Feature 2

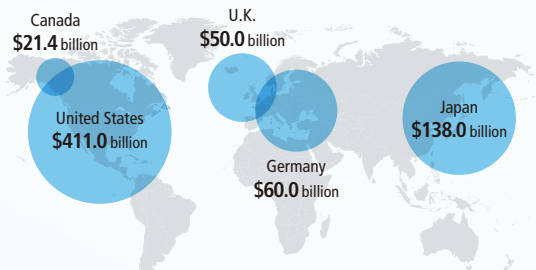
Creating an Environment Conducive to Napping for Greater Vitality

Why is it important?

To Encourage Napping that Benefits the Social Economy and Health

Lowered productivity due to lack of sleep has led to economic losses in the trillions of yen per year in five major countries. While sleepiness during the day can occur even with adequate sleep the night before, napping represents a potential way to counteract this. Napping is being studied for its effect on improving concentration and reducing the risk of cardiovascular diseases, but the key is improving the quality of sleep. Daikin believes it can contribute to addressing economic and health issues of today by developing many areas conducive to effective napping at any time.

Economic Losses in Each Country due to Lowered Productivity from Insufficient Sleep



Note: Compiled by Daikin based on data from RAND Corporation *Why Sleep Matters: Quantifying the Economic Costs of Insufficient Sleep*

Daikin's Approach

Collaborative Industry-Academia Research on the Optimal Thermal Environment for Napping

Comfortable air conditioning improves bodily comfort and enhances quality of sleep. Based on the knowledge developed through the Good Sleep mode of residential air conditioners, Daikin has focused its attention on effective short-duration sleep that leads to increase productivity. Since January 2020, we have been conducting research on optimal thermal control for daytime napping in collaboration with a lab at the University of Electro-Communications. We believe that it is essential and meaningful to modern society to offer an alternative to those who have difficulty getting a good sleep at night.

Quality sleep requires three elements: falling asleep quickly, stable sleep at a moderate depth, and conditions to prevent drowsiness pre-waking. Given that a short nap of 30 minutes or less is recommended to prevent reduced productivity during daytime sleepiness, the study set out to identify the thermal environment that optimizes each of the three stages of pre-sleep, being asleep, and waking within the 30-minute period. Brain waves of test subjects napping in the test booth were measured. The air conditioning inside the booth was controlled according to the sleep state, then the acquired data was analyzed.

Daikin's Performance

Demonstration with Interactive System Launched for Future Commercialization

In January 2022, we published the results of testing conducted over two years. In a Japanese regular office space with 40 to 60% humidity, sleep latency can be shortened by making the room temperature 27 degrees Celsius. Once asleep, non-REM sleep suitable for naps can be achieved in 10 minutes by lowering the room temperature to 26 degrees Celsius. Moreover, sleep depth will become shallower by making the room temperature 27 degrees Celsius or higher three minutes prior to waking, which will lead to more refreshing wake-up. This thermal control allows sleepiness to be resolved with 30 minutes of sleep and achieves the effect of improved brain processing speed and memory after waking. Looking ahead to the commercialization of these results, Daikin and the University of Electro-Communications have begun a demonstration test in an office environment.

This testing involves a booth set up with an interactive napping system at point 0 marunouchi,* a membership-based co-working space that Daikin is a part of. In the testing, vital sensors are used to obtain the sleep log of users, while a post-nap survey is also conducted to receive feedback on the napping space. In conjunction with demonstration testing, Daikin is also developing an algorithm to be used in future products to enable comfortable and effective napping.

* One of the projects under Daikin's collaborative platform CRESNECT under which it works with a number of partner companies. It serves as a space for demonstration testing geared toward the development of future offices. The purpose of the space is for users to experience spatial concepts Daikin has created in collaboration with each partner company in order to develop new products and services.

Next Challenge

Bringing Nap Spaces to Various Locations to Boost Human Performance

Napping is an effective way to reduce sleepiness. It has proven indispensable to those in the professions of healthcare, long-distance driving, and so on. With a growing recognition of napping as a factor linked to working with greater energy, there is an increased number of offices that encourage napping. Daikin is committed to supporting the improvement of workers' performance through the power of air by expanding our products and services which will enhance the quality of sleep such as maximizing the effect of napping spaces.

In the future, we will continue to pursue the potential of air and space and strive to create new value through our technology and collaboration with partners.

Commercialization of Technology and Knowledge Through Collaboration with Daikin

Keiki Takadama
Professor, Department of Informatics, Cluster I (Informatics and Computer Engineering)
The University of Electro-Communications Graduate School of Informatics and Engineering

This research seeks to answer the question that everyone wants to know: what kind of nap increases productivity? Deep sleep can help eliminate tiredness but makes one sleepier. On the other hand, light sleep doesn't make one sleepy but does not eliminate tiredness. The research is motivated by the desire to address this question of trade-off. We are able to expand the possibility of applications of the technology and knowledge past the confines of the university through working collaboratively with businesses. Our goal is to commercialize the idea to bring useful products to the public.

Thermal Control for Effective Napping