Original Article

The role of chronotype (morning-evening) in predicting depression and suicidal ideation

Mahrokh Zardi Nahr[1] and Reza Abdi[2*]

1. M.A. Student in General Psychology, College of Psychology, Zanjan, Iran.
2. Associate Professor, Department of Psychology, Azarbaijan Shahid Madani University, Tabriz, Iran.

Abstract

The aim of this study was to investigate the role of chronotype (morning-evening) in predicting depression and suicidal ideation. The method of this research is descriptive and correlational. The population of this research consists of all students of Shahid Madani University in the academic year 2020-2021, among whom 300 people were selected as the sample by availability sampling. Horn and Sternberg Evening-Morning Questionnaire (1976), Beck et al.'s Depression Scale (1961), and Beck Suicide Scale (1961) were used to collect the data. The data were analyzed by Pearson correlation and multivariate regression. The results of Pearson correlation indicated that there was a negative and significant relationship between chronotype variables and depression (r = -0.254) and also there was a positive and significant relationship between depression and suicidal ideation (r = 0.514). But the relationship between chronotype variables and suicidal ideation was not significant. The results of multivariate regression showed that the chronotype variable has 25% predictability of depression. The relationship revealed that chronotype variables and suicidal ideation was not statistically significant, but the indirect effect of chronotype through depression mediation was significant. Also, 26% of suicidal ideation was predictable through depression. The results indicated that having a chronotype in the evening has the ability to predict depression and with an evening chronotype the rate of depression increases. Also, the chronotype variable in the mediating role between depression and suicidal ideation can mediate the relationship between depression and suicidal ideation.

Introduction

Chronotype is a unique personal biological clock system characterized by daytime activities and sleep settings (Park, Lee & Lee, 2018). This circadian rhythm is characterized by endogenous circadian processes, sleep hemostatic factors, and environmental factors and socially regulated by social programs and requirements (Arns, Quigge, & Cogan, 2021). People in their circadian cycle have many individual differences that are during a continuum of circadian preferences that fluctuate in the range of morning, average, and evening people (Bahirooz & Haghighat, 2018). People wake up early in the morning, have the highest level of consciousness in the first half of the day, prefer daily activities, have a hard time falling asleep late. On the other hand, people in the evening are able to sleep until the last hours of the morning. They have the highest level of consciousness in

the evening, prefer night activities, and take a long time to fall asleep in the middle of the night. The third group is the moderates, which are located between the two shores in the evening and in the morning (Simpkin, Jenni, Carskadon, Wright, Akacem, Garlo & et al, 2014; Tsaousis, 2010). Research on circadian rhythms and sleep regulation has shown that changes in social rhythms, rest activities, and the sleep-wake cycle are commonly seen throughout psychiatric disorders (Pilz, Carissimi, Oliveira, Paula Francisco, Fabris, Medeiros & et al, 2018). Morning types have usually healthier lifestyles. Compared to the evening brigades. The morning type also has fewer mood disorders than the evening type (Au & Reece, 2017). Evidence also suggests that nocturnal chronotype time is associated with increased reports of anxious and depressive symptoms (Antipa, Vexling, Masters, Scores, & Pennix, 2016).

Studies show that morning and evening types are associated with some psychiatric problems. One of these

Corresponding author: Associate Professor, Department of Psychology, Azarbaijan Shahid Madani University, Tabriz, Iran.
E-mail: **Rezaabdi55@gmail.com**

disorders is depression. Depressive disorder is the most common mental illness that affects more than 350 million people in the world and is a major cause of disability in a person's life (Rice, Riglin, Lomax, Souter, Potter, Smith & et al, 2019). Depressed people can have many mental symptoms (e.g., feelings of hopelessness and helplessness), disturbed patterns of individual behavior (e.g., sleep or work problems), and distorted social interactions (e.g., avoiding contact or creating conflict. These features of depression are thought to be similar in cultures (Haroz, Ritchey, Bass, Kohrt, Augustinacius, Michalopoulos, Bukey & et al, 2017). The main and important characteristics of depressive states are a profound decrease in the desire for enjoyable activities such as interactions, recreation, exercise, nutrition, and sexual desire (Soy, Argansi & Sackman, 2020). Also, depressed people and people with mood disorders have significantly more dysfunctional attitudes or thoughts than normal people (Yesilyaprak, Batmaz, Yildiz, Sungur & Akpinar Aslan, 2019). They are also at risk for suicide, poor quality of life, and poor physical and social functioning (Balázs & et al., 2017).

Many psychological and socio-biological factors predispose to suicide. Major depression and childhood injuries are strong predictors of suicide attempt (Goldberg, Serra-Blasco, Vicent-Gil, Aguilar, Ros, Arias & et al, 2019). Suicide means self-harm with the goal of self-destruction (Becker, Versky, Heldoy, & Loeb, 2018). Suicide is a multi-step process involving suicidal ideation, suicide planning, suicide attempt, and attempting to end life; Thus, suicidal ideation is the first step to ending life and one of the predictors of suicide practice (Wang, Kou, Bai, Song, Liu, Yu, & et al, 2019). The concept of suicidal ideation means the existence of conflicting thoughts in relation to the tendency to end-of-life behavior (Kalb, Feinstein, Rohrig, Sankari & Willis, 2019). Few studies on chronotype have shown that chronotype is also associated with suicide, Individuals are more likely to commit suicide in the evening and are more likely to have psychological problems than those in the morning, such as behavioral problems and substance abuse (Lee, Kim, Cho, Kim, Bae, Kohe & et al, 2009; Gau, Shang, Merikangas, Chiu, Soong, Cheng, 2007). In other words, there are studies on the relationship between chronotype and suicide that consider sleep quality or impulsivity as the main mediator rather than a direct link (Park, Lee, & Lee, 2018).

In line with the objectives of this study, research and studies show that being in the evening is associated with emotional disorders, which include worse symptoms, poorer prognosis, and more seasonal mood swings among the evening types, while there is little empirical support for anxiety disorder and psychosis. Evening brigades also showed a more interesting tendency for health-damaging behaviors, which included substance use, poor lifestyle habits, alcohol dependence, and other addictive disorders (Kivela, Papadopoulos, Antypa, 2018). The results of the study (Akram, Stevenson, Gardani, Akram & Allen, 2019) showed that the vulnerability and personality of Machiwallism were independently related to evening chronotype, although after measuring age, gender, anxiety, and depression vulnerability was associated with evening chronotype. People who predict the evening situation may increase psychological traits due to a lack of control over emotions. In a study conducted by (Park, Lee & Lee, 2018) on chronotype and suicide mediated by the effects of depressive symptoms, the results showed that evening chronotype is associated with negative symptoms and suicide and people with evening type are more likely to have disorders. However, there was not much statistical significance between being in the evening and attempting suicide. In a study conducted by Isa Zadegan & Amiri (2015) it was shown that between the dimensions of cognitive ability based on morning and evening tendency, evening type in some dimensions of cognitive ability such as inhibitory control, decision making, and attention in comparison with the morning type Showed a significant difference. Also, comparing the morning and evening types in the dimensions of emotional styles showed that the morning type has positive emotional styles including more adaptation and tolerance. The study of Mohammadi, Qamrani, & Yarmohammadian (2016) indicated that the subscales of opposition and disobedience disorder are more activity, behavioral disorder, general depressive disorder and depression were significantly different between the three chronotype groups in the evening with other groups. Also, the amount of sleep resistance and delay in the onset of sleep and daily drowsiness in the evening type were significantly different.

According to what was mentioned and the high prevalence of depression compared to other disorders and the association of depression and suicidal ideation, as well as the prevention of this disorder and its concomitant thoughts, which is an important concern of psychiatrists and psychologists, the study of predictors This disorder is essential. One of the behaviors that seems to be unrelated to depression is sleep hygiene and sleep rhythms, given that sleep behavior and sleep cycle are diverse in humans and that depression is associated with sleep disturbance. It has to do with. Therefore, the present study aimed to the role of chronotype (morning-evening) in predicting depression and suicidal ideation.

Method

Participants

The method of the present research was descriptive-correlational. The statistical population of this study includes all students studying at the Shahid Madani University of Azerbaijan. Among them, 300 people were selected as a statistical sample using the Cochran's formula by available sampling method and answered the research questionnaires. Inclusion criteria include: current student of Shahid Madani University, no history of severe mental and physical disorders, no substance

abuse. Exclusion criteria also include unwillingness to continue cooperating with participants at any time during the research.

Instrument

Morning Evening Questionnaire (MEQ):

Developed in 1976 by Horn and Sternberg, MEQ is a 19-item questionnaire designed by Horn and Stberg to determine individuals' circadian rhythms. The questionnaire items have a number of different options and specific scoring, and by asking about the hours of sleep and wakefulness and the preferences of body hours for physical and mental work, it determines a person's daily routine. The options of the questionnaire do not have equal values and are based on analysis. The initials of its creators are given to the options of some questions of different values from other questions. The range of grades varies from 16 to 86, and a higher score indicates more morning, and a lower score indicates more evening. The original version categorizes people into 5 categories based on their score, 86-70 all morning. 69-59 Relatively morning. 58-42 Moderate. 41-31 Relatively evening. 30-16 Absolutely evening. In a study conducted by Anderson et al., The repeated reliability coefficient was reported to be 0.77. In Iran, Ziaei, Amiri & Mulavi confirmed the face validity of the questionnaire and increased Cronbach's alpha to 0.77.

Beck Depression Inventory (Second Edition):

Beck Depression Inventory was first developed in 1961 by Beck et al. (second edition) which was designed to measure depression. It consists of 21 questions designed to assess the feedback and symptoms of depressed patients, and its materials are based on the observation and summary of common attitudes and symptoms among depressed mental patients. In other words, these materials and their weights are logically selected. The content of this questionnaire is comprehensively symptomatic of depression, but focuses more on cognitive content. The total score of the questionnaire has a range from zero to 63, with a higher score indicating more depression. Psychometric studies show that this tool has good validity and reliability. Beck, Steer, and Brown reported the internal stability of this instrument as 0.73 to 0.92 with a mean of 0.86 and an alpha coefficient of 0.86 for the patient group and 0.81 for the non-patient group.

Beck Suicide Questionnaire:

A 19-item self-assessment tool. This questionnaire was designed to identify and measure the severity of attitudes, behaviors, and planning for suicide over the past week. The scale is adjusted based on 3 point degrees from 0 to 2. A person's total score is calculated based on the sum of scores, which is from 0 to 38. There is internal validity, test-retest validity, and concurrent validity on this scale. Suicidal ideation questions are consistent with. definitions of suicide. Evidence suggests that the suicidal ideation scale can be a valid option for measuring suicidal ideation on the self-assessment scale. The results of meta-analytic studies show that the average sensitivity is 84% and the average specificity is 82%. The Beck Suicide Thought Scale is highly reliable. Using Cronbach's alpha method, the coefficients were 0.37 to 0.17 and using the test-retest method, the reliability of the test was 0.51. Anisi et al. (2007) in a study of 900 male subjects with 19 to 23-year-olds selected by convenience sampling assessed the validity of the Beck Suicide Thought Scale. The results indicated that Beck scale was 0.76 correlated with Goldberg test depression scale. Also, the validity of the scale was 0.15 using Cronbach's alpha method and 0.75 from two halves method.

Results

findings indicated that the mean age of participants was 21.45 years. There were 178 females and 122 males. Of the 300 participants, 19 of whom lost data, 43 were morning, 52 were evening, and 186 were moderate. Correlation analysis was performed to determine the relationships between chronotype, depressive symptoms, and suicide. The results indicated that chronotype was negatively associated with depressive symptoms and suicide and depressive symptoms were positively associated with suicide.

Table 1. Mean and standard deviation of the variables

Variable	M	SD
Chronotype	49.32	9.16
Depression	14.11	10.02
Suicidal ideation	15.07	6.03

Table 2. Correlation coefficient between chronotype, depression, and suicidal ideation

Variable	Chronotype	Depression
Depression	- 0.254**	1
Suicidal ideation	-0.705	0.514**

As can be seen in Table 2, there is a significant relationship between chronotype and depression variables as well as depression and suicidal ideation (p < .01).

Multiple regression analysis was used to evaluate depression and suicidal ideation based on sleep cycles. Before performing regression analysis, in order to check the default of error independence and non-alignment between predictor variables (sleep preference, waking preference, and optimal performance preference), Watson camera statistics and tolerance index were examined. If the obtained statistic is less than 4, it indicates the independence of errors. For this analysis, the value of this statistic was 1.81 for depression and 1.92 for suicidal ideation which indicates that no violation of this assumption has been done. Also, the alignment index was examined separately for each of the chronotype subscales. The results indicated that the values obtained for each of the 3 subscales are in the range of zero and one. Therefore, there is no problem in using regression analysis.

Table 3. Results of regression analysis to predict depression based on morning-evening chronotype

Model	R	R2	ModifieldR2	SE
1	0.330	0.109	0.099	9.11

Model	SS	df	MS	F	Sig
Regression	2764.07	3	921.35	11.09	0.000
Residual	22677.03	273	83.06		
Total	25441.10	276			

Model	B	SE	BETA	T	Sig
Constant	29.48	3.12		9.43	0.000
wakening preference	-0.887	0.176	-0.336	-5.03	0.000
Sleep preference	0.116	0.231	0.031	0.5	0.000
Performance preference	-0.009	0.159	-0.004	-0.059	0.953

As shown in Table 3, approximately 10% of the chronotype depression variance is predictable. The F(11.09) ratio also indicates that the regression of the depression variable is significant and the preference of waking up with a beta of -0.33 significantly has the power to predict depression.

Table 4. Regression analysis results of predicting suicidal ideation based on morning-evening chronotype

Model	R	R2	ModifieldR2	SE
1	0.235	0.055	-0.016	6.278

Model	SS	df	MS	F	Sig
Regression	92.17	3	30.72	0.779	0.512
Residual	1576.79	40	39.42		
Total	1668.97	43			

Model	B	SE	BETA	T	Sig
Constant	17.96	4.91		3.65	0.001
wakening preference	-0.022	0.277	-0.014	-0.079	0.938
Sleep preference	0.206	0.380	0.091	0.543	0.590
Performance preference	-0.403	0.292	-0.247	-1.38	0.175

As can be seen in Table 4, the direct effect between chronotype and suicide was not statistically significant and no relationship was found, but the indirect effect was statistically significant, with a relationship between depression and suicidal ideation. This shows that depressive symptoms completely mediate the link between chronotype and suicide.

Discussion

The aim of this study was to investigate the role of chronotype (morning-evening) in predicting depression and suicidal ideation.

The results indicated that there is a positive and significant relationship between depression and evening. Also, the results indicated that there is no significant relationship between suicide and chronotype and path analysis showed that its direct effect is not statistically significant. However, the indirect effect was significant through depressive symptoms. Findings of the present hypothesis with the results of Akram et al. (2019), Chan &et al. (2014), Hasler et al. (2011), Gasper and Barber (2010), Park & et al. (2018), Rahafer et al. (2012) and Hashemi Nasr (2017) was in line.

Explaining the confirmation of this relationship, it can be said that the symptoms of depression and sleep problems interact with each other in many cases. Therefore, sleep problems can play an important role in

the depressive symptoms experienced by the evening type. People's moods generally fluctuate daily, and the evening-type person is more likely to get worse than the morning-type. In addition, one study suggests that short-term exposure to sunlight in evening varieties may negatively affect their mood (Adan, Fabbri, Natale, & Pratt, 2006). People of the evening type had more mental and psychosomatic disorders and were more severe than people of the morning type. These people also had more problems interacting with environmental and social demands. More emotional disturbances in the evening types can be considered due to the endogenous sleep-wake cycle that is not compatible with normal work and social programs (Díaz-Morales & Sánchez-López, 2008). Nightmare is associated with emotional disorders, especially depression. These include worse symptom severity, poorer prognosis, and higher seasonal mood swings among night owls. While these associations have been widely reported in cross-sectional studies, two recent longitudinal reports support the idea that chronotyping may be a risk factor for subsequent depression (Haraden, Mullin & Hankin, 2017; Van den Berg, Kivelä & Antypa, 2018). From a biological point of view, the suprapubic nucleus, which is part of the hypothalamus, plays an important role in the process of sleeping and waking, determining which group a person belongs to (Richardson & Tata, 2005). The nucleus sends to different centers of the body, biologically, cognitively and sensually prepares the person for morning or evening (Ziaee, Amiri & Mulavi, 2007) On the other hand, studies show that people who wake up late in the evening Like and hardly wake up in the morning, there is an interference between the biological clock and their internal clock. In other words, they are more prone to psychological disorders and depression, and because they lose some of their power to control situations and stress, they can have more behavioral problems than people in the morning. Studies show that people in the evening can't effectively prepare themselves for problems. The findings reported here replicate the link between morning and evening and depression and give more credence to a potentially important link between chronotype preference and mood disorder. The difference between morning and evening based on the diagnostic group further suggests that the association of depression may be at the level of traits, with more nocturnal mood lowering. In addition, the findings highlight one possible mechanism for this association between age and depression (through the motivational system of desire) while casting doubt on another (through behavioral inhibition) (Hasler, Allen, Sbarra, Bootzin & Bernert, 2011).

This study also analyzed the symptoms of depression and suicide based on chronotype and analyzed the mediating role of depressive symptoms in the relationship between chronotype and suicide. There was no significant direct relationship between chronotype and suicide, but the indirect effect was significant through depressive symptoms. This finding means that depression is a factor that negatively affects physical condition, job performance, and social functioning in addition to mental status, i.e. a large part of the depressed person's life suffers, so the presence of a wide range of negative factors can be reinforcements to end. Giving to this life is negative and causes the depressed person to commit suicide (Bahi Rooz & Haghiagh, 2018). Depressive symptoms completely mediate the connection between the chronicle and suicide. In a study conducted in China, suicide was high in the evening group (Gau, Shang, Merikangas, Chiu, Soong & Cheng, 2007).

In addition, after analysis and control of patients with major depression, chronotype was not associated with suicide and major depressive symptoms were considered as a predisposing factor in stimulating suicidal ideation (Selvi, Aydin, Boysan, Atli, Agargun, & Besiroglu, 2010). Barba showed that severe episodes of depression and suicide are common among the evening types (Gaspar-Barba, Calati, Cruz-Fuentes,Ontiveros-Uribe, Natale, De Ronchi & et al, 2009), suggesting that personality traits can mediate suicidal behavior. Analysis of chronotype, impulsivity and type of suicide in university students showed that violent suicide attempt is more common in the evening group. This result shows that being evening shows more impulsive tendencies and this motivation is more related to violent types of suicidal behavior (Selvi, Aydin, Atli, Boysan, Selvi, & Besiroglu, 2011).

Conclusion

Thus, previous studies analyzing chronicles, suicides, and suicidal ideation appear to suggest that there is a strong association between evening and various psychiatric pathologies associated with impulsivity and depressive symptoms, which in turn It has a lot to do with suicide.

Limitations

Among the limitations of this research was the availability of statistical samples and being limited to a specific university and lack of control over biorhythm-related factors. It is suggested that this study should be studied in a larger community and different groups with mental disorders in order to generalize the results to the community.

Disclosure Statement

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ORCID

Reza Abdi: https://orcid.org/0000-0002-7121-2516

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