Does chronobiological preference affect the clinical appearance of obsessive-compulsive disorders?

Kronobiyolojik tercih, obsesif-kompulsif bozuklukların klinik görünümünü etkiler mi?

Ayşe Sakallı Kani[1], Uzay Dural[2], Volkan Topçuoğlu[3], Kemal Sayar[3]

[1]Assist. Prof., [3]Prof. Marmara University School of Medicine, Department of Psychiatry, Istanbul, Turkey, https://orcid.org/0000-0002-7391-8221, https://orcid.org/0000-0002-4006-7520, https://orcid.org/0000-0001-6909-3012
[2]Assist. Prof., Istanbul Medeniyet University, Faculty of Arts and Humanities, Department of Psychology, Istanbul, Turkey, https://orcid.org/0000-0003-1578-6686

SUMMARY

Objective: There is a growing body of evidence supporting the involvement of circadian rhythm abnormalities in the psychopathology of obsessive-compulsive disorder. However, the effects of chronotype preference on the clinical features of this disorder are elusive. The aim of this study is to investigate how chronobiological predispositions of people with obsessive compulsive disorder affect obsessive compulsive disorder symptomatology, age of onset, course of the disease and accompanying comorbid conditions. **Method:** Within this cross-sectional study, 76 participants with mean age of 32.53, who have been under treatment with a diagnosis of obsessive-compulsive disorder, were evaluated. Sociodemographic and clinical data form, Yale-Brown Obsessive Compulsive Scale, Morningness and Eveningness Questionnaire, Hamilton Depression Rating Scale, and Hamilton Anxiety Scale were applied to the participants. **Results:** 65.8% (n=50) of the participants consisted of women. Mean age of onset is 18.74 ± 9.36 years. Most of the patients were reactive type (n=47, 61,8 %). Most common obsession type was contamination (n=53, %69,74), the most common compulsion type was cleaning/washing (n=52, %68,42). There was no significant correlation between morningness and eveningness scale scores and obsession and compulsion types. No significant correlation was found between morningness and eveningness scale scores and OCD onset age. There was no significant difference between morningness and eveningness scale scores according to the OCD type of the patients and the presence of accompanying clinical diagnoses. **Discussion:** Morningness or eveningness chronotype tendencies did not have a significant impact on the clinical appearance of OCD.

Key Words: chronotype, obsession compulsion type, clinical features

ÖZET

Amaç: Obsesif kompulsif bozukluğun psikopatolojisinde sirkadiyen ritim anormalliklerinin rol oynadığını destekleyen kanıtlar giderek artmaktadır. Ancak kişilerin kronotip farklılıklarının bu bozukluğun klinik özelliklerini nasıl etkilediği henüz bilinmemektedir. Bu çalışmanın amacı, obsesif kompulsif bozukluk tanısı olan bireylerdeki kronotip farklılıklarının obsesif kompulsif bozukluk semptomatolojisi, hastalığın ortaya çıkış yaşı, klinik seyri ve eşlik eden komorbid durumları etkileyip etkilemediğini araştırmaktır. **Yöntem:** Bu çalışmada obsesif kompulsif bozukluk tanısı ile tedavi gören yaş ortalaması 32,53 olan 76 katılımcı değerlendirilmiştir. Katılımcılara sosyodemografik ve klinik veri formu, Yale-Brown Obsesyon Kompulsiyon Ölçeği, Sabahlılık ve Akşamlılık Ölçeği, Hamilton Depresyon Derecelendirme Ölçeği ve Hamilton Anksiyete Ölçeği uygulanmıştır. **Bulgular:** Katılımcıların %65,8'i (n=50) kadınlardan oluşmaktadır. Ortalama başlangıç yaşı 18.74 ± 9.36 yıldır. Hastaların çoğu reaktif tiptir (n= 47, %61,8). En sık obsesyon tipi kontaminasyon (n=53, %69,74), en yaygın kompulsiyon tipi temizlik/yıkama (n=52, %68,42) olarak saptanmıştır. Sabahlılık ve akşamlılık ölçeği puanları ile obsesyon ve kompulsiyon tipleri arasında anlamlı bir korelasyon yoktur. Sabahlılık ve akşamlılık ölçeği puanları ile OKB başlangıç yaşı arasında herhangi anlamlı bir korelasyon saptanmamıştır. Hastaların OKB tipi ve eşlik eden klinik tanıların varlığına göre sabahlılık ve akşamlılık ölçeği skorları arasında anlamlı bir farklılık yoktur. **Sonuç:** Obsesif kompulsif bozukluk tanısı olan bireylerde, sabahlılık ve akşamlılık kronotip eğilimlerinin hastalığın klinik görünümü üzerinde anlamlı bir etkisi olmadığı gözlemiştir.

Anahtar Sözcükler: kronotip, obsesyon kompulsiyon tipi, klinik özellikler

INTRODUCTION

Like other psychiatric disorders, obsessive-compulsive disorder (OCD) is diagnosed based on clinical evaluation rather than laboratory and imaging assessments. Cardinal features of OCD are the presence of either obsessions or compulsions that are time-consuming (> 1 hour per day), distressing or impairing daily function, and are not the direct result of a medical condition or substance use (1). Despite the defining criteria having been unchanged since DSM- III, the classification of OCD in a novel diagnostic class in DSM-5 has led to the arguments regarding the nosology of the disorder and pushed experts to reconsider the phenotypic features of this disorder (2, 3).

Individuals with OCD have a wide variety of symptom profiles (subtypes/ symptom dimensions) as well as comorbid conditions and outcomes (4). Symptom dimensions most reliably identified include contamination/cleaning, doubt about harm/checking, symmetry/ordering, and unacceptable thoughts/mental rituals (5). Many studies in the literature examined the relationship of different clinical subtypes with prognosis or investigated the reflection of comorbidities on the clinical course and phenomenology (4). For instance, in a study, hoarding obsessions and compulsions were found to be a predictor of poor treatment response (6). In another study, it was found that the patients with comorbid bipolar disorder have a more episodic course, and these patients exhibit more aggressive/impulsive, sexual, religious, and pathological doubt obsessions and compulsions of checking, hoarding, and ordering (7). A study examining the relationship between OCD symptom dimension and suicidality revealed that violent obsessions have a specific role in suicidality beyond the influence of depressive symptoms (8). Finally, a recent study showed that OCD patients with symmetry dimension symptoms have more severe depressive symptoms compared to other dimensions (9). In addition to these, studies have shown that different psychopathologic processes and different neuroimaging symptom profiles are present within different symptom dimensions of OCD (10, 11). Defining the factors which affect the symptom dimension, clinical presentation, and course of the OCD; and recognizing the factors underlying the heterogeneity of the disease, will guide the next clinical classifications and studies that will enable us to understand the etiopathogenesis of the disease.

Natural tendencies regarding an individual's circadian preference for sleeping or performing everyday activities while alert and energetic are referred to as chronotypes. According to circadian typology, evening types are characterized by the later bed and rising times, more irregular sleep-wake-up habits, ascending evening energy, and a preference for nocturnal activities; morning types have an earlier bed and rising times, greater morning energy, and a preference for diurnal activities. Those people without a clear preference are termed as intermediate or neither type (12). Measures of individual differences in diurnal activity rhythms are thought to reflect the underlying circadian system (13). There is a substantial body of evidence showing that evening chronotype is a consistent risk factor for various mental health problems, such as mood disorders, attention deficit and hyperactivity disorder, anxiety, alcohol dependence, antisocial behavior, and suicide. Underlying these associations various genetic factors and neurobiological mechanisms have been postulated to be involved. But in addition to these, psychological studies suggest that eveningness chronotype is related to impulsivity, cognitive bias toward negative stimuli, slower extinction of conditioned fear, and rumination (14). Finally, later circadian rhythms are also found to be associated with poorer executive function and behavioral inhibition (14, 15).

Recently, based on the findings suggesting that circadian rhythm disruptions might also play a role in the pathogenesis of OCD (16) and the studies showing hormonal dysregulation and delayed sleep phase in patients with severe OCD (17, 18); chronobiology studies gained importance in OCD patients. However, while there is evidence regarding eveningness chronotype may be related to increased OCD symptoms, the results of the studies are contradictory (19) and the effect of chronotype differences on the symptom dimensions and clinical features of OCD is lacking in the literature.

With this study, we aimed to examine the effect of chronotype preference on the clinical appearance of OCD and to compare the patients with different chronotypes in terms of clinical course and concomitant clinical features. We hypothesized that chronotype differences might make a difference in terms of the emerging type of obsessions/compulsions, age of onset, disease course, and accompanying tic/trichotillomania and other comorbidities. Especially, due to the evidence regarding the relationship between eveningness chronotype and impulsivity cited above, we expected patients with eveningness chronotype would have more impulse related symptoms. Also, since there is a strong connection between eveningness chronotype and mood disorders, we proposed that there would be fluctuating symptom course and more depression-related symptoms, mentioned above, in patients who have eveningness tendency.

METHOD

Setting and Sample

This study was conducted on OCD patients who presented to Istanbul University Cerrahpaşa School of Medicine's Psychiatry Department between 2013 and 2014. The sample consisted of 76 patients (50 women, 65.8%) aged 18-60, who had been under treatment for at least 12 weeks with a minimum effective SSRI dose accepted for OCD treatment (20) with or without antipsychotic medication. The exclusion criteria for the participants included a history of neurological disorder, head trauma, mental retardation, and psychotic disorders. Furthermore, patients who were diagnosed primarily with bipolar disorder comorbid with OCD were not included in the study. The study was approved by the Istanbul University School of Medicine's Ethics Committee, and all participants provided written informed consent.

Measures

A semi-structured interview, which lasted approximately one hour, was conducted on the patients to evaluate their sociodemographic and clinical characteristics, and then survey scales were applied to the patients.

Sociodemographic and Clinical Data Form: After the sociodemographic data of the patients such as age, gender, marital status, and educational status was recorded, the phenomenological variables and clinical characteristics of obsessive-compulsive disorder were evaluated through a clinical data form prepared by the research team. Through this data form, the age of onset of the disease, the type of obsession (contamination, pathological doubt, somatic, symmetry, aggressive, sexual, religious, other), and compulsion (checking, washing/cleaning, mental compulsions, ordering/arranging, repeating rituals, other); obsessive-compulsive disorder type (autogenous, reactive, mixed) and the course of the disease was recorded. Also, the information about having any history of druginduced hypomanic/manic switch, comorbid diagnoses of tic disorder, trichotillomania, panic disorder, generalized anxiety disorder, eating disorder, and body dysmorphic disorder was also obtained.

Yale-Brown Obsessive-Compulsive Scale (Y-BOCS): Developed by Goodman et al. (1989) it is a semi-structured scale administered by an interviewer who knows psychopathology to measure the type and severity of obsessivecompulsive symptoms in patients with OCD (21). It consists of 19 items in total, but only the first 10 items are used to measure the symptom severity. In scoring the Y-BOCS, obsessions and compulsions are scored separately with five items, and each item is scored out of four points, the sub-total scores of obsessions and compulsions and finally, a total score of over 40 points is obtained. According to the scores obtained from the scale, the severity of the OCD is classified into four categories (0-7 subclinical; 8-15 mild; 16-23 moderate; 24-31 severe OCD). The scale was translated into Turkish by Uluğ and Savaşır, and the validity and reliability study was carried out by Karamustafalıoğlu et al. in 1993 (22).

Hamilton Depression Rating Scale (HAM-D): It is a test administered by the clinician to people with depressive symptoms, to measure the level of depression and the change in severity. (23) In this test, which includes 17 questions in total, each question is graded between 0 and 4, and the score obtained from the scale is between 0 and 53. Higher scores on the scale are associated with greater symptom severity of depression. The vali-

dity and reliability study of the Turkish form was made by A. Akdemir et al. (24).

Hamilton Anxiety Rating Scale (HAM-A): The HAM-A scale was developed by Hamilton in 1959 to determine the level and symptom distribution of anxiety and to measure the change in severity. The validity and reliability study of the Turkish form was carried out in 1998. (25, 26). The test is used to assess the anxiety level within 72 hours, it contains a total of 14 questions. Each question is scored between 0 and 4, and the total score is obtained by adding the score obtained from each item. The total score of the scale varies between 0 and 56.

Morningness and Eveningness Questionnaire (MEQ): The MEQ is a 19-item self-rated questionnaire providing an assessment of habitual waking and bedtimes, preferred times of physical and mental performance, and subjective alertness after rising and before going to bed. (27). It is the tool most frequently used to assess chronotype, both in healthy individuals and in patients. The MEQ yields scores ranging from 16 to 86. Higher scores indicate greater morningness, and lower scores indicate greater eveningness. MEQ classifies participants who score between 59 and 86 as morning types, those who score 42–58 as neither types and those who score 16–41 as evening types. The psychometric properties of the Turkish version of the MEQ were tested by Agargun et al. (2007); its validity and reliability were found to be as high as the original version (28).

Statistical Analyses

We performed statistical analyses with SPSS Version 20.0. Before analyses, all dichotomous variables (i.e., gender, marital status, the presence of obsessive symptoms, the presence of compulsive symptoms, the presence of comorbidity, and the history of other mental disorders) were dummy coded. We conducted Pearson Correlation Coefficient Analyses and SpearmanBrown Correlation Analyses to examine the relationship between variables. Kruskal Wallis test was used for the comparison of OCD type, OCD course, and the type of medication in terms of chronotype scores. Multiple regression analyses were performed to test whether chronotype predicts YBOCS scores controlling for depression level and anxiety level of patients. We calculated effect sizes by Cohen's f^2 via G*Power 3.1 (29, 30). We also performed post-hoc power analyses via G*Power 3.1 to test whether we had sufficient sample size for our statistical inferences by taking alpha level of .05 and estimated effect sizes Cohen's f^2 was calculated for effect size analyses via G*Power 3.1 (29, 30). The alpha level is .05 for all analyses.

RESULTS

Sociodemographic characteristics of the study population are presented in Table 1. The average age of the population was 32.53 and 65.8% (n=50) of the participants consisted of women. The mean age of onset is 18.74 ± 9.36 years. There was no statistically significant difference between genders in terms of age of onset. Most of the patients were reactive type (n= 47, 61,8%). Most of the patients were on selective serotonin reuptake inhibitor (SSRI) treatment during assessment (n=35, 46 %). While pathological doubt, contamination, and religious obsessions were the most common obsession types; the detailed clinical features of the participants are presented in Table 2. The most common obsession type was pathological doubt in male group (n=19, % 73,1), in females the most frequent obsession type was contamination (n= 39, % 78). Regarding compulsions, the most common compulsion types were repeating rituals and cleaning/washing in males (n= 14, %53,8) however, in females the most common type was cleaning/washing (n=38, %76). Concerning comorbidities: seven patients reported manic switch history (%9,2), 23 patients (%30,3) had general anxiety disorder, three patients had panic disorder (%3,9), and 28 patients had tic disorder (%36,8), 10 patients had trichotillomania (%13,2). Three patients had eating disorders

Table 1: Socio-demographics of patients

		Frequency	Percent
Gender	Female	50	65.8
	Male	26	34.2
Marital status	Married	26	34.2
	Single	43	56.6
	Others (divorced etc.)	7	9.2
		Mean	Std. Deviation
Age (year)		32.53	11.10
Education level (year)		10.72	3.76

Table 2. Clinical background of patients

			Mean	Std Dev.
Age of onset			18.74	9.36
			f	%
OCD type	Autogenous		4	5.26
	Reactive		47	61.84
	Mixed		25	32.89
OCD course	Chronic without any change in symptoms		17	22.37
	Chronic with worsening symptoms		24	31.58
	Episodic with partial remission		23	30.26
	Episodic with full remission		11	14.47
Type of medication	SSRI		35	46.05
	Clomipramine		7	9.21
	SSRI+AP		18	23.68
	Clomipramine+ AP		8	10.53
	SSRI+ Clomipramine+ AP		1	1.32
Type of obsessions	Contamination	Yes	53	69.74
		No	23	30.26
	Pathological doubt	Yes	50	65.79
		No	26	34.21
	Somatic	Yes	4	5.26
		No	72	94.74
	Symmetry	Yes	14	18.42
		No	62	81.58
	Aggressive	Yes	66	86.84
		No	10	13.16
	Sexual	Yes	9	11.84
		No	67	88.16
	Religious	Yes	17	22.37
		No	59	77.63
	Other types	Yes	9	11.84
		No	67	88.16
Type of compulsions	Checking	Yes	30	39.47
		No	46	60.53
	Cleaning, washing	Yes	52	68.42
		No	24	31.58
	Mental compulsions (praying, counting, repeating words)	Yes	15	19.74
		No	61	80.26
	Repeating rituals	No	43	56.58
		Yes	33	43.42
	Ordering and arranging	No	63	82.89
		Yes	13	17.11

SSRI: selective serotonin reuptake inhibitors AP: antipsychotic

(%3,9) and two patients (%2,6) had a body dysmorphic disorder history. There was no statistically significant difference in terms of comorbidities among genders and finally, no difference was detected between genders in terms of disease course type.

The relationship between Socio-Demographic Characteristics and Chronotype Tendency of OCD Patients

We examined the relationship between chronotype tendencies of OCD patients and their sociodemographic features. The analyses revealed that patients' gender (0 = male, 1 = female; r = .08), marital status (0 = single, 1 = married; r = .09), age (r = .08) and education level (r = -.02) did not have statistically significant correlations with chronotype tendencies.

The relationship between the chronotype scores and OCD symptom dimensions

We correlated the presence of obsessive symptom types and the presence of compulsive symptom types with chronotype scores (see, Table 3). The analyses yielded that patients who had morningness or eveningness tendencies did not statistically have significant correlations with the presence of contamination obsessions (r = -.043, n.s.), pathological doubt obsessions (r = .111, n.s.), somatic obsessions (Spearman ρ = -.108, n.s.), aggressive obsessions (Spearman ρ = .140, n.s.), sexual obsessions (Spearman ρ = .104, n.s.), religious obsessions (Spearman ρ = .081, n.s.), or other types of obsessions (Spearman ρ = -.063, n.s.). Similarly, morningness or eveningness tendencies did not significantly correlate with compulsive symptoms, i.e., checking (r = .176, n.s.), cleaning/washing (r = .003, n.s.), mental compulsions (Spearman ρ =

Table 3. Pearson correlation coefficients among chronotype score, YBOCS scores, Hamilton depression rating scale score, and Hamilton anxiety rating scale scores

	Mean	Std. Deviation	YBOCS, obsession sub-score	YBOCS, compulsion sub-score	YBOCS, insight sub-score	Chronotype score	Hamilton depression scale score	Hamilton anxiety scale score
YBOCS, obsession sub-score	9.83	5.055	-	.836**	.275*	-.205	.679**	.615**
YBOCS, compulsion sub-score	9.66	5.341		-	.301**	-.158	.639**	.572**
YBOCS, insight sub-score	.50	.887			-	-.098	.158	.097
Chronotype score	47.75	9.146				-	-.128	-.156
Hamilton depression scale score	10.39	6.753					-	.768**
Hamilton anxiety scale score	13.59	9.839						-

*p<.05; **p<.01.

Table 4: Results of Multiple Regression Analyses

Outcome Variable: YBOCS Obsession Sub-Scale	Unstandardized Coefficients		Standardized Coefficients	t	R^2	F	Cohen
	B	SE	Beta				
(Constant)	8.051	2.372		3.395**	.513	25.31***	.99
Depression	.358	.089	.478	4.013***			
Anxiety	.133	.061	.259	2.181*			
Chronotype	-.079	.046	-.142	-1.722			

Outcome Variable: YBOCS Compulsion Sub-Scale	Unstandardized Coefficients		Standardized Coefficients	t	R^2	F	Cohen
	B	SE	Beta				
(Constant)	6.909	2.678		2.579*	.444	19.14***	.99
Depression	.367	.101	.464	3.646**			
Anxiety	.124	.069	.229	1.804			
Chronotype	-.058	.052	-.099	-1.121			

Outcome Variable: YBOCS Insight Sub-Scale	Unstandardized Coefficients		Standardized Coefficients	t	R^2	F	Cohen
	B	SE	Beta				
(Constant)	.692	.587		1.180	.033	.81	.28
Depression	.023	.022	.177	1.051			
Anxiety	-.003	.015	-.036	-.217			
Chronotype	-.008	.011	-.084	-.720			

*$p<.05$. **$p<.01$. ***$p<.001$.

.190, n.s.), repeating rituals (r = -.100, n.s.) or ordering/arranging (Spearman ρ = -.045, n.s.).

The relationship between the chronotype scores and age of onset, disease course, current or previous comorbidities

We further examined the relationship between other OCD characteristics of patients and their chronotype scores. Chronotype score of patients did not have statistically significant correlations with the onset age of OCD (r = .17), the presence of medication-induced manic shift (r = .09, n.s.), the history of trichotillomania (r = -.06, n.s.), the history of tic disorder (r = -.17, n.s.), the history of eating disorder (r = -.10, n.s.), the comorbidity of panic disorder (r = .01, n.s.) or the comorbidity of generalized anxiety disorder (r = .12, n.s.). When the chronotype scores of the groups with different disease courses were compared, no statistically significant difference was found. Similarly, Kruskal Wallis tests revealed that chronotype tendencies did not significantly relate with OCD type [H (2) = 1.66, n.s.] and OCD course [H (3) = 1.88, n.s.].

The Relationship between chronotype scores and YBOC-S, HAM-D and HAM-A scores

Pearson correlation coefficient analyses yielded that chronotype tendencies did not statistically correlate with YBOC-S scores (obsessions sub-score, compulsion sub-score, insight sub-score), scores on Hamilton depression or anxiety rating scales (see, Table 4).

Does the chronotype score of patients predict OCD characteristics when depression and anxiety are controlled?

We finally tested whether and to what extent chronotype scores of OCD patients predicted obsessive or compulsive tendencies controlling for depression and anxiety levels. As seen in Table 5, we conducted several multiple regression analyses. In the first analysis, we regressed chronotype score, Hamilton depression rating scale score, and Hamilton anxiety rating scale score on YBOCS total score. The predictors explained 44.7% variance in Y-BOCS total score, and the model was statistically significant, F = 19.27, p < .001. Controlling for the depression level and anxiety level, chronotype did not significantly predict Y-BOCS total score (β=-.104, t=-1.184, n.s.). In subsequent analyses, chronotype, depression, and anxiety levels of patients explained 51.3% of the variance in the Y-BOCS obsession sub-scale score, 44.4% of the variance in Y-BOCS compulsion scores, and 3.3% of the variance in Y-BOCS insight score. Like findings in YBOCS total, chronotype did not predict Y-BOCS obsession score, compulsion score, or insight score at a significant level.

The effect sizes – i.e., Cohen's f^2- of these multivariate analyses ranged from .28 to .99. Posthoc power analyses revealed that with an alpha of .05 and the given effect sizes, sample size of 76 is sufficient for achieving power of .80 for all multiple regression analyses (ranging from .81 to .98).

DISCUSSION

Despite tremendous progress in the research of OCD, key problems about the disorder's proper diagnostic classification and clinical heterogeneity remain unanswered (4, 31). Previous studies suggest that circadian abnormalities and particularly eveningness chronotype may contribute to the psy-

chopathology of OCD via different mechanisms
(16, 32), furthermore, several studies indicate that
delayed bedtimes are associated with increased
obsessive-compulsive symptoms (33) and treatment
resistance (34). Finally, a recent study revealed that
chronotype causes a fluctuation in OCD symptom
severity and OCD patients were more likely to
experience peaks in symptom severity during
nonoptimal times based on their chronotype (35).
Although there is inconsistent and limited evidence
in the literature, taken together it is recommended
to examine the role of circadian rhythms for future
OCD research (19).

Our main hypothesis of this study was that the
chronotype preference would make a difference in
OCD symptom dimensions, but on the contrary,
morningness or eveningness tendencies did not sta-
tistically have significant correlations with the pres-
ence of any types of obsessions and compulsions.
Findings of a recent meta-analysis revealed that
two discrete OCD groups of "washers" and "check-
ers" significantly differ in neuropsychological func-
tioning and checkers were more impaired than
washers in executive functions which is proposed to
be associated with later circadian phases (36).
Eveningness chronotype is associated with poor
behavioral inhibition and plays a role in compulsive
behaviors. In our study, we hypothesized that com-
pulsive behaviors would be more present in partic-
ipants with eveningness tendency compared to
patients who have morningness tendency. In terms
of obsessions, we expected to find more doubt
obsessions accompanied by checking compulsions
(which are thought to be related to poorer execu-
tive functions) in patients who have an eveningness
tendency. But we did not detect any difference in
symptom presentation between the two chronotype
tendencies.

According to our knowledge, there is no study in
literature investigating the phenomenological fea-
tures of different chronotypes to make a compari-
son with our findings. But we speculate the results
of the index study may arise for several reasons. In
nearly all participants, more than one type of
obsessions and compulsions were present together
in our study. Grouping patients into certain
domains as doubt obsessions-checkers, symmetry
obsessions-ordering, and cleaning obsessions-wash-

ing would be more comparable. Another major
point was that the number of participants who has
eveningness and morningness chronotype prefer-
ences was limited. Instead of investigating the cor-
relation between symptom frequencies and chrono-
type tendencies, comparing chronotype prefer-
ences in patients with different symptom dimen-
sions or comparing symptom dimensions of
patients with different chronotypes in sizeable and
clinically well-characterized sample, would provide
more precise information. Lastly, psychotropic
medications are known to have adverse influences
on sleep and circadian rhythms broadly (37, 38). In
our study, we did not question the current bedtime
and wake-up times while evaluating the chronotype
preference of our participants. Considering that
the participants have been under treatment for at
least 3 months, although it is stated that they
should answer the questions about chronotype by
considering their whole life, there may be shifts in
their circadian rhythms as a result of chronic psy-
chotropic use, and this may have affected the
answers given to the questions. Involving drug-
naïve OCD patients or assessing circadian rhythm
changes after pharmacological treatment would
provide more accurate information.

Secondly, we hypothesized that chronotype tenden-
cies would affect the clinical features of OCD. In
terms of the onset of OCD, there was no significant
correlation between chronotype tendencies and
onset age of the disease. Similarly, the chronotype
score of patients did not differ with a history of any
psychiatric comorbidity and chronotype scores did
not differ between the different course types of the
disease. In literature, there are only two recent
studies investigating the chronotype in tic disor-
ders. However, the number of these studies is
scant, both studies similarly revealed increased
eveningness chronotype in individuals with tic dis-
orders (39, 40).

Furthermore, increased tic severity predicted
greater eveningness (40). In our study, we expected
to find greater eveningness in patients with comor-
bid tic disorders but contrary to our expectation,
neither tic disorders nor other comorbidities rose
to statistical significance in their associations with
chronotype tendencies. This might be related again
to small sample size and having a limited number of

eveningness chronotype in our sample.

Finally, controlling for the depression level and anxiety level, chronotype did not significantly predict total or sub-scores of Y-BOCS. This finding is contradictory with studies showing that the eveningness chronotype increases OCD severity (33, 34).

While interpreting our findings, several points should be noted. Our sample might have limited the validity of our findings. First, our sample might limit the generalization of our findings to the OCD population. We recruited our participants from the only outpatient clinic and this might have restricted the range of representation of all OCD patients. Furthermore, our sample size (n=76) might be relatively small, given that effect size analyses demonstrated small power for analyses on chronobiology scores. However, note that we obtained high effect sizes for analyses on depression and anxiety (one exception is the YBOCS-insight sub-scale). The lack of significant relationship between chronobiology and OCD symptoms, therefore, may be valid to some extent and we recommend future studies to retest our hypotheses with a more representative sample of OCD patients. Secondly, we did not categorize and compare the patients as morningness and eveningness groups, since most of the participants were in intermediate chronotype (n=50, %65, 8) and the number of patients with morningness and eveningness chronotype is limited (morningness n=9, %11.8; eveningness n= 17, % 22.4). Therefore, we compared the patients according to their MEQ scores: higher scores indicate greater morningness, and lower scores indicate greater eveningness. However, this usage of this instrument is supported in the literature and investigators suggest that the morningnesseveningness dimension could be considered as a continuum between two extremes (41). Finally, evaluating current or past comorbidities via psychiatric questioning merely, without using SCID, may be another study limitation that the readers should keep in mind.

In summary, the results of our study showed that chronotype tendency was not a significant factor determining the comorbidity, the age of onset, disease course, either OCD type, or a variety of obsessions and compulsions.

CONCLUSION

For the first time, this study revealed that chronotype tendency doesn't have a significant impact on the OCD symptom diversity and concomitant clinical features. Since we aimed to examine the effect of chronotypes on symptom dimensions and phenomenology of OCD, we did not consider recruiting healthy controls for the study. But investigating the presence and type of obsessions and compulsions in non-clinical individuals with different chronotype preferences would be valuable for understanding the effect of chronobiology. Also, despite our negative findings, we recommend researchers conduct prospective studies in larger clinical samples to understand the effect of chronotype preference on OCD clinical presentation. Understanding the impact of chronotype preferences on OCD presentation may affect current treatment options and can lead to a change in the clinical approach to different OCD dimensions.

Conflicts of interest: The authors declare that they have no conflict of interest.

Correspondence address: Assist. Prof. Ayşe Sakallı Kani, Marmara University School of Medicine, Department of Psychiatry, İstanbul, Türkiye akanisakalli@gmail.com

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