and session attendance rate using the Client Satisfaction Questionnaire (CSQ-8; Larsen *et al.*, 1979; Sabourin *et al.*, 1988; Sabourin *et al.*, 1989). The CSQ-8 is an 8-item questionnaire, scored on a 4-point Likert scale. This questionnaire is widely used to measure satisfaction. The sum of the CSQ-8 responses ranges from 8 to 32, with higher scores indicating greater satisfaction.

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Primary clinical outcome measures: mood instability, ED, anxiety, and mental imagery

The Internal Scale State (ISS; Bauer *et al.*, 1991) was used to measure mood instability. The ISS is a validated self-report measure designed to assess depressive and manic symptoms in people with BD. It consists of four subscales: activation, well-being, perceived conflict, and depression, with Likert-type response modalities ranging from 0 to 100 over 15 items. The scoring method of the ISS uses the activation (ACT) and the well-being (WB) subscales as measures of euthymia, depression, (hypo)mania or mixed state. Hypomania (ACT>155, WB>125), mixed state (ACT>155, WB<125), euthymia (ACT<155, WB>125), and depression (ACT<155, WB<125) can be determined by ISS subscales. The depression index indicates the level of severity of depression and is strongly and specifically correlated with the Hamilton Depression Scale (Bauer *et al.*, 1991). The perceived conflict subscale was not used in our study.

ED was measured through the Difficulties in Emotion Regulation Scale (DERS-16; Bjureberg *et al.*, 2016; Dan-Glauser and Scherer, 2013). The DERS-16 is a self-reported scale consisting of 16 items that assess different dimensions of emotional dysregulation, e.g. non-acceptance of negative emotions (3 items), inability to engage in goal-directed behaviours in distress (3 items), difficulties controlling impulsive behaviours when in distress (3 items), limited access to emotion regulation strategies perceived as effective (5 items), and lack of emotional clarity (2 items). Subjects rate their responses on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). Total scores can thus range between 16 and 80. The higher the scores, the greater the level of difficulties in emotional regulation. The DERS is a reliable tool for measuring ED in BD (Van Rheenen *et al.*, 2015). Anxiety was measured by the weekly completion of the Beck Anxiety Inventory (BAI; Beck *et al.*, 1988; Freeston *et al.*, 1994). The BAI is a 21-item self-report questionnaire assessing anxiety symptoms over the past 7 days using a Likert-type scale ranging from 0 to 4. The total score ranges between 0 and 63. Scores of 0–7 indicate minimal anxiety, 8–15 indicate mild anxiety, 16–25 indicate moderate anxiety, and total scores over 26 indicate severe anxiety. Mental imagery was measured through a 6-item visual analogue scale (VAS) measuring different characteristics of mental imagery over the past 7 days. These include: (1) vividness, (2) intrusiveness, (3) associated distress, (4) feelings of helplessness, (5) feelings of control over mental imagery, and (6) frequency of disturbing mental images. The scale was created based on previous studies using a similar method (Holmes *et al.*, 2016; Iyadurai *et al.*, 2020; Van der Berg *et al.*, 2023).

Secondary clinical outcome measures

Depressive symptomatology was measured by the Quick Inventory of Depressive Symptomatology (QIDS-SR16; Rush *et al.*, 2003; Trivedi *et al.*, 2004). Manic symptomatology was captured by the Altman Self-Rating Mania scale (ASRM; Altman *et al.*, 1997). Other dimensions measured include recovery from bipolar disorder (BRQ; Jones *et al.*, 2013), spontaneous use of emotional mental imagery (E-SUIS; O'Donnell *et al.*, 2020), post-traumatic stress disorder symptoms (PLC-5 short form; Zuromski *et al.*, 2019), self-compassion (SCS; Kotsou and Leys, 2016; Neff, 2003). All these measures were recorded at inclusion at T0 and post-treatment at T1.

Design and procedure

A case series design with multiple A-B baselines was used. After a 1-hour inclusion interview, 10 participants matching the inclusion and exclusion criteria were included. The main outcome measures – i.e. mood fluctuation, emotional dysregulation, anxiety, and mental imagery characteristics – were measured on a weekly basis to determine their evolution during the therapy. Baseline measures were recorded for 1 month, resulting in a total of four baseline measures recorded for each participant. After this baseline phase, the participants followed the 10 sessions of ImCT and a follow-up period of 1 month. Thus, primary clinical measures were collected 18 times

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for each participant. The secondary outcome variables were measured after the inclusion interview (T0) and at post-therapy (T1).

Statistical analyses

First, the dataset was plotted on graphs and visually inspected. A descriptive analysis of weekly self-reported primary variables was conducted at individual and group level. To assess individual change, reliable change indices (RCI; Jacobson and Truax, 1991) were calculated. RCI indicates if a change that has occurred over time is significantly greater than a difference that might have occurred because of the random measurement error alone. A RCI above 1.96 or below –1.96 is considered as a reliable change, reflecting a significant improvement, or worsening of the individual total score over time (Jacobson and Truax, 1991). To assess group changes between T0 and T1 on the primary clinical measures (i.e. mood instability, ED, anxiety and mental imagery) and secondary clinical measures the non-parametric Wilcoxon signed ranks test was used (Kerby, 2014). Effect sizes *r* were calculated via rank-biserial correlation coefficients, where r ∋ [0.1; 0.3] referred to a small effect size, r ∋ [0.3; 0.5] a medium effect size, and r ∋ [0.5; 1] to a large effect size (Cohen, 1992). To assess the normality of residuals we performed a Shapiro-Wilk normality test. All statistical analyses were performed with Jamovi version 1.6.23.0.

Results

Acceptability

Two of the ten participants (20%) dropped out of the therapy. The reasons for discontinuing participation were, respectively: hospitalization at the very beginning of treatment phase ($n = 1$; D10) and the initiation of a conventional CBT treatment due to reluctance to work with mental images at the end of mapping phase ($n = 1$; D07). Regarding session attendance for all participants (including J10 and D04 before drop-out), a total of 91 sessions were scheduled. Out of these 91 sessions, the attendance rate was 96.7%. One participant (B02) was unable to attend a session due to a significant decrease in mood, another participant (A01) had to miss two sessions due to the loss of her mother and a 3-week relocation to another city. Out of these three sessions, two were rescheduled. Unfortunately, the third one could not be rescheduled due to time constraints within the intervention. All participants who completed therapy reported high levels of satisfaction with the therapy with an average of 3.58/4 score per item and 29 on the global CSQ-8 scale, with an average item variance of 0.25. The CSQ-8 scores are therefore above the reference thresholds established by the French version of the scale (Sabourin *et al.*, 1989), which are 23.7 on the total CSQ-8 score, with 2.97 per item and 0.7 item variance.

Analyses of primary clinical measures

Plots of changes in mood, anxiety, and ED for each subject over the baseline, therapy and follow-up periods were made and analysed (see Fig. S2 in the Supplementary material). Descriptives analysis yield that three-quarters of the participants reported a reduction in the mean anxiety level at the follow-up period compared with the baseline level. In addition, 75% of the participants also showed a reduction in emotion dysregulation. However, no significant group differences were found on any of the main variables between the baseline and follow-up periods using the Wilcoxon signed ranks test (Table 2). Nevertheless, a trend towards a decrease in the depression index measured by the ISS ($p = 0.052$) with a large effect size ($R = 0.67$) stands out as well as a tendency of a diminished emotional dysregulation measured by the DERS-16 ($p = 0.074$) with a large effect size ($R = 0.61$). Through the comparison of the standard deviations for each of the main outcome variables (Table 3), a significant reduction in the standard deviations of the

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Table 2. Comparison of weekly depression (ISS), activation (ISS), well-being (ISS), anxiety (BAI) and emotional dysregulation (DERS-16) scores for the 8 participants combined over the baseline (4 weeks) and follow-up (4 weeks) periods

Measured variable	Baseline Mean (*SD*)	Follow-up Mean (*SD*)	Wilcoxon *W*	*p*-value	Effect size *r*
Weekly depression index (ISS)	57.94 (32.14)	49.37 (39.2)	30	**0.052**	−0.67
Weekly activation (ISS)	134.38 (64)	128.44 (100.91)	25	0.19	−0.39
Weekly wellbeing (ISS)	136.06 (40.03)	158.44 (48.75)	10	0.88	0.44
Weekly DERS-16 score	47.91 (11.98)	41.34 (17.18)	29	0.074	−0.61
Weekly BAI score	17.15 (11.91)	12.875 (14.69)	25	0.19	−0.39

Table 3. Comparison of standard deviations of weekly depression (ISS), activation (ISS), well-being (ISS), anxiety (BAI) and emotional dysregulation (DERS-16) scores for the 8 participants combined over the baseline (4 weeks) and follow-up (4 weeks) periods

Measured variable	Baseline *SD*	Follow-up *SD*	Wilcoxon *W*	*p*-value	Effect size *r*
Weekly depression index (ISS)	37.99 (16.61)	21.06 (15.53)	33	**0.019**	−0.83
Weekly activation (ISS)	79.26 (36.03)	47.63 (35.85)	31	**0.039**	−0.72
Weekly wellbeing (ISS)	47.27 (30.85)	53.85 (34.12)	9	0.82	0.36
Weekly DERS-16 score	6.8 (3.89)	3.85 (3.69)	22	0.12	0.5
Weekly BAI score	5.22 (2.45)	4.13 (4.37)	27	0.32	−0.22

Table 4. RCIs of BAI, DERS and BRQ

Participants	**BAI** Baseline to follow-up	**DERS** Baseline to follow-up	**PLC-5** Pre–post	**BRQ** Pre–post
A01	1.16	**2.9**[a]	1.32	0.14
B02	1.08	**2.49**[a]	**1.98**[a]	**1.98**[a]
C03	**5.51**[a]	1.02	1.32	0.39
D04	0.46	**2.14**[a]	**3.3**[a]	1.55
E05	−2.08[b]	**1.94**[a]	0.66	**3.04**[a]
F06	−2.54[b]	−2.74[b]	**1.98**[a]	**2.66**[a]
H08	1.81	−0.05	−1.32	1.64
I09	**6.17**[a]	**3.1**[a]	0.66	1.21

[a]Reliable change reflecting a significant improvement (i.e. >1.96);
[b]reliable change reflecting a significant worsening (i.e.<−1.96).

depression index ($p = 0.019$) post-treatment with a large effect size ($r = 0.83$) and a significant decrease of weekly activation ($p = 0.039$) with a large effect size ($r = 0.72$) were found.

At the individual level (see Table 4), all participants but one significantly improved on at least one measure suitable for RCI calculation (i.e. BAI, DERS, BRQ and PCL-5). Notably, a significant improvement in emotional dysregulation, measured by the DERS, was observed in 62.5% of participants. Among the participants showing an improvement in anxiety, only two showed a reliable improvement while two displayed increased anxiety levels post-therapy. Less than half (37.5%) of participants showed reliable improvement on the PLC-5 and the BRQ.

Analyses of secondary clinical measures

Indicators of central tendency and dispersion of the measures pre- and post-treatment are shown in Table 5. The non-parametric Wilcoxon signed rank tests reveal a significant decrease in the PLC-5 score ($p = 0.028$) with a large effect size of $r = -0.78$ and a significant increase in the Bipolar Disorder Recovery Score (BRQ) post-treatment ($p = 0.007$) with a large effect size of $r = 1$. There

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Table 5. Comparison of QIDS-16, ASRM, PLC-5, SCS and BRQ scores before (T0) and after treatment (T1)

Measured variable	Baseline Mean (*SD*)	Follow-up Mean (*SD*)	Wilcoxon *W*	*p*-value	Effect size *r*
QIDS-16	12.25 (8.88)	9 (6.09)	10.5	0.16	−0.42
ASRM	4 (3.25)	5.37 (3.85)	19.5	0.39	0.39
PLC-5	8.75 (3.33)	6.87 (3.27)	4	**0.028**	−0.78
SCS	15.89 (3.22)	17.54 (4.59)	30	**0.054**	0.67
BRQ	222.13 (42.68)	254.75 (47.51)	36	**0.007**	1

Quick Inventory of Depressive Symptomatology (QIDS-16), Altman Self-Rating Mania scale (ASRM), PTSD Check-list (PLC-5 short form), Self Compassion Scale (SCS), and Bipolar Recovery Questionnaire (BRQ).

was also a trend towards an increase in self-compassion ($p = 0.054$) with a large effect size of $r = 0.67$.

Discussion

The purpose of the present study was to evaluate the acceptability and preliminary efficacy of ImCT in reducing ED and mood instability in individuals with BD. Firstly, regarding the acceptability of the therapy, treatment adherence was high as well as overall satisfaction scores. However, the drop-out rate in our study was significantly higher than that reported in previous studies, which had respective drop-out rates of 6.6% (Holmes *et al.*, 2016), 8.3% (Hales *et al.*, 2018), 3% (Van der Berg *et al.*, 2023), and 4% (Steel *et al.*, 2023). This might be related to the fact that we considered the beginning of the therapy as the first of the four sessions of the mapping phase, and this was not the case in previous studies. Indeed, Hales *et al.* (2018) used this phase for the inclusion of participants, after which five out of 17 people were excluded. With such a procedure, the attrition rate in our study would have been zero. Furthermore, the two participants who dropped out during the mapping phase had co-morbid borderline personality disorder and did not exhibit specific concerns that were easily amenable to mental imagery. It is therefore likely that the lack of a perceived association between mental imagery and mood fluctuations and/or co-morbidities might have contributed to a reduced level of engagement and subsequent drop-out.

Secondly, although the descriptive analyses seemed to indicate an improvement in weekly measures of mood fluctuations, anxiety, and ED at a group level, only tendencies towards improvements in depressed mood and emotion dysregulation were found. However, a reduction in weekly mood instability with a large effect size was observed, consistent with previous studies demonstrating decreased mood instability and lower intensity of depressive symptoms after ImCT (Hales *et al.*, 2018; Holmes *et al.*, 2016; Van der Berg *et al.*, 2023). Interestingly, at the individual level and contrary to our hypotheses, anxiety levels decreased significantly only in two participants and increased significantly in two of them. This is unlike previous studies which have found significant effects of the ImCT on daily measures of anxiety (Van der Berg *et al.*, 2023). These inconsistent results could probably be related to contextual stressful factors that might have influenced the anxiety results for the two participants (e.g. job interview, death of a loved one, threat of job loss) and by the design of our study which consisted of weekly measures. Indeed, memory is mood-dependent (Lewis and Critchley, 2003) and retrospective memory biases are frequent, especially in BD (Latalova *et al.*, 2011; Luo *et al.*, 2020). Therefore, it is likely that anxiety is better captured in BD when it is measured daily rather than weekly (Van der Berg *et al.*, 2023).

By contrast, ED significantly improved in 5/8 participants, indicating that ImCT might lead to an alleviation of ED in people with BD. This is crucial given that ED is related to psychological difficulties and a poorer prognosis in BD (Miola *et al.*, 2022), and that psychosocial interventions targeting ED in BD are scarce (Afshari *et al.*, 2019; Eisner *et al.*, 2017). Interestingly, the three patients who claimed the most noticeable post-therapy improvements (C03, D04 and F06) were

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those for whom ImCT consisted in the rescripting of disturbing mental images and associated beliefs (e.g. 'I am a burden to others', 'My relatives would have had a better life if I did not exist'). Specifically, they claimed that they were now able to have control over these distressing images and replace them with resilient ones, which heightened their feeling of hope. This is in line with evidence suggesting that the rescripting of disturbing images may have a powerful impact on negative self-beliefs (Stopa, 2021). Indeed, according to Conway and Pleydell-Pearce (2000), self-representation may take the form of images. Therefore, changing the meaning and valence of negative self-images through the experiential perspective of the ImCT may help modify the conclusions derived from self-defining memories and facilitate access to a more positive and functional self-representation (Stopa, 2021).

In addition to changes in ED and mood, at the group level (pre–post comparisons), a significant decrease was observed in the PCL-5 score, which measures post-traumatic stress symptoms, and the BRQ score, which measures recovery in BD. Interestingly, pre-therapy, 7/8 participants met the threshold for PTSD on a screening scale for PTSD (PLC-5 score >5; Kim *et al*., 2016), despite not meeting the full *DSM-5* criteria for the disorder. Of the seven participants, five had experienced at least one type of maltreatment that scored above the cut-off for moderate abuse on the Childhood Trauma Questionnaire (Bernstein and Fink, 1998), which could explain the subthreshold PTSD symptoms in our sample of patients with BD. Rates of childhood maltreatment are higher among individuals with BD compared with the general population, and have been found to have a long-term impact on the course and outcome of BD (Daruy-Filho *et al*., 2011) and to be related to ED in BD (Prisco *et al*., 2022). Overall, these findings might suggest that ImCT may be helpful in alleviating difficulties related to aversive or traumatic past events (e.g. Singh *et al*., 2020). In addition, while it is beyond the scope of our article, our results suggest that ImCT might be helpful in relieving the impact of psychiatric co-morbidities in BD.

Regarding recovery, increased BRQ scores have been associated with lower symptomatology, better functioning, and quality of life in individuals with BD (Jones *et al*., 2013). Interestingly, recovery may be a more reliable indicator of the impact of therapy on well-being compared with emotions and mood, which are inherently fleeting and reactive to contextual events (Jones *et al*., 2013). Additionally, it has been suggested that components of the BRQ, such as self-management of health and understanding of mood experiences, may be important mechanisms in preventing relapses (Jones *et al*., 2013). These findings support the clinical value of ImCT not only for its effect on symptoms but also for its potential long-term benefits, such as reduced psychopathology and better functioning. Consistently, it is worth noting that self-compassion tended to increase post-therapy, in line with the fact that compassion-based therapies often rely on the use of imagery to change one's relationship with oneself (i.e. self-concept) (Gilbert and Irons, 2004). Relatedly, low levels of self-compassion have been associated with ED, mood instability and the sequelae of childhood maltreatment (Døssing *et al*., 2015), whereas high levels of self-compassion have been associated with attenuated psychopathology (MacBeth and Gumbley, 2012). While our research design does not allow us to draw conclusions regarding the mechanisms of change associated with ImCT, it is possible that targeting mental imagery may lead to increased self-compassion, which may be involved in ED in people with BD.

Our study has several limitations that must be considered. Firstly, the design and small sample size ($n = 8$), along with the absence of randomization between phases A and B, limit the ability to draw definitive conclusions regarding intra-individual effects. In addition, the small number of weekly measurements may not have been precise enough to reflect the effects of our intervention on some measures. Hence it is possible that the measurement schedule was not sensitive or suitable for picking up the changes caused by the treatment. To better understand the effects of ImCT on mood, ED and anxiety, time series analyses used daily (e.g. Holmes *et al*., 2016) seem particularly relevant. Indeed, weekly measures may lead to data loss when mood or anxiety fluctuations are more frequent than the sampling rate (Moore *et al*., 2013). Additionally, given that our participants had to present with high anxiety or ED scores to be included, it is possible

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that some of our post-therapy results reflect a regression to the mean. However, as some of the clinical measures improved (e.g. ED, recovery) while others did not (e.g. anxiety), a widespread regression to the mean effect seems unlikely. To better capture the clinical impacts of ImCT, future studies should therefore focus on these mood and emotional symptoms using a time-series randomized design and daily measures. In terms of the acceptability of the intervention, unlike other acceptability trials (e.g. Cruwys *et al.*, 2022), we have focused on the satisfaction of participants only. Future studies should also investigate the satisfaction of clinicians delivering the intervention.

Taken together, our findings suggest that imagery-based therapy is acceptable in routine clinical practice. Importantly, our study is the first to provide an indication that ImCT may alleviate subsyndromal mood symptoms but also emotional dysregulation in individuals with BD. The latter finding is particularly relevant given the lack of validated psychosocial interventions for ED in BD and the increased awareness of its impacts on prognosis, well-being, and recovery.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S1352465824000420

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Competing interests. The authors declare none.

Ethical standards. Participants gave written informed consent before inclusion in the study in accordance with the Declaration of Helsinki. This study was approved by the Ethics Committee of the Medical School of the University of Strasbourg (CE-2024-39) and was registered retrospectively (after study completion) in ClinicalTrials.gov (ID: NCT06497868).

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