

# The effects of chronotype on sexual satisfaction and quality of life in couples

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**Abstract. – OBJECTIVE:** Physiological, psychological, and behavioral variables are under circadian regularity audit in humans. Chronotype describes an individual's time preference regarding mental/physical endeavors and represents the circadian rhythm's physiological expressions. This study aimed to investigate the effects of couples' chronotypes on their sexual satisfaction and quality of life.

**SUBJECTS AND METHODS:** 228 heterosexual Turkish adults (114 females and 114 males with a mean age of 35.57 years and a standard deviation of 6.95 years), recruited from the general population, participated as 114 couples in this study. Demographic data were recorded. Chronotype assessment was made using the Morningness/Eveningness Questionnaire. The quality of life (QOL) was scored using the World Health Organization-BREF scale. Sexual satisfaction was assessed using the Golombok-Rust Inventory of Sexual Satisfaction (GRISS) and the New Sexual Satisfaction Scale (NSSS).

**RESULTS:** From morningness to intermediate and then to eveningness, the E-type females scored highest in the physical and psychological aspects of quality of life assessments. Regarding sexual satisfaction E-type females scored better than M-type and I-type females for most sub-scores and the overall score of GRISS. The couple/partner-centered sub-score and the overall NSSS score were highest in E-Type females. Chronotype similarity status affected QOL in females physically/psychologically, but not males. Sexual satisfaction was not significantly affected by couples' chronotype similarity.

**CONCLUSIONS:** The individual's chronotype is a significant factor affecting the quality of life in the female gender and sexual satisfaction in both genders. However, the chronotype similarity status of the couple does not substantially affect the couple's quality of life and sexual satisfaction. We suggest that chronotype similarity is not essential for improving couples' quality of life and sexual satisfaction.

*Key Words:*

Chronotype, Sexual satisfaction, Quality of life.

## Introduction

Physiological, psychological, and behavioral variables are under circadian regularity audit in humans. For example, with endogenous circadian rhythm, the peak value of body core temperature is at 7 pm, whereas melatonin reaches its peak level at 2 am, and cortisol at 7 am. Chronotype describes the individual's time preference for mental and physical endeavors and represents physiological expressions of circadian rhythms<sup>1</sup>.

The suprachiasmatic nucleus in the hypothalamus serves as the central pacemaker<sup>2</sup>. Chronotype is considered a biological trait with a range between two extremes of morning-type (M-Type) and evening-type (E-Type)<sup>3</sup>. Roenneberg et al<sup>4</sup> reported that most individuals (approximately 60%) have a pattern between these two extremes, classified as intermediate-type (I-Type) or neither-type (N-Type)<sup>5</sup>.

Chronotype is associated with various biological constituents, such as age and sexual orientation, and might change during the lifetime<sup>2</sup>. For example, from young to adolescence, the tendency shifts from morningness to eveningness, and in adults, back to morningness again<sup>6</sup>. Chronotype was also reported to have relationships with various psychological parameters, such as satisfaction with life and anxiety/depression<sup>7,8</sup>.

The individual biological and psychological aspects of chronotype have been numerous investigated. However, studies on its effects on social life, particularly on close relationships, are few and have primarily compared chronotype-matched couples to mismatched ones with contradictory results.

Therefore, this study aimed to investigate the effects of couples' chronotypes on sexual satisfaction and quality of life. The study's first hypothesis was that the couples' chronotypes and the time of sex were significant factors affecting sexual satisfaction and relationships. Its second

hypothesis was that the couple's chronotype similarity was an essential determinant of sexual satisfaction. The study also aimed at investigating the association between the chronotype and the preferred timing for having sex and the effects of morning or evening preference on satisfaction.

## Subjects and Methods

Bolu Izzet Baysal University Clinical Researches Ethics Committee approved this study (Date-June 7<sup>th</sup>, 2022 and Decision #2022/148).

### Participants of the Study

Two hundred and twenty-eight heterosexual Turkish adults (114 females and 114 males with a mean age of 35.57 years and a standard deviation of 6.95 years) participated as 114 couples. They were recruited from the general population. The study protocol complied with the international standards of ethics<sup>9,10</sup>. The couples' inclusion criteria were to be together for at least six months, consent to participate in the study, and have normal scores for Beck's Anxiety and Depression Inventories.

Psychiatric exclusion criteria were schizophrenia, depression or bipolar depression, anxiety disorder, cognitive impairment, and intellectual disability. Various exclusion criteria were medical conditions affecting the mental status and sleep patterns (neurological diseases, multiple sclerosis, Huntington's disease, dementia, cerebrovascular disorder, systemic lupus erythematosus, thyroid dysfunction, chronic renal or liver failure, cancer, a chronic obstructive pulmonary disorder, sleep apnea syndrome, decompensated heart failure, being pregnant, having used psychotropic agents in the last month, and alcohol and substance abuse).

Demographic data recorded involved the age, couple's cohabitation duration, physical disorders, family history of psychiatric disease, educational status, employment status, income level, marital status, and the presence/number of children. Their age at the first sexual intercourse, whether they were sleeping with their partners, and their desired and actual times of having sex were also recorded.

### Procedures

#### *Chronotype assessment*

The individuals' chronotypes were determined using the Morningness-Eveningness Questionnaire (MEQ). The test is a Likert-type scale com-

prising 19 questions and was developed by Horne and Östberg<sup>11</sup>. Pündük et al<sup>12</sup> made its Turkish adaptation. Participants receive scores depending on the answer they mark for each question; 1-4 points for questions 3-9 and 13-16, 1-5 points for questions 2, 10, 17, 18, 0-6 points for questions 11 and 19, and 0-5 points for question 12. According to the total score obtained, three different circadian types are classified as "Morning type-(59-86 points)", "Intermediate type-(42-58 points)", and "Evening type-(16-41 points)".

### **Anxiety and Depression Levels' Assessment**

The Beck's Anxiety (BAI) and Depression (BDI) Inventories were used to assess the individual's anxiety and depression levels. Following the assessment of depression and anxiety status, the individuals with such disorders were excluded from the study.

BAI was developed by Beck et al in 1988<sup>13</sup> to distinguish anxiety from depression. It is a Likert-type scale comprising 21 items measuring the severity of anxiety. Participants are asked to choose the option of "None", "Mild", "Moderate", and "Severe" for each item. The score that can be obtained from the inventory ranges from 0 to 63 points. 8-15 points are considered 'Mild', 16-25 points 'Moderate', and 26-63 points 'Severe'. Validity and reliability studies for Turkey were conducted by Ulusoy et al<sup>14</sup>. Thirteen items evaluate physiologic symptoms, five items explain the cognitive aspect, and three items symbolize both somatic and cognitive symptoms.

BDI is a self-assessment inventory developed by Beck et al in 1961<sup>15</sup> to evaluate the risk of depression in adults and the severity of depressive symptoms. The Likert-type scale comprises sentences expressing 21 different symptoms.

Each symptom is scored, ranging between 0 and 3. Participants are asked to reply for their last week. The score that can be obtained from the scale varies between 0-63 points. For example, scores of 0-9 points indicate 'Minimal' depression, 10-16 points suggest 'Mild' depression, 17-29 points 'Moderate' depression, and scores between 30-63 indicate 'Severe' depression. Hisli N. conducted the study on university students for BDI's validity and reliability for Turkey, and the cut-off score was determined as 17<sup>16</sup>.

### **Quality of Life Assessment**

The World Health Organization Quality of Life Assessment (WHOQOL) scale assessed the participants' quality of life. It is a comprehensive scale developed by the World Health Organization

(WHO) to evaluate well-being. Using the results of pilot studies conducted in 15 centers worldwide, the WHOQOL-100 comprising 100 questions, and the WHOQOL-BREF comprising 26 questions selected from among them, were created.

The WHOQOL-BREF scale comprises 26 questions, two about the perceived overall quality of life, two about perceived health status, and four domains (physical, psychological, social relations, and environmental). This scale does not involve a total score. Instead, each section and domain receives a maximum score of 20 or 100 points. Since the development of WHOQOL-BREF was a multinational project based on a cross-culturally sensitive concept, it is suitable for use by different nationalities<sup>17</sup>. Turkish adaptation studies of WHOQOL-BREF were conducted by Eser et al<sup>18</sup>. In the scale's Turkish adaptation, there is one additional question about the environment. Cronbach's alpha internal consistency coefficients of the scale were 0.76 for physical quality of life, 0.67 for psychological quality of life, 0.56 for social quality of life, and 0.74 for environmental quality of life. Test-retest reliability ranged between 0.51 and 0.81.

### **Sexual Satisfaction Assessment**

Sexual satisfaction was assessed using the Golombok-Rust Inventory of Sexual Satisfaction (GRISS) and the New Sexual Satisfaction Scale (NSSS). GRISS, developed and reported by Golombok and Rust<sup>19</sup> in 1985, is a tool for assessing the quality of sexual relationships and sexual dysfunctions. It is administered to heterosexual individuals with permanent partners or couples. It was standardized for the Turkish population by Tugrul et al<sup>20</sup>. The total score shows the quality of sexual functions, and sub-dimension scores provide more detailed data about various aspects of the relationship and the diagnosis.

NSSS was developed by Stulhofer et al<sup>21</sup> and was tested and validated for the Turkish population by Tugut<sup>22</sup>. The scale designed to measure sexual satisfaction in clinical and field research is a 5-point Likert-type (1-5) measurement tool. The lowest score that can be obtained from the scale is 20, and the highest score is 100. A couple-partner/sexual activity-centered sub-dimension is part of the scale. The self-centered sub-dimension determines sexual satisfaction generated by personal experiences and emotions. The partner/sexual activity-centered subscale measures the sexual satisfaction a person derives from sexual behaviors, spouse/partner reactions, and the variety and frequency of sexual activities. These two subscales represent the New Sexual Satisfaction Scale. The self-centered subscale

includes items 1-10, and the partner/sexual activity-centered subscale includes items 1-10.

### **Statistical Analysis**

The R version.2.15.3 (R. Core Team 2013) software was used for statistical analysis. Minimum, maximum, mean, standard deviation, frequency, and percentage were used to report the study data. The Shapiro-Wilk test evaluated compliance of quantitative data with normal distribution. In addition, independent samples *t*-test was used to assess quantitative variables with normal distribution between two groups.

One-way analysis of variance and the Bonferroni test were used to analyze quantitative variables with normal distribution between more than two groups. In addition, Pearson's Chi-square test, Fisher's exact test, and Fisher-Freeman-Halton's exact test were used to compare qualitative data. Finally, Pearson's correlation analysis was used to decipher the level of relationships between quantitative variables. A *p*-value of less than 0.05 was considered statistically significant.

## **Results**

The participants' demographic characteristics and chronotype distributions are presented in Table I. Of 114 couples, chronotypes of 79 (69.3%) were identical, and those of 35 differed.

Table II presents the comparison results between couples with identical and different chronotypes. The mean age at the first sexual intercourse of the similar couples (25.3±3.79 years) was significantly younger than the couples with different chronotypes (26.63±3.13) (*p*=0.006). Moreover, the identical couple group's marriage rate was considerably higher than that of the non-identical group (64.6% vs. 35.4%).

Table III demonstrates the results of WHOQOL-BREF, GRISS, and NSSS scores in females and males with different chronotypes and their statistical comparisons. Significant differences were determined in females regarding the physical and psychological domains of WHOQOL-BREF (*p*=0.049 and *p*=0.022, respectively), the infrequency (*p*=0.008), noncommunication (*p*<0.001), avoidance (*p*=0.001), nonsensuality (*p*=0.001), and vaginismus (*p*<0.001) sub-scores and the overall score (*p*<0.001) of GRISS, the couple/partner centered (*p*=0.003), and the overall score (*p*=0.026) of NSSS. In males, no significant differences were determined among the chronotypes regarding WHOQOL-BREF domains.

**Table I.** Demographic characteristics and chronotype distributions of the participants.

	Female (n=114) Mean±SD	Male (n=114) Mean±SD
<i>Age (years)</i>	34.3±6.65	36.84±7.04
<i>Age at first sexual intercourse (years)</i>	25.43±3.07	25.99±4.13
<i>Cohabitation duration (months)</i>	94.3±91.24	94.39±91.2
<i>Number of children</i>	0.81±0.82	0.81±0.82
	n (%)	n (%)
<b><i>Physical disorder</i></b>		
Present	7 (6.1)	10 (8.8)
Absent	107 (93.9)	104 (91.2)
<b><i>Family history of psychiatric disease</i></b>		
Present	5 (4.4)	5 (4.4)
Absent	109 (95.6)	109 (95.6)
<b><i>Educational status</i></b>		
University	105 (92.1)	106 (93)
High school	7 (6.1)	8 (7)
Primary school	2 (1.8)	0 (0)
<b><i>Employment status</i></b>		
Employed	110 (96.5)	111 (97.4)
Housewife	3 (2.6)	0 (0)
Student	1 (0.9)	0 (0)
Retired	0 (0)	3 (2.6)
<b><i>Income level</i></b>		
Good	6 (5.3)	9 (7.9)
Middle	108 (94.7)	105 (92.1)
Poor	0 (0)	0 (0)
<b><i>Marital status</i></b>		
Married	99 (86.8)	99 (86.8)
Bachelor	15 (13.2)	15 (13.2)
<b><i>Child/Children</i></b>		
Present	65 (57)	65 (57)
Absent	49 (43)	49 (43)
<b><i>Participant's chronotype</i></b>		
Morningness	18 (15.8)	24 (21.1)
Intermediate	68 (59.6)	53 (46.5)
Eveningness	28 (24.6)	37 (32.5)
<b><i>Couple's chronotype similarity status</i></b>		
Identical	79 (69.3)	79 (69.3)
Different	35 (30.7)	35 (30.7)

On the other hand, except for the infrequency sub-score, the chronotypes had significant differences regarding all other sub-scores and the overall score of GRISS [noncommunication ( $p=0.004$ ); dissatisfaction ( $p=0.002$ ); avoidance ( $p<0.001$ ); nonsensuality ( $p<0.001$ ); impotence ( $p<0.001$ ); premature ejaculation ( $p<0.001$ ), and overall ( $p<0.001$ )]. For NSSS, the only significant difference among the male chronotype groups belonged to the couple/partner-centered sub-score ( $p=0.027$ ).

Table IV indicates the comparison results of WHOQOL-BREF, GRISS, and NSSS scores in females and males with chronotypes identical to/different from their couples/partners. In females,

the few statistical significances belonged to the physical and psychological domains of WHOQOL-BERF ( $p=0.004$  and  $p=0.001$ , respectively) and the avoidance sub-score of GRISS ( $p=0.015$ ). In males, there were significant results, as well. However, unlike females, the few statistical significances belonged to the infrequency sub-score of GRISS ( $p=0.019$ ), the couple/partner-centered sub-score, and the overall score of NSSS ( $p=0.006$  and  $p=0.032$ , respectively).

In Table V, the comparison results of the desired and actual times of having sex in females and males with chronotypes identical to/different from their couples/partners are presented. Interestingly, the female and male participants in the

**Table II.** Results of the comparison between couples with identical and different chronotypes.

	Identical Mean±SD	Different Mean±SD	p-value
<i>Age (years)</i>	34.98±6.85	36.9±7.05	<sup>a</sup> 0.054
<i>Age at the first sexual intercourse (years)</i>	25.3±3.79	26.63±3.13	<sup>a</sup> 0.006*
	<b>n (%)</b>	<b>n (%)</b>	<b>p-value</b>
<b>Chronotype</b>			<sup>b</sup> 0.028*
Morningness	22 (52.4)	20 (47.6)	
Intermediate	90 (74.4)	31 (25.6)	
Eveningness	46 (70.8)	19 (29.2)	
<b>Educational status</b>			<sup>b</sup> 0.330
University	148 (70.1)	63 (29.9)	
Other	10 (58.8)	7 (41.2)	
<b>Marital status</b>			<sup>b</sup> <0.001*
Married	128 (64.6)	70 (35.4)	
Bachelor	30 (100)	0 (0)	
<b>Employment status</b>			<sup>c</sup> 0.679
Employed	152 (68.8)	69 (31.2)	
Unemployed	6 (85.7)	1 (14.3)	
<b>Income level</b>			<sup>c</sup> 0.007*
Good	15 (100)	0 (0)	
Middle	143 (67.1)	70 (32.9)	
<b>Physical disorder</b>			<sup>b</sup> 0.330
Present	10 (58.8)	7 (41.2)	
Absent	148 (70.1)	63 (29.9)	
<b>Family history of psychiatric disorder</b>			<sup>c</sup> 0.999
Present	7 (70)	3 (30)	
Absent	151 (69.3)	67 (30.7)	
<b>Child/Children</b>			<sup>b</sup> 0.545
Present	88 (67.7)	42 (32.3)	
Absent	70 (71.4)	28 (28.6)	

<sup>a</sup>Independent groups *t*-test; <sup>b</sup>Pearson's Chi-square test; <sup>c</sup>Fisher's exact test; \**p*<0.05

similar-chronotype couple groups differed from those in the couple groups in which the chronotypes differed from their couples regarding the desired time to have sex (*p*=0.033 and *p*=0.014, respectively). On the other hand, they had no differences regarding the time they had sex (*p*>0.05).

Table VI demonstrates the correlations in negative/positive directions among MEQ, NSSS, GRISS scores, and WHOQOL-BREF domains in participants involving all genders with chronotypes similar/different compared to their couples/partners. In the participants with an identical chronotype to their couples, MEQ was positively correlated with GRISS (*r*: 0.434, *p*<0.001), and negatively correlated with NSSS (*r*: -0.285, *p*<0.001), and physical, psychological, and social domains of WHOQOL-BREF [ (*r*: -0.257, *p*=0.001); (*r*: -0.247, *p*=0.002); and (*r*: -0.211, *p*=0.008), respectively]. Besides its correlation with MEQ in the negative direction, NSSS was also negatively correlated with GRISS (*r*: -0.705, *p*<0.001), whereas it was positively correlated

with physical, psychological, social, and environmental domains of WHOQOL-BREF [ (*r*: 0.607, *p*<0.001); (*r*: 0.578, *p*<0.001); (*r*: 0.588, *p*<0.001); and (*r*: 0.473, *p*<0.001), respectively]. GRISS was negatively correlated with physical, psychological, social, and environmental domains of WHOQOL-BREF [ (*r*: -0.524, *p*<0.001); (*r*: -0.484, *p*<0.001); (*r*: -0.631, *p*<0.001) and (*r*: -0.424, *p*<0.001), respectively]. Intra-assessment of WHOQOL-BREF revealed that all domains were significantly positively correlated.

In participants with a non-identical chronotype to their couples, MEQ was positively correlated only with GRISS (*r*: 0.280, *p*=0.019) and the social domain of WHOQOL-BREF (*r*: 0.237, *p*=0.048). NSSS was negatively correlated with GRISS (*r*: -0.500, *p*<0.001) and positively correlated with WHOQOL-BREF's social and environmental domains [(*r*: 0.272, *p*=0.023); and (*r*: 0.250, *p*=0.037), respectively]. As in the identical-chronotype group participants, the WHOQOL-BREF domains were positively correlated, as shown in Table VI.

**Table III.** The comparison results of WHOQOL-BREF, GRISS, and NSSS scores in females and males with different chronotypes.

	Females (n=114)				Males (n=114)			
	Morningness Mean±SD	Intermediate Mean±SD	Eveningness Mean±SD	p-value	Morningness Mean±SD	Intermediate Mean±SD	Eveningness Mean±SD	p-value
<b>WHOQOL-BREF</b>								
Physical	24.5±2.85	26.69±3.96	27.54±5.07	<b>0.049*</b>	27.67±4.02	28.15±3.27	28.76±4.28	<b>0.532</b>
Psychological	19.56±2.23	20.88±3.22	22.25±3.74	<b>0.022*</b>	21.54±3.3	22.89±3.47	23.32±2.56	<b>0.095</b>
Social	11.06±1.66	11.32±1.5	11.79±1.69	<b>0.263</b>	11.5±1.87	11.87±1.26	11.78±1.42	<b>0.587</b>
Environmental	26.11±5.74	27.79±4.07	26.93±3.4	<b>0.281</b>	28.54±5.18	28.3±4.28	28.92±4.76	<b>0.825</b>
<b>GRISS</b>								
Infrequency	4.33±1.24	3.31±1.61	2.75±1.96	<b>0.008*</b>	3.21±1.22	2.42±1.46	2.62±2.11	<b>0.155</b>
Noncommunication	4.5±1.82	3.04±1.47	1.82±1.91	<b>&lt;0.001*</b>	3±1.93	2.49±1.38	1.65±1.62	<b>0.004*</b>
Dissatisfaction	3.67±1.37	3.82±1.63	3.39±2.31	<b>0.563</b>	4.92±2.28	2.96±1.64	3.35±2.74	<b>0.002*</b>
Avoidance	4.44±3.78	2.59±1.69	1.86±2.21	<b>0.001*</b>	2.83±2.71	1.17±0.99	1.05±1.2	<b>&lt;0.001*</b>
Nonsensuality	4.56±2.89	3.93±2.43	2.07±2.46	<b>0.001*</b>	4.29±2.77	1.91±1.6	1.3±1.29	<b>&lt;0.001*</b>
Vaginismus	5.5±1.42	4.76±1.98	2.21±2.6	<b>&lt;0.001*</b>	-	-	-	-
Anorgasmia	4.39±2.17	4.78±2.06	4.32±3.03	<b>0.628</b>	-	-	-	-
Impotence	-	-	-	-	4.13±1.87	2.28±1.39	1.97±1.61	<b>&lt;0.001*</b>
Premature ejaculation	-	-	-	-	4.96±2.65	2.87±2.08	1.95±1.45	<b>&lt;0.001*</b>
<b>Overall</b>	<b>37.28±13.71</b>	<b>30.41±10.38</b>	<b>21.36±17.21</b>	<b>&lt;0.001*</b>	<b>30.42±12.04</b>	<b>19.19±6.06</b>	<b>16.54±7.31</b>	<b>&lt;0.001*</b>
<b>NSSS</b>								
Self-centered	34.78±10.45	36.71±7.14	40.39±10.51	<b>0.069</b>	39.79±6.63	41.08±2.97	42.22±6.9	<b>0.226</b>
Couple/partner-centered	36.39±8.15	38.09±5.59	42.5±7.54	<b>0.003*</b>	35.54±8.51	40.23±4.41	39.32±8.84	<b>0.027*</b>
<b>Overall</b>	<b>73.17±14.9</b>	<b>74.87±12.22</b>	<b>82.89±17.96</b>	<b>0.026*</b>	<b>74.88±14.2</b>	<b>81.26±6.78</b>	<b>81.49±15.17</b>	<b>0.060</b>

**WHOQOL-BREF:** World Health Organization Quality of Life; **GRISS:** Golombok-Rust Inventory of Sexual Satisfaction; **NSSS:** New Sexual Satisfaction Scale  
One-way variance analysis.

\* $p < 0.05$ .

**Table IV.** The comparison results of WHOQOL-BREF, GRISS, and NSSS scores in females and males with chronotypes identical to/different from their couples/partners.

	Females (n=114)			Males (n=114)		
	Identical Mean±SD	Different Mean±SD	p-value	Identical Mean±SD	Different Mean±SD	p-value
<b>WHOQOL-BREF Domains</b>						
Physical	27.3±3.97	24.86±4.24	<b>0.004*</b>	28.32±3.09	28.09±5.04	<b>0.803</b>
Psychological	21.71±3.2	19.43±3.04	<b>0.001*</b>	22.9±3.05	22.4±3.54	<b>0.473</b>
Social	11.46±1.58	11.26±1.6	<b>0.538</b>	11.86±1.36	11.54±1.63	<b>0.281</b>
Environmental	27.49±3.74	26.91±5.23	<b>0.557</b>	28.75±4.46	28.11±4.95	<b>0.501</b>
<b>GRISS</b>						
Infrequency	3.32±1.76	3.37±1.63	<b>0.875</b>	2.41±1.71	3.2±1.45	<b>0.019*</b>
Noncommunication	2.94±2.03	3.06±1.3	<b>0.705</b>	2.3±1.71	2.37±1.54	<b>0.841</b>
Dissatisfaction	3.7±1.98	3.69±1.23	<b>0.973</b>	3.48±2.66	3.54±1.12	<b>0.862</b>
Avoidance	3.01±2.57	2±1.7	<b>0.015*</b>	1.52±1.94	1.4±1.01	<b>0.733</b>
Nonsensuality	3.66±2.82	3.37±2.21	<b>0.560</b>	2.24±2.11	2.14±2.18	<b>0.822</b>
Vaginismus	4.22±2.38	4.34±2.41	<b>0.793</b>	-	-	-
Anorgasmia	4.73±2.56	4.31±1.76	<b>0.313</b>	-	-	-
Impotence	-	-	-	2.46±1.74	2.83±1.81	<b>0.299</b>
Premature ejaculation	-	-	-	2.99±2.5	3.06±1.78	<b>0.866</b>
Overall	29.62±15.19	28.49±9.97	<b>0.638</b>	20.77±10.78	20.51±5.75	<b>0.869</b>
<b>NSSS</b>						
Self-centered	38.1±8.13	35.51±9.91	<b>0.146</b>	41.47±5.88	40.51±4.04	<b>0.318</b>
Couple/Partner-centered	39.09±7.43	38.49±5.32	<b>0.625</b>	40.16±7.11	36.2±6.72	<b>0.006*</b>
Overall	77.2±15.22	75.14±13.1	<b>0.489</b>	81.58±12.66	76.4±9.3	<b>0.032*</b>

**WHOQOL-BREF:** World Health Organization Quality of Life; **GRISS:** Golombok-Rust Inventory of Sexual Satisfaction; **NSSS:** New Sexual Satisfaction Scale Independent groups *t*-test. \**p*<0.05.

**Table V.** The comparison results of the desired and actual times of having sex in females and males with chronotypes identical to/different from their couples/partners.

	Females (n=114)			Males (n=114)		
	Identical n (%)	Different n (%)	p-value	Identical n (%)	Different n (%)	p-value
<b>The time the participant wants to have sex</b>			<b>0.033*</b>	<b>0.014*</b>		
0:00-3:00	18 (22.8)	6 (17.1)		22 (27.8)	6 (17.1)	
3:00-6:00	0 (0)	2 (5.7)	0.032	0 (0)	2 (5.7)	0.032
6:00-9:00	2 (2.5)	5 (14.3)	0.016	2 (2.5)	5 (14.3)	0.016
9:00-12:00	0 (0)	1 (2.9)		0 (0)	1 (2.9)	
12:00-15:00	1 (1.3)	0 (0)		0 (0)	0 (0)	
15:00-18:00	3 (3.8)	0 (0)		0 (0)	0 (0)	
18:00-21:00	6 (7.6)	2 (5.7)		5 (6.3)	2 (5.7)	
21:00-24:00	49 (62)	19 (54.3)		50 (63.3)	19 (54.3)	
<b>The time the participant had sex</b>			<b>0.623</b>	<b>0.541</b>		
0:00-03:00	19 (24.1)	9 (25.7)	0:00-3:00	22 (27.8)	9 (25.7)	0:00-3:00
03:00-06:00	0 (0)	0 (0)	3:00-6:00	0 (0)	0 (0)	3:00-6:00
06:00-09:00	2 (2.5)	1 (2.9)	6:00-9:00	2 (2.5)	2 (5.7)	6:00-9:00
09:00-12:00	0 (0)	1 (2.9)	9:00-12:00	0 (0)	1 (2.9)	9:00-12:00
12:00-15:00	0 (0)	0 (0)	12:00-15:00	0 (0)	0 (0)	12:00-15:00
15:00-18:00	0 (0)	0 (0)	15:00-18:00	0 (0)	0 (0)	15:00-18:00
18:00-21:00	3 (3.8)	2 (5.7)	18:00-21:00	4 (5.1)	2 (5.7)	18:00-21:00
21:00-24:00	55 (69.6)	22 (62.9)	21:00-24:00	51 (64.6)	21 (60)	21:00-24:00

Fisher-Freeman-Halton exact test. \**p*<0.05.

**Table VI.** Correlations among MEQ, NSSS, GRISS, and W-B scores in participants with chronotypes similar/different compared to their couples/partners.

(n=228)		MEQ	NSSS	GRISS	W-B Physical	W-B Psychological	W-B Social	W-B Environmental
<i>Identical Chronotypes</i>								
MEQ	r	1.000						
	p	-						
NSSS	r	-0.285	1.000					
	p	<0.001*	-					
GRISS	r	0.434	-0.705	1.000				
	p	<0.001*	<0.001*	-				
W-B Physical	r	-0.257	0.607	-0.524	1.000			
	p	0.001*	<0.001*	<0.001*	-			
W-B Psychological	r	-0.247	0.578	-0.484	0.741	1.000		
	p	0.002*	<0.001*	<0.001*	<0.001*	-		
W-B Social	r	-0.211	0.588	-0.631	0.673	0.603	1.000	
	p	0.008*	<0.001*	<0.001*	<0.001*	<0.001*	-	
W-B Environmental	r	-0.147	0.473	-0.424	0.463	0.671	0.537	1.000
	p	0.066	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	-
<i>Different Chronotypes</i>								
MEQ	r	1.000						
	p	-						
NSSS	r	0.149	1.000					
	p	0.218	-					
GRISS	r	0.280	-0.500	1.000				
	p	0.019*	<0.001*	-				
W-B Physical	r	0.146	0.133	-0.072	1.000			
	p	0.226	0.271	0.554	-			
W-B Psychological	r	-0.047	0.187	-0.187	0.711	1.000		
	p	0.701	0.121	0.121	<0.001*	-		
W-B Social	r	0.237	0.272	0.088	0.542	0.651	1.000	
	p	0.048*	0.023*	0.470	<0.001*	<0.001*	-	
W-B Environmental	r	0.151	0.250	-0.148	0.631	0.615	0.732	1.000
	p	0.212	0.037*	0.220	<0.001*	<0.001*	<0.001*	-

MEQ: Morningness-Eveningness Questionnaire; NSSS: New Sexual Satisfaction Scale; GRISS: Golombok-Rust Inventory of Sexual Satisfaction; W-B: World Health Organization Quality of Life. Pearson's Correlation Analysis; \*p<0.05.

### Discussion

This study aimed to determine the effects of chronotypes on sexual satisfaction and quality of life in couples. Therefore, we assessed the chronotypes of participant couples, measured their quality of life and sexual satisfaction levels, and performed statistical analyzes for this purpose.

There were significant differences between identical and non-identical-chronotype couples regarding the age at the first sexual intercourse, marital status, and income level. However, when the participants' desired timing for sex and the ac-

tual timing of having sex were analyzed according to their genders, the most common first and second periods for both the sex desire and actual sex were similar in the two genders.

When the relationship of the chronotype with the quality of life was considered, females were significantly more affected than males. Actually, the males were not affected at all. Moreover, following an increasing trend from morningness to intermediate and then to eveningness, the E-Type females scored highest on the physical and psychological aspects of quality-of-life assessments. Although studies on the chronotype/the quality

of life/satisfaction with life relationships are few, the results of published studies are contradictory. For example, Jankowski<sup>23</sup>, in his report of a Polish sample, concluded that morningness was associated with higher life satisfaction for all genders. Taking support from another survey of a German sample by Randler et al<sup>24</sup>, he suggested that this association might be independent of culture. However, the scale he used differed from ours and measured satisfaction with life, not quality.

Another study by Kim et al<sup>25</sup> investigated the chronotype/depression relationship in all genders. Even though we did not include individuals with anxiety/depressive disorders, Kim's study<sup>23</sup> would shed light on our study's results regarding the quality of life. They concluded that late chronotype was associated with an elevated risk of depression in females but not males. Their study was about depression, a more severe state, not the quality of life. However, it might provide indirect evidence about the sample's quality of life for all genders. Males had not been affected in that study as well. On the other hand, their results for females contradicted ours, although indirectly.

E-Type females scored better than M-Type and I-Type females for most sub-scores, except for dissatisfaction and anorgasmia and the overall score of GRISS. Remarkably, the overall GRISS score of E-Type females was almost half the overall score of M-Type females, suggesting that the sexual satisfaction level of E-Type females was the highest. Such a result was determined in NSSS scoring; the couple/partner-centered sub-score and the overall NSSS score were highest in E-Type females. Our study's findings for sexual satisfaction-chronotype relationships in males were nearly similar to those of females. Most GRISS sub-scores and the overall GRISS score, except for infrequency, favored the E-Type males. Another remarkable finding was that the overall GRISS score of E-Type males was almost half the overall score of M-Type males, with another support for E-Type males' sexual satisfaction being the highest. Tanyi et al<sup>24</sup> reported similar results for females in their study on Hungarian couples. Evening-type females had the highest sexual satisfaction scores. However, Tanyi's results<sup>26</sup> did not comply with ours for males, and the sexual satisfaction scores of E-Type males were not the highest in their study.

In our study, the couples' chronotype similarity status seemed to affect the quality of life of females to some extent (i.e., only physically and psychologically). On the other hand, the males were not affected at all regarding the couples'

chronotype similarity. Our study revealed similar results for couples' chronotype similarity-sexual satisfaction relationships in females. Except for the avoidance sub-dimension of GRISS, none of the subscores and overall scores of GRISS and NSSS differed with chronotype similarity. In males, the study's results were almost similar.

Except for the infrequency sub-dimension, no other GRISS sub-score differed according to the couples' chronotype-similarity status. One difference between males and females was the higher satisfaction rates of the couple/partner-centered sub-score and the overall score of NSSS in the males of identical-chronotype couples. Jocz et al<sup>5</sup> reported that similarity in couples' chronotypes significantly affected sexual satisfaction in heterosexual couples, particularly in females. Their results did not comply with ours. Therefore, the similarity of couples' chronotypes was not a significant factor in increasing the quality of life and sexual satisfaction.

The desired timing to have sex was related to the chronotype similarity status in females and males. On the other hand, the timing of sex was not associated with the couples' similarity status. Even though desired timing varies with chronotype-similarity, the couples seem to act following each other's desire, enabling a common ground for actual sex. Jankowski et al<sup>1</sup>, in their study from Poland, reported that timings of desire and actual sexual activity were positively correlated. However, there were inter-gender differences in relationships of chronotype with desire for sex and actual sex.

The study also investigated correlations among the study's procedures (i.e., MEQ, NSSS, GRISS, and the four domains of WHOQOL-BREF) according to the chronotype-similarity status. Interestingly, the correlations were present among almost all procedures and were in the expected directions for participants with identical chronotypes to their couples. On the other hand, such an abundance of correlations was absent for couples with non-identical chronotypes. Particularly for MEQ's correlations, such a difference is much more apparent. Most procedures were correlated (5 of 6) in the expected direction in the identical-chronotype couples. However, participants with a different chronotype than their partners had only two correlations out of six. This result can be explained because being identical allows only a unique combination. When the couple's chronotypes differ, it enables at least three combinations, which might prevent strong correlations from being present.

## Conclusions

We determined that the individual's chronotype is a significant factor affecting the quality of life of the female gender and sexual satisfaction in all genders. However, the couple's chronotype similarity status does not substantially affect the couple's quality of life and sexual satisfaction. Therefore, chronotype similarity is not essential for improving couples' quality of life and sexual satisfaction. Furthermore, although the desired timing for sex is affected by the chronotype similarity status, it is not reflected in the actual timing of having sex. Since the reported studies on the effects of individuals' and couples' chronotypes are scarce, more studies should be conducted, and cross-cultural comparisons should be made.

### Conflict of Interests

The author declares that he has no conflict of interest.

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### Informed Consent

Written informed consent was obtained from all study participants.

### Ethics Committee Approval

Bolu Izzet Baysal University Clinical Researches Ethics Committee approved this study (Date-June 7<sup>th</sup>, 2022 and Decision # 2022/148).

### Author Contributions

Filiz Ozdemiroglu designed and conducted the research and wrote and revised the manuscript.

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