Mediating Role of Circadian Rhythm in Association Between Social Media Usage and Mental Health among Young Adults

Jeevisha Yadav* and Dr. Sundeep Kumar**

ABSTRACT

This research paper delves into the complex interplay between social media usase, circadian rhythms, and mental health in young adults (18-25). Circadian rhythms, which is internal 24-hour cycles govern sleep-wake patterns, mood, and hormone production. Disruptions to these rhythms, often caused by late-night screen time, can lead to sleep disturbances and a decline in mental well-being. This population is known for naturally later sleep schedules, making them potentially more vulnerable. Employing a cross-sectional design with 129 participants, the research revealed a significant negative correlation between social media usage and mental health. Further analysis suggested a partial mediating effect of circadian rhythm in the association between social media usage and mental health outcomes in young adults.

Keywords: *circadian rhythm, sleep disruption, mental health, young adults*

About authors:

***Master Dissertation Student, AIBAS, Amity University, Gurugram, Haryana-122413*

****Assistant Professor, AIBAS, Amity University, Gurugram, Haryana-122413*

INTRODUCTION

The constant connection of the digital age comes at a cost for young people's mental health. Research consistently links excessive screen time, especially evenings, to disrupted sleep patterns (Hale et al., 2015; Brautsch et al., 2022). Blue light emitted from devices disrupts melatonin production, the sleep-wake hormone (Nakshine et al., 2022). Social media usage deserves scrutiny. Studies by Scott et al. (2019) and others reveal a correlation between excessive engagement and negative sleep patterns, which in turn, link to anxiety, depression, and ADHD (Haripriya et al., 2019; Mei et al., 2018).

Promoting healthy sleep hygiene, like avoiding screens before bed (Cavalli et al., 2021), is crucial for young people's mental well-being. The impact goes beyond sleep. Disrupted circadian rhythms correlate with mood disorders (Walker et al., 2020), potentially worsening existing conditions. Adolescents with later sleep schedules exhibit poorer health outcomes (Gariépy et al., 2019). The COVID-19 pandemic exacerbated this issue, linking circadian rhythm abnormalities with depression and anxiety in young adults (Tao et al., 2021). Mental health disorders like schizophrenia also appear connected (Wulff et al., 2012). Focusing on adolescents, research shows excessive screen time, especially before bed, negatively impacts sleep and circadian rhythms (Lissak, 2018). This links to increased depressive symptoms, suicidal ideation, and ADHD-related behavior (Lissak, 2018; Touitou et al., 2016). Smartphone use and sleep difficulties are further linked in young adults, with females more susceptible (Maurya et al., 2022). While the causal link between social media use and mental health remains unclear, this research paper explores circadian rhythms as a potential mediator. It investigates how nighttime social media use, common among young adults, might disrupt circadian rhythms and contribute to poorer mental health. The research also acknowledges the need to explore social media content and engagement patterns in more detail.

Objectives:

- To examine the link between social media usage and mental health outcomes among young adults

- To investigate the mediating role of circadian rhythm disruption on the relationship between social media usage and mental health outcomes among young adults.

Hypotheses:

- Young adults using social media will have negative mental health.
- Circadian rhythm mediates the relationship between social media usage and mental health in young adults.

METHOD:

Design: A cross-sectional research design was chosen for this study. This design is appropriate as participant selection was based on specific characteristics defined by pre-established inclusion and exclusion criteria.

Sample: The current research study recruited a total of 129 young adults aged 18-25 years. Participants were residents of the National Capital Region (NCR) of Delhi and the state of Haryana. Snowball sampling technique was employed for participant recruitment. Individuals who have any diagnosed mental health condition were also opted out of the study.

Assessment Tools: Following assessment tools were used in the study:

Social media *usage Scale (SMUS):* SMUS, developed by Yue et al. (2020), measures how individuals interact with social media platforms. Participants respond to a series of statements using a 5-point Likert scale to indicate the degree to which each statement applies to them. Several studies have demonstrated good internal consistency and validity for the SMUS.

General Health Questionnaire-12 (GHQ-12): The General Health Questionnaire (GHQ-12), developed by David Goldberg in 1978, is a widely used instrument for assessing mental health in adults. This self-report questionnaire consists of 12 items that explore four key domains: mood, anxiety, social functioning, and sleep disturbance. The GHQ-12 demonstrates good internal consistency, with Cronbach's alpha reported to be 0.90.

Morningness-Eveningness Questionnaire (MEQ): The Morningness-Eveningness Questionnaire (MEQ), developed by Horne and Östberg (1976), is a well-established tool for assessing individual sleep-wake preferences. The MEQ utilizes a series of questions and scenarios to which participants respond by indicating their preferred timing for various activities. The instrument demonstrates good test-retest reliability, with a coefficient of 0.84.

Procedure: A survey instrument combining three validated questionnaires was developed in paper and online formats for participant convenience. After informed consent, potential participants were recruited. Those preferring online surveys received a secure link, while others received paper surveys with the option to invite eligible friends to participate online or in person.

RESULTS:

Table 1
Descriptive statistics for mental health, circadian rhythm and social media usage

	GHQ	**MEQ**	**SMUS**
Mean	13.09	51.31	3.43
Standard Deviation	7.34	9.49	0.54

Descriptive statistics are presented in Table 1. From the results shown in table 1, mean scores of general health questionnaire (GHQ) **(M=13.09),** Morningness-eveningness questionnaire(MEQ) **(M=51.31),** Social media usage scale(SMUS) **(M=3.43)** were reported. These scores imply that young adults average mental health doesn't look so good the mean score is 13.09 indicating moderate distress which needs counselling. The average score of MEQ suggest that most young adults prefer sleeping near 12:45 am to 1:30am which is detrimental for their mental health health. Furthermore social media usage scores indicate that young adult's social media usage is high, which further has worse effects on mental health and the internal clock.

Table 2

Correlation of Social media usage and mental health among young adults

Variable	**Mental health (N=129)**
Social media usage (N=129)	-0.382**

**. Correlation is significant at the .01 level (2-tailed)

Table 2 summarizes the results of the Pearson's product-moment correlation coefficient analysis examining the association between social media usage and mental health in young adults. The analysis revealed a statistically significant negative correlation **(r = -0.382, p < .01)** between these two variables. This finding indicates that higher scores on the social media usage scale, reflecting greater social media use among participants, were associated with poorer mental health outcomes. This study aligns with a growing body of research on social media's negative impacts on young adult mental health. Reviews by Karim et al. (2020) and Kumar Swain & Pati (2019) found social media use linked to anxiety, depression, and sleep disturbances in adolescents and young adults. Braghieri et al. (2022) further supported this link, suggesting social media might contribute to the recent decline in mental health observed in this age group. The present study adds to this evidence by demonstrating an association between increased social media usage and poorer mental health outcomes in young adults.

Table 3

Mediation analysis of Circadian rhythm on relationship between social media usage and mental health in young adults

		M (circadian rhythm)					**Y (Mental health)**			
Antecedent		*B*	*SE*	*p*	*β*		*B*	*SE*	*p*	*β*
X (Social media usage)	***a***	-2.29	1.53	.137	-.13	***c'***	-5.73	1.04	.000	-.43
M (circadian rhythm)		-	-	-	-	***b***	-.26	.06	.000	-.33
		$\mathbf{R^2}$ = .017					$\mathbf{R^2}$ = .253			
		F(1, 127)= 2.236, *p* < .001					F(2, 126)= 21.324, *p* <.001			

Figure 1 : *The mediation model*

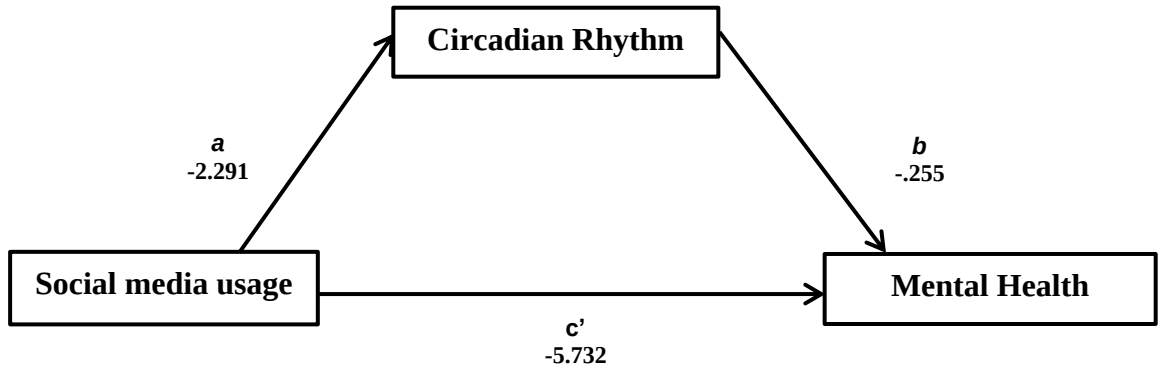

Table 3 showcases the results of mediation analysis using ordinary least squares path analysis (performed by the PROCESS SPSS macro developed by Hayes in 2022) which shows a two-fold negative association: firstly, between social media usage and circadian rhythm, and secondly, between circadian rhythm and mental health. The negative association between social media usage and circadian rhythm suggests that young adults who score higher on the social media usage scale) tend to score lower on the circadian rhythm scale. This translates to a shift towards an evening-type chronotype. As it is observable from table 2 that *b* path is significant as is the *c* path, this indicates that there is a partial mediation occurring. The paths analysis for the mediation model has been shown in figure 1.

DISCUSSION:

This study investigated the potential mediating role of circadian rhythm in the association between social media use and mental health in young adults from Delhi NCR and Haryana. The findings revealed a negative correlation between social media use and mental health, with partial mediation by circadian rhythm. This suggests that social media directly affects mental health, but disrupted sleep patterns caused by late-night social media use further exacerbate the issue. Young adults are particularly susceptible as their circadian rhythms are still maturing. While they might initially feel capable of functioning on reduced sleep, this behavior can quickly become a detrimental habit, increasing vulnerability to mental health problems. Notably, disrupted circadian rhythms and sleep deprivation have been linked to the onset of bipolar disorder, highlighting the potential severity of these combined influences. This study underscores the complex interplay between social media use, sleep patterns, and mental health in young adults. Further research could explore specific social media practices that contribute to circadian rhythm disruption and identify potential interventions to promote healthy sleep habits and social media use in this population. These findings highlight the need for future research to explore potential moderators of this relationship, establish causal direction through longitudinal studies, and incorporate objective measures of circadian rhythm.

CONCLUSIONS:

In conclusion, this study provided evidence for a partially mediated relationship between social media use and mental health in young adults, with circadian rhythm acting as a mediator. The negative association between social media use and mental health highlights potential risks associated with excessive social media engagement. Disrupted sleep patterns caused by late-night social media use further exacerbate this negative influence, particularly for young adults whose circadian rhythms are still developing. The potential for social media use to trigger mental health conditions like bipolar disorder underscores the importance of addressing this issue. Future research should explore specific social media practices that disrupt sleep and develop interventions to promote healthy sleep

habits and responsible social media usage among young adults. This would contribute to a more comprehensive understanding of this complex issue and inform strategies to protect the mental health of this vulnerable population.

REFERENCES:

Arora, V., & Grover, S. (2023). The perception of social mediaamong teenagers and its affects. *International Journal of Scientific Research*, *12*(06). https://doi.org/10.36106/ijsr/7045085

Berger, M. N., Taba, M., Marino, J. L., Lim, M. S. C., & Skinner, S. R. (2022). Social Media Use and Health and Well-being of Lesbian, Gay, Bisexual, Transgender, and Queer Youth: Systematic Review. *Journal of Medical Internet Research*, *24*(9), e38449. https://doi.org/10.2196/38449

Braghieri, L., Levy, R., & Makarin, A. (2022). Social Media and Mental Health. *American Economic Review*, *112*(11), 3660–3693. https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.20211218

Dobb, R., Martial, F., Elijah, D., Storchi, R., Brown, T. M., & Lucas, R. J. (2017). The impact of temporal modulations in irradiance under light adapted conditions on the mouse suprachiasmatic nuclei (SCN). *Scientific Reports*, *7*(1), 10582. https://doi.org/10.1038/s41598-017-11184-2

Dolsen, M. R., Wyatt, J. K., & Harvey, A. G. (2018). Sleep, Circadian Rhythms, and Risk Across Health Domains in Adolescents With an Evening Circadian Preference. *Journal of Clinical Child & Adolescent Psychology*, *48*(3), 480–490. https://doi.org/10.1080/15374416.2017.1416620

Germain, A., & Kupfer, D. J. (2008). Circadian rhythm disturbances in depression. *Human Psychopharmacology: Clinical and Experimental*, *23*(7), 571–585. https://doi.org/10.1002/hup.964

Gnocchi, D., & Bruscalupi, G. (2017). Circadian Rhythms and Hormonal Homeostasis: Pathophysiological Implications. *Biology*, *6*(4), 10. https://doi.org/10.3390/biology6010010

Hale, L., & Guan, S. (2015). Screen time and sleep among school-aged children and adolescents: A systematic literature review. *Sleep Medicine Reviews*, *21*(21), 50–58. https://doi.org/10.1016/j.smrv.2014.07.007

Jagannath, A., Peirson, S. N., & Foster, R. G. (2013). Sleep and circadian rhythm disruption in neuropsychiatric illness. *Science Direct*, *23*(5), 888–894. https://doi.org/10.1016

Karim, F., Oyewande, A., Abdalla, L., Ehsanullah, R., & Khan, S. (2020). Social Media Use and Its Connection to Mental Health: A Systematic Review. *Cureus*, *12*(6). https://doi.org/10.7759/cureus.8627

Kudale, K. M., Kannan, G., Navulla, D., & S, S. (2023, May 1). *Social Media Influences in Sleeping Patterns of Human*. IEEE Xplore. https://doi.org/10.1109/ICDT57929.2023.10151147

Lemola, S., Perkinson-Gloor, N., Brand, S., Dewald-Kaufmann, J. F., & Grob, A. (2014). Adolescents' Electronic Media Use at Night, Sleep Disturbance, and Depressive Symptoms in the Smartphone Age. *Journal of Youth and Adolescence*, *44*(2), 405–418. https://doi.org/10.1007/s10964-014-0176-x

Levenson, J. C., Shensa, A., Sidani, J. E., Colditz, J. B., & Primack, B. A. (2016). The association between social media use and sleep disturbance among young adults. *Preventive Medicine*, *85*(85), 36–41. https://doi.org/10.1016/j.ypmed.2016.01.001

Levenson, J. C., Shensa, A., Sidani, J. E., Colditz, J. B., & Primack, B. A. (2017). Social Media Use Before Bed and Sleep Disturbance Among Young Adults in the United States: A Nationally Representative Study. *Sleep*, *40*(9). https://doi.org/10.1093/sleep/zsx113

Mei, X., Zhou, Q., Li, X., Jing, P., Wang, X., & Hu, Z. (2018). Sleep problems in excessive technology use among adolescent: a systemic review and meta-analysis. *Sleep Science and*

Practice, *2*(1). https://doi.org/10.1186/s41606-018-0028-9

O'Day, E. B., & Heimberg, R. G. (2021). Social media use, social anxiety, and loneliness: A systematic review. *Computers in Human Behavior Reports*, *3*(100070). https://doi.org/10.1016/j.chbr.2021.100070

Panda, S. (2016). Circadian physiology of metabolism. *Science*, *354*(6315), 1008–1015. https://doi.org/10.1126/science.aah4967

Scott, H., Biello, S. M., & Woods, H. C. (2019). Social media use and adolescent sleep patterns: cross-sectional findings from the UK millennium cohort study. *BMJ Open*, *9*(9), 1–9. https://doi.org/10.1136/bmjopen-2019-031161

Scott, H., & Woods, H. C. (2019). Understanding Links Between Social Media Use, Sleep and Mental Health: Recent Progress and Current Challenges. *Current Sleep Medicine Reports*, *5*(3), 141–149. https://doi.org/10.1007/s40675-019-00148-9

Touitou, Y., Touitou, D., & Reinberg, A. (2016). Disruption of adolescents' circadian clock: The vicious circle of media use, exposure to light at night, sleep loss and risk behaviors. *Journal of Physiology-Paris*, *110*(4), 467–479. https://doi.org/10.1016/j.jphysparis.2017.05.001

Vitaterna, M. H., Takahashi, J. S., & Turek, F. W. (2001). Overview of Circadian Rhythms. *Alcohol Research & Health*, *25*(2), 85–93. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6707128/

Vogels, E. A., Gelles-Watnick, R., & Massarat, N. (2022). *Teens, Social Media and Technology 2022*. Pew Research Center. https://www.pewresearch.org/internet/2022/08/10/teens-social-media-and-technology-2022/

Walker, W. H., Walton, J. C., DeVries, A. C., & Nelson, R. J. (2020). Circadian rhythm disruption and mental health. *Translational Psychiatry*, *10*(1). https://doi.org/10.1038/s41398-020-0694-0

Wong, H. Y., Mo, H. Y., Potenza, M. N., Chan, M. N. M., Lau, W. M., Chui, T. K., Pakpour, A. H., & Lin, C.-Y. (2020). Relationships between Severity of Internet Gaming Disorder, Severity of Problematic Social Media Use, Sleep Quality and Psychological Distress. *International Journal of Environmental Research and Public Health*, *17*(6), 1879. https://doi.org/10.3390/ijerph17061879

Wulff, K., Dijk, D.-J., Middleton, B., Foster, R. G., & Joyce, E. M. (2012). Sleep and circadian rhythm disruption in schizophrenia. *British Journal of Psychiatry*, *200*(4), 308–316. https://doi.org/10.1192/bjp.bp.111.096321