

The History of Body Expansion and the Body Sphere of "Self"



History of body expansion through tools

Humans have expanded their body functions by inventing tools (stone tools, agricultural tools, weapons, gunpowder, steam engines, internal combustion engines, etc.), and by approaching the environment, they have enhanced their survival and built civilization. With further invention of tools (information technology, artificial intelligence, BMI, etc.), we are entering an era in which our living environment expands from the real world to the virtual world (multi-layered environment), marking a turning point in human history.



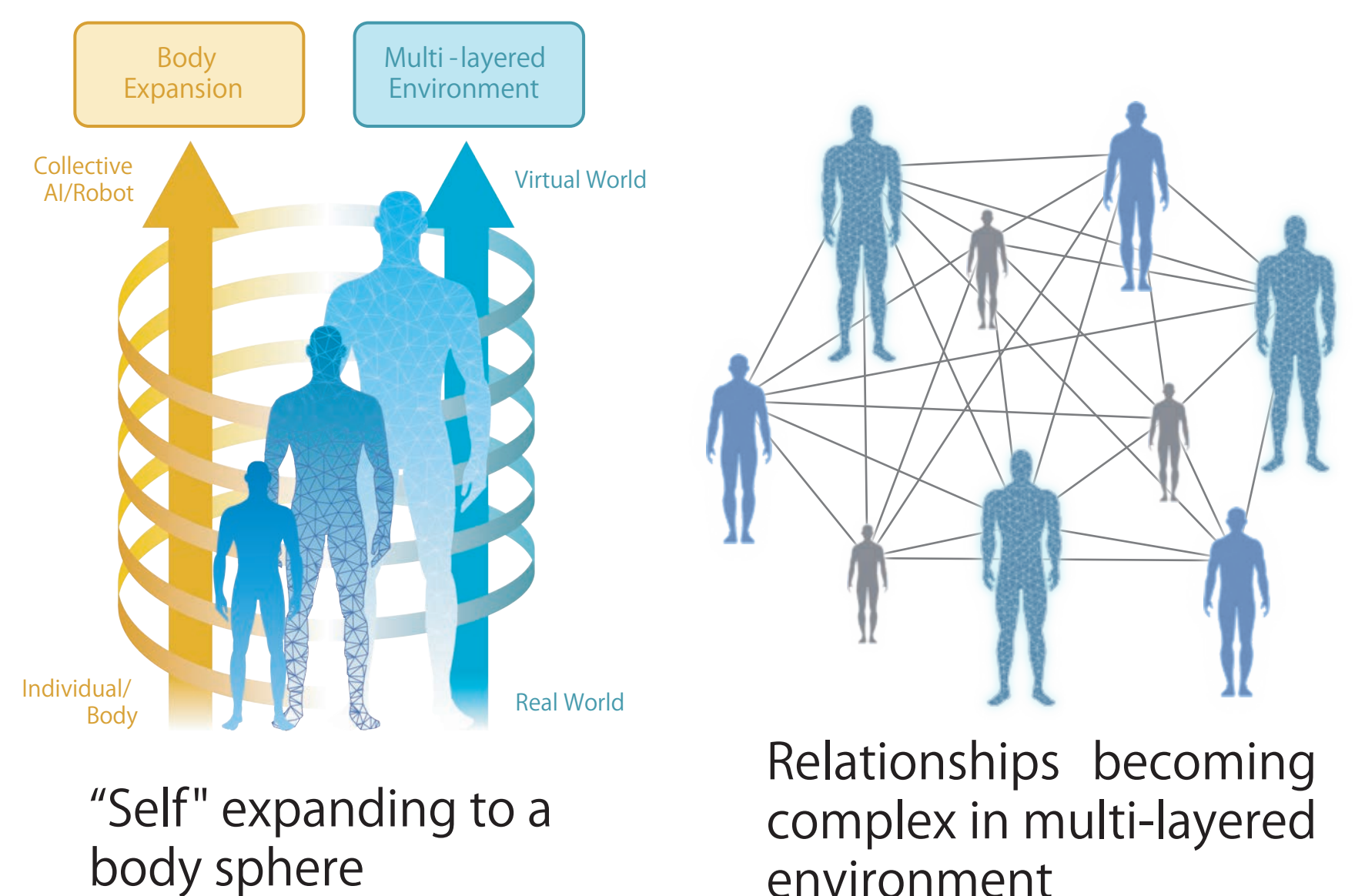
"Self" Expanding to a Body Sphere

As we move into an era in which we build relationships and engage in social lives in a multi-layered environment, the "self" expands beyond the body (body-sphere). "Body sphere research" is necessary to elucidate the various issues and potentials hidden in the relationship between a new "self" and multi-layered environment.

► See "Possibilities and Challenges"

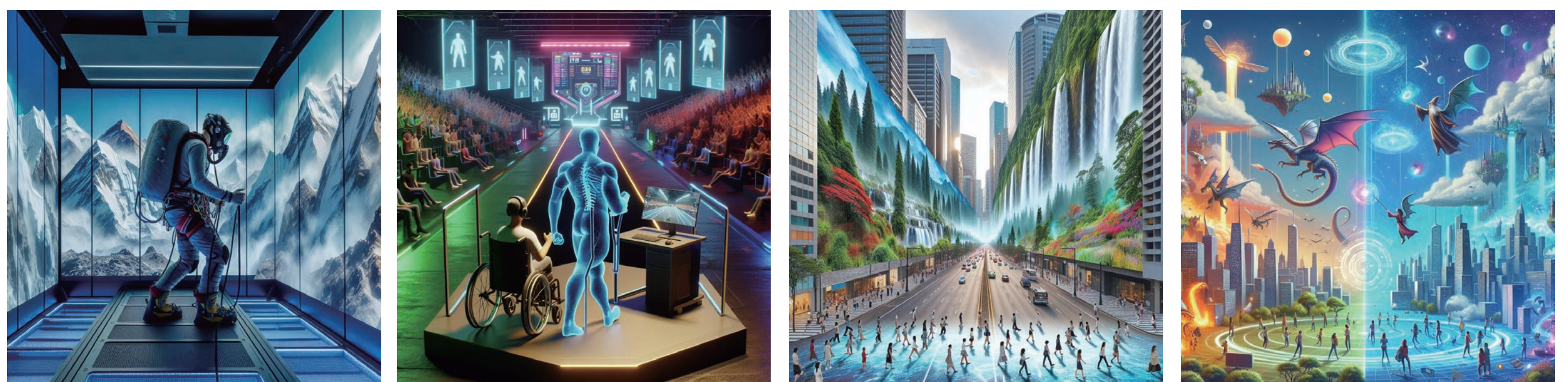
Body Sphere research focuses on all types of relationships that exist in people and society. Therefore, it requires collaborative intelligence produced from interdisciplinary research, including not only the natural sciences but also the humanities and social sciences.

► See "Ritsumeikan Advanced Cross-verse Innovation Commons"



Possibilities and challenges of humans

Expansion of brain and body functions and liberation from restrictions imposed by disabilities and minorities will be enhanced, enabling individuals to pursue their aspirations and build an equitable society in which they can respect and recognize each other. On the other hand, during the transition period, physical and mental difficulties to adjust to the dualism of society consisting of the real world and the virtual world and difficulties in achieving mutual understanding and cooperative behavior due to lack of experience in building relationships in the virtual world may arise.



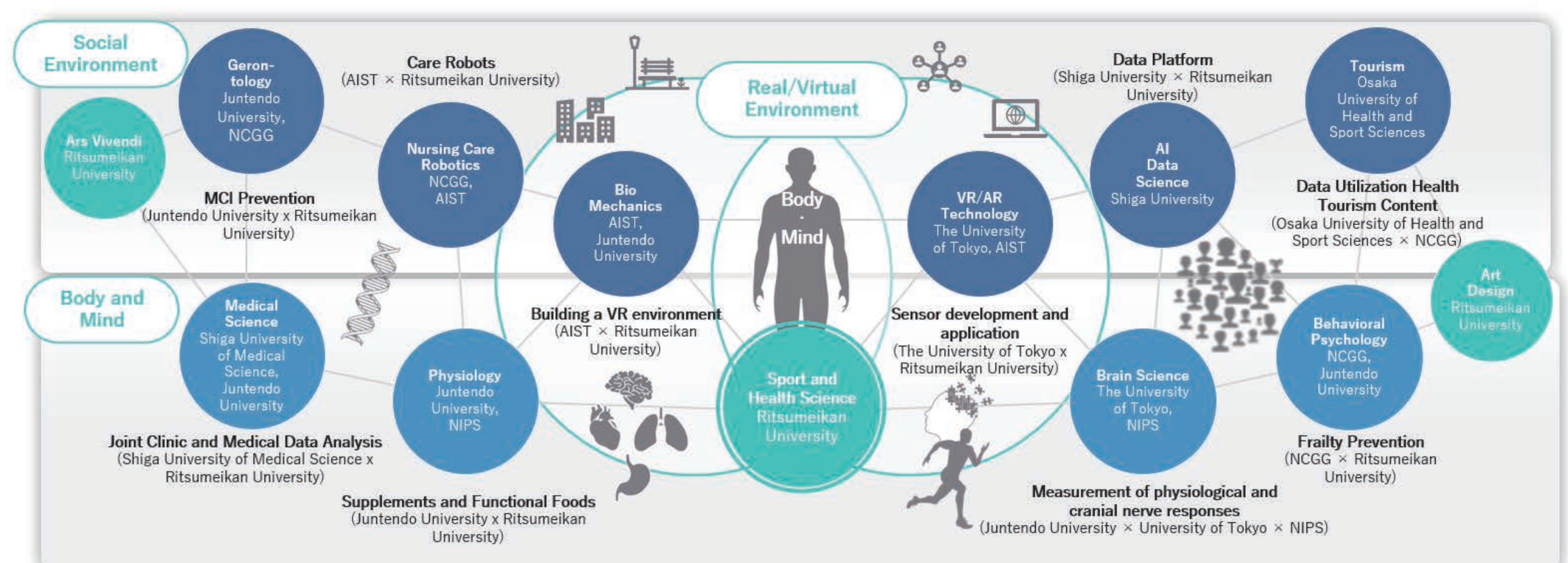
► A physical real/virtual space in which we experience the ordinary and extraordinary will emerge from the development of a multi-layered environment on an individual level.

Creating an Interdisciplinary Research Field that Solves Issues and Opens Up Possibilities in the Era of Body Sphere

Bringing together strengths of partnering institutions such as neuroscience, medical science, VR/MR environment construction, data science, and sports tourism to elucidate various issues of well-being in the era of body sphere through collaborative intelligence.

【Partnering Institutions】

National Institute for Physiological Sciences (NIPS), Shiga University of Medical Science, Juntendo University, Osaka University of Health and Sport Sciences, The University of Tokyo, Shiga University, Nara Institute of Science and Technology, National Institute of Advanced Industrial Science and Technology, National Center for Geriatrics and Gerontology (NCGG), APU



Ritsumeikan Advanced Cross-verse Innovation Commons

CVIC



Environmental intervention facilities to create multi-layered environmental conditions

Head Mount Display

XV Arena

- Space equivalent to two tennis courts
- VR projection on walls and floors
- Create an environment where a group of avatars, holograms and real humans can communicate at once

Artificial weather room

- Adjust temperature, humidity and light to create a real environment for the human body
- Installation of environment construction technology combined with VR

Highly immersive VR environment

- Highly immersive VR facility for a small group of people
- Verification environment for sensitivity and universal design

Promoting body sphere research by combining a diverse set of environmental intervention equipment with a wide range of bio and psychological measurement equipment.



▲CVIC in Ritsumeikan University Biwako-Kusatsu Campus (BKC)

New base for body sphere research

- Solve social issues in a multi-layered environmental society by installing equipment and facilities that enable intervention in multi-layered environment, including virtual world, and body measurements simultaneously.
- Establish a joint research system to achieve a cross-disciplinary and collaborative intelligence approach.
- Create a driving force to respond to social needs by accumulating empirical data on body sphere research and providing it externally.

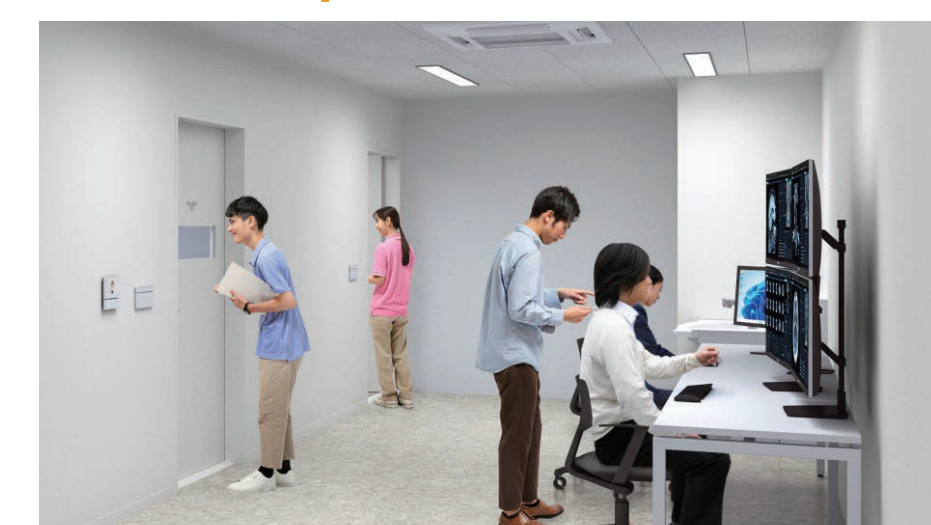
▼XV Arena



▼Highly immersive VR environment



▼Sleep measurement room



▼fMRI



Facilities to measure the biological and psychological effects of multi-layered environment

360degree Motion Capture

Joint clinic

By obtaining medical data under multi-layered environment and integrating cohort data of local residents, the long-term effects of exposure to new environment can be verified.

Biological sensing devices

Multi-dimensional measurement of biological response, group behavior and psychology.

OPM-MEG

Low-constraint wearable MEG enables measurement of brain activity at a high degree of freedom.

Physiological and biochemical measurement equipment

Biomarker measurements related to biochemistry and physiology (blood, heart rate, etc.)

Force Plate

fMRI

Research on brain cognitive mechanisms when people in remote areas meet in a virtual world for mutual communication and collaboration can be conducted.

Sleep measurement room

The impact of daily life in a multilayered environment on sleep quality can be measured.