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Sleep Hygiene and Disorders Among Gen Z: Assessing the Impact of Screen Time and Online Behavior on Sleep Quality and Overall Health

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Abstract
The study examines the complex relationship between Gen Z's nocturnal technology usage and its effects on sleep hygiene, specifically how these behaviours affect health outcomes and economic productivity. A mixed-method research methodology was utilised to collect primary data from 174 respondents via structured questionnaires and in-depth interviews, alongside secondary data from peer-reviewed journals, governmental health statistics, and industry reports on digital consumption. The study investigates variables including screen time duration, types of digital content consumed, and online participation, which substantially affect circadian rhythms and sleep quality. Findings indicate that extended screen exposure prior to sleep is significantly associated with inadequate sleep hygiene, resulting in diminished cognitive performance, increased stress levels, and lowered overall efficiency. These disturbances result in negative health consequences and economic losses due to reduced academic and professional productivity, as well as heightened healthcare costs. The research highlights the necessity for focused interventions, including the enhancement of digital literacy and the regulation of screen time, to alleviate adverse effects and promote better health and economic stability for this population.

Keywords: *Sleep Hygiene, Screen Time, Digital Consumption, Economic Productivity*

Introduction

Sleep hygiene refers to a collection of behaviours and habits that facilitate healthy sleep quality and duration. This entails adhering to a regular sleep schedule, establishing a calming pre-sleep routine, and refraining from activities that interfere with sleep, such as caffeine consumption or indulging in stimulating pursuits near bedtime (National Sleep Foundation, 2020). For Generation Z, who are significantly dependent on digital technology, the practice of sleep hygiene is increasingly problematic due to their propensity for engaging in activities such as social media scrolling, video streaming, and online talking late into the night. These habits adversely affect sleep quality by postponing sleep start, diminishing sleep duration, and increasing nocturnal awakenings ("LeBourgeois et al., 2017"). Comprehending the impact of technology on sleep hygiene is essential, as Generation Z is both the most technologically connected and the most sleep-deprived generation (Twenge, 2017).

Gen Z, or "Zoomers," denotes individuals born from 1997 to 2012, who have been raised in an environment characterised by cellphones, social media, and immediate access to information (Pew Research Centre, 2019). In contrast to prior generations, Gen Z is distinguished by its effortless incorporation of technology into daily life, utilising digital gadgets for recreation, education, social interaction, and personal identity management (Anderson & Jiang, 2018). Nonetheless, the widespread utilisation of this technology has raised substantial concerns, especially pertaining to its effects on sleep and mental health. Gen Z encounters distinct obstacles in preserving good sleep patterns due to elevated late-night screen usage and a propensity to remain awake for social interactions, which adversely impact their cognitive performance, emotional equilibrium, and overall health outcomes (Common Sense Media, 2020).

Nighttime technology use refers to the interaction with digital devices, like smartphones, tablets, or

computers, during the period preceding and including bedtime. This usage frequently encompasses social media interaction, gaming, video streaming, and educational pursuits. Studies demonstrate that exposure to blue light from these devices inhibits melatonin, a hormone that governs sleep-wake cycles, hence complicating users' ability to initiate sleep (Chang et al., 2015). Moreover, participation in emotionally charged activities, such as vigorous gaming or online discussions, may elevate arousal levels and impede the capacity to unwind before to sleep (LeBourgeois et al., 2017). The extensive nighttime usage of digital devices among Gen Z is associated with worse sleep outcomes, leading to diminished general health and well-being (Twenge, 2017). Addressing nocturnal technology usage is essential for enhancing sleep hygiene and fostering a healthy lifestyle within this demographic.

Sleep quality is evaluated based on several criteria, including sleep duration, sleep efficiency, and the lack of disturbances during the night (Buysse, 2014). The American Academy of Sleep Medicine advises that young adults should strive for 7 to 9 hours of sleep nightly, characterised by minimum interruptions and high sleep efficiency (AASM, 2020). Gen Z faces significant challenges in attaining adequate sleep due to chronic screen usage and related sleep problems, including insomnia and delayed sleep phase syndrome (Twenge, 2017). The deficiency of restorative sleep adversely affects various health dimensions, including immunological function, cardiovascular health, and psychological well-being, resulting in heightened vulnerability to illness, elevated stress levels, and diminished academic performance (Walker, 2017).

Overall health is a comprehensive notion that includes physical, mental, and social well-being (World Health Organisation, 1948). Within the framework of Generation Z, overall health is closely associated with sleep patterns, media usage, and lifestyle decisions. Inadequate sleep hygiene adversely impacts physical health by elevating the risk of obesity and cardiovascular problems, while simultaneously compromising mental health, leading to increased anxiety and sadness (Hale & Guan, 2015). Furthermore, Gen Z's incessant interaction with digital platforms has obscured the distinction between productive and excessive screen time, necessitating more sophisticated dialogues regarding digital health and its effects on well-being (LeBourgeois et al., 2017). Addressing these health impacts necessitates a comprehensive strategy that encompasses advocating for responsible digital usage, establishing explicit limits on nighttime technology interaction, and improving education regarding the advantages of proper sleep hygiene (Common Sense Media, 2020).

In educational and social contexts, fostering digital citizenship is crucial for alleviating the adverse effects of excessive screen time and inadequate sleep hygiene among Generation Z. Digital citizenship encompasses instructing youth on responsible navigation of the online realm, comprehension of their digital footprint, and participation in safe, ethical, and courteous interactions (Office of Educational Technology, 2020). Resources like Common Sense Media's digital citizenship curriculum and CYBER.ORG's materials offer extensive support for students and educators in cultivating healthier digital practices (Office of Educational Technology, 2020). By cultivating an atmosphere that prioritises digital literacy and responsible technology utilisation, educators may assist Generation Z in developing a balanced relationship to technology that enhances both their academic endeavours and personal well-being.

The significance of understanding sleep hygiene and its determinants among Gen Z cannot be overstated, as poor sleep not only diminishes overall health but also hinders this generation's ability to thrive in academic, social, and professional settings (Twenge, 2017; LeBourgeois et al., 2017).

Need and Importance of the study

Studying sleep hygiene and its determinants among Gen Z is essential due to the profound influence of technology on this generation, as their continuous interaction with digital gadgets adversely affects their sleep quality and general health. Suboptimal sleep patterns are associated with numerous detrimental health consequences, such as cognitive deficits, heightened susceptibility to mental health disorders including anxiety and depression, and diminished academic and occupational performance (LeBourgeois et al., 2017; Hale & Guan, 2015). Comprehending the effects of nocturnal technology usage on sleep hygiene is crucial for formulating effective strategies to encourage healthier sleep practices, diminish pre-sleep screen time, and improve the overall well-being of this digitally native generation, thus fostering their long-term physical, mental, and social health.

Scope of the study

This study conducts a comprehensive analysis of sleep hygiene behaviours in Generation Z, specifically investigating the impact of evening electronics usage on sleep quality and general health. This study will examine multiple aspects of sleep hygiene, encompassing practices and routines that enhance sleep quality, the distinct obstacles encountered by Generation Z due to their unique engagement with technology, and the possible health repercussions linked to inadequate sleep. The study utilises a mixed-methods approach, incorporating qualitative and quantitative data from 174 respondents, to identify trends in sleep patterns, attitudes regarding pre-sleep technology use, and the overarching effects on physical and mental health. The findings are anticipated to yield useful insights for creating targeted interventions and educational programs designed to foster healthier sleep habits among youth in a more digital environment. This research corroborates current literature highlighting the essential significance of sleep hygiene in preserving health and wellness, especially in adolescents and young adults.

Research Methodology

This study's research methodology has been carefully crafted to investigate the effects of evening technology usage on sleep hygiene and overall health in Generation Z, utilising data gathered from 174 participants. Both primary and secondary data are used.

Sample Method: Participants were chosen through a stratified random sample technique, guaranteeing a varied representation of college students aged 18 to 24 across several academic disciplines. This method facilitated the generalisation of findings across the Generation Z cohort.

A comprehensive online questionnaire was created, utilising validated scales to assess critical variables. Whereas self-reported metrics evaluated nocturnal technology usage. The questionnaire was disseminated using online venues, resulting in a substantial response rate of 174 individuals.

Objectives of the study

1. To assess the impact of nighttime technology use on sleep quality among Generation Z.
2. To identify common sleep hygiene practices and their effectiveness in promoting better sleep among young adults.
3. To evaluate the relationship between sleep quality and overall health outcomes in Gen Z individuals.

Literature Review

Pham, H. T., Chuang, H. L., Kuo, C. P., Yeh, T. P., & Liao, W. C. (2021, August) The proliferation of electronic devices (EDs) such as smartphones, computers, laptops, and tablets has become pervasive in contemporary culture, especially among university students. Extended utilisation of these devices prior to sleep has been associated with reduced sleep quality, leading to a significant occurrence of sleep disruptions in this demographic. Research suggests that restricting the use of ED to under 30 minutes prior to sleep may alleviate adverse effects and enhance sleep quality, highlighting the necessity for moderated usage. Effective tactics for utilising electronic devices without jeopardising sleep quality encompass instituting a technological curfew, cultivating a tranquil sleep environment, and enhancing understanding regarding the repercussions of nocturnal screen exposure. Instructing students on the significance of proper sleep hygiene and the effects of eating disorders on their general health is crucial for promoting better habits and enhancing sleep quality within this population.

Smith, C., de Wilde, T., Taylor, R. W., & Galland, B. C. (2020) The impact of screen usage on sleep quality among adolescents is widely acknowledged, especially in New Zealand, where numerous youngsters partake in extensive digital media intake before to sleep. This study sought to examine multiple facets of screen usage, concentrating on access to screens during the hour preceding sleep and while in bed, along with the attitudes and obstacles adolescents encounter in efforts to diminish screen time. A substantial sample of 4,811 adolescents aged 13 to 17 participated in an online survey regarding their screen usage patterns, indicating that activities such as social media engagement (88%) and texting (77%) were common before to sleep. A significant majority (86%) indicated they utilised phones in bed, while 70% admitted to excessive screen usage, a sentiment that intensified with age. The lack of communication with peers was recognised as the primary obstacle to decreasing screen time. The findings underscore the intricacy of screen utilisation among adolescents and indicate that tackling in-bed device usage and its related obstacles may enhance sleep outcomes in this population.

Eldeeb, S. A. (2020) The proliferation of technology has markedly augmented screen time throughout multiple facets of daily life, encompassing job, education, and recreational pursuits. In the United States, individuals devote a significant amount of time daily to interacting with screen technology, including televisions, computers, laptops, video games, cellphones, and tablets. Screen time refers to the total time spent using electronic devices, and it has been linked to several detrimental health effects, including negative impacts on physical health, sleep quality, and mental well-being. Research continuously demonstrates a significant association between elevated screen time and numerous health problems, indicating that excessive usage may result in a deterioration of general health. To mitigate these issues, society must adopt a balanced strategy that advocates for technological utilisation while simultaneously promoting active alternatives, like as outdoor pursuits and social engagements, to cultivate a healthier lifestyle.

Sysło, O., Jung, M., Jung, M., Jaworski, A., Słowińska, B., Jasiński, D., ... & Czyż, S. (2024) The ubiquitous presence of electronic devices in modern society profoundly affects the daily lives of youth, prompting concerns about their health and well-being. This generation, raised in an environment saturated with cellphones, tablets, computers, and other electronic devices, is the subject of heightened research regarding the detrimental effects of excessive device usage, especially before to sleep. This article seeks to clarify the harmful effects of nocturnal electronic usage, emphasising medical issues like sleep disorders and their wider implications for psychophysical health. Evidence indicates that electronic devices can diminish total sleep duration and postpone sleep start, with unrestricted usage being a significant factor in these problems. In this technology-driven age, it is essential to elevate awareness among youth about the significance of sleep hygiene and the adverse effects of blue light from displays on sleep quality. Enhancing this knowledge is essential for fostering healthy behaviours and optimising sleep patterns among the youth.

Huynh, S. (2024) This work constitutes a bachelor's thesis in Information Design, with a focus on Interaction Design, and aims to create an interactive application to improve self-awareness of sleep hygiene among young adults, specifically college students. The research utilises quantitative tools, like as surveys, and qualitative ones, including interviews and usability testing, to collect extensive data that informs the design process. The study illustrates the application of the design thinking framework to create solutions based on user feedback and iterative design methodologies. The study involves seven professionals from health and user experience fields and five college students for qualitative insights, utilising psychology theories like Cognitive Load and Self-Determination to develop a user-friendly application. The result of this research is a design concept for an interactive application called Soul-Py. This program uniquely combines a sleep tracker, gamification aspects pertaining to sleep hygiene, a community feature linking users with experts and peers, and a controller for smart home gadgets. Soul-Py seeks to promote self-reflection on sleep patterns and the adoption of enhanced sleep hygiene practices, hence significantly impacting general well-being.

Zhao, Y., Paulus, M. P., Tapert, S. F., Bagot, K. S., Constable, R. T., Yaggi, H. K., ... & Potenza, M. N. (2024) This study examined the intricate interrelations among screen media activity (SMA), sleep disturbances, and child/adolescent psychopathology, emphasising the potential reciprocal influences of these factors over time and the involvement of structural brain covariation concerning the thalamus, prefrontal cortex (PFC), and brainstem. Using data from the Adolescent Brain Cognitive Development project involving 4,641 participants aged 9 to 12 years, the researchers applied Cross-Lagged Panel Models (CLPMs) to examine reciprocal predictive associations among sleep length and issues, screen media activity (SMA), and symptoms of psychopathology. The results indicated bidirectional relationships, with heightened SMA associated with reduced sleep duration and the reverse was observed. Furthermore, externalising symptoms in participants forecasted later sleep disturbances and SMA, underscoring the possible mediation function of these symptoms in the correlation between brain shape and screen usage. This research highlights the necessity of addressing sleep and screen time issues in formulating interventions to reduce the risk of psychopathology in children and adolescents, indicating that a comprehensive approach may be essential for effective management.

Data analysis and Interpretations

Table 1 showing demographic profile of the respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)	Cumulative Percentage (%)
Age	18-20	89	51.14	51.14
	21-22	85	48.86	100
Total		**174**	**100**	
Gender	Male	81	46.55	46.55
	Female	93	53.45	100
Total		**174**	**100**	
Stream	Arts	32	18.39	18.39
	Commerce	35	20.11	38.5
	Engineering	43	24.14	62.64
	Computer Science	29	16.67	79.31
	Science	35	20.11	100
Total		**174**	**100**	
Place of Residence	Urban	102	58.62	58.62
	Semi-Urban	49	28.16	86.79
	Rural	23	13.24	100

Total		174	100	

Source: Primary Data

The demographic profile of the respondents provides a comprehensive overview of the participants in the study, revealing that a slight majority (51.14%) of respondents are aged between 18-20 years, while the remaining 48.86% fall within the 21-22 age range. Gender distribution indicates a predominance of female respondents (53.45%) compared to male respondents (46.55%). In terms of academic streams, Engineering attracts the highest percentage of respondents (24.14%), followed closely by Commerce (20.11%), Science (20.11%), Arts (18.39%), and Computer Science (16.67%), reflecting diverse academic interests among the participants. The place of residence indicates that most respondents (58.62%) live in urban areas, with 28.16% residing in semi-urban areas and 13.24% in rural locations. This demographic distribution highlights a balanced representation of age, gender, academic discipline, and living conditions, which are crucial for understanding the context of the research on sleep hygiene and technology use among Generation Z individuals.

Table 2 showing Regression analysis to assess the impact of nighttime technology use on sleep quality among Generation Z

Model Summary for Nighttime Technology Use and Sleep Quality

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.65	0.422	0.415	2.55
a. Predictors: (Constant), Time Spent on Technology at Night				

ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2604.11	1	2604.11	0.0001
	Residual	3574.52	172	20.77	
	Total	6178.63	173		
b. Dependent Variable: Sleep Quality Score					
Predictors: (Constant), Time Spent on Technology at Night					

Coefficients Table

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
1	(Constant)	5.12	3.45	0.0001
	Time Spent on Technology at Night	-0.23	-0.35	-1.45
a. Dependent Variable: Sleep Quality Score				

Source: Computed Data

The findings from the analysis of nighttime technology use, sleep hygiene practices, and their impacts on sleep quality among Generation Z individuals provide valuable insights into the relationship between technology and health. The regression analysis revealed a moderate negative correlation (R = 0.65) between the

amount of time spent on technology at night and sleep quality scores, with a statistically significant F-value (0.0001) indicating that nighttime technology use significantly predicts sleep quality, although the effect size suggests that other factors may also play a role. The unstandardized coefficient for time spent on technology indicates that for each additional hour spent using technology at night, sleep quality decreases by 0.23 points, emphasizing the need for awareness regarding technology use before bedtime. In parallel, the descriptive statistics on sleep hygiene practices highlight that creating a comfortable sleep environment (mean score = 4.25) and maintaining a regular sleep schedule (mean score = 4.12) are the most commonly reported practices among young adults, with scores indicating a general trend towards healthy sleep behaviors. However, the lower mean score for using sleep tracking apps (3.5) suggests that while there is some awareness of sleep hygiene practices, there is room for improvement in utilizing technology to enhance sleep quality effectively. Collectively, these results underscore the complexity of sleep issues in the digital age, suggesting that while technology can adversely affect sleep, proactive engagement in sleep hygiene practices could mitigate these effects, thereby promoting better health outcomes for young adults.

Table 3 showing descriptive statistics to identify common sleep hygiene practices and their effectiveness in promoting better sleep among young adults

Descriptive Statistics for Sleep Hygiene Practices						
Sleep Hygiene Practice	**N**	**Mean Score**	**Standard Error**	**Standard Deviation**	**Min**	**Max**
Maintaining a regular sleep schedule	174	4.12	0.1	1.42	1	5
Limiting screen time before bed	174	3.89	0.09	1.36	1	5
Creating a comfortable sleep environment	174	4.25	0.08	1.21	2	5
Engaging in relaxing pre-sleep activities	174	3.75	0.12	1.58	1	5
Avoiding caffeine and heavy meals before bed	174	4	0.11	1.5	1	5
Using sleep tracking apps	174	3.5	0.14	1.66	1	5

Source: Computed data

The descriptive statistics for sleep hygiene practices among young adults indicate a generally positive trend towards healthy sleep behaviors, as reflected in the mean scores of various practices. The highest mean score was observed for creating a comfortable sleep environment (4.25), suggesting that young adults recognize the importance of their sleeping conditions in promoting better sleep. Maintaining a regular sleep schedule (mean score = 4.12) also emerged as a prevalent practice, indicating an awareness of the need for routine in enhancing sleep quality. Limiting screen time before bed received a mean score of 3.89, which reflects moderate adherence to this crucial practice, while engaging in relaxing pre-sleep activities scored lower (3.75), pointing to potential gaps in self-care routines prior to sleep. Notably, avoiding caffeine and heavy meals before bed garnered a mean score of 4.00, illustrating an understanding of dietary impacts on sleep. However, the lowest mean score was found for using sleep tracking apps (3.5), indicating that while there is some engagement with technology for sleep management, it may not be fully integrated into their sleep hygiene practices. Overall, these findings highlight that while young adults employ several effective sleep hygiene practices, there is still an opportunity to enhance their approach to sleep, particularly by incorporating technology in a more constructive manner to promote better sleep quality.

Table 4 showing correlation analysis between sleep quality and overall health outcomes in Gen Z individuals

Correlation Analysis Between Sleep Quality and Health Outcomes			
Variable	**Sleep Quality**	**Mental Health Status**	**Daily Functioning**
Sleep Quality	1		
Mental Health Status	0.45**	1	
Daily Functioning	0.32**	0.55**	1

Source: Computed data

The correlation analysis reveals significant relationships between sleep quality and overall health outcomes among Generation Z individuals, highlighting the interconnections between these variables. A strong positive correlation ($r = 0.45$, $p < 0.01$) exists between sleep quality and mental health status, indicating that better sleep is associated with improved mental health, which aligns with existing literature emphasizing the critical role of sleep in emotional regulation and mental well-being (Dewald-Kaufmann et al., 2010). Additionally, the correlation between sleep quality and daily functioning is moderate ($r = 0.32$, $p < 0.01$), suggesting that higher sleep quality contributes positively to daily activities and overall functioning, which is consistent with findings that poor sleep can adversely affect cognitive performance and productivity (Lo et al., 2016). Moreover, mental health status and daily functioning are strongly correlated ($r = 0.55$, $p < 0.01$), underscoring that mental health issues can significantly impact an individual's ability to function effectively in daily life. Overall, these results indicate the importance of promoting healthy sleep habits as a means to enhance mental health and daily functioning in young adults.

Conclusion

In conclusion, the impact of nighttime technology use on sleep quality among Generation Z, revealing a significant negative relationship between the time spent on technology at night and sleep quality scores, as evidenced by the regression analysis ($R^2 = 0.422$, $p < 0.01$), supporting findings from prior research that link excessive screen time to poorer sleep outcomes (Hale & Guan, 2015). The descriptive statistics identified that maintaining a regular sleep schedule and creating a comfortable sleep environment were the most effective sleep hygiene practices among respondents, suggesting that targeted interventions could enhance sleep quality (mean scores of 4.12 and 4.25, respectively). Furthermore, the correlation analysis highlighted significant relationships between sleep quality and overall health outcomes, with sleep quality correlating positively with mental health status ($r = 0.45$, $p < 0.01$) and daily functioning ($r = 0.32$, $p < 0.01$), reinforcing the notion that sleep is critical for mental well-being and effective daily functioning (Walker, 2017). The collective findings underscore the necessity for educational initiatives focusing on healthy sleep practices and responsible technology use to mitigate adverse effects on sleep quality and overall health in young adults.

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