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Comparison of the Effectiveness of Metacognitive Therapy and Cognitive Behavioral Therapy on Social Adjustment and Post-Traumatic Stress in Individuals with Cognitive-Attentional Syndrome

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ABSTRACT

The present study aimed to compare the effectiveness of Metacognitive Therapy (MCT) and Cognitive Behavioral Therapy (CBT) on social adjustment and post-traumatic stress in individuals diagnosed with Cognitive-Attentional Syndrome (CAS) in Tehran during 2023–2024. The sampling method used in this study was simple random sampling, and the research design was quasi-experimental with a pretest-posttest control group structure. The statistical population consisted of all individuals who referred to the counseling centers of the Art and Cultural Organization of Tehran Municipality and were screened as having Cognitive-Attentional Syndrome. A total of 45 participants were selected from this population. Following the completion of pretest questionnaires, two experimental groups participated in eight therapy sessions based on either Metacognitive Therapy or Cognitive Behavioral Therapy, while the control group received no training. Data were analyzed using SPSS-26 software and repeated measures analysis of covariance (ANCOVA). The findings indicated that Metacognitive Therapy, in comparison with Cognitive Behavioral Therapy, led to greater improvement in social adjustment from pretest to posttest and follow-up. However, this result was not observed for post-traumatic stress. Both therapeutic approaches equally reduced post-traumatic stress in participants. The results demonstrated that both Metacognitive Therapy and Cognitive Behavioral Therapy had favorable effects on improving social adjustment and reducing post-traumatic stress. Nonetheless, Metacognitive Therapy proved to be more effective in enhancing social adjustment among individuals with adjustment disorders. In contrast, no significant difference was observed between the two therapies in reducing post-traumatic stress, as both were equally effective.

Keywords: Metacognitive Therapy, Cognitive Behavioral Therapy, Social Adjustment, Post-Traumatic Stress, Cognitive-Attentional Syndrome.

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Introduction

Adjustment disorders and post-traumatic stress responses represent major psychological challenges in today's increasingly complex and unpredictable social environments. These disorders are particularly prevalent among individuals with heightened cognitive-attentional vulnerabilities, who exhibit persistent maladaptive attentional biases and dysfunctional metacognitive strategies. Adjustment difficulties are not merely transient emotional states but reflect profound impairments in one's ability to adapt to social demands, regulate emotions, and maintain interpersonal harmony, especially in the aftermath of stressors or trauma (1, 2). The prevalence and impact of these disorders have necessitated the development of evidence-based psychological interventions targeting the cognitive and emotional foundations of social functioning and trauma processing.

One population particularly susceptible to adjustment and stress-related disorders includes individuals exhibiting symptoms of Cognitive-Attentional Syndrome (CAS), a transdiagnostic construct rooted in the Self-Regulatory Executive Function (S-REF) model proposed by Wells. CAS is characterized by repetitive negative thinking, including worry and rumination, attentional bias to threat, and unhelpful coping strategies such as thought suppression or avoidance (3). Metacognitive beliefs about the uncontrollability and danger of thoughts are central to the persistence of CAS (4). Recent findings confirm that CAS symptoms strongly predict stress and trauma-related outcomes, especially during high-stress periods such as the COVID-19 pandemic (5).

Among interventions developed to reduce psychological distress rooted in maladaptive cognitive processes, two major approaches have gained empirical support: Cognitive Behavioral Therapy (CBT) and Metacognitive Therapy (MCT). CBT, a first-line intervention for anxiety and depression, primarily targets the content of maladaptive thoughts through cognitive restructuring and behavioral modification (6, 7). While CBT has demonstrated efficacy in treating various mood and anxiety disorders, it may be less effective for individuals with entrenched metacognitive dysfunctions or when worry itself becomes the problem, rather than the content of thought (8).

MCT, on the other hand, focuses not on the content but on the process of thinking. It aims to modify metacognitive beliefs that sustain maladaptive coping styles such as worry and rumination (3). This therapy conceptualizes psychological disorders as a result of a prolonged activation of CAS, driven by dysfunctional metacognitions, and seeks to interrupt this cycle through techniques such as attention training, detached mindfulness, and metacognitive reappraisal (9, 10). Normann and Morina's (2018) meta-analysis supports the efficacy of MCT across a wide range of disorders, with large effect sizes for anxiety and depression (11).

Specifically in the context of post-traumatic stress disorder (PTSD), MCT has been shown to produce meaningful reductions in symptom severity. A recent meta-analysis found that MCT was effective in reducing PTSD symptoms, potentially outperforming traditional CBT approaches by targeting worry processes more directly (12). Furthermore, preliminary evidence suggests that MCT can be adapted successfully to individuals with persistent post-concussion symptoms, many of whom struggle with trauma-related cognitive disturbances (13). These findings reinforce the relevance of MCT in trauma-exposed populations and emphasize the need to compare its efficacy against CBT in such groups.

Moreover, metacognitive beliefs are not only implicated in emotional disorders but also strongly predict social adjustment problems in both clinical and subclinical populations (14, 15). Individuals with high levels

of maladaptive metacognitions often experience social withdrawal, interpersonal conflict, and difficulty adapting to academic or occupational roles (16). Social adjustment, a multi-dimensional construct involving emotional, behavioral, and interpersonal domains, is a critical indicator of psychological well-being. Studies indicate that interventions enhancing metacognitive awareness and self-regulatory capacity can facilitate improvements in adjustment outcomes (17, 18).

The use of MCT has also shown promising results in educational and adolescent populations. For instance, Khaleghi and Naseri (2024) reported significant improvements in learning styles and academic self-concept among high school girls following MCT-based interventions, supporting the generalizability of metacognitive techniques to non-clinical adjustment-related domains (19, 20). Similarly, Pashang and Khoshlehje (2019) found MCT to be superior to Acceptance and Commitment Therapy (ACT) in reducing psychological symptoms and enhancing quality of life in individuals with chronic gastrointestinal conditions, further highlighting its cross-diagnostic utility (21).

It is also essential to consider the underlying neurocognitive and attachment-related mechanisms in PTSD and adjustment disorders. Research has linked deficits in executive function and insecure attachment patterns with poor trauma processing and reduced social functioning (22). This neuropsychological evidence underscores the importance of interventions that target attentional control and cognitive regulation, both of which are central to MCT.

While MCT has gained empirical support, comparative evaluations with CBT remain limited in certain domains, particularly in populations with co-occurring adjustment problems and trauma exposure. CBT, with its emphasis on cognitive distortions, behavioral activation, and problem-solving, remains a dominant therapeutic approach. However, its efficacy may be compromised in individuals who do not respond well to efforts at restructuring thought content or who continue to engage in perseverative thinking patterns (23, 24). Meta-analytic comparisons suggest that MCT may produce faster and more durable effects, especially when worry is a central feature (24).

In clinical practice, combining insights from both therapeutic models may offer enhanced outcomes. For instance, Leahy et al. (2023) provide integrative CBT protocols that incorporate mindfulness and emotion regulation strategies, though they stop short of fully engaging with metacognitive theory (6). Moreover, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) emphasizes symptom-level categorization of PTSD and adjustment disorders, but recent research increasingly supports transdiagnostic models like CAS to account for overlapping mechanisms across disorders (25, 26).

In sum, the current study seeks to address a critical gap in the literature by comparing the efficacy of Metacognitive Therapy and Cognitive Behavioral Therapy in enhancing social adjustment and reducing post-traumatic stress symptoms among individuals exhibiting Cognitive-Attentional Syndrome.

Methods and Materials

Study Design and Participants

The present study was quasi-experimental, employing a pretest-posttest design with a control group. The statistical population consisted of all individuals who, during 2023–2024, were screened and diagnosed with Cognitive-Attentional Syndrome, and had a history of social maladjustment and post-traumatic stress disorder (PTSD) in Tehran. Participants were selected through simple random sampling. A public call was

issued in therapeutic and counseling centers affiliated with the Cultural and Artistic Organization of Tehran Municipality, and 45 individuals voluntarily participated in the treatment program. These 45 participants were randomly assigned into three groups: Metacognitive Therapy, Cognitive Behavioral Therapy, and Control.

After recording preliminary information, all participants were invited to attend an orientation session to understand the study process. At the beginning, the CAS Questionnaire, Bell Social Adjustment Inventory, and Foa PTSD Inventory were administered to all three groups. Subsequently, the Metacognitive Therapy and Cognitive Behavioral Therapy groups received eight training sessions, each lasting two hours. The control group received no training or therapy. Posttests were administered to all three groups at the end of the intervention. All participants had a prior history of social maladjustment and PTSD and had previously sought professional help at least once.

Inclusion criteria were diagnostic and psychological interviews, completion of the CAS, Social Adjustment, and PTSD questionnaires.

Exclusion criteria included use of medication and absence from more than two therapy sessions.

Data Collection

1. Bell Social Adjustment Inventory: This inventory is adapted from the original version developed by Bell in 1961. It consists of 35 items and measures five dimensions: occupational adjustment, emotional adjustment, social adjustment, health adjustment, and home adjustment. The items are rated on a Likert scale ranging from "strongly disagree" to "strongly agree." Bell (1962) reported a reliability coefficient of 0.88. In the study by Mikaeili and Emamzadeh, the total reliability was reported as 0.84 and the validity as 0.80. Sample items include: "I am satisfied and happy with my home environment" and "My current family environment provides enough opportunity for personality development."

2. Foa Post-Traumatic Stress Disorder Inventory: This inventory was developed by Foa et al. in 1993 and is based on the DSM-IV diagnostic criteria. It contains 17 items and is designed to assess PTSD symptoms. The items are categorized into four sections: (1) trauma-related event questions, (2) re-experiencing the trauma, (3) avoidance of trauma-related stimuli, and (4) hyperarousal. Traumatic experiences during adolescence can lead to several psychological disorders, the most prominent being PTSD. Mohammadi et al. used the 17-item interview-based version of the scale developed by Foa et al. (1993). The sensitivity of the Persian version was found to be 91%, specificity 78%, and test–retest reliability over two weeks was 95%. Sample items include: "You try not to think about or avoid that event" and "You get very upset when something reminds you of that event."

3. Cognitive-Attentional Syndrome Questionnaire: This is a 16-item scale developed to assess the activation of Cognitive-Attentional Syndrome (CAS). The first two items evaluate the frequency of worry and attention to threatening stimuli. The next six items assess the frequency of coping strategies used to manage negative thoughts and feelings, rated on an eight-point Likert scale from 0 to 8. The remaining eight items assess the individual's belief in metacognitive assumptions about CAS, rated from 0 to 100. The total CAS score is the sum of all 16 items, with the lowest possible score being 0. Salmani and Hasani reported a Cronbach's alpha of 0.85 for this scale. Sample items include: "In the past weeks, how much time have you

spent thinking or worrying about your problems?" and "In the past weeks, how much attention have you paid to things you perceive as threatening (such as symptoms, thoughts, or dangers)?"

Intervention

The Metacognitive Therapy (MCT) protocol in this study was based on the clinical manual developed by Adrian Wells. It consisted of eight structured sessions, each lasting approximately two hours, and aimed to modify dysfunctional metacognitive beliefs and reduce the activation of the Cognitive-Attentional Syndrome (CAS). The intervention focused on helping participants identify and challenge positive and negative metacognitive beliefs about worry, rumination, and threat monitoring. Techniques included detached mindfulness, attention training, and situational exposure to reduce cognitive perseveration and promote cognitive flexibility. Participants were guided to become aware of their thinking patterns, shift their attentional control, and learn strategies for reducing worry and avoidance behaviors. The overall goal was to alter maladaptive thinking styles and enhance emotional regulation by targeting metacognitions rather than thought content.

The Cognitive Behavioral Therapy (CBT) protocol followed the structured guidelines proposed by Leahy, Fisher, and Antony and was delivered over eight sessions of two hours each. The intervention targeted maladaptive cognitive distortions and behavioral avoidance associated with social maladjustment and post-traumatic stress. Sessions included psychoeducation about the cognitive model, identification of automatic negative thoughts, and cognitive restructuring techniques. Behavioral strategies such as exposure, behavioral activation, and problem-solving were used to help participants confront fears, reduce avoidance, and improve emotional functioning. Homework assignments were regularly used to reinforce learning and promote generalization of skills. The therapy aimed to improve coping strategies, reduce distress, and enhance adaptive functioning by modifying both cognition and behavior patterns contributing to psychological symptoms.

Data analysis

Data were analyzed using SPSS-26 software and the repeated measures analysis of covariance (ANCOVA). Participants were re-evaluated three months after the intervention. In this study, the pretest scores were included as covariates to control their impact on the posttest and follow-up scores.

Findings and Results

Given that the present study employed a quasi-experimental design with a pretest-posttest and control group, and considering that the data for each variable were continuous and interdependent across time points, repeated measures analysis of variance (ANOVA) was used for data analysis. This study included 45 participants who were randomly assigned to three groups: Metacognitive Therapy (MCT), Cognitive Behavioral Therapy (CBT), and Control. The means and standard deviations of the variables—social adjustment and post-traumatic stress—were calculated for the MCT group, CBT group, and Control group across pretest, posttest, and follow-up stages. The results are presented in Tables 1 and 2.

Table 1. Mean and Standard Deviation of Social Adjustment Variable Across Groups

Group	Pretest M (SD)	Posttest M (SD)	Follow-up M (SD)
Metacognitive Therapy	29.67 (2.69)	3.53 (1.51)	4.67 (1.11)
Cognitive Behavioral Therapy	23.93 (2.71)	0.33 (0.49)	1.6 (0.83)
Control	29.2 (1.47)	18.6 (1.06)	29.2 (1.47)

According to the results in Table 1, both the Metacognitive Therapy and Cognitive Behavioral Therapy groups showed a significant change in social adjustment from pretest to posttest, compared to the control group. Mauchly's test of sphericity for the social adjustment variable was not met (Mauchly's W = 0.311, χ^2 = 47.86, Greenhouse-Geisser ε = 0.518, $p < .05$). Therefore, the Greenhouse-Geisser correction was applied, and mixed ANOVA results were interpreted accordingly.

Table 2. Mean and Standard Deviation of Post-Traumatic Stress Variable Across Groups

Group	Pretest M (SD)	Posttest M (SD)	Follow-up M (SD)
Metacognitive Therapy	30.6 (2.16)	3.47 (2.33)	3.0 (1.89)
Cognitive Behavioral Therapy	34.13 (4.55)	4.47 (3.23)	3.4 (2.32)
Control	29.87 (4.91)	28.93 (4.57)	28.87 (4.45)

As shown in Table 2, both experimental groups exhibited a significant decrease in post-traumatic stress compared to the control group. Mauchly's test of sphericity was violated for this variable as well (Mauchly's W = 0.157, χ^2 = 75.80, Greenhouse-Geisser ε = 0.543, $p < .05$). Thus, the Greenhouse-Geisser correction was applied. The significance level was smaller than the Type I error rate (α = 0.05). To examine the differences in mean scores of social adjustment and post-traumatic stress among the three groups across all stages, a mixed ANOVA was conducted with one within-subjects and one between-subjects factor. Results are presented in Tables 3 and 4.

Table 3. Summary of Mixed ANOVA Results for Social Adjustment

Source	SS	df	MS	F	Sig.	Effect Size
Within-Subjects	Time	10089.523	2	5041.296	2440.587	.000
Time * Group Interaction	2873.896	4	718.474	347.827	.000	.943
Error	173.511	49.739	3.488	—	—	—
Between-Subjects	Group	7150.059	2	3575.03	887.652	.000
Error	169.156	42	4.028	—	—	—

Table 4. Summary of Mixed ANOVA Results for Post-Traumatic Stress

Source	SS	df	MS	F	Sig.	Effect Size
Within-Subjects	Time	11426.90	2	5713.452	1575.033	.000
Time * Group Interaction	5202.385	2.171	2396.459	358.537	.000	.945
Error	304.711	45.588	6.684	—	—	—
Between-Subjects	Group	7783.57	2	3891.785	125.148	.000
Error	1306.089	42	31.097	—	—	—

The three stages—pretest, posttest, and follow-up—were treated as the within-subjects factor, and the group membership (MCT, CBT, or Control) served as the between-subjects factor. According to Tables 3 and 4, the computed F values for both the time factor and time*group interaction were significant at $p < .01$, indicating significant differences in mean scores of social adjustment and post-traumatic stress across time and between groups. Therefore, the null hypothesis was rejected, and the influence of treatment type on the dependent variables was confirmed.

Table 5. Bonferroni Post-Hoc Test Results for Social Adjustment

Comparison	Mean Difference	SE	Sig.
Pretest – Posttest	*20.11	0.381	.000
Pretest – Follow-up	*15.78	0.334	.000
Posttest – Follow-up	*–4.33	0.135	.000
MCT vs. CBT	*4.00	0.42	.000
MCT vs. Control	*–13.04	0.42	.000
CBT vs. Control	*–17.04	0.42	.000

As shown in Table 5, significant differences were observed in social adjustment scores between pretest and both posttest and follow-up stages. Additionally, significant differences were found between both intervention groups (MCT and CBT) and the control group. Mean comparisons indicate that both MCT and CBT groups had significantly lower (i.e., better) social adjustment scores compared to the control group, reflecting the effectiveness of the interventions. A significant difference was also found between the two intervention groups, with MCT proving more effective in enhancing social adjustment.

Table 6. Bonferroni Post-Hoc Test Results for Post-Traumatic Stress

Comparison	Mean Difference	SE	Sig.
Pretest – Posttest	*19.24	0.49	.000
Pretest – Follow-up	*19.78	0.48	.000
Posttest – Follow-up	*0.53	0.12	.000
MCT vs. CBT	–1.64	1.18	.51
MCT vs. Control	*–16.87	1.18	.000
CBT vs. Control	*–15.22	1.18	.000

Table 6 indicates that both the MCT and CBT groups showed significantly lower post-traumatic stress scores compared to the control group, confirming the effectiveness of the interventions. However, no significant difference was found between the two experimental groups in terms of reducing post-traumatic stress. This suggests that while both treatments were effective, neither proved superior to the other in reducing PTSD symptoms.

Discussion and Conclusion

The findings of the present study revealed that both Metacognitive Therapy (MCT) and Cognitive Behavioral Therapy (CBT) significantly improved social adjustment and reduced post-traumatic stress symptoms in individuals diagnosed with Cognitive-Attentional Syndrome. However, the comparison between the two treatment approaches indicated that MCT was more effective than CBT in enhancing social adjustment, while both therapies were equally effective in reducing post-traumatic stress symptoms. This distinction highlights the unique strengths of MCT in addressing social functioning and suggests that interventions targeting metacognitive beliefs may exert broader effects on adjustment-related domains beyond trauma-specific symptoms.

The superior performance of MCT in improving social adjustment is consistent with the foundational premise of the metacognitive model, which attributes maladjustment to sustained activation of the Cognitive-Attentional Syndrome (CAS), characterized by worry, rumination, and threat monitoring maintained by dysfunctional metacognitive beliefs (3). By targeting these beliefs directly and modifying the processes that sustain CAS, MCT helps individuals disengage from perseverative thinking and enhances their capacity to adapt to dynamic social environments (4, 9). This mechanism may explain why participants in

the MCT group experienced more significant improvements in their ability to manage emotional demands, interpersonal expectations, and adaptive behaviors in social contexts.

These findings are supported by previous research emphasizing the relationship between metacognitive dysfunction and social maladjustment. Studies have shown that metacognitive beliefs—particularly beliefs about the uncontrollability and danger of thoughts—are closely associated with poor social functioning, avoidance behaviors, and interpersonal sensitivity (1, 14, 15). Improvements in these areas following MCT intervention align with earlier findings indicating that restructuring metacognitive beliefs contributes to better social, academic, and emotional adjustment (17, 20).

In contrast, the comparable effectiveness of MCT and CBT in reducing post-traumatic stress symptoms suggests shared mechanisms of change in addressing trauma-related pathology. Both approaches utilize structured protocols that promote emotion regulation, reduce avoidance, and expose patients to traumatic memories in a controlled manner (6, 10). However, while CBT emphasizes identifying and modifying distorted thought content related to trauma, MCT focuses on disengaging from maladaptive thinking processes, such as rumination and hypervigilance. This difference may explain why the two interventions achieved similar reductions in trauma-related symptoms but differed in broader domains such as social adjustment.

These outcomes align with empirical evidence demonstrating the efficacy of both MCT and CBT for treating trauma. Meta-analyses have shown that MCT significantly reduces PTSD symptoms and may be superior to CBT in some cases due to its focus on worry regulation and attentional control (12, 24). MCT's emphasis on metacognitive awareness enables individuals to reinterpret intrusive thoughts not as threats but as benign mental events, reducing reactivity and emotional arousal (23). This therapeutic orientation can foster a more sustainable recovery by equipping patients with strategies to interrupt the recursive nature of trauma-related cognitions.

Furthermore, the results corroborate findings from longitudinal and cross-sectional studies linking Cognitive-Attentional Syndrome with elevated trauma symptoms and stress reactivity. Dragan and Grajewski (2023) demonstrated that CAS significantly predicted trauma-related distress during the COVID-19 pandemic, emphasizing the role of metacognitive factors in trauma vulnerability (5). Similarly, Paula and Antônio José (2023) highlighted the interplay between executive dysfunction and attachment disruptions in the development of complex PTSD, suggesting the need for cognitive interventions that enhance attentional control and emotional regulation (22).

Despite CBT's effectiveness, its emphasis on content-based cognitive restructuring may be less suitable for individuals with high levels of metacognitive dysfunction, such as those who believe their thoughts are dangerous or uncontrollable. In such cases, MCT's process-oriented strategies—such as attention training and detached mindfulness—may offer a more direct route to symptom relief by altering the structure of thinking rather than its content (3, 11). This conceptual distinction helps clarify why MCT yielded greater benefits in social adjustment, where adaptive cognitive flexibility and disengagement from self-focused processing are essential for functioning in complex social environments.

The clinical implications of these findings extend to diverse populations, including adolescents, trauma survivors, and individuals with comorbid adjustment disorders. For example, Mohammadi et al. (2019) found that trauma-exposed adolescents often experience comorbid anxiety and adjustment issues,

necessitating interventions that target both trauma processing and adaptive functioning (27). The present study's results suggest that MCT may serve as a dual-action intervention in such contexts, addressing both symptomatic distress and broader psychosocial impairments.

In line with previous findings, MCT's positive influence on emotional regulation and metacognitive flexibility appears to generalize beyond trauma and anxiety. Haryono et al. (2020) demonstrated that metacognitive-based interventions, including meditation and mindfulness practices, significantly reduced stress in patients with chronic health conditions, suggesting the scalability of such approaches to various domains of psychological distress (28). Likewise, Pashang and Khoshlehje (2019) found that MCT improved psychological capital and quality of life among individuals with chronic physical illness, pointing to its broader utility in transdiagnostic treatment models (21).

In conclusion, this study contributes to the growing literature advocating for the clinical relevance of metacognitive frameworks in understanding and treating psychological dysfunction. The results demonstrate that while both MCT and CBT are effective in reducing post-traumatic stress, MCT holds particular promise in enhancing social adjustment. These findings lend empirical support to theoretical models that emphasize the role of metacognitive beliefs in maintaining emotional disorders and maladaptive social behaviors. They also point to the potential for MCT to become a frontline intervention for populations struggling with both trauma-related symptoms and broader psychosocial impairments.

This study has several limitations that should be acknowledged. First, the sample size, though sufficient for repeated-measures analysis, was relatively small and limited to individuals in Tehran, which may restrict the generalizability of the findings to broader populations or other cultural contexts. Second, the reliance on self-report measures may introduce response biases, especially given the sensitive nature of trauma and adjustment issues. Third, while the study employed a follow-up phase, the long-term sustainability of treatment effects beyond that time frame remains unknown. Moreover, potential therapist effects or variations in treatment delivery were not controlled for, which could influence the internal validity of the results.

Future research should consider replicating this study with a larger and more diverse sample to enhance external validity. Longitudinal studies are also recommended to investigate the durability of MCT's effects over extended periods. Additionally, examining mediators and moderators of treatment outcomes—such as emotion regulation, attentional control, or specific metacognitive belief patterns—could provide greater insight into mechanisms of change. Future studies could also compare MCT with other third-wave therapies, such as Acceptance and Commitment Therapy or Mindfulness-Based Cognitive Therapy, to explore potential synergies or distinctions in treatment effectiveness.

Practitioners should consider integrating metacognitive techniques into therapeutic plans for individuals with complex profiles involving trauma and social maladjustment. MCT may be particularly suitable for clients who exhibit high levels of worry, rumination, or cognitive rigidity. Training clinicians in metacognitive formulations and interventions could enhance therapeutic outcomes across diverse clinical settings. Finally, mental health organizations may benefit from adopting MCT-based group interventions to efficiently address transdiagnostic symptomatology, especially in trauma-exposed or high-stress populations.

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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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