# An Elemental Study of Motion Assist Robots Capable of Inferring Human States

**Project manager**

(selected in 2026)

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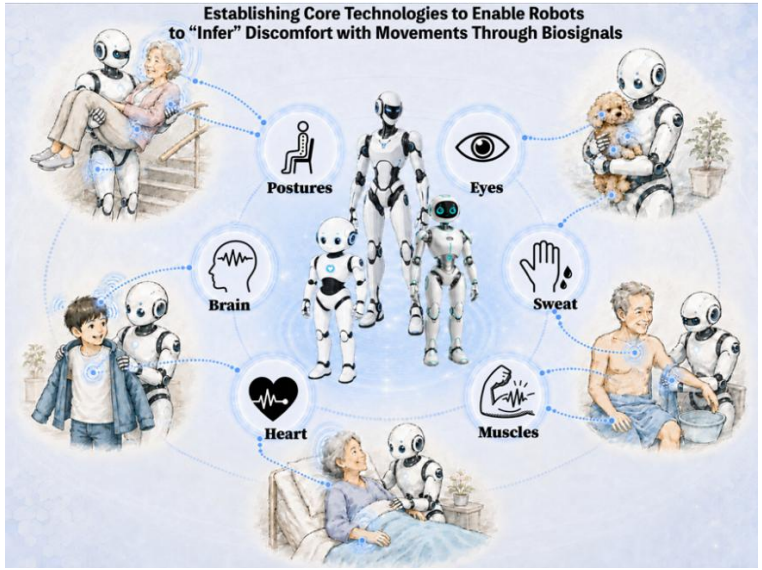


**Leader's institution**
Institute of Science Tokyo

**R&D institutions**
Institute of Science Tokyo, NCNP

## Summary of the project

This study aims to establish fundamental technologies for equipping robots with the ability to "infer" how to provide movement assistance without causing discomfort to the user. Humans have the ability to intuitively "infer" the movement speed and level of force that are comfortable for others. By estimating physiological changes associated with discomfort from biosignals, we hypothesize that humanoid robots can be equipped with the ability to "infer" natural and comfortable assistive movements. To achieve this goal, we will identify and validate physiologically grounded biomarkers of discomfort through multimodal biosignal measurements in humans and non-human primates, and develop practical technologies* for estimating natural assistive movements. (*patent pending)




## Milestone by 2028

Identifying cross-species biosignal-based biomarkers of discomfort in response to assistive movements provided by others in 2028

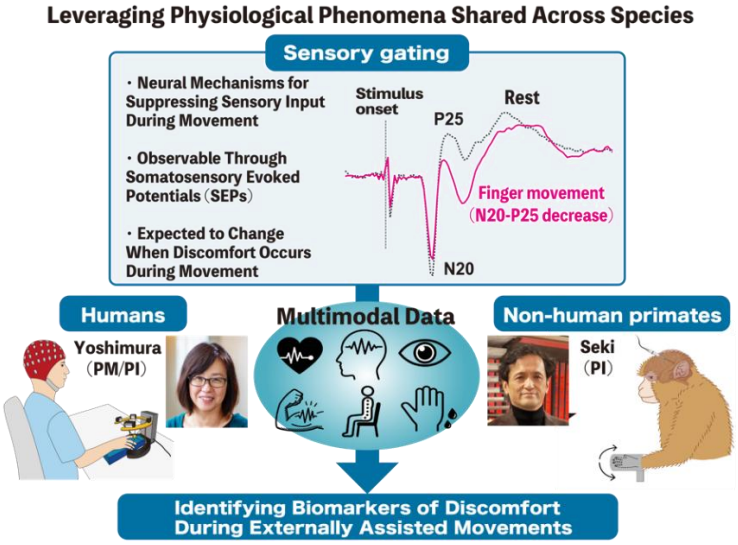
## Project structure

To realize robots that all users can comfortably entrust themselves to, robust and physiologically grounded biomarkers of discomfort are essential. This study aims to identify such biomarkers shared across humans and non-human primates, enabling individual differences in discomfort to be captured. To this end, Natsue Yoshimura (PM/PI, Science Tokyo, human studies) and Kazuhiko Seki (PI, NCNP, monkey studies) will jointly pursue R&D Items 1–3 using a unique approach: capturing subjective discomfort with assistive movements through "sensory gating," a physiological phenomenon shared across species.

Item 1: Examining the Association Between Discomfort with Assistive Movements and Sensory Gating

Item 2 : Development of an Algorithm for Estimating Sensory Gating

Item 3 : Developing an Algorithm to Directly Estimate Sensitivity to Discomfort with Assistive Movements




*Certain illustrations in this document were created with the assistance of generative AI.



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