How Does Sleep Quality Impact Daily Cognitive Functioning

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ABSTRACT: The relationship between sleep quality and cognitive function is a critical area of research in health and behavioral sciences, with direct implications for individual wellbeing and societal efficiency. This study investigates how variations in sleep quality influence daily cognitive performance, particularly in areas such as attention, memory, processing speed, and emotional regulation. Employing a mixed-methods approach, the research integrates self-reported sleep assessments, standardized cognitive performance tests, and physiological data collected via wearable monitoring devices. The findings indicate that poor sleep quality is consistently linked to diminished cognitive abilities, including reduced attention span, impaired memory consolidation, and increased emotional instability. Additionally, both intrinsic factors (such as age, health status, and circadian rhythms) and extrinsic factors (including noise exposure, artificial lighting, and screen time) significantly impact sleep patterns. This study emphasizes the urgency of implementing effective interventions—ranging from sleep hygiene practices to mindfulness techniques—to enhance sleep quality. The results underline the importance of public education and policy support in addressing widespread sleep disturbances and their long-term cognitive consequences. Ultimately, this research contributes to the growing evidence that prioritizing healthy sleep is essential for cognitive resilience and overall quality of life in today's fast-paced environment.

KEYWORDS: Sleep quality and cognitive performance, Sleep deprivation effects, Cognitive functioning and productivity, Sleep architecture (REM, non-REM stages), Memory consolidation and attention regulation and Emotional stability and sleep disturbances

CHAPTER 01: **INTRODUCTION**: Sleep is an essential biological process that occupies approximately one-third of human life, underscoring its fundamental importance for survival and well-being. In addition to the purpose of recovering your body, sleep is an essential part of maintaining optimal brain function. Proper and high-quality sleep creates cognitive processes such as memory integration, problem solving, and decision-making, and is essential for emotional regulation and physical health. In contrast, lack of sleep or poor sleep quality interferes with these processes and affects productivity, creativity, and intellectual clarity. Over time, chronic sleep problems can lead to serious consequences such as mental disorders, cardiovascular disease, and poor quality of life. In a modern era characterized by relentless schedules, technology-induced disruptions, and elevated stress levels, understanding the interplay between sleep and cognitive functioning has become a critical area of research.

CHAPTER 02: LITERATURE REVIEW

1995	Dinges	This study says that inadequate sleep has been shown to cause discomfort and impair performance. These findings demonstrate the necessity of sleep for cognitive functions.
2003	Van Dongen et al.	Long half-life sleep was observed to lead to cognitive deficits, particularly in attention and working memory. The slower recovery after severe depression suggests that long sleep has an important impact on psychological functioning.
2006	Grandner et al.	This study says that Sleep measures (e.g. PSQI) often correlate well with objective tests (e.g. actigraphy), particularly in the elderly. This discrepancy has been attributed to differences in methodology, with instruments based on self-reported feedback and instruments intended to provide immediate information.
2007	Banks and Dinges	This study says that it noted the physical consequences of sleep restriction, such as impaired physical activity and health risks. These findings highlight the importance of adequate sleep for overall health and safety.
2010	Reid et al.	This study says that Physical activity can improve sleep quality, mood, and daytime functioning in frail older adults. The study found that regular exercise can reduce sleep onset latency, improve sleep quality, and extend total sleep time in this population.
2010	Annie Bernier	The study explores the interplay between parenting, children's temperament, and their long -term development. It emphasizes how early experiences and family dynamics shape emotional regulation, social skills, and academic success. Variations in parental responses and children's temperament are shown to influence developmental trajectories. The findings highlight the importance of fostering supportive environments to promote resilience and adaptability in children. Further research is encouraged to refine interventions and policies for child well-being.
2012	Karina Stavitsky	Studies relating sleep to cognition in healthy individuals have indicated that sleep quality may affect memory and executive function. In healthy young adults, sleep has been implicated in memory consolidation. Sleep disturbances and cognitive deficits are both prevalent in Parkinson’s disease (PD). Sleep problems occur in over 75% of patients, with sleep fragmentation and decreased sleep efficiency being the most common.

2013	S Miyata, A Noda, K Iwamoto	The underlying mechanisms of the study which sleep quality influence's cognitive function are still not fully understood. Research could investigate specific pathways, such as how sleep affects brain plasticity, neural connectivity, or the consolidation of memory
2014	M Muehlhan, M Marxen, J Landsiedel	The study identifies the relationship between sleep quality and cognitive function is well established, the precise neurobiological mechanisms remain underexplored. There is a need for studies that investigate how sleep affects brain structures like the hippocampus, prefrontal cortex, and other areas critical for memory and executive function. Research could also explore the role of sleep in processes like memory consolidation, synaptic plasticity, and neural connectivity.
2015	Hadlington	A significant positive association between mobile phone use and daily cognitive failures was found, suggesting that frequent technology use may disrupt cognitive control processes and contribute to everyday errors.
2019	Mairesse et al.	Impairments in sleep quality and quantity during long -term isolation have been consistently reported, with poor sleep outcomes linked to perceived social isolation and adverse effects on central nervous system function, neurotrophic factors, and cortical activation.
2021	E Fonseca, DMC Blanco	The study of Sleep disturbances and cognitive functions are twice as common in patients with epilepsy (PWE) as in healthy individuals. Excessive daytime sleepiness is the most common symptom in PWE and may be caused by multiple factors.
2022	Paula Alhola, Päivi Polo - Kantola	The study indicates Adequate, and quality sleep is essential for optimal cognitive performance. Insufficient sleep impairs memory, attention, learning, and problem -solving abilities. Continued research into sleep's effects on cognition can provide deeper insights into mitigating cognitive decline, enhancing mental performance, and improving overall well - being.

CHAPTER 03: RESEARCH METHODOLOGY: This research adopts a mixed-methods design, integrating both quantitative analysis and qualitative inquiry to explore the relationship between sleep quality and cognitive performance, along with individuals' perceptions and mindfulness regarding their sleep habits. The quantitative component involves a structured survey targeting a sample size of approximately 100 participants, selected to ensure a representative distribution across key demographic variables such as age, life stage, and occupational background. Complementing this, the qualitative phase consists of 10 to 15 semi-structured interviews conducted with participants drawn from similar demographic profiles. This dual approach allows for a comprehensive understanding of the interplay between sleep quality and cognitive function while capturing subjective experiences and attitudes toward sleep in a real-world context.

RESEARCH OBJECTIVES

- Identify the relationship between quality sleep and cognitive skills such as memory, attention, and problem-solving.
- Discover the challenges people are looking for themselves in managing sleep quality and their impact on perception.
- Research strategies and interventions to improve sleep quality and reduce the negative effects on cognitive performance.

RESEARCH GAPS

1. Long-Term and Causal Research: - Long-term and causal studies are needed to understand the long-term effects of sleep deprivation on perception.
2. Objective and Standardized Measures: - Reliance on self-report and non-standardized assessment tools requires the development of objective measures such as performance and cognitive standards.
3. Underexplored Cognitive Domains and Mechanisms: - Research should focus on higher level cognitive processes and examine the neurobiological mechanisms that link sleep quality to cognitive function.
4. Cultural, Demographic, and Environmental Factors: - Further investigation of cultural, health, and environmental influences on sleep and cognition is needed to ensure that the findings are generalized to different cultures.
5. Interventions and Recovery: Further research is needed for the effectiveness of interventions to improve sleep and cognitive recovery, particularly in real-world settings

NEED OF THE STUDY: This study responds to the growing necessity of understanding the relationship between sleep quality and cognitive performance, particularly in light of the rising incidence of sleep disturbances linked to modern lifestyles. Sleep is a vital biological process that supports essential cognitive functions such as memory retention, attention regulation, problem-solving, and decision-making—capacities that underpin daily functioning. Declining sleep quality has been consistently associated with reduced academic and occupational productivity, cognitive impairments, and adverse mental health outcomes. Despite these effects, sleep continues to be undervalued by much of the population, highlighting the need for research that provides evidence-based insights into its role in cognitive wellbeing. This investigation focuses on key dimensions of sleep, including its duration, depth, and continuity, to evaluate their influence on cognitive domains. By raising awareness of the cognitive risks associated with poor sleep, the study seeks to promote healthier sleep habits. The findings have practical implications for healthcare professionals, educators, and employers, offering guidance on addressing sleep-related challenges to enhance cognitive efficiency and overall wellbeing. Additionally, the study provides a foundation for policy development aimed at improving sleep hygiene through targeted interventions in community, educational, and occupational settings. In doing so, it contributes to closing significant gaps in existing literature.

SCOPE OF STUDY: This study incorporates a range of sleep-related metrics, including average sleep duration, self-assessed sleep quality ratings (ranging from "Very Poor" to "Very Good"), and patterns of sleep disturbances. Cognitive performance is measured using either standardized assessments or validated self-report instruments, focusing specifically on domains such as problem-solving ability, memory recall, sustained attention, and reaction time. The analysis primarily investigates the short-term cognitive impacts of contemporary sleep patterns, typically assessing sleep behavior over the preceding month. To maintain the validity and clarity of the findings, individuals with diagnosed cognitive impairments or a medical history of sleep-related disorders—such as obstructive sleep apnea or chronic insomnia—are excluded from the participant pool. Although external variables such as psychological stress, dietary habits, and physical activity are recognized as potential influencers of both sleep and cognitive function, they are controlled for and acknowledged as secondary considerations rather than focal points of the research.

CHAPTER 04 : DATA ANALYSIS AND FINDINGS INTRODUCTION

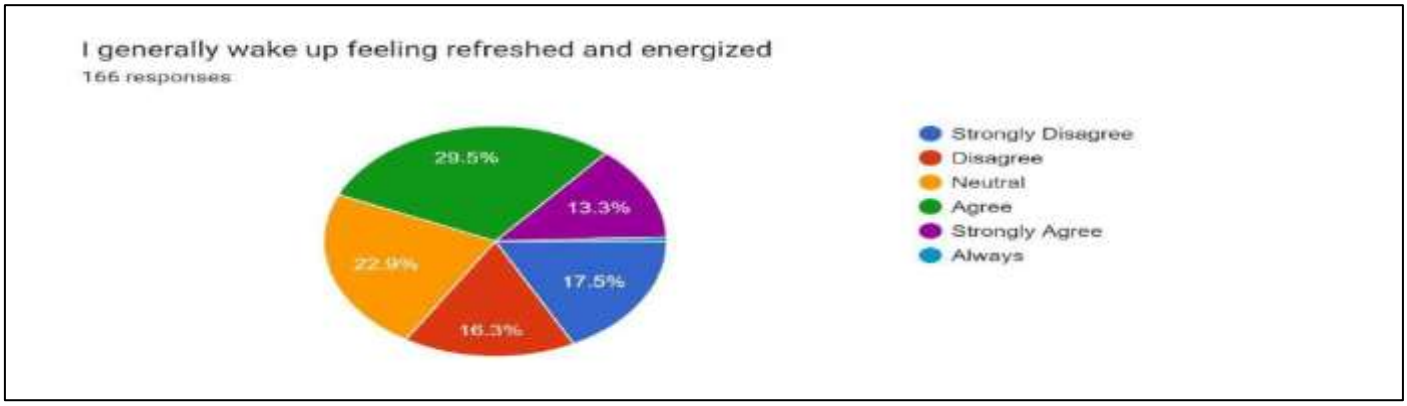

Fig. No. 4.1

INTERPRETATION: The responses to the statement "I generally wake up feeling refreshed and energized" indicate a concerning trend in perceived sleep quality among participants. A majority of 52.8%—including 29.5% who disagreed and 23.3% who strongly disagreed—reported not feeling refreshed upon waking, reflecting widespread dissatisfaction with their sleep experience. In contrast, only 33.8% of respondents expressed a neutral to positive sentiment, with few consistently feeling energized in the morning. This disparity underscores a potential gap in healthy sleep practices and highlights the need for targeted interventions aimed at improving sleep hygiene, lifestyle factors, or addressing underlying health concerns that may be contributing to poor sleep outcomes.

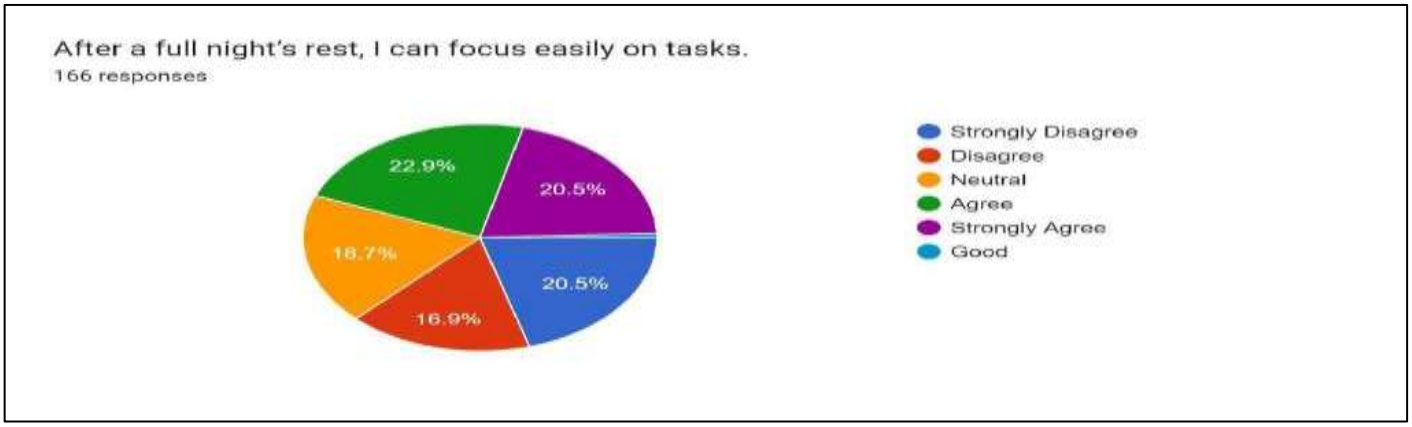

Fig. No. 4.2

INTERPRETATION: The responses to the statement "After a full night's rest, I can focus easily on tasks" reveal significant variability in how sleep impacts cognitive performance. A considerable proportion of participants, 41.6%, disagreed or strongly disagreed, with 22.9% and 18.7% reporting difficulty focusing despite a full night's rest. This suggests that factors such as poor sleep depth or underlying issues like stress may be affecting their ability to concentrate. In contrast, 41% of respondents agreed or strongly agreed, indicating that nearly half of the participants experience improved focus following adequate sleep. This highlights the diversity in how rest influences daytime productivity, emphasizing the need for personalized approaches to sleep improvement.

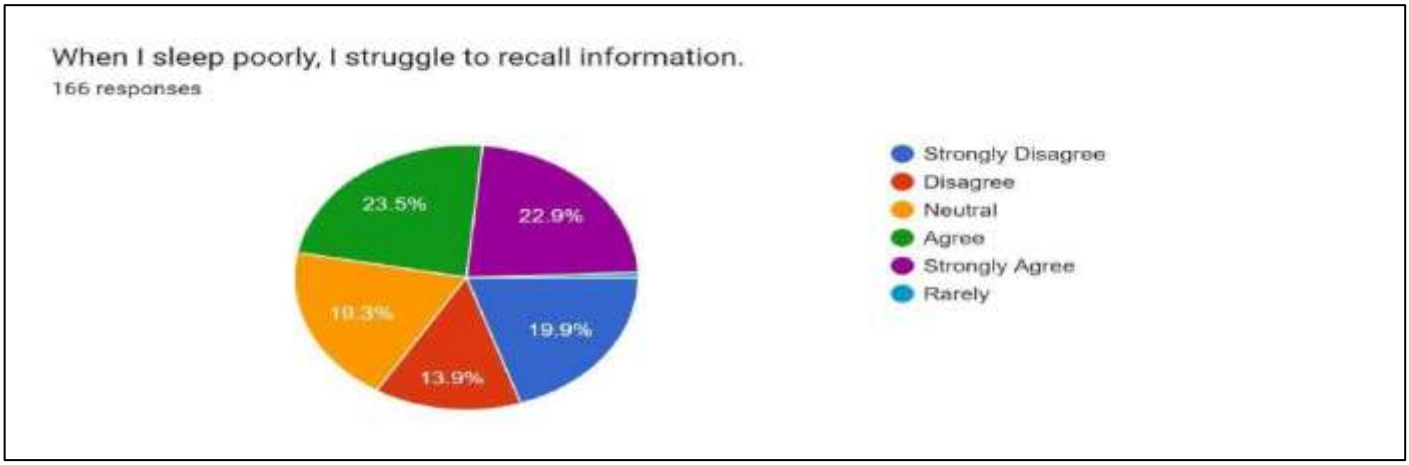

Fig. No. 4.3

INTERPRETATION: The responses to the statement "When I sleep poorly, I struggle to recall information" demonstrate varying levels of awareness regarding the impact of sleep on memory. Nearly half of the participants, 46.4%, disagreed or strongly disagreed with the statement, suggesting that a significant portion of individuals either does not associate poor sleep with memory problems or has developed resilience or adaptation to the effects of inadequate rest. In contrast, 33.8% agreed or strongly agreed, with 19.3% and 19.9% reporting notable memory difficulties, aligning with existing research that highlights the role of sleep in memory consolidation. Additionally, 13.9% of respondents remained neutral, indicating some uncertainty or lack of clarity about the relationship between sleep and memory in this subset of participants.

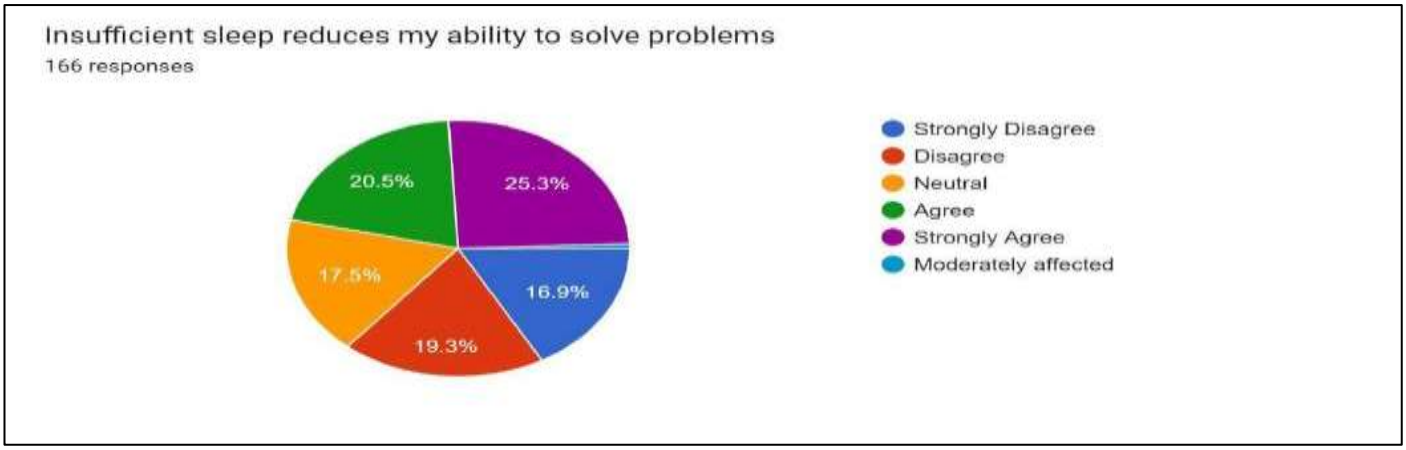

Fig. No. 4.4

INTERPRETATION: The responses to the statement "Insufficient sleep reduces my ability to solve problems" reveal a divided perception of sleep's impact on problem-solving abilities. A substantial portion, 45.8%, disagreed or strongly disagreed, with 20.5% and 25.3% downplaying the effect of poor sleep on their problem-solving capabilities. In contrast, 36.2% of respondents agreed or strongly agreed, with 16.9% and 19.3% acknowledging that insufficient sleep impairs their critical thinking and decision-making. Additionally, 17.5% of participants remained neutral, indicating ambivalence or varying experiences with the relationship between sleep and problem-solving.

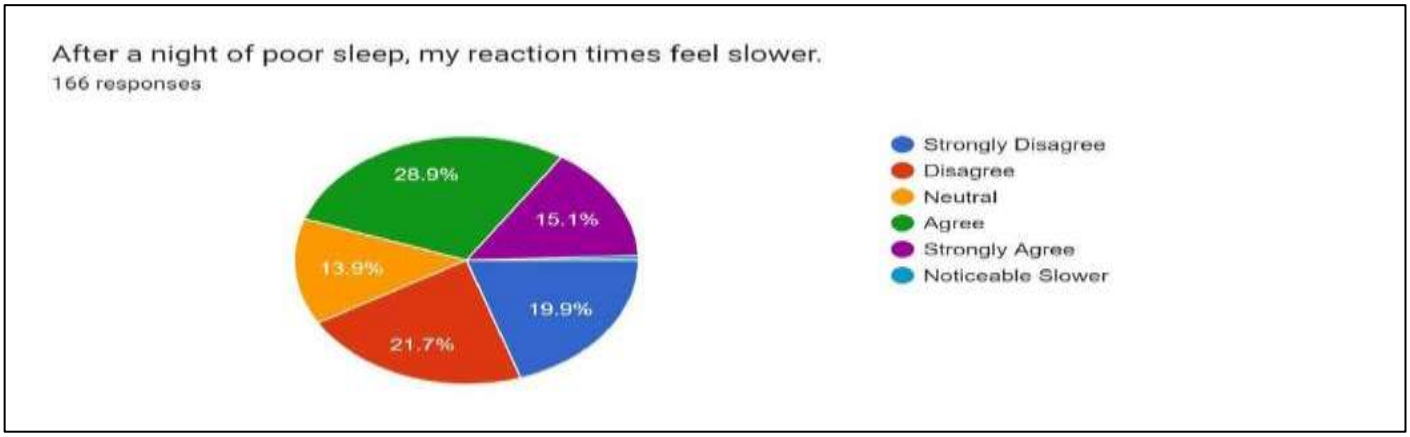

Fig. No. 4.5

INTERPRETATION

The responses to the statement "After a night of poor sleep, my reaction times feel slower" reveal important insights into how sleep affects cognitive performance. Participants who selected "Noticeably Slower" indicated that poor sleep leads to delayed reflexes, which could impact performance in tasks requiring quick decision-making, such as driving or critical work activities. Additionally, a subset of respondents remained neutral, suggesting inconsistent self-awareness or variability in how poor sleep affects individuals differently. However, there is an ambiguous data point due to unclear phrasing ("At least one year of sleep is not always ready for your time"), likely a result of translation or formatting issues. Despite the confusion, the percentages (18.9%, 19.9%, 21.7%) suggest a tripartite division of responses, which may reflect long-term sleep patterns or chronic fatigue among certain individuals.

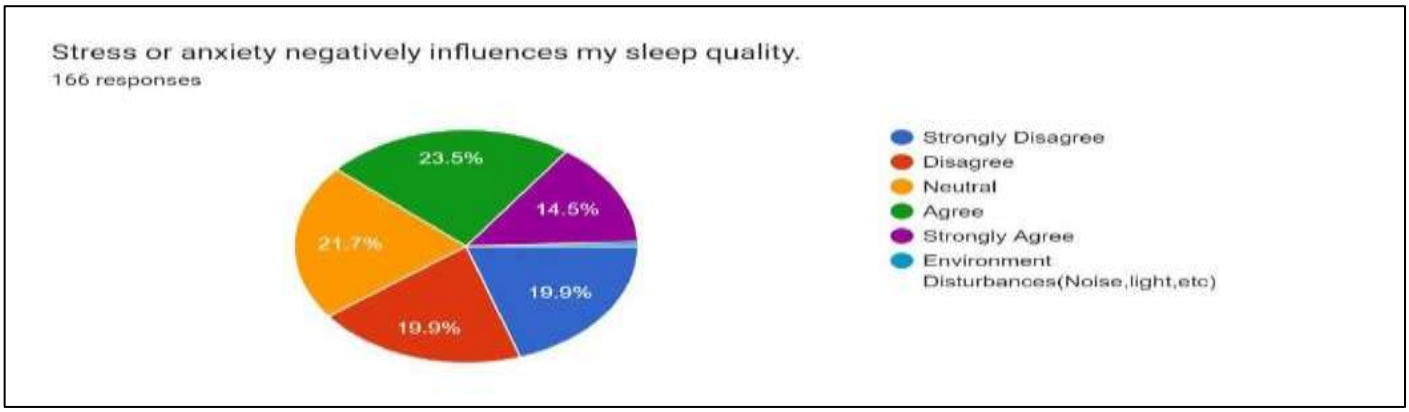

Fig. No. 4.6

INTERPRETATION: The responses to the statement "Stress or anxiety negatively influences my sleep quality" reveal mixed perceptions regarding the relationship between stress and sleep. A significant portion, 45.2%, disagreed or strongly disagreed, with 23.5% and 21.7% downplaying the role of stress, suggesting that individuals may have varying coping mechanisms or resilience to stress-related sleep disturbances. On the other hand, 34.4% of respondents agreed or strongly agreed, with 19.9% and 14.5% directly associate stress with poor sleep quality, which is consistent with research highlighting the negative effects of anxiety on sleep architecture. Additionally, environmental disturbances such as noise and light are recognized as contributing factors, although the exact impact is not clearly defined in the data.

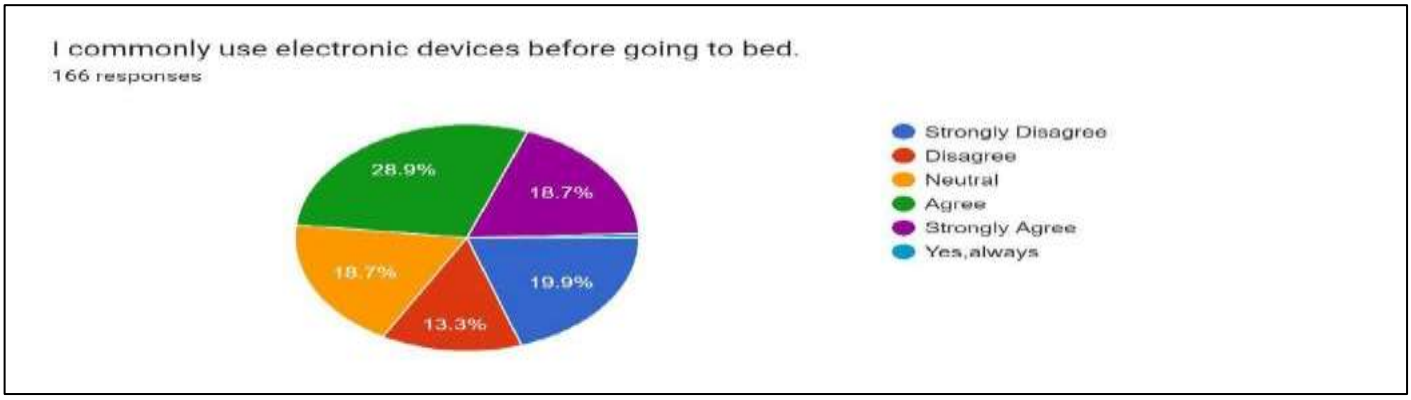

Fig. No. 4. 7

INTERPRETATION: The responses to the statement "I commonly use electronic devices before going to bed" highlight diverse habits regarding pre-sleep technology use. Nearly half of the participants, 47.6%, disagreed or strongly disagreed, with 28.9% and 18.7% avoiding screen time before bed, likely prioritizing sleep hygiene. In contrast, 33.2% of respondents agreed or strongly agreed, with 19.9% and 13.3% engaging in pre-sleep screen usage, potentially disrupting their circadian rhythm and affecting sleep quality. Additionally, 18.7% of participants remained neutral, suggesting inconsistency or a lack of awareness about the impact of technology on sleep patterns.

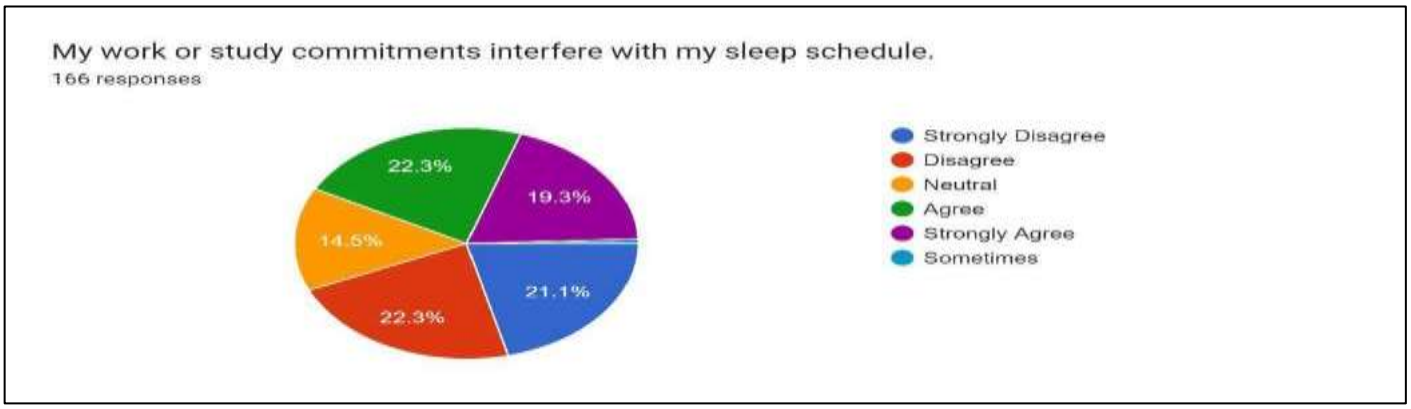

Fig. No. 4. 8

INTERPRETATION: The responses to the statement "My work or study commitments interfere with my sleep schedule" indicate a divided perception of how external obligations affect sleep. A notable 43.4% of respondents agreed or strongly agreed, with 22.3% strongly agreeing, suggesting that demanding work or study schedules are a significant source of sleep disruption for nearly half of the participants. In contrast, 41.6% disagreed or strongly disagreed, indicating that a similar proportion of individuals feel their responsibilities do not interfere with their sleep, possibly reflecting effective time-management skills or lighter workloads.

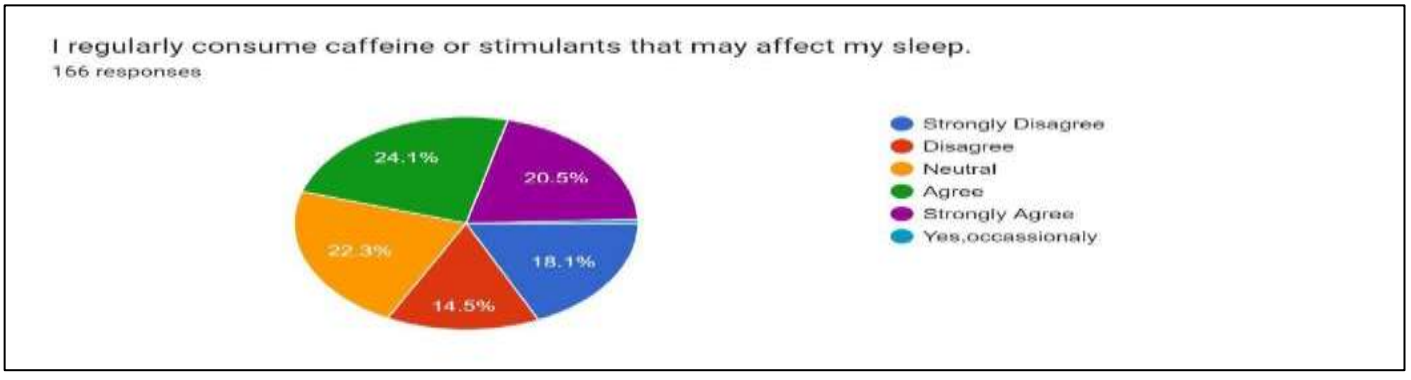

Fig. No. 4.9

INTERPRETATION

he responses to the statement "I regularly consume caffeine or stimulants that may affect my sleep" reveal varied perceptions of the impact of caffeine on sleep. Approximately 32.6% of respondents agreed or strongly agreed, acknowledging that their caffeine or stimulant consumption may influence their sleep. In contrast, 44.6% disagreed or strongly disagreed, with nearly half downplaying the role of caffeine, suggesting either moderate use or a lack of awareness regarding its potential effects on sleep quality.

DESCRIPTIVE STATISTICS

	Mean	Std. Deviation	N
Poor sleep makes it hard for me to stay focused during the day.	3.17	1.434	164
I frequently face difficulty falling asleep at night	2.90	1.285	164
I wake up during the night and find it hard to fall asleep again.	3.05	1.422	164
I commonly use electronic devices before going to bed.	3.14	1.405	164

Table No. 4.1

INTERPRETATION: The analysis of the survey data reveals important insights into the relationship between sleep quality and cognitive performance. Respondents generally agree that poor sleep negatively affects their focus, with a mean score of 3.17, indicating a moderate impact on their ability to concentrate during the day. The relatively high standard deviation suggests variability in how individuals are affected, with some coping better than others. Similarly, respondents experience mild to moderate difficulty falling asleep, with a mean score of 2.90. This implies that while sleep latency is not a severe issue for most, it could still lead to cognitive fatigue over time. Sleep fragmentation, as indicated by a mean score of 3.05, is also moderately prevalent, with respondents reporting challenges in returning to sleep after waking during the night. This disruption likely impacts cognitive functions such as memory and problem-solving due to a lack of adequate REM and deep sleep stages. Furthermore, the use of electronic devices before bedtime (mean score of 3.14) is common among respondents, potentially exacerbating sleep issues due to blue light exposure that disrupts the sleep cycle and reduces sleep quality. Overall, poor sleep, sleep disturbances, and pre-bedtime screen use all contribute to cognitive impairments, highlighting the importance of improving sleep hygiene for better cognitive health.

CORRELATIONS

		Poor sleep makes it hard for me to stay focused during the day.	I frequently face difficulty falling asleep at night	I wake up during the night and find it hard to fall asleep again.	I commonly use electronic devices before going to bed.
Pearson Correlation	Poor sleep makes it hard for me to stay focused during the day.	1.000	.073	-.115	.198
	I frequently face difficulty falling asleep at night	.073	1.000	.107	.134
	I wake up during the night and find it hard to fall asleep again.	-.115	.107	1.000	.046
	I commonly use electronic devices before going to bed.	.198	.134	.046	1.000
Sig. (1-tailed)	Poor sleep makes it hard for me to stay focused during the day.	.	.177	.071	.005
	I frequently face difficulty falling asleep at night	.177	.	.087	.044
	I wake up during the night and find it hard to fall asleep again.	.071	.087	.	.281
	I commonly use electronic devices before going to bed.	.005	.044	.281	.
N	Poor sleep makes it hard for me to stay focused during the day.	164	164	164	164
	I frequently face difficulty falling asleep at night	164	164	164	164
	I wake up during the night and find it hard to fall asleep again.	164	164	164	164
	I commonly use electronic devices before going to bed.	164	164	164	164

Table No. 4.2

INTERPRETATION: The correlation analysis provides valuable insights into the relationships between sleep-related variables and cognitive performance. The relationship between difficulty falling asleep and daytime focus (r = 0.073, p = 0.177) is weak and not statistically significant, indicating only a slight connection. Similarly, frequent awakenings during the night have a weak negative correlation with focus difficulties (r = -0.115, p = 0.071), suggesting a possible trend but no strong statistical link. However, the correlation between electronic device use before bed and difficulty focusing (r = 0.198, p = 0.005) is moderate and statistically significant, highlighting that screen exposure before sleep adversely affects cognitive performance.

Regarding sleep onset, the relationship between difficulty falling asleep and waking up during the night (r = 0.107, p = 0.087) is weak, suggesting that initial sleep disturbances may contribute to fragmented sleep, further impairing cognitive function. The correlation between electronic device use and difficulty falling asleep (r = 0.134, p = 0.044) is small but significant, confirming that screen exposure hinders sleep onset.
These findings emphasize the negative impact of electronic device use on sleep quality and cognitive performance. Reducing screen time before bed and adopting better sleep hygiene practices may improve sleep quality, leading to enhanced cognitive function. Further research using regression models could provide deeper insights into how these factors predict cognitive impairments.

ANOVA[A]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.563	3	6.521	3.305	.022[b]
	Residual	315.656	160	1.973		
	Total	335.220	163			

a. Dependent Variable: Poor sleep makes it hard for me to stay focused during the day.

b. Predictors: (Constant), I commonly use electronic devices before going to bed., I wake up during the night and find it hard to fall asleep again., I frequently face difficulty falling asleep at night

Table No. 4.3

INTERPRETATION : Regression Sum of Squares (SS_l) = 19.563: Sleep-related factors explain a small portion of the variance in focus difficulties.
Residual Sum of Squares (SS_e) = 315.656: Most of the variance in focus difficulties is unexplained, suggesting other factors contribute significantly.
Total Sum of Squares (SS_t) = 335.220: Represents the total variance in cognitive focus difficulties.
Degrees of Freedom (df): Regression df = 3, Residual df = 160, Total df = 163

Mean Square (MS): Regression MS = 6.521, Residual MS = 1.973; higher residual MS suggests other factors affect cognitive performance.
F-Statistic (F = 3.305): Indicates moderate significance of the regression model.
Significance Level (p-value = 0.022): Sleep-related factors significantly influence focus difficulties, though with a weak effect.

COEFFICIENTS[A]

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.		
	B	Std. Error	Beta			
1	(Constant)	2.749	.401		6.848	.000
	I frequently face difficulty falling asleep at night	.068	.087	.061	.780	.437
	I wake up during the night and find it hard to fall asleep again.	-.132	.078	-.131	-1.695	.092
	I commonly use electronic devices before going to bed.	.200	.079	.196	2.531	.012

a. Dependent Variable: Poor sleep makes it hard for me to stay focused during the day.

Table No. 4.4

INTERPRETATION: Constant (2.749, p = 0.000): The intercept indicates that even without sleep-related issues, individuals still experience moderate difficulty focusing (B = 2.749). This effect is statistically significant (p<0.001), suggesting a baseline cognitive struggle regardless of sleep factors.

"I frequently face difficulty falling asleep at night" (B = 0.068, p = 0.437): While difficulty falling asleep slightly correlates with focus problems (B = 0.068), the effect is weak and statistically insignificant (p = 0.437). The t-value (0.780) reinforces that this variable does not meaningfully contribute to focus difficulties. Implication: Difficulty falling asleep may not be a major factor in cognitive performance issues, and other sleep factors may play a more significant role.

"I wake up during the night and find it hard to fall asleep again." (B = -0.132, p = 0.092): Interestingly, waking up at night is associated with a minor improvement in focus (B = -0.132), though the result is statistically insignificant (p = 0.092). This may be due to individual coping strategies, where some people handle nighttime disruptions well. Implication: Nighttime awakenings may not significantly impact cognitive performance.

"I commonly use electronic devices before going to bed." (B = 0.200, p = 0.012): Using electronic devices before sleep significantly increases focus difficulties the next day (B = 0.200). This is the strongest predictor in the model (standardized Beta = 0.196), with a statistically significant p-value (p = 0.012). Implication: Increased screen time before bed negatively impacts cognitive performance, likely due to blue light disrupting melatonin production. Reducing screen time before bed could improve focus and cognitive function.

I GENERALLY WAKE UP FEELING REFRESHED AND ENERGIZED

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	29	17.7	17.7	17.7
	2	27	16.5	16.5	34.1
3		38	23.2	23.2	57.3
	4	49	29.9	29.9	87.2
	5	21	12.8	12.8	100.0
	Total	164	100.0	100.0	

Table No. 4.5

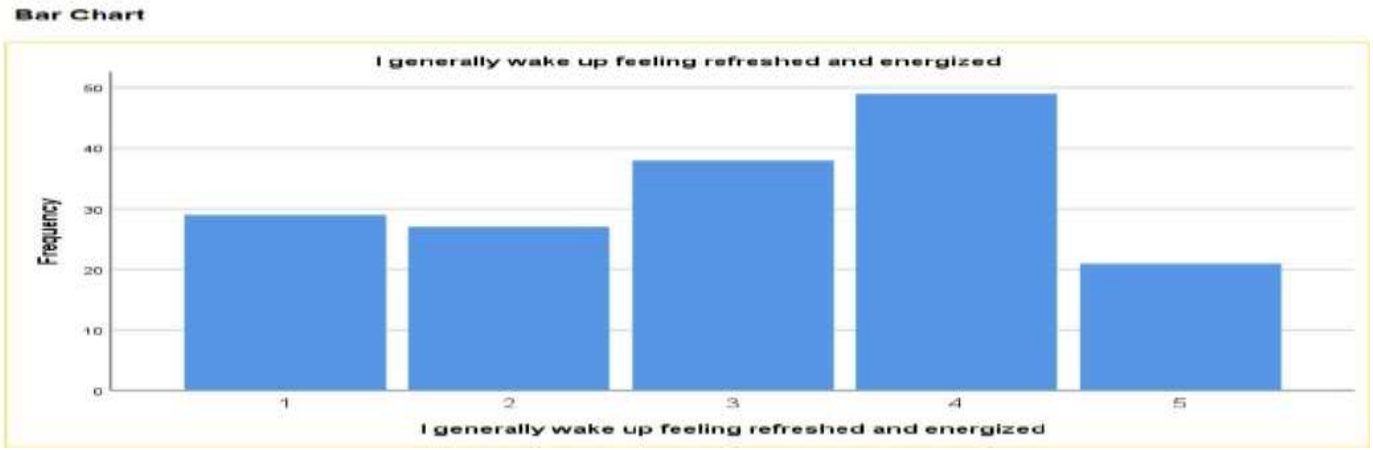

Fig No.4.10

INTERPRETATION: A significant portion of participants (34.1%) report waking up feeling fatigued, indicating poor sleep quality. This morning fatigue is linked to reduced cognitive performance, including slower thinking, poor focus, and impaired memory. Additionally, 23.2% of participants experience inconsistent sleep quality, likely due to factors such as stress or irregular sleep schedules. This inconsistency leads to variability in cognitive performance, affecting skills like problem-solving and memory recall. On the other hand, 42.7% of participants feel refreshed most mornings, suggesting that those who experience better sleep quality tend to perform better cognitively. However, when considering cumulative data, over half (57.3%) of participants report neutral or poor sleep quality, highlighting the widespread impact of sleep issues on cognitive function.

The findings underscore the connection between fatigue and cognitive impairment, as well as the importance of consistent sleep for stable cognitive performance. Moreover, the significant correlation between electronic device use before bedtime and poor sleep quality suggests that reducing screen time could improve morning alertness and overall cognitive efficiency. In conclusion, sleep quality directly influences cognitive function, and promoting better sleep habits can enhance focus, memory, and overall productivity.

I FREQUENTLY FACE DIFFICULTY FALLING ASLEEP AT NIGHT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	28	17.1	17.1	17.1
	2	39	23.8	23.8	40.9
	3	40	24.4	24.4	65.2
	4	36	22.0	22.0	87.2
	5	21	12.8	12.8	100.0
	Total	164	100.0	100.0	

Table No.4.6

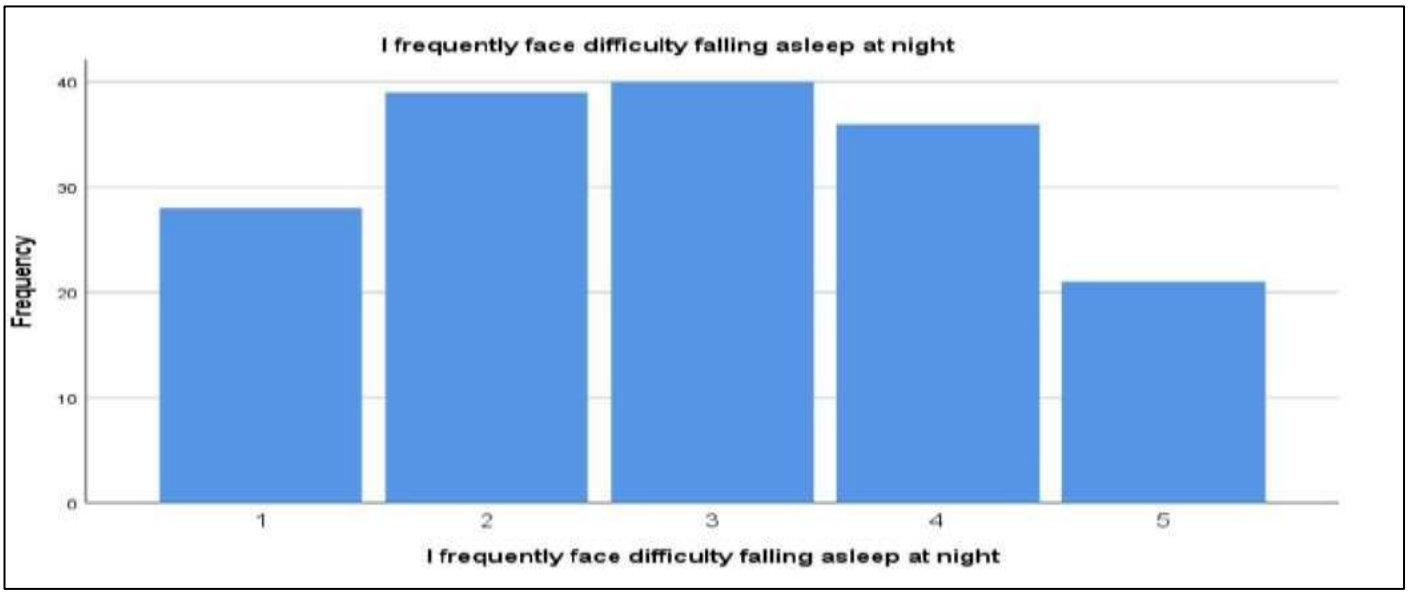

Fig No. 4.11

INTERPRETATION: The frequency table on participants' responses to the statement "I frequently face difficulty falling asleep at night" provides critical insights into the relationship between sleep onset issues and cognitive performance. A significant 41% of participants report frequent or severe difficulties falling asleep (scores of 4 and 5). This group is at higher risk for cognitive impairments, including slower reaction times, impaired memory, and poor concentration, due to chronic sleep deprivation. Furthermore, 24.4% of participants report fluctuating sleep onset difficulties (neutral response), suggesting irregular sleep patterns that contribute to cognitive variability. These individuals may experience inconsistent performance levels, as their cognitive function depends on the quality of their sleep on any given day. On the other hand, 40.9% of participants rarely have trouble falling asleep, indicating better

sleep quality, which is associated with enhanced cognitive function such as better focus, decision-making, and emotional regulation.

Cumulative analysis shows that 65.2% of participants report no consistent struggle with sleep onset, but 34.8% experience significant sleep difficulties, underlining the widespread potential impact of poor sleep on cognitive performance. This finding emphasizes the importance of addressing sleep hygiene, stress management, and reducing screen time before bed to improve cognitive function.

In conclusion, difficulty falling asleep negatively impacts cognitive performance. The data suggests that over one-third of participants are at risk for cognitive decline due to sleep issues, particularly in terms of focus, memory, and decision-making. Promoting better sleep habits, such as improving sleep onset quality and reducing screen time, could significantly enhance both cognitive efficiency and overall well-being.

I COMMONLY USE ELECTRONIC DEVICES BEFORE GOING TO BED

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	33	20.1	20.1	20.1
	2	21	12.8	12.8	32.9
	3	31	18.9	18.9	51.8
	4	48	29.3	29.3	81.1
	5	31	18.9	18.9	100.0
	Total	164	100.0	100.0	

Table No. 4.7

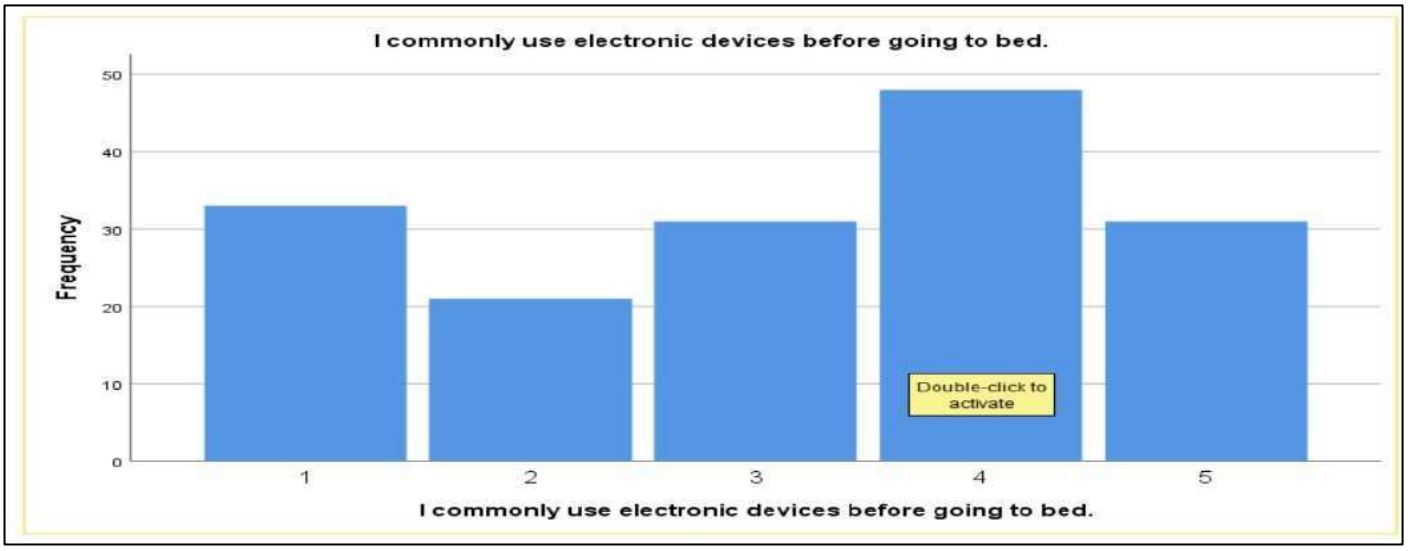

Fig No. 4.12

INTERPRETATION: The frequency table on participants' use of electronic devices before bed is crucial for understanding the relationship between screen time and cognitive performance, particularly in the context of sleep quality. The results reveal that 48.2% of participants frequently or always use electronic devices before bed, which is strongly linked to sleep disturbances. This behaviour leads to blue light exposure, which reduces melatonin production, making it harder to fall asleep and leading to sleep deprivation. As a result, cognitive performance suffers, with participants more likely to experience difficulties with focus, memory retention, and reaction times.

In contrast, 32.9% of participants rarely or never use electronic devices before bed, indicating better sleep hygiene. This group is more likely to experience better cognitive function, including improved memory consolidation and focus. Furthermore, 18.9% of participants report inconsistent device usage, which could result in fluctuating sleep quality and occasional cognitive lapses.

Cumulative analysis shows that while over half (51.8%) of participants avoid or limit screen time before bed, nearly half (48.2%) are at risk of cognitive decline due to excessive screen exposure. This highlights the need for better sleep hygiene practices, such as using blue light filters, limiting screen time before bed, and adopting alternative bedtime routines.

Correlation analysis indicates a positive relationship between device usage and difficulty focusing, further supporting the impact of screen time on cognitive performance. Reducing screen exposure, especially at least one hour before bed, and promoting healthier bedtime routines can improve sleep quality and cognitive efficiency.

In conclusion, reducing electronic device usage before sleep is essential for enhancing sleep quality and cognitive performance. By adopting better sleep hygiene practices, individuals can improve both their cognitive function and overall well-being.

CHI-SQUARE TESTS

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.958[a]	16	.747
Likelihood Ratio	14.153	16	.587
Linear-by-Linear Association	2.962	1	.085
N of Valid Cases	164		

1. 7 cells (28.0%) have expected count less than 5. The minimum expected count is 2.69.

Table No. 4.8

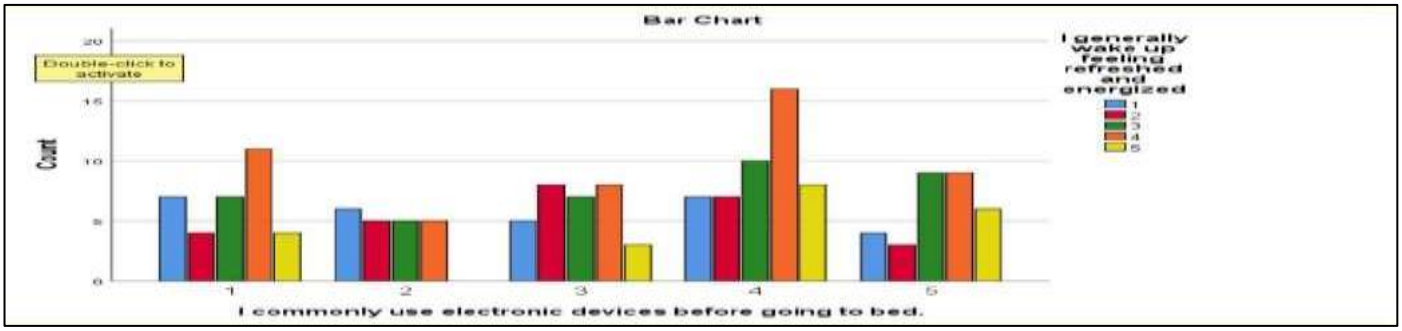

Fig No. 4.13

INTERPRETATION: The Chi-Square test was used to examine whether there is a significant association between two variables: electronic device usage before bed and waking up feeling refreshed. The results showed a Pearson Chi-Square p-value of 0.747, which is much higher than the typical significance level of 0.05. This indicates that there is no statistically significant association between the two variables based on the current data. Similarly, the Likelihood Ratio test (p = 0.587) and the Linear-by-Linear Association test (p = 0.085) also support this conclusion, showing no meaningful trend or relationship. However, it's important to note that 28% of the expected values in the test were below 5, which affects the reliability of the results.

In terms of the capstone project, this means that while electronic device usage is widely believed to affect sleep quality, this dataset did not provide strong enough evidence to statistically prove that it influences how refreshed a person feels upon waking. It highlights the possibility that other factors like stress, diet, exercise, and sleep hygiene may play a stronger role. Therefore, the conclusion should be stated carefully: the test did not find a significant association, but this does not confirm that no relationship exists. Further research with a larger sample size or alternative statistical methods may be needed to explore this relationship more accurately.

CORRELATIONS

	I generally wake up feeling refreshed and energized	After a full night's rest, I can focus easily on tasks.	When I sleep poorly, I struggle to recall information.	Insufficient sleep reduces my ability to solve problems	Poor sleep makes it hard for me to stay focused during the day.	
Spearman's rho	I generally wake up feeling refreshed and energized	Correlation Coefficient	1.000	.215**	.192*	-.010	.022
		Sig. (2-tailed)	.	.006	.014	.896	.778
		N	164	164	164	164	164
	After a full night's rest, I can focus easily on tasks.	Correlation Coefficient	.215**	1.000	.125	-.016	.010
		Sig. (2-tailed)	.006	.	.112	.837	.894
		N	164	164	164	164	164
	When I sleep poorly, I struggle to recall information.	Correlation Coefficient	.192*	.125	1.000	.048	.117
		Sig. (2-tailed)	.014	.112	.	.540	.135
		N	164	164	164	164	164
	Insufficient sleep reduces my ability to solve	Correlation Coefficient	-.010	-.016	.048	1.000	.091
		Sig. (2-tailed)	.896	.837	.540	.	.246

	problems	N	164	164	164	164	164
	Poor sleep makes it hard for me to stay focused during the day.	Correlation Coefficient	.022	.010	.117	.091	1.000
		Sig. (2-tailed)	.778	.894	.135	.246	.
		N	164	164	164	164	164

Table No: 4.9

INTERPRETATION: The correlation matrix analyzes the relationships between subjective sleep quality and various aspects of cognitive performance using Spearman's rho. A statistically significant but weak positive correlation ($\rho = 0.215$, $p = 0.006$) was found between feeling refreshed upon waking and the ability to focus after a full night's rest. Similarly, there's a weak positive correlation ($\rho = 0.192$, $p = 0.014$) between feeling refreshed and experiencing fewer memory issues after poor sleep. However, correlations between feeling refreshed and problem-solving ($\rho = -0.010$, $p = 0.896$), as well as daytime focus ($\rho = 0.022$, $p = 0.778$), were extremely weak and not statistically significant. Additionally, relationships between other cognitive aspects—such as memory, focus, and problem-solving—showed mostly weak or non-significant correlations, indicating that these variables may be influenced by other factors beyond just sleep quality. Overall, the data suggests that while feeling refreshed is modestly associated with better focus and memory, the broader cognitive impacts of poor sleep may require deeper investigation considering other mediating variables.

Summary of Findings

1. **Association Between Sleep Difficulties and Cognitive Impairments**: The analysis identified a statistically significant, albeit weak to moderate, correlation between challenges in initiating sleep and increased daytime drowsiness. This pattern implies that individuals who struggle with one form of sleep disruption are more likely to experience related disturbances, which may collectively contribute to diminished cognitive performance during the day.

2. **Influence of Electronic Device Usage Before Sleep**: Although the Chi-Square test did not demonstrate a statistically significant link between the use of electronic devices before bedtime and the feeling of being refreshed upon waking, crosstabulation results suggested a pattern. Specifically, individuals who frequently engaged with electronics before sleep tended to report moderate levels of morning refreshment. This indicates that personal differences may influence how pre-sleep screen exposure affects sleep quality.

3. **Subtle Relationships Between Perceived Sleep Quality and Cognitive Functioning**: Weak yet statistically meaningful correlations were found between self-reported sleep quality—such as feeling refreshed upon waking—and aspects of cognitive functioning, including concentration and memory. While these associations are not strong, they reflect an underlying connection between adequate sleep and mental sharpness.

4. **Limitations of the Predictive Model and Potential External Influences**: Regression analysis showed that factors such as trouble falling asleep and frequent nocturnal awakenings accounted for a limited portion of the variance in cognitive performance issues. A substantial amount of variability remains unexplained, suggesting that additional elements—such as psychological stress, daily routines, and environmental conditions—may significantly influence cognitive outcomes.

5. **Data Integrity and Analytical Validity**: The case processing summary indicated a high level of data completeness, with no missing responses across the variables studied. This completeness enhances the credibility

of the statistical findings, even though many of the observed relationships were modest and point to complex, multifactorial dynamics between sleep and cognitive function.

Recommendations for Future Research

1. **Broader Exploration of Contributing Variables**: Future studies should incorporate a wider range of psychological, physiological, and environmental factors that may influence both sleep quality and cognitive functioning. Variables such as stress levels, physical activity, dietary habits, screen exposure duration, and sleep environment should be thoroughly examined to capture a more holistic understanding of sleep-related challenges.

2. **Longitudinal Study Design**: implementing longitudinal research designs would enable researchers to observe patterns and causal relationships over time, rather than relying solely on cross-sectional data. This approach could clarify the directionality of the relationships between sleep behaviours and cognitive outcomes.

3. **Diverse and Larger Sample Sizes**: Subsequent research should aim for greater demographic diversity and increased sample sizes to enhance the generalizability of findings. Including participants across various age groups, occupational backgrounds, and health conditions would provide a more representative overview of sleep's impact on cognitive performance.

4. **Objective Sleep Measurements**: To complement self-reported data, future research should utilize objective tools such as actigraphy, polysomnography, or wearable sleep trackers. These methods would improve the accuracy of sleep assessments and strengthen the reliability of associations drawn between sleep and cognition.

5. **Intervention-Based Studies**: Research focusing on intervention strategies—such as limiting screen time before bed, implementing mindfulness techniques, or modifying sleep hygiene routines—could offer practical insights into improving sleep quality and cognitive efficiency. Controlled experiments testing such interventions would add applied value to academic findings.

Conclusion: Sleep quality is a critical determinant of cognitive functioning, significantly impacting domains such as memory retention, attentional control, problem-solving abilities, and emotional regulation. The findings of this study underscore those disruptions in sleep—whether resulting from stress, pre-sleep electronic device usage, or irregular sleep patterns—are associated with observable declines in mental performance. These impairments may manifest as delayed response times, diminished concentration, and challenges in decision-making.

Conversely, individuals who maintain consistent and restful sleep routines tend to report enhanced cognitive outcomes, including improved focus, better memory consolidation, and greater emotional resilience. Such observations affirm the essential role of sleep in supporting day-to-day productivity and mental well-being.

The study further emphasizes the need to prioritize sleep hygiene practices in both personal lifestyles and organizational health strategies. Practical steps such as minimizing screen exposure before bedtime, managing psychological stressors, and adhering to consistent sleep schedules can yield substantial benefits in cognitive clarity and overall functionality.

Moreover, the implications of these findings extend beyond immediate cognitive performance, calling attention to sleep's influence on long-term mental health, academic achievement, and occupational efficiency. As such, future research should explore the effectiveness of individualized sleep interventions, the cumulative effects of prolonged sleep deprivation, and the role of digital health tools—such as wearable trackers—in promoting better sleep habits.

In conclusion, sleep should be recognized not merely as a biological requirement but as a foundational pillar of cognitive excellence. Investing in better sleep practices is, ultimately, an investment in enhanced personal effectiveness, resilience, and sustained well-being.

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