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Investigating the Role of Chronotype in Impulsivity and Suicidal Ideation Among Soldiers

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Abstract

Aim: This study aimed to investigate the effect of chronotype on impulsivity and suicidal tendencies among soldiers.

Methods: This study employed a cross sectional design. The statistical sample consisted of active soldiers aged 18 to 25 from various branches of the military. A total of 304 eligible participants were selected through convenient sampling. Data were collected using self-report questionnaires, including the reduced Morningness-Eveningness Questionnaire (rMEQ), the Barratt Impulsiveness Scale-11 (BIS-11), and the Beck Suicidal Ideation Questionnaire (BSSI). The research findings were analyzed using one-way analysis of variance (ANOVA) and the Bonferroni post hoc test.

Results: The results indicated that participants exhibited moderate levels of impulsivity. Significant differences were found in impulsivity and its dimensions based on chronotype , with eveningness types displaying higher levels of non-planning impulsiveness, motor impulsiveness, and cognitive impulsiveness, as well as total impulsivity and suicidal ideation compared to intermediate and morningness types ($p < 0.001$). However, no significant differences were observed between intermediate and morningness chronotypes in these measures ($p > 0.05$).

Discussion and Conclusion: The findings suggest that soldiers with an eveningness chronotype are more prone to impulsivity and suicidal tendencies, highlighting the importance of chronotype in mental health outcomes among military personnel. Further research is needed to explore underlying mechanisms and additional influencing factors.

Keywords: Soldiers, Chronotype, Impulsivity, Suicide.

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Key Points

- The study investigated the relationship between chronotype (Eveningness, Intermediate, Morningness) and impulsivity and suicidal tendencies among soldiers.
- Significant correlations were found between eveningness chronotype and higher levels of impulsivity (Non-Planning, Motor, Attentional) and suicidal ideation.
- No significant relationship was observed between chronotype preferences and impulsivity or suicidal ideation in intermediate and morningness groups.
- One-way ANOVA analysis revealed significant differences in impulsivity and suicidal ideation based on chronotype preferences, with eveningness types scoring higher.
- The findings suggest that chronotype significantly affects impulsivity and suicidal tendencies in soldiers, indicating the need for targeted interventions based on chronotype preferences.

Introduction

Military service exposes individuals to new and challenging conditions that they likely have never encountered before. The specific lifestyle restrictions and changes in sleep patterns can significantly impact a person's mental health(Giuntella et al., 2021).

In recent years, considerable efforts have been made to explore human chronotypes in relation to both physical and mental health(Niroumand Sarvandani et al., 2023). Chronotype refers to the individual characteristics associated with a particular pattern of circadian functioning, including the sleep-wake cycle;(Di Milia et al., 2013; Montaruli et al., 2021).

Traditionally, chronotype is synonymous with morning-evening (ME) preferences, indicating an individual's optimal time of day for waking, sleeping, and peak activity(Majumdar & Sahu, 2020) .

Morning-oriented individuals tend to wake up easily, are more alert in the morning, and prefer morning activities. In contrast, evening-oriented individuals are more alert in the evening, prefer late-day activities, and typically sleep later in the morning;(Lipnevich et al., 2017; Zhang et al., 2022) .

Research in the psychology of time has demonstrated differing outcomes between morning and evening types(Walsh et al., 2022).

Specifically, evening types have been significantly associated with higher levels of impulsivity(Adan et al., 2010) , a trait that plays a critical role in risk-taking behaviors. Impulsivity encompasses a wide range of behaviors, including difficulties in self-regulation, poor planning, acting without considering consequences, excitement seeking,

risk-taking, low inhibition, and a preference for immediate rewards(Gvion & Apter, 2012; Nigg, 2017) Additionally, impulsivity is believed to be a key factor in suicidal behavior, as it is hypothesized that suicidal actions often result from hasty decisions with little consideration of the negative consequences. Previous studies have underscored the strong connection between impulsivity and suicidal thoughts and behaviors. Individuals with higher levels of impulsivity who have attempted suicide are at a greater risk of further suicidal behavior(Anestis et al., 2014).

A recent multivariate regression analysis revealed that impulsivity remained a significant predictor of suicidal ideation, even when controlling for sociodemographic factors, duration of treatment, and comorbid depression(Jakšić et al., 2017) .

Thus, individuals with high trait impulsivity and suicidal ideation are at an increased risk of acting on suicidal thoughts(Hadzic et al., 2020; Mann et al., 1999) .

Similarly, examining the relationship between chronotype and self-destructive behaviors is crucial, as soldiers may engage in self-injurious acts as maladaptive coping mechanisms or as a response to psychological distress(Harrison et al., 2021).

Self-destructive behaviors, such as self-harm, eating disorders, or substance abuse, can severely impact soldiers' mental and physical health, overall well-being, and operational readiness. Understanding the potential connection between chronotype and these behaviors can inform preventive efforts and interventions aimed at reducing self-destructive tendencies among soldiers(Tuman) .

Self-injurious behaviors, also known as non-suicidal self-injury, involve deliberate acts of self-harm without the intent to die. This includes actions such as cutting, burning, or any behavior that results in physical harm(Favazza, 1998) . While suicidal behavior and self-injurious behaviors are distinct concepts, they share complex interrelationships. Suicide involves the deliberate intent to end one's life and encompasses completed suicides, attempted suicides, and suicidal thoughts(Ngwena et al., 2017) .

Suicide represents the most severe consequence of poor mental health, with a global death rate of 10.5 per 100,000 people in 2016(Mathers, 2020) .

Furthermore, factors associated with eveningness and suicidality appear to overlap, with evening-type individuals experiencing greater psychiatric symptom severity and higher rates of suicidality compared to morning types(Müller et al., 2016) .

A recent study by(Park et al., 2018) concluded that the effect of chronotype on suicide among college students may be fully mediated by depressive symptoms. (Rumble et al., 2020) found that evening types report more suicidal thoughts, a higher prevalence of suicide attempts, and a greater tendency to choose violent methods of suicide(Selvi et al., 2011) .

Conversely, it has been hypothesized that a morning chronotype may serve as a protective factor against depression, anxiety, and other disorders, potentially reducing the risk of suicide(Gaspar-Barba et al., 2009; Sarvandani et al., 2024) .

The importance of this research lies in addressing the mental health challenges faced by soldiers, particularly in relation to impulsivity and suicidal tendencies. This study aims to contribute to the existing literature on military mental health and to inform preventive strategies and support systems by examining the relationship between chronotype, impulsivity, and suicidal tendencies in soldiers.

Methods

This study employed a cross-sectional design within a military environment, involving active soldiers from various branches of the military. A total of 304 soldiers, aged 18 to 25, were selected through convenience sampling from military bases and facilities. Inclusion criteria required participants to be active soldiers within the specified age range who were willing to participate in the study. Exclusion criteria were the presence of known or diagnosed sleep disorders or psychiatric conditions that could significantly affect the study variables.

Ethical approval for this research was obtained from the appropriate organizational and review board. Participants were assured of the confidentiality of all information collected. To minimize response bias, clear instructions were provided, and participants were encouraged to answer honestly. Depending on participant preferences and available resources, questionnaires were administered either in paper-and-pencil format or electronically.

The research data were collected using a series of self-report questionnaires, including the reduced Morningness-Eveningness Questionnaire (rMEQ), the Barratt Impulsiveness Scale-11 (BIS-11), and the Suicidal Ideation Questionnaire (BSSI).

The Morningness-Eveningness Questionnaire (MEQ):

originally developed by Horne and Östberg in 1976, consists of 19 items across three subscales: wakefulness preference (7 items), sleep preference (4 items), and optimal performance preference (4 items)(Panjeh et al., 2021). For this study we have used The Reduced Morningness-Eveningness Questionnaire (rMEQ) is a concise adaptation of the original Morningness-Eveningness Questionnaire (MEQ) created by Horne and Östberg in 1976. The rMEQ consists of 5 items designed to efficiently assess an individual's chronotype, specifically their preference for morning or evening activities. It has been widely used in research due to its brevity and the ease with which it can be administered. The rMEQ has demonstrated sufficient internal consistency across various studies. For example, the original English version of the rMEQ has shown good reliability with Cronbach's alpha typically ranging around 0.70 to 0.80, depending on the sample. The items in the rMEQ are correlated, reflecting a coherent measurement of the morningness-eveningness dimension(Danielsson et al., 2019).

In Iran, the Persian version of the rMEQ was translated and validated by Rahafar and colleagues (2015). This version retained the core items and structure of the original questionnaire but was adapted to fit the linguistic and cultural context of Persian-speaking populations. The study by Rahafar et al. confirmed the reliability and validity of the Persian rMEQ, reporting a Cronbach's alpha of 0.70, indicating acceptable internal consistency. The questionnaire also demonstrated good construct validity, making it a suitable tool for assessing chronotype in Iranian populations.

Given its robust psychometric properties and ease of use, the Persian version of the rMEQ by Rahafar et al. is a valuable instrument in chronobiological research within Persian-speaking communities (Rahafar et al., 2015).

Beck suicidal ideation scale (BSSI) :

The Barratt Impulsiveness Scale-11 (BIS-11) is another questionnaire utilized in this study, developed by Ernst Barratt. The BIS-11 consists of 30 items designed to measure three factors of impulsivity: attentional impulsivity, motor impulsivity, and non-planning impulsivity. Respondents rate each item on a four-point scale, ranging from 1 (never/rarely) to 4 (almost always), with total scores ranging from 30 to 120(Stanford et al., 2009).

The Persian version of the BIS-11 scale indicates that it is a reliable tool for assessing impulsiveness in an Iranian sample, with a Cronbach's alpha of 0.81(Javid et al., 2012).

Results

The statistical population of the current study consisted of 304 soldiers who were serving in various branches of the military. Tables 1 present the demographic characteristics of the participants, categorized by age and education level.

Table 1. Frequency and Percentage of Participants by Age(n=304)

Age (years)	**Frequency**	**Percentage (%)**
18-20	124	40.8
20-22	68	22.4
22-24	37	12.2
Above 24	75	24.7
Education Level		
Elementary	14	4.6
Diploma	122	40.1
Associate Degree	26	8.6
Bachelor's Degree	71	23.4
Master's Degree	44	14.5
Ph.D	27	8.9

As shown in Table 1, the majority of participants (40.8%) were between the ages of 18 and 20 years, followed by 22.4% aged 20 to 22 years, and 12.2% aged 22 to 24 years. Participants above 24 years accounted for 24.7% of the total sample. In terms of educational background, 40.1% had completed a diploma, 23.4% held a bachelor's degree, 14.5% had a master's degree, and 8.9% had a Ph.D. Only 4.6% of participants had an elementary-level education, and 8.6% had an associate degree.

Table2. Minimum, Maximum, Mean, Standard Deviation of Research Variables

Variable		Min	Max	Mean	Standard deviation
Chronotype	Eveningness	6.00	11.00	8.73	1.92
	Intermediate preference	12.00	17.00	14.59	1.50
	Morningness	17.00	23.00	18.52	1.61
impulsivity	Non-Planning Impulsiveness	9.00	35.00	21.96	3.93
	Motor Impulsiveness	12.00	46.00	29.56	5.59
	Attentional Impulsiveness	4.00	16.00	10.11	2.39
	Total impulsivity	30.00	111.00	74.90	12.20
Suicidal Ideation		19.00	19.00	57.00	30.31

As shown in Table 2, the chronotype scores ranged from 6 to 23, with participants exhibiting eveningness having a mean score of 8.73 (SD = 1.92), intermediate preference a mean of 14.59 (SD = 1.50), and morningness a mean of 18.52 (SD = 1.61). Impulsivity was assessed in three dimensions: non-planning impulsiveness had a mean of 21.96 (SD = 3.93) with scores ranging from 9 to 35, motor impulsiveness had a mean of 29.56 (SD = 5.59) with scores between 12 and 46, and attentional impulsiveness had a mean of 10.11 (SD = 2.39) with scores ranging from 4 to 16. The total impulsivity score ranged from 30 to 111, with a mean of 74.90 (SD = 12.20). Suicidal ideation scores ranged from 19 to 57, with a mean of 30.31.

Table 3. Results of one-way analysis of variance to investigate the level of impulsivity among soldiers based on chronotype

Impulsivity and its dimensions	chronotype	Mean	Std. Deviation	F	Sig.
Non-Planning Impulsiveness	Eveningness type	23.44	4.11	8.27	0.0001
	Intermediate	21.57	3.68		
	Morningness type	21.05	3.90		
Motor Impulsiveness	Eveningness type	32.49	6.24	16.12	0.0001
	Intermediate	28.58	5.10		
	Morningness type	28.39	4.52		
Attentional Impulsiveness	Eveningness type	11.31	2.25	14.72	0.0001
	Intermediate	9.67	2.26		
	Morningness type	9.75	2.40		
Total impulsivity score	Eveningness type	81.74	13.66	19.02	0.0001
	Intermediate	72.82	10.93		
	Morningness type	71.53	9.91		
Suicidal Ideation	Eveningness type	37.11	12.02	30.76	0.0001
	Intermediate	27.89	7.76		
	Morningness type	28.03	7.02		

As shown in Table 3, a one-way analysis of variance (ANOVA) revealed significant differences in impulsivity and its dimensions based on chronotype. For non-planning impulsiveness, soldiers with an eveningness chronotype had the highest mean score (M = 23.44, SD = 4.11), followed by intermediate chronotype (M = 21.57, SD = 3.68) and morningness chronotype (M = 21.05, SD = 3.90), with a significant effect (F = 8.27, p = 0.0001). Motor impulsiveness also varied significantly across chronotypes (F = 16.12, p = 0.0001), with eveningness type soldiers scoring higher (M = 32.49, SD = 6.24) compared to intermediate (M = 28.58, SD = 5.10) and morningness types (M = 28.39, SD = 4.52). For attentional impulsiveness, eveningness types again showed the highest scores (M = 11.31, SD = 2.25), followed by morningness (M = 9.75, SD = 2.40) and intermediate types (M = 9.67, SD = 2.26), with a significant difference (F = 14.72, p = 0.0001). Total impulsivity scores were also significantly higher in the eveningness type (M = 81.74, SD = 13.66) compared to intermediate (M = 72.82, SD = 10.93) and morningness types (M = 71.54, SD = 9.91) (F = 19.02, p = 0.0001). Additionally, suicidal ideation scores were significantly higher in eveningness type soldiers (M = 37.11, SD = 12.02) compared to intermediate (M = 27.89, SD = 7.76) and morningness types (M = 28.03, SD = 7.02) (F = 30.76, p = 0.0001).

To examine in which group the differences are significantly greater, the Bonferroni post-hoc test was used, and the results are presented in Table 4.

Table 4. Results of the Bonferroni Post-Hoc Test to Examine Differences in Impulsivity and its Dimensions Based on Chronotype

Dependent Variable	Time trends (I)	Time trends (J)	Mean Difference (I-J)	Std. Error	Sig.
Lack of planning impulsivity	**eveningness**	**Intermediate**	1.86*	.52	.001
		morningness	2.38*	.67	.001
	morningness	**Intermediate**	-.52	.59	1.000
Movement impulsivity	**eveningness**	**Intermediate**	3.90*	.72	.000
		morningness	4.10*	.93	.000
	morningness	**Intermediate**	-.19	.82	1.000
Cognitive impulsivity	**eveningness**	**Intermediate**	1.64*	.31	.000
		morningness	1.56*	.39	.000

	morningness	**Intermediate**	.07	.35	1.000
Total impulsivity	**eveningness**	**Intermediate**	8.91*	1.57	.000
		morningness	10.21*	2.01	.000
	morningness	**Intermediate**	-1.29	1.77	1.000
Suicidal ideation	**eveningness**	**Intermediate**	9.22*	1.22	.000
		morningness	9.07*	1.56	.000
	morningness	**Intermediate**	.14	1.38	1.000

The results of the Bonferroni post-hoc test presented in Table 4 reveal significant differences in impulsivity and its dimensions, as well as suicidal ideation, based on chronotype preferences. Specifically, soldiers with an eveningness chronotype exhibit significantly higher levels of non-planning impulsivity (Mean Difference = 2.38, p = .001), motor impulsivity (Mean Difference = 4.10, p = .000), and cognitive impulsivity (Mean Difference = 1.56, p = .000) compared to those with a morningness or intermediate chronotype. Additionally, total impulsivity scores were significantly greater for eveningness types compared to both intermediate (Mean Difference = 8.91, p = .000) and morningness groups (Mean Difference = 10.21, p = .000). Similarly, suicidal ideation was significantly higher in soldiers with an eveningness chronotype compared to intermediate (Mean Difference = 9.22, p = .000) and morningness types (Mean Difference = 9.07, p = .000).

However, the results indicate no significant differences between intermediate and morningness types in terms of impulsivity, its dimensions, or suicidal ideation (p > .05). This suggests that while impulsivity and suicidal ideation are more pronounced in soldiers with an eveningness chronotype, there are no meaningful differences between soldiers with intermediate and morningness chronotypes in these measures. Thus, the findings highlight that eveningness preference is associated with higher impulsivity and suicidal ideation, whereas intermediate and morningness preferences do not differ significantly in these aspects.

Discussion

This study aimed to explore the influence of chronotype on psychological impulsivity and suicidal ideation among active-duty soldiers. The results underscore the significance of circadian rhythms in mental health and behavioral regulation, particularly within high-stress environments like the military. Specifically, morning chronotypes exhibited lower levels of impulsivity, while evening chronotypes demonstrated a greater prevalence of self-harm behaviors and suicidal ideation. These findings align with prior research but also extend our understanding by contextualizing them within the unique demands of

military service.

The association between chronotype and impulsivity in this study mirrors the conclusions drawn from previous research that suggests morning chronotypes generally have better cognitive control and self-regulation compared to evening types (Urbán et al., 2011). Morning types tend to have circadian rhythms that align well with societal schedules, leading to more optimal performance in activities requiring high executive functioning and self-control(Roenneberg et al., 2004) . In contrast, evening chronotypes are often misaligned with external schedules, resulting in reduced impulse control. This circadian misalignment, particularly in military settings where schedules are rigid and typically morning-oriented, exacerbates impulsivity in evening types. This finding is important because impulsivity is a known predictor of risk behaviors and poor decision-making, especially in environments like the military where high-stress situations demand quick, controlled responses(Nock et al., 2008) .

However, not all research aligns with the notion that evening chronotypes consistently exhibit greater impulsivity. Some studies have suggested that while evening types may show impulsivity under sleep deprivation or disrupted schedules, their cognitive performance can match or even exceed morning types under more flexible conditions (Liu et al., 2024). This divergence underscores the complexity of the relationship between chronotype and impulsivity, suggesting that interventions aimed at mitigating impulsivity in evening types should focus on improving circadian alignment rather than assuming inherent impulsivity deficits.

The significant association between evening chronotype and higher levels of self-harm behaviors and suicidal ideation is concerning. These results align with previous research showing that individuals with evening chronotypes often experience circadian rhythm misalignment, which contributes to emotional dysregulation and increased vulnerability to self-destructive behaviors(Scheer et al., 2009) . Evening types tend to have greater difficulty maintaining consistent sleep schedules, and this sleep disruption has been linked to increased emotional instability, leading to higher risks of self-harm and suicidal ideation(Wright et al., 2013) .

Consistent with these findings, the literature on circadian misalignment suggests that evening chronotypes are at greater risk for mood disorders such as depression and anxiety, both of which are strong predictors of suicidal behavior (Adan & Almirall, 1991). This study contributes to this body of work by highlighting the specific risks faced by evening-type soldiers, a population that encounters unique stressors and demands. Military personnel are often subjected to rigid schedules that favor morningness, further intensifying the misalignment experienced by evening types. Moreover, sleep disturbances—common among evening types—are known to exacerbate feelings of hopelessness and distress, particularly in high-pressure environments like the military(Kantermann et al., 2010) .

While the association between eveningness and increased psychological distress is well-documented, there are studies that contradict these findings. Some research suggests that evening types, when allowed to self-regulate their schedules, may experience lower stress and better emotional outcomes than morning types (Krystal, 2020). This indicates that the context in which circadian preferences are expressed—whether under externally imposed

schedules or more flexible routines—plays a crucial role in determining psychological outcomes. Therefore, military environments, which offer little flexibility, may disproportionately disadvantage evening chronotypes.

One of the strengths of this study is the demographic diversity of the sample, which included variation in age and educational background, while minimizing confounding factors such as substance abuse. The absence of significant substance use allows for a clearer interpretation of the findings regarding chronotype and psychological outcomes. This strengthens the argument that circadian rhythm misalignment, rather than substance-induced dysregulation, is a primary contributor to the observed impulsivity, self-harm, and suicidal ideation in evening-type soldiers.

Given the military's demographic variability, it is critical that interventions addressing mental health consider individual differences in chronotype. Tailored interventions focusing on improving circadian alignment, perhaps through chronotherapy or flexible shift scheduling, could be particularly beneficial. By addressing the unique needs of evening-type soldiers, the military could enhance overall well-being and operational performance (Baron & Reid, 2014).

Conclusion

This study provides a robust foundation for understanding the relationship between circadian rhythm disturbances and health outcomes, particularly in a military population. The findings contribute valuable insights into how chronotype can influence psychological well-being, highlighting the potential for tailored interventions to improve mental health outcomes. By identifying key associations between chronotype and variables such as impulsivity and suicidal thoughts, this research underscores the importance of considering circadian factors in psychological assessments and interventions.

Despite the strengths of this study, several limitations warrant consideration. The reliance on self-reporting tools introduces the possibility of biases, such as social desirability and recall bias, which may affect the validity and reliability of the data. While objective measures were employed alongside self-reports, these biases could still influence the results. Additionally, although the sample size was substantial, it may not have been sufficient to capture rare or unusual effects, and some subgroups, such as individuals with severe circadian rhythm disturbances or those from specific cultural backgrounds, may have been underrepresented. This potential underrepresentation could limit the applicability of the findings to these groups. Moreover, external factors such as environmental conditions and socio-cultural influences were not fully controlled, which could have impacted the results.

To better establish causal relationships between circadian rhythm disturbances and health outcomes, future research should prioritize longitudinal studies. These studies could explore how changes in circadian rhythms over time impact health outcomes, providing insights into the long-term effects and potential reversibility of circadian disturbances. A comprehensive understanding of how circadian rhythm disorders affect health will require investigating the biological, psychological, and social mechanisms involved.

Future research should examine specific physiological processes, such as hormonal fluctuations, immune responses, and metabolic changes, that mediate the effects of circadian misalignment. Additionally, exploring psychological factors like stress and cognitive load, along with social influences such as support networks and lifestyle choices, will help clarify their role in the relationship between circadian rhythms and health. By addressing these areas, future studies can enhance the validity and generalizability of findings, ultimately contributing to more effective interventions and improved health outcomes.

Disclosure Statements

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper also The authors have no financial interests to disclose.

Counseling or Therapeutic Significance

This study highlights the importance of assessing chronotype in military mental health interventions, as eveningness chronotype soldiers may be more prone to impulsivity and suicidal ideation. Tailored counseling approaches based on chronotype could enhance the effectiveness of mental health support for soldiers, potentially reducing impulsivity and suicide risk.

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