

Japan-U.S. Brain Research Cooperation Program
Group Joint Study Project Program FY2022 - FY2023 :Report

Field: 3(Behavior/System/Cognition)

1. Principal Researcher

Name: Kahori Kita

Title: Assistant Professor

Affiliation: Graduate School of Medicine, Kyoto University (*1)

2. Research Title: The nature of task switching in human motor control

3. Japanese Group Organization

Principal Researcher

Name: Kahori Kita

Title and Affiliation: Assistant Professor, *1

Co-Principal Researcher

Name: Takashi Hanakawa

Title and Affiliation: Professor, *1

4. U.S. Group Organization

Principal Researcher

Name: Adrian M. Haith

Title and Affiliation: Associate Professor of Neurology,
Johns Hopkins University School of Medicine (*2)

Co-Principal Researcher

Name: John W. Krakauer

Title and Affiliation: Professor of Neurology, Neuroscience,
and Physical Medicine and Rehabilitation, *2

Collaborating Researcher

Name: Yue Du

Title and Affiliation: Postdoc researcher of Neurology, *2

5. Research Period, from/to (yyyy/mm/dd) and total number of years.

From 2022/04/01 to 2023/08/31 (2 years)

6. Abstract, Results, and Research Significance (300 words):

Abstract: We frequently shift between cognitive tasks in everyday life. For instance, while reading a book, we may receive and respond to an email, and then return to reading the book. The ability to switch tasks is thought to require cognitive process subserving attention, memory, and perception which causes a switch cost. The behavioral manifestation of this cognitive switch cost is slower performance during the first trials after a switch. The need to switch tasks is not restricted to cognitive settings, however, but might be also necessary in motor skills. However, task switching has to date been discussed in only cognitive control but not in motor control, and it's unclear the extent to which task switch costs exist in motor control settings, and what the nature of these switch costs may be.

Result: We asked whether analogous switch costs exist in the context of switching between different motor skills. We tested whether participants could switch between a newly learned skill associated with a novel visuomotor mapping, and an existing skill associated with an intuitive mapping. Participants showed increased errors in trials immediately following a switch between mappings. These errors were attributable to persisting with the pre-switch policy, rather than imperfect implementation or retrieval of the post-switch policy. A subset of our participants further learned a second new skill. Switching between these two novel skills was initially very challenging but improved with further training.

Significance: Our findings suggest that switching between newly learned motor skills can be challenging, and that errors in the context of switching between skills are primarily attributable to perseveration with the wrong control

policy. Knowledge gained from this project will allow us to understand task switch costs in the context of motor control and will help to build a more unified view of cognitive and motor control.

7. Other (Research-related concerns, particular points of note):

N/A

*Please attach any reference materials as necessary.