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# **Research for the Sleep Health and the Lifestyle Relationship**

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## Abstract:

The health of sleep is a main factor determining people's daily lives, which depends on lifestyle in many aspects. The study is based on the dataset Laksika Tharmalingam generated for the statistical analyses of sleep health and lifestyle. The research uses linear regression to analyze sleep health effect factors by the relationship of sleep duration, people's quality of sleep, which is self-reported, and the lifestyle of physical activity, people's daily steps, and stress level. Participants consisted of 374 individuals from different occupations from age 27 to 59, both male and female. The research mainly focuses on the physical activity, daily steps, and stress levels of people with people's sleep health. Across the sample, physical activity level and step quality positively correlated with sleep health, and stress level of people is negatively correlated with people's sleep health. Sleep quality is statistically significantly impacted by step quantities and stress levels, which can also have significant effects on sleep health. However, the amount of physical exercise has no statistical impact on sleep quality.

**Keywords:** Sleep health; lifestyle relationship; linear regression.

# **1. Introduction**

Sleep is one of the most important activities that people do every day, which can help people keep healthy and energetic to support people's activities. Sleep health is the key factor that helps people do activities at a healthy level, make decisions, and memorize. Sleep deprivation may cause many problems, bring negative effects on people's mood and concentration, or even cause more serious problems like high blood pressure to people. In addition, sleep deprivation can lead to social withdrawal and loneliness, create problems in people's society, and bring isolation. In the long term, sleep deprivation may lead to negative effects on health and productivity to people, causing an estimated \$680 billion in economic losses each year [1]. Therefore, studying the various factors that may affect sleep quality is important to develop interventions to improve people's sleep quality.

In previous studies, PhD Grant Benham conducted an online survey of undergraduate students, prompting people to reflect on their sleep quality and perceived stress levels [2]. The findings revealed the negative association between people's stress and sleep health: as perceived stress increases, sleep quality decreases among undergraduate students. According to Campos et al., daily physical activity can impact people's mental health and quality of sleep [3]. People with more physical activities have higher sleep quality, and people with a higher number of steps have more sleep duration than others. Ernstsen and Havnen conclude that physically active adults have lower stress than others, which means that they have lower odds of sleep disturbances and high sleep quality [4]. Gardiner mentioned that the participants say that staying physically active can help people moderate sleeping patterns and improve sleep quality [5]. In conclusion, understanding the affected factors of sleep health can help people better figure out the way to keep sleep healthy and improve people's lives.

This article finds out the relationship between people's sleep health and lifestyle. To figure out the effect that stress levels, physical activities, and daily steps may bring on people's sleep health. This study provides support for researchers to continue studying potential lifestyle reasons to enhance overall health and sleep quality.

## 2. Methods

### 2.1 Dataset

The Sleep Health and Lifestyle dataset from Kaggle is the study's foundation, which was built by Laksika Tharmalingam. The dataset contains 400 participants and includes several variables related to people's daily activities and sleep habits. Covering people's ID and personal information, including gender, age, occupation, and sleep patterns: sleep duration, quality of sleep, sleep disorder, as well as daily routines: physical activity level, stress level, BMI category, blood pressure, heart rate, and the daily steps. The dataset mainly focuses on people's comprehensive sleep metrics and lifestyle factors, which provide scientific evidence for the study. The dataset includes many variables that are related to lifestyle, while the study mainly focused on physical activity levels, daily steps, stress levels, with people's sleep quality and duration. The physical activity level is the number of minutes that a person takes the physical activity in a day. The stress level is a score that people rate by themselves of the stress experienced, which is from 1 to 10 score. The number of steps that people take in one day is the daily steps. People rate the

quality of sleep from 1 to 10 score to indicate the quality of sleep, which is subjective.

## 2.2 Method

The study uses multiple linear regression (LR), which can show the relationship between each variable directly. The LR analysis can estimate the LR between the independent variables and the dependent variable. For the previous studies, Demir points out that for the study of patients after living donor liver transplantation who have poor sleep quality, as the increase of people's anxiety and stress levels, the sleep quality decreases, which indicates that stress level is a main factor to determine the sleep quality [6]. The physical level and steps may also associate with the quality of sleep because Wang says that proper physical activity can help college students to improve the quality of sleep and improve the sleep health of people [7].

The function of the LR is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon \tag{1}$$

Y is the quality of sleep,  $X_1$  is the physical activity level,

 $X_2$  is the stress level, and  $X_3$  is the daily steps of people. The study focused on the dependent variable, sleep quality, which can be affected by the independent variables: physical activities, daily steps, and stress levels. The LR analysis can figure out the correspondence between three of the lifestyle factors and the sleep quality of the participants. The independent variable's impact on sleep quality is statistically significant when the p-value is smaller than 0.05. The estimated coefficient for each variable can show the relationship between each variable, physical activity levels, daily steps, and stress levels, and the relationship with sleep quality.

## 3. Result

Figure 1 contains the factors that may affect people's quality of sleep: daily steps, physical activity level, and stress level. The x-axis is the specific values of each factor, which shows the level of the activities. The y-axis is the quality value of people's sleep, showing the people's sleep health level.

The quality of sleep slightly increases when the steps that people take daily and the physical activity rise. Additionally, the sleep quality of people declines when people's stress levels rise.

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Fig. 1 The scatter plot matrix displays the association between daily steps, physical level, and stress level with the sleep quality (Photo/Picture credit: Original).

Table 1 shows the LR analysis of the sleep quality, whichfactors: physical activity level, stress level, and dailyis a dependent variable, and three lifestyle-independentsteps.

	Estimate	Standard Error	T-Value	P-Value
Intercept	9.74000	0.12100	80.80000	0.00000
Physical Activity Level	0.00204	0.00194	1.05000	0.29500
Stress Level	-0.62600	0.01470	-42.50000	0.00000
Daily Steps	0.00012	0.00002	4.73000	0.00000

Table 1. Result of the LR analysis of the dependent variable,

Overall, the intercept shows the value of people's quality of sleep value when the independent variable does not have any effect on the quality of sleep of people. According to the physical activity level estimate, people's physical activity levels and sleep quality are positively correlated. The standard error is small, showing the high precision of measure. However, the p-value of the physical activity level is greater than 0.05, and the t-value is relatively low, suggesting that the physical activity level in the study cannot show a statistically significant effect. For the stress level, the estimate indicates that stress levels and sleep quality are negatively correlated. The t-value's absolute value is big, and the p-value is 2.30e- 144, which is smaller than 0.05 at a great level. The small positive relationship between daily steps and people's sleep quality. Daily steps have low standard error, a relatively high t-value, and a p-value of 3.16e- 6, which is also smaller than 0.05 (Fig. 2).



Fig. 2 The relationship between people's sleep duration in hours and sleep quality. The sleep quality increases as the number of hours that people sleep increases (Photo/Picture credit: Original).

# 4. Discussion

In Figure 1, the daily steps have a slightly relative positive skew with the sleep quality shown on the graph. The quality of sleep of people increases as the physical activities people do in hours increases. However, the stress level is strongly negatively correlated to the sleep quality. As the stress level increases in the graph, the quality of sleep declines in a strong skew.

In Table 1, the physical activity level's p-value is higher than 0.05, indicating that there is no statistically significant effect between physical activity level and sleep quality. The research has a similar conclusion to Liang's previous research. For healthy individuals, physical activity level and the quality of sleep do not significantly correlate, while the increase in physical activities can bring sleep efficiency for people with insomnia [8]. For the stress level, the large absolute value of the t-value and the p-value smaller than 0.05 at a great level suggest the significant effect that stress level can bring on the quality of people's sleep, which indicates that stress is a main effect factor of sleep quality. The more stressed people are the less sleep health. The result has a similar conclusion to the previous study that Demir et al. did. The estimation indicates that the daily steps and the quality of sleep are positively correlated. Daily steps have a statistically significant impact on sleep quality, because of the high t-value and low

p-value being less than 0.05. Focus on three of the independent variables of sleep quality. Stress level appears to be the main factor that affects people's sleep quality, and the daily step also has a statistically significant effect on it.

To improve people's sleep health, people should stay relaxed and keep an optimistic state of mind to bring benefit to people's sleep quality. Regular daily exercise, such as taking a walk, will also help. Increasing the sleep duration of people can also improve the quality of sleep somehow, and because of the positive relationship between the sleep duration and the quality of sleep in Figure 2.

There are some limitations to this research. The sleep quality of people and stress levels are based on the score that people rated themselves, which is subjective and may not be accurate. So, sleep health may not be reflected by the factor completely. Also, the study may have some confounding variables that are not mentioned in the dataset, such as mental health problems and some bad habits during daily life. For future studies, research should involve more professional scores of people's sleep quality and stress levels. Also, the participants can be grouped by different health statuses.

# 5. Conclusion

The study discusses the relationship between people's life-

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styles and sleep health for adults of different ages with different backgrounds. According to LR analysis and scatter plot analysis, people's sleep quality is positively correlated with the steps and physical activity that people take in a day. There is a negative correlation between stress levels and sleep quality. Stress levels and the daily steps people take significantly affect people's sleep quality and are the main lifestyle factors that may affect people's sleep health. People should keep a healthy mood and proper exercise lifestyle to stay in better sleep health.

For future research, it would be valuable to explore additional lifestyle factors, such as dietary habits and screen time, and their potential impact on sleep quality, as well as to investigate more diverse populations to gain a broader understanding of the factors influencing sleep health across different cultures and environments.

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