



Insomnia Catastrophizing and Affective Temperaments in Major Depressive Disorder

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Background and Objective We aim to assess the role of affective temperaments, insomnia severity, sleep quality, and depressive anxiety symptoms in predicting catastrophizing insomnia in patients with major depressive disorder (MDD).

Methods Our study employed a case-control design, involving 90 drug-free MDD patients and 90 healthy controls (HCs) with identical sociodemographic characteristics. Participants completed a comprehensive set of assessments, including the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Insomnia Catastrophizing Scale (ICS), and Temperament Evaluation of Memphis, Pisa, Paris, San Diego Autoquestionnaire (TEMPS-A).

Results Among the 90 MDD patients, 80% were female ($n = 72$), with a mean age of 32.2 ± 13.6 years. The MDD group exhibited significantly higher scores on the BDI, BAI, ISI, PSQI, ICS night, ICS daytime, and ICS total scores, along with depressive, cyclothymic, irritable, and anxious temperament scores, compared to the HCs ($p < 0.001$). Notably, the hyperthymic temperament showed no correlation with insomnia catastrophizing in either group. Our findings revealed that the ISI score was a predictive factor for the ICS night; age and ISI were predictive factors for the ICS daytime; and age, anxious temperament, and ISI were predictive factors for the ICS total in the MDD group.

Conclusions The severity of insomnia, young age, and an anxious temperament were identified as positive predictors of insomnia catastrophizing. **Sleep Med Res 2024;15(3):173-181**

Keywords Affective temperament; Catastrophizing; Insomnia; Major depression.

INTRODUCTION

Depression often leads to insomnia symptoms, such as difficulty falling asleep, difficulty staying asleep, and early morning awakenings [1]. A substantial number of patients with depression who either partially or fully recover with antidepressants continue to experience persistent insomnia symptoms. Persistent insomnia, even after depression treatment, increases the risk of recurrent depressive episodes and suicide [2,3]. Treating only depression is insufficient for addressing insomnia in these patients. Specific interventions targeting the underlying factors contributing to insomnia are essential to effectively manage this condition. Thus, clinicians should first perceive insomnia as a psychosomatic condition, understand models of insomnia etiology, particularly the cognitive model, and apply specific treatments to depressive patients with insomnia based on this cognitive model [4].

The most significant component of the insomnia cognitive model is catastrophizing [4].

Catastrophizing involves the irrational belief that future events will have a negative outcome [5]. The model illustrates that individuals with insomnia tend to overestimate the likelihood of adverse effects, focus on negative potentials, and believe they are unable to cope with these outcomes [6]. The process of catastrophizing about insomnia includes the following steps. Initially, the insomniac becomes increasingly preoccupied with sleep due to psychological arousal and begins to monitor their sleep more closely. Subsequently, they start to catastrophize the negative consequences of insomnia, thus exacerbating its severity. Ultimately, these negative thoughts about insomnia are reinforced by the worsened severity of the condition, perpetuating the destructive cycle of insomnia. Research has confirmed that individuals with insomnia frequently overestimate insomnia's detrimental impact on their functionality. Addressing and restructuring the catastrophizing associated with insomnia is essential for treating insomnia in patients with depression. Cognitive behavioral therapy for insomnia (CBT-I), recommended as the primary treatment for insomnia, specifically targets and aims to modify catastrophizing by fostering more rational thoughts [7-9].

Affective temperaments refer to an individual's dominant temperament and are described on a continuum, ranging from healthy individuals to those with mood disorders [10]. These are divided into five categories: cyclothymic, irritable, depressive, hyperthymic, and anxious [11]. They partly influence depressive symptoms through interpersonal sensitivity [12]. Additionally, they mediate the effects of childhood maltreatment on adult depression [13]. Moreover, depressive, irritable, and anxious temperaments are associated with an increased risk of suicide-related ideation [14]. Affective temperaments are also linked to insomnia [15]. In the general population, insomnia is positively correlated with anxious, cyclothymic, depressive, and irritable temperaments, and negatively correlated with hyperthymic temperaments [16]. Furthermore, workers with an anxious temperament are more prone to insomnia [17]. A recent study indicates that the impact of insomnia on depressive symptoms is positively moderated by cyclothymic, depressive, and anxious temperaments and negatively by hyperthymic temperament [15].

To the best of our knowledge, the role of affective temperaments in catastrophizing about insomnia has not been explored in both healthy populations and MDD patients. In our study, we aim to compare catastrophizing about insomnia and affective temperaments in healthy controls (HCs) and MDD patients and to assess the role of affective temperaments, insomnia severity, sleep quality, and depressive-anxiety symptoms in predicting catastrophizing about insomnia in depressive patients.

METHODS

Study Design and Participants

We designed our research as a case-control study. To deter-

mine the sample size, we identified an effect size of Cohen's $d = 0.5$ with 80% power ($\alpha = 0.05$, two-tailed). The minimum sample size required for depression patients was 79. All patients meeting the inclusion criteria and visiting Canakkale Onsekiz Mart University Faculty of Medicine Hospital's Psychiatry outpatient clinic for the first time between June 15, 2022, and March 1, 2023, along with HCs meeting the same criteria, were informed about the study method and signed the consent form. Participants completed the sociodemographic data form, Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Insomnia Catastrophizing Scale (ICS), and Temperature Evaluation of Memphis, Pisa, Paris, and San Diego Autoquestionnaire (TEMPS-A). Our case-control study comprised 90 MDD patients and 90 HCs with identical sociodemographic characteristics.

Inclusion criteria for MDD patients were: 1) willingness to participate; 2) diagnosis of major depression per Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria; 3) aged 18 to 65; 4) first-time visitors to our clinic; and 5) no psychiatric treatment (pharmacological or psychotherapy) received in the past 6 months. Inclusion criteria for HCs were: 1) willingness to participate; 2) aged between 18 and 65; and 3) absence of mental illness.

Exclusion criteria for all participants were: 1) any primary sleep disorder as per DSM-5; 2) any comorbid psychiatric disorder as per DSM-5; 3) any additional medical disease (such as neurological diseases like multiple sclerosis, Huntington's chorea, dementia, cerebrovascular disease, systemic lupus erythematosus, thyroid dysfunction, chronic renal failure, liver failure, oncological disorders, chronic obstructive pulmonary disease, sleep apnea syndrome, cardiovascular disorders); 4) pregnancy; 5) comorbid alcohol substance use disorder; 6) psychotropic drug use; and 7) any conditions that would hinder their ability to complete the scales (vision-hearing disability, reading-writing disability, intellectual disability). Our study received approval from the Canakkale Onsekiz Mart University Faculty of Medicine Clinical Research Ethics Committee (decision number: 01.06.2022-10-16).

Measures

Sociodemographic data form

Our research team developed it to gather information on participants' sociodemographic data such as age, gender, marital status, and economic status.

Beck Depression Inventory

The Beck Depression Inventory (BDI) was developed to measure depression severity in patients. It is the most widely utilized scale in research to assess depression severity. The BDI comprises 21 items, each rated between 0 and 3, with total scores ranging from 0 to 63. Higher scores reflect increased severity of

depression. Hisli [18] conducted the validity-reliability study of the scale in Turkey. In our study, the Cronbach's alpha for the BDI was 0.83 in the MDD group and 0.82 in the HC group.

Beck Anxiety Inventory

The Beck Anxiety Inventory (BAI) assesses symptoms of anxiety such as nervousness, dizziness, and an inability to relax. This self-report scale consists of 21 items. Responses are evaluated on a 4-point Likert scale ranging from 0 (not at all) to 3 (severely), with higher scores indicating more severe anxiety. The Turkish version of the BAI was validated by Ulusoy et al. [19]. In our study, the Cronbach's alpha for the BAI was 0.91 in the MDD group and 0.94 in the HC group.

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI), a self-report questionnaire, is designed to evaluate sleep quality over the previous month. It includes 19 items across seven dimensions: 1) subjective sleep quality, 2) sleep latency, 3) sleep duration, 4) sleep efficiency, 5) sleep disturbances, 6) use of sleep medication, and 7) daytime dysfunction. Each dimension is scored from 0 to 3, with the total PSQI score being the sum of these dimensions, ranging from 0 to 21. Higher scores denote poorer sleep quality. Ağargün et al. [20] validated the Turkish version of the PSQI.

Insomnia Severity Index

The Insomnia Severity Index (ISI), a 7-item self-report tool utilized in insomnia research, assesses various aspects such as the severity of sleep onset, maintenance, and early morning awakenings; dissatisfaction with sleep; impact of sleep problems on daily activities; perception of sleep issues by others; and distress caused by sleep difficulties. Each item is scored from 0 to 4, with totals reflecting more severe insomnia symptoms. The Turkish version of the ISI is psychometrically sound [21]. In our research, the Cronbach's alpha for the ISI was 0.90 in the MDD group and 0.92 in the HC group.

Insomnia Catastrophizing Scale

The Insomnia Catastrophizing Scale (ICS) was developed to assess catastrophic thoughts regarding nocturnal symptoms of insomnia and the resulting daytime dysfunction. The Turkish ICS comprises 12 items split into two subscales [22]. The first part, the ICS-Night, contains seven items, while the second part, the ICS-Daytime, includes five items. Responses utilize a 6-point Likert scale (0 = never, 5 = always), where a higher total score indicates more catastrophizing about insomnia [22]. In our study, the Cronbach's alpha for the ICS-Total was 0.95 in the MDD group and 0.94 in the HC group.

Temperature Evaluation of Memphis, Pisa, Paris and San Diego Autoquestionnaire

The Temperature Evaluation of Memphis, Pisa, Paris and San

Diego Autoquestionnaire (TEMPS-A) is a true-false questionnaire with 99 items and evaluates various dimensions, including emotional, cognitive, psychomotor, interpersonal, and vegetative aspects such as sleep and sexual desire [23]. The TEMPS-A categorizes participants into five distinct temperament types: depressive, cyclothymic, hyperthymic, irritable, and anxious, with elevated scores reflecting increased intensity of these temperaments.

Statistical Analysis

Statistical analyses were conducted using jamovi (Version 2.3.24.0; <https://www.jamovi.org/>) and JASP (Version 0.17.1; <https://jasp-stats.org/>). Descriptive statistics summarized the data collected. Continuous variables were presented as mean \pm standard deviation or as median, minimum, and maximum values, while categorical variables were expressed as numbers and percentages. The normality of numerical variables was assessed using Shapiro-Wilk, Kolmogorov-Smirnov, and Anderson-Darling tests. Differences in categorical variables between groups were analyzed using Pearson chi-square test for 2×2 tables with expected values of 5 or more, and Fisher's test for tables with expected values below 5. Fisher Freeman for exact test and $R \times C$ tables expecting values under 5 were evaluated using Halton test. In comparisons of two independent groups, such as between depression patients and HCs, independent samples t-test was employed for normally distributed numerical variables, while the Mann-Whitney U test was used when distributions were not normal. In situations where numerical variables were not normally distributed across more than two independent groups among depression severity categories, the Kruskal-Wallis H test was utilized. In nonparametric tests, group differences were evaluated using Dwass-Steel-Critchlow-Fligner test. Spearman's method was applied for variables that did not display normal distribution in each group. Rho correlation coefficient was also utilized. We conducted a regression analysis to investigate how factors such as age, depression level, anxiety, sleep quality, insomnia severity, and temperaments influence catastrophizing about insomnia. In statistical analyses, significance was set at a p-value of 0.05.

RESULTS

Sociodemographic Characteristics

A total of 180 participants were included, consisting of 90 patients diagnosed with MDD and 90 HCs. In both groups, 80% of the participants were women ($n = 72$) and 20% were men ($n = 18$). The mean age of the patient group was 32.2 ± 13.6 years. The mean age of the HC group was 34.4 ± 13.4 years (Table 1).

Table 1. Sociodemographic variables of the participants and comparisons between groups

Variable	Control (n = 90)	Patient (n = 90)	p-value
Gender			0.999 [‡]
Female	72 (80.0)	72 (80.0)	
Male	18 (20.0)	18 (20.0)	
Age (yr)	34.4 ± 13.4	32.2 ± 13.6	0.292 [*]
Working status			0.059 [‡]
Not working	12 (13.3)	22 (24.4)	
Student	33 (36.7)	33 (36.7)	
Officer	19 (21.1)	9 (10.0)	
Employee	17 (18.9)	10 (11.1)	
Retired	3 (3.3)	5 (5.6)	
Other (tradesman, own business)	6 (6.7)	11 (12.2)	
Educational status			0.999 [‡]
Primary school	21 (23.3)	21 (23.3)	
High school	19 (21.1)	19 (21.1)	
University	50 (55.6)	50 (55.6)	
Marital status			0.891 [‡]
Married	39 (43.3)	36 (40.0)	
Single	44 (48.9)	46 (51.1)	
Widow	7 (7.8)	8 (8.9)	
Living with			0.017 [‡]
Alone	16 (17.8)	8 (8.9)	
With family	62 (68.9)	56 (62.2)	
Other (with friends in dormitory etc.)	12 (13.3)	26 (28.9)	
Economical situation			0.016 [‡]
Bad	5 (5.6)	17 (18.9)	
Average	64 (71.1)	57 (63.3)	
Good	18 (20.0)	16 (17.8)	
Very good	3 (3.3)	0 (0.0)	

Values are presented as n (%) or mean ± standard deviation.

*Independent samples t-test; [‡]Mann-Whitney U test; [‡]Pearson chi-square/Fisher's exact test/Fisher-Freeman-Halton test.

Comparison of clinical scales between HCs and patient groups

The mean BDI score for patients with MDD was 27.5 [10.0–48.0], whereas the mean score for the HC group was 7.5 [0.0–38.0], which was significantly higher in the MDD group than in the HC group. The mean BAI score for patients with MDD was 23.0 [6.0–52.0], compared to 4.0 [0.0–43.0] for the HC group, again significantly higher in the depression group than the HC group. The mean PSQI total score was 8.5 [1.0–20.0] in the patient group, which was significantly higher than the 4.0 [0.0–13.0] in the HC group ($p < 0.001$). In the patient group, the mean ICS-

night score was 13.0 [0.0–35.0], the mean ICS-daytime score was 9.0 [0.0–25.0], and the mean ICS-total score was 24.0 [0.0–55.0], all of which were significantly higher than those in the HCs ($p < 0.001$). The mean depressive temperament score in the TEMPS-A was 9.0 [1.0–16.0], mean irritable temperament score was 7.0 [0.0–17.0], mean anxious temperament score was 14 [2.0–23.0], and mean cyclothymic temperament score was 12.5 [0.0–19.0], all significantly higher than the HCs. The mean hyperthymic temperament score in the HC group was 10 [0.0–19.0] and 7 [1.0–18.0] in the patient group, being higher in the HCs. In the depression group, only 1 dominant temperament was identified in 26.7% of patients ($n = 24$), while 2 or more dominant temperaments were identified in 14.4% ($n = 13$). In the HC group, only 1 dominant temperament was detected in 4.4% ($n = 4$), and 2 or more dominant temperaments in 1.1% ($n = 1$) (Table 2).

Correlation analyses between catastrophizing about insomnia and other clinical variables in the patient group

A moderate negative correlation of significance was detected between the ICS-night score and age ($r = -0.307$, $p = 0.003$). Additionally, high positive significant correlations were observed between BDI ($r = 0.551$), BAI ($r = 0.516$), ISI ($r = 0.668$), PSQI ($r = 0.509$), TEMPS-A cyclothymic temperament score ($r = 0.568$), TEMPS-A anxious temperament score ($r = 0.504$) and ICS-night score. Moderate positive significant correlations were noted between TEMPS-A depressive temperament score ($r = 0.337$), TEMPS-A irritable temperament score ($r = 0.387$) and ICS-night score ($p < 0.05$ for each) (Table 3). A moderate negative significant relationship was found between the ICS-daytime score and age ($r = -0.357$, $p < 0.001$). Conversely, a high significant relationship with ISI ($r = 0.542$) was found; moderate significant relationships with BDI ($r = 0.361$), cyclothymic temperament score ($r = 0.494$), and TEMPS-A anxious temperament score ($r = 0.391$) were noted; low significant relationships were identified with BAI ($r = 0.296$), PSQI ($r = 0.282$), TEMPS-A depressive temperament score ($r = 0.287$) ($p < 0.05$ for each). There were no significant relationships between TEMPS-A hyperthymic temperament score, TEMPS-A irritable temperament score and ICS daytime score (Table 3). A moderate negative significant relationship was found between the ICS total score and age ($r = -0.354$, $p < 0.001$), whereas high positive relationships were observed with BDI ($r = 0.530$), ISI ($r = 0.715$), TEMPS-A cyclothymic temperament score ($r = 0.584$), TEMPS-A anxious temperament score ($r = 0.504$) and ICS total score. Moderate positive significant relationships were noted with BAI ($r = 0.483$), PSQI total score ($r = 0.476$), TEMPS-A depressive temperament score ($r = 0.321$), TEMPS-A irritable temperament score ($r = 0.307$) and ICS total score ($p < 0.05$ for each). No significant correlation was observed between the TEMPS-A hyperthymic temperament score and the ICS-night, ICS-daytime, ICS-total scores (Table 3).

Table 2. Comparisons of the instruments between control and patient group

Scales	Control (n = 90)	Patient (n = 90)	p-value
BDI	7.5 [0.0–38.0]	27.5 [10.0–48.0]	<0.001*
BAI	4.0 [0.0–43.0]	23.0 [6.0–52.0]	<0.001*
ISI	4.0 [0.0–20.0]	14.0 [0.0–26.0]	<0.001*
PSQI	4.0 [0.0–13.0]	8.5 [1.0–20.0]	<0.001*
Component 1: sleep quality	1.0 [0.0–8.0]	2.0 [0.0–3.0]	<0.001*
Component 2: sleep latency	1.0 [0.0–3.0]	2.0 [0.0–3.0]	<0.001*
Component 3: sleep duration	0.0 [0.0–3.0]	1.0 [0.0–3.0]	0.007*
Component 4: habitual sleep efficiency	0.0 [0.0–3.0]	0.0 [0.0–3.0]	<0.001*
Component 5: sleep disturbance	1.0 [0.0–3.0]	2.0 [0.0–3.0]	<0.001*
Component 6: use of sleeping medication	0.0 [0.0–1.0]	0.0 [0.0–3.0]	0.637*
Component 7: daytime functioning	0.0 [0.0–3.0]	1.0 [0.0–3.0]	<0.001*
ICS night	1.0 [0.0–35.0]	13.0 [0.0–35.0]	<0.001*
ICS daytime	2.5 [0.0–25.0]	9.0 [0.0–25.0]	<0.001*
ICS total	4.5 [0.0–60.0]	24.0 [0.0–55.0]	<0.001*
Temperament characteristics (TEMPS-A)			
TEMPS-A depressive, yes	3 (3.3)	17 (18.9)	0.002 [†]
TEMPS-A cyclothymic, yes	2 (2.2)	5 (5.6)	0.444 [†]
TEMPS-A irritable, yes	1 (1.1)	8 (8.9)	0.034 [†]
TEMPS-A anxious, yes	2 (2.2)	23 (25.6)	<0.001 [†]
TEMPS-A dominant temperament			<0.001 [†]
None	85 (94.4)	53 (58.9)	
Only 1 temperament	4 (4.4)	24 (26.7)	
2 or more dominant temperaments	1 (1.1)	13 (14.4)	
TEMPS-A depressive	4.0 [0.0–14.0]	9.0 [1.0–16.0]	<0.001*
TEMPS-A cyclothymic	6.0 [0.0–18.0]	12.5 [0.0–19.0]	<0.001*
TEMPS-A hyperthymic	10.0 [0.0–19.0]	7.0 [1.0–18.0]	0.004*
TEMPS-A irritable	1.0 [0.0–13.0]	7.0 [0.0–17.0]	<0.001*
TEMPS-A anxiety	4.0 [0.0–18.0]	14.0 [2.0–23.0]	<0.001*

Values are presented as mean [minimum–maximum] or n (%).

*Mann-Whitney U test; [†]Pearson chi-square/Fisher's exact test/Fisher-Freeman-Halton test.

BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory; ISI, Insomnia Severity Index; PSQI, Pittsburg Sleep Quality Index; ICS, Insomnia Catastrophizing Scale; TEMPS-A, Temperature Evaluation of Memphis, Pisa, Paris and San Diego Autoquestionnaire.

Correlation analyses between catastrophizing about insomnia and other clinical variables in the HC group

There was a significant high positive correlation between ICS night score and several indices including BDI ($r = 0.626$), BAI ($r = 0.577$), ISI ($r = 0.722$), PSQI total score ($r = 0.712$), TEMPS-A anxious temperament score ($r = 0.539$), and TEMPS-A cyclothymic temperament score ($r = 0.571$). A moderately positive significant correlation was found between TEMPS-A depressive temperament score ($r = 0.356$) and TEMPS-A irritable temperament score ($r = 0.497$) ($p < 0.05$ for each). No significant relationship was observed between age, TEMPS-A hyperthymic temperament score and ICS night score ($p = 0.097$ and $p = 0.525$, respectively) (Table 4). There was a low level neg-

ative significant correlation between ICS daytime score, and age ($r = -0.302$), the TEMPS-A hyperthymic temperament score ($r = -0.234$) ($p = 0.004$ and $p = 0.026$, respectively); a highly significant correlation was found for BDI ($r = 0.584$), BAI ($r = 0.534$), ISI ($r = 0.583$), PSQI total score ($r = 0.661$), and TEMPS-A anxious temperament score ($r = 0.550$) with ICS daytime score; there was a moderate significant correlation between TEMPS-A cyclothymic temperament score ($r = 0.414$), TEMPS-A irritable temperament score ($r = 0.332$) and ICS daytime score. A low-level significant correlation was noted between TEMPS-A depressive temperament score ($r = 0.295$) and ICS daytime score ($p < 0.05$ for each) (Table 4). Additionally, a low-level negative significant correlation existed between ICS total score and age

Table 3. Correlations insomnia catastrophizing and other clinical variables in patient group

Variables	ICS night		ICS daytime		ICS total	
	Spearman's rho	p-value	Spearman's rho	p-value	Spearman's rho	p-value
Age	-0.307	0.003	-0.357	<0.001	-0.354	<0.001
BDI	0.551	<0.001	0.361	<0.001	0.530	<0.001
BAI	0.516	<0.001	0.296	0.005	0.483	<0.001
ISI	0.688	<0.001	0.542	<0.001	0.715	<0.001
PSQI	0.509	<0.001	0.282	0.007	0.476	<0.001
TEMPS-A depressive	0.337	0.001	0.287	0.006	0.321	0.002
TEMPS-A cyclothymic	0.568	<0.001	0.494	<0.001	0.584	<0.001
TEMPS-A hyperthymic	0.047	0.661	-0.115	0.280	-0.003	0.978
TEMPS-A irritable	0.387	<0.001	0.148	0.164	0.307	0.003
TEMPS-A anxiety	0.504	<0.001	0.391	<0.001	0.504	<0.001

BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory; ISI, Insomnia Severity Index; PSQI, Pittsburg Sleep Quality Index; ICS, Insomnia Catastrophizing Scale; TEMPS-A, Temperature Evaluation of Memphis, Pisa, Paris and San Diego Autoquestionnaire.

Table 4. Correlations insomnia catastrophizing and other clinical variables in healthy controls

Variables	ICS night		ICS daytime		ICS total	
	Spearman's rho	p-value	Spearman's rho	p-value	Spearman's rho	p-value
Age	-0.176	0.097	-0.302	0.004	-0.279	0.008
BDI	0.626	<0.001	0.584	<0.001	0.666	<0.001
BAI	0.577	<0.001	0.534	<0.001	0.613	<0.001
ISI	0.722	<0.001	0.583	<0.001	0.725	<0.001
PSQI	0.712	<0.001	0.661	<0.001	0.775	<0.001
TEMPS-A depressive	0.356	<0.001	0.295	0.005	0.369	<0.001
TEMPS-A cyclothymic	0.571	<0.001	0.414	<0.001	0.521	<0.001
TEMPS-A hyperthymic	-0.068	0.525	-0.234	0.026	-0.193	0.068
TEMPS-A irritable	0.497	<0.001	0.332	0.001	0.440	<0.001
TEMPS-A anxiety	0.539	<0.001	0.550	<0.001	0.626	<0.001

BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory; ISI, Insomnia Severity Index; PSQI, Pittsburg Sleep Quality Index; ICS, Insomnia Catastrophizing Scale; TEMPS-A, Temperature Evaluation of Memphis, Pisa, Paris and San Diego Autoquestionnaire.

($r = -0.279$, $p = 0.008$). High-level positive significant correlations were found between BDI ($r = 0.666$), BAI ($r = 0.613$), ISI ($r = 0.725$), PSQI total score ($r = 0.775$), TEMPS-A cyclothymic temperament score ($r = 0.521$), and TEMPS-A anxious temperament score ($r = 0.626$) with ICS total score; moderate level positive significant correlations were observed between TEMPS-A depressive temperament score ($r = 0.369$) and TEMPS-A irritable temperament score ($r = 0.440$) with ICS total score ($p < 0.05$ for each). No significant relationship was detected between TEMPS-A hyperthymic temperament score and ICS total score ($p = 0.068$) (Table 4).

Regression Analyses

When examining factors affecting the ICS night score in patients, age negatively impacts the score, while BDI, BAI, ISI, PSQI, and TEMPS-A anxious, depressive, irritable, and cyclothymic temperament scores have positive and significant effects

($p < 0.05$ for each beta value). Additionally, multivariate evaluation of these factors' effects on the ICS-night score revealed a significant relationship only with the ISI score (Table 5). Analyzing factors affecting the ICS-daytime score in patients, age exhibited a negative effect, whereas BDI, BAI, ISI, PSQI total score, and TEMPS-A anxious, depressive, and cyclothymic temperament scores had positive and significant effects ($p < 0.05$ for each beta value). A significant correlation was observed between age and ISI score when assessing the impact of these factors on the ICS-daytime score multivariate (Table 5). Investigating influences on the ICS total score, age had a negative effect, while BDI, BAI, ISI, PSQI total score, and TEMPS-A anxious, depressive, irritable, and cyclothymic temperament scores presented positive and significant effects ($p < 0.05$ for each beta value). Multivariate analysis of these factors on the total ICS score identified significant relationships with age (95% CI -0.44–-0.07, $p = 0.008$), TEMPS-A anxious temperament score (95%

Table 5. Regression analysis of insomnia catastrophizing in the patient group

	Univariate beta coefficient [95% CI]	p-value	Multivariate beta coefficient [95% CI]	p-value
Dependent variable: ICS night				
Age	-0.23 [-0.37--0.08]	0.004	-0.10 [-0.22-0.03]	0.126
BDI	0.62 [0.43-0.82]	<0.001	0.15 [-0.07-0.37]	0.179
BAI	0.50 [0.32-0.68]	<0.001	0.08 [-0.10-0.26]	0.413
ISI	1.12 [0.86-1.37]	<0.001	0.71 [0.40-1.02]	<0.001
PSQI	1.51 [1.01-2.02]	<0.001	0.31 [-0.18-0.81]	0.220
TEMPS-A anxiety score	0.94 [0.59-1.29]	<0.001	0.27 [-0.10-0.64]	0.164
TEMPS-A depressive score	0.90 [0.31-1.49]	0.004	-0.06 [-0.61-0.49]	0.843
TEMPS-A irritable score	0.89 [0.42-1.37]	<0.001	0.22 [-0.18-0.62]	0.291
TEMPS-A cyclothymic score	1.21 [0.82-1.60]	<0.001	0.05 [-0.43-0.53]	0.828
Dependent variable: ICS daytime				
Age	-0.19 [-0.29--0.08]	<0.001	-0.16 [-0.26--0.05]	0.005
BDI	0.29 [0.13-0.45]	<0.001	-0.06 [-0.25-0.12]	0.492
BAI	0.21 [0.07-0.36]	0.005	-0.07 [-0.23-0.08]	0.354
ISI	0.66 [0.45-0.87]	<0.001	0.63 [0.36-0.89]	<0.001
PSQI	0.63 [0.21-1.04]	0.004	-0.17 [-0.59-0.25]	0.425
TEMPS-A depressive score	0.54 [0.10-0.97]	0.018	0.08 [-0.38-0.54]	0.738
TEMPS-A cyclothymic score	0.78 [0.48-1.07]	<0.001	0.16 [-0.24-0.56]	0.442
TEMPS-A anxiety score	0.57 [0.30-0.83]	<0.001	0.29 [-0.02-0.6]	0.073
Dependent variable: ICS total				
Age	-0.41 [-0.64--0.19]	<0.001	-0.26 [-0.44--0.07]	0.008
BDI	0.92 [0.61-1.23]	<0.001	0.10 [-0.23-0.42]	0.563
BAI	0.71 [0.43-1.00]	<0.001	0.01 [-0.27-0.27]	0.996
ISI	1.78 [1.40-2.17]	<0.001	1.31 [0.85-1.78]	<0.001
PSQI	2.14 [1.33-2.95]	<0.001	0.20 [-0.54-0.93]	0.604
TEMPS-A depressive score	1.44 [0.54-2.35]	0.002	0.09 [-0.73-0.90]	0.836
TEMPS-A cyclothymic score	1.99 [1.41-2.57]	<0.001	0.28 [-0.43-0.99]	0.439
TEMPS-A irritable score	1.11 [0.36-1.86]	0.005	-0.06 [-0.66-0.53]	0.833
TEMPS-A anxiety score	1.51 [0.97-2.05]	<0.001	0.58 [0.03-1.14]	0.041

BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory; ISI, Insomnia Severity Index; PSQI, Pittsburg Sleep Quality Index; ICS, Insomnia Catastrophizing Scale; TEMPS-A, Temperature Evaluation of Memphis, Pisa, Paris and San Diego Autoquestionnaire; CI, confidence interval.

CI 0.03-1.14, $p = 0.041$), and ISI score (95% CI 0.85-1.78, $p < 0.001$) (Table 5).

DISCUSSION

Insomnia is the primary factor contributing to recurrent depression, making it essential to explore the causes of insomnia in depressed patients. Our study focused on examining insomnia's catastrophizing, a key cognitive factor in its persistence among depressed patients. We also included age, gender, marital status, and education-matched HCs in the patient group for

comparison.

One of our main findings was that the dimensions of catastrophizing insomnia—total, daytime, and night—were higher in the MDD group than in HCs. According to the cognitive model of insomnia's vicious cycle proposed by Harvey [4] in 2002, insomnia induces excessive repetitive thinking throughout the day and night, subsequently increasing selective attention to one's sleep state. This selective attention further exacerbates the catastrophizing of the adverse daytime and night effects of insomnia. Most critically, such catastrophizing heightens physiological arousal and subsequently exacerbates insomnia. Catastrophizing insomnia emerged as the strongest predictor of objective

sleep latency [24]. CBT-I is advocated as the primary treatment for insomnia. CBT-I targets the catastrophizing of insomnia and attempts to diminish physiological arousal by advising against monitoring one's sleep status [25]. A significant factor in the persistence of insomnia is the excessive effort to sleep, primarily driven by catastrophizing of insomnia [26]. Recent research indicated that catastrophizing was more prevalent in patients with both MDD and insomnia than in those with insomnia alone [27]. Catastrophizing is identified as the primary cognitive error in MDD [28]. The depressive mood may have contributed to the high level of catastrophizing insomnia observed in patients with MDD in our study. Thus, developing interventions targeting catastrophizing insomnia in MDD patients may prevent recurring depression by protecting them from insomnia.

One of the main findings of our study was that hyperthymic temperament did not correlate with catastrophizing insomnia in either the patient group or the HCs. Affective temperaments have been demonstrated to be associated with insomnia in both depressed patients and the general population [15]. Previous research identified a positive association between cyclothymic, depressive, anxious, and irritable temperaments and insomnia [16], while a negative correlation was found between hyperthymic temperament and insomnia [16,29]. Our findings that hyperthymic temperament was not linked with total catastrophizing insomnia in both groups suggest that hyperthymic temperament may act as a protective factor against insomnia. The fact that individuals with hyperthymic temperament, as defined by Akiskal et al. [11], are optimistic, frequently sleep fewer than 6 hours, and remain energetic, might explain their resistance to catastrophizing insomnia and the absence of a correlation.

One of the main findings of our study was that in the multiple regression analysis, all dimensions of insomnia catastrophizing were positively predicted by insomnia severity in the patient group. Additionally, age negatively predicted daytime and total insomnia catastrophizing, while an anxious temperament positively predicted total insomnia catastrophizing. Studies indicate that individuals with both depression and insomnia are more prone than those with only insomnia to adopt challenging sleep beliefs [30]. Treatment-resistant insomnia has been linked to these beliefs. For instance, individuals who believe they need 8 hours of sleep per night to function during the daytime experience higher levels of anxiety when they sleep less than 8 hours, which hampers their ability to concentrate and stay focused [22]. Rumination, a common symptom of depression, is closely associated with poor sleep quality and negative perceptions of the impact of insomnia on daily functioning, often involving worst-case scenario thinking [31]. Age was identified as a negative predictor of the ICS daytime and ICS total score. This phenomenon can be attributed to age-related changes in sleep physiology, wherein older individuals adjust to and normalize decreases in sleep quantity and quality. They also tend to report fewer sleep complaints and their depressive symptoms often manifest as

physical ailments [32,33]. The study also identified anxious temperament as a predictor that increases the ICS total score. A critical element of the cognitive model of insomnia includes excessive worry about sleep and its consequences, which in turn intensifies insomnia by heightening alertness. A study by McGowan et al. [34] found that anxiety experienced during the day predicted increased sleep disturbance that night. This study evaluated 50 high trait worriers regarding their sleep and anxiety levels both throughout the day and just before sleep onset. An anxious temperament was also associated with insomnia in another study that explored affective temperament, occupational stress, and sleeplessness among Japanese workers [17].

Our study has several limitations. It was conducted at a single center, had a relatively small sample size, and featured predominantly female participants. Additionally, due to the cross-sectional design, it was not possible to establish a causal relationship. Moreover, the sleep scales used in our study were self-reported. Despite these limitations, our study maintained strict inclusion and exclusion criteria and was the first to explore the relationship between affective temperaments, insomnia catastrophizing, and insomnia severity in patients with depression.

Finally, the results we obtained underscored the importance of conducting a comprehensive evaluation of insomnia in all patients with depression. It has become evident that identifying dysfunctional catastrophizing thoughts about sleep is vital, as these thoughts perpetuate insomnia—one of the most common persistent symptoms that prevent the disease from going into remission and increase the likelihood of future recurrence. The variables of age, anxious temperament, and the severity of insomnia were identified as predictors of catastrophizing thoughts about insomnia in patients with MDD.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Author Contributions

Conceptualization: all authors. Data curation: Hilal Sezer Soylu, Hilal Uygur, Hülya Ertekin. Formal analysis: Hilal Uygur, Hilal Sezer Soylu. Investigation: Hilal Uygur, Hilal Sezer Soylu, Erhan Akıncı. Methodology: all authors. Resources: all authors. Software: Hilal Sezer Soylu, Hilal Uygur. Supervision: Hülya Ertekin, Erhan Akıncı. Validation: Hilal Uygur, Hilal Sezer Soylu, Hülya Ertekin. Visualization: Hilal Sezer Soylu, Hülya Ertekin, Hilal Uygur. Writing—original draft: Hilal Uygur, Hilal Sezer Soylu. Writing—review & editing: Hilal Uygur, Hilal Sezer Soylu, Hülya Ertekin.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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