Here begins our new MIRAI
MOONSHOT RESEARCH & DEVELOPMENT PROGRAM

R&D Theme

Multidisciplinary investigation on how avatars and devices affect users

Progress until FY2022

1. Outline of the project

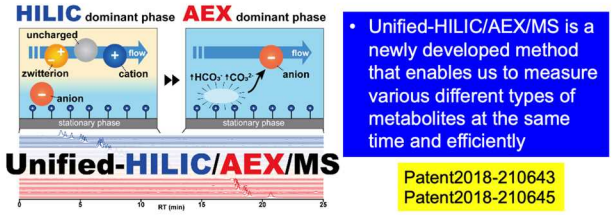
Our group tries to thoroughly understand how the use of CA and devices affect the human multi-omics network. This group is tightly connected to all other groups in the moonshot goal 1. Deepening our understanding of how CA and devices affect humans will enable us to design CA in light of omics-level biology, evaluate developed CA more objectively, and develop sustainable symbiosis with CA.

This group utilizes omics analyses where we thoroughly measure > 10,000 different molecules to understand how the use of CA and devices affect e.g., metabolism in humans. This strategy is very different from conventional methods where researchers use text-based phycological surveys and measurements of specific molecules such as cortisol, possibly opening up a completely new venue in this area.

In FY2022, we developed a new metabolomics method that largely advances our omics capacity, investigating how the use of gaming affects human omics networks. We also found that CA has an ability to make people more challenging in certain gambling tasks.

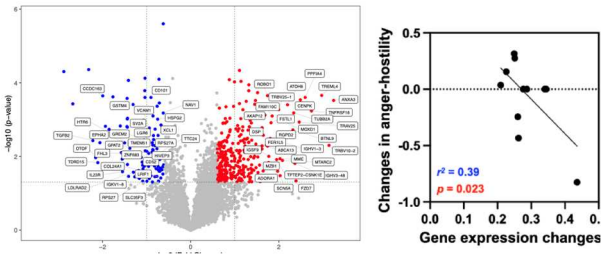
2. Outcome so far

We have developed a new metabolomics method that helps us to achieve our aims. Metabolomics analyses measure various different metabolites from cells. Importantly, each metabolite has unique molecular properties such as molecular weight, polarity, and so on. It is of note that a specific experimental setting in metabolite measurements is often specialized for specific types of metabolites (e.g., low molecular and hydrophilic), not allowing measurements for different types of metabolites. Associate Prof. Izumi in our team developed a method called Unified-HILIC/AEX/MS) that measures a wider range of metabolites at the same time.

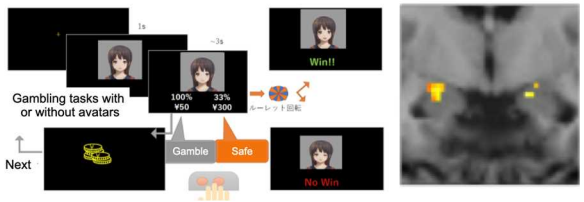


Using our platform, we analyzed human multi-omics during 2h gaming. We found that 2h gaming changes various gene expressions in immune cells. Interestingly, the degrees of gene expression changes were correlated with the reduction in anger-hostility measured by a psychological test POMS2, demonstrating the usefulness of multi-omics analyses to evaluate how CA affects human physiology.

Prof. Haruno in our team addressed the effects of CA in a gambling task using brain response measurements.



In the experiments, participants play a gambling task with an observer, who is either CA or not. Prof.



Haruno revealed that CA alters participants' behavior, making them more challenging in gambling tasks, which was associated with the activity in amygdala. These results clearly demonstrated that CA alters brain activity and human behavior.

3. Future plans

We will reveal how the use of CA and devices affect human physiology under various contexts including gaming, communication, device use, and so on. Our studies will open up new research fields that promote an avatar-symbiotic society in safe and sustainable manner.

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