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Effectiveness of Dialectical Behavior Therapy on Executive Functions and Emotion Dysregulation in Adults with Bipolar Disorder

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ABSTRACT

Objective: To evaluate whether dialectical behavior therapy (DBT) improves executive functions and reduces emotion dysregulation in adults with bipolar disorder using a quasi-experimental, pretest–posttest, controlled design with four-month follow-up.

Methods and Materials: Thirty adults with DSM-5 bipolar disorder (25–45 years) were recruited via purposive sampling and randomly assigned to DBT (n=15) or wait-list control (n=15). The intervention comprised eight 90-minute group sessions over four weeks based on Linehan's skills modules (mindfulness, emotion regulation, distress tolerance, interpersonal effectiveness). Outcomes were assessed at pretest, posttest, and four-month follow-up using Nejati's Executive Function Questionnaire (30 items) and the Difficulties in Emotion Regulation Scale (36 items). Data were analyzed in SPSS 26 using mixed repeated-measures ANOVA with assumption checks and Greenhouse–Geisser corrections; significance was set at .05.

Findings: Groups were demographically comparable at baseline. Significant group and time effects emerged for both outcomes. Executive functions improved in the DBT group from pretest to posttest and were largely maintained at follow-up, whereas controls showed no meaningful change (group effect F large; partial $\eta^2 \approx .66$; time effect partial $\eta^2 \approx .69$). Emotion dysregulation decreased significantly in DBT relative to control and remained improved at follow-up (group effect partial $\eta^2 \approx .89$; time effect partial $\eta^2 \approx .31$). No adverse events were reported, and retention exceeded 80%.

Conclusion: Brief group-based DBT produced clinically and statistically significant improvements in executive functions and reductions in emotion dysregulation that persisted for four months. Findings support integrating DBT skills training as an adjunct to standard care for bipolar disorder; larger randomized trials with longer follow-up and treatment-fidelity monitoring are warranted.

Keywords: Dialectical Behavior Therapy, Executive Functions, Emotional Dysregulation, Bipolar Disorder.

Introduction

Bipolar disorder is one of the major mood disorders characterized by significant fluctuations in emotional state, activity levels, and individual functioning, encompassing a clinical spectrum ranging from manic to depressive episodes (Oliva et al., 2025). Formerly referred to as manic-depressive illness, bipolar disorder has a considerable prevalence in the general population and exerts profound effects on patients' personal lives, occupational performance, and social relationships (Poletti et al., 2024). Individuals with bipolar disorder not only experience extreme mood and energy shifts but may also exhibit symptoms such as irritability, impaired judgment, impulsive behaviors, periods of insomnia, and, in some cases, psychotic features (Kessing, 2024). Severe depressive episodes significantly undermine patients' motivation and social functioning, while manic or hypomanic episodes can increase the risk of high-risk behaviors and hasty decision-making (O'Connell et al., 2025). The complex interplay of biological, psychological, and social factors in the onset and persistence of this disorder makes treatment and management particularly challenging (Zhong et al., 2024). Furthermore, contemporary studies highlight that bipolar disorder is often comorbid with anxiety disorders, substance use disorders, and personality disorders, complicating the course of treatment and underscoring the need for more comprehensive and multidimensional therapeutic approaches (Song et al., 2024). Early identification and the provision of psychosocial support are also emphasized as effective strategies for preventing relapse and improving patients' quality of life (Guo et al., 2024).

Among the critical yet often overlooked consequences of bipolar disorder are deficits in executive functions (Cañada et al., 2024) and emotional dysregulation (Paulet & Weiner, 2025), both of which substantially contribute to functional impairments and interpersonal difficulties. Executive functions—defined as a set of higher-order cognitive processes including planning, selective attention, cognitive flexibility, response inhibition, working memory, and problem-solving—are essential for everyday functioning, social adaptation, and goal attainment (Bao et al., 2024). Research findings consistently indicate that individuals with bipolar disorder experience significant deficits in these areas even during apparently stable (euthymic) phases, suggesting that these impairments are not confined to acute episodes (Singh et al., 2025). Poor self-control, weak planning, and difficulties adapting to changing environmental demands may result in occupational dysfunction, unstable relationships, and increased risk of relapse (Ribeiro et al., 2024). In parallel, emotional dysregulation emerges as another salient feature of bipolar disorder, playing a key role in symptom exacerbation and diminished quality of life (De Prisco et al., 2023).

Emotional dysregulation refers to difficulties in identifying, understanding, processing, and effectively managing emotions, often leading to heightened emotional reactivity, impulsivity, and maladaptive behaviors (Ayık et al., 2023). Empirical evidence shows that deficits in executive functioning and emotional dysregulation are strongly associated with illness severity, relapse frequency, and functional outcomes, while also influencing treatment responsiveness (Hsu et al., 2025). Thus, interventions targeting these dimensions hold significant promise in improving clinical outcomes for patients with bipolar disorder.

One emerging therapeutic approach that has gained increasing attention is dialectical behavior therapy (DBT), which demonstrates substantial potential in enhancing executive functioning and facilitating emotional regulation among individuals with bipolar disorder (Goldstein et al., 2024). Originally developed by Marsha Linehan for the treatment of borderline personality disorder, DBT integrates principles of cognitive-behavioral therapy with dialectical philosophy and mindfulness, aiming to strike a balance between acceptance and change (Jones et al., 2023). What distinguishes DBT from many other psychotherapeutic modalities is its emphasis on four core skill sets—mindfulness, distress tolerance, emotion regulation, and interpersonal effectiveness—each of which can strengthen cognitive and emotional capacities in patients with bipolar disorder (Bailey et al., 2024). Empirical studies have demonstrated that DBT-based interventions effectively reduce impulsivity, enhance emotional self-awareness, improve emotion regulation skills, and strengthen executive functions across a wide range of psychiatric conditions, including bipolar disorder (Vijayapriya & Tamarana, 2023). By providing a safe and supportive therapeutic environment, DBT

helps patients move away from maladaptive emotion regulation strategies and gradually adopt effective stress management and problem-solving skills in real-life contexts (Mossini, 2024). Mindfulness practices foster attentional control and reduce rumination, while emotion regulation and distress tolerance skills mitigate maladaptive behaviors and the escalation of mood episodes (Durpoix et al., 2023). Clinically, DBT's dual focus on acceptance of mood fluctuations and gradual behavioral change makes it highly compatible with the needs of bipolar patients, contributing to reduced relapse rates, improved quality of life, and enhanced social and cognitive functioning (Manion, 2022).

Despite advances in understanding the biological and psychological underpinnings of bipolar disorder and the availability of diverse treatment modalities, a significant gap remains regarding the effectiveness of DBT in addressing the cognitive and emotional underpinnings of the disorder. Most prior research has focused primarily on reducing mood symptoms or relapse rates, with limited attention to deeper constructs such as executive functions and emotional dysregulation, which are critical for long-term quality of life and prognosis. Moreover, many earlier studies have been constrained by small clinical samples, lack of controlled designs, or limited demographic representation, restricting the generalizability of findings. The mediating and interactive role of DBT skill acquisition on cognitive and emotional capacities—particularly in comparison with other therapeutic protocols—has not been thoroughly investigated. Against this backdrop, the central research question arises: Can dialectical behavior therapy significantly enhance executive functions and improve emotion regulation in patients with bipolar disorder, thereby producing clinical benefits beyond the reduction of mood symptoms?

Methods and Materials

This study employed a quasi-experimental design with a pre-test, post-test, control group, and a four-month follow-up. The statistical population consisted of all patients with bipolar disorder in Isfahan during the last quarter of 2023. The sample included 30 patients who were willing to participate and were selected using purposive sampling. Participants were then randomly assigned to either the experimental group (n = 15), which received dialectical behavior therapy (DBT), or the control group (n = 15), which received no intervention during the study.

The experimental group participated in eight weekly DBT sessions, each lasting 90 minutes, while the control group did not receive any intervention during this period. Eligibility criteria required participants to have a confirmed DSM-5 diagnosis of bipolar disorder and to be experiencing active symptoms such as depressive, manic, or mixed episodes at the time of enrollment. Additionally, at least five years had to have passed since the onset of illness, with a history of previous treatment attempts (including pharmacotherapy or psychotherapy) that had not provided sufficient symptom relief. Participants were required to be between 25 and 45 years of age, capable of providing informed consent, and willing to adhere to the therapeutic protocols. Furthermore, entry into the DBT group required relative mood stability, with participants not currently experiencing severe manic or depressive episodes.

Exclusion criteria included failure to complete the full course of treatment, absence from more than three therapy sessions, the occurrence of adverse events or side effects making continuation impossible, and the emergence of active suicidal ideation with intent, which necessitated immediate clinical intervention and withdrawal from the study.

All participants were assured of confidentiality, anonymity, and the use of data solely for research purposes. Informed consent forms were obtained in an introductory session, and unique identification codes were assigned to preserve privacy. Both groups were assessed on executive functions and emotional dysregulation before the intervention, immediately after the eight DBT sessions, and again at the four-month follow-up. After the completion of the study, the control group was also offered DBT. Data were analyzed using SPSS version 26 with repeated-measures ANOVA (mixed design).

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Instruments

1. Executive Function Questionnaire: Developed by Nejati et al. (2013), this questionnaire consists of 30 items across seven subscales: memory, inhibition, selective attention, decision-making, planning, sustained attention, social cognition, and cognitive flexibility. Items are rated on a 5-point Likert scale (1 = very low to 5 = very high). The social cognition subscale is reverse-scored. In Nejati's original study, Cronbach's alpha was reported at 0.83, with test–retest reliability of 0.86. In the present study, Cronbach's alpha was calculated at 0.87, confirming strong internal consistency.

2. Difficulties in Emotion Regulation Scale (DERS): Developed by Gratz & Roemer (2004), this scale contains 36 items assessing deficits in emotional regulation across six domains: non-acceptance of negative emotions, difficulty engaging in goal-directed behavior under distress, impulse control difficulties under distress, limited access to effective regulation strategies, lack of emotional awareness, and lack of emotional clarity. Items are rated on a 5-point Likert scale (1 = almost never, 5 = almost always). Higher scores indicate greater difficulties in emotion regulation. Gratz and Roemer reported an internal consistency coefficient of 0.93 and external validity of 0.88. In Iranian adaptations, Alidoosti & Naderi (2024) reported an alpha reliability of 0.92, while in the present study, Cronbach's alpha was 0.91.

Dialectical Behavior Therapy (DBT) Protocol

The DBT training protocol was based on Marsha Linehan's model, adapted by Alijanzadeh et al. (2014). It was implemented in a group format over four weeks, with two sessions per week, totaling eight 90-minute sessions. The content of the sessions is outlined below.

Table 1

Dialectical Behavior Therapy Sessions

	Content
1	Introduction to goals and rules; participants learn about three states of mind: rational mind, emotional mind, and wise mind.
2	Practice of states of mind from Session 1; training in "what" mindfulness skills (observing, describing, participating) and "how" skills (non-judgmental stance, self-awareness, acting effectively).
3	Practical training in "what" and "how" mindfulness skills is considered the core of DBT.
4	Review of previous exercises; introduction to emotion regulation skills, including defining emotions and their components.
5	Further emotion regulation skills, including identifying and labeling emotions, to increase control over them.
6	Review of previous skills; training in acceptance of negative emotions and strategies for reducing vulnerability to negative affect.
7	Introduction to distress tolerance strategies, including crisis survival techniques such as distraction and self-soothing through the five senses.

8 Review of all skills; training in "improving the moment" and pros-and-cons techniques for coping with frustration and anger; emphasis on generalizing DBT skills outside therapy sessions.

Findings and Results

The demographic analysis revealed that out of 30 participants, 9 (30%) were female and 21 (70%) were male. The mean age in the DBT group was 33.1 years (SD = 5.06), while in the control group it was 32.0 years (SD = 2.66), with an overall age range of 26–42 years. In terms of educational level, most participants held a high school diploma (n = 25, 83.3%), while 4 (13.3%) had a bachelor's degree and only 1 (3.3%) held a master's degree; no participants had doctoral-level education. Statistical analysis using Fisher's exact test and ANOVA showed no significant differences between groups with respect to gender, age, or educational level ($p > 0.05$). Thus, the two groups were considered homogeneous in terms of demographic variables, strengthening the validity of subsequent comparisons.

Table 2

Comparison of means and standard deviations of executive functions and emotional dysregulation in the two groups across three time points

Variable	Group	Pre-test M (SD)	Post-test M (SD)	Follow-up M (SD)
Executive functions	DBT	66.5 (5.80)	99.6 (13.8)	98.7 (13.2)
	Control	68.4 (6.97)	69.3 (5.25)	68.4 (5.24)
Emotional dysregulation	DBT	112.3 (15.09)	99.8 (12.1)	101.2 (10.8)
	Control	113.1 (13.2)	111.7 (13.02)	113.6 (12.9)

As shown in Table 2, the post-test and follow-up scores in the DBT group demonstrated improvements in both executive functions and emotional dysregulation compared to the pre-test scores. In contrast, the control group's mean scores remained relatively unchanged, suggesting the effectiveness of DBT. However, to determine the statistical significance of these differences, appropriate inferential analyses were conducted. Tests of normality (Shapiro–Wilk) confirmed that the data were normally distributed across groups ($p > 0.05$). Levene's test for homogeneity of variances indicated no violation of assumptions for executive functions ($F = 4.21$, $p = 0.051$) and emotional dysregulation ($F = 2.97$, $p = 0.096$). However, Mauchly's test of sphericity indicated a violation ($\chi^2 = 284.9$, $p = 0.001$). Therefore, Greenhouse–Geisser corrections were applied.

Table 3

Results of multivariate analysis of variance (MANOVA) for dependent variables

Test	SS	df	MS	F	Sig.	Partial η^2
Assumed sphericity	1049.2	5	209.8	26.0	0.001	0.481
Greenhouse–Geisser	1049.2	1.79	584.2	26.0	0.001	0.481
Huynh–Feldt	1049.2	1.98	529.9	26.0	0.001	0.481
Upper-bound	1049.2	1	1049.2	26.0	0.001	0.481

As indicated in Table 3, there was a statistically significant difference between the two groups in at least one of the dependent variables ($p < 0.001$). The partial eta squared ($\eta^2 = 0.481$) indicated that approximately 48% of the variance in the dependent measures could be attributed to group differences, which is both statistically and practically meaningful.

Table 4

Repeated measures ANOVA (3×2 design) for executive functions and emotional dysregulation

Variable	Effect	F	Sig.	Effect size (η^2)	Power
Executive functions	The main effect of the group	247.3	0.001	0.662	1.0
	Main effect of time	198.4	0.001	0.686	1.0
Emotional dysregulation	The main effect of the group	232.06	0.001	0.890	1.0
	Main effect of time	12.2	0.001	0.310	1.0

Table 4 demonstrates that both executive functions and emotional dysregulation showed significant main effects of group ($p < 0.001$) as well as time ($p < 0.001$). This indicates that the DBT group experienced

significant improvements across pre-test, post-test, and follow-up compared with the control group.

Table 5

Bonferroni post hoc comparisons across the three-time points

Variable	Time I	Time J	Mean difference (I–J)	Sig.
Executive functions	Pre-test	Post-test	8.56*	0.001
	Pre-test	Follow-up	8.94*	0.001
Emotional dysregulation	Pre-test	Post-test	−7.25*	0.021
	Pre-test	Follow-up	−7.96*	0.004

*Significant at $p < 0.05$.

As Table 5 shows, executive function scores improved significantly from pre-test to both post-test and follow-up ($p < 0.001$). Similarly, emotional dysregulation scores significantly decreased from pre-test to post-test ($p = 0.021$) and from pre-test to follow-up ($p = 0.004$). These findings confirm the effectiveness of DBT in enhancing executive functioning and reducing emotional dysregulation in patients with bipolar disorder, with improvements maintained over the four-month follow-up period.

Discussion and Conclusion

The present study aimed to examine the effectiveness of dialectical behavior therapy (DBT) on executive functions and emotional dysregulation in patients with bipolar disorder. The findings demonstrated that DBT significantly improved executive functioning in these patients. This outcome is consistent with the results of (Bailey et al., 2024; Goldstein et al., 2024; Vijayapriya & Tamarana, 2023).

In interpreting these findings, it should be noted that bipolar disorder is one of the major mood disorders, characterized by substantial fluctuations in mood, activity levels, and functional capacity. As Oliva et al. (2025) pointed out, it encompasses a spectrum of episodes ranging from mania to depression. According to Poletti et al. (2024), this disorder not only has a high prevalence in the general population but also exerts profound effects on various domains of life, including occupational, academic, and social functioning. Moreover, as Kessing (2024) and O'Connell et al. (2025) emphasized, in addition to mood instability, symptoms such as irritability, impaired judgment, impulsivity, insomnia, and even psychotic features are often observed in patients' lived experiences. These challenges, embedded in a complex interplay of biological, psychological, and social factors, are frequently compounded by comorbid conditions such as anxiety disorders, substance use, and personality disorders, which further complicate treatment (Zhong et al., 2024). This underscores the importance of comprehensive therapeutic approaches, early detection, and psychosocial support systems (Guo et al., 2024).

Executive functions, as a set of higher-order cognitive processes, play a fundamental role in organizing and directing goal-oriented behavior and provide the foundation for successful adaptation in complex life situations (Bao et al., 2024). These functions include planning, organization, working memory, selective attention, response inhibition, cognitive flexibility, and problem solving, which are largely mediated by the prefrontal cortex (Cañada et al., 2024). Working memory, a critical subcomponent of executive function, allows for the active retention and manipulation of information, enabling effective decision-making (Singh et al., 2025). Similarly, planning and organization enable individuals to break complex tasks into smaller steps and prioritize them; response inhibition supports impulse control and the prevention of maladaptive behaviors; and cognitive flexibility allows for adaptation to environmental changes and new information (Ribeiro et al., 2024). Deficits in these domains are particularly detrimental in mood disorders such as bipolar disorder, where executive dysfunction is often more pronounced (Bao et al., 2024).

Research shows that patients with bipolar disorder experience impairments in executive functions not only during acute manic or depressive episodes but also in inter-episode or euthymic phases when overt mood symptoms appear to subside (Cañada et al., 2024; Singh et al., 2025). These deficits include poor working memory, reduced planning ability, inflexibility in responding to environmental demands, and diminished impulse regulation, which collectively hinder daily problem solving, occupational and academic success,

interpersonal relationships, and contribute to risky behaviors (Ribeiro et al., 2024; Zhong et al., 2024). Such dysfunctions are further associated with reduced self-control, heightened interpersonal conflict, and difficulties in time management and prioritization, often accompanied by negative affect, hopelessness, and decreased motivation (De Prisco et al., 2023; Hsu et al., 2025). Taken together, executive dysfunction not only affects social and functional competence but also plays a pivotal role in relapse vulnerability, making it a key target for modern psychological interventions, including DBT (Goldstein et al., 2024; Vijayapriya & Tamarana, 2023).

The findings of this study also confirmed that DBT effectively reduced emotional dysregulation in patients with bipolar disorder, aligning with the results of De Prisco et al. (2023) and Hsu et al. (2025). Emotional dysregulation—defined as a relative inability to identify, understand, process, and effectively manage emotions—can severely disrupt decision-making, daily functioning, and social relationships (Paulette, 2024). Research has consistently shown that individuals with bipolar disorder, especially during acute episodes, often display heightened emotional reactivity, impulsivity, and disproportionate responses to stressors. However, even in apparently stable phases, deficits in emotion regulation persist, serving as a key factor in chronicity and relapse (Ayık et al., 2023; Hsu et al., 2025).

DBT, originally developed by Linehan for borderline personality disorder, integrates cognitive-behavioral techniques with mindfulness and dialectical philosophy, emphasizing the balance between acceptance and change. Its structured framework, which teaches four core skill modules—mindfulness, emotion regulation, distress tolerance, and interpersonal effectiveness—offers a comprehensive means of addressing emotion regulation difficulties in bipolar disorder (Goldstein et al., 2024; Jones et al., 2023). Mindfulness training, for example, has been shown to reduce hypersensitivity to negative stimuli and intrusive thoughts while improving attentional control (Bailey et al., 2024; Durpoix et al., 2023). Distress tolerance strategies, such as deep breathing and non-judgmental acceptance of emotions, enhance patients' resilience against negative affect without resorting to maladaptive coping. Emotion regulation skills, specifically aimed at improving recognition, labeling, and modification of emotional responses, help interrupt cycles of impulsivity and interpersonal conflict (Goldstein et al., 2024; Vijayapriya & Tamarana, 2023). Clinical studies report significant reductions in emotional reactivity, high-risk behaviors (e.g., substance use, unsafe sexual behavior), and improvements in flexibility and coping among patients undergoing DBT (Bailey et al., 2024; Manion, 2022).

A distinctive advantage of DBT lies in its supportive, non-judgmental stance. Rather than fostering shame or guilt, the therapy empowers patients to accept their current experiences while gradually working toward meaningful change and personal growth (Goldstein et al., 2024; Linehan & Wilks, 2015). The group-based delivery format further fosters empathy, peer support, and the sharing of lived experiences, reducing isolation and building social capital (Bailey et al., 2024; Vijayapriya & Tamarana, 2023). Assignments and in-session exercises help patients directly apply newly acquired skills to real-life stressors, thereby enhancing the ecological validity and long-term effectiveness of DBT in bipolar disorder.

Overall, the evidence suggests that DBT—by providing practical skill training within a supportive therapeutic context—substantially enhances emotional regulation, reduces maladaptive reactivity, and strengthens rational decision-making in individuals with bipolar disorder (Durpoix et al., 2023; Goldstein et al., 2024; Manion, 2022). These benefits extend beyond symptom reduction, contributing to fewer relapses, improved quality of life, stronger interpersonal relationships, and greater hope for the future (Bailey et al., 2024; Poletti et al., 2024).

This study had several limitations: the relatively small sample size and the use of purposive sampling limited the generalizability of the findings. The restriction to patients in Isfahan aged 25–45 years further narrows external validity. The follow-up period of four months, while informative, may not adequately capture the long-term sustainability of treatment effects. Furthermore, the exclusive reliance on self-report measures raises concerns regarding response bias. Finally, the study did not assess the potential interaction of DBT with concurrent pharmacotherapy or other psychotherapeutic interventions.

Future research should therefore aim to include larger, randomized samples across diverse geographic and demographic populations, employ longer follow-up periods, and incorporate objective measures such as

neurocognitive testing and clinician-rated assessments. Combining DBT with pharmacological and other psychosocial interventions may also provide a more comprehensive understanding of its clinical utility.

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