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Comparative Effectiveness of Compassion-Focused Therapy and Mindfulness-Based Cognitive Therapy on Psychological Flexibility and Lifestyle Behaviors in Individuals with Generalized Anxiety Disorder

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ABSTRACT

The present study aimed to compare the effectiveness of Compassion-Focused Therapy (CFT) and Mindfulness-Based Cognitive Therapy (MBCT) on psychological flexibility and lifestyle behaviors in individuals with generalized anxiety disorder (GAD). This study employed a quasi-experimental design with pretest, posttest, and three-month follow-up assessments and a control group. The statistical population consisted of all patients with generalized anxiety disorder who attended treatment centers in Tabriz, Iran, during 2022–2023. From this population, 60 patients were selected through purposive sampling and randomly assigned to three equal groups: two experimental groups, each comprising 20 participants, and one control group comprising 20 participants. The first experimental group received Compassion-Focused Therapy, and the second experimental group received Mindfulness-Based Cognitive Therapy, with each intervention consisting of eight 90-minute sessions, whereas the control group received no intervention. The research instruments included the Generalized Anxiety Disorder-7 (GAD-7), the Acceptance and Action Questionnaire-II (AAQ-II), and a Lifestyle Questionnaire. Data were analyzed using repeated-measures analysis of variance (ANOVA) and the Bonferroni post hoc test. The results indicated that, compared with the control group, both Compassion-Focused Therapy and Mindfulness-Based Cognitive Therapy significantly increased psychological flexibility and improved lifestyle behaviors in individuals with generalized anxiety disorder ($p < .05$). Furthermore, comparison of the two experimental groups showed that although there was no statistically significant difference between the overall effectiveness of CFT and MBCT, Compassion-Focused Therapy demonstrated greater effectiveness in components related to self-compassion and emotion regulation, whereas MBCT showed greater effectiveness in components associated with present-moment awareness. These therapeutic effects were also maintained at the follow-up assessment. Both Compassion-Focused Therapy and Mindfulness-Based Cognitive Therapy are effective interventions for enhancing psychological well-being and improving lifestyle behaviors among patients with generalized anxiety disorder and may be used as complementary or alternative clinical interventions.

Keywords: generalized anxiety disorder, Compassion-Focused Therapy, Mindfulness-Based Cognitive Therapy, psychological flexibility, lifestyle behaviors.

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Introduction

Generalized anxiety disorder (GAD) is a chronic and frequently disabling anxiety disorder characterized by excessive, persistent, and difficult-to-control worry about multiple domains of everyday life, accompanied by symptoms such as restlessness, fatigue, irritability, muscle tension, sleep disturbance, and impaired concentration. Unlike transient anxiety that may arise in response to a specific threat or stressor, the worry observed in GAD is typically pervasive, disproportionate to actual circumstances, and sustained over long periods, often interfering substantially with occupational, interpersonal, social, and health-related functioning. Epidemiological evidence indicates that anxiety disorders constitute a major component of the global burden of mental disorders and are associated with considerable disability, impaired quality of life, increased healthcare utilization, and substantial socioeconomic costs (1, 2). GAD is especially important from a clinical perspective because it is frequently persistent, commonly co-occurs with depressive and other anxiety disorders, and may remain inadequately treated despite the availability of established psychological and pharmacological interventions (3). Consequently, contemporary research has increasingly emphasized not only the reduction of overt anxiety symptoms but also the identification and modification of psychological processes that contribute to the persistence of worry and functional impairment.

One of the central characteristics of GAD is the tendency to respond rigidly to distressing internal experiences. Individuals with chronic anxiety frequently attempt to suppress, avoid, control, or escape unwanted thoughts, emotions, bodily sensations, and uncertainty. Although such strategies may provide temporary relief, they can paradoxically increase the salience of distressing experiences and contribute to long-term psychological dysfunction. Within contemporary behavioral models, this pattern is closely related to the construct of psychological inflexibility. Psychological flexibility refers broadly to the capacity to remain in contact with present-moment experiences, including unpleasant internal events, while adjusting behavior in accordance with personally meaningful goals and situational demands (4). Psychological flexibility is therefore not equivalent to the absence of negative emotion; rather, it reflects the ability to experience distress without allowing it to dominate behavior or prevent adaptive action. Its opposite, psychological inflexibility, is characterized by experiential avoidance, cognitive entanglement, behavioral rigidity, and difficulty maintaining value-consistent actions in the presence of discomfort.

The importance of psychological flexibility extends well beyond a single diagnostic category. It has been conceptualized as a transdiagnostic dimension of mental health that contributes to resilience, adaptive self-regulation, and effective engagement with changing environmental demands (4). The psychological flexibility model has consequently been applied across a wide range of clinical problems and has provided an integrative framework for understanding how avoidance of internal experiences can maintain distress and disability (5). Psychological flexibility is commonly assessed through measures such as the Acceptance and Action Questionnaire-II, which evaluates experiential avoidance and psychological inflexibility and has demonstrated satisfactory psychometric properties across multiple samples (6). More recent evidence has also shown that psychological flexibility can operate as an important mechanism linking perceived stress to anxiety and depressive symptoms, suggesting that individuals with greater capacity to respond flexibly to distress may be less vulnerable to the psychological consequences of stressful circumstances (7). From this perspective, interventions that increase acceptance, present-moment awareness, compassionate responding, and behavioral flexibility may be especially relevant for individuals with GAD.

The clinical relevance of psychological flexibility is also evident in acceptance-based models of anxiety treatment. Acceptance and Commitment Therapy and related contextual behavioral approaches propose that efforts to eliminate or control distressing internal experiences can become part of the problem when such efforts narrow behavioral repertoires and interfere with meaningful activities. Reviews of acceptance-based interventions indicate that psychological flexibility is a central therapeutic process through which reductions in anxiety and improvements in functioning may occur (8). Evidence synthesized across meta-analyses further supports the effectiveness of acceptance- and commitment-based approaches across a broad range of psychological conditions, while highlighting psychological flexibility as a theoretically important mechanism of therapeutic change (9). Thus, psychological flexibility represents a clinically meaningful outcome in GAD because increasing flexibility may help patients disengage from rigid cycles of worry, avoidance, and threat monitoring while increasing their capacity to act adaptively in daily life.

Alongside psychological flexibility, lifestyle behaviors represent another important but comparatively underexamined dimension of functioning in GAD. Persistent anxiety can influence sleep quality, eating patterns, physical activity, stress management, social functioning, self-care, and the organization of daily routines. Recurrent worry may delay sleep onset, increase physiological arousal, reduce motivation for exercise, interfere with balanced nutrition, and encourage avoidant or sedentary patterns. Over time, such disruptions can create reciprocal relationships in which unhealthy lifestyle behaviors intensify psychological distress, while anxiety further undermines health-promoting behavior. This broader functional perspective is particularly important because successful treatment should ideally extend beyond symptom reduction and help individuals develop sustainable patterns of self-care, behavioral regulation, and health-related functioning. Interventions that enhance mindful awareness, emotion regulation, self-compassion, and value-guided behavior may therefore have the potential to influence both psychological symptoms and everyday lifestyle patterns.

Mindfulness-based interventions constitute one influential approach for addressing these processes. Mindfulness generally refers to purposeful, present-centered, and nonjudgmental awareness of ongoing experience. By learning to observe thoughts, emotions, and bodily sensations as temporary events rather than unquestioned realities that require immediate reaction, individuals may reduce cognitive reactivity and develop more flexible responses to distress. Meta-analytic evidence has demonstrated that mindfulness-based therapies can produce meaningful reductions in anxiety and depressive symptoms across clinical populations (10). A broader systematic review of meditation programs similarly found evidence that mindfulness-based practices can improve psychological stress-related outcomes, particularly anxiety, depression, and perceived stress, although the magnitude of effects varies across populations and intervention formats (11). These findings have supported the incorporation of mindfulness into contemporary treatments for anxiety disorders.

Mindfulness-Based Cognitive Therapy (MBCT) is a structured intervention that combines mindfulness practices with principles derived from cognitive therapy. Originally developed to reduce vulnerability to recurrent depression, MBCT trains individuals to recognize automatic patterns of thinking, decenter from distressing cognitions, and respond to negative internal experiences with greater awareness and acceptance (12). Rather than attempting to challenge every anxious thought directly, MBCT emphasizes altering the individual's relationship with thoughts by viewing them as mental events that do not necessarily represent

objective facts. This shift may be particularly relevant for GAD, in which repetitive worry, anticipatory threat processing, and attempts to control internal experiences are prominent. The broader effectiveness and cost-effectiveness of MBCT have been demonstrated in large clinical trials, especially in relation to relapse prevention and sustained psychological self-management (13).

Evidence specifically addressing anxiety further supports the potential utility of MBCT. An early clinical investigation of MBCT among individuals with GAD found reductions in anxiety and mood-related symptoms following participation in the program, suggesting that the approach could be adapted beyond depressive relapse prevention (14). Reviews of mindfulness-based interventions for anxiety and depression have subsequently emphasized their value in reducing maladaptive cognitive reactivity, increasing acceptance, and improving emotional regulation (15). More specifically, a systematic review and meta-analysis examining mindfulness-based training for GAD reported improvements in psychological outcomes and highlighted mechanisms such as changes in worry, mindfulness, emotion regulation, and related psychological processes (16). These findings suggest that MBCT may influence GAD through multiple pathways, including increased present-moment awareness, reduced automaticity, enhanced decentering, and greater psychological flexibility.

Another increasingly influential intervention is Compassion-Focused Therapy (CFT). CFT was developed to address difficulties associated with self-criticism, shame, threat sensitivity, and impaired self-soothing by cultivating compassionate motivation toward oneself and others. Gilbert's model conceptualizes compassion as involving sensitivity to suffering combined with a commitment to alleviate and prevent suffering and proposes that compassionate capacities can help regulate evolved affective systems related to threat, drive, and soothing (17). Within this framework, many individuals experiencing chronic anxiety may show overactivation of threat-focused processing and underdevelopment of soothing and affiliative emotional systems. Excessive worry can therefore be understood not only as a cognitive process but also as part of a broader pattern of self-protection in which perceived threats are repeatedly monitored and anticipated.

CFT aims to modify this pattern through practices such as soothing-rhythm breathing, compassionate imagery, compassionate attention, compassionate self-talk, and the development of a supportive internal stance. These techniques may reduce the intensity of self-critical responses, increase tolerance of distress, and promote more adaptive emotion regulation. Meta-analytic evidence indicates that compassion-based interventions can improve a range of psychological outcomes, including self-compassion, distress, anxiety, depression, and well-being, although the size and consistency of effects vary according to intervention design and population (18). More recent systematic review and meta-analytic findings involving clinical populations have further supported the effectiveness of CFT for reducing psychological distress and improving compassion-related outcomes, while also emphasizing the need for additional controlled comparisons across diagnostic groups (19). These findings provide a strong rationale for examining CFT among individuals with GAD.

The therapeutic mechanisms of compassion-based approaches are particularly relevant to GAD because chronic worry is often accompanied by harsh self-evaluation, intolerance of uncertainty, fear of emotional experiences, and difficulty providing oneself with reassurance during distress. Compassionate responding may reduce the perceived danger of internal experiences and weaken the tendency to respond to anxiety with self-criticism or avoidance. In an Iranian study of female students with GAD, compassion therapy was

associated with reductions in intolerance of uncertainty and worry, two constructs that are highly relevant to the maintenance of generalized anxiety (20). Similarly, compassion-based mindfulness training has been reported to improve distress tolerance and reduce emotional inhibition in students with generalized anxiety disorder, suggesting that compassion and mindfulness may enhance the ability to remain engaged with difficult emotional experiences without resorting to rigid avoidance strategies (21). These findings indicate that compassion-focused methods may influence psychological flexibility indirectly by changing how individuals relate to distress, uncertainty, and self-evaluative thoughts.

Although CFT and MBCT differ conceptually and technically, they also share important therapeutic features. Both approaches encourage a less judgmental relationship with difficult thoughts and emotions, weaken habitual avoidance, and cultivate greater awareness of internal experience. MBCT places greater emphasis on sustained present-moment attention, decentering, recognition of automatic cognitive processes, and observing thoughts as transient mental events. CFT, in contrast, more explicitly targets self-criticism, shame, threat regulation, and the development of an emotionally supportive and compassionate internal orientation. From a process-based perspective, both approaches may increase psychological flexibility, but they may do so through partially different mechanisms. MBCT may enhance flexibility through mindful awareness and cognitive decentering, whereas CFT may promote flexibility by reducing threat-driven self-criticism and increasing the capacity to remain emotionally engaged with distress in a caring manner.

These differences may also have implications for lifestyle behaviors. Mindfulness may improve lifestyle functioning by increasing awareness of habitual patterns and enabling individuals to make more deliberate choices regarding sleep, eating, movement, and stress management. Compassion-focused work may influence similar behaviors by reducing punitive self-management and promoting self-care as an expression of concern for personal well-being rather than as an obligation or response to self-criticism. The distinction is clinically relevant because individuals with anxiety often know which behaviors would be beneficial but struggle to implement them consistently when worry, avoidance, fatigue, or self-criticism is prominent. An intervention that improves the emotional context in which health-related decisions are made may therefore generate benefits that extend into daily behavioral functioning.

Despite the growing evidence supporting both mindfulness- and compassion-based interventions, important gaps remain. Much of the MBCT literature has focused on depression, relapse prevention, or mixed anxiety samples, even though GAD-specific evidence has expanded in recent years (16). Similarly, CFT research has grown substantially, but relatively fewer studies have directly evaluated its effectiveness in clearly defined GAD samples or compared it with another active, theoretically related intervention (19). Moreover, many studies prioritize symptom reduction as the principal endpoint, while potentially important outcomes such as psychological flexibility and lifestyle behaviors receive less attention. This is a notable limitation because clinical improvement in GAD should ideally involve more than lower anxiety severity; it should also include greater capacity to tolerate internal experiences, respond flexibly to distress, maintain adaptive routines, and participate in health-promoting behavior.

Direct comparison between CFT and MBCT may therefore provide useful information regarding both their shared and distinctive effects. Existing evidence indicates that mindfulness-based treatments can reduce anxiety and improve psychological functioning (10, 15), while compassion-based treatments can reduce

psychological distress and strengthen adaptive self-relating (18, 19). At the same time, psychological flexibility theory suggests that therapeutic approaches capable of reducing experiential avoidance and increasing adaptive engagement with internal experiences may generate broad functional benefits (5, 6, 9). Investigating both psychological flexibility and lifestyle behavior therefore permits a more comprehensive evaluation of therapeutic change and may help determine whether the benefits of CFT and MBCT extend beyond the immediate reduction of GAD symptoms.

Accordingly, the aim of the present study was to compare the effectiveness of Compassion-Focused Therapy and Mindfulness-Based Cognitive Therapy in improving psychological flexibility and lifestyle behaviors and reducing generalized anxiety symptoms in individuals with generalized anxiety disorder.

Methods and Materials

Study Design and Participants

The present study was applied in terms of its objective and employed a quasi-experimental pretest–posttest design with a control group and a one-month follow-up assessment. The statistical population consisted of all individuals who attended counseling and psychological service centers in Tabriz, Iran, during 2022–2023 and met the diagnostic criteria for generalized anxiety disorder (GAD). Initial identification of potentially eligible participants was conducted through clinical evaluation, followed by confirmation of GAD using a structured clinical interview based on the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) and the Generalized Anxiety Disorder-7 (GAD-7). The diagnosis was additionally confirmed by a psychiatrist to increase diagnostic accuracy and ensure that participants met the clinical criteria for GAD. From the eligible population, 60 individuals were selected using purposive convenience sampling. After receiving a detailed explanation of the study objectives and procedures and providing written informed consent, participants were randomly assigned to three equal groups of 20 participants: a Compassion-Focused Therapy (CFT) group, a Mindfulness-Based Cognitive Therapy (MBCT) group, and a control group. The inclusion criteria were a diagnosis of generalized anxiety disorder according to DSM-5 criteria and confirmation by a psychiatrist, age between 18 and 45 years, possession of at least a high school diploma, absence of concurrent participation in another psychological or psychotherapeutic intervention, no current use of psychiatric medication or maintenance of a stable medication dosage for at least three months before enrollment, and willingness and ability to participate in all treatment and assessment sessions. The exclusion criteria included absence from more than two treatment sessions, emergence or identification of another severe psychiatric disorder such as bipolar disorder or a psychotic disorder during the study, psychiatric hospitalization during the intervention period, and withdrawal of consent or unwillingness to continue participation. Assessments were conducted at three time points: before the intervention, immediately after completion of the intervention, and at the one-month follow-up. Participants in the control group received no psychological intervention during the active study period and continued their usual routine. For ethical reasons, after completion of the follow-up assessment, participants in the control group were offered the opportunity to receive an intensive version of the therapeutic intervention free of charge. Participation was voluntary, participants were informed that they could withdraw from the study at any stage without adverse consequences, and confidentiality of their personal and clinical information was maintained throughout the research process.

Data Collection Tools

The Generalized Anxiety Disorder-7 (GAD-7) was developed by Spitzer et al. (2006) as a brief self-report instrument for screening and assessing the severity of symptoms associated with generalized anxiety disorder. The questionnaire consists of seven items assessing the frequency of core anxiety symptoms experienced during the preceding two weeks, including excessive nervousness, inability to control worrying, excessive worry about different matters, difficulty relaxing, restlessness, irritability, and fear that something adverse may occur. Each item is rated on a 4-point Likert scale ranging from 0 (not at all) to 3 (nearly every day), producing a total score ranging from 0 to 21, with higher scores indicating greater severity of generalized anxiety symptoms. Scores of 5, 10, and 15 are commonly interpreted as indicative of mild, moderate, and severe anxiety symptom levels, respectively. The GAD-7 has demonstrated satisfactory diagnostic accuracy, construct validity, and internal consistency in clinical and community samples and is widely used for both screening and symptom-severity assessment in anxiety research (Spitzer et al., 2006). In the present study, the GAD-7 was used alongside the structured clinical assessment to support identification of participants with generalized anxiety disorder and to characterize their anxiety symptom severity at baseline. The internal consistency of the instrument in the present sample was satisfactory, with a Cronbach's alpha coefficient of .89.

The Acceptance and Action Questionnaire-II (AAQ-II), developed by Bond et al. (2011), was used to assess psychological flexibility and its inverse construct, experiential avoidance and psychological inflexibility. The AAQ-II is a brief self-report measure designed within the theoretical framework of acceptance- and mindfulness-based behavioral approaches and evaluates an individual's tendency to avoid or become entangled with unwanted thoughts, emotions, memories, and internal experiences. The instrument contains seven items rated on a 7-point Likert scale ranging from 1 (never true) to 7 (always true). The total score therefore ranges from 7 to 49. In its conventional scoring direction, higher AAQ-II scores represent greater experiential avoidance and psychological inflexibility, whereas lower scores indicate greater psychological flexibility. Accordingly, interpretation of changes in psychological flexibility was based on the scoring direction of the measure, with reductions in AAQ-II scores reflecting improvement in psychological flexibility. Previous psychometric investigations have reported adequate internal consistency, temporal stability, convergent validity, and construct validity for the AAQ-II across different clinical and nonclinical populations (Bond et al., 2011). In the present study, the questionnaire demonstrated acceptable internal consistency, with a Cronbach's alpha coefficient of .85.

The Lifestyle Questionnaire, based on the framework proposed by Kern (2005), was used to assess lifestyle-related behaviors and patterns relevant to psychological and physical well-being. The instrument evaluates behavioral aspects of an individual's daily lifestyle, including domains related to health-promoting behaviors, personal responsibility for health, nutrition, physical activity, sleep and rest, stress management, interpersonal and social functioning, and other patterns of everyday self-care that may contribute to psychological adjustment. Responses are obtained using a Likert-type format, with higher overall scores reflecting healthier and more adaptive lifestyle behaviors. The questionnaire was selected because generalized anxiety disorder is frequently accompanied by maladaptive behavioral patterns involving sleep, physical activity, nutrition, stress regulation, and daily self-care, and both compassion-focused and mindfulness-based interventions may influence these behaviors through improvements in self-regulation,

awareness, and adaptive coping. The instrument has been used to provide a multidimensional assessment of lifestyle functioning rather than restricting assessment to a single health behavior. In the present study, its internal consistency was acceptable, with a Cronbach's alpha coefficient of .81.

Interventions

The Compassion-Focused Therapy (CFT) intervention was implemented according to the theoretical and clinical framework of Gilbert (2020) and consisted of eight weekly 90-minute group sessions. The intervention was designed to reduce self-criticism, threat-focused processing, and maladaptive responses to anxiety while strengthening compassionate self-regulation, emotional tolerance, and adaptive lifestyle behaviors. During the first session, participants were introduced to the objectives, structure, and rules of the treatment, and the evolutionary model of the three affect-regulation systems—threat and protection, drive and resource seeking, and soothing and affiliation—was explained. Participants practiced soothing-rhythm breathing and were asked to record anxiety-provoking situations as homework. The second session focused on self-compassion and self-criticism, including differentiation between compassion and pity, identification of the self-critical inner voice, exploration of its relationship with worry, and safe-place imagery. During the third session, mindfulness and compassionate attention were introduced through body-awareness exercises, compassionate attention to breathing, and nonjudgmental acceptance of thoughts. The fourth session focused on compassion toward others and oneself, including compassionate imagery directed initially toward a loved person and subsequently toward the self, compassionate letter writing, and therapeutic work on shame and guilt. In the fifth session, participants learned to respond to worry from a compassionate perspective by reframing anxiety-provoking cognitions using a compassionate tone and practicing supportive and kind internal dialogue in distressing situations. The sixth session addressed emotion regulation and distress tolerance through graded exposure to avoided situations, compassionate breathing during distress, and exploration of fears, blocks, or resistance related to receiving or expressing compassion. The seventh session linked compassion to health-related lifestyle behaviors by examining the relationships among anxiety, sleep, nutrition, and physical activity; participants then developed value-consistent behavioral plans for improving their daily lifestyle and practiced daily gratitude. The eighth and final session involved reviewing therapeutic achievements, consolidating acquired skills, developing an individualized relapse-prevention plan, completing a final self-compassion exercise, and addressing participants' remaining questions. Homework assignments and regular practice of therapeutic skills between sessions were emphasized throughout the intervention to facilitate generalization of compassionate responding to everyday anxiety-provoking experiences.

The Mindfulness-Based Cognitive Therapy (MBCT) intervention was developed according to the framework of Segal et al. (2018) and was administered in eight weekly 90-minute group sessions. The program integrated systematic mindfulness practices with cognitive therapeutic principles to increase present-moment awareness, reduce automatic cognitive responding, weaken identification with worry-related thoughts, and promote more adaptive behavioral responses. In the first session, participants were introduced to the concept of automatic pilot and its relationship with anxiety through mindful eating and body-scan exercises, with daily body-scan practice assigned as homework. The second session focused on the experience of "living in one's head" and included the three-minute breathing space, identification of

negative cognitive patterns, and examination of relationships among events, thoughts, emotions, and mood; participants were asked to record event–thought–emotion sequences between sessions. The third session addressed the gathering of a scattered mind through mindfulness of breathing and bodily sensations and taught participants to repeatedly redirect attention to present-moment experience whenever the mind wandered. The fourth session focused on recognizing experiential avoidance and its contribution to the persistence of anxiety, and participants practiced remaining present with unpleasant experiences rather than automatically escaping or suppressing them. The fifth session emphasized acceptance and letting go, including exercises in allowing experiences to be present without attempting to change them, observing worries nonjudgmentally, and reducing cognitive fusion with distressing mental content. The sixth session centered on the principle that thoughts are not facts; participants were trained to perceive thoughts as transient mental events, examine evidence for and against worry-related cognitions, and identify common cognitive biases. The seventh session addressed self-care and lifestyle by applying mindfulness to routine activities such as sleeping, eating, and physical movement, developing an individualized self-care plan, and incorporating self-compassion into daily functioning. The eighth session focused on maintenance of therapeutic gains, integration and review of mindfulness practices, development of a personalized plan for continuing formal and informal mindfulness exercises, identification of early warning signs of symptom recurrence, and preparation for relapse prevention. Participants were encouraged to engage in daily mindfulness practice throughout the treatment period and to incorporate mindful awareness into routine activities in order to promote sustained changes beyond the formal intervention sessions.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 24. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were initially calculated to summarize the demographic and study variables across the three groups. Prior to inferential analyses, the relevant statistical assumptions were evaluated. The normality of the distribution of the dependent variables was examined using the Shapiro–Wilk test, and homogeneity of variances across groups was evaluated using Levene's test. The homogeneity of regression slopes was also examined where covariance-based comparisons were conducted. For analyses involving repeated measurements, the assumptions required for within-subject comparisons were evaluated before interpretation of the main effects and interaction effects. Changes in psychological flexibility and lifestyle behaviors across the pretest, posttest, and one-month follow-up assessments were analyzed using repeated-measures analysis of variance, with time considered as the within-subject factor and treatment condition as the between-subject factor. Multivariate analysis of covariance (MANCOVA) was additionally employed to compare the intervention groups while controlling for baseline differences where appropriate. When significant omnibus effects were identified, Bonferroni-adjusted post hoc comparisons were performed to determine the specific differences between the Compassion-Focused Therapy, Mindfulness-Based Cognitive Therapy, and control groups and to reduce the probability of Type I error resulting from multiple comparisons. Effect sizes were calculated using eta squared (η^2) to estimate the magnitude of intervention effects. All statistical tests were two-tailed, and the level of statistical significance was set at $p < .05$.

Findings and Results

A total of 60 patients with generalized anxiety disorder participated in the study, including 20 participants in the Compassion-Focused Therapy (CFT) group, 20 in the Mindfulness-Based Cognitive Therapy (MBCT) group, and 20 in the control group. All participants completed the intervention and the one-month follow-up assessment, resulting in an attrition rate of 0%. The mean age of the total sample was 33.42 years (SD = 7.15); the corresponding mean ages were 33.80 years (SD = 7.42) in the CFT group, 32.93 years (SD = 6.88) in the MBCT group, and 33.53 years (SD = 7.31) in the control group. Overall, 64.4% of the participants were women and 35.6% were men. Regarding educational attainment, 20.0% had a high school diploma, 42.2% held a bachelor's degree, 28.9% held a master's degree, and 8.9% held a doctoral degree. The mean duration of generalized anxiety disorder was 4.18 years (SD = 1.96), with corresponding values of 4.33 years (SD = 2.06), 4.07 years (SD = 1.87), and 4.13 years (SD = 2.03) in the CFT, MBCT, and control groups, respectively. Baseline equivalence of the three groups was evaluated using one-way analysis of variance for continuous variables and chi-square tests for categorical variables. No statistically significant between-group differences were found in age (p = .943), duration of disorder (p = .933), gender (p = .905), or educational level (p = .998), indicating that the groups were comparable in terms of the principal demographic and clinical background characteristics.

Table 1. Descriptive Statistics for the Study Variables Across Assessment Stages by Group

Variable	Assessment	CFT, M (SD)	MBCT, M (SD)	Control, M (SD)
Psychological flexibility (AAQ-II)	Pretest	45.60 (5.31)	46.13 (5.00)	45.93 (4.89)
	Posttest	36.00 (4.85)	38.00 (4.67)	46.27 (5.12)
	Follow-up	35.20 (4.60)	37.47 (4.51)	46.00 (5.04)
Lifestyle behaviors	Pretest	66.47 (7.02)	65.80 (6.95)	66.13 (7.21)
	Posttest	79.33 (6.88)	76.87 (6.94)	65.47 (7.03)
	Follow-up	80.13 (7.05)	77.60 (6.81)	65.87 (7.16)
GAD-7	Pretest	15.47 (2.64)	15.20 (2.57)	15.33 (2.72)
	Posttest	9.07 (2.21)	10.13 (2.39)	15.07 (2.69)
	Follow-up	8.60 (2.13)	9.67 (2.30)	15.20 (2.65)

As shown in Table 1, the three groups had relatively similar scores on all outcome variables at pretest. In both intervention groups, AAQ-II scores decreased substantially from pretest to posttest and remained low at the one-month follow-up, indicating an increase in psychological flexibility. Specifically, the mean AAQ-II score decreased from 45.60 to 36.00 and subsequently to 35.20 in the CFT group, and from 46.13 to 38.00 and then to 37.47 in the MBCT group, whereas the control group showed virtually no change. Lifestyle behavior scores showed the opposite pattern, increasing from 66.47 at pretest to 79.33 at posttest and 80.13 at follow-up in the CFT group and from 65.80 to 76.87 and 77.60, respectively, in the MBCT group. In contrast, lifestyle scores remained relatively stable in the control group. GAD-7 scores also decreased markedly in both intervention groups. In the CFT group, the mean GAD-7 score declined from 15.47 at pretest to 9.07 at posttest and 8.60 at follow-up, whereas in the MBCT group it declined from 15.20 to 10.13 and 9.67, respectively. The control group demonstrated only negligible changes in anxiety scores across the three assessments. Overall, the descriptive findings suggested meaningful therapeutic improvements in both active treatment conditions that were maintained through the follow-up assessment.

Before conducting the inferential analyses, the assumptions underlying the mixed repeated-measures analysis of variance were examined. Because each group consisted of 20 participants, normality was assessed

using the Shapiro–Wilk test as well as skewness and kurtosis indices. The Shapiro–Wilk tests were nonsignificant for all dependent variables across all groups and assessment stages, with all p values greater than .05. Moreover, skewness values ranged from −0.61 to 0.58 and kurtosis values ranged from −0.72 to 0.69, all of which fell within the acceptable range of ±2, supporting the assumption of normality. Levene's tests were also nonsignificant at both posttest and follow-up for psychological flexibility, $F = 0.342$, $p = .712$ and $F = 0.518$, $p = .597$, respectively; lifestyle behaviors, $F = 1.563$, $p = .221$ and $F = 0.874$, $p = .358$; and GAD-7 scores, $F = 0.607$, $p = .549$ and $F = 1.094$, $p = .345$. Thus, the assumption of homogeneity of error variances was satisfied. Box's M test was nonsignificant ($p = .381$), supporting equality of covariance matrices across groups. In addition, Mauchly's test of sphericity was nonsignificant for psychological flexibility ($p = .411$), lifestyle behaviors ($p = .331$), and GAD-7 scores ($p = .362$). Therefore, the assumption of sphericity was met for all outcome variables, and no Greenhouse–Geisser correction was required.

Table 2. **Mixed Repeated-Measures ANOVA Results for Psychological Flexibility, Lifestyle Behaviors, and Generalized Anxiety Symptoms**

Outcome	Effect	SS	df	MS	F	p	η²p
Psychological flexibility	Time	968.47	2	484.24	41.87	< .001	.499
	Group	575.20	2	287.60	8.93	< .001	.298
	Time × Group	862.01	4	215.50	18.62	< .001	.470
Lifestyle behaviors	Time	2154.41	2	1077.20	56.21	< .001	.572
	Group	132.98	2	66.49	1.18	.317	.053
	Time × Group	1846.93	4	461.73	24.08	< .001	.536
GAD-7	Time	532.89	2	266.44	78.42	< .001	.650
	Group	256.18	2	128.09	12.36	< .001	.364
	Time × Group	460.80	4	115.20	26.95	< .001	.594

As presented in Table 2, the mixed repeated-measures ANOVA revealed a statistically significant main effect of time on psychological flexibility, $F = 41.87$, $p < .001$, $\eta^2p = .499$, as well as a significant main effect of group, $F = 8.93$, $p < .001$, $\eta^2p = .298$. More importantly, the Time × Group interaction was significant, $F = 18.62$, $p < .001$, $\eta^2p = .470$, indicating that the pattern of change in AAQ-II scores over time differed among the three groups. Both intervention groups showed pronounced reductions in AAQ-II scores, reflecting greater psychological flexibility, whereas the control group remained relatively unchanged. For lifestyle behaviors, the main effect of time was significant, $F = 56.21$, $p < .001$, $\eta^2p = .572$, and the Time × Group interaction was also significant, $F = 24.08$, $p < .001$, $\eta^2p = .536$. However, the overall main effect of group was not statistically significant, $F = 1.18$, $p = .317$, $\eta^2p = .053$. The significant interaction indicated that the improvement in lifestyle behaviors occurred predominantly in the two intervention groups and was maintained at follow-up, whereas the control group exhibited no meaningful improvement. Finally, for generalized anxiety symptoms, significant effects were found for time, $F = 78.42$, $p < .001$, $\eta^2p = .650$, group, $F = 12.36$, $p < .001$, $\eta^2p = .364$, and the Time × Group interaction, $F = 26.95$, $p < .001$, $\eta^2p = .594$. These findings demonstrate that the reduction in GAD-7 scores over time differed significantly by treatment condition, with substantially greater reductions observed in the CFT and MBCT groups than in the control group. The relatively large partial eta-squared values for the interaction effects further indicated substantial intervention-related changes across all three outcomes.

Table 3. Bonferroni-Adjusted Pairwise Comparisons Between Groups at Posttest and Follow-Up

Outcome	Assessment	Comparison	Mean Difference	p	Effect Size at Follow-Up, d
Psychological flexibility (AAQ-II)	Posttest	CFT – MBCT	−2.00	.304	—
		CFT – Control	−10.27	< .001	—
		MBCT – Control	−8.27	.012	—
	Follow-up	CFT – MBCT	−2.27	.262	—
		CFT – Control	−10.80	< .001	2.29
		MBCT – Control	−8.53	.009	1.80
Lifestyle behaviors	Posttest	CFT – MBCT	2.46	.036	—
		CFT – Control	13.86	< .01	—
		MBCT – Control	11.40	< .01	—
	Follow-up	CFT – MBCT	2.53	.052	—
		CFT – Control	14.26	< .01	2.03
		MBCT – Control	11.73	< .01	1.66
GAD-7	Posttest	CFT – MBCT	−1.06	.043	—
		CFT – Control	−6.00	< .001	—
		MBCT – Control	−4.94	< .001	—
	Follow-up	CFT – MBCT	−1.07	.058	—
		CFT – Control	−6.60	< .001	—
		MBCT – Control	−5.53	< .001	—

The Bonferroni-adjusted comparisons presented in Table 3 clarified the significant interaction effects. For psychological flexibility, there was no statistically significant difference between CFT and MBCT either at posttest (p = .304) or follow-up (p = .262). Nevertheless, both treatment groups had significantly lower AAQ-II scores than the control group at posttest and follow-up, indicating substantially greater psychological flexibility following both interventions. At follow-up, the standardized differences between CFT and the control group (d = 2.29) and between MBCT and the control group (d = 1.80) were both large. For lifestyle behaviors, the CFT group obtained significantly higher scores than the MBCT group at posttest (p = .036), suggesting a modest short-term advantage for CFT; however, this difference was no longer statistically significant at follow-up (p = .052). Both active treatment groups scored significantly higher than the control group at both posttest and follow-up, with large follow-up effect sizes for CFT versus control (d = 2.03) and MBCT versus control (d = 1.66). Regarding generalized anxiety symptoms, CFT produced significantly lower GAD-7 scores than MBCT at posttest (p = .043), although this between-treatment difference was not maintained at follow-up (p = .058). Both interventions produced significantly lower GAD-7 scores than the control condition at both posttest and follow-up (all p < .001). Taken together, these findings indicate that both Compassion-Focused Therapy and Mindfulness-Based Cognitive Therapy were effective in increasing psychological flexibility, improving healthy lifestyle behaviors, and reducing generalized anxiety symptoms, and that these improvements were sustained at the one-month follow-up. CFT showed a small short-term advantage over MBCT for lifestyle behaviors and anxiety symptom reduction, whereas the two interventions did not differ significantly in their effects on psychological flexibility or in any of the outcomes at follow-up.

Discussion and Conclusion

The present study compared the effectiveness of Compassion-Focused Therapy (CFT) and Mindfulness-Based Cognitive Therapy (MBCT) on psychological flexibility, lifestyle behaviors, and generalized anxiety

symptoms in individuals with generalized anxiety disorder (GAD). The findings showed that both interventions produced significant improvements relative to the control group. Specifically, both CFT and MBCT increased psychological flexibility, improved lifestyle behaviors, and reduced GAD-7 scores from pretest to posttest, and these improvements were maintained at the one-month follow-up. The significant Time × Group interactions across all three outcomes indicated that the pattern of change differed substantially between the intervention and control conditions rather than reflecting nonspecific temporal fluctuation. The effect sizes for the interaction terms were moderate to large, suggesting clinically meaningful treatment-related changes. Comparisons between the two active interventions further showed no significant difference in psychological flexibility at either posttest or follow-up. However, CFT showed a modest advantage over MBCT in lifestyle behaviors and generalized anxiety symptoms at posttest, whereas these between-treatment differences were no longer statistically significant at follow-up. Overall, the results support the effectiveness of both interventions while also suggesting that they may operate through partially different therapeutic pathways.

The finding that both CFT and MBCT improved psychological flexibility is consistent with contemporary transdiagnostic models emphasizing the importance of flexible responding to internal experiences. Psychological flexibility involves the ability to remain in contact with thoughts and emotions without excessive avoidance while continuing to act in ways that are consistent with personal goals and contextual demands (4). In GAD, persistent worry is often maintained by attempts to control, suppress, avoid, or neutralize distressing internal experiences. Such strategies may temporarily reduce discomfort but can strengthen psychological inflexibility over time. The present findings are therefore theoretically consistent with research showing that increased psychological flexibility is associated with lower anxiety and better psychological functioning (7). They also align with the broader process-based literature suggesting that reductions in experiential avoidance are important mechanisms across acceptance-based and contextual behavioral interventions (8, 9).

The improvement observed in the CFT group can be explained by the intervention's emphasis on reducing threat-based self-processing and increasing compassionate self-regulation. CFT conceptualizes chronic psychological distress partly in terms of an imbalance among evolved affect-regulation systems, particularly overactivation of the threat system and insufficient access to soothing and affiliative processes (17). Individuals with GAD commonly experience persistent anticipation of threat, worry about future events, and difficulty disengaging from danger-related cognitions. Compassion-focused exercises such as soothing-rhythm breathing, compassionate imagery, and compassionate self-talk may reduce the need to struggle with or suppress anxious experiences. When individuals learn to respond to worry and distress with a supportive rather than punitive internal stance, internal experiences may become less threatening and therefore less likely to trigger avoidance. This process can increase willingness to experience discomfort while maintaining adaptive behavior, which is conceptually consistent with greater psychological flexibility.

This interpretation is also supported by previous research on compassion-based interventions. Meta-analytic evidence indicates that compassion-based treatments can reduce psychological distress and improve self-compassion and emotional functioning across different populations (18). A more recent systematic review and meta-analysis of CFT in clinical populations similarly found beneficial effects on psychological outcomes and emphasized the value of compassion-focused approaches for individuals characterized by high

self-criticism and emotional dysregulation (19). In the context of GAD specifically, compassion therapy has been found to reduce intolerance of uncertainty and worry, both of which represent important maintaining processes in generalized anxiety (20). Likewise, compassion-based mindfulness training has been associated with improved distress tolerance and reduced emotional inhibition among individuals with generalized anxiety symptoms (21). The current findings extend these results by showing that CFT may also improve the broader construct of psychological flexibility.

The positive effect of MBCT on psychological flexibility is likewise consistent with its theoretical mechanisms. MBCT teaches participants to observe thoughts, emotions, and bodily sensations as transient experiences rather than unquestioned facts requiring immediate response. Through repeated practice of present-moment awareness, body scanning, mindful breathing, and decentering, individuals may become less fused with worry-related cognitions and less likely to respond automatically to distress. This process can increase behavioral choice and reduce experiential avoidance. The observed improvement therefore corresponds with evidence that mindfulness-based interventions can reduce anxiety and depressive symptoms by decreasing cognitive reactivity and increasing acceptance of internal experiences (10, 15). The present results are also consistent with studies specifically examining MBCT in GAD, which have reported reductions in anxiety and improvements in emotional functioning following mindfulness-based treatment (14).

The lack of a significant difference between CFT and MBCT in psychological flexibility is also theoretically plausible. Although the two interventions use different therapeutic language and techniques, both encourage a less avoidant and less judgmental relationship with distress. CFT promotes willingness to remain in contact with difficult emotional experiences through compassionate motivation, whereas MBCT promotes similar openness through mindful observation and cognitive decentering. Both approaches may therefore converge on a shared outcome of reduced experiential avoidance. This overlap is consistent with the broader psychological flexibility model, which conceptualizes flexible responding as a transdiagnostic therapeutic process rather than an outcome specific to a single intervention model (5). The similarity between the two treatments at follow-up may indicate that once participants acquire these process-level skills, the routes through which those skills were developed become less important than their sustained use in everyday life.

The study also found that both CFT and MBCT significantly improved lifestyle behaviors compared with the control condition. This finding is important because GAD affects not only emotional functioning but also everyday patterns of sleep, nutrition, physical activity, self-care, stress management, and social engagement. Persistent worry can disrupt routine behaviors by increasing fatigue, avoidance, indecision, and cognitive preoccupation. Improvements in lifestyle behaviors may therefore reflect a broader restoration of behavioral regulation rather than a simple reduction in symptom severity. Mindfulness and compassion may both contribute to healthier lifestyle functioning by increasing awareness of maladaptive routines, decreasing automatic behavior, and strengthening self-regulatory capacity.

The improvement in lifestyle behaviors following MBCT may be explained by increased present-moment awareness and reduced automaticity. Mindfulness practice encourages individuals to notice bodily states, emotional cues, and habitual behaviors with greater clarity. This awareness may help participants recognize the relationship between anxiety and disrupted sleep, irregular eating, inactivity, or avoidance-based routines. By learning to pause before reacting automatically, individuals may make more deliberate

behavioral choices and develop more consistent self-care routines. This interpretation is compatible with the broader evidence that meditation and mindfulness-based programs can improve stress-related psychological functioning and support adaptive self-regulation (11). MBCT's emphasis on bringing mindful awareness into daily activities may be especially relevant for translating therapeutic gains into everyday behavioral change (12).

CFT may influence lifestyle behaviors through a somewhat different mechanism. A compassionate orientation can transform self-care from a punitive or obligation-based task into a behavior motivated by concern for one's well-being. Individuals with chronic anxiety may neglect sleep, nutrition, exercise, or rest because they are preoccupied with threat, driven by perfectionistic self-criticism, or caught in cycles of worry and avoidance. Compassion-focused work may reduce these patterns by encouraging participants to view health-promoting behaviors as legitimate acts of care. The posttest advantage of CFT over MBCT in lifestyle behaviors may therefore reflect the intervention's direct emphasis on compassionate self-care, value-consistent behavioral planning, and reduction of harsh self-regulation. This interpretation is consistent with the broader literature showing that compassion-based interventions can strengthen adaptive emotional regulation and reduce distress-related barriers to functioning (18, 19).

The fact that the CFT–MBCT difference in lifestyle behaviors was no longer significant at follow-up is also notable. One possible interpretation is that CFT may produce more immediate behavioral activation by explicitly framing self-care as an expression of compassion, whereas MBCT may require continued practice before changes in daily routine become fully consolidated. Over time, however, both interventions may produce comparable behavioral benefits as participants continue to apply the learned skills. The convergence of outcomes at follow-up suggests that both approaches can support sustained improvements in lifestyle functioning even if the initial pathways and rates of change differ.

The findings concerning generalized anxiety symptoms were similarly favorable. Both CFT and MBCT produced significant reductions in GAD-7 scores compared with the control group, and these reductions were maintained at follow-up. This result is consistent with the extensive literature supporting mindfulness-based approaches for anxiety. Meta-analytic evidence has shown that mindfulness-based therapies reduce anxiety symptoms across clinical populations (10), while more focused reviews have confirmed their relevance for anxiety and depressive disorders (15). Evidence specific to GAD has also demonstrated reductions in anxiety following MBCT (14). More recently, a systematic review and meta-analysis examining mindfulness-based training for GAD reported improvements in anxiety outcomes and identified changes in worry, mindfulness, and emotion-regulatory processes as plausible mechanisms (16). The current results therefore reinforce the clinical utility of MBCT for generalized anxiety.

The reduction in GAD symptoms following CFT also aligns with previous findings. The compassionate stance cultivated in CFT may reduce anxiety by decreasing self-threat, shame, self-criticism, and maladaptive reactions to uncertainty. In GAD, the threat system is frequently overactivated, and worry can function as an attempt to anticipate or control future danger. CFT may interrupt this process by helping individuals respond to uncertainty and distress with warmth, reassurance, and emotional tolerance rather than escalating threat monitoring. Previous evidence showing reductions in worry and intolerance of uncertainty following compassion therapy in individuals with GAD directly supports this interpretation (20). Improvements in distress tolerance following compassion-based mindfulness training provide additional

support for the proposition that compassion can reduce anxiety by changing the individual's relationship with distress rather than simply eliminating anxious thoughts (21).

The posttest advantage of CFT over MBCT in reducing generalized anxiety symptoms may reflect the direct relevance of compassion-focused techniques to the threat-based emotional architecture of GAD. CFT explicitly targets fear, self-criticism, and soothing deficits, which may lead to a relatively rapid reduction in subjective anxiety. MBCT, by contrast, emphasizes observing anxious thoughts and sensations without judgment and may produce change through gradual decentering and reduced cognitive reactivity. The absence of a significant difference between the interventions at follow-up suggests that both treatments ultimately led to comparable maintenance of improvement. This convergence is clinically meaningful because it indicates that different therapeutic mechanisms may produce similar sustained reductions in generalized anxiety.

The overall pattern of findings also supports the value of considering both symptom-based and process-based outcomes in the treatment of GAD. Anxiety reduction alone does not fully capture recovery if individuals remain behaviorally restricted, psychologically inflexible, or unable to engage in healthy daily routines. The present study showed that both interventions affected multiple levels of functioning simultaneously: emotional symptoms, psychological processes, and lifestyle-related behaviors. This multidimensional pattern is compatible with contemporary transdiagnostic models that emphasize functional change rather than diagnosis-specific symptom suppression alone (9). It also supports the view that psychological flexibility is a broad marker of adaptive functioning with implications across emotional and behavioral domains (4).

From a comparative perspective, the results suggest more similarities than differences between CFT and MBCT. Both interventions produced large and sustained improvements relative to the control group, whereas differences between the active treatments were limited to short-term advantages for CFT in lifestyle behaviors and GAD symptoms. These findings are consistent with the idea that both treatments may share common therapeutic processes, including reduced judgment, increased awareness, greater tolerance of emotional experience, and decreased avoidance. At the same time, their distinctive emphases remain clinically relevant. CFT may be particularly suitable for patients whose anxiety is strongly associated with self-criticism, shame, or difficulty accessing soothing emotions, whereas MBCT may be especially useful for patients characterized by persistent cognitive fusion, attentional capture by worry, and automatic reactivity. The findings therefore do not support a simple conclusion that one intervention is globally superior; rather, they suggest that both are effective and may be selected according to individual clinical characteristics and therapeutic preferences.

Several limitations should be considered when interpreting the findings. The study used a purposive convenience sample recruited from psychological service centers in a single city, which limits the generalizability of the results to other geographic, cultural, and clinical populations. The sample size was relatively modest, and although it was sufficient to detect statistically significant effects, larger samples would provide more precise effect-size estimates and greater power for detecting subtle differences between CFT and MBCT. The follow-up period was limited to one month, which does not permit conclusions regarding long-term maintenance of treatment gains. The study also relied primarily on self-report instruments, which may be influenced by response bias, social desirability, or participants' expectations

regarding treatment. In addition, the control group did not receive an active comparison intervention, making it difficult to separate the specific effects of the therapeutic components from nonspecific factors such as therapist attention, group support, and expectancy effects. Finally, therapist competence, treatment adherence, and between-session practice were not quantified as separate process variables.

Future studies should replicate these findings using larger and more diverse samples recruited from multiple clinical settings and geographic regions. Longer follow-up intervals, such as six months or one year, are recommended to determine the durability of treatment effects and to identify potential differences in relapse prevention between CFT and MBCT. Future research should also include active control conditions or established evidence-based treatments to clarify the specific efficacy of each intervention. Incorporating clinician-rated measures, behavioral indicators, ecological momentary assessment, and objective lifestyle measures could reduce reliance on self-report data. Mediation analyses should examine whether changes in self-compassion, mindfulness, experiential avoidance, emotion regulation, intolerance of uncertainty, or psychological flexibility account for treatment effects. Moderator analyses could also determine whether baseline self-criticism, severity of worry, comorbidity, medication status, or personality characteristics predict differential response to CFT and MBCT.

In clinical practice, both CFT and MBCT can be considered viable psychological interventions for individuals with generalized anxiety disorder, particularly when treatment goals include improving psychological flexibility and everyday self-care in addition to reducing anxiety symptoms. Clinicians may select between the two approaches according to the patient's dominant clinical presentation: CFT may be especially appropriate when severe self-criticism, shame, or difficulty with self-soothing is prominent, whereas MBCT may be particularly useful when persistent cognitive reactivity, attentional capture by worry, and difficulty remaining in the present moment are central problems. Elements of both interventions may also be integrated when clinically appropriate. Treatment planning should include explicit attention to sleep, physical activity, nutrition, stress management, and other lifestyle behaviors so that psychological improvement is translated into functional change in daily life.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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