Review

Psikiyatride Güncel Yaklaşımlar-Current Approaches in Psychiatry 2026; 18(1):332-353

doi: 10.18863/pgy.1621073

Effectiveness of Metacognitive Therapy in the Treatment of Generalized Anxiety Disorder: A Systematic Review

Yaygın Anksiyete Bozukluğunun Tedavisinde Üstbilişsel Terapinin Etkililiği: Sistematik Bir Gözden Geçirme

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ABSTRACT

Metacognitive therapy has become a field of increasing interest in the treatment of generalized anxiety disorder and has increasingly been discussed in literature. This study aimed to review the effectiveness of metacognitive therapy in the treatment of generalized anxiety disorder. Accordingly, a review of ScienceDirect, PubMed, Web of Science, and EBSCOHost databases revealed that 11 studies met the inclusion and exclusion criteria. The included studies were evaluated in various aspects such as sample, methodology and results. The results of the review revealed that patients diagnosed with generalized anxiety disorder who receive metacognitive therapy have significantly reduced levels of worry and anxiety and that the majority of these patients demonstrate clinical recovery. Following metacognitive therapy, it was determined that the proportion of patients who no longer met the diagnostic criteria for generalized anxiety disorder and completely recovered was relatively high. The results also demonstrate that metacognitive therapy yields higher recovery rates than applied relaxation, cognitive behavioral therapy and intolerance of uncertainty therapy and stands out as a more effective treatment option in the short and long term. Metacognitive therapy significantly reduces both positive and negative metacognitive beliefs, which play critical role in the development and maintenance of generalized anxiety disorder. Furthermore, metacognitive therapy is an effective intervention in the treatment of generalized anxiety disorder, regardless of whether it is applied in an individual or group format.

Keywords: Metacognitive therapy, generalized anxiety disorder, effectiveness, systematic review

ÖZ

Üstbilişsel terapi, yaygın anksiyete bozukluğunun tedavisinde giderek artan bir ilgi görmekte ve alan yazında daha sık ele alınmaktadır. Bu araştırmanın amacı yaygın anksiyete bozukluğunun tedavisinde üstbilişsel (metakognitif) terapinin etkililiğini gözden geçirmektir. Bu doğrultuda ScienceDirect, PubMed, Web of Science ve EBSCOHost veri tabanlarında yapılan tarama sonucunda, belirlenen dahil etme ve dışlama kriterlerini karşılayan 11 araştırma olduğu görülmüştür. Çalışmaya dahil edilen araştırmalar örneklem, yöntem ve sonuçlar gibi çeşitli yönlerden değerlendirilmiştir. Gözden geçirme sonuçları, üstbilişsel terapi alan yaygın anksiyete bozukluğu tanısı olan hastaların endişe ve anksiyete düzeylerinin önemli ölçüde azaldığını ve bu hastaların büyük çoğunluğunun klinik düzeyde iyileşme gösterdiğini ortaya koymaktadır. Üstbilişsel terapi sonrasında yaygın anksiyete bozukluğu tanı kriterlerini artık karşılamayarak tamamen iyileşen hastaların oranının ise oldukça yüksek olduğu tespit edilmiştir. Araştırma sonuçları ayrıca üstbilişsel terapinin gevşeme uygulaması, bilişsel davranışçı terapi ve belirsizliğe tahammülsüzlük terapisiyle karşılaştırıldığında daha yüksek iyileşme oranları sağladığını ve hem kısa hem de uzun vadede daha etkili bir tedavi seçeneği olarak öne çıktığını göstermektedir. Üstbilişsel terapi, yaygın anksiyete bozukluğunun gelişiminde ve sürmesinde kritik rol oynayan olumlu ve olumsuz üstbilişsel inançları etkili bir şekilde azaltmaktadır. Ayrıca üstbilişsel terapinin, bireysel veya grup formatında uygulanmasından bağımsız olarak, yaygın anksiyete bozukluğunun tedavisinde etkili olduğu belirlenmiştir.

Anahtar sözcükler: Üstbilişsel terapi, yaygın anksiyete bozukluğu, etkililik, sistematik gözden geçirme

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Received: 17.01.2025 | **Accepted:** 03.06.2025

Introduction

Generalized anxiety disorder (GAD) is an anxiety disorder characterized by excessive anxiety and worry about various events or situations lasting for at least six months, accompanied by physical symptoms such as muscle tension and restlessness, and difficulty in controlling worry (American Psychiatric Association [APA] 2022). The most fundamental feature of GAD is worry (Borkovec 1994). Worry consists of intrusive thoughts about the future that enter consciousness involuntarily, persistently and repetitively, centered on the anticipation that bad things will happen (Ruscio et al. 2001). Although worry is a transdiagnostic factor observed in various psychological disorders, particularly anxiety disorders and major depressive disorder, it has been stated that more severe, frequent, intense, and pervasive worry—triggered more easily and associated with greater distress—is specific to GAD (Olatunji et al. 2010). Data from the World Mental Health Survey conducted in 26 countries between 2001 and 2012 indicate that the 12-month prevalence of GAD based on DSM-5 diagnostic criteria is 1.8%, and the lifetime prevalence is 3.7% worldwide (Ruscio et al. 2017). In Turkey, the prevalence of GAD among patients applying to primary healthcare services was found to be 6.8% (Keskin et al. 2013). According to a national study conducted in the United States (USA), the lifetime prevalence of GAD among children aged 13–18 years is 3% (Burstein et al. 2014). In the USA, the prevalence of GAD among children aged 7–17 years has been reported as 6.8% (Kendall et al. 2010). In Iran, this rate was found to be 2.6% among children aged 6–18 years (Mohammadi et al. 2020). Studies conducted with both adults and children have consistently shown that the prevalence of GAD is higher in women and girls than in men and boys (Keskin et al. 2013, Burstein et al. 2014, Mohammadi et al. 2020).

One of the theoretical approaches explaining GAD is the metacognitive model. This model explains the development of worry perceived as uncontrollable, as well as the factors that maintain it, through dysfunctional metacognitive processes (Wells and Purdon 1999). Metacognition refers to the structures and processes responsible for monitoring, evaluating, and controlling cognitive processes (Flavell 1979). Individuals' evaluations of their own cognitions and their positive and negative beliefs about cognitive processes are key components of metacognitive processes (Wells 2009). These processes also encompass individuals' evaluations of and emotional responses to their mental states. According to the model, there are two different ways of experiencing thoughts and beliefs. In the object mode, thoughts may be perceived as real by failing to distinguish them from actual events in the external world. In contrast, in the metacognitive mode, thoughts can be evaluated independently from the individual and the reality of the external world. Maladaptive strategies such as focusing attention on threat, controlling thoughts, suppression, and avoidance are defined as metacognitive control strategies. The metacognitive model of GAD is based on the self-regulatory executive function (S-REF) model, which is an information processing model. According to the S-REF model, GAD is caused by the cognitive attentional syndrome (CAS) (Wells and Matthews 1996). CAS includes repetitive thinking (worry and rumination), monitoring of threat, avoidance of danger, and maladaptive coping behaviors such as thought suppression, avoidance, and substance use (Wells 2009).

According to the metacognitive model of GAD, when individuals with GAD encounter a trigger, positive metacognitive beliefs that worry is helpful and useful in coping with problems become activated. These positive metacognitive beliefs trigger the CAS, leading individuals to perceive worry as a coping strategy and initiating the Type 1 worry process. Type 1 worry refers to worries that individuals may experience occasionally in response to problems. An increase in worry activates anxiety symptoms, and as worry persists over time, negative metacognitive beliefs begin to emerge. These negative metacognitive beliefs, which involve the perceived uncontrollability and dangerousness of worry, initiate the Type 2 worry process. Type 2 worry, which involves worrying about worry itself, is therefore referred to as meta-worry. Meta-worry, triggered by negative metacognitive beliefs, further intensifies anxiety symptoms. In an attempt to cope with meta-worry, individuals resort to maladaptive strategies such as thought control, suppression, avoidance, and reassurance-seeking. However, these strategies prevent individuals from learning that worry is actually harmless and controllable. Efforts to control or suppress thoughts not only fail to reduce worry, but also lead to an increase in intrusive thoughts and reinforce the belief that worry is uncontrollable. As a result, the CAS process, initially triggered by positive metacognitive beliefs,

continues through the influence of negative metacognitive beliefs and is sustained by maladaptive coping strategies. In this way, metacognitive processes play a critical role in the development and maintenance of GAD (Wells 2010).

Metacognitive processes are considered an important vulnerability factor in the development of GAD (van der Heiden et al. 2010). Studies indicated that patients with GAD exhibit higher levels of both negative metacognitive beliefs and meta-worry compared to individuals with and without anxiety (Davis and Valentiner 2000) as well as those with other anxiety disorders and depression (Wells and Carter 2001). Similarly, studies have shown that negative metacognitive beliefs are significantly higher in patients with GAD compared to control groups, and that these beliefs predict the level of worry (Görgü 2014). Negative metacognitive beliefs are regarded as a specific vulnerability factor for GAD (Strand et al. 2023) not only because they are strongly associated with the severity of GAD symptoms (White et al. 2024) but also because they can distinguish individuals diagnosed with GAD from those who experience high levels of worry (Ruscio and Borkovec 2004). Nevertheless, findings on whether positive metacognitive beliefs are specific to GAD have been inconsistent. For instance, it has been reported that patients with GAD hold higher levels of positive metacognitive beliefs compared to individuals with and without anxiety (Davis and Valentiner 2000) while other studies have found that they possess lower levels than those in control groups (Aydın et al. 2019). Moreover, these beliefs have not been found to distinguish individuals with GAD from those who experience high levels of worry (Ruscio and Borkovec 2004). Studies conducted with non-clinical samples have shown that increases in both positive and negative metacognitive beliefs predict levels of worry (Yılmaz et al. 2008, Safrancı 2010, Uzun 2019). Overall, findings suggest that negative metacognitive beliefs, in particular, may represent a GAD-specific and distinguishing vulnerability factor; however, inconsistencies in the literature regarding positive metacognitive beliefs indicate the need for further research on this issue.

Studies examining the role of metacognitive processes in the development of emotional disorders during childhood indicate that as children's levels of anxiety and worry increase, their metacognitive beliefs also increase (Cartwright-Hatton et al. 2004, Bacow et al. 2009). These findings suggest that it may be beneficial to test the metacognitive model of GAD in children, as has been done in adults (Ellis and Hudson 2010). In line with this, a study conducted with adolescents aged 12–17 found that individuals diagnosed with GAD, those without GAD, individuals with anxiety, and those with comorbid anxiety/depression scored higher on metacognitive processes than the control group; however, no significant differences were observed between the diagnostic groups. Moreover, since negative metacognitive beliefs were more strongly associated with GAD symptoms, the model was partially supported in adolescents (Ellis and Hudson 2011). It has also been found that children aged 7–12 with a GAD diagnosis had higher levels of metacognitive beliefs compared to non-anxious children (Donovan et al. 2016). Similarly, a study conducted with children and adolescents aged 7–17 showed that those with GAD scored higher on metacognitive processes than both anxious and non-anxious groups, and that negative metacognitive beliefs were the strongest predictor of worry (Esbjørn et al. 2014). These findings support the applicability of the metacognitive model of GAD in children. However, since studies conducted with children are more limited than those conducted with adults, further research is needed to examine the model more comprehensively during childhood.

In order to understand the role of metacognitive processes in the development of GAD, findings from longitudinal studies that reveal how these relationships change over time are of particular importance. The existing literature findings suggest that metacognitive processes, especially negative metacognitive beliefs, predict future anxiety symptoms and that there may be a bidirectional and dynamic relationship between these processes and anxiety symptoms (Yılmaz et al. 2011, Hjemdal et al. 2013, Ramos-Cejudo and Salguero 2017, Ryum et al. 2017, Nordahl et al. 2023). Negative metacognitive beliefs have been found to predict changes in anxiety symptoms among patients with GAD, to be associated with prolonged worry, and to predict increases in worry (Sica et al. 2007, Thielsch et al. 2015). It has also been demonstrated that metacognitive processes strengthen the CAS over time (Nordahl et al. 2023) and that positive metacognitive beliefs predict maladaptive coping styles (Sica et al. 2007). Children's initial and follow-up metacognitive processes have been found to mediate the relationship between their mothers'

metacognitive processes and the children's anxiety symptoms three years later (Walczak et al. 2021). Taken together, these findings indicate that metacognitive processes are not only associated with GAD symptoms but may also play a role in the development of these symptoms over time. Nevertheless, prospective longitudinal studies are needed to better understand the role of metacognitive processes.

Metacognitive therapy (MCT) for GAD is a treatment approach grounded in the metacognitive model, which explains the development and maintenance of GAD (Wells 2000). MCT targets the identification and modification of the CAS and the metacognitive beliefs associated with it, which contribute to the persistence of negative emotional experiences and the recurrence of emotional distress. The treatment focuses on developing attentional control skills, identifying maladaptive coping strategies and replacing them with more adaptive alternatives, modifying the individual's relationship with their own cognitions, and shifting experiential processing from the object mode to the metacognitive mode. MCT typically consists of 10 to 12 sessions, with each session lasting approximately 60 minutes in individual therapy and 90 minutes in group therapy. During the treatment process, individualized worry patterns, worry-triggering situations, positive and negative metacognitive beliefs, and the maladaptive coping strategies that maintain worry are first identified (Wells 2009). Subsequently, positive and negative metacognitive beliefs, along with the associated CAS processes, are evaluated and restructured (Wells 2000). The technique of postponing worry is employed to challenge negative metacognitive beliefs and promote awareness that worry is controllable. The detached mindfulness technique is used to help individuals develop a new relationship with their thoughts and evaluate them objectively. In applying detached mindfulness, metaphors such as clouds passing through the sky or trains leaving a station are used to facilitate the recognition of thoughts and beliefs as mental events that are independent from external reality. Rather than engaging in struggle with thoughts, the goal is to allow them to pass through the mind without resistance. Attention training is provided to enhance the individual's capacity to delay and regulate worry. Testing the reality of worry helps challenge positive metacognitive beliefs that regard worry as functional. Training in problem-solving skills is implemented to promote the use of more adaptive coping strategies (Fisher and Wells 2009). At these stages, Socratic dialogue is used to identify metacognitive beliefs and maladaptive coping strategies, and to examine the evidence supporting these beliefs. Techniques such as behavioral experiments and exposure are also employed to test and modify metacognitive beliefs.

Esbjørn et al. (2015) adapted MCT for GAD (Wells 2009) by tailoring it to children diagnosed with GAD and developed a treatment manual. The adapted MCT program for children consists of 8 group therapy sessions for children, 2 parent-focused workshops, and 1 voluntary booster session for both children and parents, conducted 3–5 weeks after the end of treatment. Each session and workshop lasts 2 hours. In order to facilitate the internalization of MCT by children, therapeutic techniques are practiced both during sessions and in vivo contexts under the therapist's guidance. Homework assignments, worksheets, developmentally appropriate metaphors, Socratic dialogue, and behavioral experiments are employed throughout the treatment (Esbjørn et al. 2015). During the treatment process, children receive psychoeducation on the metacognitive model and the CAS, worry triggers are identified, and negative metacognitive beliefs that worry is uncontrollable and dangerous are challenged. Through attention training, children develop skills in attentional control and in redirecting self-focused attention. Detached mindfulness is used to help children notice their worry-triggering thoughts and allow them to pass without engaging with them. Metaphors such as trains and clouds are used to facilitate children's understanding of thoughts as transient mental events. More adaptive coping strategies are developed to replace maladaptive strategies such as avoidance, reassurance-seeking from parents, and thought suppression. Beliefs that worry is beneficial are empirically tested to challenge positive metacognitive beliefs. Treatment concludes with a focus on consolidating adaptive coping strategies and preventing relapse. In the parent workshops, psychoeducation is provided on GAD and CAS, and parents are guided to recognize and manage their children's reassurance-seeking and avoidance behaviors. The booster session is used to reinforce relapse prevention planning (Esbjørn et al. 2015).

Directly targeting the metacognitive processes underlying GAD is what sets MCT apart from traditional approaches. While approaches such as Cognitive Behavioral Therapy (CBT) typically focus on modifying the content of negative thoughts, MCT aims to change individuals' relationship with their thoughts and

their thinking patterns. The limited and superficial changes produced by interventions that target thought content, combined with the growing recognition of the role of metacognitive processes in psychological disorders, have laid the foundation for the development of MCT (Wells 2009, Nordahl et al. 2018). In this context, the distinctiveness of MCT lies in its focus on metacognitive processes—such as how worry is evaluated and maintained—rather than on the content of thoughts. Indeed, MCT, which directly intervenes in metacognitive processes in anxiety disorders, has been shown to produce greater metacognitive change than CBT, and to yield positive effects on cognitive processes as well (Johnson et al. 2018). Moreover, it has been suggested that change in metacognitions, rather than in thought content, may play a more decisive role in recovery (Kahl et al. 2012).

The number of studies evaluating the effectiveness of MCT, a relatively recent therapeutic approach, has been steadily increasing. Several systematic reviews and meta-analyses have investigated the effectiveness of MCT for anxiety disorders and depression. These studies have examined the overall effectiveness of MCT (Normann and Morina 2018), its effectiveness across all anxiety disorders and depression (Normann et al. 2014, Sadeghi et al. 2015, McEvoy 2019), and randomized controlled trials (RCTs) specifically comparing MCT with CBT (Rawat et al. 2023). On the other hand, two narrative reviews focusing on the theoretical background of MCT and the metacognitive model of GAD (Wells 2010, van der Heiden 2013) evaluated only three studies addressing GAD treatment, reporting preliminary findings that suggested MCT may be effective. Although additional studies have been conducted on the effectiveness of MCT for GAD following these meta-analyses and reviews, comprehensive literature searches have not identified a systematic review specifically focusing on this issue. To address these gaps, the present study systematically reviews all empirical studies on the effectiveness of MCT in the treatment of GAD. Furthermore, the finding that children's metacognitive processes are associated with future anxiety symptoms (Walczak et al. 2021) indicates that these processes may influence anxiety at a developmental level as well. Therefore, the current review aims to evaluate the effectiveness of MCT not only in adults but also in children. In this regard, the present study is original in that it constitutes the first systematic review specifically focused on this topic in the literature. Through a comprehensive and integrative assessment of studies examining the effectiveness of MCT in the treatment of GAD, the present review aims to make significant theoretical and clinical contributions to the literature. The findings of the review are expected to provide guidance for both clinical interventions and therapeutic practices across different age groups.

Method

This study was conducted in accordance with the decision criteria outlined in the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which are internationally recognized in the field of systematic review research (Page et al. 2021). To determine the keywords to be used in the systematic review and the databases to be searched, a comprehensive preliminary literature search was conducted on MCT and GAD. As a result of this preliminary search, no Turkish-language publications addressing both MCT and GAD were found in the national databases Ulakbim and TRDizin. Therefore, Turkish keywords were not included in the systematic search, and national databases were excluded. The preliminary search also revealed that the most frequently used keywords in the literature related to MCT and GAD were “metacognitive therapy,” “meta-cognitive therapy,” “MCT,” “generalized anxiety disorder,” and “GAD.” Accordingly, the search terms (“metacognitive therapy” OR “meta-cognitive therapy” OR “MCT”) AND (“generalized anxiety disorder” OR “GAD”) were used in the systematic review. To identify eligible studies for inclusion, the databases ScienceDirect, PubMed, Web of Science, and EBSCOhost were searched. The existing literature indicates that the earliest theoretical studies on MCT began to be published in 2000 (Wells 2000). In this context, studies published between January 2000 and September 2024 were included in the systematic review. Finally, database searches were initiated in June 2024 and continued until the end of August 2024.

Results

As shown in Figure 1, a total of 102 studies were identified through database searches using the specified

keywords in ScienceDirect (n = 12), PubMed (n = 29), EBSCOhost (n = 36), and Web of Science (n = 25). After removing duplicates (n = 50), the remaining number of studies was 52. The titles and abstracts of these 52 studies were reviewed in detail, and 13 studies that did not meet the aims of the current review, either because GAD was not the primary variable or the intervention did not involve MCT, were excluded. The full texts of the remaining 39 studies were then examined in depth. Based on the exclusion criteria detailed in Figure 1, an additional 28 studies were removed. Following this multi-stage screening process, 11 studies were included in the systematic review.

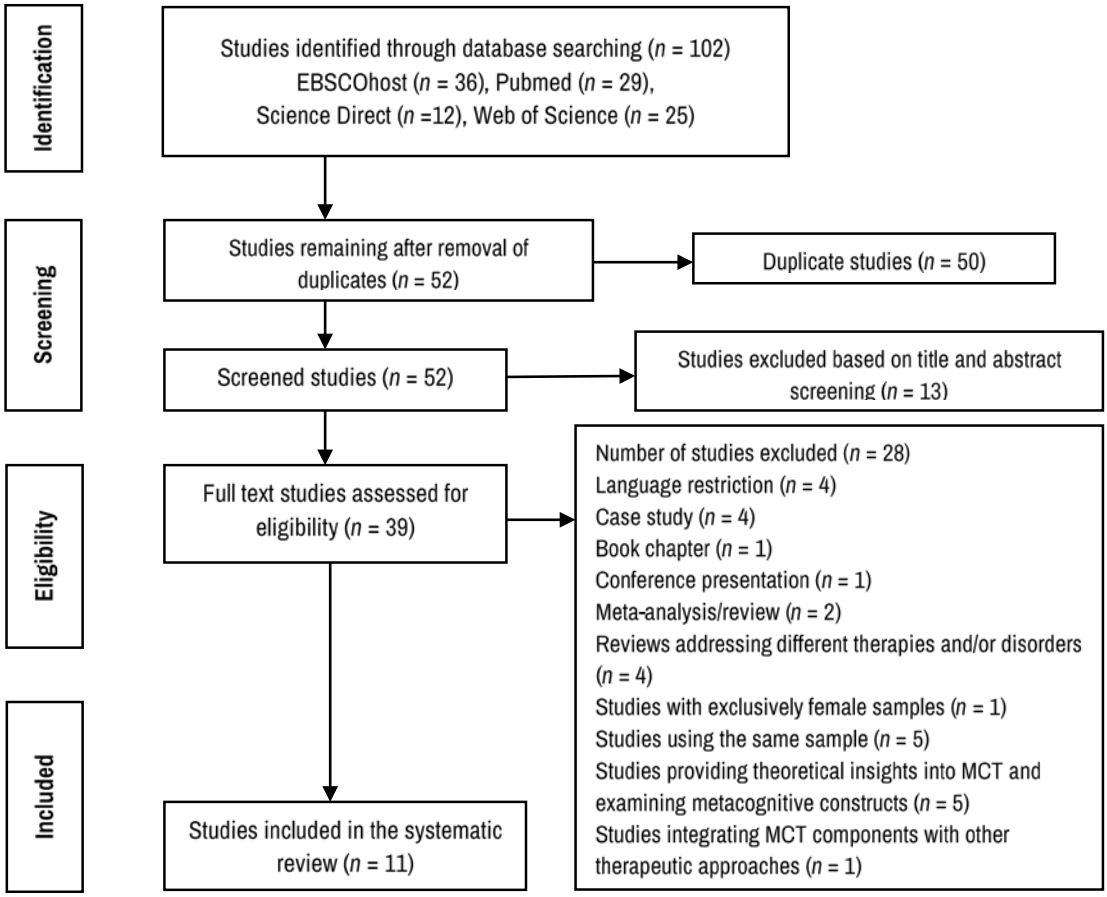

Figure 1. PRISMA flow diagram

The included studies were evaluated in terms of methodology, treatment characteristics, and treatment effectiveness. Detailed information regarding this evaluation is presented in Table 1.

Sample

When the sample characteristics of the studies are examined, it is observed that in 9 studies (81.8%) the samples consisted of adults (Wells and King 2006, Wells et al. 2010, van der Heiden et al. 2012, van der Heiden et al. 2013, McEvoy et al. 2015, Nordahl et al. 2018, Haseth et al. 2019, Solem et al. 2021, af Winklerfelt Hammarberg et al. 2023), while in 2 studies (18.2%), the samples consisted of children and their parents (Esbjørn et al. 2018, Walczak et al. 2019). One of these studies (Solem et al. 2021) is a 9-year follow-up of another study included in this review (Nordahl et al. 2018); thus, the follow-up sample was drawn from the original study. Although both studies involved the same sample, the follow-up study was also included due to its extended follow-up period and focus on long-term treatment effects. Sample sizes across studies ranged from 10 (Wells and King 2006) to 126 participants (van der Heiden et al. 2012). In adult samples, participant ages ranged from 18 to 78, with mean ages ranging from 29.7 (Haseth et al. 2019) to 49.1 years (Wells et al. 2010). In studies involving children, age ranged from 7 to 14 years, with mean ages of 9.7 (Esbjørn et al. 2018) and 9.9 (Walczak et al. 2019).

Table 1. Characteristics of studies included in the systematic review

Study	Aim	Sample	Treatment Groups	Dropout Rate	Measures	Design	Treatment Features	Main Findings and Conclusions
Wells and King (2006)	To investigate the effectiveness of MCT in the treatment of GAD	10 adults aged 25-76 with a primary diagnosis of GAD Male = 4 Female = 6 Mean age= 38	MCT (*n* = 10)	-	BAI BDI STAI-T AnTI	Pretest-posttest without a control group Follow-up: 6 & 12 months	- 3 to 12 sessions of individual MCT Mean sessions: 7.4 Frequency: Once per week Duration: 45-60 minutes	After treatment, social and health-related worries, anxiety, and worry about worry decreased. Recovery rates for anxiety were high (87.5%). These effects were largely maintained at the 6- and 12-month follow-ups (75%).
Wells et al. (2010)	To compare the effectiveness of MCT and applied relaxation in the treatment of GAD	20 adults aged 25-78 with a primary diagnosis of GAD Male = 8 Female = 12 Mean age = 49.1	MCT (*n* = 10) Applied relaxation (*n* = 10)	-	SCID-I STAI-T PSWQ BAI BDI MCQ	Pilot RCT Pretest-posttest active control group design Follow-up: 6 & 12 months	- 8 to 12 sessions of individual MCT - 8 to 12 sessions of individual applied relaxation Frequency: Once per week Duration: 45-60 minutes	MCT was more effective than applied relaxation in reducing worry, anxiety, and metacognitive beliefs. Recovery rates for worry and anxiety were higher in the MCT group (80%) compared to the applied relaxation group (10%). These effects were significantly maintained at the 6- and 12-month follow-ups. All participants in the MCT group no longer met GAD diagnostic criteria after treatment, and 90% at the 12-month follow-up. In the applied relaxation group, 50% no longer met GAD criteria both after treatment and at the 12-month follow-up.
van der Heiden et al. (2012)	To compare the effectiveness of MCT and IUT in the treatment of GAD	126 adults aged 18-65 with a primary diagnosis of GAD Male = 34 Female = 92 Mean age = 35	MCT (*n* = 54) IUT (*n* = 52) Waitlist (*n* = 20)	MCT: 11 (%18) IUT: 14 (%23.3) WL: 1 (%5)	SCID-I PSWQ STAI-T SCL-90 BDI-II MCQ IUS	RCT Pretest-posttest control group design Follow-up: 6 month	- 14 session of individual MCT - 14 session of individual IUT Frequency: Once per week Duration: 45 minutes	Both treatment groups were more effective than the waitlist control group in reducing worry, anxiety, and metacognitive beliefs. MCT produced better outcomes than IUT on all outcome measures. The recovery rates for worry and anxiety were between 68–72% for MCT and 48–59% for IUT, and these rates were maintained at the six-month follow-up. After treatment, 91% of the MCT group and 93% at follow-up no longer met the diagnostic criteria for GAD, while 80% of the IUT group after treatment and 90% at follow-up no longer met the criteria for GAD.
van der Heiden et al. (2013)	To investigate the effectiveness of MCT in the treatment of GAD	33 adults aged 18-65 with a primary diagnosis of GAD Male = 12 Female = 21 Mean age = 31.3	MCT (*n* = 33)	9 (%27.3)	PSWQ STAI-T MCQ-30	Pretest-posttest without a control group Follow-up: 6 month	- 14 session of group MCT Frequency: Once per week Duration: 90 minutes Number of groups: 3 (10-14 participants)	There were significant reductions in worry, anxiety, and negative metacognitive beliefs. The effect sizes for worry and anxiety were lower compared to studies involving individual MCT treatment for GAD. However, the recovery rates for worry (71%) and anxiety (47%) were similar to or lower than those of individual MCT.
McEvoy et al. (2015)	To examine the acceptability and effectiveness of brief MCT in the treatment of GAD.	52 adults aged 18 and over with (*n* = 40) and without (*n* = 12) a primary diagnosis of GAD Male = 21 Female = 31 Mean age = 38	Brief MCT (*n* = 52)	6 (%11.5)	PSWQ RTQ-10 RRS CCL MCQ-30 K10 PANAS BDI-II BAI Q-LES-Q-SF	Pretest-posttest without a control group Follow-up: 1 month	- 6 session of brief group MCT and 1 follow-up session Frequency: Once per week Duration: 2 hours Number of groups: 3 (10-14 participants)	There were significant reductions in worry, anxiety, and positive metacognitive beliefs, particularly in negative metacognitive beliefs and repetitive negative thoughts. Based on recovery rates for worry, 86% of patients showed improvement, and 74% fully recovered after treatment and at the 1 month follow-up. The dropout rate was low, and the therapy was considered acceptable by patients.
Esbjørn et al. (2018)	To examine the	44 children aged 7–13	MCT (*n* = 44)	1 (%2.3)	ADIS-IV-C/P	Pretest-posttest	- 8 session group MCT and 2 session parent workshop	After treatment and at the 6 month follow-up, there were significant reductions in

	effectiveness of MCT in children with a GAD diagnosis.	with a primary diagnosis of GAD and their parents Male = 22 Female = 22 Mean age= 9.7			RCADS PSWQ-C MCQ-C_{30} WISC-III WISC-IV	without a control group Follow-up: 6 month	Frequency: Once per week Duration: 2 hours Number of groups: 8 (5-6 participants) Booster session: 1 session after 5 weeks (optional)	children's anxiety, worry, and dysfunctional metacognitions. Based on recovery rates for anxiety, 70% of the children recovered after treatment, and 77% at follow-up. Additionally, 86.4% of the children no longer met the diagnostic criteria for GAD after treatment, and 75% at the 6 month follow-up. MCT is an acceptable treatment for children.
Nordahl et al. (2018)	To compare the effectiveness of MCT and CBT in the treatment of GAD.	81 adults aged 18 and over with a primary diagnosis of GAD Male = 22 Female = 59 Mean age= 37.8	MCT (*n* = 32) IUT (*n* = 28) Waitlist (*n* = 21)	-	PSWQ STAI-T BAI BDI IIP-64	RCT Pretest-posttest control group design Follow-up: 24 month	- Up to 12 sessions of individual MCT - Up to 12 sessions of individual CBT Frequency: Once per week Duration: 1 hour	Both treatments are effective in reducing worry and anxiety. However, while MCT is more effective than CBT in reducing worry, there is no significant difference between the two treatments in reducing anxiety. Based on recovery rates for worry, there is a significant difference between the MCT group (65%) and the CBT group (38%). These rates were largely maintained at the 24 month follow-up. No recovery was observed in the waitlist control group. Both therapies are effective in reducing GAD symptoms, but MCT is superior to CBT.
Haseth et al. (2019)	To examine the acceptability of MCT by patients and its effectiveness in the treatment of GAD	23 adults aged 18 and over with a primary diagnosis of GAD Male = 1 Female = 22 Mean age= 29.7	MCT (*n* = 23)	-	PSWQ GAD-7 PHQ-9 GADS-R	Pretest-posttest without a control group Follow-up: 3 month	- 10 session of group MCT Frequency: Once per week Duration: 90 minutes Number of groups: 4 (4-6 participants)	After treatment, worry, anxiety, positive and negative metacognitive beliefs, dysfunctional coping strategies, and avoidance behaviors significantly decreased. Recovery rates for worry were high both after treatment (65.3%) and at follow-up (78.3%). 87% of patients no longer met the diagnostic criteria for GAD after treatment, and 78.3% at follow-up. Only one patient did not respond to treatment. According to the patients, group MCT is an acceptable treatment.
Walczak et al. (2019)	To compare the effectiveness of MCT and CBT in children with diagnosed GAD and to examine the variables that may influence treatment outcomes.	63 children aged 7-14 diagnosed with GAD and their parents. Male: 27 Female: 36 Mean age: 9.9	MCT (*n* = 38) CBT (Cool Kids Program) (*n* = 25)	-	ADIS-IV-C/P RCADS	Quasi-experimental Pretest-posttest with active control groups Follow-up: -	- 8 session group MCT and 2 session parent workshop Frequency-Duration: Once per week, 2 hours Number of groups: Not specified Booster session: 1 session for children and parents 4-5 weeks later (voluntary) - 10 session group CBT for children and parents (Cool Kids Program) Frequency-Duration: Once per week, 2 hours Number of groups: Groups of 6-7 participants	Age, gender, symptom severity, and comorbid SAD variables had no significant effect on treatment outcomes. In children with higher symptom severity or a comorbid diagnosis of SAD, CBT was more effective than MCT in reducing anxiety; however, this difference was not significant. Recovery rates for anxiety were higher in the CBT group (84%) than in the MCT group (78.9%), but the difference was not statistically significant. 79.2% of the CBT group and 71.1% of the MCT group recovered from all anxiety disorders, including GAD.
Solem et al. (2021)	To evaluate the long-term effects of MCT and CBT effectiveness in the treatment of GAD.	39 adults aged 18 and over with a primary diagnosis of GAD Male: 13 Female: 26 Mean age: 48.1	MCT (*n* = 22) CBT (*n* = 17)	-	PSWQ BAI BDI	9 year follow-up study	- Up to 12 sessions of individual MCT - Up to 12 sessions of individual CBT Frequency: Once per week Duration: 1 hour	At the 9 year follow-up, the recovery in worry and anxiety symptoms was greater in the MCT group compared to the CBT group. Recovery rates were higher in MCT (57%) than in CBT (38%). It was observed that 23.1% of the CBT group and 9.5% of the MCT group still met the diagnostic criteria for GAD. While the effects of both treatments persisted, individuals who received MCT continued to show greater long-term recovery compared to those who received CBT.

af Winklerfelt Hammarberg et al. (2023)	To investigate the feasibility and preliminary effectiveness of MCT and IUT in primary healthcare patients with a GAD diagnosis.	64 adults aged 18 and over with a primary diagnosis of GAD Male: 12 Female: 52 Mean age: 36.4	MCT (*n* = 31) IUT (*n* = 33)	MCT: 6 (%19.4) IUT: 1 (%3.03)	PSWQ PHQ-9 WHODAS 2.0 SWLS CTS-R MCT-CS	Pilot RCT Pretest-posttest with active control groups Follow-up: 6 month	- 10 to 12 sessions of individual MCT Frequency: Once per week Duration: 45–60 minutes - 10 to 12 sessions of individual IUT Frequency: Once per week Duration: 1 hour	MCT is more effective than IUT in reducing worry. Recovery rates for worry were higher in the MCT group (81.5%) compared to the IUT group (37.5%) and were largely maintained at the 6 month follow-up. A lower number of sessions was sufficient for recovery in the MCT group. Both treatments were considered acceptable by patients with GAD. As a more effective and time-efficient treatment than IUT, MCT is a feasible treatment option in primary healthcare settings.

ADIS-IV-C/P: Anxiety Disorders Interview Schedule for DSM-IV-Child and Parent Versions, AnTI: Anxious Thoughts Inventory, BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, BDI-II: Beck Depression Inventory-II, CBT: Cognitive Behavioral Therapy, CCL: Cognition Checklist, Cool Kids Program: A CBT program for young people with anxiety disorders, CTS-R: Cognitive Therapy Scale-Revised, GAD-7: Generalized Anxiety Disorder-7, GADS-R: Generalized Anxiety Disorder Scale-Revised, IIP-64: Inventory of Interpersonal Problems, IUS: Intolerance of Uncertainty Scale, IUT: Intolerance of Uncertainty Therapy, K10: Kessler Psychological Distress Scale, MCQ: Metacognitions Questionnaire, MCQ-30: Metacognitions Questionnaire-30, MCQ-C30: Metacognitions Questionnaire for Children-30, MCT: Metacognitive Therapy, MCT-CS: Metacognitive Therapy Competency Scale, PANAS: Positive and Negative Affect Schedule, PHQ-9: Patient Health Questionnaire-9, PSWQ: Penn State Worry Questionnaire, PSWQ-C: Penn State Worry Questionnaire for Children, Q-LES-Q-SF: Quality of Life Enjoyment and Satisfaction Questionnaire-Short Form, RCADS: Revised Child Anxiety and Depression Scale, RCT: Randomized Controlled Trial, RRS: Ruminative Responses Scale, RTQ-10: Repetitive Thinking Questionnaire, SAD: Social Anxiety Disorder, SCL-90: Symptom Check List, SCID-I: Structured Clinical Interview for DSM-IV Axis-I, STAI-T: State-Trait Anxiety Inventory-Trait Version, SWLS: Satisfaction with Life Scale, WHODAS 2.0: WHO Disability Assessment Schedule 2.0, WISC-III: Wechsler Intelligence Scale for Children-Third Edition, WISC-IV: Wechsler Intelligence Scale for Children-Fourth Edition.

In terms of gender distribution, the proportion of female participants ranged from a minimum of 50% (Esbjørn et al. 2018) to a maximum of 95.7% (Haseth et al. 2019). In all included studies, participants were diagnosed with GAD based on structured [ADIS (Brown et al. 1994), MINI (Sheehan et al. 1998), SCID (First et al. 2002)] and semi-structured [ADIS-IV-C/P (Silverman and Albano 1996)] clinical interviews developed according to DSM-IV (APA 1994), DSM-IV-TR (APA 2000), or DSM-5-TR (APA 2022) diagnostic criteria. In all studies, a primary diagnosis of GAD was the inclusion criterion. In one study involving children (Esbjørn et al. 2018) an additional inclusion criterion required participants to demonstrate a normal range of intellectual functioning, operationalized as a score of 70 or above on standardized intelligence scales [WISC-III (Wechsler 1991), WISC-IV (Wechsler 2003)]. In eight studies, the proportion of participants with a diagnosis of GAD only (i.e., without comorbid conditions) ranged from 10% (Walczak et al. 2019) to 77% (McEvoy et al. 2015). These proportions were not reported in the remaining three studies (Nordahl et al. 2018, Solem et al. 2021, af Winklerfelt Hammarberg et al. 2023).

Research Designs

Of the studies included in the systematic review, only four (Wells et al. 2010, van der Heiden et al. 2012, Nordahl et al. 2018, af Winklerfelt Hammarberg et al. 2023) employed a design in which participants were randomly assigned to treatment, active control, and waitlist control groups. Among these, two were RCTs (van der Heiden et al. 2012, Nordahl et al. 2018) while the remaining two were designed as pilot RCTs (Wells et al. 2010, af Winklerfelt Hammarberg et al. 2023). The study by Walczak et al. (2019) was classified as quasi-experimental, as participants were not randomly assigned to conditions. The study by Solem et al. (2021) was a 9-year follow-up study of another study included in the review, namely that of Nordahl et al. (2018). In six of the reviewed studies, the effectiveness of MCT was compared to other treatment approaches. Nordahl et al. (2018) compared MCT with CBT and a waitlist control group; Solem et al. (2021) compared MCT with CBT; and Walczak et al. (2019) compared MCT for children with CBT (Cool Kids Program). af Winklerfelt Hammarberg et al. (2023) compared MCT with IUT, while van der Heiden et al. (2012) compared MCT with IUT and a waitlist control group. In Wells et al. (2010) MCT was compared with applied relaxation. The studies conducted by Esbjørn et al. (2018), Haseth et al. (2019), McEvoy et al. (2015), van der Heiden et al. (2013), and Wells and King (2006) examined the effectiveness of MCT in the treatment of GAD without using any control group. All studies included pre-test and post-test measurements. Except for one (Walczak et al. 2019) follow-up assessments were conducted in all studies. The longest follow-up period was reported in Solem et al. (2021) extending up to 9 years. In the remaining studies, follow-up durations ranged from a minimum of 1 month (McEvoy et al. 2015) to a maximum of 24 months (Nordahl et al. 2018).

Table 2. Post-treatment effect sizes (Cohen's d) in studies included in the systematic review

Studies	Group	PSWQ	PSWQ-C	STAI-T	RCADS
Wells and King 2006	MCT	-	-	2.86	-
van der Heiden et al. 2013	MCT	1.86	-	1.23	-
McEvoy et al. 2015	MCT	1.82	-	-	-
Esbjørn et al. 2018	MCT		0.95	-	1.20
Haseth et al. 2019	MCT	2.42	-	-	-
Wells et al. 2010	MCT	3.41	-	2.30	-
	AR	0.95	-	0.55	-
Nordahl et al. 2018	MCT vs. WL	1.73	-	1.42	-
	CBT vs. WL	0.86	-	0.87	-
Walczak et al. 2019	MCT	-	-	-	1.31
	CBT	-	-	-	1.68
	MCT vs. CBT	-	-	-	-0.29
van der Heiden et al. 2012	MCT	2.39	-	2.01	-
	IUT	1.43	-	1.42	-
	MCT vs. IUT	0.96	-	0.59	-
af Winklerfelt Hammarberg et al. 2023	MCT	-3.78	-	-	-
	IUT	-2.69	-	-	-
	MCT vs. IUT	-2.03	-	-	-

AR: Applied Relaxation, CBT: Cognitive Behavioral Therapy, IUT: Intolerance of Uncertainty Therapy, MCT: Metacognitive Therapy, PSWQ: Penn State Worry Questionnaire, PSWQ-C: Penn State Worry Questionnaire for Children, RCADS: Revised Child Anxiety and Depression Scale, STAI-T: State-Trait Anxiety Inventory-Trait Version

Measures Used in the Assessment of Treatment Outcomes

In assessing treatment outcomes, various self-report measures were employed to evaluate the effectiveness of MCT in the treatment of GAD, and in some studies, clinical interviews were conducted to assess diagnostic criteria. To screen for GAD diagnostic criteria, SCID-I (First et al. 2002) was used in studies with adults (Wells et al. 2010, van der Heiden et al. 2012) while ADIS-IV-C/P (Silverman and Albano 1996) was administered in studies with children (Esbjørn et al. 2018, Walczak et al. 2019). To assess GAD symptoms, one study (Haseth et al. 2019) employed the GAD-7 (Spitzer et al. 2006) and GADS-R (Wells 2009). Worry was measured using the PSWQ (Meyer et al. 1990) in eight studies (Wells et al. 2010, van der Heiden et al. 2012, van der Heiden et al. 2013, McEvoy et al. 2015, Nordahl et al. 2018, Haseth et al. 2019, Solem et al. 2021, af Winklerfelt Hammarberg et al. 2023), the PSWQ-C (Chorpita et al. 1997) in one study (Esbjørn et al. 2018), and the AnTI (Wells 1994) in another study (Wells and King 2006). To assess anxiety, four studies (Wells and King 2006, Wells et al. 2010, van der Heiden et al. 2012, van der Heiden et al. 2013) used the STAI-T (Spielberger et al. 1983); three studies (Wells and King 2006, Wells et al. 2010, van der Heiden et al. 2013) used the BAI (Beck et al. 1988); and two studies (Esbjørn et al. 2018, Walczak et al. 2019) used the RCADS (Chorpita et al. 2000). In some studies, anxiety was treated as a secondary outcome; in this context, the STAI-T (Spielberger et al. 1983) and BAI (Beck et al. 1988) were used in the study by Nordahl et al. (2018) and the BAI (Beck et al. 1988) alone in Solem et al. (2021). To assess positive and negative metacognitive beliefs, two studies (Wells et al. 2010, van der Heiden et al. 2012) used the MCQ (Cartwright-Hatton and Wells 1997) and two others (van der Heiden et al. 2013, McEvoy et al. 2015) used the MCQ-30 (Wells and Cartwright-Hatton 2004). Esbjørn et al. (2018) assessed children's metacognitive beliefs using the MCQ-C30 (Esbjørn et al. 2013). Haseth et al. (2019) evaluated metacognitive beliefs, avoidance, and coping strategies with the GADS-R (Wells 2009). In the study by af Winklerfelt Hammarberg et al. (2023) the feasibility of MCT was

assessed based on treatment intake flow, willingness to participate in therapy, and dropout rates. Therapist competence in delivering MCT was also evaluated using the MCT-CS (Nordahl and Wells 2009). The measures used to assess secondary outcomes (e.g., depression, interpersonal difficulties) are presented in Table 1.

Characteristics of the Treatment

MCT was delivered in an individual therapy format in six studies (Wells and King 2006, Wells et al. 2010, van der Heiden et al. 2012, Nordahl et al. 2018, Solem et al. 2021, af Winklerfelt Hammarberg et al. 2023) and in a group therapy format in five studies (van der Heiden et al. 2013, McEvoy et al. 2015, Esbjørn et al. 2018, Haseth et al. 2019, Walczak et al. 2019). In MCT for adults, the number of sessions in individual therapy ranged between 3 and 14, with 12 sessions reported in Nordahl et al. (2018) and Solem et al. (2021), 14 sessions in van der Heiden et al. (2012), 3–12 in Wells and King (2006), 8–12 in Wells et al. (2010), and 10–12 in af Winklerfelt Hammarberg et al. (2023). In group therapy, the number of sessions was 7 (6 sessions and 1 follow-up session) in McEvoy et al. (2015), 10 in Haseth et al. (2019), and 14 in van der Heiden et al. (2013). MCT for children (Esbjørn et al. 2018, Walczak et al. 2019) consisted of 8 group therapy sessions and 2 parent workshop sessions, one held before the children's sessions and the other after the first four sessions. Additionally, one voluntary booster session was conducted for children and their parents 4–5 weeks after the end of treatment. In all studies, sessions were held once per week. Session durations in individual therapy generally ranged from 45 to 60 minutes (Wells and King 2006, Wells et al. 2010, af Winklerfelt Hammarberg et al. 2023); van der Heiden et al. (2012) reported a 45-minute duration, while Nordahl et al. (2018) and Solem et al. (2021) reported 60 minutes. In group therapy, session duration ranged from 90 minutes (van der Heiden et al. 2013, Haseth et al. 2019) to 2 hours (McEvoy et al. 2015, Esbjørn et al. 2018, Walczak et al. 2019).

In most studies, MCT treatment guidelines for adults by Wells (1997, 2009) were followed, while one study (McEvoy et al. 2015) employed the group MCT manual developed by Anderson and Campbell (2011). When the session contents and techniques used are evaluated, it appears that individual and group MCT share a similar structure. The initial sessions begin with the formulation of a case based on the metacognitive model and the provision of psychoeducation on the metacognitive model and MCT, thereby ensuring that clients are informed about the treatment rationale and actively engaged in the process. Homework is an essential component of MCT, beginning with the monitoring of worry in the first session and continuing throughout treatment with the identification and modification of metacognitive beliefs and maladaptive coping strategies. From the second session onward, treatment sequentially targets the identification and modification of negative beliefs about the uncontrollability and dangerousness of worry, followed by the evaluation and restructuring of positive beliefs regarding the usefulness and functionality of worry. In the treatment process, verbal techniques such as Socratic questioning are used to evaluate the evidence supporting these beliefs, while behavioral experiments are employed to test both negative and positive beliefs about worry. Attention training is used to reduce attention focused on threat, worry postponement exercises are introduced, and detached mindfulness techniques are applied to help clients notice worry-triggering thoughts and allow them to pass without engaging with them. In the later sessions, exposure and response prevention techniques are used to modify maladaptive coping strategies such as avoidance, thought suppression, and reassurance-seeking. These interventions aim to modify cognitive bias and unhelpful strategies. In the final sessions, the treatment process is reviewed, and relapse prevention is addressed. In MCT for children (Esbjørn et al. 2018, Walczak et al. 2019) the treatment manual developed by Esbjørn et al. (2015) was used. No significant differences have been identified between adult and child MCT protocols in terms of session procedures and techniques. While the same techniques are applied in therapy, supplementary materials such as pictures, worksheets, rewards, and board games are used to help children internalize these techniques. Experiments are conducted both during sessions and outside of therapy through in vivo activities such as field trips. In parent workshops, psychoeducation is provided on GAD and dysfunctional parenting behaviors, the child's progress is reviewed, and alternative methods to support the child are discussed. For those who participated in the voluntary booster session, relapse prevention plans are reinforced (Esbjørn et al. 2015). In most of the studies, the treatments were

administered by psychologists and clinical psychologists, while in some studies, the therapy team also included psychiatric nurses (Haseth et al. 2019) and social workers (af Winklerfelt Hammarberg et al. 2023). No information was provided about the therapists in the study by Wells and King (2006). Regarding therapists' training backgrounds, in most studies the therapists had training in MCT (Wells et al. 2010, Nordahl et al. 2018, Haseth et al. 2019, Solem et al. 2021) or CBT (van der Heiden et al. 2012, van der Heiden et al. 2013, af Winklerfelt Hammarberg et al. 2023) whereas other studies did not provide detailed information about therapists' training. It was reported that therapists received supervision in all studies. In three studies (Esbjørn et al. 2018, Haseth et al. 2019, Walczak et al. 2019) MCT-trained experts supervised therapists, while in the study by af Winklerfelt Hammarberg et al. (2023) a one-day MCT workshop was held for therapists before the treatment by trainers who had received MCT training.

Effectiveness of the Treatment

Studies have shown that both individual (Wells and King 2006) and group formats of MCT (van der Heiden et al. 2013, McEvoy et al. 2015, Haseth et al. 2019) lead to significant reductions in levels of worry and anxiety. Comparisons between MCT and other treatments have revealed that MCT is more effective. Wells et al. (2010) found that MCT was more effective than applied relaxation in reducing worry and anxiety. van der Heiden et al. (2012) reported that both MCT and IUT were more effective than the waitlist control group in reducing worry and anxiety, but MCT produced better outcomes than IUT. Similarly, af Winklerfelt Hammarberg et al. (2023) demonstrated that MCT was more effective than IUT in reducing worry. Nordahl et al. (2018) found that MCT was more effective than CBT in reducing worry, although there was no significant difference between the two treatments in reducing anxiety. In the 9-year follow-up study of this trial (Solem et al. 2021) recovery in worry and anxiety symptoms was greater in the MCT group compared to the CBT group. In a study conducted with children (Walczak et al. 2019) both MCT and CBT were found to be effective in reducing anxiety levels. Additionally, CBT produced a greater effect than MCT in reducing anxiety among children with higher levels of GAD symptoms or a comorbid diagnosis of social anxiety disorder (SAD); however, this difference was not statistically significant. Another study (Esbjørn et al. 2018) also showed that children's levels of anxiety and worry significantly decreased following MCT.

When examining recovery rates following MCT recovery in worry was reported as 71% (van der Heiden et al. 2013), 74% (McEvoy et al. 2015), and 65.3% (Haseth et al. 2019); recovery in anxiety was reported as 87.5% (Wells and King 2006) and 47% (van der Heiden et al. 2013). Recovery rates in worry were found to be 74% at 1-month follow-up (McEvoy et al. 2015) and 78.3% at 3-month follow-up (Haseth et al. 2019) while recovery in anxiety was maintained at 75% at both 6- and 12-month follow-ups (Wells and King 2006). In group-format MCT (van der Heiden et al. 2013) effect sizes for worry and anxiety were lower compared to studies involving individual MCT for GAD. However, recovery rates for worry (71%) and anxiety (47%) were found to be similar to or lower than those in individual MCT.

Comparisons between MCT and other interventions indicate that recovery rates are higher in MCT. Wells et al. (2010) found that recovery rates in worry and anxiety were significantly higher in the MCT group (80%) compared to the applied relaxation group (10%) and these rates were largely maintained at 6- and 12-month follow-ups. In the first study comparing MCT and IUT (van der Heiden et al. 2012) recovery rates for worry and anxiety ranged from 68% to 72% in the MCT group and from 48% to 59% in the IUT group; these rates were preserved at the 6-month follow-up. In the second study (af Winklerfelt Hammarberg et al. 2023) recovery in worry was higher in the MCT group (81.5%) than in the IUT group (37.5%) and fewer sessions were sufficient to achieve recovery in the MCT group; these outcomes were largely maintained at 6-month follow-up. Three studies compared MCT with CBT. Nordahl et al. (2018) reported that recovery in worry was significantly higher in the MCT group (65%) compared to the CBT group (38%) and that these rates were substantially maintained over a 2-year follow-up. The findings demonstrated that although both therapies were effective in the treatment of GAD, MCT was superior to CBT. In the 9-year follow-up study by Solem et al. (2021) recovery rates were found to be higher in the MCT group (57%) compared to the CBT group (38%), suggesting that the long-term effects of MCT may surpass those of CBT. Looking at the two studies conducted with children, Esbjørn et al. (2018) found that the recovery rate in anxiety was high (70%) in the MCT group and maintained at follow-up (77%). Walczak et al. (2019) reported that the recovery rate in

anxiety was higher in the CBT group (84%) than in the MCT group (78.9%), although the difference was not statistically significant. Additionally, Walczak et al. (2019) found that variables such as age, gender, symptom severity, and comorbid SAD had no significant impact on treatment outcomes.

As shown in Table 2, Cohen's d values reported in the studies were examined (Cohen 1992). The effect sizes of MCT on anxiety ranged from 1.20 to 2.86, while the effect sizes on worry ranged from 0.95 to 2.4 (Wells and King 2006, van der Heiden et al. 2013, McEvoy et al. 2015, Esbjørn et al. 2018, Haseth et al. 2019). When MCT was compared with applied relaxation, the effect sizes of MCT were reported as 2.30 for anxiety and 3.41 for worry (Wells et al. 2010). When compared with CBT, the effect size of MCT was reported as 1.42 (Nordahl et al. 2018) and 1.31 (Walczak et al. 2019) for anxiety, and 1.73 (Nordahl et al. 2018) for worry. In comparisons with IUT, the effect size of MCT was found to be 2.01 for anxiety (van der Heiden et al. 2012) and it ranged from 2.39 (van der Heiden et al. 2012) to -3.78 (af Winklerfelt Hammarberg et al. 2023) for worry. Among the studies, only Solem et al. (2021) reported long-term follow-up findings using partial eta squared (ηp^2) instead of Cohen's d (Lakens 2013). Therefore, the findings of that study cannot be directly compared with the Cohen's d values presented in Table 2. The results indicate that the difference between MCT and CBT was statistically significant over time, and that MCT had a greater and more lasting effect than CBT on both anxiety ($\eta p^2 = 0.11$) and worry ($\eta p^2 = 0.09$).

Following treatment, whether patients continued to meet the diagnostic criteria for GAD was assessed. In the study by Haseth et al. (2019) 87% of patients no longer met GAD diagnostic criteria after MCT, and this rate was 78.3% at follow-up. In the study by Esbjørn et al. (2018) 86.4% of children no longer met the diagnostic criteria after MCT, and this rate was 75% at the 6-month follow-up. In addition, differences between treatments in terms of no longer meeting GAD diagnostic criteria were examined. In the study by Wells et al. (2010) all patients in the MCT group no longer met diagnostic criteria post-treatment, and 90% still did not at the 12-month follow-up, whereas in the applied relaxation group, 50% of patients no longer met the criteria both post-treatment and at the 12-month follow-up. In the study by van der Heiden et al. (2012) 91% of patients in the MCT group and 93% at follow-up no longer met diagnostic criteria, while in the IUT group, these rates were 80% post-treatment and 90% at the 6-month follow-up. Walczak et al. (2019) reported that 79.2% of the CBT group and 71.1% of the MCT group no longer met the diagnostic criteria for both primary GAD and comorbid anxiety disorders post-treatment. Lastly, Solem et al. (2021) found that 90.5% of patients in the MCT group and 76.9% in the CBT group no longer met GAD diagnostic criteria.

Dropout rates for MCT were reported as 2.3% (Esbjørn et al. 2018), 11.5% (McEvoy et al. 2015), and 27.3% (van der Heiden et al. 2013). When comparing MCT and IUT, van der Heiden et al. (2012) found that the dropout rate was lower in the MCT group, whereas af Winklerfelt Hammarberg et al. (2023) reported a lower dropout rate in the IUT group. Some studies emphasized that MCT was perceived as acceptable by patients. Esbjørn et al. (2018) supported the acceptability of MCT for children, while McEvoy et al. (2015) and Haseth et al. (2019) demonstrated that MCT in a group format was also acceptable to patients. af Winklerfelt Hammarberg et al. (2023) concluded that MCT was more effective and yielded faster results compared to IUT, indicating that MCT might be applicable in primary healthcare settings for the treatment of GAD. Additionally, therapists' competence in delivering the treatment was found to be moderate, and their adherence to the treatment protocol was reported as low to moderate.

The effectiveness of MCT in targeting dysfunctional metacognitions, coping strategies, avoidance behaviors, and repetitive negative thinking, which play a significant role in the maintenance of GAD, has been evaluated. van der Heiden et al. (2013) reported significant reductions in negative metacognitive beliefs; McEvoy et al. (2015) found decreases in repetitive negative thinking, as well as in both positive and negative metacognitive beliefs; and Esbjørn et al. (2018) observed significant reductions in children's dysfunctional metacognitions. In the study by Haseth et al. (2019) MCT was shown to be effective in reducing positive and negative metacognitive beliefs, maladaptive coping strategies, and avoidance behaviors. Comparisons of MCT with applied relaxation (Wells et al. 2010) and IUT (van der Heiden et al. 2012) revealed that MCT was more effective in reducing metacognitive beliefs.

Discussion

The study aimed to examine the effectiveness of MCT in the treatment of GAD. A total of 11 studies that met the predefined inclusion criteria were reviewed. The results indicate that MCT is effective in reducing levels of worry and anxiety. According to Cohen's (1992) benchmarks for effect sizes (0.2 = small, 0.5 = medium, 0.8 = large), the magnitude of this effect is large or very large. Patients receiving MCT demonstrated substantial recovery from symptoms of worry and anxiety. These high recovery rates were maintained at both short-term and long-term follow-up assessments (Wells and King 2006, van der Heiden et al. 2013, McEvoy et al. 2015, Esbjørn et al. 2018, Haseth et al. 2019). The majority of patients with GAD no longer met the diagnostic criteria for GAD following MCT, and were considered fully recovered (Esbjørn et al. 2018, Haseth et al. 2019). These findings, obtained from diverse samples and clinical populations, support the metacognitive model of GAD and provide strong evidence for the high effectiveness of MCT in its treatment.

MCT has yielded better outcomes compared to applied relaxation (Wells et al. 2010) and IUT (van der Heiden et al. 2012, af Winklerfelt Hammarberg et al. 2023) in terms of reducing worry and anxiety levels, achieving higher recovery rates, and demonstrating both short- and long-term treatment effects. Moreover, the effect of MCT on reducing anxiety and worry levels has been found to be considerably greater than that of these treatments. These findings indicate that MCT is a more effective intervention for reducing GAD symptoms and leads to a more substantial recovery. Applied relaxation is one of the behavioral CBT techniques aimed at reducing the somatic symptoms of anxiety in the treatment of GAD (Clark and Beck 2010). The greater effectiveness of MCT compared to applied relaxation may be due to the latter not being supported by cognitive restructuring. According to the intolerance of uncertainty model, the most significant factor contributing to the development of GAD is a high level of intolerance of uncertainty (Dugas et al. 1998). IUT, which was developed within the framework of this model, aims to reduce patients' levels of intolerance of uncertainty and to modify positive beliefs about worry (Dugas and Ladouceur 2000). In MCT, by contrast, the goal is to modify both positive and negative metacognitive beliefs. The greater effectiveness of MCT compared to IUT consistent with previous findings (Ruscio and Borkovec 2004, Strand et al. 2023) highlights the importance of negative metacognitive beliefs in the etiology of GAD. MCT achieved recovery in worry levels in fewer sessions compared to IUT (af Winklerfelt Hammarberg et al. 2023). On the other hand, interestingly, despite not including an intervention that specifically targets intolerance of uncertainty, MCT has been found to be more effective than IUT in reducing intolerance of uncertainty (van der Heiden et al. 2012). According to researchers, targeting dysfunctional metacognitive beliefs in MCT may contribute indirectly to the reduction of intolerance of uncertainty by weakening metacognitive beliefs that might be associated with perceiving uncertainty as a threat. In addition, MCT aims to reduce cognitive avoidance strategies used to cope with worry, such as persistent threat monitoring and excessive thinking (Wells 2009). In this context, it has been suggested that MCT may be more effective than IUT in reducing intolerance of uncertainty by promoting the development of more adaptive strategies for managing worry (van der Heiden et al. 2012). These findings suggest that, in the treatment of GAD, preferring MCT over IUT may lead to faster and more effective outcomes. However, the mechanisms through which MCT reduces intolerance of uncertainty have not yet been fully clarified. Therefore, further research comparing the effectiveness of MCT and IUT is needed to better understand and comprehensively evaluate the effects of MCT on intolerance of uncertainty.

Studies have demonstrated that, in adult samples, MCT is more effective than CBT in both reducing worry and anxiety levels and leading to the loss of GAD diagnostic status following treatment (Nordahl et al. 2018, Solem et al. 2021). MCT has shown a significantly greater effect than CBT in reducing anxiety and worry levels (Nordahl et al. 2018). This finding indicates that MCT is a stronger intervention than CBT for reducing GAD symptoms and leads to more substantial recovery. CBT aims to modify dysfunctional thoughts and maladaptive beliefs related to themes of threat and danger in the treatment of GAD (Barışkın 2009). In contrast, MCT is an approach that targets both positive and negative metacognitive beliefs (Wells 2009). In this context, what distinguishes MCT from CBT is its focus on achieving metacognitive change beyond cognitive-level modification. The superior effectiveness of MCT may be attributed to the limitation of CBT, which focuses primarily on cognitive-level change, potentially making it insufficient on its own. This

explanation is consistent with the metacognitive perspective's critique of cognitive approaches for targeting only limited aspects of cognitive processing (Hayes 2004). These findings suggest that by targeting metacognitive beliefs that contribute to the emergence and maintenance of GAD symptoms, MCT may promote a more fundamental and lasting change. The findings suggest that MCT is an effective and acceptable treatment for GAD in childhood, just as it is in adulthood. Although CBT showed a larger effect size than MCT in reducing anxiety levels, this difference was not found to be significant, and both treatments yielded high recovery rates across anxiety disorders, including GAD (Walczak et al. 2019). These results indicate that MCT and CBT are similarly effective in reducing anxiety levels in children. In light of these findings, it is suggested that while MCT may be more beneficial in adults, it could be considered an alternative to CBT in children. A possible explanation for the lack of superiority of MCT over CBT in children may be that CBT targets thought content, whereas MCT focuses on thinking processes (Wells and Purdon 1999). Adult patients may acquire the ability to reflect on their thinking processes and to modify dysfunctional metacognitive beliefs more quickly than children and may be more successful in applying these changes.

Walczak et al. (2019) on the other hand, highlighted the similarities between the Cool Kids CBT program (Rapee et al. 2006) and MCT. Unlike traditional CBT, the worry surfing technique used in this program resembles the detached mindfulness technique employed in MCT. Both treatments include behavioral experiments and exposure. The researchers suggested that these similarities might explain the comparable treatment outcomes (Walczak et al. 2019). However, the purpose of applying these techniques and their impact on therapeutic change differ. Moreover, it is thought that the focus on thought content in CBT and on thinking processes in MCT may be a more decisive distinction. The Cool Kids CBT program (Rapee et al. 2006) is designed to target all anxiety disorders and includes social skills training, which is particularly beneficial for children diagnosed with SAD (Sertelin Mercan and Yavuzer 2017). In the study, CBT was found to be more effective than MCT among children with a comorbid diagnosis of SAD, although this difference was not significant and may be associated with the inclusion of social skills training. This assumption is supported by previous findings showing the effectiveness of social skills training integrated into the CBT approach in reducing symptoms of social anxiety (Sertelin Mercan and Yavuzer 2017). Furthermore, the comparison of a broad-based CBT program with GAD-specific MCT may have introduced a confounding effect on the results. The fact that most of the children who participated in the study had comorbid diagnoses makes it difficult to determine whether the findings reflect GAD specifically or other disorders. Consequently, given the limited number of studies examining the effectiveness of MCT in children and comparing it with CBT, the current findings should be interpreted with caution. To better understand the effectiveness of MCT in treating childhood GAD, more research across different age groups is needed. In future studies, it will be important to compare MCT not only with CBT but also with other approaches, to ensure that the treatment is specific to GAD, to implement it in an individual format, and to include long-term follow-up.

MCT aims to modify these dysfunctional beliefs, and reductions in such beliefs are considered an indicator of treatment success (Wells 2009). In this context, the effectiveness of MCT in the treatment of GAD is closely related not only to symptom recovery but also to changes in both positive and negative metacognitive beliefs. Studies have reported significant reductions in positive and negative metacognitive beliefs following MCT (van der Heiden et al. 2013, McEvoy et al. 2015, Esbjørn et al. 2018, Haseth et al. 2019). Consistent with studies examining the metacognitive model of GAD (Strand et al. 2023, White et al. 2024) these findings support the importance of reducing dysfunctional metacognitive beliefs in the treatment of GAD. Therefore, in line with the metacognitive model of GAD, the findings suggest that reducing worry may depend more on modifying positive and negative metacognitive beliefs than on changing negative automatic thoughts associated with worry. However, some previous studies (Wells and King 2006, Nordahl et al. 2018, Walczak et al. 2019, af Winklerfelt Hammarberg et al. 2023) have addressed only GAD symptoms and have not assessed changes in metacognitive beliefs. In future studies investigating whether MCT is effective in the treatment of GAD, it would be beneficial to also evaluate changes in metacognitive beliefs. The present study suggests that MCT is more effective in reducing metacognitive beliefs compared to applied relaxation and IUT (Wells et al. 2010, van der Heiden et al. 2012). Of course, these findings may be related to the fact that metacognitive change is not a treatment target in applied relaxation or IUT.

Nonetheless, further research comparing different treatments is needed to allow for more objective conclusions.

To date, studies have shown that group-based MCT is perceived as an acceptable treatment by both adults (McEvoy et al. 2015, Haseth et al. 2019) and children (Esbjørn et al. 2018) diagnosed with GAD. Individual MCT has been found to be a feasible treatment option for patients with GAD seeking care in primary health settings and to require fewer sessions to achieve recovery compared to IUT. In addition, therapist competence and adherence to MCT have been reported to range from low to moderate levels (af Winklerfelt Hammarberg et al. 2023). Dropout rates in MCT vary across studies. Mixed findings have been reported regarding dropout rates for MCT and IUT. For example, one study (van der Heiden et al. 2012) found a lower dropout rate in MCT, whereas another (af Winklerfelt Hammarberg et al. 2023) reported a lower dropout rate in IUT. In this context, the current study supports the acceptability and feasibility of MCT among patients diagnosed with GAD; however, further evidence is needed.

Findings from the current study regarding the number of sessions, duration, and structure of MCT treatments are consistent with the existing literature on the typical length of MCT (Wells 2009). This consistency allows for the interpretation and comparison of results across studies. In most studies, individual MCT was preferred, while group MCT was used in the remainder. The study by van der Heiden et al. (2013) was the first to examine the effectiveness of MCT for GAD in a group format. Research has shown that both individual and group MCT are effective in the treatment of GAD. Based on this finding, the current study may be considered important in demonstrating the effectiveness of MCT in treating GAD regardless of therapy format. However, it has been reported that recovery rates in group MCT are sometimes comparable to those in individual MCT, while in some cases they are lower. Moreover, some studies suggests that the average dropout rate tends to be lower in group MCT. Therefore, it may be concluded that the current evidence is not yet sufficient to determine whether therapy format has a significant impact on recovery rates and treatment acceptability. When evaluating the effectiveness of psychotherapy intervention, it is considered that various therapist-related factors such as training, competence, and adherence may influence treatment outcomes (Elkin 1999). It has also been suggested that receiving supervision during the psychotherapy process may have an impact on treatment results (Holloway and Neufeldt 1995). In some studies, therapists trained in MCT were involved (Wells et al. 2010, Nordahl et al. 2018, Haseth et al. 2019, Solem et al. 2021), while in others, therapists received supervision from an MCT-trained expert (Esbjørn et al. 2018, Haseth et al. 2019, Walczak et al. 2019). One study (af Winklerfelt Hammarberg et al. 2023) reported that therapist competence and adherence to MCT ranged from low to moderate levels. In that study, it was noted that the therapists were CBT-oriented, had not received formal training in MCT, and had only participated in a one-day MCT workshop prior to treatment. The limited competence and adherence observed among therapists may be attributable to their lack of training and experience with MCT.

It is noteworthy that in more than half of the studies, the sample size was below 50, and only one study (van der Heiden et al. 2012) included more than 100 participants. Studies with smaller sample sizes tend to report greater treatment effects compared to those with larger samples (Dechartres et al. 2013). Therefore, when interpreting treatment effects, the small sample sizes should be taken into account, and future studies should be conducted with larger samples to enable more accurate evaluations. In all studies except for that of Esbjørn et al. (2018) female participants outnumbered male participants, and in the study by Haseth et al. (2019) only one male participant was included. The higher prevalence of GAD in women (Keskin et al. 2013, Burstein et al. 2014, Mohammadi et al. 2020) may have led to the greater representation of women in these studies. Nevertheless, efforts to ensure gender balance across treatment groups appear to have been made. All of the studies were conducted with participants whose primary diagnosis was GAD. In eight of the studies, comorbid diagnoses were reported, and the rate of comorbidity was high. It is well established that GAD has a high comorbidity rate (Nutt et al. 2006, Simon 2009). In this context, the high comorbidity rates observed in the included studies are consistent with findings reported in the existing literature.

Follow-up assessments are important for examining whether recovery is sustained after treatment (Nicholson and Berman 1983). Research findings indicate that follow-up measurements were conducted

between 1 month (McEvoy et al. 2015) and 24 months (Nordahl et al. 2018) to evaluate the effectiveness of treatment over time. In addition, the study conducted nine years after MCT treatment (Nordahl et al. 2018) reported by Solem et al. (2021) represents the longest follow-up evaluation assessing the effectiveness of MCT in the treatment of GAD. The findings are significant in that they demonstrate MCT gains were sustained for up to nine years and that MCT produced more enduring effects than CBT. The study closest in duration is the 30-month follow-up conducted by van der Heiden and Melchior (2014) which similarly showed that the MCT group continued to demonstrate better outcomes than the IUT group. These data indicate that MCT is effective in both the short and long term and may have stronger and more lasting effects than CBT and IUT in the long term. Although conducting follow-up assessments more than once is important for evaluating the sustainability of treatment effects, most of the reviewed studies included only one follow-up, and only two studies (Wells and King 2006, Wells et al. 2010) conducted two follow-up assessments. Increasing the number of follow-up assessments and conducting further long-term follow-up studies that compare the effects of MCT with those of CBT and IUT would be beneficial. On the other hand, meta-analyses (Nicholson and Berman 1983, Bandelow et al. 2018) have shown that follow-up evaluations generally indicate sustained treatment effects but provide a more limited contribution to determining overall treatment effectiveness than expected. In addition, methodological limitations—such as the absence of control groups or the difficulty of accounting for patients starting other treatments during the follow-up period—should also be taken into consideration (Nicholson and Berman 1983, Bandelow et al. 2018).

RCT designs are considered the gold standard in studies investigating the effectiveness of psychotherapies (Shean 2014). RCT designs aim to determine whether there is a significant difference between treatment, comparison, and waitlist control groups. In this way, valuable information can be obtained regarding whether the observed change is specific to the treatment being evaluated (Rifkin 2007). However, only a small number of studies have employed an RCT design, and these studies included comparison groups such as CBT (Nordahl et al. 2018) and IUT (van der Heiden et al. 2012) as well as waitlist control groups. The use of multiple control groups is important for evaluating treatment outcomes independently of the passage of time or the absence of an active intervention (Howick 2009). Additionally, the inclusion of a placebo control group would allow for a more reliable assessment of treatment effectiveness. In pilot RCT studies, applied relaxation (Wells et al. 2010) and IUT (af Winklerfelt Hammarberg et al. 2023) were used as active control groups. When the treatment being evaluated is compared with another treatment, the latter is referred to as an active control group (Howick 2009). In such studies, it should be considered that the differences observed between treatments may be attributable to the specific interventions applied. Therefore, the findings from pilot RCT studies using only active control groups should be interpreted with caution. Similarly, in a quasi-experimental study comparing MCT and CBT (Walczak et al. 2019) the presence of an active control group warrants careful interpretation of the results. For this reason, it would be beneficial to replicate these studies using a full RCT design. In conclusion, to better understand the effects of MCT in the treatment of GAD and to more robustly demonstrate that treatment outcomes are specific to MCT, further studies employing RCT designs are needed.

This study is the first systematic review in the literature to evaluate the effectiveness of MCT in the treatment of GAD. Another strength of the study is that the sample was extended to include children, allowing for a comprehensive evaluation of the effectiveness of MCT on GAD symptoms in both adulthood and childhood. In addition to these strengths, the study also has some limitations. The first limitation is that, as a systematic review, the study was conducted within the framework of specific inclusion and exclusion criteria. Therefore, the search was limited to selected databases, and studies published in languages other than Turkish and English were not included. This limitation restricts the generalizability of the findings. The second limitation is that the effectiveness of MCT in the treatment of GAD could be compared to only a limited number of treatment approaches. This may be due to the fact that MCT is still a relatively new therapeutic approach. The third limitation concerns the consistency of the outcome measures, statistical analyses, and reported treatment results across studies. Most studies reported recovery in worry and anxiety levels as the primary treatment outcome. However, only a few studies

assessed whether participants continued to meet the diagnostic criteria for GAD after treatment. These methodological differences reduce the comparability of the study results.

Conclusion

This systematic review demonstrates that MCT can be used as an effective treatment for GAD. The findings indicate that MCT is effective in reducing worry and anxiety levels as well as in decreasing both positive and negative metacognitive beliefs among patients diagnosed with GAD. MCT is associated with higher recovery rates compared to applied relaxation, IUT, and CBT, particularly in terms of long-term effects. The majority of patients treated with MCT no longer met the diagnostic criteria for GAD and were considered fully recovered. The evidence suggests that MCT may be more effective than CBT in adults diagnosed with GAD and as effective as CBT in treating GAD in children. In this context, MCT should be considered an alternative treatment option for GAD, as it allows for faster and more effective outcomes and offers results that are superior or at least equivalent to other treatments. On the other hand, the low dropout rates, its demonstrated effectiveness in both individual and group formats, and its broad acceptability among both adults and children contribute to the expanding applicability of MCT and support its use as an appropriate treatment option for patients with GAD. Nevertheless, further studies employing RCT designs are needed to more comprehensively evaluate the effectiveness of MCT. The results of this review suggest that a treatment approach based on a relatively recent theoretical framework—one that focuses not on the content of thoughts but on thinking processes—may offer advantages over traditional GAD treatments. In order to expand the clinical utility of MCT, it is important for future research to focus both on examining the metacognitive model of GAD and on comparing the effectiveness of MCT with other treatments, particularly CBT and IUT, among patients diagnosed with GAD.

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Authors Contributions: The author(s) have declared that they have made a significant scientific contribution to the study and have assisted in the preparation or revision of the manuscript
Peer-review: Externally peer-reviewed.
Ethical Approval: This review study does not require ethical clearance.
Conflict of Interest: No conflict of interest was declared.
Financial Disclosure: No financial support was declared for this study.