

The Effect of Sleep Quality and Sleep Duration on Emotional Intelligence of Medical Student with the Mediating Role of Procrastination

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ABSTRACT

The current study examines the effects of sleep quality and sleep duration on the emotional intelligence of medical students while keeping a focus on the mediating role of procrastination. Emotional intelligence is known to be an important factor for academic success and well-being and is explored concerning sleep habits in this study. A causal research design was utilized to measure the proposed hypotheses. Data from 174 medical students was collected through a customized questionnaire. For statistical analysis, SPSS and PLS-SEM techniques were used. The results reveal an insignificant association between sleep quality and emotional intelligence. Whereas, a significant relationship was found between sleep duration and emotional intelligence, suggesting that a longer amount of sleep results in enhanced emotional intelligence. Third, this study tested whether procrastination mediate the relationship between emotional intelligence and sleep quality, which was rejected, showing no significant effect. However, the findings reveal that procrastination significantly mediate the relationship between sleep duration and emotional intelligence, revealing that procrastination influences how sleep duration affects emotional intelligence among medical students.



Introduction

Humans require sleep as a basic need. Sleep quality has been extensively researched as a crucial component of sleep (Bian et al., 2020). Maintaining emotional stability and cognitive function requires both the quantity and quality of sleep. While sleep duration refers to the total amount of sleep acquired, sleep quality includes elements like latency, continuity, and depth (Hirshkowitz et al., 2015). The National Sleep Foundation has updated its recommendations for the range of appropriate sleep hours, which are as follows: It is 7-9 hours for adults, with an additional hour for younger adults (18–25 years old). According to other studies, students who get nine hours or more

of sleep each night do better academically than those who get less than six. Additionally, students who slept for less than six hours displayed stress-related symptoms, and their diminished neurocognitive functioning was accompanied by a loss of creativity (Kelly et al., 2001)

During the sleep cycle, the human body goes through several sleep phases which are crucial for learning and skill development. Processing and consolidation of memories depend heavily on sleep. To enable memorization, information must be stored in long-term memories, which requires memory consolidation. Additionally, it has been shown that irregular sleep patterns and insufficient sleep are associated with impaired attention, poor cognitive function, and difficulty focusing in class (Kelly et al., 2001; Raschet al., 2013). Decreased attention, increased irritability, and generally poorer health have also been linked to short sleeping hours and poor-quality sleep. In more detail, such risky behaviors include Irresponsible use of drugs, alcohol, or tobacco; and unsafe sex according to Almojaliet al., (2017). More so, medical students who have a demanding timetable and heavily packed schedules are most vulnerable to sleep disorders (Giriet al., 2023).

In light of research done recently, it became important to get enough sleep in order to maintain good control over one's feelings and to think clearly. For instance, Wong et al. (2021) highlighted those students pursuing medicine in their academic education revealed compromised academic performance and social interactions whenever they were experiencing poor sleep quality, meaning that they possessed low emotional intelligence Almojali et al. (2017) were also able to find evidence of high levels of stress, poor quality of sleep, and poor emotional intelligence levels among medical students. This is rather a call for health promotion aimed at improving the sleep quality and regularity of such patients. In the study conducted by Dickinson and his colleagues (2018), the study subjects who were university students described negative consequences that include mental health issues, reduced effectiveness, and poor cognitive functioning for students who often lack adequate sleep. Numerous factors have been associated with less restful sleep among college students: social responsibilities; professional demands; and academic duties. Based on Langer et al. (2020), in order to control the levels of stress, being able to manage one's thoughts and feelings effectively is important particularly when one is faced with emotionally taxing experiences such as university life.

In this specific research done in the University of Washington, the correlation between amount and quality of sleep and academic performance of college students was examined. This is in accordance with the study conducted where students with better sleep practice including getting into bed at the right time and having enough sleep have better scores. In the article by Gaultney et al. (2017), the deficit is described as the total of all liabilities minus the sum of all assets. In the study, the University of Oxford established the link between teenagers' performance in school and their sleeping patterns. Based on this study, students who took their regular sleeping schedules, and those who slept for about 8-9hrs, got better performance in their classes.

According to Gruber et al., (2014) Thus there is evidence that social networking is being used in the clinical research setting through the help of new technologies. The effects of sleep have been an area of study in the recent past and clearly, sleep has important consequences with regard to the psychological and emotional health of the individual. For instance, Hershner, and O'Brien, (2018) revealed that by far most medical students are sleep deprived and the effect ranges from being unable to learn and recall information to intra-personal instability. As stated in past literature, this study also reveals that sleep deficits are detrimental to the student's mental health and academic performance.

Namely, emotional intelligence is helpful when it comes to medicine. According to Salovey and Mayer (1990), emotional intelligence entails the ability to understand, identify, manage, and appraise emotions. Cherry et al. (2021) hold that EI enables to handle stress at the workplace and engage patients effectively while decision-making is informed by stress. The findings have shown that increased EI levels, controlling for initial levels of job performance, predict enhanced productivity and satisfaction at work, as well as higher academic performance (Wong et al., 2021).

In a study conducted by Bhat (2022), the levels of EI reported by postgraduate students, professionals, and non-professionals were compared. In both components, professional students scored higher EI, and there were gender differences in articles favoring female students. In the study by Bavafa et al. (2019), the authors investigated the correlation between the level of EI in Iranian students and sleep quality. One fascinating fact emerged to the study and that was that a significant percentage of the participants (61%) reported poor sleep quality, which was associated with the overall sleep quality and EI. A comparison of EI in social work and commerce students was carried out by Sarode & Tendolkar (2015).

One finding that came as a shock was that the EI of non-professional commerce students was higher than that of social work professionals. This means that a person's area of specialization or academic level, or educational level may affect the emotional intelligence that he or she possesses. Social Emotional Regulation is specifically an aptitude crucial for efficient functioning in social and working relationships. This means that an individual's knowledge or discipline of choice affects his/her emotional intelligence. Emotional regulation is another vital aspect to consider as it determines how well an individual is able to manage his/her emotions and feelings when interacting in social relations, business, and other related affairs. Whether in friendships or romantic relationships, young adults experience heightened emotional vulnerability in the developmental stage, which dictates the importance of emotional intelligence.

Emotional intelligence is an important factor when it comes to human interactions and given the intensity of medical college the role of sleep in EI could not have been emphasized any further. Inadequate or poor quality of sleep can lead to emotional dysregulation which in turn poses a threat to medical students' ability to handle stress and Aval; interact with patients and fellow students empathetically (Giriet al. , 2023). It is for this reason that the knowledge of the impact of sleep on the EI facet can be helpful in the development of strategies to foster medical students' emotional and cognitive health. Based on previous studies, the present study has also emphasized the importance of EI more specifically in the medical field.

Emotional intelligence was described as having a positive impact on medical students' psychological resilience by Arora et al. (2020), who underlined that these students would be more capable of coping with the stress of medical school if they had higher levels of EI. A proposal in the study asserts that EI can benefit the mental health of medical students as well as increase proficiency in performance among these learners.

Procrastination is the inclination to put off significant duties and obligations in spite of the unfavorable effects of doing so. It is believed that procrastination and perception of time are closely related (Steel, 2007). Procrastinators often concentrate on current tasks or activities that are easier or more satisfying to complete rather than long-term plans. Postponing work is frequently a strategy used to reduce the stress associated with tiresome, challenging, or demanding tasks. Delays also result from improper planning and estimation of the amount of time required finishing a task.

Procrastination refers to delaying assignments or tasks despite possible consequences and it affects many students, including those enrolled in medical schools (Steel, 2007). Sleep quality and duration can be further compromised by procrastination, which can also result in elevated stress, decreased productivity, and subpar academic performance (Sirois, 2014). Procrastination can make sleep issues worse for medical students, setting off a vicious cycle that impairs their emotional intelligence.

In the modern world, procrastination is a major issue that affects a lot of people, especially students. According to one study, 39.3% of graduate students said they procrastinated studying for exams almost always or always, 41.7% said they did the same for term papers, and 60% said they did the same for their weekly reading assignments (Onwuegbuzie, 2000). Recently, studies have started to look into how procrastination fits into this dynamic. For example, Kim and Seo (2015) found that procrastination was a robust, negative indicator of sleep quality, as it plays a mediatory role of sleep for behavior concerning emotional outcomes. Thus, building upon the previous study by Sirois (2014), it is proposed that helping students manage their procrastination may well be one of the best strategies that can aid them in the improvement of their emotional intelligence and sleep.

Research also shows that the existence of a direct relationship between EI, sleep length, and quality could be moderated by the extent and frequency of procrastination. In daily life, Sirois (2014) found out that procrastination often results in poor time management, stress, and poor sleep coupled with emotional instability. In another of their studies, Ferrari et al. (2015) also establish that as a result of procrastination, people are likely to have sleep disturbances; they are therefore likely to have low levels of emotional intelligence.

Additionally, Ramos and Jones (2021) also recognize the importance of further researching the necessary and sufficient conditions by which sleep enhances or diminishes the aspects of EI. Based on their research, Skal Stray and Narrate noted that there exists a significant relationship between EI and sleep and acknowledged that more research is required to determine the presence of other factors like procrastination and empower the development of effective intervention processes.

The effects of sleep on emotion and cognition have been brought out by recent research and these have revealed the significant role that sleeps plays. For example, Wong et al. (2021) conducted a study that established that emotional intelligence is reduced in medical students with poor quality of sleep. In the same manner, Cherry et al. (2021) confirmed that poor well-being among medical students was caused by poor sleep quality which consequently compromised students' ability to manage their stress and emotions. Nonetheless, minimal research has targeted, self-procrastination at explaining the role of mediating between sleep and emotional intelligence. The aim of the present research is to fill this gap by assessing the impact that procrastination has on the time, quantity, and quality of sleep, as well as a measure of emotional intelligence, among medical students. Therefore, this study intends to present a more refined understanding of the ways in which sleep impacts emotional intelligence and proposes enhancements in these effects to show how procrastination might be a potential mediator for it.

Significance

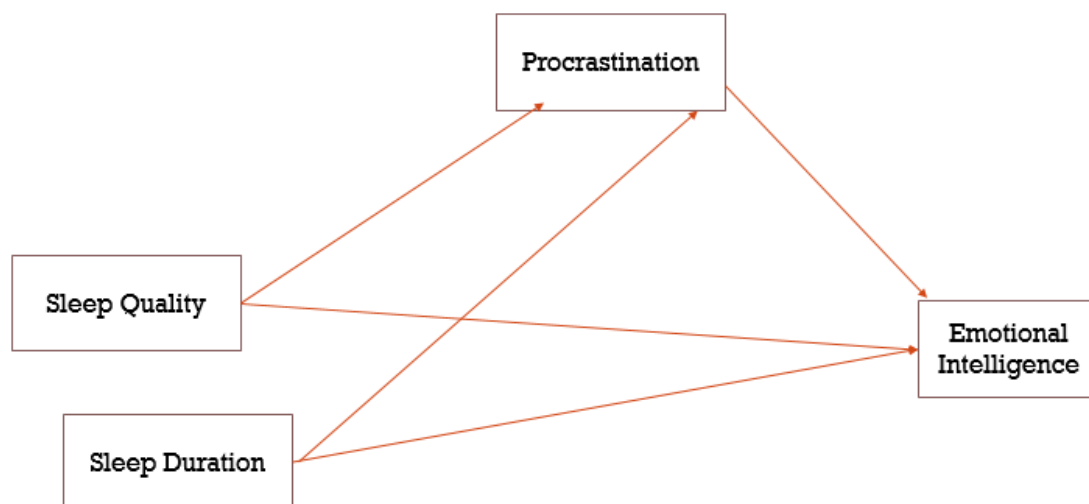
This study focuses on medical students, a group known to experience high levels of stress in their fields. By understanding the link between sleep, emotional intelligence, and procrastination, we can develop ways to help them cope with the pressure and perform better. Emotional intelligence

is also very important in the medical field. It allows doctors to understand patients' emotions, build rapport, and manage difficult situations. This study can help identify factors that influence this important skill and checking the relationship with their sleep will help us generate new interventions to help them live efficiently and perform better in their lives.

Conceptual Framework

Self-Regulation Theory: This theory suggests that individuals have a limited capacity of self-regulatory resources and Poor sleep quality and less sleep duration can disturb these resources, making it harder to resist procrastination. Therefore, when students are sleep-deprived, they may struggle to focus in their daily life activities, plan effectively, and manage their emotions, this indicates that all aspects are somehow important for overcoming procrastination.

Conservation of Resources (COR) Theory: This theory shares that individuals strive to maintain and achieve resources that are essential for their well-being. Sleep is a important resource, and therefore, when sleep is compromised, medical students may perceive a lack of resources to cope with the demands of their studies. This perception can lead to procrastination as a coping mechanism to avoid feeling overwhelmed. Procrastination, however, further reduces their ability to manage their workload effectively, creating a negative cycle.



Literature Review

Sleep quality and duration of sleep are two different domains that can be investigated, they might overlap sometimes but qualitative differences are present between them that can't be overlooked. (Pilcher, Ginter and Sadowsky, 1997) Sleep quality can be understand as the subjective experience of how a person experience sleep being rested or even when waking up and feels satisfied with the sleep. While, on the other hand, sleep duration refers to the objective domain that includes the time an individual is asleep. (Marques et al., 2017) The amount of sleep an individual requires depends on various factors and varies from individual to individual. (Savoie, 2015) Various studies showed low and non-significant correlation results between children and adolescents sleep duration and sleep quality (Mercer, Merritt, and Cowell, 1998)

Sleep Quality

Sleep quality is defined as individual's subjective perception of their sleep experience. It includes aspects like sleep latency, sleep continuity, sleep depth, and overall feelings of restfulness upon waking. (Browning et al., 2014) Although both sleep domains are connected with the emotional state, behavior and cognitive functioning of the individual (Pilcher, Ginter and Sadowsky, 1997) these associations are more significant for sleep quality as compared to their sleep duration. (Krystal and Edinger, 2008)

Lack of sleep and poor patterns among medical students are frequent worldwide. A questionnaire-based study on medical students at Ajman University of Science and Technology, UAE, from February 2015 to April 2015, found that insufficient sleep is connected with poor academic performance (*Hamed et al., 2015*)

The research investigated the relationships between sleep quality, sleep quantity, and other aspects of health, and well-being, in college students and nonclinical populations. Findings indicated that sleep quality had a stronger association with health, well-being, and sleepiness compared to sleep quantity. The study emphasized the importance of considering both sleep quality and quantity in understanding the impact of sleep on daily life and suggested that future research and preventative medicine should focus on sleep quality alongside sleep quantity (June, 2012)

Another study, this time at King Abdelaziz University in Jeddah, looked at how common sleep problems were among medical students. A population of 70.4% of students reported poor sleep quality, and 37.3% even experienced excessive daytime sleepiness (EDS). This suggests that sleep issues are a major concern for medical students at this university (Ibrahim et al., 2017).

Researchers at the University of Washington investigated the relationship between sleep habits and academic success in college students (Gaultney, 2017) Students who had good sleep hygiene, and got enough sleep each night, have higher grades (Gaultney, 2017) This finding aligns with what we know about the importance of sleep for cognitive function. It is conceptualized that when we're rested or sleeping, we focus better, and learn and retain information more effectively, and easily. The high prevalence of poor sleep quality was also reported among medical students in the above mentioned study by (Ibrahim et al., 2017) which suggests that many medical students might be missing out on the cognitive benefits of good sleep.

Sleep Duration

The Definition from Hirshkowitz et al., 2015 for Sleep duration can be defined as the total amount of time a person spends sleeping during a specific period, typically measured in hours per night. A cross-sectional study was done to check the relationship between sleep duration and obesity in medical students, the researchers were expecting a significant correlation between shorter sleep duration and higher BMI. However, the key finding regarding the association between duration of sleep and obesity in medical students was significantly negative between short sleep duration and overweight and obesity. None of the obese students were sleeping more than 8 hours per night, and 61.54% of obese students were sleeping less than 6 hours per night (Rathod, et al., 2024).

The study conducted at King Saud University (KSU) investigated the relationship between sleep duration, body mass index (BMI), and dietary behavior among 311 students from February to May 2021. The findings showed a significant positive association between less sleep duration and

obesity among KSU students, as well as a link between duration of sleep with their dietary factors. The key findings suggested that less sleep duration in medical students was associated with levels of obesity among KSU students (Alafif and Alruwaili, 2023).

Another study was conducted in Nigeria to check the sleep health of medical students. The study was based on cross-sectional survey design and included 288 medical students in which 53.1 % were males and while the females were 46.9 % in the study population. The frequency of good sleep health was 19 (6.6 %) while the mean sleep score was recorded as 4.9 with no significant differences found in age or sex. The results of this study shared that sleep health is a main problem identified among medical students in Nigeria and it is reported in other report from other researchers conducted within Africa and globally (De Castro Corrêa et al., 2017) (Wondie et al., 2021)

The study included data from 27 universities in 26 countries across Asia, Africa, and the Americas, for a comprehensive view of sleep duration and its health correlates among universities. The study found that sociodemographic variables, health risk behaviors, and health status variables were associated with both short and long sleep duration among university students. The average self-reported hours of sleep among university students was 7.07 hours, with a prevalence of 39.2% reporting ≤ 6 hours, 46.9% reporting 7-8 hours, and 13.9% reporting ≥ 9 hours of sleep duration. Both short sleepers (≤ 6 hours) and long sleepers (≥ 9 hours) were found to be at increased risk of all-cause mortality (Peltzer and Pengpid, 2015), as indicated by previous research studies (Wondie et al., 2021).

In the study on self-reported and measured sleep duration by (Lauderdale et al., 2008) the researchers found that the average measured sleep duration was 6 hours, while the average self-reported sleep duration was 6.8 hours. The researchers also observed that subjective reports tended to increase by approximately 34 minutes for each additional hour of measured sleep. Furthermore, the study shared that the correlations and the average differences found between self-reports and measured sleep varied by health conditions, their socio-demographic, and sleep characteristics. This suggests that factors such as age, gender, health status, and sleep patterns may influence how accurately individuals report their sleep duration compared to objective measurements (Lauderdale et al., 2008)

Emotional Intelligence

Emotional intelligence includes the capacity to recognize, understand, and regulate both oneself and the emotions of others. Goleman defines the term as "the complete set of capabilities that helps a person to manage himself/herself and others."

Emotional intelligence has been considered an important aspect of literature (Bhat, 2022) compared EI levels in professional and non-professional postgraduate students and found higher EI in professional students, with a significant gender difference in females. (Bavafa et al. 2019) investigated the link between EI and sleep quality in Iranian students and found an alarming prevalence (61%) of poor sleep quality, and a positive correlation between EI and overall sleep quality.

A study explored the link between personality traits, procrastination, and emotional intelligence (EI) in Lebanese medical students. Researchers selected nearly 300 students and checked their personalities using a standard test. The interesting finding was that emotional intelligence acted as a mediator between certain personality traits and procrastination. Students high in neuroticism and

openness were more likely to procrastinate. However, higher emotional intelligence helped to reduce procrastination even in these students (Awad et al., 2023).

Another study investigated the relationship between bedtime procrastination and emotional intelligence among college students in India. The sample of this study consisted of 488 college students, divided into non-professional (NP=232) and professional (P=256) groups as well as by gender (M= 243, F= 245). The results showed a weak positive correlation between bedtime procrastination and emotional intelligence and showed no gender differences and no significant differences between the groups, professional and non-professional college students (Andrew, 2024).

Procrastination

Procrastination is defined as voluntarily delaying an action although being aware of the consequence of that delay. (Steel, 2007) and is common, especially among university students (Beutel et al., 2016). It is defined that a number of university students engage in consistent and problematic academic procrastination (Day, Mensink and O'Sullivan, 2000).

In a study with Cross-sectional design, it was suggested that procrastination is linked with symptoms of extreme depression, stress and feeling of loneliness with reduced life satisfaction (Beutel et al., 2016). Procrastination is linked with various physical health conditions (Sirois, 2007), and for cardiovascular disease (Sirois, 2015), and other unhealthy lifestyle behaviors (Kroese and de Ridder, 2015).

The research explores the relationship between sleep hygiene, sleep quality, and various factors such as gender differences, psychological distress, and bedtime procrastination among adolescents and young adults. The researchers found that individuals with high sleep effort showed higher levels of insomnia severity, anxiety, and stress, as well as bedtime procrastination behavior. Bedtime procrastination was identified as partially mediating the relationship between sleep effort and insomnia severity among university students (Campbell et al., 2023).

A study was conducted to check whether problematic smartphone use can influence school engagement and disengagement among middle school students through the mediating effect of academic procrastination and sleep quality. The research was conducted at a middle school in China and involved 289 students. Academic procrastination was identified as a significant mediator in the relationship between PSU and school engagement. Sleep quality was also found to mediate the relationship between PSU and both school engagement and disengagement (Li et al., 2023).

Research Questions

1. To investigate the association between sleep quality and duration of sleep with Emotional intelligence in Medical students.
2. To check the mediation of procrastination with sleep quality, sleep duration on Emotional intelligence of medical students.

Hypothesis

H1. There will be an association between quality of sleep and emotional intelligence.

H2. There will be an association between sleep duration and emotional intelligence.

H3. Procrastination will significantly mediate the relationship between sleep quality and emotional intelligence.

H4. Procrastination will significantly mediate the association between sleep duration and emotional intelligence.

Methodology

Study Design

The study is quantitative and followed causal-correlational design.

Study area and population:

This study will be conducted in Medical Students of Pakistan. The population of the study will be Medical and Pharm D students.

Sample size and technique:

The data will be collected from 174 students who were selected by the non-probability purposive sampling technique.

Inclusive Criteria:

The study has included only the students from Medical and Pharm D students.

Exclusive Criteria:

Participants from other medical fields and regions were excluded from the study. Also, participants with any physical and mental condition were not included in the study.

Data collection tool:

The participants will receive a thorough explanation of the study's purpose. To determine whether sleep quality and sleep duration of medical students' self-reported emotional intelligence and procrastination are correlated, a self-designed questionnaire will be distributed online. Complete confidentiality will be maintained, and participation will be considered voluntary. The four-section questionnaire asked questions on the students' sleeping quality and duration, which will then be compared to their emotional intelligence and procrastination.

Demographic form:

The demographic data gathered encompassed age, gender, medical education year, and health sciences field.

b. Sleep Quality Scale (SQS):

With 28 items, the SQS contains six areas of sleep quality including the symptoms throughout the day, recovery from sleep, difficulty falling and staying asleep, trouble to wake up, and satisfaction with the sleep. The test retest reliability of the questionnaire was (0.81), and its internal consistency was (0.92). Respondents can indicate how frequently they feel and experience these

specific sleep patterns on a four-point Likert- scale (0 = "few to 3 = "almost always"). There is no reverse scoring for this scale. Higher scores in this scale indicate severe sleep issues and the total score of the scale can vary from 0 to 84.

a. Pittsburgh sleep quality index (PSQI):

The PSQI scale was designed to check the overall sleep quality and duration in the population. The scale consists of 19 self-reported items that belongs to seven subcategories: including the subjective sleep quality, latency of sleep, duration, the habitual efficiency of sleep duration, disturbances arise during the sleep, medicational themes, and dysfunctioning during the day. The other additional five questions are based on the respondent's roommate perspective. the scale has an internal reliability of $\alpha=.83$, high test-retest reliability of .85, and a sensitivity percentage of 89.6%, and a specificity of 86.5%.

Emotional Intelligence Scale by Nicola Schutte, 1998

The scale for emotional intelligence is constructed based on the Peter Salovey and John's Mayer's theory intelligence model. The scale access the emotions expression towards others and the person itself, the emotion regulation and their utilization. There are total 33 items in the scale consisting of five point Likert scale from strongly disagree to strongly agree. Scoring can range from 10 to 60, indicating more emotional intelligence with higher scores.

Procrastination Scale by Lay 1986 for Student Population

The scale statements can be used to check how procrastinate the person in his/her daily life (Lay, 1986) the scale is specifically designed for student populations the items can be answered on the 5-point scale that most accurately represents you. This 20 item scale has 3 items neutral while the other contains various other characteristics. Determine if each statement is characteristic or uncharacteristic of you using the following five-point rating system; keep in mind that a statement evaluated as neutral (3 on the scale) does not indicate that it is characteristic or unusual of you.

Data analysis:

SPSS was used to clean, code, and enter the data. The data was analyzed using appropriate statistical tests, and the findings will be shown as percentages in tables and graphs.

Ethical consideration:

Before participants open the questionnaire link, consent will be obtained. Data will only be utilized for the study. Confidentiality and privacy will be preserved.

Results

Data Analysis

The current chapter discuss the Data Analysis of the study while analyzing the hypotheses model. Various statistical techniques were employed, including SPSS and Smart PLS, for data purification and hypothesis testing. This chapter will thoroughly discuss the analysis and results.

Demographic Characteristics

Using the SPSS, Frequency analysis was run to gain the demographic profile of the available sample. The complete demographic profile of the current study includes Gender, Age, field, and year.

Table 1: Descriptive Statistics (N= 174)

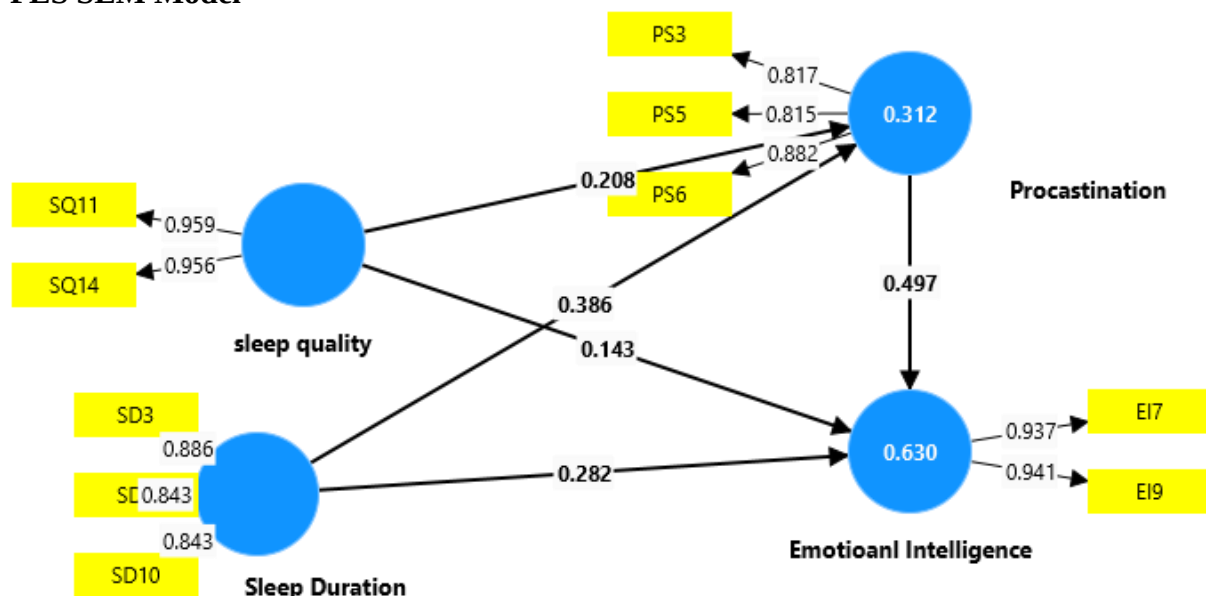
		Age	Field	Gender	Year
N	Valid	174	174	174	174
	Missing	0	0	0	0
Mean		2.05	1.56	1.54	2.83
Median		2.00	2.00	2.00	3.00
Std. Deviation		.821	.498	.500	1.424

Statistical Analysis

After the screening and initial testing of the available data, the purified data was put into the smart PLS for SEM analysis. Then the tests were conducted to test Inner and outer model measurements to examine the reliability and generate results.

PLS-SEM is a known statistical technique used to investigate the relationship between variables. According to **(Henseler, Ringle, Sarsted, 2015)**, this software technique is quite useful for testing complex theoretical framework that consists of multiple independent or dependent variables.

PLS SEM Model



This theoretical model is constructed using the PLS-SEM. Items 11 and 14 were included from the variable sleep quality, items 3, 6, and 10 were included from the variable sleep duration, items 3, 5, and 6 were included from procrastination, and items 17 and 19 were included from the emotional intelligence. Other items of each variable were removed to obtain good reliability and discriminant validity.

Table 2: Outer Loadings

	Emotional Intelligence	Procastination	Sleep Duration	Sleep Quality
EI7	0.937			
EI9	0.941			
PS3		0.817		
PS5		0.815		
PS6		0.882		
SD5			0.843	
SD7			0.886	
SD9			0.843	
SQ4				0.959
SQ7				0.956

(Hair et al, 2014) suggests the threshold value for outer loadings, highlighting that the values above 0.7 are generally considered acceptable, suggesting a strong relationship between the constructs.

The given table shows the values of outer loadings, showing all the items of the constructs meet the minimum requirements, except the ones being removed.

Construct Reliability and Validity

Reliability measures the consistency (Neuman, 2007) which is required to evaluate the quality of the study being conducted. The current study utilizes the composite reliability technique in smart PLS software to measure the reliability of the available data. Hair Jr et al 2014 suggest that composite reliability is quite a better indicator to evaluate data's internal consistency than Cronbach's Alpha.

Regardless, if the values of Composite reliability (CR) and Average Variance Extract (AVE) are greater than 0.7 and 0.5 respectively, it confirms data reliability. Hence, the values of CR and AVE in the table below show that they meet the minimum requirement of the threshold, ensuring external internal consistency.

Table 3: Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Emotional Intelligence	0.867	0.867	0.937	0.882
Procastination	0.788	0.789	0.876	0.703
Sleep Duration	0.820	0.829	0.893	0.753
Sleep Quality	0.909	0.910	0.957	0.917

Heterotrait Monotrait Matrix HTMT

Discriminant validity is the test that measures the extent to which all the variables in the framework differ from each other (Hair Jr et al., 2014). We can also say that if the constructs are unique, discriminant validity automatically establishes while holding major value in the research because it guarantees certainty of the results (Henseler et al., 2015).

While there are many techniques used to determine the discriminant validity, we have used the Heterotrait- monotrait ratio (HTMT). This technique suggests that all the values should be less than 0.85 (Hair, 2015) to confirm the establishment of discriminant validity and even if the value is above and have no issues with other results, the above value can be added. Hence the following table confirms that the discriminant validity is established as all the values meet the threshold requirement.

Table 4: Heterotrait Monotrait Matrix HTMT

	AA	HS	PS	SA
EI				
PS	0.872			
SD	0.776	0.664		
SQ	0.674	0.579	0.861	

Predictive Relevance of the Model

R square defines how the independent variable influences the dependent. In the inner model measurement, it is important to determine the predictive relevance of the model. Besides, knowing and determining the quality of the model is also crucial after confirming its validity and reliability (Hair B, 2010).

The R square values of (0.630 and 0.618) indicate a strong mediation. Generally, values above 0.30 suggest that the model effectively supports variance. Regardless, the given table shows a strong influence of procrastination on emotional intelligence.

Table 5: R² and Adj-R²

	R-square	R-square adjusted
Emotional Intelligence	0.630	0.618
Procastination	0.312	0.297

Table 6: Path Coefficient/ Hypothesis Testing

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
Sleep Quality -> Emotional Intellgence	0.143	0.132	0.161	0.889	0.374
Sleep-> Emotional Intelligence	0.282	0.278	0.139	2.029	0.042

The path coefficient table reveals the results of the hypothesis proposed in the study. The results show that the findings of the results do not support H1, stating an association between sleep quality and emotional intelligence. The beta value specifies the relationship between these two variables and the positive beta of 0.143 suggests that there could be a weak positive relationship between sleep quality and EI. Besides, the p-value of 0.374 suggests to rejection of the hypothesis. It indicates there is no significant association between sleep quality and emotional intelligence.

Moreover, H2 predicted an association between sleep duration and emotional intelligence, and our findings support this hypothesis. The findings reveal a significant relationship between these two variables. The beta value of 0.282 reveals a weak +ve association, suggesting a longer sleep duration associated with higher EI. Also, the p-value of 0.042 suggests a statistically significant association. It means the association is unlikely due to chance.

Table 7: Mediation Analyses

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T-statistics ((O/STDEV))	P-values
Sleep quality -> Procastination -> Emotional Intelligence	0.103	0.105	0.064	1.621	0.105
Sleep Duration -> Procastination -> Emotional Intelligence	0.192	0.206	0.081	2.361	0.018

The mediation effect was examined through the specific indirect effects on PLS-SEM. We proposed H3 on the idea that procrastination will mediate the relationship between sleep quality and emotional intelligence. The results showed ($p=0.105$) indicating that the H3 is Rejected.

We hypothesized that procrastination will mediate the relationship between sleep duration and emotional intelligence, the p-value is 0.018 suggesting that H4 is accepted.

Discussion

The analysis of the constructs, including sleep quality, sleep duration, procrastination, and emotional intelligence provided us with noteworthy findings that contribute to our understanding of the complex relationship between these variables.

Emotional intelligence is known to be the individual's capacity to effectively cope with emotions, including handling frustrations, adjusting impulses, regulating mood, and inhibiting stress from impairing cognitive abilities and empathy (Goleman, 2000). Several studies have been conducted to evaluate the importance of EI and according to (Serrat, 2019)

EI plays an important role in an individual's personal well-being, interactions in a social environment, and overall success in different aspects of life, enabling individuals to navigate emotions and relationships with absolute skill.

Also, past literature suggests that emotional intelligence is sustained by various external factors, including sleep quality, physical activity, and stress (Anggraini & Alnedral, 2019). Besides, based on the statistical analysis between sleep quality and EI, we conclude that there's a significant

negative relationship between these two variables, meaning the better the sleep quality, the higher level of EI you'll have.

Generally, the literature defines sleep quality as the individual's potential to fulfill their sleep requirement according to their optimal needs (Sulana et al., 2020). Poor quality of sleep can lead to negative effects on the body, such as the body being sensitivity to diseases, fatigue, lack of focus, and emotional instability like stress and anxiety, eventually impacting the overall performance. Thus maintaining a good quality of sleep is very important for the emotional well-being of an individual.

Furthermore, the literature highlights that professions in social services, such as healthcare, often experience high levels of sleep-related problems (Simonelli et al., 2018). Prior studies reveal that nurses usually face sleep deprivation and the amount of sleep they get can vary based on their age (Chien et al., 2013)

Nevertheless, the literature proposes a connection between sleep quality, duration, and psychological factors, such as emotion management. The study stresses the significance of cognitive emotion regulation, especially for healthcare workers who face various emotionally challenging situations in their professions (Castellano et al., 2019). Additionally, the study highlights the relationship between subjective well-being, sleep duration, and sleep quality, emphasizing how subjective sleep quality mediates this association (Lemola et al., 2013).

Moving forward to the mediation role of procrastination. It was no surprise that the proposed hypothesis, stating procrastination will significantly mediate the association between sleep quality and emotional intelligence, is rejected. Although procrastination has been an increasingly concerning concept and its prevalence is well-established (Ferrari, O'Callaghan, & Newbegin, 2005) in the literature, still a variety of its domains didn't receive enough attention that it deserves.

Lastly and surprisingly, the findings supported H4, stating procrastination will significantly mediate the association between sleep duration and emotional intelligence.

Limitations

The study has several limitations that give potential to future researchers for further study in the context. Here are some of the major limitations of the study.

The findings of the study are based on the data exclusively collected from the medical and Pharm-D students in the Karachi region. It limits the results to a certain geographical location and specific group of students. Even though a sample size of 174 can be enough to generate optimal results for the study, a larger sample size could provide stronger results and enhance the generalization of the findings. Small sample sizes can limit the statistical power when going through different tests.

Implications

The findings highlight the importance of good sleep habits for medical students. By getting enough quality sleep, they can improve their emotional intelligence and potentially their academic performance and well-being. Understanding the connection between sleep, procrastination, and emotional intelligence can lead to interventions that improve emotional intelligence in medical students. This could involve workshops on sleep hygiene, stress management, and procrastination reduction.

Overall, this research can help medical schools and students develop strategies to promote better sleep, reduce procrastination, and, enhance emotional intelligence.

Conclusion

Based on the results of the analysis and findings, it can be safely concluded that the better or longer the duration of sleep an individual takes, the higher the emotional intelligence he will experience, eventually positively influencing overall well-being. Undoubtedly, medical students require a good amount of quality sleep to freshen up their minds and lower the stress levels that come with their hectic routines.

Besides, the current study reveals a non-significant association between sleep quality and EI, meaning whether an individual sleeps well or poorly, it doesn't really seem to have an effect on their emotional intelligence. On the other hand, the amount of sleep can impact the EI, which is not surprising. So, getting more or less might influence the ability to manage and understand emotions.

Also, the study found that procrastination doesn't affect the relationship between sleep quality and EI, meaning even if you do procrastinate generally, it might not affect how sleep quality influences your ability to manage emotions. Yet, the study also reveals that procrastination does change the association of sleep duration with EI, meaning that if medical students tend to likely procrastinate, it can have an impact on how the amount of sleep they get affects their ability to manage and understand emotions.

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APPENDIX – A

DEMOGRAPHIC SHEET:

- a) Age: _____
b) Gender: _____
c) Medical education year: _____

Sleep Quality Scale

The following survey is to know the quality of sleep you had for the last one month. Read the questions and check the closest answer.

Examples

Rarely : None or 1-3 times a month

Sometimes : 1-2 times a week

Often : 3-5 times a week

Almost always : 6-7 times a week

		Rarely	Sometimes	Often	Almost always
1	I have difficulty falling asleep.				
2	I fall into a deep sleep.				
3	I wake up while sleeping.				
4	I have difficulty getting back to sleep once I wake up in middle of the night.				
5	I wake up easily because of noise.				
6	I toss and turn.				
7	I never go back to sleep after awakening during sleep.				
8	I feel refreshed after sleep.				
9	I feel unlikely to sleep after sleep.				
10	Poor sleep gives me headaches.				
11	Poor sleep makes me irritated.				
12	I would like to sleep more after waking up.				
13	My sleep hours are enough.				
14	Poor sleep makes me lose my appetite.				
15	Poor sleep makes hard for me to think.				
16	I feel vigorous after sleep.				
17	Poor sleep makes me lose interest in work or others.				
18	My fatigue is relieved after sleep.				

Procrastination Scale

Procrastination Scale (Lay, 1986) - For student populations

Instructions:

People may use the following statements to describe themselves. For each statement, decide whether the statement is uncharacteristic or characteristic of you using the following 5 point scale. Note that the 3 on the scale is Neutral – the statement is neither characteristic nor uncharacteristic of you. In the box to the right of each statement, fill in the number on the 5 point scale that best describes you.

	Extremely <u>Un</u> characteristic	Moderately <u>Un</u> characteristic	Neutral	Moderately Characteristic	Extremely Characteristic
	1	2	3	4	5
1. I often find myself performing tasks that I had intended to do days before.					☐
2.* I do not do assignments until just before they are to be handed in.					☐
3.* When I am finished with a library book, I return it right away regardless of the date it is due.					☐
4. When it is time to get up in the morning, I most often get right out of bed.					☐
5. A letter may sit for days after I write it before mailing it.					☐
6. I generally return phone calls promptly.					☐
7. Even with jobs that require little else except sitting down and doing them, I find they seldom get done for days.					☐
8. I usually make decisions as soon as possible.					☐
9. I generally delay before starting on work I have to do.					☐
10.* I usually have to rush to complete a task on time.					☐
11. When preparing to go out, I am seldom caught having to do something at the last minute.					☐
12. In preparing for some deadline, I often waste time by doing other things.					☐
13.* I prefer to leave early for an appointment.					☐
14.* I usually start an assignment shortly after it is assigned.					☐
15. I often have a task finished sooner than necessary.					☐
16. I always seem to end up shopping for birthday or Christmas gifts at the last minute.					☐
17. I usually buy even an essential item at the last minute.					☐
18. I usually accomplish all the things I plan to do in a day.					☐
19. I am continually saying "I'll do it tomorrow".					☐
20. I usually take care of all the tasks I have to do before I settle down and relax for the evening.					☐

Name _____ Period _____ Date _____

HANDOUT 11-9

Emotional Intelligence Scale

Instructions: Indicate the extent to which each item applies to you using the following scale:

- 1 = strongly disagree
- 2 = disagree
- 3 = neither disagree nor agree
- 4 = agree
- 5 = strongly agree

- _____ 1. I know when to speak about my personal problems to others.
- _____ 2. When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.
- _____ 3. I expect that I will do well on most things I try.
- _____ 4. Other people find it easy to confide in me.
- _____ 5. I find it hard to understand the nonverbal messages of other people.
- _____ 6. Some of the major events of my life have led me to re-evaluate what is important and not important.
- _____ 7. When my mood changes, I see new possibilities.
- _____ 8. Emotions are some of the things that make my life worth living.
- _____ 9. I am aware of my emotions as I experience them.
- _____ 10. I expect good things to happen.
- _____ 11. I like to share my emotions with others.
- _____ 12. When I experience a positive emotion, I know how to make it last.
- _____ 13. I arrange events others enjoy.
- _____ 14. I seek out activities that make me happy.
- _____ 15. I am aware of the nonverbal messages I send to others.
- _____ 16. I present myself in a way that makes a good impression on others.
- _____ 17. When I am in a positive mood, solving problems is easy for me.
- _____ 18. By looking at their facial expressions, I recognize the emotions people are experiencing.
- _____ 19. I know why my emotions change.
- _____ 20. When I am in a positive mood, I am able to come up with new ideas.
- _____ 21. I have control over my emotions.
- _____ 22. I easily recognize my emotions as I experience them.
- _____ 23. I motivate myself by imagining a good outcome to tasks I take on.
- _____ 24. I compliment others when they have done something well.
- _____ 25. I am aware of the nonverbal messages other people send.
- _____ 26. When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself.
- _____ 27. When I feel a change in emotions, I tend to come up with new ideas.
- _____ 28. When I am faced with a challenge, I give up because I believe I will fail.
- _____ 29. I know what other people are feeling just by looking at them.
- _____ 30. I help other people feel better when they are down.
- _____ 31. I use good moods to help myself keep trying in the face of obstacles.
- _____ 32. I can tell how people are feeling by listening to the tone of their voice.
- _____ 33. It is difficult for me to understand why people feel the way they do.

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