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The Effectiveness of Acceptance and Commitment Therapy on Non-Suicidal Self-Injury and Executive Functions in Patients with Borderline Personality Disorder

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A B S T R A C T

Borderline personality disorder (BPD) is a complex clinical condition characterized by affective instability, impulsivity, interpersonal dysregulation, identity disturbance, and recurrent self-harming behaviors. Non-suicidal self-injury (NSSI) is particularly important in BPD because it is often used as a short-term strategy for regulating painful emotions, yet it is associated with considerable clinical risk and functional impairment. Executive functions, including inhibition, planning, self-organization, emotional self-regulation, and self-motivation, are also frequently impaired in this population. Acceptance and Commitment Therapy (ACT) may be clinically useful because it targets experiential avoidance and promotes psychological flexibility, values-based action, and acceptance of difficult internal experiences. This quasi-experimental study used a pretest-posttest-follow-up design with a control group. The statistical population included patients diagnosed with BPD who attended psychological and psychiatric treatment centers in Shahrood, Iran, in 2022. Forty participants were selected by convenience sampling and were then randomly assigned to an ACT group (n = 20) or a waiting-list control group (n = 20). The ACT group received eight intervention sessions, while the control group received no psychological intervention during the study period. Outcomes were assessed using the Barkley Deficits in Executive Functioning Scale and the Inventory of Statements About Self-Injury. Assessments were conducted at pretest, posttest, and two-month follow-up. Repeated-measures analysis was used to examine group, time, and group-by-time effects. ACT significantly reduced both intrapersonal and interpersonal NSSI functions. Significant group-by-time effects were found for intrapersonal NSSI ($F = 11.55$, $p < .001$, partial $\eta^2 = .23$) and interpersonal NSSI ($F = 15.02$, $p < .001$, partial $\eta^2 = .28$). ACT also significantly improved executive-function domains, including time self-management, self-organization/problem-solving, self-restraint/inhibition, self-motivation, and emotional self-regulation. Pairwise comparisons showed significant improvements from pretest to posttest and from pretest to follow-up, whereas posttest-to-follow-up differences were not significant, suggesting maintenance of treatment gains. The findings suggest that ACT may be an effective psychological intervention for reducing NSSI behaviors and improving executive-function difficulties in patients with BPD. The results support the use of ACT as an adjunctive clinical approach for targeting emotional dysregulation, maladaptive self-injury functions, and executive dysfunction in this population. Further randomized clinical trials with larger samples and longer follow-up periods are recommended.

Keywords: *borderline personality disorder; acceptance and commitment therapy; non-suicidal self-injury; executive functions; psychological flexibility*

1. Introduction

Borderline personality disorder (BPD) is a severe and heterogeneous psychiatric condition associated with instability in affect regulation, interpersonal relationships, self-image, impulse control, and behavioral regulation (1-4). Individuals with BPD often experience intense emotional states, fear of abandonment, chronic feelings of emptiness, recurrent crises in relationships, and impulsive behaviors that may include self-harm and suicidal or non-suicidal self-injury. Contemporary reviews emphasize that BPD is not merely a disorder of personality structure but a multidimensional condition involving affective, interpersonal, cognitive, and behavioral dysregulation (4). Because of this complexity, effective treatment requires interventions that can address both emotional distress and the maladaptive behavioral strategies used to manage it. Non-suicidal self-injury (NSSI) refers to the deliberate and direct destruction of one's own body tissue without conscious suicidal intent (5, 6). In patients with BPD, NSSI is frequently maintained by intrapersonal functions, such as reducing emotional tension, escaping intolerable affect, or interrupting dissociative states, as well as interpersonal functions, such as communicating distress, seeking care, or influencing interpersonal situations (5, 7). Although NSSI may temporarily reduce emotional arousal, it tends to reinforce avoidance-based coping and may contribute to a cycle of shame, distress, and repeated self-harm. This makes NSSI a clinically meaningful outcome in studies involving patients with BPD. Executive functions are another important domain in BPD. They include higher-order cognitive processes that allow individuals to organize behavior, inhibit impulsive responses, regulate emotions, plan actions, solve problems, and remain goal-directed under conditions of stress or emotional activation (8, 9). Research on BPD has shown that many patients experience difficulties in inhibition, decision-making, working memory, planning, and cognitive flexibility (10, 11). Such deficits may intensify emotion-driven behavior and reduce the ability to choose adaptive coping strategies when distress is high. Therefore, interventions that improve executive regulation may indirectly reduce self-harming behaviors and support better daily functioning.

Acceptance and Commitment Therapy (ACT) is a contextual behavioral therapy that aims to increase psychological flexibility: the capacity to remain in contact with the present moment and act in accordance with personal values, even in the presence of difficult thoughts, emotions, and bodily sensations (12, 13). ACT uses six interrelated processes: acceptance, cognitive defusion, present-moment awareness, self-as-context, values clarification, and committed action. Rather than attempting to eliminate painful internal experiences, ACT teaches patients to change their relationship with these experiences. In BPD, this approach is theoretically relevant because self-injury, impulsivity, and interpersonal crises are often linked to experiential avoidance and rigid attempts to escape distress [15,16]. Existing research supports the potential usefulness of ACT for a range of psychological and behavioral problems, including suicidality, deliberate self-harm, emotional distress, and cognitive functioning (14-16). However, evidence on ACT specifically among individuals with BPD remains comparatively limited, and fewer studies have simultaneously examined NSSI functions and executive-function domains. Given the central role of emotional avoidance, poor inhibitory control, and difficulties in values-based action in BPD, ACT may provide a coherent intervention model for reducing maladaptive self-injury functions while strengthening self-regulatory capacities. The present study was conducted to examine the effectiveness of ACT on NSSI behaviors and executive functions in patients with BPD. It was hypothesized that ACT would reduce intrapersonal and interpersonal functions of NSSI and improve executive-function domains, including time self-management, self-organization/problem-solving, self-restraint/inhibition, self-motivation, and emotional self-regulation. The study also examined whether post-treatment improvements were maintained at two-month follow-up.

2. Methods and Materials

2.1. Study Design

This study used a quasi-experimental pretest-posttest-follow-up design with a waiting-list control group. Participants were initially selected through convenience sampling from clinical treatment centers and were then randomly allocated to either the ACT group or the control group. The ACT group received eight intervention sessions, whereas the control group remained on a waiting list and did

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not receive psychological intervention during the study period. Outcome assessments were conducted at three time points: before the intervention, immediately after the intervention, and two months after the intervention. Because the sampling procedure was non-probability-based, the study is best described as a quasi-experimental trial with random allocation after recruitment rather than a fully randomized clinical trial.

2.2. *Participants and Setting*

The statistical population included all patients with a clinical diagnosis of BPD who attended psychological and psychiatric treatment centers in Shahrood, Iran, during the winter of 2022. Approximately 120 eligible patients were estimated to be available in the participating centers. Based on common recommendations for experimental psychological studies and allowing for possible attrition, 40 participants were recruited and assigned to two equal groups: ACT (n = 20) and control (n = 20). The mean age was 33.95 years in the ACT group and 34.70 years in the control group. In both groups, women represented the larger proportion of participants, and most participants had a bachelor's degree.

2.3. *Eligibility Criteria*

Inclusion criteria were: diagnosis of BPD based on clinical interview by the clinical supervisor and psychiatrist, according to the diagnostic criteria routinely applied in the participating treatment centers; the study did not use an independent structured diagnostic interview, such as the SCID-5-PD, and this point is acknowledged as a limitation; at least high-school diploma education to ensure adequate understanding of the questionnaires; ability to complete self-report measures; no concurrent psychological treatment during the intervention period; and meeting the predetermined cutoff criteria on the executive-function and NSSI measures. Exclusion criteria included absence from more than two treatment sessions, concurrent substance or alcohol use that could interfere with treatment, and any condition judged by the clinical team to disrupt participation in the intervention.

2.4. *Measures*

Executive functions were assessed using the Barkley Deficits in Executive Functioning Scale (BDEFS), a self-report instrument designed to evaluate everyday executive-function difficulties in adults (17). The scale assesses domains such as time self-management, self-organization/problem-solving, self-restraint/inhibition, self-motivation, and emotional self-regulation. Higher scores reflect greater executive-function difficulties. The BDEFS has been widely used as an ecologically oriented measure of executive functioning in daily life. NSSI functions were assessed using the Inventory of Statements About Self-Injury (ISAS), developed by Klonsky and Glenn (7). The ISAS evaluates multiple functions of NSSI and organizes them into intrapersonal and interpersonal dimensions. Intrapersonal functions typically refer to emotion regulation, anti-dissociation, self-punishment, or distress reduction, whereas interpersonal functions refer to social communication, influence, autonomy, or interpersonal boundaries. Items are rated on a Likert-type scale, with higher scores reflecting stronger endorsement of self-injury functions.

2.5. *Intervention*

The ACT intervention consisted of eight structured sessions developed from the core ACT model and its six therapeutic processes: acceptance, cognitive defusion, present-moment awareness, self-as-context, values clarification, and committed action. The protocol focused on psychological flexibility, acceptance of difficult internal experiences, mindfulness-based awareness, defusion from distressing thoughts, values clarification, and values-guided behavioral change. Some exercises, such as crisis coping, emotion-awareness practice, and interpersonal practice, may overlap with skills commonly used in other third-wave interventions; however, in the present protocol they were delivered within an ACT-based framework and were explicitly linked to acceptance, defusion, values, and committed action. Table 1 summarizes the intervention structure.

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Table 1

Eight-session ACT intervention protocol used in the experimental group.

Session	Core content
1	Introduction, treatment rationale, psychoeducation about ACT, orientation to psychological flexibility, and identification of pleasant and meaningful daily activities.
2	ACT model, psychological flexibility, acceptance, awareness, self-as-context, cognitive defusion, personal narratives, and committed action.
3	Emotional awareness, mindful observation and description of internal experiences, and staying present with emotions without impulsive reaction.
4	Present-moment awareness, contact with internal experiences, goal setting, social lifestyle planning, and practical commitment.
5	Nonjudgmental recognition of personal strengths and vulnerabilities, acceptance of distressing internal experiences, values-consistent crisis coping, and self-soothing with mindful awareness.
6	Review of previous sessions, feedback, ACT-consistent practice in noticing emotions, reducing experiential avoidance, and choosing valued actions during emotional discomfort.
7	Values-consistent interpersonal action, assertive expression of needs, trust, self-respect, and group review of practice assignments.
8	Committed acceptance, psychological flexibility, consolidation of learned skills, relapse-prevention planning, and feedback on the intervention process.

2.6. Procedure

After coordination with treatment centers, eligible patients were informed about the aims and procedures of the study. Participants who agreed to take part completed the pretest questionnaires before any intervention session was delivered. They were then assigned to two equal groups. The ACT group received eight treatment sessions, while the control group received no intervention during the study period. Immediately after completion of the eighth session, both groups completed the posttest assessment. A follow-up assessment was conducted two months later to evaluate maintenance of changes. Ethical principles, confidentiality, voluntary participation, and the right to withdraw were explained to all participants before participation.

2.7. Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics were used to summarize demographic characteristics and outcome variables. The Shapiro-Wilk test was used to examine normality, and Levene's test was used to examine homogeneity of variances. Mauchly's test of sphericity was examined for repeated-measures analyses. When the sphericity assumption was violated, Greenhouse-Geisser correction was applied. Repeated-measures analysis was used to evaluate changes across pretest, posttest, and follow-up and to examine group-by-time interaction effects. Partial eta squared was reported as an effect-size index. A significance level of $p < .05$ was used.

3. Findings and Results

3.1. Participant Characteristics and Assumption Testing

Forty patients with BPD participated in the study, with 20 participants in the ACT group and 20 in the waiting-list control group. The mean age was 33.95 years in the ACT group and 34.70 years in the control group. Women constituted the larger proportion of the sample in both groups, and most participants had bachelor-level education. Preliminary analyses indicated that the distributions of executive-function and NSSI variables were normal at pretest and posttest in both groups, as Shapiro-Wilk p-values were greater than .05. Levene's test also supported homogeneity of variances for the primary study variables. For repeated-measures analyses, Mauchly's test indicated violation of sphericity for some variables; therefore, Greenhouse-Geisser corrected values were used where required.

3.2. Effects of ACT on Non-Suicidal Self-Injury

The first main analysis examined whether ACT reduced intrapersonal and interpersonal functions of NSSI. As shown in Table 2, the main group effect for intrapersonal NSSI functions was borderline and should be interpreted cautiously ($F = 3.85$, $p = .050$, partial $\eta^2 = .09$), whereas the main group effect for interpersonal NSSI functions was significant ($F = 11.16$, $p = .002$, partial $\eta^2 = .22$). More importantly, the group-by-time interaction was significant for both intrapersonal NSSI ($F = 11.55$, $p < .001$, partial η^2

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= .23) and interpersonal NSSI (F = 15.02, p < .001, partial η^2 = .28). These findings indicate that changes over time differed between the ACT and control groups, with greater improvement in the ACT group.

Table 2

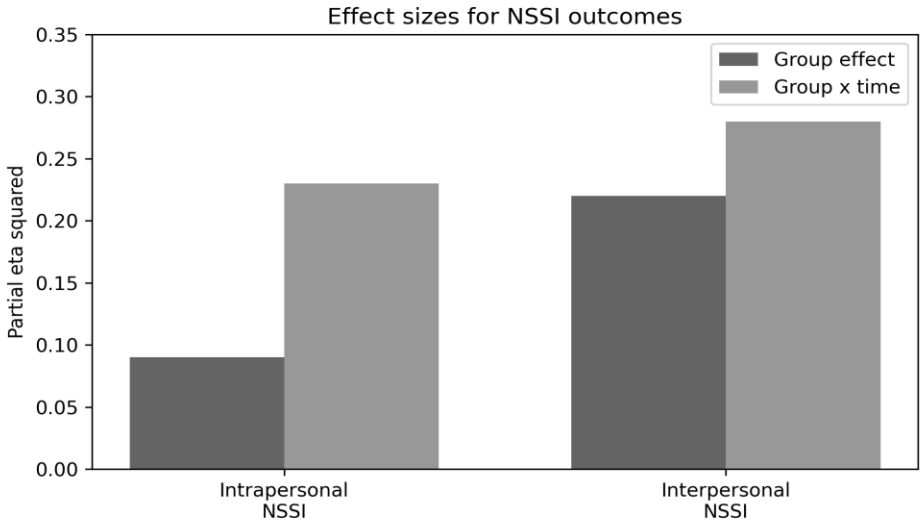
Effects of ACT on intrapersonal and interpersonal functions of NSSI.

Outcome	Effect	SS	df	MS	F	p / partial η^2
Intrapersonal NSSI	Group	496.13	1	496.13	3.85	p = .050; η^2p = .09
Intrapersonal NSSI	Group × time	134.46	2	67.23	11.55	p < .001; η^2p = .23
Interpersonal NSSI	Group	880.20	1	880.20	11.16	p = .002; η^2p = .22
Interpersonal NSSI	Group × time	142.01	1.67	84.62	15.02	p < .001; η^2p = .28

Pairwise comparisons showed significant differences between pretest and posttest and between pretest and follow-up for both intrapersonal and interpersonal NSSI functions (p < .05). In contrast, posttest-to-follow-up differences were not significant, suggesting that treatment effects were maintained over the two-month follow-up period. For intrapersonal NSSI, the mean differences were 2.55 for pretest-posttest (p = .001), 2.00 for pretest-follow-up (p = .003), and -0.55 for posttest-follow-up (p = .700). For interpersonal NSSI, the corresponding mean differences were 2.20 (p = .001), 2.82 (p = .001), and 0.62 (p = .650). As shown in Figure 1, the group-by-time effect sizes were larger than the main group effects for both NSSI domains, supporting the interpretation that change across assessment points was the key treatment-related pattern.

Figure 1

Partial eta squared values for group and group-by-time effects on intrapersonal and interpersonal NSSI functions.



3.3. *Effects of ACT on Executive Functions*

The second set of analyses examined changes in executive-function domains. Because higher BDEFS scores indicate greater executive-function difficulties, treatment-related improvement was interpreted as reduction in deficit scores across assessment points. As shown in Table 3, significant group effects were found for all executive-function outcomes: time self-management (F = 23.85, p < .001, partial η^2 = .38), self-organization/problem-solving (F = 42.57, p < .001, partial η^2 = .52), self-restraint/inhibition (F = 33.61, p < .001, partial η^2 = .46), self-motivation (F = 46.03, p < .001, partial η^2 = .54), and emotional self-regulation (F = 51.51, p < .001, partial η^2 = .57). Significant group-by-time effects were also observed for time self-

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management (F = 61.10, p < .001, partial η² = .62), self-organization/problem-solving (F = 29.67, p < .001, partial η² = .44), self-restraint/inhibition (F = 41.11, p < .001, partial η² = .52), self-motivation (F = 43.70, p < .001, partial η² = .53), and emotional self-regulation (F = 77.72, p < .001, partial η² = .67).

Table 3

Effects of ACT on executive-function domains.

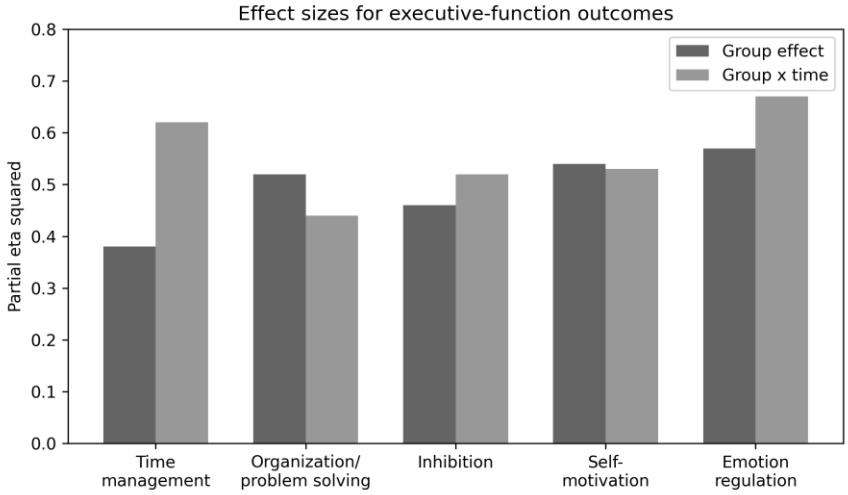
Outcome	Effect	SS	df	MS	F	p / partial η²
Time self-management	Group	621.075	1	621.075	23.85	p < .001; η²p = .38
Time self-management	Group × time	805.55	1.70	472.17	61.10	p < .001; η²p = .62
Self-organization/problem-solving	Group	1456.033	1	1456.033	42.57	p < .001; η²p = .52
Self-organization/problem-solving	Group × time	473.26	2	236.63	29.67	p < .001; η²p = .44
Self-restraint/inhibition	Group	598.533	1	598.533	33.61	p < .001; η²p = .46
Self-restraint/inhibition	Group × time	488.51	1.62	300.31	41.11	p < .001; η²p = .52
Self-motivation	Group	822.786	1	822.786	46.03	p < .001; η²p = .54
Self-motivation	Group × time	305.51	1.51	201.67	43.70	p < .001; η²p = .53
Emotional self-regulation	Group	691.200	1	691.200	51.51	p < .001; η²p = .57
Emotional self-regulation	Group × time	289.35	2	144.67	77.72	p < .001; η²p = .67

Higher BDEFS scores indicate greater executive-function difficulties; therefore, improvement should be interpreted as reduction in deficit scores over time.

Pairwise comparisons indicated significant improvements from pretest to posttest and from pretest to follow-up for all executive-function domains (p < .05). No significant posttest-to-follow-up differences were observed, suggesting that the observed improvements were maintained during the two-month follow-up period. Between-group comparisons also favored the ACT group for all executive-function outcomes. As shown in Figure 2, the largest group-by-time effect was observed for emotional self-regulation, followed by time self-management, self-motivation, self-restraint/inhibition, and self-organization/problem-solving. This pattern suggests that ACT may be particularly relevant for executive domains closely connected to emotional and motivational regulation.

Figure 2

Partial eta squared values for group and group-by-time effects across executive-function domains.



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4. Discussion

This study examined the effectiveness of ACT on NSSI functions and executive-function difficulties in patients with BPD. The findings showed that ACT significantly reduced intrapersonal and interpersonal NSSI functions and improved all measured executive-function domains. These improvements were maintained at two-month follow-up, as posttest-to-follow-up differences were not significant. Overall, the results suggest that ACT may be useful for reducing maladaptive self-injury functions and strengthening self-regulatory capacities among individuals with BPD.

The reduction in intrapersonal and interpersonal NSSI functions is clinically meaningful. In BPD, self-injury often functions as an immediate strategy for reducing intense emotional distress, escaping aversive internal states, or communicating psychological pain (5-7). ACT directly addresses this process by helping patients observe distressing thoughts and emotions without automatically acting on them. Through acceptance, defusion, mindfulness, and values-based commitment, patients may learn that painful internal experiences can be tolerated without resorting to self-harm. This mechanism is consistent with the ACT model, which views rigid experiential avoidance as a central process underlying many maladaptive behaviors (12, 13).

The significant decrease in interpersonal functions of NSSI also deserves attention. Patients with BPD frequently experience interpersonal sensitivity, fear of abandonment, and difficulty communicating needs under emotional stress (1, 4). When self-injury becomes a way of expressing distress or influencing the interpersonal environment, treatment must help the patient develop alternative, values-consistent forms of communication and relational behavior. ACT may support this change by clarifying values related to relationships, self-care, and personal dignity, and by encouraging committed actions that are not controlled by momentary emotional urges. In this sense, ACT may reduce NSSI not only by decreasing emotional avoidance but also by increasing behavior guided by long-term values.

The observed improvements in executive functions are also theoretically coherent. ACT is not a cognitive-remediation program in the traditional neuropsychological sense; however, it may improve everyday executive functioning by reducing the dominance of avoidance, impulsive responding, and emotion-driven behavioral patterns. The present findings showed improvements in time self-management, organization/problem-solving, inhibition, motivation, and emotional self-regulation. These domains are closely linked to the ability to pause before acting, identify valued goals, organize behavior toward those goals, and remain engaged despite emotional discomfort. Such changes may be especially relevant in BPD, where executive dysfunction and emotional dysregulation interact to maintain impulsive behavior (9-11).

The largest effect sizes were observed in emotional self-regulation and self-motivation. This pattern is understandable because ACT directly targets the processes through which individuals respond to difficult emotions and remain committed to valued actions. Patients with BPD may experience emotions as overwhelming and uncontrollable, and self-injury may become a rapid way to reduce this intensity. ACT does not require the immediate disappearance of painful emotions; instead, it teaches patients to make room for those emotions while choosing behaviors that serve personal values. This process may strengthen emotional self-regulation and motivation by shifting the behavioral focus from short-term escape to long-term valued living. This interpretation is further supported by evidence that psychological flexibility, values-based work, and mindfulness-related processes are central mechanisms through which ACT may influence behavioral regulation and adaptive functioning (18-20).

The maintenance of treatment effects at follow-up is an important finding. Pairwise comparisons indicated that improvements from pretest to posttest remained evident at two-month follow-up, while posttest-to-follow-up differences were not significant. This suggests that participants may have retained and continued using ACT-based skills after the intervention ended. Nevertheless, the follow-up period was relatively short. Future studies should examine whether these gains remain stable over longer periods, particularly because BPD symptoms and NSSI behaviors may fluctuate in response to interpersonal stressors and life events.

Although the findings are promising, several methodological considerations should be acknowledged.

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First, the study used convenience sampling and a relatively small sample, which limits generalizability. Second, the control group was a waiting-list group rather than an active comparison condition; therefore, nonspecific therapeutic factors, including attention, expectancy, group support, and therapist contact, cannot be fully ruled out. Third, outcomes were assessed using self-report questionnaires, which may be influenced by response bias, social desirability, or participants' awareness of treatment goals. Fourth, BPD diagnosis was based on clinical evaluation in the participating centers, and no independent structured diagnostic interview was reported. Fifth, formal treatment-fidelity assessment was not conducted; therefore, adherence to a pure ACT model cannot be fully verified. Despite these limitations, the study contributes to the clinical literature by examining two important treatment targets in BPD: NSSI functions and executive-function difficulties. The findings support the idea that ACT may be a useful adjunctive intervention for patients with BPD, particularly when treatment aims to reduce experiential avoidance, improve emotion regulation, and promote values-guided behavior. Future research should use larger samples, active control groups, independent fidelity assessment, longer follow-up periods, and multi-method outcome assessment, including clinician-rated and behavioral executive-function measures.

5. Conclusion

The present study suggests that ACT can reduce intrapersonal and interpersonal functions of NSSI and improve executive-function domains in patients with BPD. By strengthening psychological flexibility, acceptance, mindfulness, and values-based action, ACT may help patients respond to distress without relying on self-injury and may support more adaptive self-regulatory functioning. The maintenance of improvements at two-month follow-up further supports the potential clinical usefulness of this approach. However, future studies with stronger randomized designs, active control conditions, larger samples, and longer follow-up assessments are needed before firm clinical conclusions can be drawn.

6. Clinical Implications

The findings have practical implications for clinicians working with patients with BPD. ACT may be integrated into treatment programs to help patients identify the functions of self-injury, develop greater willingness to experience painful emotions, practice cognitive defusion, and choose actions consistent with personal values. The intervention may also be useful for improving daily executive functioning, especially in domains related to time management, inhibition, self-motivation, and emotion regulation. Clinicians should, however, consider risk level, comorbidities, and crisis-management needs when applying ACT with patients who engage in self-injury.

7. Limitations and Future Directions

This study had several limitations. The sample size was small and selected through convenience sampling. The waiting-list control condition did not control for therapist attention or expectancy effects. The follow-up period was limited to two months. The use of self-report measures may have introduced response bias. The study also did not report treatment fidelity assessment or structured diagnostic verification by independent raters. Future research should use larger multi-center samples, active comparison groups, longer follow-up periods, blinded assessment, and behavioral or clinician-rated indicators of executive functioning and self-injury risk.

Authors' Contributions

All authors contributed to the conception and design of the study, data collection, interpretation of findings, manuscript drafting, and critical revision.

Declaration

The authors acknowledge that language-editing support and manuscript-structuring assistance were used during preparation of the English version of this manuscript. The authors reviewed, revised, and approved all content and remain fully responsible for the accuracy, integrity, and scientific validity of the final manuscript.

Transparency Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Participation was voluntary, and written informed consent was obtained from all participants before data collection. Participants were informed about the objectives of the study, confidentiality of their information, and their right to withdraw at any stage without negative consequences.

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