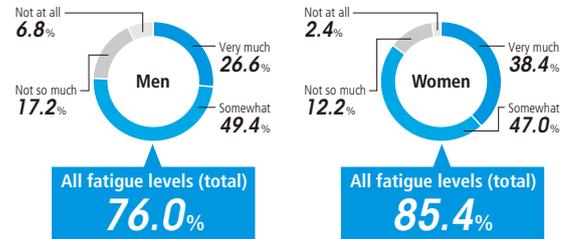


Why is it important?

Fatigue Has Become a Social Problem That Adversely Affects Human Health and Reduces Productivity

Health is affected by numerous mental and physical factors, including the quality of sleep, fatigue, and stress. Among these, fatigue is one that especially requires a solution because it not only adversely affects health but also leads to losses for society in the form of lowered productivity. However, it is difficult to objectively evaluate fatigue, and it is unclear as to what the relationships are between things like the causes of fatigue and illness.

Which Best Describes Your State of Fatigue?



Note: Compiled by Daikin based on 2017 survey on state of fatigue of business people working in Tokyo, by Yomeishu Seizo Co., Ltd.

Feature

Reducing Fatigue and Realizing Pleasant Air Environments through Open Innovation

DAIKIN'S APPROACH

Joint Research toward the Creation of the Air and Spaces Demanded by Society

In 2015, Daikin established the Technology and Innovation Center (TIC). Employing approximately 700 engineers, the TIC collaborates with other companies, research institutes, and universities to conduct joint research aimed at creating new value that contributes to solving issues faced by society in areas such as the environment, energy, and health.

As part of open innovation spawning breakthroughs by pooling the technologies and know-how of Daikin and partners, in October 2016 we opened the RIKEN-DAIKIN Wellness Life Collaboration Program together with Riken, Japan, and began joint research under the theme of comfortable, healthy spaces.

The parties will combine Daikin's air control technologies and Riken's know-how in fatigue, health, and life sciences, and under the theme of creating spaces that help people reduce fatigue, will conduct validation of how factors such as temperature and humidity relate to fatigue. The aim is to create new value for society through, for example, the development of scientifically proven products.

DAIKIN'S PERFORMANCE

Approximately 120 People Take Part in Experiments to Validate Relationship between Room Environment and Fatigue

Despite the fact that the majority of people spend at least 90% of their time indoors, there is still much that is not known about how room conditions such as temperature and humidity affect people. That's why for the very first research topic, we chose to clarify and benchmark the effects that air environments in offices and other rooms have on people.

To realize this research topic, we established test facilities at Riken's Integrated Innovation Building (IIB) in Kobe in November 2017. We gathered the test subjects from the public, and in December we began tests to clarify the relationship between room environment and level of fatigue.



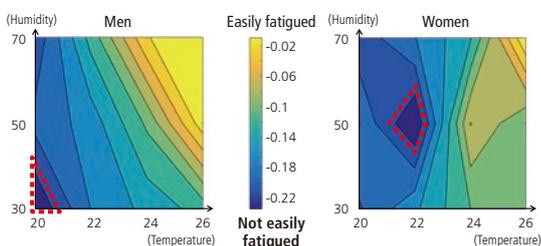


The test facilities have four rooms, each of which can be given its own environment by controlling precisely for temperature (in 0.1°C increments) and humidity (in 1% increments). The 120 test subjects were put in various temperature and humidity environments and given computer work requiring concentration. Data for the subjects was gathered; for example, they were measured for the state of autonomous nerves that can be estimated from the change in heart rate, and for the change in work efficiency and subjective level of fatigue.

Tests so far have indicated that, regarding mental, physiological, and activity aspects, the conditions most conducive to warding off fatigue in an office environment in the winter are a temperature of 20°C and a humidity of 30% for men, and a temperature of 22°C and a humidity of 50% for women. This is the first time ever that tests have clarified the difference in how air environments affect men and women differently. These test results were presented in May 2018 at the Japan Society of Fatigue Science. (See diagram below.)

Plans for future research include changes caused to the body when a person goes back and forth between two spaces with different temperatures, a cause of heat shock, and revealing how this eventually affects a person's health; and how to create ideal air environments for a person's individual characteristics and condition through a combination of factors other than temperature and humidity, such as airflow, lighting, and odors.

Relation between Temperature/Humidity and Level of Physiological Fatigue (Men/Women)



Stakeholder's Comment

Bringing People of Future Generations Scientifically Proven Healthy and Comfortable Air

The human race has always used its ingenuity to come up with air and environments that are comfortable and healthy. One way we are doing this is through our program with Daikin. Toward realizing healthy, comfortable environments that meet people's individual requirements, we are collaborating with Daikin by maximizing our R&D capabilities in controlling all types of daily environments and our comprehensive strength in fatigue research.



Dr. Yasuyoshi Watanabe
Director,
RIKEN BDR-DAIKIN
Collaboration Center

NEXT CHALLENGE

Reveal the Relationship between Environment and Health, and Strive for Air That Raises the Overall Quality of Life

Under the RIKEN-DAIKIN Wellness Life Collaboration Program, we aim to establish a fatigue index for warm environments before the end of fiscal 2018. By using this index, we want to propose and validate air environments aimed at preventing and recovering from fatigue, which will eventually lead to the development of products scientifically proven to realize low-fatigue environments.

In addition, in July 2017, Daikin and Osaka University signed a 10-year comprehensive agreement for further joint research into creating air environments that improve sleep quality, an area Daikin has spent years researching. We will continue to use open innovation toward the realization of creating air and spaces that improve peoples overall quality of life.