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The effect of mindfulness and metacognition on anxiety symptoms: a case-control study

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Abstract

Background: Anxiety disorders (ADs) are associated with numerous psychiatric disorders; despite the efforts in psychotherapy models targeting their etiology, novel treatment strategies are still developing. We aimed to assess whether mindfulness and metacognition differ between patients with ADs and healthy controls (HCs) and whether the symptom severity of ADs is related to mindfulness and metacognition among patients. Two-hundred participants were enrolled in this study. Structured clinical interview, sociodemographic form, Five Facet Mindfulness Questionnaire-Short Form, Metacognition Questionnaire-30, and Hamilton Anxiety Rating Scale were administered. Multivariate analysis of covariance was conducted to compare the groups in terms of mindfulness and metacognition. Correlation and multiple linear regression analyses were performed to measure the association between the variables.

Results: The main finding indicates that positive beliefs about worry are associated with reduced symptom severity of ADs. Furthermore, HCs have more positive beliefs about worry and nonjudging of inner experience compared to patients with ADs, who utilize negative beliefs about uncontrollability and danger and need to control thoughts to a greater extent.

Conclusions: This study demonstrates that dysfunctional metacognitive beliefs may influence the anxiety severity of adult patients. We suggest that focusing on reducing maladaptive metacognitions may be supportive of AD improvement.

Keywords: Anxiety, Metacognition, Mindfulness, Metacognitive beliefs

Background

Anxiety disorders (ADs) are considered to be among the most widespread psychiatric disorders, and they substantially harm individuals [13, 46, 53, 73, 79, 88]. ADs are assumed to usually start during early adulthood or adolescence [88]. Women were frequently reported to have higher ADs prevalence than men [62, 80]. According to one study, as high as 33.7% of the general population may develop a particular AD during their lifespan [8], while specific phobias were suggested to be the most prevalent ADs [44]. All ADs are characterized by disproportionate fear (emotional reaction to actual or supposed impending

danger), anxiety (expectation of future danger), and associated behavioral problems [2].

It was proposed that the etiology of ADs is complex and may be related to a variety of individual differences [64]. Additionally, several etiological models of ADs were put forward, drawing attention to both genetic [11, 38, 39, 72, 84] and environmental factors [11, 24, 39, 43]. Due to various distinctive factors, different approaches were suggested for treating ADs, comprising pharmacotherapy, psychotherapy, or a mixture of both. Cognitive-behavioral therapy was suggested to be the most effective type of psychotherapeutic treatment, whereas selective serotonin reuptake inhibitors and serotonin-norepinephrine reuptake inhibitors were recommended as first-line medications for managing ADs [9, 13, 79, 88]. Nevertheless, current pharmacologic treatments do

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not always yield favorable outcomes for many individuals with ADs [114].

However, additional studies are necessary to advance the contemporary intervention strategies focusing on the etiology of ADs [61, 83]. Accordingly, we would like to emphasize two factors that are related to each other and have potential contributions to anxiety symptoms: mindfulness and metacognition.

Mindfulness

Mindfulness refers to the state of increased awareness, where individuals directly focus on their here and now experiences. This practice may be especially beneficial since it was suggested that people's daily lives are full of mindless states associated with different detrimental outcomes [20]. The construct of mindfulness was studied extensively in relation to different psychological problems [35]. It was implied that mindfulness might be a prominent factor in each psychotherapy approach [60].

The existing literature has identified that mindfulness was associated with numerous positive outcomes, such as improved self-esteem [76, 81], empathy [10, 17], sleep quality [42, 111], attention [57, 59], emotional intelligence [63, 91], reduced distress [30, 45], and occupational burnout [112].

Likewise, mindfulness was shown to be the relevant factor in many ADs, including selective mutism [67], specific phobia [41], social anxiety disorder (social phobia) [34, 50, 78], panic disorder [47, 48, 56], and generalized anxiety disorder [28, 40, 48].

Metacognitions

While metacognition may be simply explained as "thinking about thinking" [54], it denotes the advanced way of thinking where individuals exhibit more control over underlying mental processes [58], and it includes the states of heightened self-regulation and self-awareness [89]. Many people with average intelligence employ metacognitive regulation while dealing with complex mental tasks that demand a higher level of attention [58]. One of the most prominent frameworks that have its origins in metacognitive therapy is the self-regulatory executive function (S-REF) model [106, 107]. S-REF was developed for conceptualizing worry and anxiety-related disorders such as generalized anxiety disorder [95], posttraumatic stress disorder [108], and social anxiety disorder [25]. This model suggests that maladaptive metacognitive beliefs trigger unhealthy coping mechanisms (e.g., extended thinking), aggravating mental disorders [86]. According to the S-REF model, a specific thinking style known as cognitive attentional syndrome (CAS) is key to psychological distress. Negative ideas and emotions are perpetuated due to CAS, leading to failures to modify

dysfunctional metacognitive beliefs and resolve self-discrepancies in a stable manner [107].

Metacognitive beliefs are usually separated into positive and negative [100, 101]. The positive metacognitive beliefs refer to the usage of rumination as a specific coping strategy (e.g., "I need to ruminate about my problems to find answers to my anxiety"), whereas the negative metacognitive beliefs represent harm and uncontrollability of rumination, as well as its adverse effects on social functioning (e.g., "Ruminating about my anxiety could make me kill myself"; "Ruminating about my problems is uncontrollable") [75]. Metacognitive models of ADs suggest that one's negative beliefs about the danger and uncontrollability of worry may predict the onset and continuance of ADs [82]. These negative appraisals are also called "type 2 worry" or "meta-worry," and they increase anxiety as these people have a constant need for worrying in order to believe they can deal with a particular situation [96].

Maladaptive metacognitions were observed in several ADs, encompassing social anxiety disorder (social phobia) [33, 55, 71, 99], panic disorder [4, 22, 68], and generalized anxiety disorder [4, 49, 99, 105].

The associations between mindfulness and metacognition

Mindfulness produces positive treatment outcomes in individuals by utilizing a metacognitive type of information processing [96], in which individuals may modify how they process information according to the ever-changing circumstances [51]. Moreover, "detached mindfulness" is a technique used in metacognitive therapy. This metacognitive state contains various mechanisms, such as metacognitive control and monitoring, activating metacognitive knowledge, and delaying conceptual processing [97]. Sherwood et al. [82] have reasoned that those with diminished mindfulness may be at increased risk for developing negative cognitive processes, which often transform into negative metacognitive beliefs. Previous research comparing the neural correlates of metacognition and mindfulness has found that both are linked to increased activity in the anterior cingulate cortex [7, 77, 109], prefrontal cortex [21, 65, 66, 77, 109], and insular cortex [32, 77, 109].

Aims of the study

Although ADs are pervasive and detrimental, their etiology may not be entirely ascertained [61, 83]. Therefore, investigating possible associations between anxiety symptoms and two related cognitive states, mindfulness, and metacognition may pose a different perspective on the developmental origins and treatment modalities of ADs. We aimed to examine whether the symptom severity is connected to mindfulness and metacognition

among adults with ADs. To the best of the authors' knowledge, the association between these variables among adults was not reviewed among the psychiatric population in the existing literature. We hypothesized that low mindfulness and dysfunctional metacognitions might be associated with increased anxiety symptoms. In addition, we hypothesized that mindfulness and meta-cognition would differ between patients with AD and healthy controls (HC).

Methods

Participants

Two groups of research participants were recruited for the present study. The patients were selected from the individuals who applied to the psychiatric outpatient unit of the Celal Bayar University Hospital between January and June 2020 if they met the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria for at least one of the anxiety disorders, including social anxiety disorder, panic disorder, agoraphobia, and generalized anxiety disorder according to the Structured Clinical Interview for DSM-5 [26]. The inclusion criteria for patient selection were as follows: (i) to be between 18 and 65 years of age range, (ii) no current hospital admission, and (3) no treatment change in the last month prior to study participation. The exclusion criteria for patients were as follows: (1) the presence of any psychiatric disorder rather than DSM-5 anxiety disorders class and (2) ineligibility to fill in the self-report questionnaires. Additionally, gender-matched HCs were recruited through advertisements on social networks of the clinic for the present study. HC group also underwent a Structured Clinical Interview for DSM-5 [26]. For HCs, we excluded individuals with psychiatric disorders only. Initially, we reached 100 outpatients and 100 HCs; however, 27 patients were excluded due to having comorbid psychiatric disorders rather than anxiety disorders ($n = 19$), not responding to all the items in questionnaires ($n = 6$), and withdrawing the consent ($n = 2$). Seven HCs were excluded due to lacked or fixed scoring of at least one questionnaire. At the time of the study, all patients were under regular antidepressant and anxiolytic treatment. All participants provided written informed consent, and the study was approved by the Institutional Review Board of Celal Bayar University (Decision no: 20.478.486).

Instruments

Sociodemographic form

This form was developed to gather the sample's primary sociodemographic data (including age, gender, education level, and marital status).

Five Facet Mindfulness Questionnaire-Short Form (FFMQ-S)

Five Facet Mindfulness Questionnaire-Short Form (FFMQ-S; [93]) is the abridged (20 items) version of the original Five Facet Mindfulness Questionnaire (FFMQ) developed by Baer et al. [5]. In FFMQ-S, the statements are scored on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). FFMQ-S comprises five mindfulness factors like FFMQ: observing (OBS), describing (DES), acting with awareness (ACT), nonjudging of inner experience (NJ), and nonreactivity to inner experience (NR). High scores on FFMQ-S denote a raised level of trait mindfulness. Psychometric properties of FFMQ-S are appropriate in the original version (Cronbach's alphas for FFMQ-S subscales range from 0.62 to 0.81; [93]). Similarly, validity and reliability analyses of the Turkish version indicated that FFMQ-S might be utilized among the Turkish sample (Cronbach's $\alpha = 0.71$; [3]). In our study, the range is between 0.71 and 0.79.

Metacognition Questionnaire-30 (MCQ-30)

Metacognition Questionnaire-30 (MCQ-30; [104]) is the shortened, 30-item version adapted from the Metacognition Questionnaire (MCQ; [15]) that contains 65 items. MCQ-30 measures individual differences in five prominent factors of the metacognitive model of psychological disorders. These factors are positive beliefs about worry (POS), negative beliefs about uncontrollability and danger (NEG), need to control thoughts (NC), (lack of) cognitive confidence (CC), and cognitive self-consciousness (CSC). The items presented in MCQ-30 are assessed on a 4-point Likert scale, ranging from 1 (*do not agree*) to 4 (*agree very much*), and higher scores signify greater levels of maladaptive metacognitions [104]. MCQ-30 has established acceptable both internal consistency and test-retest reliability values (Cronbach's $\alpha = 0.72$ – 0.93 , $r = 0.59$ – 0.87 ; [87]). Turkish version of MCQ-30 has likewise shown good psychometric properties [92]. In our study, Cronbach's alpha ranged from 0.76 to 0.89.

Hamilton Anxiety Rating Scale (HAM-A)

The Hamilton Anxiety Rating Scale (HAM-A; [36]) is a clinician-rated scale used to evaluate anxiety symptoms' severity. HAM-A is still commonly utilized in research and clinical settings due to its versatility: it applies to adult, adolescent, and children populations. HAM-A comprises 14 items, each described by a series of symptoms, and it measures both somatic anxiety (physical complaints linked to anxiety) and psychic anxiety (mental agitation and psychological distress). Each item is scored on a 5-point Likert scale ranging from 0 (*not present*) to 4 (*severe*). A total score range is 0–56, where < 17 implies mild severity of anxiety symptoms, 18–24

mild-to-moderate severity, and 25–30 moderate to severe [36]. HAM-A has strong internal consistency (Cronbach’s $\alpha = 0.89$; [52]) and good inter-rater reliability as determined by an intra-class correlation coefficient of 0.74–0.96 [12]. In [113], Yazici et al. confirmed the validity of the Turkish version of HAM-A. We found Cronbach alpha = 0.87 in our study.

Statistical analysis

Post hoc power analyses using G*Power software version 3.1.9.4 confirmed that we had an adequate sample size to be able to achieve a high level of power and reduce the chance of making a type 2 error, considering α error = .05, $f^2 = 0.20$, and power ($1 - \beta$ error) = 0.90. Descriptive statistics methods were used to estimate the mean, standard deviation, total count, and frequency of the variables. The normality of distribution was checked by the Shapiro-Wilk test, skewness, and kurtosis. The normality assumptions were fulfilled. Independent samples *t*-test and chi-square were run to reveal the differences in the sociodemographic variables between HC and AD groups. Multivariate analysis of covariance (MANCOVA) was conducted for controlling covariates (age and marital status) while comparing the groups’ variances in FFMQ-S and MCQ-30 subtests. To measure the relationships between HAM-A-total, FFMQ-S, and MCQ-30 factors, bivariate (Pearson) correlation analyses were executed. Multiple linear regression analysis (enter method used) was subsequently carried out to examine the predictive value of FFMQ-S and MCQ-30 factors for the outcome variable HAM-A-total after verifying that multiple linear regression analysis assumptions were justified. Cohen’s f^2 was calculated to determine the effect size of a multiple linear regression model. According to Cohen’s guidelines, $f^2 \geq .02$, $f^2 \geq 0.15$, and $f^2 \geq 0.35$ represent small, medium, and large effect sizes, respectively [18]. The level of statistical significance (*p*) was set to < .05. Statistical Package for Social Sciences (SPSS) version 22.0 (IBM Corp.,

Armonk, NY, USA) was utilized for running the statistical analyses.

Results

Characteristics of the groups

The sociodemographic characteristics of the two groups are presented in Table 1. The groups differed in age ($t(164) = -5.41, p < .001$) and marital status ($\chi^2(2) = 22.38, p < .001$). There were no significant differences in education level ($t(164) = 1.51, p < 0.133$) and gender ($\chi^2(1) = 3.03, p = .082$). The results showed that the average HAM-A-total score in the AD patients group ($M = 15.9, SD = 6.6$) corresponds to the mild severity of anxiety symptoms [36].

Comparison of the FFMQ-S and MCQ-30 scores between HC and AD groups showing the results from MANCOVA

MANCOVA was used to determine the effects of HC and AD groups on FFMQ-S and MCQ-30 factors. Age and marital status were entered as covariates to control their effects on group differences. There were no statistically significant effects of age ($F(10, 153) = 1.24, p = 0.270, \eta_p^2 = .08$) and marital status ($F(10, 153) = 0.34, p = 0.970, \eta_p^2 = .02$) on groups. Statistically, significant group effects were observed in FFMQ-S-NJ ($F(1, 162) = 6.03, p = .015, \eta_p^2 = .04$), MCQ-30-POS ($F(1, 162) = 13.92, p < .001, \eta_p^2 = .08$), MCQ-30-NEG ($F(1, 162) = 18.60, p < .001, \eta_p^2 = 0.10$), and MCQ-30-NC ($F(1, 162) = 11.82, p = .001, \eta_p^2 = .07$). On contrary, no group effects were obtained in FFMQ-S-ACT ($F(1, 162) = 1.58, p = 0.211, \eta_p^2 = .01$), FFMQ-S-NR ($F(1, 162) = 2.68, p = 0.104, \eta_p^2 = .02$), FFMQ-S-OBS ($F(1, 162) = 0.77, p = 0.381, \eta_p^2 = .01$), FFMQ-S-DES ($F(1, 162) = 0.46, p = 0.497, \eta_p^2 < .01$), MCQ-30-CC ($F(1, 162) = 0.07, p = 0.796, \eta_p^2 < .01$), and MCQ-30-CSC ($F(1, 162) = 3.07, p = .082, \eta_p^2 = .02$). The results are presented in Table 2.

Table 1 Sociodemographic features of the groups

Variable	Group	Healthy controls (n = 93)			Anxiety disorder patients (n = 73)			Statistics
		M	SD	n (%)	M	SD	n (%)	
1. Age		26.6	8.3		34.5	10.6		$t(164) = -5.41, p < .001$
2. Education (years)		15.0	2.7		14.2	3.8		$t(164) = 1.51, p = 0.133$
3. Gender								
Male				43 (46.2%)			24 (32.9%)	$\chi^2(1) = 3.03, p = .082$
Female				50 (53.8%)			49 (67.1%)	
4. Marital status								
Married				24 (25.8%)			45 (61.6%)	$\chi^2(2) = 22.38, p < .001$
In relationship				18 (19.4%)			10 (13.7%)	
Single				51 (54.8%)			18 (24.7%)	

Table 2 Group comparison of FFMQ-S and MCQ-30 subtests showing the results from MANCOVA analysis with age and marital status as covariates

Variable	Group		Healthy controls (n = 93)		Anxiety disorder patients (n = 73)		F (1, 162)	p	η ²
	M	SD	M	SD	M	SD			
1. FFMQ-S-ACT	11.9	3.4	11.7	4.1	1.58		0.211	.01	
2. FFMQ-S-NJ	12.2	3.6	10.1	3.6	6.03		.015	.04	
3. FFMQ-S-NR	13.4	2.8	12.5	3.7	2.68		0.104	.02	
4. FFMQ-S-OBS	14.5	2.7	13.9	3.6	0.77		0.381	.01	
5. FFMQ-S-DES	14.0	3.3	14.4	3.2	0.46		0.497	< .01	
6. MCQ-30-POS	14.3	4.2	12.1	4.4	13.92		< .001	.08	
7. MCQ-30-NEG	14.7	4.4	17.8	4.2	18.60		< .001	0.10	
8. MCQ-30-NC	14.8	3.6	16.4	3.3	11.82		.001	.07	
9. MCQ-30-CC	13.2	5.0	13.5	4.8	0.07		0.796	< .01	
10. MCQ-30-CSC	17.7	3.0	18.3	2.9	3.07		.082	.02	

FFMQ-S Five Facet Mindfulness Questionnaire-Short Form, MCQ-30 Metacognition Questionnaire-30, MANCOVA Multivariate analysis of covariance, FFMQ-S-ACT Acting with awareness facet of FFMQ-S, FFMQ-S-NJ Nonjudging of inner experience facet of FFMQ-S, FFMQ-S-NR Nonreactivity to inner experience facet of FFMQ-S, FFMQ-S-OBS Observing facet of FFMQ-S, FFMQ-S-DES Describing facet of FFMQ-S, MCQ-30-POS Positive beliefs about worry subtest of MCQ-30, MCQ-30-NEG Negative beliefs about uncontrollability and danger subtest of MCQ-30, MCQ-30-NC Need to control thoughts subtest of MCQ-30, MCQ-30-CC Cognitive confidence subtest of MCQ-30, MCQ-30-CSC Cognitive self-consciousness subtest of MCQ-30

Associations between HAM-A-total, FFMQ-S, and MCQ-30 factors among AD patients group

The bivariate correlation coefficients for the AD patients group are presented in Table 3. HAM-A-total score was negatively correlated with FFMQ-S-NJ ($r = -0.27, p = .034$) and MCQ-30-POS ($r = -0.27, p = .034$), while it was positively correlated with MCQ-30-NEG ($r = 0.28, p = .029$). Results from multiple linear regression analysis (enter method used) are presented in Table 4. MCQ-30-POS was a significant predictor of HAM-A-total ($F(3, 69) = 4.00, p = .012$), explaining

17.4% of the total variance in the regression model. The effect size of the final regression model was medium ($f^2 = 0.20$).

Discussion

This study aimed to assess whether mindfulness and metacognition differ between AD patients and HCs and examine the potential contribution of metacognition and mindfulness to anxiety symptoms in adults with AD diagnosis. The results have suggested that patients with AD have utilized negative beliefs about uncontrollability

Table 3 The correlational coefficients between HAM-A-total, FFMQ-S, and MCQ-30 subtests among anxiety disorder patients group

Variable	1	2	3	4	5	6	7	8	9	10	11
1. FFMQ-S-ACT	—	0.28*	0.33**	-0.10	0.18	-0.12	-0.43**	-0.23	-0.36**	-0.29*	-0.14
2. FFMQ-S-NJ		—	0.15	-0.19	0.15	-0.01	-0.49**	-0.47**	-.08	-0.37**	-0.27*
3. FFMQ-S-NR			—	-0.11	0.17	.02	-0.44**	-0.11	-0.17	-0.13	-0.14
4. FFMQ-S-OBS				—	0.23*	.09	.08	.09	-.03	0.31**	-.01
5. FFMQ-S-DES					—	-0.16	-0.31**	-0.23	-0.49**	.03	-.04
6. MCQ-30-POS						—	.07	0.19	0.24*	0.17	-0.27*
7. MCQ-30-NEG							—	0.41**	0.14	0.51**	0.28*
8. MCQ-30-NC								—	0.17	0.38**	0.11
9. MCQ-30-CC									—	-.08	0.16
10. MCQ-30-CSC										—	-.04
11. HAM-A-total											—

HAM-A-total Hamilton Anxiety Rating Scale-total score, FFMQ-S Five Facet Mindfulness Questionnaire-Short Form, MCQ-30 Metacognition Questionnaire-30, MANCOVA Multivariate analysis of covariance, FFMQ-S-ACT Acting with awareness facet of FFMQ-S, FFMQ-S-NJ Nonjudging of inner experience facet of FFMQ-S, FFMQ-S-NR Nonreactivity to inner experience facet of FFMQ-S, FFMQ-S-OBS Observing facet of FFMQ-S, FFMQ-S-DES Describing facet of FFMQ-S, MCQ-30-POS Positive beliefs about worry subtest of MCQ-30, MCQ-30-NEG Negative beliefs about uncontrollability and danger subtest of MCQ-30, MCQ-30-NC Need to control thoughts subtest of MCQ-30, MCQ-30-CC Cognitive confidence subtest of MCQ-30, MCQ-30-CSC Cognitive self-consciousness subtest of MCQ-30

*p < .05, **p < .01

Table 4 Multiple linear regression (enter method used) statistics with HAM-A-total as the outcome variable and FFMQ-S and MCQ-30 factors as the predictor variables (anxiety disorder patients group)

Dependent variable	Predictors	B	SE	Beta (β)	t	p	R ²
1. HAM-A-total	1. FFMQ-S-NJ	−0.27	0.25	−0.14	−1.07	0.290	0.17
	2. MCQ-30-POS	−0.43	0.20	−0.26	−2.13	.038*	
	3. MCQ-30-NEG	0.40	0.23	0.23	1.76	.085	

HAM-A-total Hamilton Anxiety Rating Scale-total score, FFMQ-S Five Facet Mindfulness Questionnaire-Short Form, MCQ-30 Metacognition Questionnaire-30, FFMQ-S-NJ Nonjudging of inner experience facet of FFMQ-S, MCQ-30-POS Positive beliefs about worry subtest of MCQ-30, MCQ-30-NEG Negative beliefs about uncontrollability and danger subtest of MCQ-30

* $p < .05$

and danger and the need to control thoughts to a greater extent. In contrast, HCs had more positive beliefs about worry and nonjudging of inner experience. Additionally, positive beliefs about worry were associated with decreased symptom severity of ADs, whereas we did not show any relationships between mindfulness and anxiety symptoms.

One finding of this study was that patients with ADs possessed more negative metacognitive beliefs when compared to the HC group. This result is in line with previous studies that have suggested a positive association between negative metacognitive beliefs and anxiety [1, 4, 6, 14, 23, 29, 82, 90]. Negative metacognitive beliefs may incite anxiety when individuals begin catastrophizing about the potential outcomes of worrying [98]. Although the correlation analyses of our sample have shown that negative metacognitive beliefs were positively associated with symptom severity of ADs, this was not confirmed by the multiple linear regression analyses. This finding may potentially be explained by the fact that all patients with ADs in our sample were under regular treatment, and no hospital admission may imply that their anxiety levels were under control, which was supported by the HAM-A scale, according to which they had mild severity of anxiety symptoms [36]. Therefore, it is possible that the results would be different for moderate or severe anxiety.

Another finding our study has indicated is that patients with ADs held more need to control thoughts than HCs, which is a type of negative metacognitive belief [103]. This metacognitive belief represents the lack of control over thoughts which people with ADs may consider a negative experience [94]. Previous research has suggested that the need to control thoughts may relate to heightened anxiety [4, 6, 22, 29, 68, 90, 94, 102]. Individuals with ADs may monitor their internal states and try to eliminate from the consciousness all the thoughts that trigger worry, though this coping strategy is not practical because the use of thought suppression typically intensifies the negative beliefs associated with thought control [103, 110].

In this study, positive beliefs about worry were the only predictor of decreased symptom severity of ADs. This finding was supported by a recent study in which positive beliefs about worry have negatively predicted panic disorder and generalized anxiety disorder [4]. It was suggested that holding positive beliefs about worry is “quite normal” [97, 102] since they are employed in the process of emotion and cognition regulation [19]. Prior studies have proposed that positive metacognitive beliefs do not signal the incidence of ADs, as they alone cannot produce the symptoms of anxiety [70, 90, 98, 102], and they become pathological and may lead to ADs only in the presence of negative metacognitive beliefs [19, 97, 102]. Wells [98] has argued that positive metacognitive beliefs may reduce anxiety only if individuals successfully meet their internal objectives. According to this, the finding that the HC group in our study has employed more positive metacognitive beliefs may be interpreted so that they were successful in attaining their internal objectives. Furthermore, since patients with ADs have shown mild symptom severity, it may be assumed that they still possess necessary coping mechanisms in positive metacognitive beliefs, which preclude the detrimental effects of negative metacognitive beliefs [4].

Ostafin et al. [74] have suggested that individuals high in nonjudging of inner experience do not assess feelings, thoughts, and impulses as good, harmful, or dangerous, nor attempt to alter them [74]. Our findings have presented that nonjudging of inner experience was negatively correlated with symptom severity of ADs, and the HC group has scored higher on this mindfulness factor. These outcomes are consistent with the previous literature indicating the inverse relationship between anxiety and this mindfulness component [16, 27, 31, 37, 69, 74, 85]. However, it should be noted that our regression model did not support these findings. This result may be explained by the fact that the mindfulness scores of our sample (both HCs and patients) are different compared to the scores in the validity and reliability study [3]. The small sample size and subject variables, including age and gender, may account for the observed differences.

This research has a few notable limitations. First, small sample size and nonrandom sampling threaten the validity of our results. Due to the self-report instruments' application, recall bias and answer accuracy may have influenced our findings. Regardless of our attempt to statistically control extraneous variables, there may have been some overlooked effects of subject variables, such as comorbid physical conditions that may cause anxiety symptoms; therefore, we suggest that future studies consider them as the exclusion criteria. Additionally, given that our sample corresponds to mild severity of anxiety symptoms, it is likely that different results would be observed at different severity stages of the ADs. Moreover, the cross-sectional design of this study cannot identify the cause-and-effect pattern of the observed associations. Future studies should use longitudinal designs to look at the differences in mindfulness and metacognitions over time and pinpoint causal predictors of symptom severity of ADs. Finally, it would have been preferable to assess mindfulness and metacognition among patients with ADs who are not under pharmacological or non-pharmacological treatment to avoid their effects on symptom severity.

Conclusions

In conclusion, this study suggests that positive beliefs about worry may be associated with decreased symptom severity of ADs among adults. Contrary to our expectations, mindfulness was not found to be associated with mild anxiety symptoms. Therefore, we advise that focusing on improving dysfunctional metacognitive beliefs rather than mindfulness may assist more in the maintenance treatment of the adult AD population. Given that this is the initial study on this topic, additional research is required to determine the effects of metacognitive beliefs on adults' anxiety.

Abbreviations

AD: Anxiety disorder; HC: Healthy control; S-REF: Self-regulatory executive function; CAS: Cognitive attentional syndrome; DSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; FFMQ-S: Five Facet Mindfulness Questionnaire-Short Form; OBS: Observing; DES: Describing; ACT: Acting with awareness; NJ: Nonjudging of inner experience; NR: Nonreactivity to inner experience; MCQ-30: Metacognition Questionnaire-30; POS: Positive beliefs about worry; NEG: Negative beliefs about uncontrollability and danger; NC: Need to control thoughts; CC: Cognitive confidence; CSC: Cognitive self-consciousness; HAM-A: Hamilton Anxiety Rating Scale; MANCOVA: Multivariate analysis of covariance; SPSS: Statistical Package for Social Sciences.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43045-022-00260-7>.

Additional file 1.

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Authors' contributions

FO conducted the analysis, results interpretation, and discussion. EÇ, PUA, and AED contributed to the data collection. OA was involved in the supervision of the work and design, aided in the result interpretation, and contributed to the manuscript writing. The authors read and approved the final manuscript.

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Availability of data and materials

All data generated or analyzed during this study are included in this published article (and its supplementary information files).

Declarations

Ethics approval and consent to participate

Informed consent was obtained from all individual participants included in the study. All procedures performed in the study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. The study was approved by the Institutional Review Board of Celal Bayar University (No. 20.478.486).

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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