

# Evaluation of Cognitive Emotion Regulation and Metacognition Effects on Anxiety Symptoms in Generalized Anxiety Disorder and Comparison with Healthy Control

Esengül Ekici,<sup>1</sup> Işık Batuhan Çakmak,<sup>2</sup> Mustafa Abanuzoğlu,<sup>2</sup> Fatih Yığman<sup>3</sup>

<sup>1</sup>Department of Psychiatry, Memorial Ankara Hospital, Yüksek İhtisas University Faculty of Medicine, Ankara, Türkiye

<sup>2</sup>Department of Psychiatry, Sungurlu State Hospital, Çorum, Türkiye

<sup>3</sup>Private Practice, Psychiatrist, Ankara, Türkiye



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## Address for correspondence:

Esengül Ekici.  
Yüksek İhtisas Üniversitesi Tıp  
Fakültesi, Memorial Ankara  
Hastanesi Psikiyatri Kliniği,  
Ankara, Türkiye  
Phone: +90 312 253 66 66  
E-mail:  
gulekici09@gmail.com

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## ABSTRACT

This study examined metacognition and maladaptive cognitive emotion regulation strategies that are considered to play a crucial role in the onset and progression of generalized anxiety disorder (GAD). Eighty-five individuals with GAD and 70 healthy individuals participated in the assessment via the State-Trait Anxiety Inventory, Cognitive Emotion Regulation Questionnaire (CERQ), and Metacognitions Questionnaire-30, and participants with GAD were assessed for clinical differences with the control group. It was found that the CERQ-positive refocusing domain and Metacognitions Questionnaire-beliefs about the need to control thoughts had predictive effects on trait and state anxiety severity in GAD. Nevertheless, only the CERQ-rumination and CERQ-positive reappraisal domains had predictive effects on trait anxiety severity in GAD. This implies that establishing a comprehensive approach to GAD that combines perspectives of both metacognitive and cognitive emotion regulation is beneficial for achieving a deeper understanding of GAD and, developing strategies to improve treatment effectiveness.

**Keywords:** Generalized anxiety disorder, metacognition, cognitive emotion regulation, anxiety.

## ÖZ

### Yaygın Anksiyete Bozukluğunda Bilişsel Duygu Düzenleme ve Üstbilişlerin Kaygı Belirtileri Üzerine Etkilerinin Değerlendirilmesi ve Sağlıklı Kontrolle Karşılaştırılması

Bu çalışmada, yaygın anksiyete bozukluğunun (YAB) başlamasında ve ilerlemesinde önemli bir rol sahip olduğu düşünülen üstbilişlerin ve maladaptif bilişsel duygu düzenleme stratejilerinin değerlendirilmesi amaçlandı. Çalışmaya 85 YAB'lı ve 70 sağlıklı birey, Durumluk-Sürekli Kaygı Ölçeği (DSKÖ), Bilişsel Duygu Düzenleme Ölçeği (BDDÖ) ve Üstbiliş Ölçeği-30 (ÜBÖ) yoluyla değerlendirilerek alındı. YAB'lı bireyler ile kontrol grubu arasındaki klinik farklar da kontrol edildi. YAB'da BDDÖ-olumlu yeniden odaklanma stratejisi ve ÜBÖ-düşünceleri kontrol ihtiyacı alt boyutlarının durumluk ve sürekli kaygı üzerinde yordayıcı etkisi saptandı. Fakat, sadece YAB'da BDDÖ-ruminasyon ve BDDÖ-olumlu yeniden değerlendirmenin sürekli kaygı üzerinde yordayıcı etkisi tespit edildi. Bu sonuçlar, YAB'a üstbiliş ve bilişsel duygu düzenleme perspektiflerini birleştiren kapsamlı bir yaklaşımın elde edilmesinin, YAB'ın daha derinlemesine anlaşılmasına ve dolayısıyla YAB'da tedavi etkinliğini artıracak stratejilerin kullanılmasına faydalı olabileceği anlamına gelebilir.

**Anahtar Kelimeler:** Yaygın anksiyete bozukluğu, üstbiliş, bilişsel duygu düzenleme, kaygı.

## INTRODUCTION

Generalized anxiety disorder (GAD) is a persistent psychiatric disorder characterized by anxiety, excessive worry, and physical symptoms combined with prominent distress, in which social, academic, and other areas of functioning are impaired (American Psychiatric Association, 2013). Metacognition is defined as “thinking about thinking” and acknowledging emotions, thoughts, intentions, and how they relate to form comprehensive mental representations (Myers & Wells, 2015). The metacognitive model has gained prominence in understanding psychological vulnerability, as evidenced by the growing body of literature on the subject, including associations with the conceptualization of worry- and anxiety-related disorders (Aydin et al, 2019; Gkika et al, 2018). The SREF model proposes that cognitive-attentional syndrome (CAS) involves dysfunctional belief activation, increased self-focused attention, vigilant threat monitoring, and ruminative processing. CAS refers to the failure of healthy coping mechanisms that promote mental disorders and are triggered by maladaptive metacognitive beliefs (Spada et al, 2015; Wells & Matthews, 1996). CAS is a perseverative thinking style that is a transdiagnostic feature of psychopathology. It emerges from maladaptive metacognitive beliefs that encompass ideas about the process and outcomes of thinking. In studies related to mental disorders, five common domains of metacognitive beliefs were frequently examined, including positive beliefs about worry (PBW), negative beliefs about uncontrollability and danger of worry (NBW), beliefs about the need to control thoughts (NCT), cognitive confidence (CC), and cognitive self-consciousness (CSC) (Wells & Cartwright-Hatton, 2004). These metacognitive models of an AD propose that these beliefs could be associated with the onset and maintenance of AD, specifically in GAD symptoms and metacognitions about NBW, PBW, and NCT (Aydin et al, 2019; Aydin et al, 2022; Mansueto et al, 2022; Sherwood et al, 2020).

Emotion regulation is a process that adjusts emotional experiences through cognitive, behavioral, interpersonal, and intrapersonal strategies (Gross, 2002). The comprehensive conceptualizations of emotion regulation include many strategies that elaborate behavioral and cognitive regulation, such as acceptance, positive reappraisal, putting into perspective, positive refocusing, planning (these five are adaptive), catastrophizing, self-blame, rumination, and blaming others (these four are maladaptive) (Garnefski et al, 2001), which causes emotion dysregulation. Emotion dysregulation has been demonstrated to emphasize the onset and progression of affective, obsessive-compulsive, depressive, anxiety, and personality disorders (Bayes et al, 2016; Ekici et al, 2023; Salguero et al, 2019). Studies have

reported that patients with GAD experience trouble regulating emotions, such as when identifying, clarifying, and rejecting related emotional feelings through maladaptive emotion regulation strategies (Mennin et al, 2005; Salguero et al, 2019). Numerous studies have demonstrated that cognitive emotion strategies are associated with rumination, catastrophizing, and self-blaming (Chan et al, 2015; Martin & Dahlen, 2005), and maladaptive emotion dysregulation predicts higher anxiety-related symptoms (Garnefski et al, 2007).

In this study, we first examined the differences in metacognition and cognitive emotion dysregulation between individuals with GAD and healthy controls (HCs). Second, we tested the specific predictions of trait and state anxiety levels using metacognition and cognitive emotion dysregulation in a GAD sample. Considering the literature, we hypothesized that the NBW and NCT of metacognition and maladaptive emotion regulation strategies would have higher scores in the GAD group than in the HC group. On the contrary, we expected that the various metacognition and domains of maladaptive emotion regulation would have specific associations with trait and state anxiety in patients with GAD.

## METHODS

Following the psychiatry outpatient visits, patients with GAD were assessed by a psychiatrist via the Structured Clinical Interview for DSM-5 –Clinician Version (SCID-5-CV) in 2022–2023 (Elbir et al, 2019). Eighty-five patients who met the DSM-5 criteria for GAD based on SCID-5-CV assessed by psychiatrists were admitted for the study. However, five patients with GAD were excluded from the study because they answered the scales randomly. Eighty patients with GAD aged 18–65 years were included. Patients with neurocognitive disease or mental retardation, psychotic disorders, bipolar affective disorders, and substance use disorders according to the DSM-5 and those taking psychotropic medication or psychotherapy for worry or anxiety in the last 12 months were excluded. In the HC group, which is 70, a thorough assessment of psychiatric history was conducted, relying on the participants' self-reported responses. Individuals who reported a current or past psychiatric disorder diagnosis were excluded from the study. After having been explained detailed information about the study, informed consent was obtained from the participants.

### Ethical Committee

Ethical Committee approval was obtained from the Local Ethics Committee (Ufuk University Noninterventional Clinical Research Ethics Committee, dated 13.12.2022, numbered 12024861/88), which followed the ethical standards of the 2013 Declaration of Helsinki.

### Data Collection Tools

State–Trait Anxiety Inventory (STAI, Spielberger et al., 1983): This measure is used to assess state and trait anxiety. The 40-item version and demonstrated high validity and reliability (Spielberger et al, 1983). High measurement scores imply high anxiety levels. In the Turkish population, Öner and LeCompte (1983) adapted the STAI and conducted psychometric analyses (Öner & LeCompte, 1983). Item remainder reliability was determined to range from 0.34 to 0.72 and 0.42 to 0.85 for trait and state anxiety, respectively, indicating acceptable item performance. Test–retest reliability values ranged from 0.71 to 0.86 and 0.26 to 0.68 for trait and state anxiety, respectively, indicating good stability over time. The adapted scale also demonstrated strong validity, as evidenced by significant relationships with other anxiety scales, ranging from  $r=0.58$  to  $r=0.84$ .

Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski, 2001): Garnefski et al. (2001) developed the CERQ, which consists of 36 items (Garnefski et al., 2001) and assesses emotion regulation strategies, including self-blame, acceptance, rumination, putting into perspective, positive refocus, refocus on planning, positive reappraisal, catastrophizing, and blaming others. Subscale scores were calculated by summing the item scores related to each strategy, resulting in subscale scores between 4 and 20. Higher scores imply greater engagement with the emotion regulation strategy. As measured using Cronbach's alpha values, internal consistency ranged from 0.68 to 0.86 across different populations, indicating good reliability. Test–retest correlations of the CERQ subscales in a study with the general adult population ranged from 0.48 (refocus on planning) to 0.65 (blaming others), indicating moderate to strong temporal stability (Garnefski & Kraaij, 2007). Regarding construct, convergent, and discriminant validity, the CERQ scales demonstrated moderate to strong validity (Garnefski et al, 2002). Tuna and Bozo (2012) translated the CERQ into Turkish with Cronbach's alpha values for the CERQ subscales ranging from 0.72 to 0.83, and the test–retest Cronbach's alpha values of the subscales varied from 0.50 to 0.70 after a 1-month period (Tuna & Bozo, 2012).

The Metacognitions Questionnaire-30 (MCQ30; Wells, 2004): The MCQ-30, developed by Wells and Cartwright-Hatton (2004), measures metacognitive beliefs. The scale consists of 30 items, and respondents rate each item on a 4-point Likert scale. The MCQ-30 is organized into five subdimensions, each capturing different aspects of metacognitive beliefs: MCQ-PBW assesses the extent to which an individual believes that repetitive thinking or worrying is beneficial; MCQ-NBW estimates the extent to which an individual views persistent thinking or worries as out of control and potentially hazardous; MCQ-CC evaluates an individual's confidence in

their attention and memory abilities; MCQ-NCT measures the extent to which an individual believes that particular thoughts should be suppressed or controlled; and MCQ-CSC estimates an individual's tendency to monitor for their thoughts and concentrate their attention inwardly. Higher scores on these subtests indicate maladaptive metacognition. The MCQ-30 has Cronbach's alpha values ranging from 0.72 to 0.93, meaning that the items within each subdimension reliably measure the same construct. Test–retest reliability is also acceptable, with correlation coefficients ( $r$ ) ranging from 0.59 to 0.87, indicating that the scale yields consistent results over time (Wells & Cartwright-Hatton, 2004). Tosun and Irak (2008) examined whether the Turkish version of the MCQ-30 is valid and reliable in the Turkish sample (Tosun & Irak, 2008).

### Statistical Analysis

The data analysis for the study was conducted using SPSS software version 25.0. Descriptive statistics were calculated to summarize the characteristics of the data. We used the Kolmogorov–Smirnov test to assess the normality, the Student's  $t$ -test, and the Mann–Whitney  $U$  test for comparisons. Pearson correlation analysis was used to explore the relationships among the MCQ, CERQ, and STAI domains. A level of  $p<0.05$  was considered statistically significant. Hierarchical regression analyses were performed to assess the predictive factors (metacognition and cognitive emotion regulation are in our study) of state and trait anxiety scores. The data did not show multicollinearity, indicating strong correlations among variables. However, the correlations among variables were not too high ( $<0.80$ ).

The researchers used an online calculation tool based on Soper's work to determine sample size. The tool requires input on the anticipated effect size, desired statistical power level, number of predictors in each model, and probability level (Soper, 2024). They received an expected effect size of 0.3 and a desired power of 0.80. The number of predictors was 2 for one model (age and gender) and 14 for another model (the subscales of STAI, CERQ, and MCQ), and the alpha was set to 0.05. On the basis of these inputs, the researchers determined that the required sample size for each group should be at least 76. After conducting the study, post hoc analyses were performed, and the power of each model was calculated to be in the range of 0.83 (Soper, 2024).

## RESULTS

### Clinical Characteristics

Eighty individuals with GAD and 70 HCs were enrolled in the study. The group descriptions were similar regarding age, gender, and marital status. The years of education and current and past treatment of the GAD and HC groups differed (Table 1).

**Table 1.** Sociodemographic data

	GAD (n=80)	Control (n=70)	p
Age; year Mean (SD)	23.40 (5.48)	25.16 (6.63)	0.078
Years of education; year Mean (SD)	13.22 (2.05)	14.74 (1.60)	0.000
Sex			0.123
Female	73 (91.3%)	58 (82.9%)	
Male	7 (8.8%)	12 (17.1%)	
Marital status			0.847
Single	65 (81.3%)	56 (80%)	
Married	15 (18.8%)	14 (20%)	
Current treatment			
Yes	28 (35%)	0 (0%)	
No	52 (65%)	70 (100%)	
Past treatment			
Yes	43 (53.8%)	0 (0%)	
No	37 (46.3%)	70 (100%)	

SD: Standard deviation; GAD: Generalized anxiety disorder.

The descriptive statistics related to the MCQ-30, CERQ, and STAI subscales for each group are presented in Table 2. HCs had lower mean values for CERQ-self-blame, CERQ-rumination, CERQ-putting into perspective, CERQ-catastrophizing, CERQ-blaming others, MCQ-NBW, MCQ-NCT, and MCQ-CSC. Conversely, individuals in the GAD group had higher mean scores for CERQ-positive refocusing, CERQ-refocusing on planning, and CERQ-positive reappraisal. There were no differences between the GAD and HC groups on CERQ-acceptance, MCQ-PBW, and MCQ-CC (Table 2).

We conducted a hierarchical regression analysis to examine the relationship between trait and state anxiety severity and the MCQ and CERQ subscales of individuals with GAD. In the first step, we controlled for the effects of age and gender on anxiety severity. In the second step, we evaluated the effects of the MCQ and CERQ domains on anxiety severity. For the GAD group, the first regression model was significant ( $F(16, 63)=7.899, p<0.001$  with an adjusted R square 0.583) and determined that the CERQ-positive refocusing MCQ-NCT domains had negative and positive predictive effects on state anxiety severity ( $\beta=-0.235, p<0.001$ ;  $\beta=0.364, p<0.001$ ), respectively. After controlling for age and gender, the second model was also significant ( $F(16, 63)=16.047, p<0.001$  with an adjusted R square 0.753) and determined that CERQ-rumination and MCQ-NCT domains had positive predictive effects ( $\beta=0.391, p<0.001$ ;  $\beta=0.345, p<0.001$ ), and CERQ-positive refocusing and CERQ-positive reappraisal had

negative predictive effects on trait anxiety severity ( $\beta=-0.266, p<0.001$ ;  $\beta=-0.265, p<0.001$ ) (Table 3, 4).

## DISCUSSION

This study aimed to understand the possible roles of metacognition and cognitive emotion dysregulation in trait and state anxiety in a GAD population. Regression analyses of our hypothesized model and the amount of explained variance in the GAD sample indicate that the proposed model is valuable.

Our study demonstrated higher scores for self-blame, blaming others, catastrophizing, rumination domains of cognitive emotion dysregulation, negative metacognitive beliefs, and the need to control thought domains of metacognition in individuals with GAD than in HC, which is consistent with our hypothesis. This result aligns with previous studies that have indicated a positive relationship between negative metacognition and anxiety (Anderson et al, 2019; Capobianco et al, 2020), specifically determining these differences between GAD and HC (Aydin et al, 2019; Aydin et al, 2022; Mansueto et al, 2022). Another noteworthy finding of our study is that individuals with GAD demonstrated a greater tendency to control their thoughts than HCs. Past research has indicated that the need to control thoughts may be linked to increased anxiety levels (Bailey & Wells, 2015; Sun et al, 2017), specifically determining these differences between GAD and HC (Aydin et al, 2019; Mansueto et al, 2022). Patients with GAD may monitor

**Table 2.** Symptom severity and independent variable means and standart deviations

	<b>GAD</b> <b>Mean (SD)</b>	<b>Control</b> <b>Mean (SD)</b>	<b>p</b>
Measures of severity			
STAI-state anxiety	50.19 (11.40)	37.68 (9.67)	<0.001
STAI-trait anxiety	58.08 (9.36)	43.96 (10.58)	<0.001
Predictor variables			
CERQ-self-blame	13.31 (3.98)	10.98 (3.07)	<0.001
CERQ-acceptance	12.24 (3.68)	11.64 (3.04)	0.286
CERQ-rumination	15.16 (3.43)	13.13 (3.33)	<0.001
CERQ-positive refocusing	8.51 (3.56)	10.91 (3.98)	<0.001
CERQ--refocusing on planning	11.87 (4.04)	14.48 (3.26)	<0.001
CERQ-positive reappraisal	10.46 (3.80)	13.67 (3.13)	<0.001
CERQ-putting into perspective	10.92 (3.58)	2.70 (2.97)	0.001
CERQ-catastrophizing	12.42 (4.25)	8.78 (3.18)	<0.001
CERQ-blaming others	11.61 (3.71)	10.11 (2.67)	<0.001
MCQ-PBW	11.12 (4.28)	12.17 (3.32)	0.094
MCQ-NBW	17.70 (3.58)	13.53 (3.45)	<0.001
MCQ-CC	13.20 (5.30)	11.88 (4.69)	0.112
MCQ-NCT	20.41 (3.73)	14.33 (4.49)	<0.001
MCQ-CSC	19.15 (2.83)	16.75 (2.98)	<0.001

SD: Standard deviation; GAD: Generalized anxiety disorder; STAI: State–Trait Anxiety Inventory; BDI: Beck Depression Inventory; CERQ: Cognitive Emotion Regulation Questionnaire; MCQ-PBW: Metacognitions Questionnaire –positive beliefs about worry; MCQ-NBW: Metacognitions Questionnaire –negative beliefs about the uncontrollability and danger of worry; MCQ-CC: Metacognitions Questionnaire –cognitive confidence; MCQ-NCT: Metacognitions Questionnaire –beliefs about the need to control thoughts; MCQ-CSC: Metacognitions Questionnaire –cognitive self-consciousness.

their internal states and attempt to dismiss any thoughts that trigger worry from their consciousness. However, this coping strategy is often impractical because thought suppression typically intensifies negative beliefs related to thought control (Wells & Carter, 2009; Wenzlaff & Wegner, 2000). Studies have reported that positive metacognitive beliefs in individuals with GAD are significantly different from those in healthy individuals (Mennin et al, 2005). Positive beliefs may help reduce anxiety when individuals achieve their internal goals. But, later on, when combined with negative beliefs, these positive beliefs can trigger anxiety, especially when the individual begins to catastrophize situations inflexibly by worrying (Wells, 2005). Therefore, in our study, it is possible to consider that healthy participants were successful in achieving their internal goals and were able to prevent anxiety by having elevated positive metacognitive beliefs. This finding could be explained by the heterogeneity of the patients with GAD in our sample, who received various forms of treatment, and none required hospital admission. This indicates that their anxiety levels were

relatively controlled. It may also be related to HC STAI scores, which were supported by STAI scores showing moderate severity of anxiety symptoms (Spielberger et al, 1983) and close to STAI cutoff values (Ercan et al, 2015). Previous studies have revealed differences in maladaptive emotion regulation strategies, which have been demonstrated to be related to anxiety (Bruggink et al, 2016; Chan et al, 2015) and between individuals with GAD and HCs (Nasiri et al., 2020), consistent with our findings.

It has been determined that positive refocusing had a negative prediction effect and negative metacognitive beliefs had a positive prediction effect for state anxiety; rumination and negative metacognitive beliefs had positive and positive refocusing, and positive reappraisal had a negative prediction effect for trait anxiety when controlling for age and gender, which is consistent with our hypothesis. Negative metacognitive beliefs significantly predicted the GAD group compared with the HC group (Aydın et al,



**Table 3.** Summary of the regression equations predicting the STAI-state anxiety score

Model	Adj. R square	B	SE	$\beta$	CI (LL)	CI (UL)
Step 1	-0.002					
1: Female 2: Male		5.435	4.629	0.136	-3.783	14.653
Age (year)		-0.210	0.226	-0.107	-0.659	0.240
Step 2	0.583**					
1: Female 2: Male		2.625	3.189	0.065	-3.749	8.998
Age (years)		-0.235	0.166	-0.120	-0.567	0.097
CERQ-self-blame		0.043	0.256	0.015	-0.468	0.554
CERQ-acceptance		-0.135	0.289	-0.044	-0.713	0.442
CERQ-rumination		0.464	0.383	0.140	-0.301	1.228
CERQ-positive refocusing		-0.752	0.327	-0.235	-1.404	-0.099
CERQ-refocusing on planning		0.071	0.352	0.025	-0.633	0.775
CERQ-positive reappraisal		-0.710	0.379	-0.237	-1.467	0.046
CERQ-putting into perspective		-0.090	0.410	-0.028	-0.909	0.728
CERQ-catastrophizing		0.578	0.378	0.216	-0.177	1.334
CERQ-blaming others		-0.335	0.285	-0.109	-0.905	0.236
MCQ-PBW		-0.041	0.206	-0.016	-0.453	0.370
MCQ-NBW		-0.090	0.298	-0.028	-0.686	0.507
MCQ-CC		0.221	0.185	0.103	-0.148	0.591
MCQ-NCT		1.113	0.364	0.364	0.386	1.840
MCQ-CSC		-0.383	0.393	-0.095	-1.169	0.402

STAI: State–Trait Anxiety Inventory; BDI: Beck Depression Inventory; CERQ: Cognitive Emotion Regulation Questionnaire; MCQ-PBW: Metacognitions Questionnaire-positive beliefs about worry; MCQ-NBW: Metacognitions Questionnaire-negative beliefs about the uncontrollability and danger of worry; MCQ-CC: Metacognitions Questionnaire-cognitive confidence; MCQ-NCT: Metacognitions Questionnaire-beliefs about the need to control thoughts; MCQ-CSC: Metacognitions Questionnaire-cognitive self-consciousness.

2019) and were strongly associated with anxiety (Aydin et al, 2022; Wells, 2005), consistent with our results. Negative metacognitive beliefs can trigger anxiety when people start catastrophizing about the consequences of worrying about a particular situation (Wells, 2005). State anxiety refers to temporary emotional and physiological reactions that arise in response to specific situations or events in a particular moment or circumstance. Trait anxiety is an enduring characteristic in individuals who perceive situations as threatening, leading to higher baseline physiological arousal and avoidance of anxiety-provoking problems (Elwood et al, 2012). Furthermore, adaptive strategies related to anxiety include positive refocusing and positive reappraisal. Cognitive emotion regulation strategies associated with lower anxiety levels include “positive refocusing” (Garnefski & Kraaij, 2012) and “positive reappraisal” (Garnefski & Kraaij, 2006; Tao et al, 2022). Cognitive reappraisal, which may also aid in symptom reduction and improvements in overall

well-being when patients are used to this coping strategy, involves attempting to alter the subjective assessment of a situation that triggers emotions to change its emotional effect (King & dela Rosa, 2019). Studies have stated that strategies like rumination, positive refocusing, and positive reappraisal (Omran, 2011) can distinguish individuals with GAD from those with excessive worrying (Nasiri et al, 2020). Related to our results, there were prediction differences in state and trait anxiety: rumination and positive refocusing. Individuals with high trait anxiety are more susceptible to stress and exhibit specific neurocognitive styles, such as dealing with threats or ambiguous situations. This style includes a selective attentional bias toward stimuli associated with threats, tends to construe ambiguous stimuli related to emotion as negative information, and, consequently develops conditioned fear responses (Sandi & Richter-Levin, 2009). Understanding as a form of negative rumination, a response to threat stimuli, involves recurring thoughts and

**Table 4.** Summary of the regression equations predicting the STAI- score

Model	Adj. R Square	B	SE	β	CI (LL)	CI (UL)
Step 1	0.004					
1: Female 2: Male		4.106	3.788	0.125	-3.437	11.649
Age (year)		-0.238	0.185	-0.148	-0.606	0.130
Step 2	0.753**					
1: Female 2: Male		2.108	2.015	0.064	-1.918	6.134
Age (year)		-0.192	0.105	-0.119	-0.401	0.018
CERQ- self-blame		0.095	0.161	0.040	-0.228	0.418
CERQ- acceptance		-0.213	0.183	-0.084	-0.578	0.152
CERQ- rumination		1.067	0.242	0.391	0.584	1.550
CERQ- positive refocusing		-0.700	0.206	-0.266	-1.112	-0.288
CERQ- refocusing on planning		-0.165	0.223	-0.071	-0.610	0.280
CERQ- positive reappraisal		-0.653	0.239	-0.265	-1.131	-0.175
CERQ- putting into perspective		-0.210	0.259	-0.081	-0.728	0.307
CERQ- catastrophizing		-0.120	0.239	-0.055	-0.598	0.357
CERQ- blaming others		0.207	0.180	0.082	-0.153	0.568
MCQ-PBW		0.014	0.130	0.006	-0.246	0.274
MCQ-NBW		-0.040	0.188	-0.015	-0.416	0.337
MCQ-CC		0.175	0.117	0.099	-0.059	0.408
MCQ-NCT		0.866	0.230	0.345	0.407	1.325
MCQ-CSC		-0.228	0.248	-0.069	-0.724	0.269

STAI: State–Trait Anxiety Inventory; BDI: Beck Depression Inventory; CERQ: Cognitive Emotion Regulation Questionnaire; MCQ-PBW: Metacognitions Questionnaire-positive beliefs about worry; MCQ-NBW: Metacognitions Questionnaire-negative beliefs about the uncontrollability and danger of worry; MCQ-CC: Metacognitions Questionnaire-cognitive confidence; MCQ-NCT: Metacognitions Questionnaire-beliefs about the need to control thoughts; MCQ-CSC: Metacognitions Questionnaire-cognitive self-consciousness.

self-focused attention (Segerstrom et al, 2003). Studies have reported specific associations among rumination, refocusing, and trait anxiety (Hong, 2007; Munoz-Navarro et al, 2022; Nasiri et al, 2020; Wang et al, 2019). High trait anxiety did not directly cause anxiety disorders; people with high trait anxiety experienced inadequate attention control, cognitive inhibition, and task-switching difficulties (Ansari et al, 2008), and they stimulated the body’s dysfunctional neurocognitive cascade with stressful events (Weger & Sandi, 2018), which is different from state anxiety. Therefore, increasing people’s susceptibility to stress could end with rumination and no positive refocusing, consequently leading to increased anxiety and GAD symptoms. Some studies did not find rumination to be predictive of anxiety, which is inconsistent with our findings (Hong, 2007). One likely explanation of these inconsistencies may be that cognitive factors associated with trait anxiety are related to distinct factors contributing to varying characteristics of emotion dysregulation strategies,

and rumination could exhibit heterogeneity within itself. Investigating trait anxiety and emotion dysregulation with negative metacognition in psychotherapy may promote the treatment of GAD.

Our study has some limitations in terms of interpreting the results. This was a cross-sectional research; therefore, causal relationships could be established. This study was conducted at a single center and relied on self-report scales. The sample of individuals with GAD was heterogeneous regarding symptom duration, type of pharmacotherapy and psychotherapy, and comorbid conditions that could affect emotion regulation and metacognition (Manos et al, 2010). The study had more female participants, leading to unequally distributed samples (Veilleux et al, 2021a; Veilleux et al, 2021b). To ensure the generalizability of the results, conducting longitudinal studies with larger sample sizes and equal gender distribution across multiple centers is essential.

## CONCLUSIONS

The findings of this study have several theoretical implications. The findings revealed that varying degrees of emotion dysregulation and metacognition were associated with trait and state anxiety predictions. These results support Wells's metacognition model and Garnefsky's cognitive emotion regulation model. Specifically, our study found that positive refocusing negatively predicted state anxiety, whereas negative metacognitive beliefs had a positive prediction. For trait anxiety, rumination and negative metacognitive beliefs had a positive prediction, whereas positive refocusing and positive reappraisal were negative when age and gender were controlled for. In general, a range of cognitive factors may contribute to the onset and progression of GAD. This research has important implications for understanding the cognitive underpinnings of GAD, cognitive emotion regulation strategies, and metacognition, as well as their roles in the severity both state and trait anxiety. Notably, trait anxiety represents distinct features that may be linked to neurocognitive characteristics (Weger & Sandi, 2018). Future research should further explore the intricate relationships between state and trait anxiety, metacognition, and cognitive emotion regulation strategies in the context of GAD. Such investigations can provide invaluable insights into the complex interplay between cognitive processes and symptomatology in GAD, ultimately contributing to the development of more precise and effective interventions. Specific interventions that modify cognitive coping strategies can be incorporated into existing coping skill training programs, metacognitive therapy, and cognitive behavioral therapy.

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