

## 1. Development and Measurement of “Maemuki (Forward-looking)” indices

### Progress until FY2023

#### 1. Outline of the project

In this R&D item, which aimed to create and measure a forward-looking index, we used a variety of survey platforms to create and measure a MAEMUKI (forward-looking) index. We conducted a large-scale online survey using the draft of the prospective subjective scale, conducted item reduction and factor extraction for the prospective subjective scale, and revised the items for the prospective subjective scale. In a real-world measurement of top athletes, we conducted a prospective scale and multidimensional body measurements for different competitive athletes. In addition, the flow experience items of the prospective scale were adapted into a questionnaire scale that takes cultural differences into account, and an English version was completed. We also developed a model for estimating prospective using laboratory and open data.

#### 2. Outcome so far

##### ● Mechanisms of Embodied MAEMUKI

We conducted a large-scale survey (cross-sectional and longitudinal) using the “Prospective Scale” created in the previous year. In addition, we created several cognitive tasks to evaluate the cognitive function of prospective, and found that some of them were related to mood and memory, which led to the submission of a paper and presentation at an academic conference. We succeeded in creating a machine learning model capable of estimating the amount of illusion and metacognition from individual data on positive illusions (illusion of superiority), the main component of prospective (Matsuyoshi,

Isato, Yamada. 2024). Furthermore, we examined the causal relationship between positive illusions (optimism bias) and mood based on longitudinal large-scale survey data, and found that optimism bias influences mood (Isato et al., 2023).

##### ● Real-world sensing and sports performance evaluation

We conducted a survey and interviews with a large number of athletes using a draft of a prospective scale. In addition, we prepared a measurement system, prepared the environment, and collected data for measurement in athletes’ daily lives and in actual competition situations, in cooperation with athletes and organizations in the sports to be measured. We succeeded in capturing changes in cognitive state from analysis of the blink of an eye of a driver while driving a formula car (Nishizono, Saijo, Kashino, 2023). In addition, EEG analysis during e-sports matches revealed that brain activity directly related to winning and losing appeared just before the match (Minami et al., 2023).

##### ● Circulation and generalization of MAEMUKI through flow experiences

For the creation of flow experience items and examination of cultural differences in the prospective scale, we interviewed students at the California Institute of Technology, examined the validity of the items in Western culture, and selected items that we thought were necessary for the prospective scale. We also integrated the items with the flow scale and completed a provisional English version of the Flow-MAEMUKI Integrated Scale.

For the prospective circulation and generalization experiments, we conducted a preliminary study by creating cognitive and behavioral tasks that produced flow experiences in various situations. We selected multiple flow experience tasks that generate solo/team flow, such as e-games that use

the whole body in addition to tabletop and on-screen games, and e-games developed in collaboration with a company, and conducted multi-module biometric measurements, including EEG, 3D capture, pupil and gaze measurements, and heart rate and respiration measurements.

#### 3. Future plans

Based on the results of FY2023, a tentative version of the “MAEMUKI Scale” will be created as a well-going indicator in FY2024 and beyond, and data will be collected through ongoing multidimensional measurement experiments of the mind, brain, and body. Based on the results of these surveys and experiments, we plan to create a prototype of “Body2Positive,” which estimates subjective “MAEMUKI” from physical information, and link it to technology that can read individual “MAEMUKI” and assist and train people.