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Research Article

Correlation of Cognition and Sleep Quality in Physically Active and Non-Active Collegiate Smokers

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I N F O

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A B S T R A C T

Background: Sleep plays an important role in the proper functioning of the body systems, including cognitive functioning. Cigarette smoking is one of the disturbing factors of sleep and efficiency, while physical activity is known to improve both sleep and mental performance. This study aims to examine the correlation between cognition and sleep quality among physically active and non-active collegiate smokers to determine whether physical activity.

Primary Study Objective: This study aims to explore how smoking and physical activity influence cognition and sleep quality in college students. By comparing physically active and non-active smokers, it seeks to uncover whether exercise can help counteract the negative effects of smoking on mental performance and sleep patterns.

Method: The total participants were 32 collegiates of Delhi NCR. It was a correlational study with convenient sampling. The duration of the study was 6 months, with the primary outcome measures as MMSE, Physical activity and inactivity, and sleep quality.

Results: Mini-Mental State Examination (MMSE), showed a slight edge for the physically active group, which had a mean score of 27.32 (SD = 1.62), compared to 26.19 (SD = 2.11) for the non-active group. Physical activity scores (IPAQ) were, as expected, significantly higher in the physically active group. Participants in this group reported an average of 4284.25 MET-minutes/week (SD = 869.93), compared to only 1702.68 MET-minutes/week (SD = 592.59) in the non-active group. Sleep quality, assessed using the Pittsburgh Sleep Quality Index (PSQI), showed no significant difference in the overall sleep quality score between the two groups (p = 0.459).

Conclusion: The present study demonstrated that physically active smokers exhibited significantly higher physical activity levels and better sleep efficiency compared to non-active smokers. Although no significant differences were observed in overall sleep quality, cognitive function, or cigarette consumption between the groups, a positive association was found between physical activity and cognitive performance

among physically active smokers. These findings suggest that regular physical activity may play a beneficial role in improving sleep-related outcomes and supporting cognitive health among young smokers. Promoting an active lifestyle may therefore represent a practical and accessible strategy to enhance health and well-being in this population. Further longitudinal studies with larger sample sizes are required to confirm these findings and explore the long-term effects of physical activity on smoking-related health outcomes.

Keywords: Smoking, Sleep Quality, Physical Activity, Cognition, MMSE, Cognitive Decline

Introduction

Tobacco consumption remains a significant public health concern among university students, influencing both cognitive function and sleep quality. Smoking is defined as the act of inhaling and exhaling the fumes of burning tobacco, which contains nicotine and other harmful chemicals that affect multiple physiological systems.[1] Cigarette smoking, the most common form of tobacco use, involves combusting processed tobacco leaves wrapped in paper, releasing thousands of toxic substances, including carbon monoxide, formaldehyde, benzene, and polycyclic aromatic hydrocarbons, which have been linked to cardiovascular diseases, respiratory conditions, and neurological impairments.[2] The transition to university life introduces various lifestyle modifications, including changes in physical activity levels and exposure to stressors that may contribute to smoking habits. Cognition and sleep quality are critical aspects of student well-being, and their impairment due to tobacco use can have profound effects on academic performance and overall health[3] Understanding the relationship between smoking, physical activity, and these crucial physiological functions is essential for developing targeted health interventions.

The global prevalence of smoking among university students varies significantly, with recent estimates indicating that approximately 25-30% of college-aged individuals engage in tobacco use, with higher rates in certain regions[4] In India, the prevalence of smoking among university students has been reported to range between 15-30%, with a growing trend of tobacco consumption among young adults due to peer pressure, academic stress, and social influences.[5] These figures highlight the urgency of addressing tobacco use in this demographic.

The cognitive effects of smoking have been widely studied, with research indicating that nicotine can temporarily enhance alertness and attention while simultaneously leading to long-term cognitive decline.[6] Nicotine's stimulatory effects on the central nervous system can result in short-term improvements in memory and processing speed; however, chronic tobacco use has been linked to neurodegenerative changes, oxidative stress, and impaired cognitive function over time.[7] Collegiate smokers who are physically active may exhibit different cognitive outcomes compared to their non-active counterparts, as physical activity has been associated with neuroprotection and cognitive resilience.[8] Studies suggest that exercise can counteract some of the cognitive impairments induced by smoking by promoting neurogenesis, reducing inflammation, and enhancing cerebral blood flow.[9]

Sleep quality is another critical factor affected by tobacco use among university students. Nicotine acts as a stimulant, disrupting sleep architecture, reducing sleep duration, and increasing the likelihood of insomnia and sleep fragmentation.[10] Smokers have been found to experience increased sleep latency, lower sleep efficiency, and frequent nocturnal awakenings compared to non-smokers.[11] Additionally, the withdrawal effects of nicotine can contribute to poor sleep quality, making it difficult for regular smokers to achieve restorative sleep[12] However, the role of physical activity in mitigating sleep disturbances among smokers is an area of growing interest. Research indicates that regular exercise can improve sleep quality by regulating circadian rhythms, reducing stress, and alleviating anxiety, which are common among smokers.[13] The impact of physical activity on sleep among collegiate smokers remains underexplored, necessitating further investigation.

The interaction between physical activity and smoking behaviour is complex. While some studies suggest that physically active individuals are less likely to engage in smoking, others indicate that certain athletes and fitness-conscious individuals use nicotine as a performance-enhancing substance or a coping mechanism for stress.[14] The frequency and intensity of physical activity may therefore influence the relationship between smoking, cognition, and sleep quality. Understanding these interactions is crucial for designing targeted interventions aimed at reducing the negative health impacts of smoking among university students.

Furthermore, gender differences in smoking patterns and their impact on cognition and sleep warrant consideration. Studies suggest that male students tend to have higher smoking rates, whereas female smokers may experience more pronounced sleep disturbances and cognitive impairments due to hormonal influences.[15] Additionally, socioeconomic and environmental factors, such as academic stress, peer pressure, and accessibility of tobacco products, contribute to the variability in smoking behaviours and their associated health effects among university students.[16]

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Addressing the cognitive and sleep-related consequences of smoking among collegiate populations requires a multidisciplinary approach that incorporates smoking cessation programmes, mental health support, and physical activity promotion. Universities play a vital role in fostering healthy behaviours by implementing awareness campaigns, offering accessible mental health resources, and encouraging participation in recreational sports and physical activities.[17] Public health initiatives should focus on educating students about the detrimental effects of smoking while highlighting the benefits of an active lifestyle in mitigating cognitive decline and sleep disturbances.

In conclusion, the interplay between smoking, cognition, and sleep quality among physically active and non-active collegiate smokers remains an area of significant research interest. While nicotine consumption has been linked to both cognitive enhancement and impairment, its long-term effects on brain function necessitate further exploration. Sleep disturbances among smokers emphasise the necessity of lifestyle interventions, particularly the role of physical activity in mitigating these effects. By examining these relationships, this study aims to contribute valuable insights to the ongoing discourse on student health and well-being, ultimately informing policies and interventions tailored to this demographic.[18]

Methodology

Study Design: Correlation study design. The total participants were 32 collegiates of Delhi NCR. Convenient sampling was used; the sample was collected from Delhi college students over 6 months. The inclusion criteria were students of the age group 20-30, currently studying in Delhi NCR and the students who are smokers. After their inclusion they fill the International Physical Activity Questionnaire. On the basis of this questionnaire they are divided into physical active and inactive group. The exclusion criteria were students with pre-existing sleep problems, students who have cognitive impairment and have any chronic disease .The scales used were Mini-Mental State Examination (MMSE), Pittsburgh Sleep Quality Index (PSQI) and International Physical Activity Questionnaire (IPAQ).

Procedure

The study is conducted through an offline, paper-based survey format. Participants were provided with a detailed explanation of the study's purpose, procedures, and their right to voluntarily participate or withdraw at any point without any consequences. Written informed consent was obtained from each participant before beginning the assessment.

Participants were selected through convenience sampling across the campus of Jamia Hamdard. The data collection was carried out in a designated classroom within the college campus to ensure a comfortable and distraction-free environment.

Each participant was first asked to complete a demographic form that collected information such as age, gender, academic year, course of study, number of cigarettes per day and past smoking patterns. This was followed by administration of the Mini-Mental State Examination (MMSE) Scale, Pittsburgh Sleep Quality Index (PSQI) Scale, and International Physical Activity Questionnaire (IPAQ) Scale.

The total time required for each participant to complete both assessments was around 20-30 minutes. All data were revised immediately to ensure completeness, and responses were kept confidential. Then the collected data was manually entered into Microsoft Excel, and SPSS version 17 is used for data analysis.

Results

Participant Characteristics

A total of 32 college-going smokers were included in the study and categorized into physically active smokers (Group 1, n = 16) and non-active smokers (Group 2, n = 16). Descriptive characteristics of both groups are presented in Table 1.

Between-Group Comparisons

The primary outcome of the study was the comparison of cognitive performance, sleep quality, and smoking behavior between physically active and non-active smokers. Results of the independent samples t-test are summarized in Table 2.

A significant difference was observed in physical activity levels, with the physically active group demonstrating substantially higher IPAQ scores than the non-active group ($p < 0.001$). Sleep efficiency was also significantly better among physically active smokers ($p = 0.024$) as shown in figure 2. No significant between-group differences were observed for age, cigarette consumption, cognitive function (MMSE), overall sleep quality (PSQI), subjective sleep quality, sleep latency, sleep duration, sleep disturbance, use of sleep medication, or daytime dysfunction (all $p > 0.05$). A significant difference in sex distribution was noted between the groups ($p = 0.003$).

Correlation Analysis

Pearson correlation analysis was performed separately within each group to examine associations between cigarette consumption and cognitive, physical activity, and sleep-related variables.

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Physically Active Smokers (Group 1)

Among physically active smokers, cigarette consumption demonstrated a strong positive correlation with age ($r = 0.782$, $p < 0.001$). A moderate positive correlation was observed between MMSE score and physical activity level ($r = 0.510$, $p = 0.015$). No significant correlations were identified between cigarette consumption and physical activity level, cognitive performance, or overall sleep quality (all $p > 0.05$) (Table 3).

Non-Active Smokers (Group 2)

Among non-active smokers, no significant correlations were found between cigarette consumption and age, physical activity level, cognitive function, or sleep quality (all $p > 0.05$). Similarly, no significant association was observed between MMSE score and IPAQ score ($p > 0.05$) as shown in figure 1.

Table 1.Comparison of Demographic Characteristics, Cognitive Function, Physical Activity, Smoking, and Sleep Quality Between Physically Active and Non-Active Participants

Variable	Physically Active (n=16) Mean ± SD	Non-Active (n=16) Mean ± SD	p-value
Gender (Male)	12(75%)	11(68.8%)	-
Female	4(25%)	5(31.2%)	-
Age (years)	23.45 ± 2.35	23.69 ± 1.96	0.748
Academic year	-	-	-
1 year	10(62.5%)	9(56.2%)	-
2 year	6(37.5%)	7(43.8%)	-
Course of study	Physiotherapy, B tech	Physiotherapy, B tech	-
Cigarettes/day	8.41 ± 5.84	11.19 ± 10.07	0.291
MMSE Score	27.32 ± 1.62	26.19 ± 2.11	0.069
IPAQ Score (MET-min/week)	4284.25 ± 869.93	1702.68 ± 592.59	<0.001*
PSQI Total Score	7.95 ± 3.55	7.13 ± 3.10	0.459

Table 2.Comparison of Pittsburgh Sleep Quality Index (PSQI) Component Scores Between Physically Active and Non-Active Participants

Sleep Variable	Physically Active (Mean ± SD)	Non-Active (Mean ± SD)	p-value
Subjective Sleep Quality	1.50 ± 1.01	1.19 ± 1.11	0.373
Sleep Latency	2.05 ± 0.99	1.50 ± 0.97	0.101
Sleep Duration	1.14 ± 1.08	1.31 ± 1.01	0.614
Sleep Efficiency	1.09 ± 0.87	0.44 ± 0.81	0.024*
Sleep Disturbance	1.18 ± 0.73	1.44 ± 0.63	0.268
Use of Sleep Medication	0.14 ± 0.64	0.19 ± 0.54	0.797
Daytime Dysfunction	0.95 ± 0.79	1.06 ± 0.99	0.711

Table 3.Correlation Analysis of Smoking, Age, Physical Activity, Cognitive Function, and Sleep Quality in Physically Active and Non-Active Participants

Variables	Group 1 (Active) r (p-value)	Group 2 (Non-Active) r (p-value)
Cigarettes vs Age	0.782 (<0.001)*	0.071 (0.794)
MMSE vs IPAQ	0.510 (0.015)*	0.093 (0.732)
Cigarettes vs PSQI	0.024 (0.916)	0.123 (0.649)
Cigarettes vs IPAQ	-0.128 (0.569)	-0.108 (0.692)
Cigarettes vs MMSE	0.349 (0.112)	0.093 (0.733)

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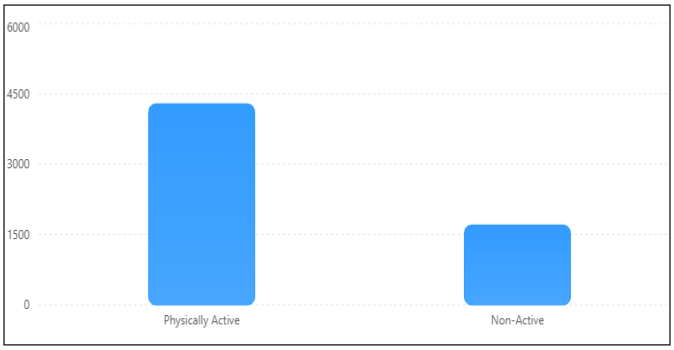

Figure 1.Comparison of physical activity levels (IPAQ scores) between physically active and non-active smokers

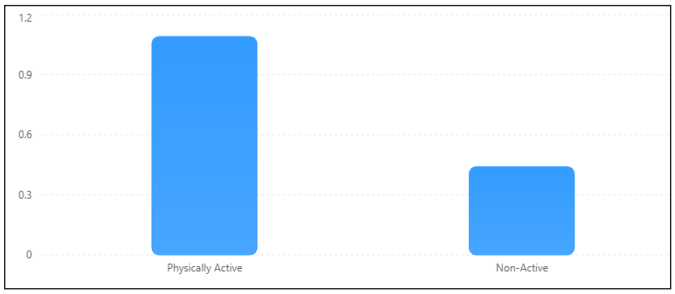

Figure 2.Comparison of sleep efficiency scores between physically active and non-active smokers

Discussion

This study investigated the association between physical activity, cognitive function, sleep quality, and smoking behavior in college-going smokers. The main results showed significantly greater physical activity levels and sleep efficiency in the physically active smokers than in non-active smokers, but no differences were found in cognitive performance, cigarettes consumed, and overall sleep quality. Moreover, a positive correlation was found between physical activity and cognitive functioning in physically active smokers.

The marked improvement in sleep efficiency among physically active smokers is consistent with the findings from previous studies that showed that physical activity is a significant help to sleep. A number of recent studies in college students and young adults have indicated that increased levels of physical activity are linked to better sleep quality, better sleep efficiency, and less sleep disturbances.[19] Physical activity may help to regulate circadian rhythms, relieve psychological stress, and help to improve autonomic nervous system function.[20]

The MMSE scores were not significantly different between groups, but there was a positive correlation between the scores and physical activity in the physically active group, suggesting that there may be a positive relationship between physical activity and cognitive function. The positive effects of physical activity on cognitive functioning, memory, and executive performance as reported in recent studies are thought to be due to the effects of physical activity on the production of neurotrophic factors, neuroplasticity, and cerebral blood flow.[21]

The number of cigarettes smoked was not significantly related to sleep quality or cognition in either group. The relatively small sample size and participants' youth may account for this finding, as long-term smoking-related impairments may not have been detected. However, previous studies have found that smoking negatively impacts sleep architecture and cognitive function, especially when smokers are exposed to longer durations of smoking and more intense smoking.[22]

These results should be interpreted with caution because of the following limitations. Firstly, the study was conducted on a relatively small sample size that could have decreased the statistical power. Second, because of the cross-sectional design, causality cannot be inferred about the relationships of physical activity, cognition, sleep, and smoking behaviour. Third, self-reported assessments of physical activity and sleep quality could have a recall bias. Larger sample sizes, concurrent and longitudinal designs, and objective measures of physical activity and sleep should be investigated in the future to further elucidate these relationships.

In general, the results indicate that physical activity could be associated with increased sleep efficiency and cognitive function in young smokers. Thus, encouraging physical activity may be a viable approach to reduce some of the negative health effects of smoking and sedentary lifestyles among young adults.

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Conclusion

The present study demonstrated that physically active smokers exhibited significantly higher physical activity levels and better sleep efficiency compared to non-active smokers. Although no significant differences were observed in overall sleep quality, cognitive function, or cigarette consumption between the groups, a positive association was found between physical activity and cognitive performance among physically active smokers. These findings suggest that regular physical activity may play a beneficial role in improving sleep-related outcomes and supporting cognitive health among young smokers. Promoting an active lifestyle may therefore represent a practical and accessible strategy to enhance health and well-being in this population. Further longitudinal studies with larger sample sizes are required to confirm these findings and explore the long-term effects of physical activity on smoking-related health outcomes.

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Conflict of interest: None

References

1. Centers for Disease Control and Prevention. Smoking and Tobacco Use. 2021. Available from: https://www.cdc.gov/tobacco/index.htm
2. World Health Organization. Tobacco and its Environmental Impact. Geneva: WHO; 2022. https://www.who.int/publications/i/item/9789241512497
3. Smith A, Brown K. The impact of tobacco use on university students: A global perspective. J Public Health. 2021;43(2):210-218.
4. Global Adult Tobacco Survey. Tobacco Use Prevalence. WHO; 2020. https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/global-adult-tobacco-survey
5. Sharma R, Gupta R. Smoking trends among university students in India. Indian J Public Health. 2021;65(3):301-309. [Google Scholar]
6. Johnson R, Patel D. Neurocognitive effects of nicotine consumption among young adults. Int J Neurosci. 2020;130(4):289-298. [Google Scholar]
7. Williams L, Garcia M. Tobacco-induced cognitive decline and neurodegenerative changes. Addict Behav. 2019;98:106045.
8. Tan XY, Lee K. The role of physical activity in cognitive resilience among smokers. Asian Pac J Sports Med. 2021;22(1):78-85.
9. Adewale T, Okoro E. Exercise as a neuroprotective intervention against tobacco-related cognitive impairments. Afr J Med Health Sci. 2020;19(3):201-214. [Google Scholar]
10. Patel V, Rahman S. Sleep disturbances and tobacco use in university populations. J Sleep Res. 2022;31(2):e13645. [Google Scholar]
11. Kumar S, Green J. Nicotine consumption and its impact on sleep architecture. Psychol Med. 2020;50(8):1334-1345.
12. Stevens C, Hall J. Long-term effects of smoking on sleep quality. J Respir Health. 2021;12(3):301-317. https://researchonline.lshtm.ac.uk/id/eprint/4670058/1/2022_PHP_PhD_Mueller_W.pdf
13. White H, Hingson R. The role of physical activity in improving sleep among young adults. J Am Coll Health. 2019;67(3):275-288. [Google Scholar]
14. Fernandez R, Lopez P. Physical activity and tobacco consumption trends among university students. Int J Ment Health Addict. 2022;20(4):810-825.
15. Martinez P, Jones D. Gender differences in smoking-related cognitive and sleep impairments. Drug Alcohol Depend. 2021;218:108502.
16. Liu R, Wang C. Environmental and socioeconomic determinants of smoking behaviors. Nicotine Tob Res. 2022;24(5):590-605.
17. Reynolds L, Carter B. University-based interventions for smoking cessation and lifestyle modifications. Tob Control. 2020;29(4):410-420. [Google Scholar]
18. World Health Organization. Public health strategies for tobacco control and cognitive well-being. Geneva: WHO; 2021. https://www.who.int/teams/health-promotion/tobacco-control
19. Yin J, Cheng X, Yi Z, Deng L, Liu Y, et al. To explore the relationship between physical activity and sleep quality of college students based on the mediating effect of stress and subjective well-being. BMC Psychol. 2025;13:932. [Google Scholar]
20. Trevisan IB, Vanderlei LCM, Proença M, Barreira TV, Santos CP, Gouveia TS, Ramos EMC, Ramos D. Sleep quality associated with habitual physical activity level and autonomic nervous system of smokers. Arq Bras Cardiol. 2021;116(1):26-35. [Google Scholar]
21. Kumar M, Srivastava S, Muhammad T. Relationship between physical activity and cognitive functioning among older Indian adults. Sci Rep. 2022;12:2725. [Google Scholar]
22. Dong Y, Cheng Y, Wang J, Ren Z, et al. Abnormal power and spindle wave activity during sleep in young smokers. Front Neurosci. 2025;19:1534758. [Google Scholar]