【Grant-in-Aid for Transformative Research Areas（A）】

Integrated science of brain function recovery information linking molecules to society

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Project Information	Project Number : 26A401　Project Period (FY) : 2026-2030 Keywords: Functional recovery, Multi-layer integrative analysis, Bioinformatics, Life and social design, Environmental factors

Purpose and Background of the Research

● **Outline of the Research**

When the brain is damaged by stroke or injury, paralysis of limbs and speech impairment may occur. However, through appropriate rehabilitation, it is possible to partially regain lost brain function. This is thought to occur because the brain's endogenous "recovery program" is activated, yet the underlying mechanism remains largely unknown. "Recoveromics" (recovery + omics) is an interdisciplinary research area that simultaneously unravels brain function recovery from five levels: molecular, cellular, neural, individual, and social. Researchers from neuroscience, medicine, mathematical statistics, information science, architecture, environmental science, and sociology have joined forces to achieve the world's first systematic academic framework for the brain's recovery mechanisms.

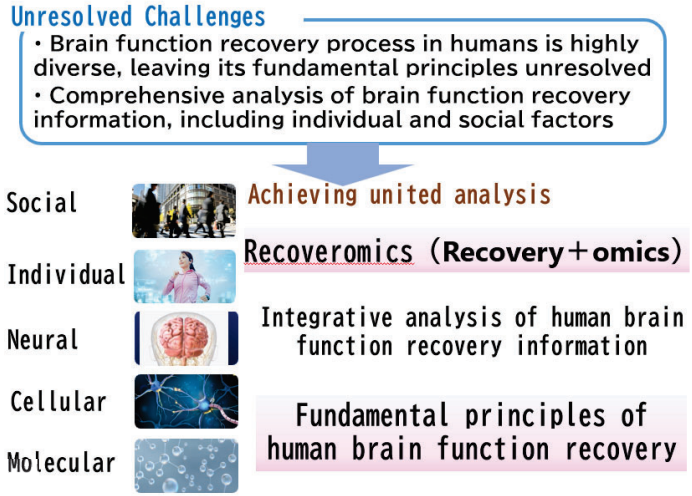

Figure 1. Whole-project ove diagram

● **Why Is This Research Needed?** Japan has the world's most rapidly aging society, and the number of people requiring care due to stroke sequelae and dementia continues to rise. Designing effective rehabilitation scientifically has become a pressing social need. Previously, animal model studies, clinical patient research, and life/social welfare research were each conducted independently. This project brings together researchers from all three areas and accelerates integrative analysis through mathematical and information sciences — enabling brain function recovery to be studied as a unified science "from molecules to society" and creating medicine and society that sustain and promote recovery at every level.

● Deciphering the Brain's "Recovery Program" This research elucidates genes, cells, and neural circuits active in post-injury brain recovery through animal and human studies. Circuit reorganization near damaged regions is measured from molecular to social levels, to decode the fundamental mechanisms of brain function recovery and build a new academic theory.

● Opening New Horizons in Brain Science Recoveromics unifies fragmented disciplines into a new domain, spreading the concept that "the brain is an organ capable of healing" worldwide. It promotes the design of medical and welfare services and social environments that offer each individual optimal means of brain function recovery.

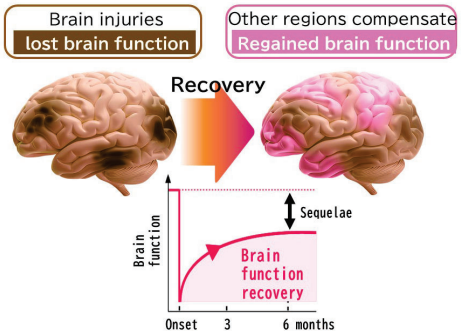

Figure 2. (Brain functional recovery)

Expected Research Achievements

● Academic Transformation: Unifying the Fragmented Fields of Brain Function Recovery Disciplines including neuroscience, rehabilitation medicine, information science, architecture, and sociology are unified under "brain function recovery," establishing Recoveromics as a pioneering worldwide academic framework. Collaborating with leading advisors globally, the project leads a Japan-originated academic transformation.

● Toward Personalized Medical and Social Welfare Implementation

By integrating real-world data across molecular-to-social levels, this research clarifies when and by what mechanisms brain-injured individuals recover. Findings will inform welfare systems sustaining functional recovery in daily life. Predicting outcomes from physical, lifestyle, and environmental factors will enable truly personalized medical and social welfare.

● Training Next-Generation Researchers and Integrating Brain Function Recovery Data

By involving researchers in planned and open-call studies, the project trains scientists to analyze brain function recovery across molecular-to-social levels. Extending beyond stroke to all conditions impairing brain function, it builds an integrative theory of recovery on the concept that "the brain is an organ capable of healing."

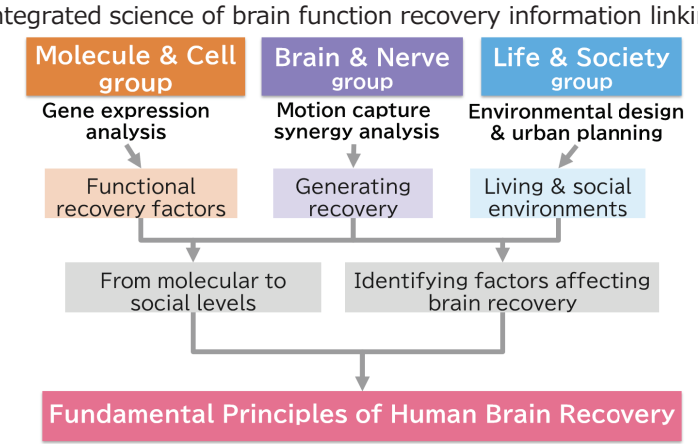

Figure 3. Algorithm of Recoveromics

Website(s)	https://strk-renaissance.sakura.ne.jp/recoveromics/