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Correlational Study of Perceived Stress, Sleep Quality, and Ergonomic Factors among Office Workers

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ABSTRACT

Office workers today are increasingly struggling with stress and poor sleep; poor ergonomic conditions are a big reason for this. Workspaces that aren't designed well can interrupt a person's circadian rhythm, increasing stress levels and worsening sleep quality. This study collected data from 73 office workers in India through the Perceived Stress Scale, BOSSA Time-Lapse survey, and Pittsburgh Sleep Quality Index. The results showed that younger workers and those with less experience struggled more with stress and sleep, probably because they're not yet great at handling work pressures. People in consultancy jobs seemed to have it worse than those in IT, reporting higher stress levels and worse ergonomic conditions. A strong link was found between stress and bad sleep; poor ergonomics also seemed to worsen sleep quality. These findings point to the need for offices to be more ergonomic to keep employees healthy and productive.

1. Introduction

In today's modern office environment, work and health are very closely linked to each other. Ergonomics are a big part of an employee's life, as they govern how comfortable and productive a person will be in their place of work. If the ergonomics of office space are not up to par, it could lead to various health problems, including a disrupted circadian rhythm, which can affect sleep quality and overall well-being (Roenneberg & Merrow, 2016).

Large numbers of people work in corporate sectors in India. Most office workers spend the majority of their time seated on a desk in front of their computers, which prolongs their exposure to blue light and even bad posture. This is why the ergonomics of an office environment are essential as they are where office workers spend their time working for the majority of the day. If these places are not adequately supplied with ventilation, natural daylight, comfortable chairs, etc, it could lead to a multitude of issues such as increased discomfort, increased absenteeism, decreased productivity, higher stress levels, and poor sleep quality.

A study showed that almost 80% of their respondents reported muscular and/or physical ailments due to poor ergonomics and only 18.8% of respondents had formal training on the topic of ergonomics (Chandwani et al., 2019). These findings highlight the need for good

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ergonomics and awareness, as such issues that cause physical pain, could hurt employee productivity and cause sleep issues, negatively impacting their overall health. Hence, it is essential to study the need for good ergonomics in office spaces, so that the body's circadian rhythm is not negatively affected.

1.1. Perceived Stress

Stress is a state of worry or mental tension caused by challenging circumstances and is a common part of any human's life. Stress can be seen to appear in 2 different forms - eustress and distress. Eustress, or beneficial stress, is a type of stress that stems out of a challenging but attainable task. Eustress is thought to have a positive impact on an individual’s health, performance, motivation, and overall well-being.

On the other hand, distress is harmful stress that stems from overwhelming or negative experiences. Distress is also described as being in a state of extreme suffering and pain, just going to show how the effects of distress can be detrimental to a person’s mental health.

The General Adaptation Syndrome (GAS) theory by Hans Selye (Selye, 1946) outlines the mind’s reaction to stress in 3 stages: alarm, resistance, and exhaustion. The first stage, the alarm stage, refers to the mind’s initial response to a stressful situation. This initiates the fight or flight response, which is a way your mind protects you by preparing you to either run away from the issue or protect yourself from it. The major symptoms of this stage are increased heart rate, the release of cortisol (a type of stress hormone), and a boost of adrenaline (Higuera, 2018). The second stage is the resistance stage, in which the mind begins to return the body to pre-alarm stage levels. In normal situations, when the stressful situation has been mitigated, the body will lower its heart rate, and reduce the secretion of cortisol and adrenaline. However, if a person stays in this stressful situation for too long, their body will never receive an indication to return to pre-alarm stage levels. This will cause cortisol and adrenaline to be secreted in high amounts and an elevated heart rate. This can cause disturbances in digestion, immunity, and reproduction, but most notably a person’s circadian rhythm and sleep cycle (Mariotti, 2015). The last stage, exhaustion, is caused by chronic or prolonged stress. The body enters this stage due to having to endure stress without any breaks to recover which drains a person’s physical and mental energy. This causes the body to reach a point where it can no longer deal with the sheer amount of stress, leading to a sense of burnout and fatigue.

Workplace pressure exerted by supervisors and/or colleagues often leads to employees experiencing distress. For instance, a study revealed that work-related pressure can lead to health issues, both physically and mentally (Alshammari et al., 2023). Additionally, work stress leads to approximately a 10 to 40 percent increase in risk of cardiovascular-related diseases (Kivimäki & Kawachi, 2015). To avoid reaching the exhaustion stage, the workplace needs to ensure employees are not constantly bombarded with tense situations, and that work is spread out. Introducing stress management programmes have also proved to be useful (Testa et al., 2020).

1.2. Sleep Quality

Sleep, an essential part of every person’s life, helps support growth, development, and the formation of long-term memories. Hence, getting an adequate amount and quality of sleep is essential and studies have proven that the quality of sleep attained is more important than its quantity (Kohyama, 2021). Sleep quality is closely related to the circadian rhythm. The circadian rhythm is the body's 24-hour biological clock that controls mood, physical state, and behavioral tendencies. If the circadian rhythm is somehow disturbed, it could lead to a plethora of detrimental effects including excessive daytime sleepiness, mood swings, and decreased alertness. Hence, poor sleep quality inadvertently leads to a poor life quality (Lee et al., 2021). The circadian rhythm is entrained to a day's cycle using external stimuli, most notably light. Light is a stimulus that can change our circadian rhythms and consequently our routines. Simply changing the amount and time of sunlight exposure can shift our natural rhythms. Figueiro et al. (2017) found that effective exposure to natural daylight in offices leads to improved sleep quality and reduced depression among office workers.

Other factors in the workplace can negatively impact the sleep cycle and circadian rhythm, such as an unbalanced diet, excessive stress, etc. Poor sleep affects office workers' health, decision-making, and emotional control. This sleep deprivation could lead to lower productivity rates and increased health risks (Chen et al., 2017). Hence, improving workplace conditions that do not disrupt employees' circadian rhythm is essential for health and work performance.

1.3. Ergonomic Factors

Ergonomics involves designing the workplace to fit the workers' needs, promoting good well-being, comfort, and productivity. In office spaces, some ergonomic factors are lighting, noise levels, privacy, air quality, temperature, individual space, etc. These factors are important as they may impact employees' mental and physical well-being. McKeown (2017) showed that ergonomically designed office spaces improve health, productivity, and overall wellness, hence highlighting the need for such offices. Studies show that office environments can cause employees to feel stressed (Awada et al., 2022). Poor ergonomics can also lead to employees suffering from musculoskeletal disorders (Mohammadipour et al., 2018).

For example, comfort and individual space are essential so that employees can work without any physical strain. Privacy is needed so that employees feel safe and secure, giving them some peace of mind. Proper lighting is key to ensure that employees do not experience eye strain, and have a good sleep-wake cycle. Low noise levels ensure that employees can work without any distractions, which promotes productivity.

Good air quality and temperature are very important in the workplace. Adequate ventilation makes sure that employees are not exposed to irritants or air pollution, which could impact their health. For example, Palacios et al. (2021) conducted a study that revealed that poor air quality in office environments can lead to a decrease in productivity. Additionally, ensuring the workplace is at an optimal temperature helps boost productivity. Choosing the optimal temperature is dependent upon the workplace's employees and location. However, a temperature of approximately 17°C was found to be optimum for employee performance (Fan & Zhu, 2023).

2. Methodology

2.1. Aim

To study the relationship between perceived stress, sleep quality, and ergonomic factors among office workers.

2.2. Objectives

1. To explore the difference in perceived stress levels among office workers
2. To explore the difference in quality of sleep among office workers
3. To explore the difference in ergonomic factors among office workers
4. To explore the relationship between perceived stress, sleep quality, and ergonomic factors

2.3. Hypothesis

H1 = There is a substantial difference present between age groups on the dependent variable of perceived stress.

H2 = There is a substantial difference present between age groups on the dependent variable of Pittsburgh Sleep Quality Index (PQSI) scores.

H3 = There is a substantial difference present between age groups on the dependent variable of ergonomic assessment.

H4 = There is a substantial difference present between the onsite and hybrid working modes on the dependent variable of perceived stress.

H5 = There is a substantial difference present between the onsite and hybrid working modes on the dependent variable of Pittsburgh Sleep Quality Index (PQSI) scores.

H6 = There is a substantial difference present between the onsite and hybrid working modes on the dependent variable of ergonomic assessment.

H7 = There is a substantial difference present between the IT and consultant work sectors on the dependent variable of perceived stress.

H8 = There is a substantial difference present between the IT and consultant work sectors on the dependent variable of Pittsburgh Sleep Quality Index (PQSI) scores.

H9 = There is a substantial difference present between the IT and consultant work sectors on the dependent variable of ergonomic assessment.

H10 = There is a substantial difference present between years as a working professional on the dependent variable of perceived stress.

H11 = There is a substantial difference present between years as a working professional on the dependent variable of Pittsburgh Sleep Quality Index (PQSI) scores.

H12 = There is a substantial difference present between years as a working professional on the dependent variable of ergonomic assessment.

H13 = There is a substantial difference present between working days in a week on the dependent variable of perceived stress.

H14 = There is a substantial difference present between working days in a week on the dependent variable of Pittsburgh Sleep Quality Index (PQSI) scores.

H15 = There is a substantial difference present between working days in a week on the dependent variable of ergonomic assessment.

H16 = There is a correlation between the variables of perceived stress, Pittsburgh Sleep Quality Index (PQSI) scores, and ergonomic assessment.

2.4. Research Design

The present study made use of a correlational research design to research the relationship between ergonomic factors, perceived stress, and sleep quality among office workers. The correlational design was chosen to identify associations between these variables and how they are connected. Data was collected through an online Google form.

2.5. Sample and Sampling Technique

Responses in the present study were taken from 73 office desk workers, with there being 44 male respondents and 29 female respondents who completed the questionnaire.

The study employed snowball sampling, a non-probability sampling technique where present participants recruit future possible participants through their contacts. This method was chosen due to its effectiveness in reaching a broad and diverse group of office workers across different industries in India.

2.6. Instrumentation

Three standardized questionnaires were used to measure the key variables of the study:

1. Pittsburgh Sleep Quality Index: The Pittsburgh Sleep Quality Index, created by Buysse et al. (1989), was employed to assess sleep quality. This questionnaire consists of 19 self-reported items. These items belong to 7 sub-categories, such as subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Additionally, five items in the questionnaire have to be rated by the respondent's roommate or bed partner. These items are not scored. PQSI has a high internal reliability of α=0.83.
2. Perceived Stress Scale: The perceived stress scale, created by Cohen et al. (1983), was used to measure employees' perceptions of their stress. The scale consists of 10 items, scored on a 5-point Likert scale ranging from 0 (Never) to 4 (Very Often). This scale is reliable with α ranging between 0.78 and 0.91. On 4 items (questions 4,5,7, and 8) a reverse scoring system is utilized with 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0. Scores on this scale range from 0 to 40 with 0-13 indicating low stress, 14-26 indicating moderate stress, and 27-40 indicating high perceived stress.
3. BOSSA Time-Lapse survey (BOSSA, n.d.): This 31-item questionnaire is utilized for assessing the ergonomic factors. The items in the questionnaire assess employees' comfort with office spaces and individual spaces, indoor air quality and comfort with the indoor temperature, noise distraction and privacy, visual comfort, personal control and building imaging, and overall satisfaction. The questionnaire uses a 7-point Likert scale.

2.7. Data Collection Procedure

A survey was created using Google Forms and the data was procured from office workers in the Delhi NCR region, Mumbai, and Bangalore.

2.8. Ethical Considerations

Consent was sought from the participants. Confidentiality of responses was maintained. Instructions regarding what the study is about and how to fill out the questionnaires were explicitly stated in the Google Form.

3. Results

Table 1. The ANOVA values for age and perceived stress.

		n	*M*	*df*	*F*	*p*	*η2*
Age	22 - 25	12	23.17	5	4.63	.001	0.27
	26 - 30	15	18.67				
	31 - 35	8	17.88				
	36 - 40	10	17.4				
	41 - 45	11	17.27				
	46+	14	14.29				

According to Table 1, which looks at the mean difference between age and perceived stress scores by using ANOVA, it was revealed that the *$p<0.05$ ($p=0.001$)*. This implies that there is a statistically substantial difference between the variables of age and perceived stress. The value of η2 is *0.27*, indicating a large effect size. Thus H1, which states that a profound difference is present between the ages of office workers on the dependent variable of perceived stress among office workers was accepted.

Table 2. The ANOVA values for age and Pittsburgh Sleep Quality Index (PSQI) scores.

		n	M	df	F	p	η2
Age	22 - 25	12	11.5	5	2.33	.052	0.15
	26 - 30	15	13.4				
	31 - 35	8	9.63				
	36 - 40	10	7.9				
	41 - 45	11	8.09				
	46+	14	7.71				

According to Table 2, which looks at the mean difference between age and Pittsburgh Sleep Quality Index scores by using ANOVA, it was revealed that the *$p>0.05$ ($p=0.052$)*. This implies that there is no significant difference between the variables of age and Pittsburgh Sleep Quality Index scores. The value of η2 is *0.15*, indicating a large effect size. Thus H2, which states that a substantial difference is present between ages on the dependent variable of Pittsburgh Sleep Quality Index (PQSI) scores was rejected.

Table 3. The ANOVA for age and ergonomic assessment

		n	*M*	*df*	*F*	*p*	*η2*
Age	22 - 25	12	107.83	5	6.78	<.001	0.35
	26 - 30	15	98.87				
	31 - 35	8	108.5				
	36 - 40	10	115.9				
	41 - 45	11	122				
	46+	14	136				

According to Table 3, which looks at the mean difference between age and ergonomic assessment scores by using ANOVA, it was revealed that *$p<0.05$ ($p<0.001$)*. This indicates that there is a statistically significant difference between the two variables of age and ergonomic assessment. The value of η2 is *0.35*, which indicates a large effect size. On average, older people had higher ergonomic assessment scores, indicating greater satisfaction with their office space. Thus H3, which states that a substantial difference is present between ages on the dependent variable of ergonomic assessment, is accepted.

Table 4. The t-test values for working mode and perceived stress

		n	*Mean*	*SD*	*t*	*p*	*Cohen's d*
Perceived Stress	On-site working	30	19.7	5.45			
					2.19	.032	0.54
	Hybrid working	36	16.89	4.95			

Significant mean differences were revealed in the findings with *t=-2.19, p<0.05 (p=0.032).* The findings showed that there was a significant mean difference between on-site worker sample scores *(M=19.7, SD=5.45)* and hybrid worker sample scores *(M=16.89, SD=4.95)*. The value of Cohen's d was *0.54* which indicates a medium effect size. On average, onsite workers had higher perceived stress scores than hybrid workers, indicating higher stress levels. Thus H4, which states that a substantial difference is present between the onsite and hybrid working modes on the dependent variable of perceived stress was accepted.

Table 5. The t-test values for working mode and Pittsburgh Sleep Quality Index (PSQI) scores

		n	*M*	*SD*	*t*	*p*	*Cohen's d*
PSQI Scores	On-site working	30	11.1	7			
					1.3	.197	0.32
	Hybrid working	36	9.25	4.44			

Non-significant mean differences were revealed in the findings with *t=-1.3, p>0.05 (p=0.197).* The findings showed that there was no significant mean difference between onsite worker sample scores *(M=11.1, SD=7)* and hybrid worker sample scores *(M=9.25, SD=4.44).* The value of Cohen's d was *0.32* which indicates a small effect size. On average, on-site workers had higher PSQI scores than hybrid workers, indicating poorer sleep quality. Thus H5, which states that a substantial difference is present between the onsite and hybrid working modes on the dependent variable of Pittsburgh Sleep Quality Index (PSQI) scores was rejected.

Table 6. The t-test values for working mode and ergonomic assessment

		n	*Mean*	*SD*	*t*	*p*	*Cohen's d*
Ergonomic Assessment	On-site working	30	110.73	19.27			
					-1.45	.152	0.36
	Hybrid working	36	118.69	24.37			

Non-significant mean differences were revealed in the findings with *t=-1.45, p>0.05 (p=0.152)*. The findings showed that there was no significant mean difference between on-site worker sample scores *(M=110.73, SD=19.27)* and hybrid worker sample scores *(M= 118.69, SD=24.37)*. The value of Cohen's d was *0.36* which indicates a small effect size. Thus H6, which states that a substantial difference is present between the onsite and hybrid working modes on the dependent variable of ergonomic assessment was rejected.

Table 7. The t-test values for the work sector and perceived stress.

		Frequency	*Mean*	*SD*	*t*	*p*	*Cohen's d*
Perceived Stress	IT services	24	15.67	5.04			
					2.49	.017	0.75
	Consultancy	20	20.15	6.88			

Table 7 revealed significant mean differences between perceived stress and work sector, *t=2.49, p<0.05 (p=0.017)*. The value of Cohen's d was *0.75* which indicates a large effect size. On average, on-site workers had higher perceived stress scores than hybrid workers, indicating higher stress levels. Thus H7, which states that a substantial difference is present between the IT and consultant work sectors on the dependent variable of perceived stress was accepted.

Table 8. The t-test values for the work sector and Pittsburgh Sleep Quality Index (PSQI) scores.

		Frequency	*Mean*	*SD*	*t*	*p*	*Cohen's d*
PSQI Scores	IT services	24	7.58	3.97			
					2.56	.014	0.77
	Consultancy	20	11.7	6.59			

Table 8 revealed significant mean differences in the Pittsburgh Sleep Quality Index scores according to work sector, $t=2.56$, $p<0.05$ $(p=0.014)$. The value of Cohen's d was *0.77* which indicates a large effect size. On average, workers in the consultancy sector had higher PSQI scores than workers in the IT sector. Thus H8, which states that a substantial difference is present between the IT and consultant work sectors on the dependent variable of Pittsburgh Sleep Quality Index (PSQI) scores was accepted.

Table 9. The t-test values for the work sector and ergonomic assessment.

		Frequency	*Mean*	*SD*	*t*	*p*	*Cohen's d*
Ergonomic Assessment	IT services	24	126.96	17.92			
					-3.46	.001	1.05
	Consultancy	20	107.35	19.63			

Table 9 revealed a significant mean difference in ergonomic assessment according to work sector, $t=-3.46$, $p<0.05$ $(p=0.001)$. The value of Cohen's d was *1.05* which indicates a large effect size. On average, workers in the IT sector had higher ergonomic assessment scores than workers in the consultancy sector. Thus H9, which states that a substantial difference is present between the IT and consultant work sectors on the dependent variable of ergonomic assessment was accepted.

Table 10. The ANOVA for years as a working professional and perceived stress.

		n	*M*	*df*	*F*	*p*	*η2*
Years as a working professional	0 - 2 years	16	20.19	5	2.28	.057	0.15
	3 - 6 years	15	18.93				
	7 - 10 years	7	17.29				
	11 - 15 years	13	17.92				
	16 - 20 years	13	17.54				
	21+ years	9	13.22				

According to Table 10, which looks at the mean difference between years as a working professional and perceived stress scores by using ANOVA, it was revealed that the $p>0.05$ $(p=0.057)$. This indicates that there is no significant difference between the two variables of age and ergonomic assessment. The value of $\eta 2$ is *0.15*, which indicates a large effect size. On average, employees with fewer years as working professionals had higher perceived stress scores, indicating higher stress levels. Thus H10, which states that a substantial difference is present between years as a working professional on the dependent variable of perceived stress was rejected.

Table 11. The ANOVA for years as a working professional and Pittsburgh Sleep Quality Index (PSQI) scores.

		n	*M*	*df*	*F*	*p*	*η2*
Years as a working professional	0 - 2 years	16	11.75	5	1.46	.216	0.1
	3 - 6 years	15	11.47				
	7 - 10 years	7	10.43				
	11 - 15 years	13	7.54				
	16 - 20 years	13	8.23				
	21+ years	9	7.89				

According to Table 11, which looks at the mean difference between years as a working professional and Pittsburgh Sleep Quality Index scores by using ANOVA, it was revealed that the *p>0.05 (p=0.216)*. This indicates that there is no significant difference between the two variables of years as a working professional and sleep quality. The value of η2 is *0.1*, which indicates a moderate effect size. On average, employees with fewer years as working professionals had higher PSQI scores, indicating poorer sleep quality. Thus H11, which states that a substantial difference is present between years as a working professional on the dependent variable of Pittsburgh Sleep Quality Index (PSQI) scores was rejected.

Table 12. The ANOVA for years as a working professional and ergonomic assessment

		n	*M*	*df*	*F*	*p*	*η2*
Years as a working professional	0 - 2 years	16	115.13	5	6.49	<.001	0.33
	3 - 6 years	15	98.33				
	7 - 10 years	7	102				
	11 - 15 years	13	118.85				
	16 - 20 years	13	127.85				
	21+ years	9	135.44				

Table 12, which looks at the mean difference between years as a working professional and ergonomic assessment by using ANOVA, revealed that the *p<0.05 (p<0.001)*. This indicates that there is a statistically significant difference between the two variables of working days and ergonomic assessment. The value of η2 is *0.33*, which indicates a large effect size. Thus H12, which states that a substantial difference is present between years as a working professional on the dependent variable of ergonomic assessment was accepted.

Table 13. The ANOVA for working days in a week and perceived stress

		n	*M*	*df*	*F*	*p*	*η2*
Working days in a week	2 - 3 days	16	17.81	3	0.62	.603	0.03
	4 - 5 days	33	18.36				
	More than 5 days	16	18.81				
	Remote working	7	15.71				

Table 13, which looks at the mean difference between working days in a week and perceived stress by using ANOVA, revealed that the *p<0.05 (p=0.603)*. This indicates that there is no significant difference between the two variables of working days and ergonomic assessment. The value of η2 is *0.03*, which indicates a small effect size. Thus H13, which states that a substantial difference is present between working days in a week on the dependent variable of perceived stress, was rejected.

Table 14. The ANOVA for working days in a week and Pittsburgh Sleep Quality Index (PQSI) Scores

		n	*M*	*df*	*F*	*p*	*η2*
Working days in a week	2 - 3 days	16	9.31	3	1.64	.188	0.07
	4 - 5 days	33	9.06				
	More than 5 days	16	12.5				
	Remote working	7	8				

Table 14, which looks at the mean difference between working days in a week and Pittsburgh Sleep Quality Index scores by using ANOVA, revealed that the *p>0.05 (p=0.188)*. This indicates that there is no significant difference between the two variables of working days and ergonomic assessment. The value of η2 is *0.07*, which indicates a medium effect size. Thus H14, which states that a substantial difference is present between working days in a week on the dependent variable of Pittsburgh Sleep Quality Index (PSQI) scores was rejected.

Table 15. The ANOVA for working days in a week and ergonomic assessment

		n	*M*	*df*	*F*	*p*	*η2*
Working days in a week	2 - 3 days	16	128.56	3	3.75	.015	0.14
	4 - 5 days	33	108.06				
	More than 5 days	16	116				
	Remote working	7	123.14				

Table 15, which looks at the mean difference between working days in a week and ergonomic assessment by using ANOVA, revealed that the *p<0.05 (p=0.015).* This indicates that there is a noteworthy difference between the two variables of working days and ergonomic assessment. The value of η2 is *0.14*, which indicates a large effect size. Thus H15 which states that a considerable difference is present between working days in a week on the dependent variable of ergonomic assessment was accepted.

Table 16. The correlation between stress, sleep quality, and ergonomic assessment.

		Perceived Stress	*Psqi Scores*	*Ergonomic Assessment*
Perceived Stress	Correlation	1	0.35	-0.23
	P		.002	.049
Psqi Scores	Correlation	0.35	1	-0.24
	P	.002		.043
Ergonomic Assessment	Correlation	-0.23	-0.24	1
	P	.049	.043	

Findings from Table 16 revealed that there is a significant positive correlation between perceived stress and PSQI scores (r=0.35, p<0.05), and between perceived stress and ergonomic assessment, a substantial negative correlation was found (r=-0.23, p<0.05). There is also a significant negative correlation between PSQI scores and ergonomic assessment (r=-0.24, p<0.05).

4. Discussion

The current study which aimed to look at the correlation between sleep quality, ergonomic assessment, and perceived stress among office workers found that there was a significant positive correlation between sleep quality and perceived stress, a notable negative correlation was found between sleep quality and ergonomic assessment; perceived stress and ergonomic assessment also reported a significant negative correlation. This is corroborated by a study conducted by Choi et al. (2018) in which it was found that office workers with a mid-high household income had more stress awareness with a shorter sleep duration. More specifically, salaried workers who had a sleep duration of 5 hours or less had a higher chance for higher stress awareness. Hence, these workers need to get sufficient sleep to manage high stress levels. Furthermore, Güngördü et al. (2023) also conducted a study in which it was found that an increase in stress came with an increased probability of worse sleep quality, by 2.59 times, and older participants had a lower risk of poor sleep.

Ergonomic factors tend to contribute to employees' overall satisfaction with their workspace. Studies have found that office workers have commonly reported lower back problems (Robertson et al., 2017) and stress levels, particularly moderate and high stress, tend to increase the chances of lower back pain among workers (Vinstrup et al., 2020). This can be attributed to the lack of proper furnishings, such as chairs, desks, equipment, etc. Furthermore, a study carried out by Coelho et al. (2015) found that lack of satisfaction with a job is correlated with musculoskeletal pain, particularly in the upper body, and the existence of postural ergonomic mismatches tends to be correlated with the prevalence of job insecurity. Moreover, the location of the workstation, whether it is in an open-plan office or a small room, showed a significant negative correlation with social support and leadership quality.

Ergonomics can also be seen to affect sleep quality. As shown through the results of the present study, there is a significant negative correlation between ergonomic factors and sleep quality. This is further supported by a study carried out by Figueiro et al., 2017, which revealed that employees in areas with access to daylight had improved sleep quality. This could be attributed to the fact that these workers would have less access to daylight, leading to their circadian rhythm not being aligned with the light-dark cycle.

Furthermore, the present study found that younger office workers tended to have higher perceived stress scores, indicating higher levels of stress. The youngest age bracket studied (22-25) showed the highest mean perceived stress score of 23.17. However, the highest age bracket studied (46+) showed the lowest mean perceived stress score of 14.29. The ages in between showed a general decrease in mean scores, however, the difference between these middle age groups was minuscule. This finding contradicts previous studies, such as the study conducted by Osmanovic-Thunström et al. (2015) which found that perceived stress increases with age in adults. This discrepancy in findings may be attributed to differences in the work culture present in Indian offices and offices in other nations. Moreover, this difference could be seen as a result of the different years in which the studies were conducted. After the COVID-19 pandemic, the world has changed, with workers having the option to work either from home, the office, or both. This could be a major factor that contributes to increased stress levels amongst employees as they have less job security; a company could hire a part-time worker who works at home to complete the same job at a lower salary. This especially affects younger employees as they have minimal work experience and may be seen as bringing nothing of value to a company. The pandemic also led to an increase in general stress amongst all age groups, due to the loss of family members, health issues, etc. Moreover, the difference could be because being able to handle stress is a skill that comes with time and experience.

The present study also found that, on average, on-site workers tended to have a higher perceived stress score than hybrid workers. The study did not look at home workers due to a small sample size (7 respondents) in that demographic. However, some studies have pointed out the potential downsides of remote work on mental health, such as increased loneliness and work-life balance challenges (Oakman et al., 2020). The increased stress amongst onsite workers could be due to rigid timetables, commute times, and greater workload and nervousness due to face-to-face contact with managers.

Furthermore, the present study found a positive correlation between perceived stress and PSQI scores, which suggests that higher stress levels are associated with poorer sleep quality. A similar correlation was found in a study conducted by Choi et al. (2018b), where it was revealed that shorter sleep duration is often associated with higher stress awareness among office workers. The study was specifically conducted with office workers of higher income and education levels. Shorter sleep duration is associated with worse sleep quality as it limits time in certain stages of the sleep cycle and interrupts the REM (Rapid eye movement) cycle. This leads to a feeling of unrefreshing sleep. Also, a restricted sleep window can disrupt the body's circadian rhythm, especially if the shorter sleep durations are regular. This disruption in the circadian rhythm can lead to many problems, especially at the workplace, such as decreased vitality and increased absenteeism.

Moreover, the present study obtained results that revealed a significant negative correlation between PSQI scores and ergonomic assessment, implying that better ergonomic conditions lead to better sleep. A study found that musculoskeletal disorders are correlated with poorer sleep among office workers (Okan, 2023). A reason for this correlation could be because of body pain, workers tend to sense discomfort and thus aren't able to get a good night's sleep. To fix this issue offices should get chairs with better ergonomics. Also, working spaces should have ample access to natural daylight so that the circadian rhythm is entrained to the light-dark cycle (Figueiro et al., 2017).

Additionally, the present study found that there is a significant negative correlation between perceived stress and ergonomic assessment, indicating that better ergonomic conditions in offices are associated with lower stress levels. This suggests that the physical workspace plays a critical role in relieving stress because ergonomically optimized environments reduce physical strain, which can cause mental stress, either due to pain or tension disorders.

Also, on average, workers in the consultancy sector had higher PSQI scores than workers in the IT sector. This could be because consultants tend to have flexible schedules that can spill into unusual night hours, due to meetings with clients abroad/in other time zones. The work of employees in the IT sector is limited to a certain number of hours in an office desk. Hence, their circadian rhythm could be better due to consistent day-to-day routines and adequate sleep times. Thach et al. (2020) conducted a study that could be used to corroborate this claim, as a consultant's work could be compared to shift work in some ways. The study revealed that shift work leads to a higher risk of poorer sleep quality.

5. Conclusion

The study revealed that ergonomics, stress levels, and sleep quality have a strong correlation with each other among office workers. These findings underscore the essential role that well-designed ergonomic spaces play in maintaining employee well-being and productivity. Sub-optimal ergonomics, such as inadequate natural daylight, uncomfortable chairs, and poor air quality can lead to sleep disruptions and higher stress levels. Ergonomic factors significantly affect perceived stress and sleep quality as they impact an employee's circadian rhythm, the cycle that governs all of the body's actions. These findings highlight the need for businesses to invest in ergonomically optimized environments to maximize employee productivity. The correlation between the three factors also emphasizes the importance of having sufficient sleep.

Furthermore, the study revealed demographic differences in stress perception, with younger workers experiencing higher stress levels than older workers, possibly due to post-pandemic work culture changes and job insecurity. Also, it may suggest that stress management improves with experience, hence the amount of stress older people perceive they have is less. Moreover, the study found that employees with fewer years as workers tended to have poorer sleep, which could be attributed to the fact that adjusting to work life and the stresses that come along with it are hard, leading to disruptions in hormone levels and stress levels.

5.1. Limitations

1. The present study was conducted on a smaller sample size (N=73) with an imbalance between male & female respondents. This makes it difficult to generalize the findings to a wider population and study gender differences within the existing sample.
2. The reliance on self-reported scores could introduce bias, as participants of the study may have underreported or overestimated their sleep quality and/or stress.
3. Data collection was mostly limited to metropolitan areas which may not reflect the experiences of office workers in other parts of the country.
4. Factors such as job role, socioeconomic background, or lifestyle choices were not controlled, which could influence stress levels and sleep quality.

5.2. Future Recommendations

1. Future researchers can delve into a cross-cultural study to gauge how geographical differences impact office workers. They can also consider adding more variables such as physical health, lifestyle factors, and work-life balance to understand the broader influences on stress and sleep.
2. A mixed-methods approach can be utilized for an in-depth analysis of people's perceptions of their workspaces.
3. Offices can gain some key ways from the present study to make their spaces fit for the well-being of their employees. Firstly, ergonomically optimized chairs should be put into place. Secondly, office spaces should have ample access to natural sunlight and minimal blue light at night. They should also consider investing in air purifiers to ensure the air their employees breathe in is clean. Lastly, businesses should consider adding recreational areas into office spaces so that employees can take regular breaks and relieve stress.
4. Education programs should be implemented, teaching employees about the importance of ergonomics and good sleep habits. Employees can ensure their sleep quality is better, by practicing good sleep habits such as not using electronic devices at least an hour before bed.

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