Goal9 Realization of a mentally healthy and dynamic society by increasing peace of mind and vitality by 2050.

Realization of a society where people can live a forward-looking life in the face of adversity.

Here begins our new MIRAI

MOONSHOT
RESEARCH & DEVELOPMENT PROGRAM

R&D Theme

Assistance and training for Maemuki (Forward-looking)

Progress until FY2022

1. Outline of the project

In this R&D theme, we will develop training technology to enable sustained improvement of the "Maemuki (forward-looking)" factor and technology to assist in improving the "Maemuki" factor. The goal is to establish "Maemuki" assistance/training/education technologies that can be used in a manner that is tailored to the individual's situation.

2. Outcome so far

In FY2022, the first year of our plan, we focused on building the technical foundation for "Maemuki" training and assistance, and on conducting preliminary experiments in preparation for the start of the main experiment in the following year and beyond.

● **Establishment of a technical foundation for "Maemuki" assistance and training**

In order to measure gait in the laboratory, we created computer graphics (CG) images that are synchronously projected with walking speed of a treadmill (Fig. 1a). In addition, taking advantage of the CG images, visual stimuli that are candidates for "Maemuki" manipulation were implemented in the CG.

● **Development of a technological foundation and preliminary experiment for physical intervention**

In preparation for the verification of the relationship between "Maemuki" mind and the body, Dr. Yamada (National Institutes for Quantum Science and Technology), Dr. Hirao (National Institutes for Quantum Science and Technology), and Dr. Sado (University of Tsukuba) collaborated to construct an environment that can simultaneously measure multiple signals such as electroencephalogram (EEG), gaze behavior, electrocardiogram (ECG), respiration, and gait. Dr. Sado also constructed a posture measurement environment focusing on biomechanical indices by using motion capture cameras, force plates, and electromyography (EMG), with the aim of establishing a method for a detailed evaluation on posture (Fig. 1b). Preliminary data acquisition and analysis of gait are underway to improve the measurement accuracy.

As the preliminary experiment on body posture intervention, the data on the effects of posture intervention by eye-movement guidance of CG images on the "Maemuki" factor were collected. The analysis is currently underway, and the results will be used in planning for the next year's main experiment.
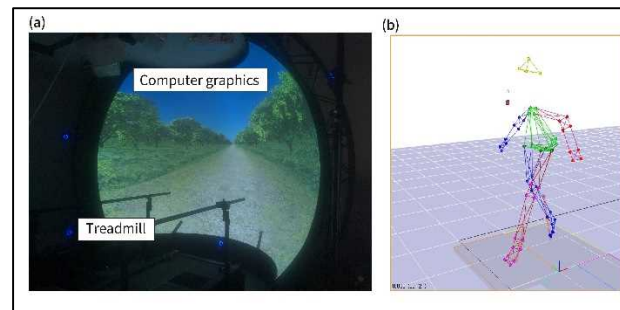

Fig. 1 (a) CG images projected synchronously with the walking speed of the treadmill. (b) Gait measurement environment focusing on biomechanical indices.

3. Future plans

We plan to accumulate data for the purpose of verifying the effect of the training intervention on the "Maemuki." In addition, we will construct a biofeedback system using multiple signals by utilizing the technological foundation established in FY2022 (Fig. 2).

Moreover, Dr. Minamimoto (National Institutes for Quantum Science and Technology) and Dr. Inoue (Kyoto University) are planning to start their studies on this R&D theme. They are engaged in research on designer receptor exclusively activated by designer drugs (DREADD) to investigate how pharmacological and chemogenetic neurotransmitter manipulation in monkeys can lead to "Maemuki" with a view to human application in 2050.
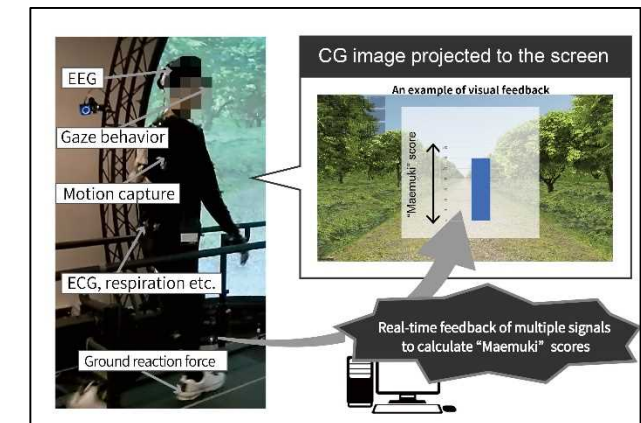

Fig. 2 Biofeedback system to be constructed.