

Comparison of the Effectiveness of Rumination-Focused Cognitive Behavioral Therapy and Classical Cognitive Behavioral Therapy on Rumination and Positive Beliefs About Rumination in Individuals With Obesity: A Single-Case Multiple-Baseline Study

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ABSTRACT

The present study aimed to compare the effectiveness of rumination-focused cognitive behavioral therapy and classical cognitive behavioral therapy in reducing rumination and positive beliefs about rumination among individuals with obesity. The study employed a single-case experimental design using a multiple-baseline design across participants. Following screening, six adults with obesity were randomly assigned to two treatment conditions, with three participants in each condition. Baseline phases included four to six measurement points, the intervention phase included eight measurement points, and the follow-up phase included four measurement points. Both interventions were delivered in ten weekly 60-minute sessions; the eight assessment occasions during the intervention phase did not correspond one-to-one with the ten treatment sessions. Rumination was assessed using the Ruminative Responses Scale, and positive beliefs were assessed using the nine-item Positive Beliefs About Rumination Scale. Data were analyzed using visual analysis, percentage improvement, and the Nonoverlap of All Pairs (NAP) and Tau-U indices. The mean of the final two baseline data points in both groups was 76 for rumination and 32 for positive beliefs. At posttreatment, the percentage improvement in rumination was 24.6% in classical cognitive behavioral therapy and 52.7% in rumination-focused cognitive behavioral therapy; at follow-up, these values were 21.7% and 51.8%, respectively. For positive beliefs, posttreatment improvement was 23.9% and 61.5% for the two approaches, respectively, and follow-up improvement was 20.3% and 59.4%, respectively. In comparisons of baseline with intervention, NAP for rumination was near the ceiling in both treatments, whereas Tau-U slightly favored classical cognitive behavioral therapy. In contrast, both indices for positive beliefs favored rumination-focused cognitive behavioral therapy. Individual graphs indicated that reductions in positive beliefs began earlier in the rumination-focused condition and were followed shortly thereafter by an accelerated reduction in rumination. Final score levels, improvement percentages, and visual patterns in this sample favored rumination-focused cognitive behavioral therapy, particularly for positive beliefs about rumination. However, the limited inconsistency in the Tau-U index for rumination indicates that conclusions should be based on convergence across multiple indicators and interpreted cautiously.

Keywords: rumination; positive beliefs about rumination; rumination-focused cognitive behavioral therapy; classical cognitive behavioral therapy; obesity.

1. Introduction

Obesity is a complex and multifactorial health condition that is influenced not only by biological and behavioral factors but also by cognitive and emotional processes that may contribute to the onset, persistence, and recurrence of maladaptive eating patterns. Psychological variables are particularly important because obesity frequently co-occurs with mood disturbance, negative self-evaluation, impaired emotion regulation, and dysfunctional responses to stress. Longitudinal evidence has demonstrated a bidirectional association between obesity and depression, suggesting that individuals with obesity are at elevated risk for subsequent depressive symptoms and that depression itself may increase the likelihood of developing obesity over time (Luppino et al., 2010). Such findings indicate that obesity cannot be conceptualized solely in terms of caloric intake and energy expenditure; rather, the psychological mechanisms that maintain distress and maladaptive behavioral responses warrant direct investigation. Among these mechanisms, repetitive negative thinking, and particularly rumination, has received considerable attention because of its role in sustaining negative affect, limiting adaptive problem solving, and amplifying maladaptive cognitive and behavioral patterns.

Rumination is commonly conceptualized as a repetitive and relatively passive pattern of thinking in which individuals repeatedly focus on the causes, meanings, and consequences of distress without engaging in effective action to resolve the underlying problem. The response styles framework initially emphasized rumination as a cognitive response to depressed mood, but subsequent theoretical and empirical work has established that rumination is broader than a depression-specific phenomenon (Nolen-Hoeksema et al., 2008). Psychometric investigations of the Ruminative Responses Scale have also demonstrated that rumination is not a unitary construct and that different forms, such as brooding and reflection, may have different psychological correlates and consequences (Treynor et al., 2003). This distinction is important because repetitive thinking is not inevitably maladaptive. Its consequences depend on factors such as content, context, purpose, degree of abstractness, emotional valence, and the manner in which individuals engage with repetitive thought (Watkins, 2008). Nevertheless, persistent, abstract, self-focused, and negatively valenced rumination is consistently associated with poor emotional adjustment and reduced capacity to respond flexibly to challenging situations.

A major development in the study of rumination has been its conceptualization as a transdiagnostic process. Rather than being restricted to depressive disorders, repetitive negative thinking appears across a broad range of psychological difficulties and can function as a shared mechanism underlying the development and maintenance of emotional disorders (Ehring & Watkins, 2008). Consistent with this perspective, rumination has been shown to predict and maintain both depressive and anxiety symptoms, supporting its role as a transdiagnostic vulnerability factor rather than a disorder-specific symptom (McLaughlin & Nolen-Hoeksema, 2011). Rumination may prolong emotional arousal, interfere with problem solving, enhance retrieval of negatively valenced autobiographical memories, increase negative cognitive biases, and reduce engagement in rewarding activities. These processes can create a self-perpetuating cycle in which distress prompts further rumination, while rumination itself intensifies distress and reduces the probability of adaptive behavioral responses (Watkins & Roberts, 2020). Accordingly, interventions that directly modify ruminative processing may have broader therapeutic value than approaches that address only the specific content of individual negative thoughts.

Rumination may also be especially relevant in individuals with obesity because it can become intertwined with concerns about eating, body weight, body image, self-criticism, and perceived social evaluation. Evidence from eating-disorder research indicates that rumination is significantly associated with eating-disorder psychopathology and may intensify maladaptive concerns regarding food, shape, and weight (Smith et al., 2018). Among individuals with binge-eating disorder and obesity, greater rumination has also been associated with more severe eating-disorder psychopathology and greater internalization of weight bias (Wang et al., 2017). These associations are clinically important because individuals who repeatedly focus on weight-related failures, eating episodes, perceived loss of control, or stigmatizing social experiences may become increasingly vulnerable to negative affect and maladaptive coping. Rumination may therefore serve as a cognitive mechanism that links emotionally distressing experiences with dysfunctional eating behavior, reduced self-regulation, and persistent dissatisfaction with weight or body image. In this context, directly reducing rumination may be relevant to psychological treatment for individuals with obesity even when weight loss itself is not the immediate therapeutic target.

The persistence of rumination may depend not only on negative emotional states but also on metacognitive beliefs about the presumed usefulness of ruminative thinking. Individuals may believe, for example, that repeatedly analyzing distress will help them understand themselves, solve problems, prevent future mistakes, gain emotional control, or make sense of adverse experiences. Such positive beliefs can encourage the initiation and continuation of rumination even when the process is objectively distressing or ineffective. Metacognitive accounts therefore distinguish the content of negative thoughts from beliefs about the cognitive process itself. Empirical research has demonstrated significant relationships among rumination, worry, metacognitive beliefs, and depressive symptoms, suggesting that beliefs about repetitive thinking may contribute to the maintenance of maladaptive cognitive cycles (Soleimani et al., 2015). Similarly, single-case evidence has shown that interventions targeting metacognitive beliefs can produce reductions in rumination and depressive symptoms, further supporting the clinical importance of metacognitive mechanisms (Dargahian et al., 2011).

The metacognitive model of rumination proposes that positive metacognitive beliefs may facilitate engagement in rumination, whereas negative metacognitive beliefs concerning uncontrollability or harmful consequences may subsequently intensify distress. A systematic review and meta-analysis of clinical and nonclinical samples has provided empirical support for major components of this model and has demonstrated meaningful associations between metacognitive beliefs, rumination, and depressive symptoms (Cano-López et al., 2022). Thus, positive beliefs about rumination can be considered a potentially important treatment target rather than merely an accompanying cognitive feature. This issue may be particularly relevant for individuals with obesity who repeatedly analyze eating behavior, body weight, social comparison, or self-control under the assumption that such analysis will help prevent future difficulties. If these beliefs remain unchallenged, the individual may continue to engage in a repetitive thinking style even after recognizing its emotional costs.

The assessment of both rumination and beliefs about rumination is therefore important in determining therapeutic change. Reliable and valid measures have been developed to assess the frequency and intensity of ruminative responses and the metacognitive beliefs that may support them. The Ruminative Responses Scale has been extensively used in research on repetitive negative thinking, while measures of

positive and negative beliefs about rumination provide a more direct assessment of metacognitive appraisals. Evidence supporting the factorial structure, validity, and reliability of Persian-language measures of ruminative responses and beliefs about rumination has also been reported, supporting their application in Persian-speaking populations (Farrokhi et al., 2017). The availability of psychometrically supported instruments makes it possible to examine not only whether treatment reduces rumination itself, but also whether it changes the beliefs that may sustain ruminative processing.

Classical cognitive behavioral therapy (CBT) is one of the most established psychological treatments for emotional disorders and typically focuses on identifying dysfunctional thoughts, evaluating cognitive distortions, restructuring maladaptive beliefs, increasing adaptive behavior, developing problem-solving skills, and preventing relapse. Classical CBT may indirectly reduce rumination by modifying negative automatic thoughts and improving coping strategies, yet rumination can also function as a process that interferes with conventional cognitive restructuring. When individuals are highly ruminative, attempts to analyze or dispute negative thoughts may sometimes become incorporated into the same repetitive and abstract style of thinking that maintains distress. This limitation contributed to the development of interventions that focus more directly on the process and functional characteristics of rumination rather than exclusively on the content of cognitions.

Rumination-focused cognitive behavioral therapy (RFCBT) was developed specifically to modify maladaptive repetitive thinking by targeting the processes that maintain rumination. The approach emphasizes functional analysis of ruminative episodes, identification of environmental and emotional triggers, differentiation between abstract and concrete processing, cultivation of more specific and experiential modes of thinking, behavioral activation, attention training, and development of alternative responses to triggers (Watkins, 2016). The theoretical foundation of RFCBT is closely connected to the distinction between constructive and unconstructive repetitive thought, according to which abstract, evaluative, and decontextualized processing is more likely to produce adverse outcomes, whereas concrete and context-sensitive processing can support adaptive problem solving (Watkins, 2008). Accordingly, RFCBT seeks not merely to suppress thoughts but to alter how individuals process experiences and respond to the onset of rumination.

Initial clinical evidence has supported the therapeutic potential of RFCBT. In a randomized controlled trial involving individuals with residual depression, rumination-focused CBT produced meaningful improvements in rumination and depressive symptoms, indicating that direct modification of ruminative processes can yield clinically significant benefits (Watkins et al., 2011). Subsequent work has extended these findings across different formats and populations. A web-based randomized controlled trial demonstrated that RFCBT could reduce stress-related vulnerability and prevent worsening depressive symptoms among highly ruminative university students, suggesting that the approach can be delivered effectively beyond traditional face-to-face clinical settings (Cook et al., 2019). More recent theoretical work has further clarified the mechanisms, antecedents, consequences, and treatment implications of rumination and has reinforced the rationale for process-focused interventions (Watkins & Roberts, 2020).

Comparative evidence between RFCBT and classical CBT is particularly relevant because both approaches may reduce distress through partially overlapping but theoretically distinct mechanisms. In a phase II trial comparing group RFCBT with group CBT for depression, both interventions demonstrated therapeutic benefit, while the findings also supported further investigation of whether directly targeting rumination offers specific advantages over conventional cognitive-behavioral methods (Hvenegaard et al., 2020). Similar comparative research has reported reductions in rumination and depressive symptoms after both rumination-focused and classical CBT, while suggesting potentially different magnitudes or patterns of change between the two approaches (Moayedfar et al., 2020). Iranian research has likewise indicated that RFCBT can reduce rumination and depressive symptoms and improve problem-solving strategies, providing evidence for the applicability of this treatment within Persian-speaking clinical contexts (Eshtad et al., 2022).

The evidence base for RFCBT has expanded in recent years. A systematic review of the effects of RFCBT on depressive symptoms concluded that the intervention shows promising efficacy, particularly through its explicit focus on repetitive negative thinking and related cognitive processes (Li & Tang, 2024). In addition, a recent randomized multicenter clinical trial among patients with recurrent major depressive disorder found that RFCBT was effective in reducing depression, negative affect, and rumination, providing further support for its clinical efficacy in

populations characterized by persistent and recurrent emotional difficulties (Hasani et al., 2025). These findings strengthen the rationale for examining RFCBT in other populations in which rumination may contribute to psychological vulnerability, including individuals with obesity.

Despite the growing evidence supporting RFCBT, relatively little research has specifically examined whether its potential advantage extends to individuals with obesity and, more importantly, whether it produces stronger changes in positive beliefs about rumination. This distinction is theoretically meaningful. Classical CBT may successfully reduce distress and dysfunctional cognitions, but RFCBT explicitly addresses the functional role of rumination and may therefore have a more immediate impact on the metacognitive beliefs that sustain repetitive thinking. If positive beliefs about rumination decline early in treatment, individuals may become less willing to engage in prolonged abstract self-analysis, potentially allowing subsequent reductions in rumination itself. Examining the temporal and individual pattern of change is therefore valuable, particularly when the purpose is to understand whether change in beliefs about rumination accompanies or precedes reductions in rumination.

A single-case experimental design is particularly suitable for examining such questions because it allows repeated assessment of each participant across baseline, intervention, and follow-up phases. Unlike group-level designs that primarily summarize average differences between conditions, single-case designs permit detailed evaluation of within-person changes, temporal correspondence between intervention onset and outcome change, replication across individuals, and variability in treatment response (Kazdin, 2011). Multiple-baseline designs further strengthen causal inference when treatment effects are reproduced across participants whose intervention phases begin after different baseline lengths (Kratichwill et al., 2010). Such designs can therefore provide clinically informative evidence in early-stage comparative research, particularly when participant numbers are necessarily limited.

Interpretation of single-case data also requires convergence between visual inspection and quantitative indices. Visual analysis traditionally considers changes in level, trend, variability, immediacy of effect, overlap, and consistency across phases, but quantitative effect-size indicators can increase the transparency and reproducibility of interpretation. The Nonoverlap of All Pairs (NAP) index was introduced as an improved nonoverlap measure for

single-case research and quantifies the proportion of pairwise baseline-to-intervention comparisons that demonstrate improvement (Parker & Vannest, 2009). Tau-U subsequently extended this framework by combining nonoverlap with adjustment for baseline trend, thereby providing a more refined index when the baseline is not completely stable (Parker et al., 2011). More recent methodological work has emphasized that selection and interpretation of Tau-U should depend on the characteristics of the single-case data and that researchers should carefully determine whether and how baseline trend correction is appropriate (Fingerhut et al., 2021). Thus, relying on multiple indicators rather than a single effect-size statistic is consistent with contemporary methodological recommendations.

The present study was therefore designed to address both clinical and methodological gaps by examining rumination and positive beliefs about rumination as distinct but related therapeutic outcomes in adults with obesity. Comparing classical CBT with RFCBT makes it possible to assess whether a treatment explicitly focused on the process and function of rumination yields greater improvements than a broader cognitive-behavioral approach. Repeated measurement across multiple-baseline, intervention, and follow-up phases also enables examination of the stability, timing, magnitude, and maintenance of change at the level of individual participants. Given the established relationship of rumination with emotional disorders, eating-related psychopathology, weight-bias internalization, and metacognitive beliefs, this comparison may contribute to a more precise understanding of how cognitive-behavioral interventions can be tailored to the psychological processes relevant to obesity.

Accordingly, the aim of the present study was to compare the effectiveness of rumination-focused cognitive behavioral therapy and classical cognitive behavioral therapy in reducing rumination and positive beliefs about rumination in individuals with obesity using a single-case multiple-baseline design.

2. Methods and Materials

2.1. Study Design and Participants

The present study was part of a single-case experimental study employing a multiple-baseline design across participants, a design that allows examination of within-person changes and replication of intervention effects across baselines of varying lengths (Kazdin, 2011; Kratochwill et al., 2010). The target population consisted of adults aged 18 to 50 years with obesity residing in Shiraz. The sample was selected purposively following the screening of 20 volunteers. The main inclusion criteria were a body mass index (BMI) of 30 or higher, informed willingness to participate, the ability to attend sessions regularly, and a clinically meaningful level of rumination. Exclusion criteria included severe psychiatric disorders or an acute clinical condition, serious risk of self-harm, concurrent participation in another psychotherapy, major changes in psychiatric medications or medications affecting body weight, severe physical illness, repeated absences, and failure to complete the primary assessments. Ultimately, six individuals entered the study and were randomly assigned to the two treatment conditions. Participants 1, 3, and 5 received classical cognitive behavioral therapy, whereas Participants 2, 4, and 6 received rumination-focused cognitive behavioral therapy.

Table 1

Structure of the Baseline, Intervention, and Follow-Up Phases for Participants

Participant	Treatment Condition	Baseline Length	Baseline Points	Intervention Points	Follow-Up Points
1	Classical cognitive behavioral therapy	14 days	4	8	4
2	Rumination-focused cognitive behavioral therapy	28 days	6	8	4
3	Classical cognitive behavioral therapy	21 days	5	8	4
4	Rumination-focused cognitive behavioral therapy	14 days	4	8	4
5	Classical cognitive behavioral therapy	28 days	6	8	4
6	Rumination-focused cognitive behavioral therapy	21 days	5	8	4

2.2. Instruments

Rumination was assessed using the Ruminative Responses Scale. This instrument consists of 22 items rated on a four-point scale; therefore, total scores range from 22 to 88, with higher scores indicating a greater tendency toward ruminative responding (Nolen-Hoeksema & Morrow, 1991; Treynor et al., 2003).

Positive beliefs about rumination were measured using the nine-item Positive Beliefs About Rumination Scale developed by Papageorgiou and Wells. Each item is scored from 1 to 4, resulting in a total score ranging from 9 to 36; higher scores indicate stronger endorsement of the perceived usefulness of rumination (Papageorgiou & Wells, 2001). Evidence regarding the factorial structure, validity, and reliability of the Persian version of this scale has also been reported (Farrokhi et al., 2017).

2.3. Intervention

Both interventions were delivered in ten weekly 60-minute sessions and were structurally matched with respect to session duration, homework assignments, and the repeated-assessment schedule. The interventions were administered by the researcher, who held a master's degree in clinical psychology and had specialized training in cognitive behavioral therapy. In classical cognitive behavioral therapy, Sessions 1 and 2 were devoted to assessment, cognitive formulation, and goal setting; Sessions 3 and 4 focused on behavioral activation and identification of automatic thoughts; Sessions 5 and 6 addressed cognitive restructuring and problem solving; Sessions 7 and 8 focused on emotion regulation and exposure to triggers; and Sessions 9 and 10 were devoted to skill consolidation and relapse prevention. In rumination-focused cognitive behavioral therapy, Sessions 1 and 2 focused on the functional formulation of rumination and monitoring its contextual antecedents; Sessions 3 and 4 addressed the distinction between abstract and concrete processing and included concreteness training; Sessions 5 and 6 focused on testing positive beliefs, absorption, and flexible attention; Sessions 7 and 8 addressed alternative behavioral responses and self-compassion; and Sessions 9 and 10 focused on generalization of skills and prevention of rumination relapse (Watkins, 2016). The intervention phase comprised eight assessment occasions; these assessment points did not correspond one-to-one with the ten therapy sessions and are therefore reported as assessment occasions

rather than session numbers. The exact time intervals between assessment occasions were not documented in the available records; consequently, no more precise temporal schedule was attributed to the data. No independent assessor was employed in this study, and blinding was not implemented. Treatment fidelity was also not assessed systematically. These issues were taken into consideration in the interpretation of the findings and in the limitations section.

2.4. Data analysis

Data analysis was based on the convergence of visual analysis and quantitative indices. Visual analysis examined level, trend, variability, immediacy of effect, degree of overlap, and maintenance of effects during follow-up. For both variables, lower scores indicated improvement. Percentage improvement at the end of treatment was calculated using the following formula: “the mean of the final two baseline data points minus the end-of-treatment score, divided by the mean of the final two baseline data points, multiplied by 100.” For follow-up, the mean follow-up score was substituted for the end-of-treatment score. The Nonoverlap of All Pairs (NAP) index represented the proportion of pairwise comparisons between baseline and the subsequent phase that were in the direction of improvement. Tau-U combined nonoverlap with correction for a possible baseline trend (Fingerhut et al., 2021; Parker et al., 2011; Parker & Vannest, 2009). The primary unit of analysis was the individual participant. Group-level NAP and Tau-U values were obtained by calculating the arithmetic mean of the values for the three participants in each treatment condition and were used solely as descriptive summaries. No single index was used as the sole basis for inference; instead, the final interpretation was based on convergence across participant-level visual analysis, percentage improvement, NAP, and Tau-U.

3. Findings and Results

The mean of the final two baseline data points was identical in the two groups: the mean rumination score was 76 in both groups, and the mean positive-beliefs-about-rumination score was 32. Baseline scores were high, showed little variability, and lacked a systematic downward trend; therefore, subsequent reductions could not be regarded merely as a continuation of a pre-existing decreasing trend. Following the initiation of the intervention, scores on both variables decreased under both treatment conditions.

Examination of the individual graphs indicated that, in all three participants receiving rumination-focused cognitive behavioral therapy, reductions in positive beliefs emerged earlier and were larger in magnitude, followed by an

accelerated decline in rumination. Among participants receiving classical cognitive behavioral therapy, changes were more gradual and more limited.

Table 2

Individual Changes in Rumination

Participant	Group	Final Baseline	End of Treatment	Follow-Up Mean	End-of-Treatment Improvement	Follow-Up Improvement
1	Classical cognitive behavioral therapy	74.00	56.00	58.00	24.3%	21.6%
2	Rumination-focused cognitive behavioral therapy	78.00	38.00	38.50	51.3%	50.6%
3	Classical cognitive behavioral therapy	76.00	57.00	59.50	25.0%	21.7%
4	Rumination-focused cognitive behavioral therapy	74.00	34.00	34.50	54.1%	53.4%
5	Classical cognitive behavioral therapy	78.00	59.00	61.00	24.4%	21.8%
6	Rumination-focused cognitive behavioral therapy	76.00	36.00	37.00	52.6%	51.3%

Table 3

Individual Changes in Positive Beliefs About Rumination

Participant	Group	Final Baseline	End of Treatment	Follow-Up Mean	End-of-Treatment Improvement	Follow-Up Improvement
1	Classical cognitive behavioral therapy	31.00	24.00	25.00	22.6%	19.4%
2	Rumination-focused cognitive behavioral therapy	33.00	13.00	13.50	60.6%	59.1%
3	Classical cognitive behavioral therapy	32.00	24.00	25.50	25.0%	20.3%
4	Rumination-focused cognitive behavioral therapy	31.00	12.00	12.50	61.3%	59.7%
5	Classical cognitive behavioral therapy	33.00	25.00	26.00	24.2%	21.2%
6	Rumination-focused cognitive behavioral therapy	32.00	12.00	13.00	62.5%	59.4%

Table 4

Group Summary of Improvement Percentages

Variable	Classical Baseline	Rumination-Focused Baseline	Classical End of Treatment	Rumination-Focused End of Treatment	Classical Follow-Up	Rumination-Focused Follow-Up
Rumination	76.00	76.00	24.6%	52.7%	21.7%	51.8%
Positive beliefs about rumination	32.00	32.00	23.9%	61.5%	20.3%	59.4%

At the end of treatment, the difference between the two groups in percentage improvement was 28.1 percentage points for rumination and 37.6 percentage points for positive beliefs. At follow-up, these differences increased to 30.1 and 39.1 percentage points, respectively. Thus, in this sample,

rumination-focused cognitive behavioral therapy was associated with greater descriptive reductions at both posttreatment and follow-up. Nevertheless, these differences should be interpreted within the context of the small sample size and the single-case nature of the study.

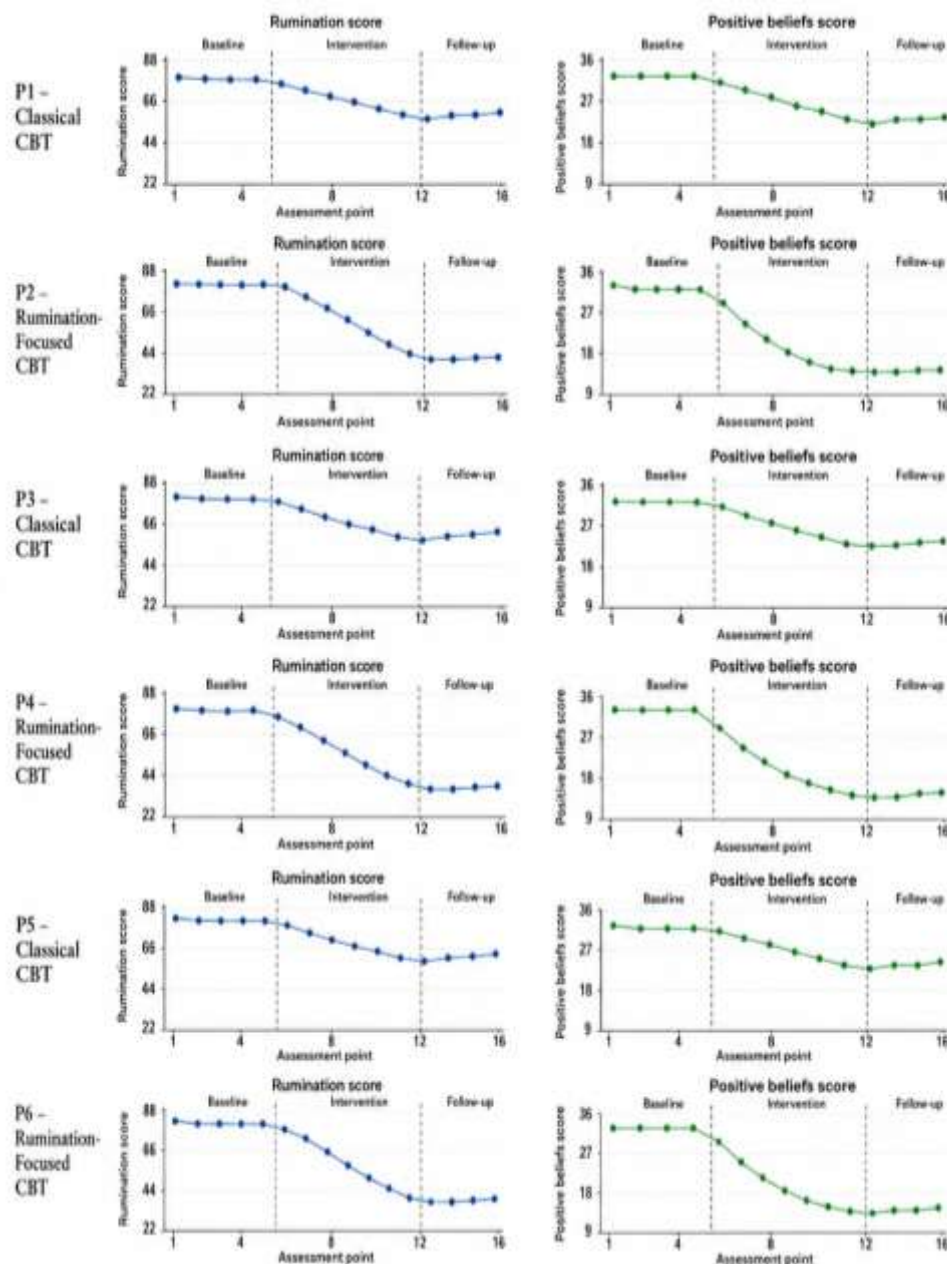
Table 5

Group Summary of NAP and Tau-U Indices

Variable	Comparison	Classical NAP	Rumination-Focused NAP	Classical Tau-U	Rumination-Focused Tau-U
Rumination	Baseline to intervention	1.000	0.993	0.967	0.908
Rumination	Baseline to follow-up	1.000	1.000	0.967	0.922
Positive beliefs	Baseline to intervention	0.943	1.000	0.664	0.800
Positive beliefs	Baseline to follow-up	1.000	1.000	0.778	0.800

Figure 1

Trajectories of rumination scores and positive-beliefs-about-rumination scores for participants across the baseline, intervention, and follow-up phases.



For rumination, baseline-to-intervention NAP was 1.000 for classical cognitive behavioral therapy and 0.993 for rumination-focused cognitive behavioral therapy, while Tau-U values were 0.967 and 0.908, respectively. Thus, the nonoverlap indices for rumination did not indicate an advantage for rumination-focused treatment, and Tau-U slightly favored classical cognitive behavioral therapy. A different pattern was observed for positive beliefs: NAP increased from 0.943 in classical cognitive behavioral therapy to 1.000 in rumination-focused cognitive behavioral therapy, while Tau-U increased from 0.664 to 0.800. At follow-up, NAP reached 1.000 for both variables under both treatment conditions. Tau-U for rumination was 0.967 in classical cognitive behavioral therapy and 0.922 in rumination-focused cognitive behavioral therapy, whereas Tau-U for positive beliefs was 0.778 and 0.800, respectively. Accordingly, the clearest relative advantage of rumination-focused cognitive behavioral therapy was observed for positive beliefs and in the final score levels and improvement percentages, rather than across all indices of rumination.

For the primary baseline-to-intervention comparison, individual NAP and Tau-U values for rumination for Participants 1 through 6, respectively, were as follows: 1.000 and 1.000; 0.979 and 0.892; 1.000 and 0.900; 1.000 and 0.833; 1.000 and 1.000; and 1.000 and 1.000.

For positive beliefs about rumination, individual NAP and Tau-U values for Participants 1 through 6, respectively, were as follows: 1.000 and 0.333; 1.000 and 1.000; 0.912 and 0.825; 1.000 and 1.000; 0.917 and 0.833; and 1.000 and 0.400. These values indicate that the group-level summaries should be interpreted in conjunction with the heterogeneity of response patterns across individual participants.

As shown in Figures 1 through 6, the point-by-point trajectories of rumination scores and positive-beliefs-about-rumination scores are presented for each participant across the baseline, intervention, and follow-up phases. Participants 1, 3, and 5 received classical cognitive behavioral therapy, whereas Participants 2, 4, and 6 received rumination-focused cognitive behavioral therapy.

4. Discussion

The present study compared the effectiveness of rumination-focused cognitive behavioral therapy (RFCBT) and classical cognitive behavioral therapy (CBT) in reducing rumination and positive beliefs about rumination among adults with obesity using a single-case multiple-baseline

design. Overall, the findings indicated that both interventions were associated with reductions in rumination and positive beliefs about rumination from baseline to intervention and follow-up; however, RFCBT produced substantially greater reductions in the final score levels and percentage improvement for both outcomes. The difference was especially pronounced for positive beliefs about rumination. At the end of treatment, improvement in rumination was 24.6% in the classical CBT condition and 52.7% in the RFCBT condition, while corresponding follow-up values were 21.7% and 51.8%. For positive beliefs about rumination, improvement at the end of treatment was 23.9% under classical CBT and 61.5% under RFCBT, with follow-up values of 20.3% and 59.4%, respectively. Visual inspection also showed that, among participants receiving RFCBT, reductions in positive beliefs tended to occur earlier and with greater magnitude, followed by an acceleration in the decline of rumination. Nevertheless, the nonoverlap indices did not uniformly favor RFCBT: for rumination, NAP was near the ceiling in both conditions and Tau-U slightly favored classical CBT, whereas for positive beliefs both NAP and Tau-U showed a clearer advantage for RFCBT. Thus, the results suggest a stronger descriptive effect of RFCBT, particularly on metacognitive beliefs about rumination, while also underscoring the importance of interpreting single-case findings through convergence across multiple indicators rather than relying on any single effect-size index.

The finding that RFCBT produced marked reductions in rumination is consistent with the theoretical premise that rumination is not simply a collection of negative cognitions but a repetitive processing style that can itself become a treatment target. Rumination-focused interventions are designed to modify the function, mode, and context of repetitive thinking rather than merely challenge the propositional content of individual thoughts (Watkins, 2016). This distinction is important because maladaptive rumination is typically characterized by abstract, evaluative, decontextualized, and repetitive thinking, whereas more concrete and context-sensitive processing is associated with improved problem solving and emotional adaptation (Watkins, 2008). By helping participants identify the triggers and consequences of rumination, shift from abstract to concrete processing, engage in alternative behavioral responses, and develop greater attentional flexibility, RFCBT may have disrupted the processes that maintained repetitive negative thinking more directly than classical CBT.

The present reduction in rumination is also consistent with accumulating clinical evidence regarding RFCBT. Watkins and colleagues demonstrated that a treatment specifically focused on rumination produced significant improvement in residual depressive symptoms and ruminative thinking, supporting the proposition that directly modifying repetitive negative thinking can yield clinically meaningful benefits (Watkins et al., 2011). Similar findings have been reported in later clinical and preventive applications. A randomized trial of web-based RFCBT among highly ruminative university students demonstrated reductions in risk-related cognitive and emotional processes, suggesting that rumination can be modified across different delivery formats and populations (Cook et al., 2019). More recently, evidence from a multicenter randomized clinical trial showed that RFCBT reduced rumination, depressive symptoms, and negative affect among individuals with recurrent major depressive disorder (Hasani et al., 2025). The present findings extend this general pattern to adults with obesity and suggest that the therapeutic value of targeting rumination may not be confined to samples selected primarily on the basis of depressive disorders.

The findings are further consistent with evidence from Persian-speaking samples. Eshtad and colleagues found that RFCBT significantly reduced rumination and depressive symptoms while improving problem-solving strategies (Eshtad et al., 2022). Likewise, comparative research has suggested that both RFCBT and classical CBT can reduce rumination and depressive symptoms, while the degree and pattern of improvement may differ between approaches (Moayedfar et al., 2020). The current results reinforce this comparative perspective. Classical CBT was clearly associated with improvement, but the magnitude of reduction in final scores and improvement percentages was smaller than that observed in RFCBT. This difference may reflect the fact that classical CBT addresses a broad range of cognitive and behavioral mechanisms, whereas RFCBT concentrates therapeutic attention on the mechanisms most directly responsible for persistent repetitive thinking. In individuals whose difficulties are strongly maintained by rumination, a more process-specific intervention may therefore produce a stronger effect on the targeted cognitive mechanism.

The observed superiority of RFCBT in positive beliefs about rumination is particularly important. Positive metacognitive beliefs may include assumptions that rumination is useful for understanding problems, preventing mistakes, controlling emotions, gaining insight, or preparing

for future difficulties. Such beliefs may motivate individuals to initiate and persist in rumination even when the process worsens distress. Evidence supporting the metacognitive model indicates that beliefs about the usefulness and consequences of rumination are meaningfully associated with ruminative processing and depressive symptoms across both clinical and nonclinical samples (Cano-López et al., 2022). Research has also demonstrated associations among rumination, worry, metacognitive beliefs, and depressive symptomatology, supporting the idea that beliefs about thinking play an important role in maintaining repetitive negative cognition (Soleimani et al., 2015). The marked reductions in positive beliefs observed in RFCBT may therefore indicate that the treatment successfully altered an important maintaining mechanism rather than merely reducing the surface frequency of ruminative thoughts.

The temporal visual pattern observed in this study provides additional support for this explanation. In participants receiving RFCBT, positive beliefs about rumination appeared to decline earlier than rumination itself, after which the reduction in rumination became more pronounced. Although this pattern cannot establish mediation in a single-case study of this size, it is theoretically plausible that weakening beliefs regarding the presumed usefulness of rumination reduces motivation to engage in the process, thereby facilitating subsequent reductions in ruminative responding. Metacognitive treatment studies have similarly indicated that modifying metacognitive beliefs can be accompanied by reductions in rumination and emotional symptoms (Dargahian et al., 2011). Thus, one possible interpretation of the present pattern is that RFCBT initially undermined the perceived value or necessity of rumination and then enabled participants to disengage more effectively from repetitive negative thinking.

The findings may also be understood in relation to the transdiagnostic conceptualization of rumination. Repetitive negative thinking has been described as a process that cuts across diagnostic categories and contributes to the maintenance of diverse emotional problems (Ehring & Watkins, 2008). Rumination is also implicated in both depression and anxiety, suggesting that its effects are not restricted to a single symptom cluster (McLaughlin & Nolen-Hoeksema, 2011). This is particularly relevant in obesity, where psychological difficulties may involve combinations of negative affect, self-criticism, body dissatisfaction, eating-related concerns, and experiences of stigma. A process-focused intervention may therefore be

useful because it addresses a mechanism that can operate across several domains of distress rather than targeting a single disorder-specific belief system. The broader literature on rumination has emphasized that persistent repetitive thinking can amplify negative mood, impair problem solving, narrow attentional focus, and reduce adaptive behavioral engagement (Nolen-Hoeksema et al., 2008; Watkins & Roberts, 2020). Reducing this process may consequently have benefits that extend beyond the immediate cognitive outcome measured in the present study.

The relevance of rumination to obesity is further supported by studies linking repetitive negative thinking to eating-related psychopathology. Meta-analytic evidence indicates a meaningful association between rumination and eating-disorder symptoms, suggesting that individuals who engage more strongly in repetitive negative thought also tend to report greater disturbances related to eating, shape, and weight (Smith et al., 2018). In individuals with obesity and binge-eating disorder, rumination has also been associated with greater eating-disorder psychopathology and internalized weight bias (Wang et al., 2017). These findings provide a plausible context for the strong response observed in the RFCBT condition. Individuals with obesity may repeatedly analyze eating episodes, body weight, perceived failures in self-control, social comparison, and stigmatizing experiences. Such repetitive processing may intensify negative affect and reinforce maladaptive coping. By helping participants disengage from this style of thinking and replace it with more concrete, functional, and behaviorally oriented responses, RFCBT may interrupt a psychologically relevant maintenance loop.

The present findings should also be interpreted against the established association between obesity and depression. Longitudinal meta-analytic evidence has shown a bidirectional relationship in which obesity increases the risk of subsequent depression and depression increases the risk of later obesity (Luppino et al., 2010). Although depressive symptoms were not the primary outcome in the current investigation, rumination may represent one mechanism that helps explain this reciprocal relationship. Persistent self-focused negative thinking can prolong dysphoria and impair coping, while obesity-related distress may itself provide recurring triggers for rumination. Therefore, reducing rumination may be clinically relevant in obesity even when treatment is not designed primarily as an intervention for depression.

Another important finding was that both interventions produced very high NAP values for rumination, with NAP

reaching or approaching 1.00. This indicates that scores during intervention and follow-up showed very little overlap with baseline scores. However, Tau-U for rumination was slightly higher in classical CBT than in RFCBT. This apparent discrepancy illustrates an important methodological issue in single-case research. NAP summarizes the proportion of pairwise comparisons showing nonoverlap in the therapeutic direction (Parker & Vannest, 2009), whereas Tau-U combines nonoverlap with adjustment for baseline trend (Parker et al., 2011). Consequently, two interventions can show similar or nearly complete nonoverlap while producing somewhat different Tau-U values depending on baseline characteristics and trend correction. Current methodological guidance emphasizes that Tau-U should be selected and interpreted carefully and that different versions or corrections may yield different conclusions when baseline trends are present (Fingerhut et al., 2021). Accordingly, the present findings should not be interpreted as indicating that classical CBT was superior for rumination simply because its Tau-U value was modestly higher.

Instead, the convergence of final score levels, percentage improvement, individual trajectories, and maintenance at follow-up provides stronger descriptive evidence for greater change under RFCBT. This interpretation is also consistent with methodological recommendations that single-case research should integrate visual and quantitative evidence. Single-case experimental methodology places primary emphasis on replicated within-participant change and the temporal relationship between phase transitions and outcome trajectories (Kazdin, 2011). Multiple-baseline designs strengthen inference when change occurs after intervention introduction across baselines of different lengths (Kratochwill et al., 2010). In the present study, the relatively stable baseline patterns followed by decreases after treatment onset across participants support an intervention-related interpretation, although the small number of cases means that causal conclusions should remain appropriately bounded.

The relative advantage of RFCBT for positive beliefs may also help explain why percentage improvement in rumination remained substantially higher at follow-up. If treatment changes only the immediate content of negative thoughts, gains may be vulnerable when similar triggers recur. In contrast, altering beliefs about the utility of rumination and teaching alternative modes of processing may provide a more durable framework for responding to future stressors. RFCBT explicitly trains individuals to

recognize rumination as a behavioral and cognitive habit, identify its triggers, evaluate its consequences, and intentionally shift toward alternative strategies (Watkins, 2016). Such learning may support maintenance because the individual acquires a generalized response to the process of rumination itself rather than only a set of responses to specific thought contents. The relatively small decline in improvement from posttreatment to follow-up in the RFCBT group is compatible with this interpretation.

The overall findings are also consistent with broader reviews of RFCBT. A systematic review concluded that RFCBT is a promising intervention for reducing depressive symptoms and related ruminative processes, while also emphasizing the need for further studies across populations and settings (Li & Tang, 2024). Comparative trial evidence has likewise shown that both group RFCBT and group CBT can be beneficial, while leaving open the question of whether process-focused treatment offers particular advantages for specific outcomes or subgroups (Hvenegaard et al., 2020). The present study contributes to this literature by suggesting that positive beliefs about rumination may be one outcome for which a more targeted treatment advantage is especially visible. At the same time, because all participants improved to some extent under both approaches, the results should not be interpreted as undermining the effectiveness of classical CBT. Rather, they suggest that matching treatment emphasis to the maintaining cognitive process may enhance therapeutic effects in individuals characterized by substantial rumination.

An additional implication concerns the measurement of rumination itself. Rumination is multidimensional, and psychometric work has distinguished relatively maladaptive brooding from more reflective forms of repetitive thought (Treyner et al., 2003). Moreover, repetitive thought can have either constructive or unconstructive consequences depending on processing mode and context (Watkins, 2008). The present study measured overall ruminative responding and therefore cannot determine whether RFCBT differentially affected specific subtypes of rumination. Nevertheless, the substantial decline in total rumination alongside an even larger reduction in positive beliefs suggests that participants may have changed both the frequency of repetitive thinking and their relationship to it. The availability of validated Persian measures of rumination and beliefs about rumination further supports the interpretability of these changes in the present cultural context (Farrokhi et al., 2017).

5. Conclusion

Taken together, the current findings suggest that both classical CBT and RFCBT can reduce rumination and positive beliefs about rumination in adults with obesity, but that RFCBT may yield greater reductions in the final level of both outcomes, particularly in metacognitive beliefs regarding the usefulness of rumination. The pattern is theoretically consistent with process-based accounts of repetitive negative thinking and empirically aligned with clinical studies showing that directly targeting rumination can reduce maladaptive repetitive thought and related emotional symptoms (Cook et al., 2019; Eshtad et al., 2022; Hasani et al., 2025; Watkins et al., 2011). However, the slight inconsistency between some nonoverlap statistics for rumination reinforces the need for cautious interpretation. The most defensible conclusion is therefore based on the convergence of visual patterns, percentage improvement, final score levels, maintenance during follow-up, and quantitative nonoverlap measures rather than on any individual statistic.

The present study has several limitations. First, the sample consisted of only six participants, which substantially restricts the generalizability of the findings beyond the cases studied. Second, although the multiple-baseline design provided repeated within-person observations, the absence of a no-treatment control condition limits comparison with spontaneous change or nonspecific therapeutic influences. Third, the researcher administered the interventions and no independent assessor or blinding procedure was used, which may have introduced expectancy or observer-related bias. Treatment fidelity was not evaluated systematically, making it impossible to quantify adherence to the intended protocols. In addition, the exact intervals between repeated intervention assessments were not available in the study records, which restricts precise interpretation of the temporal course of change. Outcomes were based on self-report measures, and no behavioral, physiological, eating-related, or weight-related indices were included. Finally, the follow-up period was relatively limited, preventing conclusions regarding the long-term durability of the observed effects.

Future research should replicate these findings in larger and more heterogeneous samples and should employ adequately powered randomized controlled trials alongside replicated single-case studies. Studies should include longer follow-up periods to determine whether reductions in rumination and positive beliefs persist over several months

and whether they translate into changes in eating behavior, emotional eating, binge eating, body image, weight-related self-stigma, and weight-management outcomes. Future investigations could also test whether changes in positive beliefs about rumination mediate subsequent reductions in rumination and whether early changes in these beliefs predict treatment response. More detailed measurement of rumination subtypes, including brooding and reflection, would help clarify which components are most responsive to RFCBT. Researchers should additionally incorporate independent assessors, formal treatment-fidelity procedures, standardized measurement intervals, ecological momentary assessment, and objective behavioral outcomes to strengthen internal validity and provide a more fine-grained account of how change unfolds during treatment.

In clinical practice, the findings suggest that assessment of rumination and beliefs about the usefulness of rumination may be valuable when working with individuals with obesity, particularly when repetitive self-focused thinking is prominent. Practitioners may benefit from explicitly assessing whether clients view rumination as a useful strategy for understanding problems, preventing mistakes, controlling eating, or managing distress. When these beliefs are strong, incorporating techniques that target the function of rumination, promote concrete processing, increase attentional flexibility, strengthen alternative behavioral responses, and reduce habitual engagement with repetitive negative thinking may complement standard cognitive-behavioral interventions. Treatment planning should remain individualized, and clinicians should monitor response patterns across sessions rather than assuming that one approach is universally superior. Integrating rumination-focused strategies into broader obesity-related psychological care may be particularly useful when emotional distress, self-criticism, or persistent weight-related preoccupation interferes with adaptive coping and behavioral change.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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Ethical Considerations

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

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