

### 3. Maemuki (Forward-looking) ELSI and social applications

#### Progress until FY2023

##### 1. Outline of the project

This R&D item is responsible for the ELSI (Ethical, Legal, and Social Issues) and social application of “Maemuki (forward-looking)”. By accomplishing this R&D item, we will evaluate Maemuki in various social situations and clarify the elements and degree of Maemuki leading to desirable mental states in populations with various attributes and situations (different life stages such as children, adults, and the elderly; different mental states such as palliative care patients and mania and depression). This will contribute to the project’s goal of developing positive estimation and assistive technologies.

The challenge in achieving this goal is that the definition of “Maemuki” is different depending on life stage and health status, and at the same time, it is difficult to conduct an objective evaluation method of Maemuki based on the same criteria because of differences in physical functions and body size. We are also working on the development of Maemuki evaluation and intervention methods that take ELSI into account, with the idea of assisting and training Maemuki in accordance with the individual’s situation and needs.



Fig.1 Evaluation of developmental stage, aging stage, and patient’s Maemuki based on posture.

##### 2. Outcome so far

###### ●Consideration of the significance and ethics of Maemuki

The research group of Dr. Shigeru Taguchi (Hokkaido University) has delved deeper into the theoretical refinement of the “Maemuki” concept. Through reviewing, analyzing, and discussing various literature, they have further explored the significance of the “middle voice” concerning the “Maemuki” concept. This has allowed them to clarify the structure of an attitude that accepts things as they are and a positive attitude mediated by negative elements. The analysis of ELSI revealed a relatively high acceptance of “Maemuki assist technologies.” However, it also showed that there are many negative reactions towards the use of these technologies without the individual’s knowledge.

###### ●The Relationship between Life Stages, Health Status, and Maemuki

The research group of Dr. Maiko Fujimori (National Cancer Center) conducted a study on creating a Maemuki scale for elderly and palliative care patients. The questionnaire survey results indicated no specific biases compared to the general adult population. However, it was suggested that elderly cancer patients scored significantly lower in aspects related to self-growth compared to younger cancer patients. Using natural language processing methods, content analysis identified gratitude related to interpersonal relationships and fulfilling obligations as contributing factors to Maemuki attitudes in cancer patients and the elderly. Additionally, a longitudinal study on palliative care patients suggested that patients who perceive their cancer as potentially curable have a higher one-year survival rate compared to those who perceive it as incurable. In terms of physical measurements related to Maemuki attitudes in the elderly and palliative care patients, data from gait analysis suggested that elderly cancer patients might be physically more fragile compared to younger cancer

patients and healthy elderly individuals. Moreover, an examination of the relationship between body posture and emotions indicated that the physical function scores were lower under physical posture restrictions, and negative moods were higher compared to the normal state.

The research group of Dr. Tetsuya Matsuda (Tamagawa University) conducted an online lifestyle habits survey, Maemuki survey, and physical fitness tests with 1,365 university students. Data-driven analysis was used to examine the relationships between the indicators, revealing a strong connection between a Maemuki attitude, physical fitness, and exercise habits. These results suggest that having a Maemuki attitude is associated with maintaining exercise habits and high physical fitness. Additionally, the group analyzes the relationship between walking patterns, Maemuki attitudes, and lifestyle habits by capturing walking movements on video. They are also developing an AI-based method for automatic motion capture from walking videos.

The research group of Dr. Hidehiko Takahashi (Tokyo Medical and Dental University) is collaborating with other PIs to investigate Maemuki attitudes in mental and neurological disorders. They are exploring methods for evaluating Maemuki attitudes and physical measurements. The study plans to enter a full-scale survey phase starting from the fourth year.

##### 3. Future plans

In the future, data will be enriched for palliative care patients, patients with mental disorders, and individuals in developmental stages. As these data are obtained, patient-specific, life-stage-specific, and developmental age-specific characteristics will be identified, and “Maemuki” evaluation methods for each will be developed. In parallel, the ELSI for “Maemuki” assistive training based on the needs of society will also be studied.