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Effects of Sedentary Behavior on the Sleep Quality of college and university students: A Systematic Review

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Abstract: *Sedentary behavior is becoming increasingly common among undergraduate students, and studies have suggested that it can have a negative impact on sleep quality. However, the results of various studies remain inconsistent, and there has been no systematic review to comprehensively integrate the existing evidence for this population. Therefore, this systematic review aims to explore the relationship between sedentary behavior and sleep quality among undergraduate students, and to summarize the methodological characteristics and evidence quality of related studies. The study followed the PRISMA 2020 guidelines and conducted a systematic literature search in PubMed and the Web of Science Core Collection. Studies published in English that involved the association between sedentary behavior and sleep quality or sleep outcomes among undergraduate or college students were included. Data on study characteristics, measurement methods of sedentary behavior, sleep assessment methods, and main findings were extracted, and the methodological quality was evaluated using the National Institutes of Health (NIH) observational cohort and cross-sectional study quality assessment tool. A total of seven studies met the inclusion criteria, including six cross-sectional studies and one randomized controlled trial. Among these five studies, it was found that prolonged sitting behavior was significantly correlated with decreased sleep quality or poor sleep outcomes. In two of the studies, one provided indirect evidence and the other provided mixed results. There was considerable heterogeneity in the measurement and classification of prolonged sitting behavior across the studies. Overall, the included studies demonstrated acceptable methodological quality, but still had limitations such as sample rationality, adjustment for confounding factors, and being primarily cross-sectional designs. The existing evidence indicates that there is a correlation between increased prolonged sitting behavior and decreased sleep quality among undergraduate students. More longitudinal and experimental studies are needed in the future, using standardized measurement methods, to clarify the causal relationship between prolonged sitting behavior and sleep quality.*

Keywords: *Sedentary Behavior; sleep quality; college students; undergraduate students; systematic review*

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1. Introduction

Many studies have shown that poor sleep quality is associated with a variety of adverse health outcomes, leading to the occurrence of chronic diseases such as cardiovascular disease and hypertension. Especially for contemporary undergraduate students, the quality of sleep directly affects the state of physical activity and mental activity (Wu.2023). However, with the progress of science and technology, the application of intelligent electronic products has a great impact on the lifestyle of undergraduate students. The time spent outdoors and physical exercise is replaced by playing games, watching TV series and watching short videos indoors. As a result, the sleep problems of undergraduate students are becoming more and more serious, and their health status is also declining. Studies have shown that the proportion of college students experiencing deteriorating sleep quality has been steadily increasing. Nearly half of the students sleep for less than 7 hours each night, and 27% meet the criteria for clinical insomnia. (Lo,J. C., & Carskadon, M,A. 2025).

The widespread use of electronic devices, including smartphones, tablets, and computers, has changed the way of work and study, which has also led to more and more fixed or static postures such as sedentary in study and work. A study in the United States showed that office workers spend more than 70% of their working time in static sitting and standing (Clemes, S.A., O 'Connell, S.E., & Edwardson, C.L.2014).Sedentary behavior has been shown to negatively affect sleep quality (Han Y T,Du X X 2023).

Studies have shown that screen exposure often occurs concurrently with sedentary behavior, both of which may have an impact on sleep. Prolonged sedentary behavior can reduce energy consumption in the body, thereby weakening the accumulation of Sleep Pressure (homeostatic sleep drive), and subsequently affecting the quality of sleep at night. Moreover, nighttime screen exposure may cause a delay in the secretion rhythm of melatonin, and further disrupt the normal sleep process. (Bumrungpert et al ., 2024)。At the same time, prolonged sedentary behavior is also associated with metabolic dysfunction, chronic low-grade inflammation, and other factors, all of which may further affect the ability to recover sleep (Owens. 2010). Although many studies have found a significant association between sedentary behavior and sleep outcomes, some studies have shown that the relationship is weak, indirect, or not statistically significant.

The differences in the measurement and classification of sedentary behavior may to some extent explain these inconsistencies. Sedentary behavior can be assessed through self-reporting and methods such as accelerometers. Self-reporting may be influenced by subjective factors such as memory bias and social expectations, thereby reducing the accuracy of the data (Prince et al., 2020). While accelerometers are generally relatively objective and accurate, differences in device types, as well as the methods and positions of wearing, can also lead to variations in the collected data (Freedson, P. S., & John, D. 2013). Similarly, there are also differences in the classification methods used by various studies for sedentary behavior. Some studies focus on the total duration of sedentary time, while others pay attention to specific sedentary patterns or sedentary behaviors in different contexts. All of these may lead to inconsistencies in the final research results.

Due to the scarcity of literature on the impact of prolonged sitting behavior among college students on sleep quality, there are even fewer related research reviews. To our knowledge, no systematic review has previously been able to comprehensively integrate the existing evidence on the relationship within this population. Given the increasing prevalence of prolonged sitting behavior in the daily lives of college students and the significance of sleep for physical and mental health as well as academic achievements, it is necessary to conduct a systematic assessment of the current evidence.

The purpose of this systematic review is to synthesize the existing literature and explore the relationship between sedentary behavior and sleep quality among college students or undergraduate students. It also aims to analyze the methodological differences among various studies, including the measurement and classification methods of sedentary behavior, and assess the quality and bias risk of the existing evidence. In summary, we hypothesize that the longer the duration of sedentary behavior, the more it is associated with decreased sleep quality and the occurrence of adverse sleep outcomes.

2. Method

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines (Page et al., 2021). The review protocol was not prospectively registered.

2.1 Eligibility criteria

Studies that meet the following criteria are included: (1) Original research published in peer-reviewed journals; (2) published in English; (3) Regarding undergraduate or college students; (4) Using subjective or objective measurement methods to assess sedentary behavior; (5) Using subjective or objective methods to assess sleep quality or sleep-related outcomes; (6) Reported the relationship between sedentary behavior and sleep quality or provided relevant data.

Studies that meet any of the following criteria are excluded: (1) reviews, systematic reviews, meta-analyses, conference abstracts, commentaries or letters; (2) studies not involving undergraduate or college students; (3) studies not assessing sedentary behavior and sleep quality or sleep-related outcomes; (4) studies not reporting the data of relevant research outcomes; (5) studies for which the full text cannot be obtained; (6) duplicate publications.

2.2 Information sources

Literature was retrieved through two electronic databases, PubMed and Web of Science Core Collection. All articles published before the final search date were considered for inclusion. The search was limited to articles published in English. Additionally, we manually screened the reference lists of relevant studies to identify any potentially eligible articles that were not captured in the database search.

2.3 Search strategy

The initial search began on June 10, 2026, and involved conducting a literature search using two electronic databases, PubMed and Web of Science Core Collection, for all articles published before that date. The same search strategy was applied to each database, mainly including three key concepts: Sedentary Behavior, Sleep Quality, and Undergraduate Students. First, for each core concept, separate MeSH Terms and free words were searched: for "Sedentary Behavior", the standardized subject terms were retrieved from the PubMed MeSH database, along with supplementary free words (such as Sitting Time, Sedentary Time, Sedentary Lifestyle, etc.); for "Sleep Quality" and "Undergraduate Student", the subject terms were first searched, and then the free words were combined with the subject terms using the "OR" logical operator to form three independent concept search sets, and then the three concept search sets were combined using the "AND" logical operator to obtain literature that simultaneously covered all three. The same search was conducted in Web of Science using Topic terms. The complete search strategy is presented in Supplementary file.

2.4 Study selection

We evaluated the inclusion of the literature based on the previously discussed criteria (see Eligibility criteria). After the initial search, all retrieved records were imported, duplicate records were removed, and a preliminary assessment of the titles and abstracts was conducted to determine if they were potentially relevant studies. For the potentially eligible literature, the full-text documents were evaluated according to the inclusion criteria, and the studies that met all the inclusion criteria were included in the final review. The study selection was conducted in accordance with the PRISMA 2020 guidelines.

2.5 Data collection process

A data extraction form was developed using Microsoft Excel, with reference to previously published systematic and established data extraction procedures(Ryan and Hill, 2019).Data extraction includes the author, publication year, country, research design, sample size, demographic characteristics (such as age and gender), measurement methods for Sedentary Behavior, measurement methods for Sleep Quality, and the main research results regarding the relationship between sedentary behavior and sleep quality or Sleep outcomes.

2.6 Risk of bias in individual studies

To assess the risk of bias in individual studies, the quality assessment tool for observational cohort and cross-sectional studies of the National Institutes of Health (NIH) was used to conduct a methodological quality assessment of the included studies. This tool contains 14 evaluation criteria, which are used to assess the methodological quality of cohort longitudinal and cross-sectional studies, as well as the internal validity and potential bias risk of observational studies.

According to the evaluation guidelines of NIH, each criterion is evaluated as "YES", "No", "Cannot Determine", "Not Reported" or "Not Applicable". Given the methodological differences among the included studies, some criteria are considered not applicable to specific research designs. For instance, the follow-up loss rate is not applicable to cross-sectional studies, and some items such as whether the assessors remain blinded to the exposure status of the participants are also difficult to determine in the included studies. Therefore, during the quality evaluation process, appropriate explanations were provided for the relevant items based on different research designs.

2.7 Data Synthesis

Due to significant heterogeneity in the study design, measurement methods of sedentary behavior, and Sleep outcomes included in the research, a meta-analysis was not conducted. Instead, a narrative synthesis was used to summarize and generalize the research results.

3. Results

3.1 Study selection

The initial search results from PubMed and Web of science. A total of 477 relevant documents were retrieved. After deleting 107 duplicate documents, 370 documents need to be screened for titles and abstracts.352 articles were excluded based on this screening. 18 articles were then assessed for full inclusion using the criteria described above (see Eligibility criteria), 11 articles were excluded. Among them, Did not examine the association between sedentary behavior and sleep outcomes (n=7), The full text is not available(n=2), Review articles(n=2). No new records were included from the manual reference search. Finally, seven studies met the inclusion criteria and were included in this review. This information is presented in flowchart (see Figure 1) based on the PRISMA template (Page et al., 2021).

3.2 Study characteristics

Seven studies were included in the review. Detailed study information including Sample size,Country,Sex,Age,Sedentary behavior and Sleep Quality are presented in Table 1(Menezes-Júnior et al 2024; Grimaldi-Puyana et al 2020; Hargens et al 2021; Huang et al 2025; Li et al 2022; Liu et al 2021; Pilcher et al 2017). Most studies employed a cross - sectional design, while one study used an Randomized Controlled Trial design.

The seven included studies resulted in a total of 11479 participants(M=1640, SD=2942 , range =81-8059).The sample displayed some variability in age(M=22.8, SD=1.8, range=18-24) and was,on average,gender balance(% female; M=64.53%, SD=4.73%,range=39.86-67.10%).

Regarding the measurement methods for sedentary behavior, there were 6 studies that involved the measurement of sedentary behavior. Among them, 3 used purely objective measurement methods (n=3), 3 used subjective measurement methods, and one study was a randomized

controlled trial that replaced sedentary behavior with light exercise and did not measure sedentary behavior. In the studies that used objective measurement and reported the location of the equipment worn, 2 used the wrist of the non-dominant hand to wear the equipment; another study used hip-worn equipment, which were (ActiGraph wGT3X-BT, ActiGraph GT9X Link & Axivity AX3). The criterion for determining sedentary behavior was based on the number of activity counts per minute, with less than 100 being considered sedentary behavior, and the main records were continuous sedentary behavior of more than 10 minutes. In the studies that used subjective measurement for sedentary behavior, all studies evaluated sedentary behavior using the self-reported method. Two studies used validated questionnaires (IPAQ-SF & ASAQ) (Nascimento-Ferreira et al., 2022 & Iswari, Y., et al. 2025), and another study used a single question to assess sedentary behavior.

In the measurement of sleep quality, two of the methods are purely objective (n=2), while five use subjective methods. For the studies using objective measurement methods, all employed wrist-worn devices worn by the non-dominant hand. In the studies using subjective measurement of sedentary behavior, all evaluated sleep quality through self-reported methods. Among these, four studies used validated questionnaires (WHOQOL-brief & PSQI) (Buysse et al., 1989 & Liu et al., 1996 & WHOQOL Group, 1998), and another one used a self-developed questionnaire containing three questions about sleep to assess sleep quality.

Most of the studies on sleep outcomes (n = 5/7) reported a significant correlation between sedentary behavior and sleep quality. The longer the sedentary time, the worse the sleep quality. Two other studies indirectly confirmed that sedentary behavior may be related to sleep quality. One study showed that sedentary behavior was positively correlated with smartphone usage, and using the phone at night, frequent phone use or screen exposure were associated with changes in sleep patterns, sleep disorders, difficulty falling asleep, and shortened sleep duration (Grimaldi-Puyana et al 2020). The other study was a randomized controlled trial. After replacing sedentary behavior with light exercise, there were no significant differences in sleep duration and sleep quality. However, after five weeks of analysis, sleep quality in the sedentary group decreased, while there was no decrease in the sedentary replacement group (Pilcher et al 2017).

Most of the studies were cross-sectional studies (n=6/7), and only one study adopted a longitudinal approach (n=1/6). After integrating the data over 10 weeks, this study found that there were no significant differences in sleep duration and sleep quality after replacing sedentary behavior with light exercise. However, after analyzing for five weeks, the sleep quality of the sedentary group decreased, while that of the sedentary-replacement group did not.

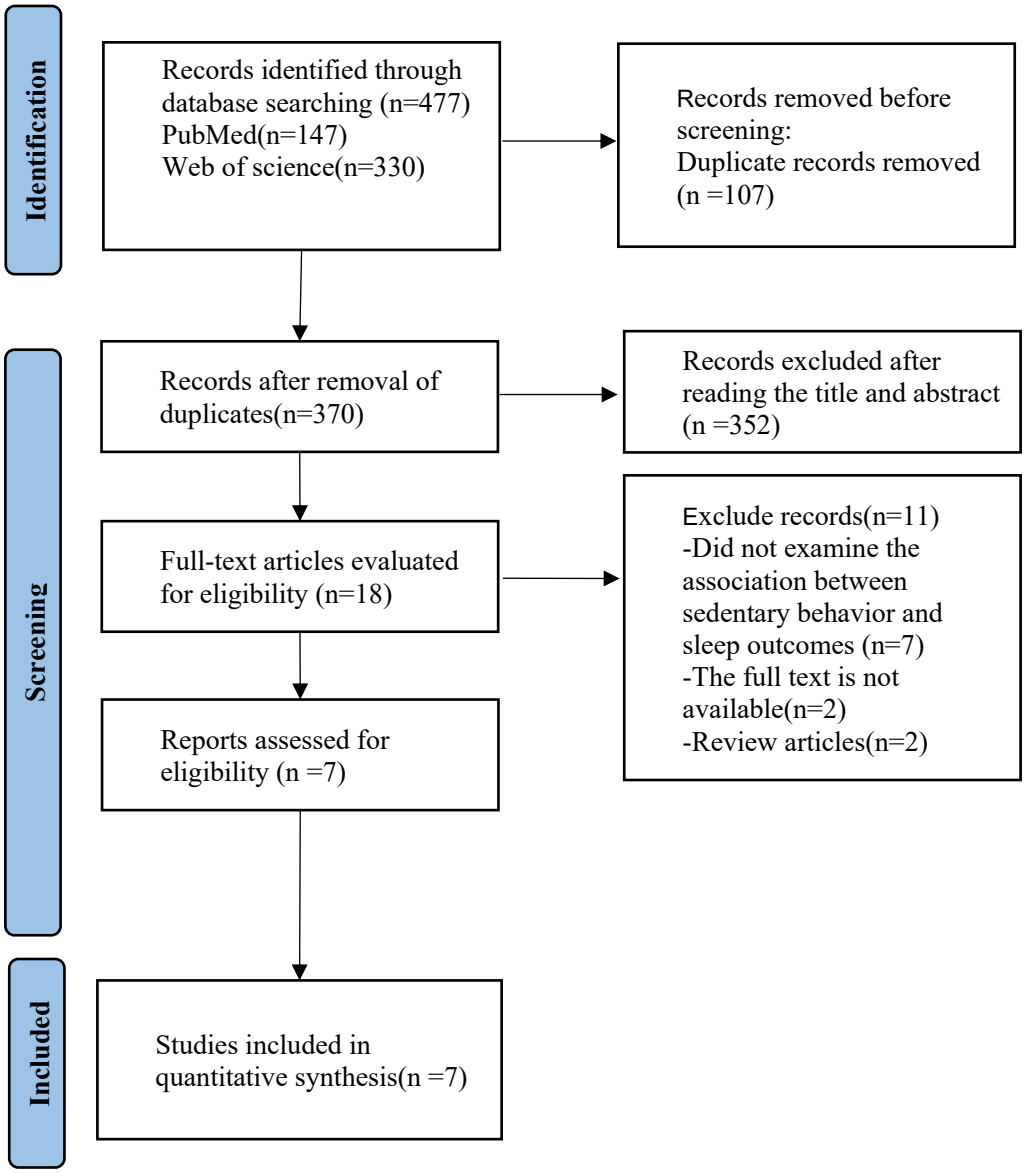


Figure 1 PRISMA flow diagram of the study process. PRISMA, Preferred Reporting Items for Systematic review

Table 1 Sedentary Behavior and Sleep Quality

Author (year)	Country	Design	Sample Size	Female	Mean age	Sedentary Measure	Sleep Measure	Main Findings
Menezes-Júnior et al (2024)	Brazil	Cross-sectional	8059	65.35%	23.9	Self-reported	WHOQOL - brief	Sedentary behavior can lead to a deterioration in sleep quality.
Grimaldi-Puyana et al (2020)	Spain	Cross-sectional	306	39.86%	20.7	IPAQ	PSQI	(Indirect evidence) Sedentary behavior is positively correlated with smartphone usage; using the phone at night, frequent use of the phone, exposure to the screen are associated with changes in sleep patterns, sleep disorders, difficulty falling asleep, and shortened sleep duration.
Hargens et al (2021)	the United States	Cross-sectional	81	65.43%	NR	Accelerometer(ActiGraph wGT3X-BT)	Accelerometer(Acti Graph wGT3X-BT)	The total sleep time is negatively correlated with the (duration of sedentary time, the number of sedentary sessions, and the total sedentary time). Students with a total sleep time of less than 6 hours have more sedentary sessions per day and a longer average daily sedentary duration. The total sleep time is negatively correlated with the total sedentary time.
Huang et al (2025)	China	Cross-sectional	349	57.60%	19.75	Accelerometer(Axivity AX3)	PSQI	The longer one sits, the worse the sleep quality will be. Replacing sedentary behavior with moderate-intensity physical activities can improve sleep quality.
Li et al (2022)	China	Cross-sectional	2347	67.10%	20	ASAQ	PSQI	The longer the sedentary behavior lasts, the poorer the sleep quality will be.A moderate physical activity level and high sedentary time, and a low physical activity level and high sedentary time were interactively associated with increased risks of poor sleep quality, respectively.
Liu et al (2021)	China	Cross-sectional	220	52.27%	20.29	Accelerometer(ActiGraph GT9X Link)	Accelerometer(Acti Graph GT9X Link)	The longer the sedentary behavior lasts, the worse the sleep quality becomes; prolonged sedentary behavior and a higher BMI value may lead to shorter sleep duration and reduced sleep efficiency.
Pilcher et al (2017)	the United States	RCT	117	64.10%	18.39	Experimental groups: Sedentary group and sedentary group replaced with slow cycling group	Self - reported	Based on the data from 10 weeks, there was no significant difference in sleep duration and sleep quality after replacing sedentary behavior with light exercise. However, after the fifth week of analysis, the sleep quality of the sedentary group decreased, while that of the sedentary-replacement group did not.

3.3 Risk of bias results

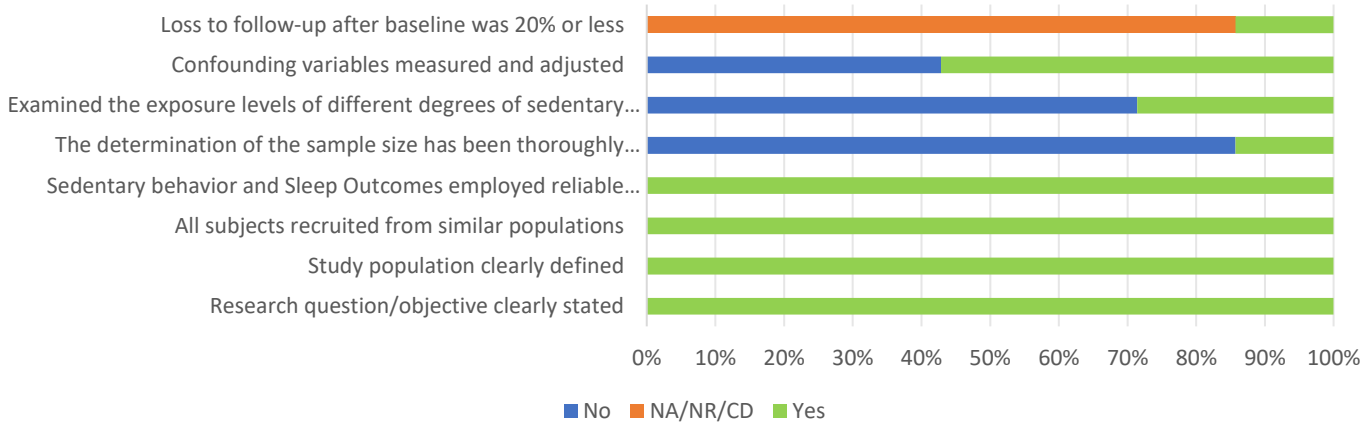
The risk of bias assessment indicates that the methodology quality of most of the included studies is good. All studies clearly stated their research purposes (100%), defined the study population (100%), and recruited participants from similar populations (100%). Moreover, both sedentary behavior and Sleep outcomes were measured using reliable measurement tools (100%).

However, there are also some studies that have methodological limitations. Only one study (14.3%) provided a rationale for the sample size. Only two studies (28.6%) examined different levels of sedentary behavior exposure. Four studies (57.1%) fully considered potential confounding factors, while the remaining studies did not report sufficient adjustment for confounding factors. Since most of the included studies adopted a cross-sectional design, the evaluation criterion of "follow-up loss rate after baseline ≤ 20%" is applicable to only one study, and this study meets this criterion.

All the included cross-sectional studies failed to confirm that the exposure to sedentary behavior occurred before the assessment of sleep outcomes. Similarly, only one study (14.3%) provided a sufficient time range to reasonably observe the association between sedentary behavior and sleep-related outcomes. Although five studies conducted multiple assessments of sedentary behavior, the widespread nature of the cross-sectional design limited the ability to infer temporal or causal relationships.

Since six out of the seven included studies adopted a cross-sectional design, the criteria related to follow-up are mostly not applicable. Similarly, the criterion regarding whether the result evaluators remain blinded to the participants' exposure status is not applicable to the included studies. Overall, the included studies demonstrated advantages in terms of clear research objectives, study population, and measurement procedures. However, they had limitations in terms of the rationality of sample size, the control of confounding factors, and the ability to establish the temporal relationship between sedentary behavior and sleep outcomes.

Figure 2
Risk of bias plot



3.4 Synthesis of results

Among the seven included studies, five reported a significant association between sedentary behavior and sleep quality, indicating that higher levels of sedentary behavior are associated with poorer sleep quality. Specifically, the longer the duration of sedentary time, the worse the sleep quality; the shorter the sleep duration, the lower the sleep efficiency.(Menezes-Júnior et al 2024 & Hargens et al 2021 & Huang et al 2025 & Li et al 2022 & Liu et al 2021).

Several studies demonstrated a direct relationship between sedentary behavior and sleep quality(Menezes-Júnior et al 2024 & Huang et al 2025 & Li et al 2022).此外 Huang et al (2025)It has been pointed out that replacing sedentary behavior with moderate-intensity physical activity can improve sleep quality. Li et al (2022) also found that prolonged sitting and low levels of physical activity would additionally increase the risk of deteriorating sleep quality. Two studies that objectively evaluated sleep results using accelerometers showed that total sleep time was negatively correlated with sedentary time, the number of sedentary episodes, and the total sedentary time per day (Hargens et al 2021). Liu et al (2021) also discovered that prolonged sedentary behavior is associated with shorter sleep duration and lower sleep efficiency.

The other studies reported indirect or mixed results. Grimaldi-Puyana et al (2020) found that sedentary behavior was positively correlated with smartphone usage; while using the phone at night, frequent phone usage, screen exposure were associated with changes in sleep patterns, sleep disorders, difficulty falling asleep, and shortened sleep duration. Although the direct association between sedentary behavior and sleep quality was not directly examined, the research results indicated that sedentary behavior might cause poor sleep outcomes through other pathways.

Pilcher et al (2017) conducted a randomized controlled trial in which sedentary behavior was replaced with light physical activity (light cycling). During the entire 10-week intervention period, no significant differences in sleep duration or sleep quality were observed between the two groups. However, when the intervention period was divided into the first five weeks and the last five weeks, the sleep quality of the sedentary group declined, while that of the active replacement group remained stable.

Overall, existing studies have shown a consistent association between high sedentary behavior among undergraduate students and poor sleep quality or poor sleep outcomes. However, cross-sectional studies dominate, which limits our ability to determine causal relationships.

4. Discussion

4.1 Measurement of Sedentary behavior

This systematic review reveals that there are differences in the measurement of sedentary behavior among various studies. The studies employed both subjective and objective methods to assess the sedentary behavior of undergraduate students, which may be related to factors such as the age of the research subjects, sample size, and cost (Hardy et al., 2013). The total

sedentary time measured objectively is more accurate, while subjective measurement is more suitable for understanding the specific context of the behavior (Aunger, J., & Wagnild, J. 2022). The differences in the measurement methods may also lead to variations in the research results regarding the relationship between sedentary behavior and sleep outcomes.

Among the seven included studies, three used objective measurement methods to assess sedentary behavior, while the other three relied on self-reporting. There was also a randomized controlled trial that examined the effect of light physical activity as an alternative to sedentary behavior, and thus did not directly measure sedentary behavior. Among the three studies using objective measurement included, the devices used were ActiGraph wGT3X-BT, ActiGraph GT9X Link and Axivity AX3. These devices calculate the total sedentary time by identifying periods of continuous inactivity.

Two of the studies used accelerometers worn on the wrist, while the other study employed the method of wearing them on the hip. Previous research has shown that differences in the way and position of wearing the accelerometers may affect the assessment results of sedentary behavior (Kalisch et al., 2022). Therefore, future studies should consider adopting more standardized methods for measuring sedentary behavior to enhance the comparability between studies.

The self-report method is widely adopted due to its simplicity of operation, low cost, and suitability for large-scale surveys. Among the included studies, two used validated questionnaires, namely the International Physical Activity Questionnaire (IPAQ) and the Adolescent Sedentary Behavior Questionnaire (ASAQ), while another study assessed sedentary behavior through a single self-report question. Although questionnaire-based assessments are widely used in epidemiological research, there may be issues of recall bias and inaccurate reporting. Therefore, the differences in measurement methods may to some extent explain the variations in the results.

Overall, despite the differences in methodology, both objective and subjective evaluations consistently indicate that prolonged sitting behavior is associated with decreased sleep quality. However, the higher the standardization of the assessment of prolonged sitting behavior, the more it helps to strengthen the authenticity of the evidence and improve the comparability of the results across different studies.

4.2 Classification of Sedentary behavior

Although most of the included studies examined the total amount of sedentary time, the classification methods of sedentary behavior varied among the studies, which to some extent explains the differences in the results of each study. Most studies mainly focused on the total time of sedentary behavior, while others considered specific sedentary patterns, such as prolonged continuous sedentary time, frequency of sedentary behavior, or sedentary behavior related to screens.

A number of studies on sedentary behavior have mainly focused on the total duration of sitting and have consistently shown that the longer the sitting time, the worse the sleep quality

(Menezes-Júnior et al 2024 & Huang et al 2025 & Li et al 2022). However, studies that use accelerometers for assessment indicate that not only the total duration of sedentary behavior, but also the accumulation pattern of sitting time throughout the day may be of great significance. For instance, Hargens et al (2021) found that Sedentary bouts and the frequency of sitting are negatively correlated with total sleep time; while Liu et al (2021) discovered that prolonged consecutive sitting behavior is associated with shorter sleep duration and lower sleep efficiency.

Furthermore, a study investigated the relationship between sedentary behavior and smartphone usage as well as screen exposure (Grimaldi-Puyana et al 2020). The study indicated that increased sedentary behavior was associated with increased smartphone usage, while nighttime smartphone use, frequent smartphone usage, and prolonged screen exposure were linked to sleep disorders, sleep difficulties, and shortened sleep duration. These findings suggest that specific forms of sedentary behavior may influence sleep outcomes through different behavioral pathways.

Another important consideration is to replace sedentary behavior with physical activity. Huang et al. (2025) reported that when moderate-intensity physical activity was used to replace sedentary behavior, sleep quality improved. Similarly, Pilcher et al. (2017) found that participants in the group that replaced sedentary behavior with light cycling maintained good sleep quality during the experiment, while the sleep quality of the sedentary group participants declined. These studies indicate that the negative impact of sedentary behavior on health is not only dependent on the duration of sedentary time, but also related to the activities performed as a substitute.

In conclusion, the research results emphasize the importance of not only considering the total amount of sedentary time, but also paying attention to the specific patterns and contexts of sedentary behavior. Future studies should further explore whether different forms of sedentary behavior have different effects on sleep quality and related sleep outcomes.

5. Conclusion and future directions

This systematic review examines the relationship between sedentary behavior and sleep quality among undergraduate students. To our knowledge, this is one of the few reviews that specifically summarize the existing evidence on the correlation between sedentary behavior and sleep in this population.

Overall, the research results indicate that the higher the level of sedentary behavior, the worse the sleep-related outcomes. This correlation is relatively consistent. Most of the included studies reported a significant association between sedentary behavior and sleep quality or sleep-related outcomes. An increase in sedentary time is associated with a decline in sleep quality, a shortened sleep duration, and a decrease in sleep efficiency. Although one study provided indirect evidence and another obtained mixed results, neither contradicted the overall trend observed in the literature.

Although the results of these studies are generally consistent, the findings of the existing research still require careful interpretation. Most of the included studies adopted cross-sectional

designs, which limited the ability to establish a causal relationship between sedentary behavior and sleep outcomes. Therefore, although the current evidence supports a significant correlation between sedentary behavior and the decline in sleep quality among undergraduate students, further longitudinal studies and experimental research are needed to clarify the specific causal relationship between sedentary behavior and sleep quality and the underlying mechanisms.

Like other systematic reviews, this one also has several limitations. Only studies published in English were included, which may lead to language bias. Moreover, only two electronic databases were searched, and some relevant studies might still have been missed. The relatively small number of studies ultimately included and the heterogeneity of measurement methods in the studies also limited the ability to draw more favorable conclusions.

Future research should adopt more longitudinal and experimental research designs to better understand the causal relationship between sedentary behavior and sleep quality among college students. Additionally, higher standardization in the measurement and classification of sedentary behavior is needed to enhance the comparability among different studies. At the same time, future research should also explore whether different forms and patterns of sedentary behavior (such as prolonged continuous sitting, sedentary activities based on screens, and sedentary behavior replaced by physical activities) have different effects on sleep quality and related sleep outcomes.

In conclusion, the available evidence indicates that the more sedentary behavior college students engage in, the poorer their sleep quality will be. Reducing sedentary behavior and promoting physical activity may be effective strategies to improve the sleep health of this population.

References

Aunger, J., & Wagnild, J. (2022). Objective and subjective measurement of sedentary behavior in human adults: A toolkit. American Journal of Human Biology, 34(1), e23546. https://doi.org/10.1002/ajhb.23546

Bumrungpert, A., & Pavasuthipaisit, C. (2024). Circadian rhythms, chrononutrition, physical training, and redox homeostasis—Molecular mechanisms in human health. Cells, *13*(2), 138. https://doi.org/10.3390/cells13020138

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Psychiatry Research, 28(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Clemes, S.A., O'Connell, S.E., & Edwardson, C.L. (2014).Office workers' objectively measured sedentary behavior and physical activity during and outside working hours.Journal of Occupational and Environmental Medicine, 56(3), 298–303.https://doi.org/10.1097/jom.0000000000000101

Freedson, P. S., & John, D. (2013). Comment on "Estimating Activity and Sedentary Behavior from an Accelerometer on the Hip and Wrist". Medicine & Science in Sports & Exercise, 45(5), 962–963. https://doi.org/10.1249/MSS.0b013e31827f024d

Gogniat, M. A., Won, J., Cruz, C., Aranda, A., Verma, A., Gujral, S., Weinstein, A. M., Zaheed, A. B., Cole, K. R., Full, K. M., & Snitz, B. E. (2025). Sedentary behavior, cognition, and brain health in older adults: A systematic review. Frontiers in Aging Neuroscience, 17, Article 1622049. https://doi.org/10.3389/fnagi.2025.1622049

Grimaldi-Puyana, M., Fernández-Batanero, J. M., Fennell, C., & Sañudo, B. (2020). Associations of objectively-assessed smartphone use with physical activity, sedentary behavior, mood, and sleep quality in young adults: A cross-sectional study. International Journal of Environmental Research and Public Health, *17*(10), 3499. https://doi.org/10.3390/ijerph17103499

Han Y T,Du X X.(2023).Level of physical activity and sedentary behavior influence on college students' mental health and sleep quality: an empirical investigation.Abstract Collection of the 13th National Sports Science Congress -- Wall Poster Exchange (Sports Psychology Branch) (1)53-55.doi:10.26914/c.cnkihy.2023.079108

Hardy, L. L., Hills, A. P., Timperio, A., Cliff, D., Lubans, D., Morgan, P. J., Taylor, B. J., & Brown, H. (2013). A hitchhiker's guide to assessing sedentary behaviour among young people: Deciding what method to use. Journal of Science and Medicine in Sport, 16(1), 28–35. https://doi.org/10.1016/j.jsams.2012.05.010

Hargens, T. A., Scott, M. C., Olijar, V., Bigman, M., & Edwards, E. S. (2021). Markers of poor sleep quality increase sedentary behavior in college students as derived from accelerometry. Sleep and Breathing, *25*(1), 537–544. https://doi.org/10.1007/s11325-020-02190-2

Huang, Y., Zheng, K., Tan, T. C., Zheng, J., Chen, T., Huang, T., & Wang, K. (2025). Associations of objectively measured physical activity and sedentary behavior with sleep quality in college students. Complementary Therapies in Clinical Practice, *59*, 101964. https://doi.org/10.1016/j.ctcp.2025.101964

Iswari, Y., Letcmi, S., Nambiar, N., & Yuniarahmah, D. (2025). The relationship between sedentary behaviour and the incidence of obesity in school-aged children. Malaysian Journal of Medicine and Health Sciences, *21*(s3), 125–130.

Kalisch, T., Theil, C., Gosheger, G., Ackmann, T., Schoenhals, I., & Moellenbeck, B. (2022). Measuring sedentary behavior using waist- and thigh-worn accelerometers and inclinometers – Are the results comparable? Therapeutic Advances in Musculoskeletal Disease, 14, 1759720X221079256. https://doi.org/10.1177/1759720X221079256

Li, D., & Li, X. (2022). Independent and combined associations between physical activity and sedentary time with sleep quality among Chinese college students. International Journal of Environmental Research and Public Health, *19*(11), 6697. https://doi.org/10.3390/ijerph19116697

Liu Xian Chen,et al.(1996)Reliability and validity of the Pittsburgh Sleep Quality Index.Chinese Journal of Psychiatry,2:103-7

Liu, W., Yuan, Q., Zeng, N., McDonough, D. J., Tao, K., Peng, Q., & Gao, Z. (2021). Relationships between college students' sedentary behavior, sleep quality, and body mass index. International Journal of Environmental Research and Public Health, *18*(8), 3946. https://doi.org/10.3390/ijerph18083946

Lo, J. C., & Carskadon, M. A. (2025). From curfews to skipping 8 am classes: 100 years of university student sleep culture. Sleep, 48(10), zsaf183. https://doi.org/10.1093/sleep/zsaf183

Menezes-Júnior, L. A. A., Barbosa, B. C. R., de Paula, W., Ferreira, A. D., Cardoso, C. S., de Freitas, E. D., de Carvalho Vidigal, F., Ferreira, L. G., Nobre, L. N., da Silva, L. S., & Meireles, A. L. (2024). Isotemporal substitution analysis of time between sedentary behavior, and physical activity on sleep quality in younger adults: A multicenter study. BMC Public Health, *24*(1), 2460. https://doi.org/10.1186/s12889-024-19995-5

Nascimento-Ferreira, M. V., Rosa, A. C. A., Azevedo, J. C., Santos, A. R. A., De Araujo-Moura, K., & Ferreira, K. A. (2022). Psychometric properties of the online International Physical Activity Questionnaire in college students. International Journal of Environmental Research and Public Health, 19(22), Article 15380. https://doi.org/10.3390/ijerph192215380

Owens, S. (2010). Sedentary versus inactive: distinctions for disease prevention. Nature Reviews Cardiology, 7, 1. https://www.nature.com/articles/nrcardio.2010.68-c1

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, *372*, n71. https://doi.org/10.1136/bmj.n71

Pilcher, J. J., Morris, D. M., Bryant, S. A., Merritt, P. A., & Feigl, H. B. (2017). Decreasing sedentary behavior: Effects on academic performance, meta-cognition, and sleep. Frontiers in Neuroscience, *11*, 219. https://doi.org/10.3389/fnins.2017.00219

Prince, S. A., Cardilli, L., Reed, J. L., Saunders, T. J., Kite, C., Douillette, K., Fournier, K., & Buckley, J. P. (2020). A comparison of self-reported and device measured sedentary behaviour in adults: A systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity, 17(1), 31. https://doi.org/10.1186/s12966-020-00938-3

Ryan, R., & Hill, S. (2019). Supporting implementation of Cochrane methods in complex communication reviews: resources developed and lessons learned for editorial practice and policy. Health Research Policy and Systems, *17*(1). https://doi.org/10.1186/s12961-019-0435-0

The WHOQOL Group. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. Psychological Medicine, 28(3), 551–558. https://doi.org/10.1017/S0033291798006667

Wu Qiang,Li (2023) Research on the relationship between sleep quality and physical health index of Undergraduate students Proceedings of the 4th National Fitness Science and Sports Academic Exchange Conference and International Academic Forum on Sports and Health:97,doi:http://www.cnki.net

Supplementary File

Complete retrieval strategy

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