RESEARCH PAPER

Sleep Inertia and Sleep Quality among Female and Male Students: A Comparative Study

Minal Agarwal[1], Pooja Jaiswal[2] and Renu Agarwal[3]

[1]Student, Final Year - BA Psychology (Hons with Research), Chandigarh University, Mohali, Punjab, India
[2]Assistant Professor, Department of Psychology, Chandigarh University, Mohali Punjab, India.
[3]Assistant Professor, Shrimathi Devkunvar Nanalal Bhatt Vaishnav College for Women, Chennai, Tamil Nadu, India.
[1]minal93430@gmail.com, [2]Myselfpoojajaiswal1@gmail.com and [3]goldie_agarwal2002@yahoo.com

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ABSTRACT
Sleep is an important factor in physical well-being, mental functioning and emotional stability. Poor sleep quality and sleep inertia are issues that are widespread among students and can impact their daily operations and academic success. The short period of sleepiness and lack of concentration immediately after waking up is referred to as sleep inertia. A quantitative cross-sectional study was conducted on 108 students (65 males and 43 females) aged between 19 and 25 and aimed at assessing the quality and inertia of their sleep and studying the relationship between the two. The Quality of Sleep was measured using the Pittsburgh Sleep Quality Index, and the Sleep Inertia Scale was used to measure sleep inertia. Some of the descriptive statistics that were used included the mean, standard deviation and percentage. Pearson correlation analysis was used to find out the significance of the relationship between the variables. The Quality of Sleep in students was different, as shown by a mean PSQI score of 12.19 (SD = 5.50). The mean of sleep inertia was 29.36 (SD = 9.55). The Pearson correlation analysis revealed a small and nonsignificant positive correlation between sleep quality and sleep inertia ($r = .063$, $p > .05$). The results indicate that students have dissimilar degrees of sleep quality and sleep inertia, but their correlation is weak. Encouraging the healthy sleeping habits of students can potentially enhance the functioning of the post-sleep and well-being.

Keywords: *Sleep quality, Sleep inertia, Students, Gender differences, Sleep patterns*
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1. INTRODUCTION

Sleep is a very important biological procedure that is extremely vital in the provision of physical health, mental processes and emotional stability. Sleep is necessary in attentions, memory, learning and emotional control. The effect of sleep disturbances on normal daily activity and quality of life can be negative. It has been shown that poor health conditions, such as poor academic outcomes and poor mental health, are associated with sleep disorders revealed in the short and long term (Medic et al., 2017). Healthy sleep is of special importance in students due to the academic requirements and modified lifestyle.

Drowsiness-related problems are typically common among students, especially in teens and young adults. Some of the factors that have contributed to the lack of or low Quality of Sleep are sleep disorders, screen time, school stress, and social activities. The national recommendations on the number of hours of sleep reference the fact that young adults should get enough sleep to achieve optimal performance, and most students fail to meet the recommendations (Hirshkowitz et al., 2015). It is also discovered that disturbed sleep patterns are linked to poor academic performance and the inability to concentrate among students (Khare et al., 2024).

The concept of sleep quality is the subjective evaluation of the condition of sleep that a person experiences, which is the duration of sleep, the sleep latency, the number of night awakening and the functioning in the daytime. Physical complaints, emotional issues, and poor quality of life were also identified to be linked with the Quality of Sleep among university students (Carpi et al., 2022). Pittsburgh Sleep Quality Index (PSQI) is probably among the most widespread tools used to assess the Quality of Sleep since it provides an elaborate description of the difficulties associated with sleep within one month (Buysse et al., 1989). The valuation of sleep quality is therefore of great importance to the knowledge of sleep challenges among a group of students.

Sleep inertia is also another part of sleep which does not attract much attention. It is characterized as the condition of low alertness, reduced alertness, and ineffective performance of their thinking immediately after they have awakened. Sleep inertia is a short-lasting condition that, however, may play a significant role in the activity of a morning, in making decisions and grades. Some of the

**Author for Correspondence: minal93430@gmail.com*

factors that may contribute to the increase in the severity of sleep inertia include sleep deprivation, abnormal sleep patterns, and low Quality of Sleep, hence applicable in case of students with habitual sleep patterns that have been derailed.

The sleep quality and sleep inertia are inseparable. Even though the low Quality of Sleep could be one of the factors contributing to better sleep inertia, the magnitude of this association may vary across individuals. The relationship between the two aspects of sleep is important to know in order to identify the potential areas of intervention. It has also been reported that there are variations in the sleep patterns of men and women, where variations in the duration of sleep, Quality of Sleep and complaints related to sleep have been noted in the two sexes (Tsai and Li, 2004). These differences, which are gender based, can be explained by biological aspects, lifestyle differences and coping styles.

Sleep-related interventions, including sleep aids, such as melatonin, have also come into the limelight of the young populations in recent years. Sleep habits of use refer to persistent sleep problems in children and young adults and the necessity to learn more about sleep health among this population (Tedroff et al., 2022).

The aim of the study is to assess the sleep inertia and Quality of Sleep among male and female students. Also, it seeks to examine the relationship between sleep quality and sleep inertia among students.

2. REVIEW OF LITERATURE

The Quality of Sleep is such a problem which has been studied extensively because of its significant contribution to physical, cognitive and emotional health. The Quality of Sleep has also been cited by some of the studies to be one of the factors that is prevalent among students and has been linked to poor academic performance as well as day-to-day operations. Okano et al. (2019) observed that the students who had quality, duration and consistency of sleep performed well in college. In the same way, Sexton-Radek and Pichler-Mowry (2011) also came to the same conclusion that daily activities and lifestyle problems are also relevant to the Quality of Sleep among young adults.

Standardized measures of the Quality of Sleep have frequently been used (like the PSQI). Aloba et al. (2007) also tested the validity of PSQI in relation to university students and determined that it can be used in the detection of sleep-related issues. The researchers have equally raised the fact that sleep deprivation correlates to poor recovery and augmented fatigue that could adversely impact the physical and psychological performance (Åkerstedt et al., 2009). Moreover, the research was able to find out that sleep deprivation and disturbed sleep adversely affect attention, memory, and learning processes (Short and Banks, 2013).

Another field of sleep research is sleep inertia, which is the feeling of drowsiness and inability to be alert upon waking up. Tassi and Muzet (2000) have also given an in-depth account of sleep inertia and its impact on performance in their early research. Later studies have indicated that sleep inertia is able to interfere with higher-order cognition, as in decision making or reaction time, especially at the early waking-up phase (Wertz et al., 2006). The effects can be applied particularly to students who might have to be engaged in cognitively demanding activities as soon as they get up.

The research has been improved in later studies, which have provided research on the biological and circadian implications of sleep inertia. According to Burke et al. (2015), sleep homeostasis and circadian rhythms have an impact on sleep inertia, and, in its turn, the latter has an impact on post-sleep cognitive performance. The same authors (Hilditch and McHill 2019) also highlighted that sleep inertia is also individual and can be worsened by sleep deprivation or sleep disorders. These findings suggest that sleep inertia is a complex phenomenon which is influenced by different physiological factors.

The bond between the Quality of Sleep and quality-of-life outcome has also been studied. The systematic review and meta-analysis study conducted by Silla et al. (2023) confirms that poor Quality of Sleep is strongly correlated with poor quality of life, particularly in the elderly patient population, which implies that the Quality of Sleep has a lifelong impact. Although sleep quality and sleep inertia are two different constructs, it has been reported that they have an impact on daytime functioning and well-being.

Studies done on students have been able to point out the interaction effects of the length of sleep, the quality of the sleep and the consistency of the sleep on the cognitive ability and academic performance. Mantua and Simonelli (2019) discussed the possibility of experiencing poor thinking because of excessive and inadequate sleep periods. Moreover, as Hershner and Chervin (2014) observed, the lack of sleep patterns and sleep deprivation are most likely to cause excessive sleepiness during the day in college students, which further contributes to the importance of healthy sleep patterns in the given population.

In sum, all the literature shows that the Quality of Sleep and sleep inertia are of great importance as factors of sleep wellness that influence its cognitive functioning, academic performance, and daily activities. However, little research has explored such variables individually and collectively, particularly about the disparity in gender among students, and therefore, a need exists to carry out additional studies in this area.

3. METHODS

3.1 Research Design

The present research was founded on both cross-sectional and quantitative research designs. It was decided that the quantitative design was appropriate because the study presupposed the measurement of the sleep quality and sleep inertia by using some standard numerical scales. The cross-sectional design provided the chance to measure

these variables at a single point in time and examine their relationship with one another among students.

3.2 Participants

The study population consisted of 108 students, 65 males and 43 females. The respondents were aged 19-25 years, and this is a youthful adult group of students. Only those who completed the questionnaires to the last were taken into the actual analysis.

3.3 Sampling Technique

A suitable sampling technique was used to select the subjects of the research. The justification behind the use of this method is the fact that it was not difficult to access and get access to students during the data collection period. Convenience sampling is usually used in student-based research, and it is suitable for descriptive and exploratory research.

3.4 Instruments

Pittsburgh Sleep Quality Index

The Quality of Sleep was measured with the use of the PSQI. PSQI is a self-report questionnaire planned to assess the Quality of Sleep in the last month; it is a standardized questionnaire. It evaluates various sleep-related variables such as duration of sleep, sleep latency, sleep disturbances, and daytime performance. The lower the PSQI, the better the sleep quality and the higher the number, the poor sleep quality.

Sleep Inertia Scale

Sleep inertia was measured on the Sleep Inertia Scale (SIS). The scale also employs a scale which indicates the level of grogginess, diminished alertness and impairment of mental and physical functioning, immediately after one wakes up. Higher scores on the scale imply higher sleep inertia. The two tools are also widespread in the studies of sleep and are considered to be suitable in the context of measuring the Quality of Sleep and sleep inertia among students.

3.5 Procedure

The self-report questionnaires were used to collect the data. Before data collection, the participants were informed of the objective of the study. All the participants provided their consent, and it was all voluntary. No personally identifiable data was gathered, and the responses were confidential. The participants were told that they could discontinue the research whenever they wanted without consequences.

3.6 Statistical Analysis

Descriptive and inferential statistics were utilized in the collection of the data. The mean, standard deviation, minimum, maximum, frequency, and percentage were the descriptive statistics applied in the description of the demographic characteristics, sleep quality scores, and sleep inertia scores. Data distribution was evaluated with the help of the Shapiro-Wilk and Kolmogorov-Smirnov tests of normality. To determine the relationship that exists between sleep inertia and sleep quality, the Pearson product-moment correlation and the Spearman rank correlation were employed. These correlation analyses were used to find the nature and intensity of the relationship between the variables of the study.

4. RESULTS

The results of the current study are delivered in the form of descriptive statistics, the tests of normality, and correlation analysis to obtain answers to the research questions.

4.1 Demographic Characteristics of the Participants

The total number of participants (students) was 108, 65 of them were males (60.2%), and 43 of them were females (39.8%). The participants of the sample were aged between 19 and 25, with the mean age of 21.68 years, and standard Deviation (SD = 2.34). The other areas which attracted the sample included Rajasthan (33.3%), Gujarat (35.2%), and Chandigarh (31.5%). The demographic features of the participants are presented in Table 1. The sample was formed by 108 students (male and female) in various cities and aged 18-25.

Table 1: Demographic Characteristics of the Participants (N = 108)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	65	60.2
	Female	43	39.8
Age (years)	18	13	12.0
	19	15	13.9
	20	8	7.4
	21	11	10.2
	22	17	15.7
	23	14	13.0
	24	15	13.9
	25	15	13.9
City	Chandigarh	34	31.5
	Gujarat	38	35.2
	Rajasthan	36	33.3

The distribution of the gender of the participants is depicted in Figure 1. As indicated in the figure, the sample was composed of male students in a greater percentage than female students.

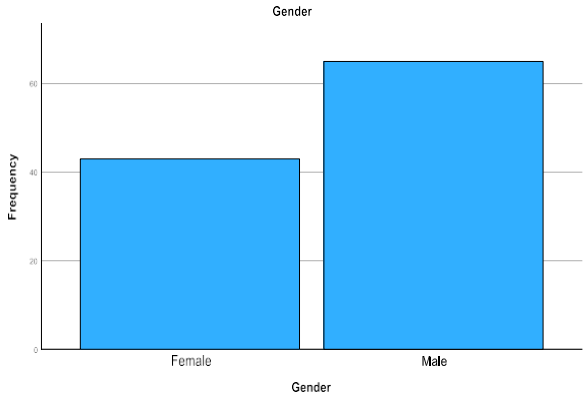

Figure 1: Bar Chart Showing Gender Distribution of Participants

4.2 Descriptive Statistics of Sleep Quality and Sleep Inertia

Descriptive statistics were used to compute the Quality of Sleep and sleep inertia of the individuals. The mean PSQI of 12.19 (SD = 5.50) demonstrated the difference in the level of sleep quality among the students. The sample had moderate scores on the SIS, with a mean of 29.36 (SD = 9.55). Table 2 presents the descriptive statistics of the variables age, Quality of Sleep, and sleep inertia of the participants.

Table 2: Descriptive Statistics of Age, Sleep Quality and Sleep Inertia Scores

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
Age	108	21.68	22.00	2.336	18	25
Sleep Quality (PSQI)	108	12.19	12.00	5.50	4	21
Sleep Inertia (SIS)	108	29.36	29.50	9.55	12	45

The distribution of the individuals' sleep quality scores is shown in Figure 2. There is variation in the levels of sleep quality, as indicated by the distribution of scores across the range.

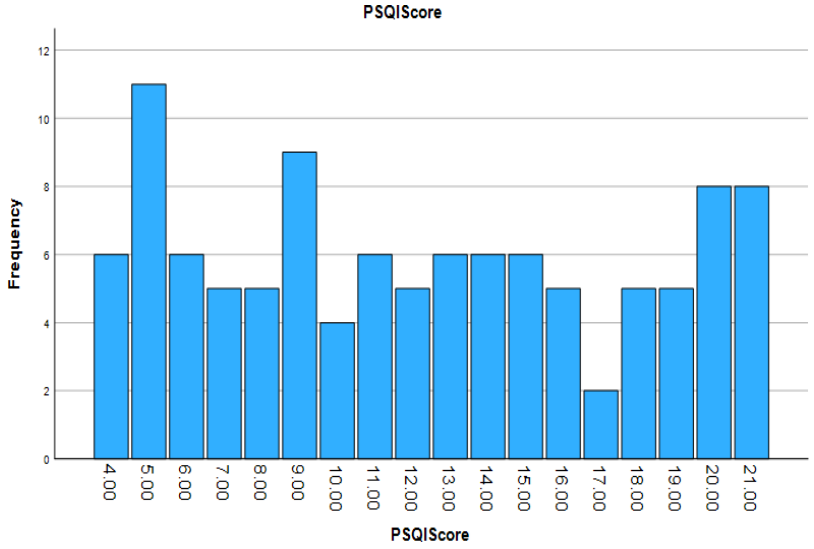

Figure 2: Distribution of Sleep Quality Scores (PSQI)

4.3 Tests of Normality

Normal tests were conducted to aid in the testing of the distribution of scores in sleep quality and sleep inertia. The Kolmogorov-Smirnov and Shapiro-Wilk tests revealed that PSQI and the SIS scores were not normally distributed ($p < .05$). Age and gender variables were also observed to have the same deviation. Table 3 presents the results of the Kolmogorov-Smirnov test and the Shapiro-Wilk test of normality of the study variables. The results have demonstrated that the age, Quality of Sleep, sleep inertia and gender distributions were significantly non-normal.

Table 3: Tests of Normality for Study Variables (N = 108)

Variable	Kolmogorov–Smirnov Statistic	df	Sig.	Shapiro–Wilk Statistic	df	Sig.
Age	.133	108	< .001	.917	108	< .001
Sleep Quality (PSQI)	.107	108	.004	.931	108	< .001
Sleep Inertia (SIS)	.112	108	.002	.949	108	< .001
Gender	.393	108	< .001	.621	108	< .001

Figure 3 shows the distribution of the sleep inertia scores of the participants. The value shows that there is a difference in the levels of sleep inertia among the sample.

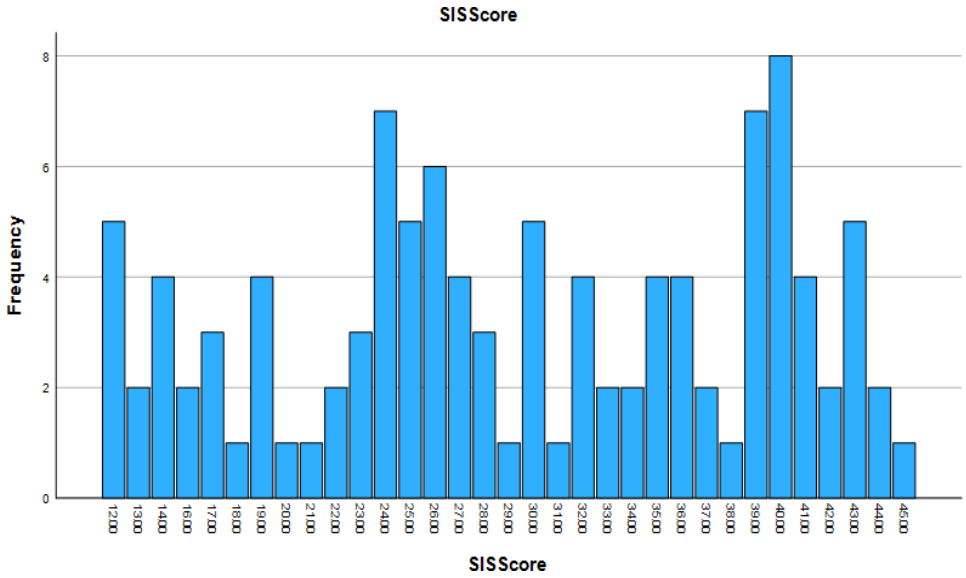

Figure 3: Distribution of Sleep Inertia Scores (SIS)

4.4 Relationship Between Sleep Quality and Sleep Inertia

The correlation tests were used to examine the relationship between sleep quality and sleep inertia. Pearson product-moment correlation revealed the existence of a weak and non-significant positive correlation between PSQI and SIS scores (r =. 063, p = .520). Similarly, the Spearman rank correlation between the sleep quality and sleep inertia generated weak and non-significant (0.566) results.

These findings suggest that no significant relationships were found between poor sleep quality levels and the levels of sleep inertia in the current sample.

4.5 Relationship of Study Variables with Demographic Factors

The correlation analysis aimed to determine the linkage between age and gender, which are demographic factors, and sleep inertia and quality. Pearson correlation data showed no significant difference in the Quality of Sleep (r = -.045, p >.05) or sleep inertia (r = -.005, p =.05). On the same note, there was no significant correlation of gender with sleep quality (r =.024, p >.05) or sleep inertia (r = -.057, p >.05).

The rank correlation analysis by Spearman did not show any significant age-sleep inertia (012, p >.05) or age-sleep quality (052, p >.05) relationship. Also, gender did not have any significant correlation with sleep inertia (0.15 = -.054, p >.05) or sleep quality (0.15 =.022, p >.05). This implies that both gender and age were not significantly related to either sleep inertia or sleep quality of the current group.

5. DISCUSSION

The research was directed towards investigating sleep quality and sleep inertia in male and female students and determining the correlation between the two. Based on the results of the study, it can be seen that the students have mentioned different sleep quality rates and sleep inertia rates and hence demonstrated that there are sleep-related issues amongst the students. It has been stated on numerous occasions in the existing literature that sleep issues might potentially lead to titanic consequences on the daytime performance and the general quality of life, especially in the case of young adults (Szentkirályi et al., 2009).

The descriptive findings showed that the subjects attained a moderate outcome of low sleep quality and sleep inertia. The low Quality of Sleep has been largely blamed as the cause of poor cognitive functioning, alertness and emotional problems. The research also claims that the Quality of Sleep, which is changing daily, could influence the health-related quality of life and functional outcomes (Carlozzi et al., 2022). The abnormal sleep patterns and the stress in a group of students in relation to academic issues may also contribute to the disruption of sleep patterns and predispose the students to sleep-related problems.

The outcomes of the correlation of sleep quality and sleep inertia used in the current study were non-significant and weak. This finding implies that there is not always a high correlation between poor sleep quality and sleep inertia, though it is observed to co-exist. This is also present in other previous investigations and signifies that the sleep inertia is capable of being affected by numerous factors other than the Quality of Sleep, such as sleep debt, circadian rhythms, and individual variability in sleep physiology (Van Dongen et al., 2003). Other than that, there is sleep inertia, a temporary, transitory state following waking up after sleep and sleep quality, a long experience of sleep.

The differences between the male and female students were documented considering the gender in terms of sleep experiences. The previous studies have shown that sleep

behaviour and sleeping disorders are likely to vary according to gender; females complain more of poor sleep quality (Tsai and Li, 2004). Biological and psychological factors, such as the effects of hormones and stress reactions, can be used to determine such differences. The neurobiological processes of sleep disorders have also been quoted as the potential causes of gender differences in sleep performance (Van Someren, 2021).

The findings of the present study are mostly consistent with the literature on the development of the negative outcomes of sleeping disturbance in terms of cognitive and mental health outcomes. The effect and cause of degradation of attention, memory, and executive functioning have been stated to be the lack of sleep and sleeping disorders (Khan and Al-Jahdali, 2023). In addition, anxiety and depression were also listed as such mental problems that can be attributed to irregular sleeping patterns, and this fact again proves the importance of healthy sleep patterns (Palagini et al., 2022).

On the whole, it can be concluded that the Quality of Sleep and sleep inertia are convenient variables of sleep health and correlation may be complex and require many variables that may interact with one another. In agreement with the studies above, during adolescence and young adulthood, sleep issues could have long-term effects on daily activities as well as health (O'Brien, 2011). In order to have a more ideal view of sleep inertia and sleep quality among students, the research can be improved in the future by including other variables, e.g. sleep duration and circadian preference.

6. CONCLUSION

The recent study examined the association of two important parameters of sleep and examined the Quality of Sleep and sleep inertia among male and female students. The findings have revealed that there was no similarity between the sleep inertia and the quality of the students, thus causing the implication that sleeping problems exist within the student population. The results show that the two variables affect the performance of students after sleep and their daily performances on their part, even though the correlation between the Quality of Sleep and sleep inertia was found to be moderately poor and insignificant. The other observation made in the paper was the difference between the sleep experience of both male and female students, and the analysis of the sleep patterns should consider the gender specific factors. The general findings imply the significance of sleep quality as the variable is of high priority in alertness, cognition, and emotions after waking. In practice, the results suggest that the students require more attention in the areas of healthy sleeping behaviour, like routine sleeping habits and the duration of sleeping, to facilitate them to carry out their daily activities and schoolwork. It is also not without its points of contribution, despite the limitations of the study also being present. It is also small in terms of sample size, and the self-report measures were obtained, which would restrict extrapolation of findings. Moreover, the age group of the subject did not cover other age groups in a comprehensive manner. It is the future whereby bigger and more diverse samples should be used, objective measures of sleep, and other variables, e.g. length of sleep and sleep habits, should be considered in an attempt to know more about the quality and sleep inertia of sleep among students.

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