



# Lights Out, Wide Awake

## LED Lighting and Student Health

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### Abstract

This study examines the relationship between LED lighting exposure and its effects on sleep quality and eye strain among high school students. As LED lighting has become the dominant form of lighting in schools and homes due to its efficiency, concerns have emerged regarding its potential impact on human health. Survey data was collected to analyze student lighting habits, sleep patterns, and visual discomfort. The results suggest that while the relationship between nighttime lighting and sleep quality is not consistent across all students, eye strain shows a clearer association with prolonged exposure to artificial lighting. These findings highlight the importance of considering both the benefits and potential drawbacks of LED lighting in student environments.

### Introduction/Summary

Light-emitting diode (LED) technology has rapidly become the dominant form of lighting in homes, schools, and public spaces due to its energy efficiency and long lifespan. As a result, students are exposed to artificial lighting for extended periods both in classrooms and at home. Many LED sources emit higher levels of blue light, which plays a key role in regulating the body's circadian rhythm. However, excessive exposure, particularly during nighttime hours, can suppress melatonin production and disrupt natural sleep cycles. In addition to sleep-related concerns, prolonged exposure to artificial lighting has been associated with eye strain, discomfort, and headaches. Despite its widespread use, the potential health effects of LED lighting are often overlooked, especially in student environments. The purpose of this study is to examine how LED lighting exposure, particularly at night, relates to sleep quality and eye strain among high school students. By identifying patterns in lighting habits and reported symptoms, this research aims to better understand how everyday lighting conditions may influence student well-being and to provide insight into more effective and balanced lighting practices.

### Methodology

This study collected both quantitative and qualitative data through an anonymous digital survey distributed to high school students across multiple grade levels. Participation was voluntary, and no identifying information was collected. The survey measured daily LED exposure, nighttime lighting habits, sleep patterns, and frequency of eye strain. Independent variables included the duration, timing, and type of lighting exposure, while dependent variables included sleep quality and visual discomfort. Additional questions assessed screen time to account for external influences. The collected data was analyzed to identify trends and potential relationships between lighting exposure and student outcomes, with results presented through comparative graphs and distributions.

### Findings/Discussion

The results indicate that LED lighting exposure is a common and consistent part of student routines, with many students reporting moderate to high daily exposure and frequent use of artificial lighting during nighttime hours. While some patterns suggest a possible relationship between increased nighttime lighting and decreased sleep quality, this trend was not consistent across all responses. This suggests that sleep is influenced by multiple factors beyond lighting alone, including screen use, personal habits, and individual differences in daily routines. In contrast, eye strain showed a more consistent pattern. Many students reported experiencing visual discomfort at least occasionally, with higher frequencies generally associated with greater overall exposure to artificial lighting. This indicates a more direct relationship between prolonged lighting exposure and eye strain in students' daily experiences.

Several limitations should be considered when interpreting these findings. The study relies on self-reported data, which may vary in accuracy, and does not fully isolate lighting exposure from screen time. Future research could strengthen these findings by incorporating more controlled conditions or tracking exposure more precisely. Overall, the findings suggest that while LED lighting exposure alone may not determine sleep quality, it remains a relevant contributing factor. More clearly, the consistent reports of eye strain highlight the importance of more intentional lighting habits. Reducing exposure to bright lighting at night, incorporating warmer or mixed lighting environments, and being mindful of prolonged screen use may help improve both visual comfort and overall student well-being.

### References

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