

# Epidemiological Study on Association between Habitual Physical Activity and Sleep Time in Seven Years

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## Summary

This is a report of an investigation into the link between physical activity and sleep, hitherto not a fully analyzed topic. This study did not purport to investigate the direct influence of sleep on the body. Rather, the author's continued efforts have centered on the relationship between length of sleep time and habitual exercise. The finding regarding habitual exercise was that the rate of non-exercisers tended to be high in the group of persons with inadequately short sleep time.

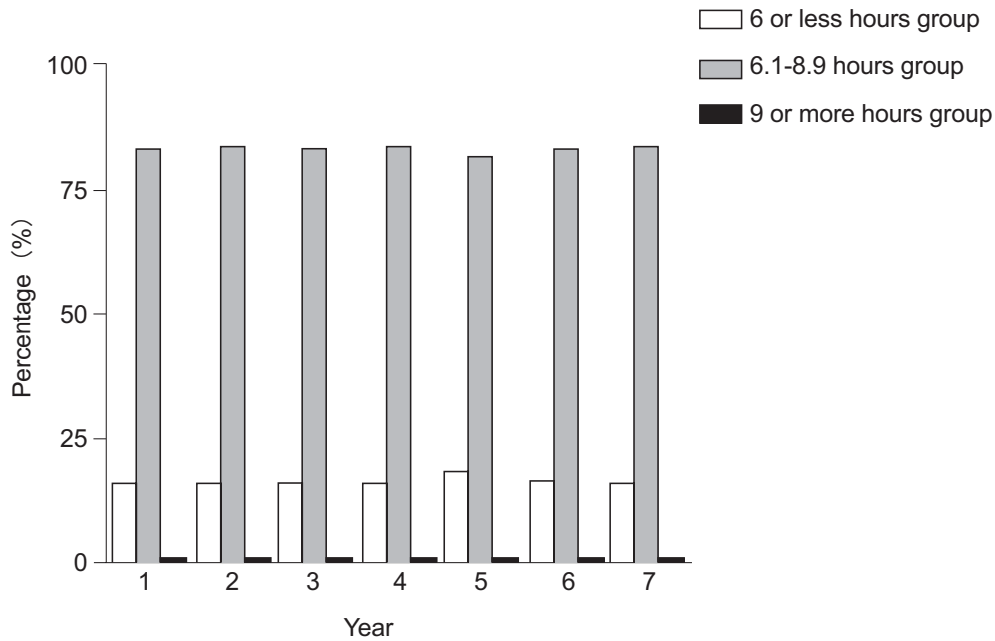
## I . Introduction

Lifestyle's great influence on health is a well known fact. The influence of sleep on health, in particular, is considered to be great, due to the proportion of the day's activities spent on it. In the field of public health relatively little attention has hitherto been paid to sleep as a research topic. Research work concerning the mechanisms of sleep and changes in the duration of sleep fall into the field of brain physiology. Much other research concerns such topics as: sleep disorders caused by shift work; apnea and its adverse effects on daily life; REM-related sleep disorder's effects on social life; sleep disorders among the aged or drug-induced sleep disorders. Measures to cope with these adverse effects are also discussed<sup>1-2)</sup>. Most of those studies address the effects of sleep without consideration to other factors that may be eliciting disease. However, multiple factors such as age, social environment, physical and mental condition or lifestyle influence sleep in a complex manner<sup>3-4)</sup>. It is difficult to gain

sufficient insight into the nature of preventive methods that may actually be effective in practical situations by simply studying sleep alone. Given this situation, the author's research team has been engaged in a continuous survey of seven years standing, surveying 1,700 employees of a large business establishment to conduct analyses on the relationship between sleep and important component factors of lifestyle-related diseases, namely, dietary habit, drinking and smoking, etc<sup>5)</sup>. This is a report of an investigation into the link between physical activity and sleep, hitherto not a fully analyzed topic.

## II . Subjects and Method

They were employees of a chemical plant located in Sakai, Osaka, Japan. Among the employees who received routine health examinations between 1992 to 1998, those who satisfied conditions 1) through 4) were selected: 1) Men between the ages of 20 to 59 years; 2) Those who did not require more detailed examinations other than a routine health examination; 3) Those who were not given a diagnosis of



**Fig.1 Percentages for 3 groups (less than 6, 6.1 to 8.9, 9 or more) classified by hours of sleep between seven years**

chronic diseases at the routine examination (such as cardiac disease or diabetes mellitus); 4) Those who did not report an abnormality, such as fatigue or a common cold on the day of the routine health examination; 5) Those who were not workers on the 3 shifts on the production line.

Most operated the computer-controlled equipment and were not at risk of being exposed to toxic chemicals. The number of individuals ultimately selected were: 1,687 in the first year; 1,810, the second year; 1,860, the third year; 1,782, the fourth year; 1,747, the fifth year; 1,795, the sixth year; 1,652, the seventh year.

Prior to the health examination, question sheets were distributed to the test subjects so that they could report on their hours of sleep and exercise and dietary habits. The completed forms were collected on the day of the health examination. The rate of recovery was 99.9%. The same form was used throughout the entire study period.

Two groups were set up to analyze the effects of habitual exercise. The first group consisted of persons who stated that they hardly exercised (non-exercise group). The second group included three categories: persons who said that they exercised “once in a while”

; persons who said that they “exercised regularly once or twice a week”; and persons who said that they “exercised almost every day” (exercise group).

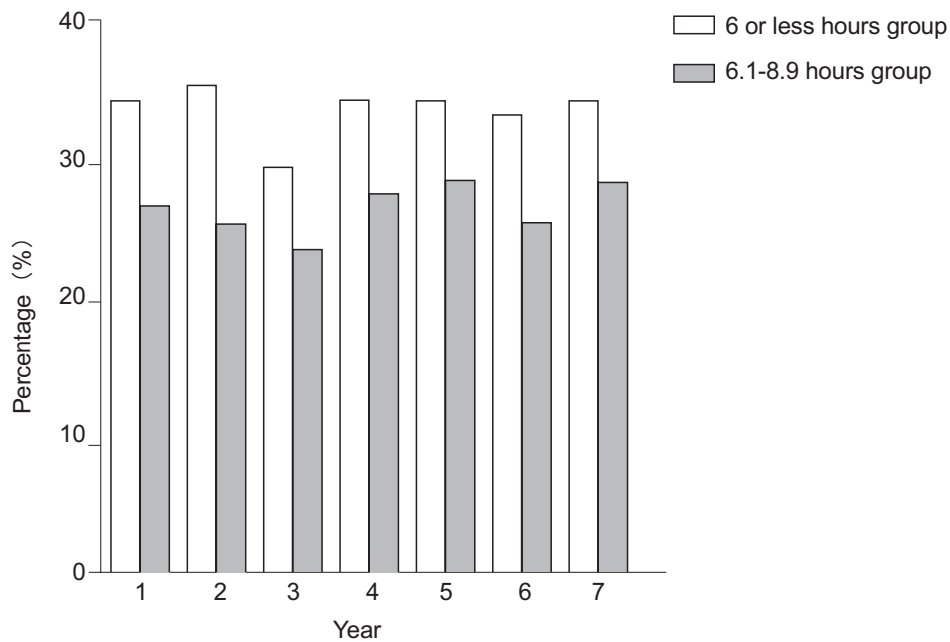
### III . Results and Discussion

The survey was administered each year. In every year approximately 70% of participants belonged to the exercise group, while 30%, fell in the non-exercise group.

In each year the survey was carried out, the highest number of participants (approximately 83 %) fell in the 6.1-8.9 sleep hour category. Next in ranking was the group of persons with less than 6 hours sleep (approximately 16%). The group of persons with over 9 hours sleep contained less than 1% of the total number . (Fig. 1)

Throughout the seven years of the survey on the relationship between physical activity and sleep, the percentage of non-exercisers in the group with less than 6 hours of sleep was prominently low when compared to the group with 6.1-8.9 hours of sleep (Fig. 2). However, the difference was not statistically significant.

“Nutrition,” “exercise” and “rest” have in recent years been regarded as important factors the preven-



**Fig.2 Percentage of non exercise in the 2 groups (less than 6, 6.1 to 8.9)classified by hours of sleep between seven years**

tion of lifestyle-related diseases. In particular, sleep, as the largest component of what is called in daily life “rest,” may be considered to play an important role such diseases’ onset or recovery. Sleep has been a health factor that has hitherto received relatively little attention. Thus, research work on the topic has been limited in quantity<sup>6-8)</sup>. In comparison with works that study the relevance of smoking or drinking to the disease, epidemiological studies that investigate the connection between sleep and the disease are very few in number. A 6-year follow-up survey of such studies by the American Cancer Society has made clear that regardless of gender, age, or presence/absence of previous illness, e.g., cardiac disease or diabetes, persons who either slept less than four hours or longer than 10 hours had a higher mortality than those in the group of 7-8 hours of sleep<sup>9)</sup>. Among persons whose sleep time was extremely short or long, statistically significant high rates of cardiac disease, cerebrovascular disease, malignant neoplasm or suicide, was in evidence. A normal distribution (bell-shaped curve) was taken to represent the relationship between sleep time and average health status. Mortality wise, sleep times of 7-8 hours were found ideal for the health of persons in this group regardless

of gender. The worst health status was associated with sleep times of less than seven hours. The health status of persons with sleep times of longer than eight hours also fell in the negative range. Namely, too much as well as too little sleep was found to adversely affect persons’ health status<sup>10)</sup>. Sleep, one of lifestyle factors, appears to influence health to a far greater degree than our expectations, when taken together with other lifestyle factors, such as eating and habitual exercise that may also act as disease causing agents<sup>11)</sup>.

The current work did not purport to investigate the direct influence of sleep on the body. Rather, the author’s continued efforts have centered on the relationship between length of sleep time and habitual exercise. The finding regarding habitual exercise was that the rate of non-exercisers tended to be high in the group of persons with inadequately short sleep time. Namely, persons in this group tended to show the pattern of physical inactivity together with a high liability to lifestyle disease. This result can be regarded as indirectly supplementing the above mentioned data that described the relationship between sleep time and mortality/morbidity. The result with the group of insufficient sleep suggested

not only the inadequacy of sleeping time, but also of other features of lifestyle, particularly as concerns physical activities.

## V . Reference

- 1) Bliwise DL, King AC, Harris RB :Habitual sleep durations and health in a 50-65year old populations. J Clin Epidemiol ,47, 35-41 (1994)
- 2) Hopton JL, Dlugolecka M : Need and demand for primary health care: a comparative survey approach. BMJ, 310, 1369-1373 (1995)
- 3) Gall R, Isaac L, Kryger M : Quality of life in mild sleep apnea syndrom. Sleep 16(8Suppl), S59-S61 (1993)
- 4) Spiegel K, Leproult R, Van Caunter E :Impact of sleep debt on metabolic and endocrine function. Lancet, 354, 1435-1439 (1999)
- 5) Imaki M, Hatanaka Y, Ogawa Y, Yoshida Y, Tanada S : An epidemiological study on relationship between the hours of sleep and life style factors in Japanese factory workers. J physiol Anthropol, 21, 115-120 (2002)
- 6) Kim K, Uchiyama M, Okawa M, Liu X, Ogihara R : An epidemiological study of insomnia among the Japanese general population. Sleep, 23, 41-47 (2000)
- 7) Ohida T, Kamal AM, Uchiyama M, Kim K, Takemura S, Sone T, Ishii T : The influence of lifestyle and health status factors on sleep loss among the Japanese general population. Sleep24, 333-338 (2001)
- 8) Seki N : Relationship between walking hours, sleeping hours,meaningfulness of life(Ikigai) and mortality in the elderly:prospective cohort study. Jpn J Hyg, 56, 535-540 (2001) (in Japanese)
- 9) Hammond EC, Garfinkel L : Coronary heart disease, stork, and aortic aneurysm:factors in the etiology. Arch Environ Health 19, 167-182 (1969)
- 10) Kusaka Y, Kondo H, Morimoto K : Healthy lifestyles are associated with higher natural killer cell activity. Environ. Health Prev. Med., 21, 602-615 (1996)
- 11) Morimoto K : Lifestyle and health. Jpn J Hyg, 54, 572-591 (2000)(in Japanese)

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## 7年間の習慣的な身体活動と睡眠時間に関する疫学研究

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睡眠は、生活習慣状況等の多種多様の要因と複合的に絡み合っている。睡眠の単独的な解明では、実際の疾病予防のための十分な知見を得ることは難しい。そのため、生活習慣病予防の重要な要因である食生活、飲酒、喫煙などの生活習慣要因と睡眠の関連性について、大規模事業所従業員約 1700 名を対象に、7年間の継続的調査により解析している。その中で、本研究においては、解析が不十分であった身体活動と睡眠に関して検討した。その結果、習慣的な身体活動と睡眠時間との関連について、7年間の調査期間を通じて、概ね睡眠時間の6時間未満の群は、6.1-8.9時間の群に比較して、ほとんど運動をしない者の割合が低値を示した。つまり、睡眠時間不足群は、単に睡眠時間が短いだけでなく、身体活動を中心とした生活習慣も不適切であることが示唆された。

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