Micro-refresh to Restore Intellectual Concentration Decline during Office Work: An Attempt at Quantitative Effect Evaluation

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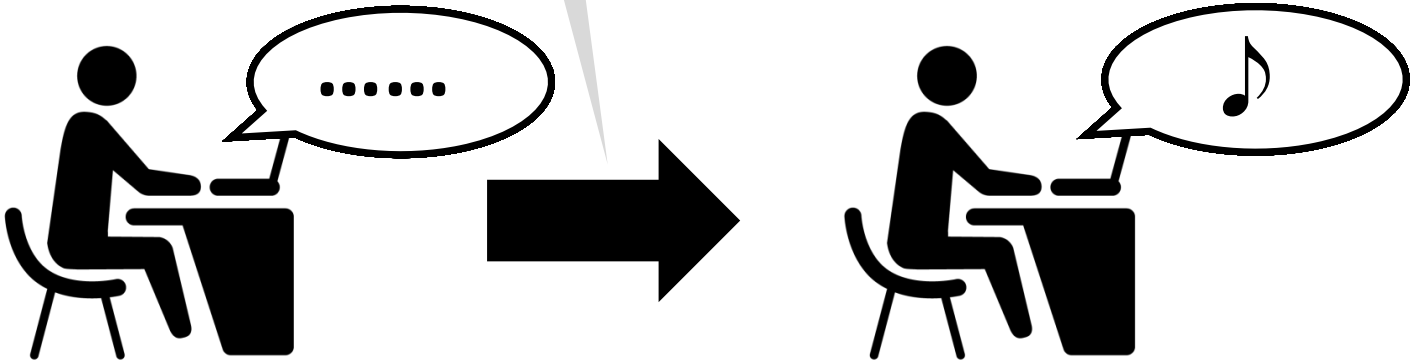
Introduction: intellectual concentration

- In Japan…

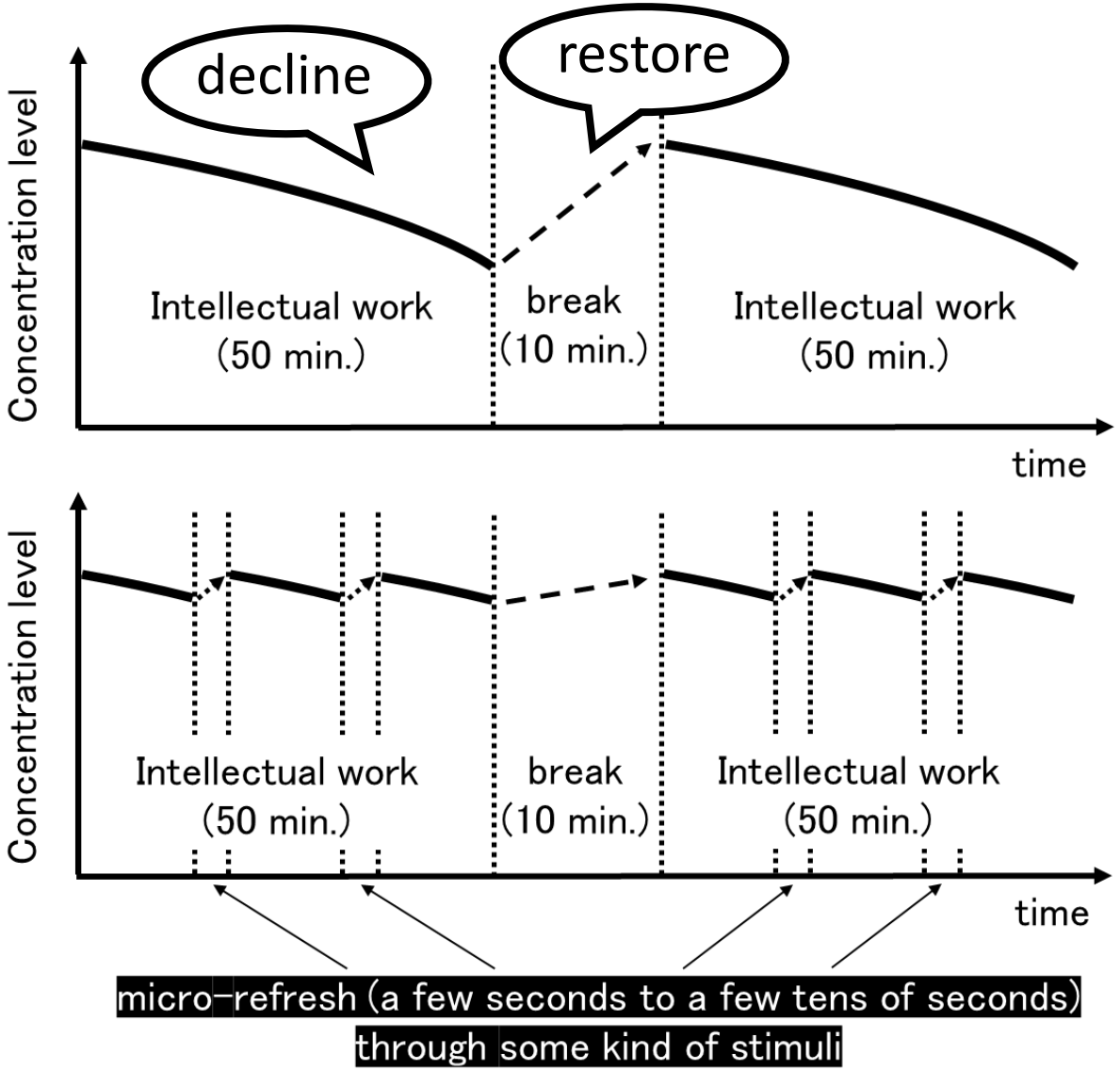
  working population↓　　working hours↓

- Improving intellectual concentration is important.

  →　Companies can make more profits.

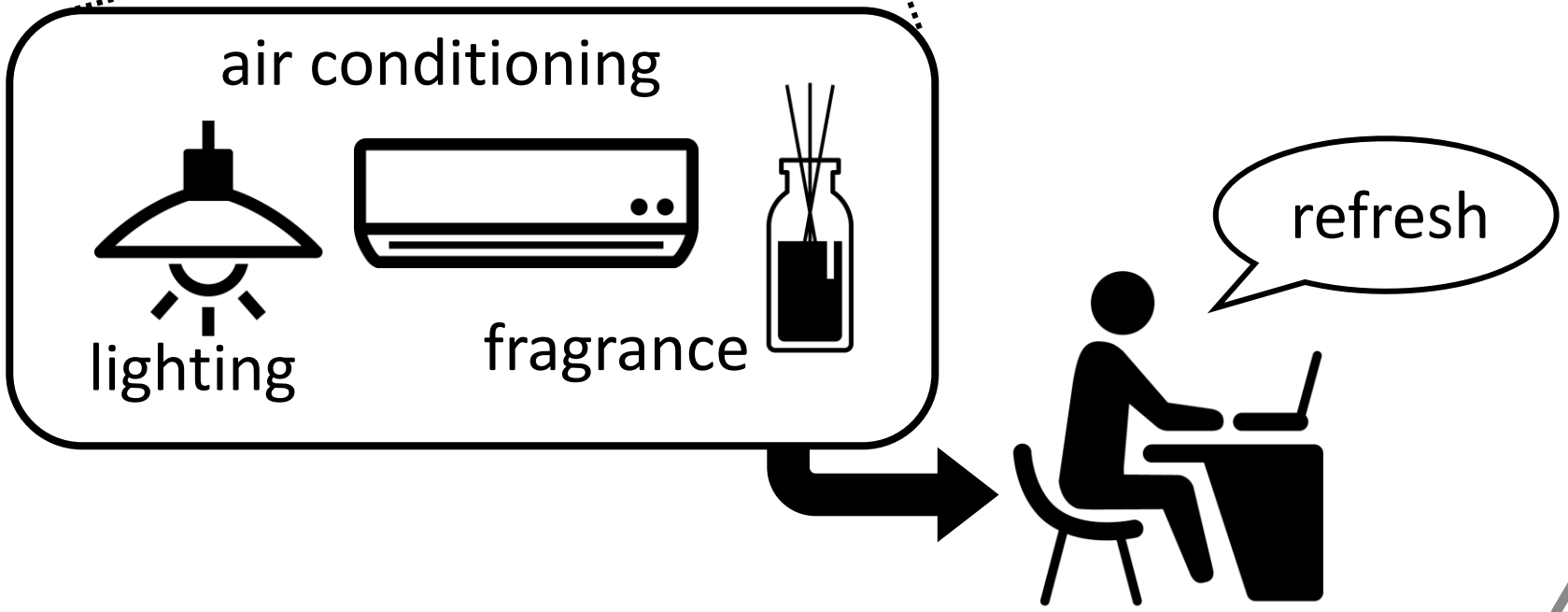


Introduction: micro-refresh



Concept of micro-refresh

- “micro-refresh”
  - **Actively encourage** office workers to refresh themselves through some kind of stimuli



Flow of the research on micro-refresh

STEP1

Purpose of this research:

to **firstly** confirm that the effect of micro-refresh can be measured quantitatively by an experiment

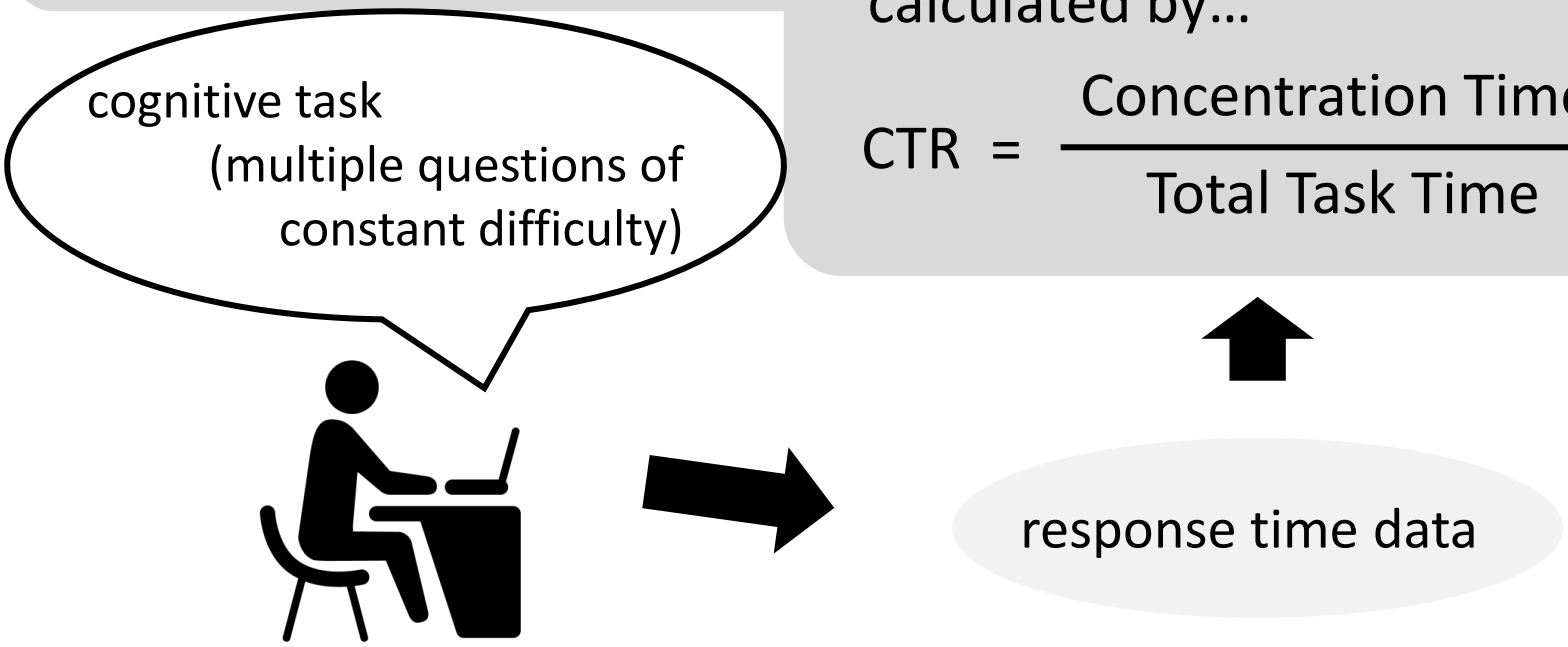
STEP2

to explore environmental control methods that can appropriately introduce micro-refresh

Measures: CTR

- **CTR (Concentration Time Ratio)***:
  - Quantitative index of intellectual concentration calculated by…

$$CTR = \frac{\text{Concentration Time}}{\text{Total Task Time}} (\%)$$



*:Kosuke Uchiyama, Koutarou Ooishi, Kazune Miyagi, Hirotake Ishii, Hiroshi Shimoda (2013) "Process of Evaluation Index of Intellectual Productivity Based on Work Concentration", Proceedings of ICSTE 2013

Measures: Questionnaires

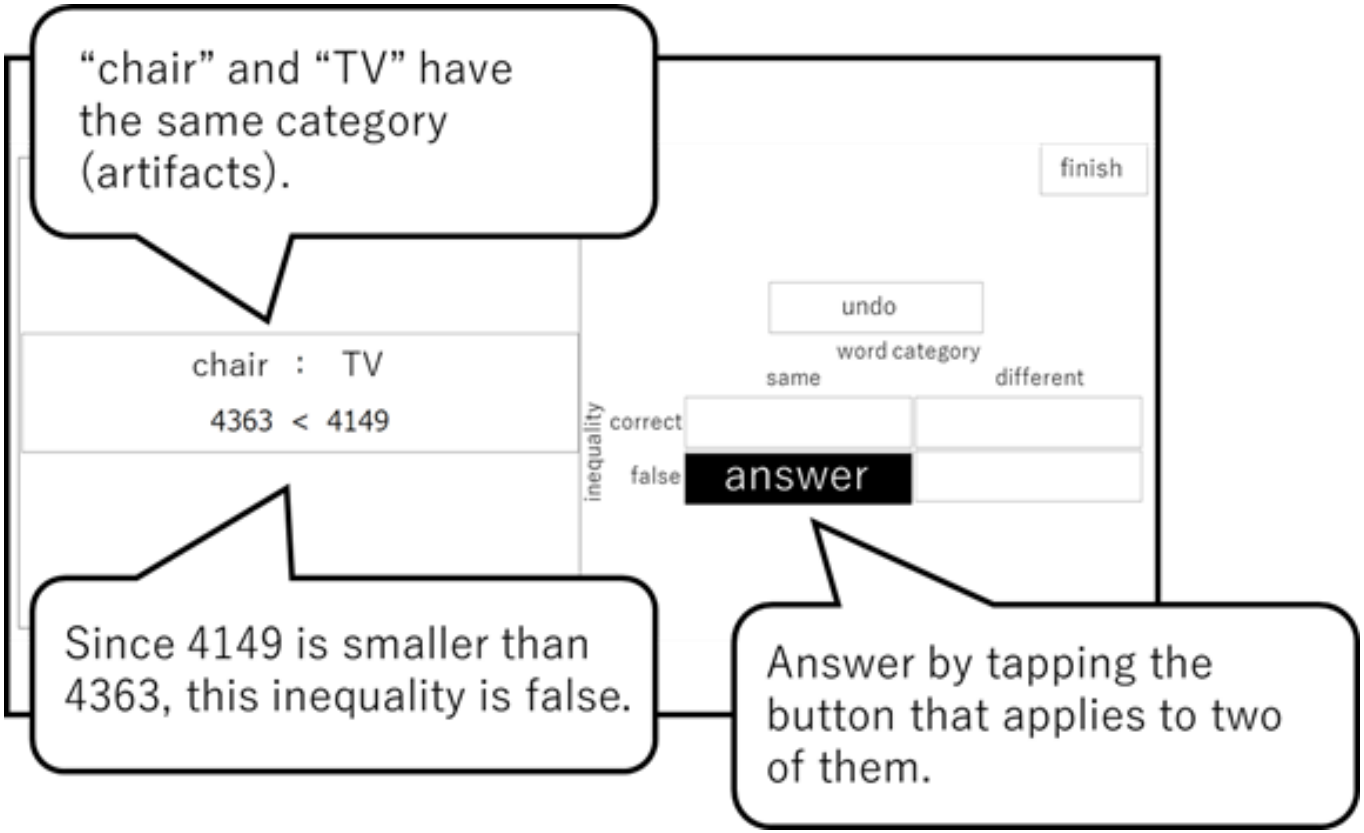
- **Progress Questionnaire:**
  - asking about subjective level of concentration and fatigue.

- **NASA-TLX:**
  - asking about mental workload.

- **Subjective symptom screening:**
  - capturing changes in fatigue status (feeling of sleepiness, blurriness, and sluggishness) over time.

Cognitive task: Comparison task*

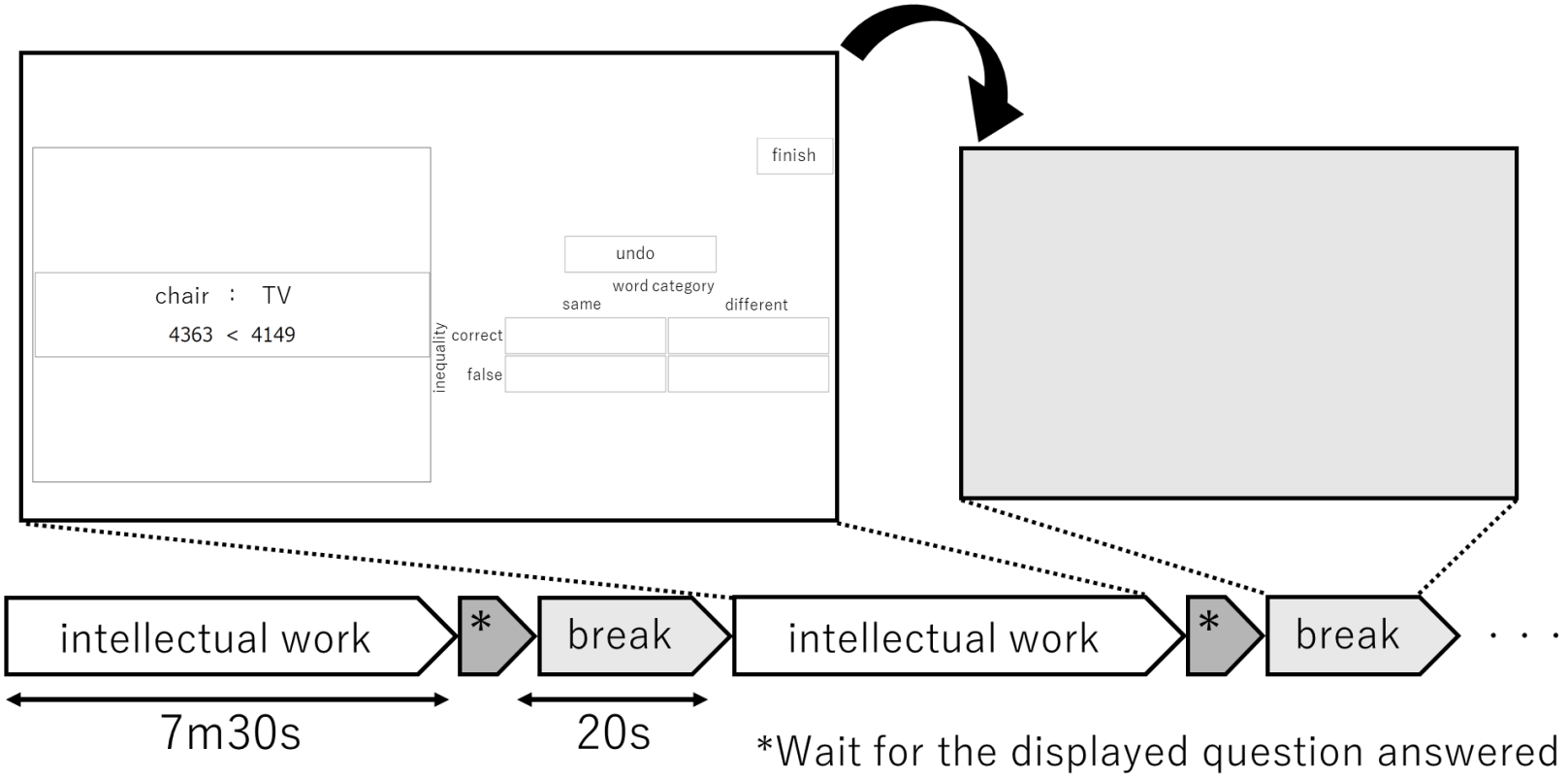
- Consisting of multiple questions of constant difficulty



*: Kimi Ueda, Hiroshi Shimoda, Hirotake Ishii, Fumiaki Obayashi, Kazuhiro Taniguchi: Development of a New Cognitive Task to Measure Intellectual Concentration Affected by Room Environment, The Fifth International Conference on Human-Environment System, 2016.

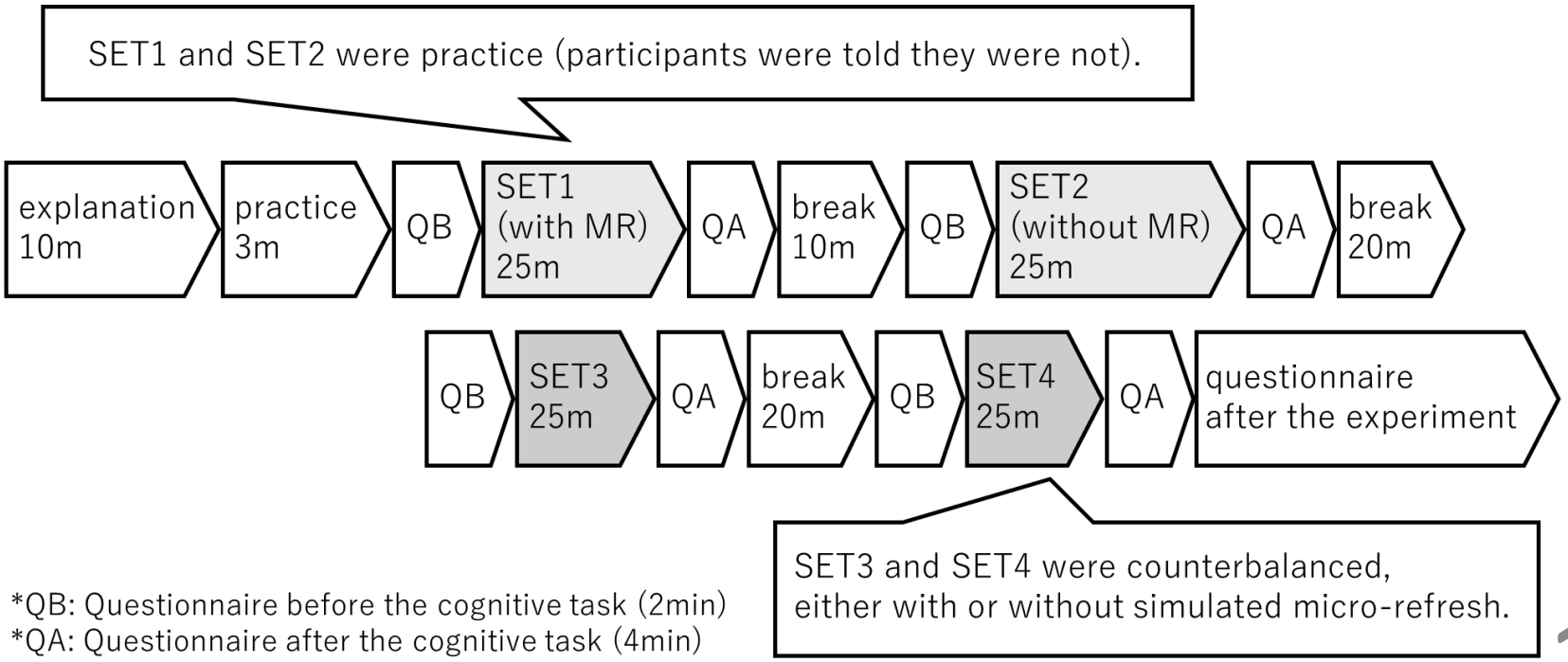
System of the experiment

- How to get participants to take simulated micro-refresh.



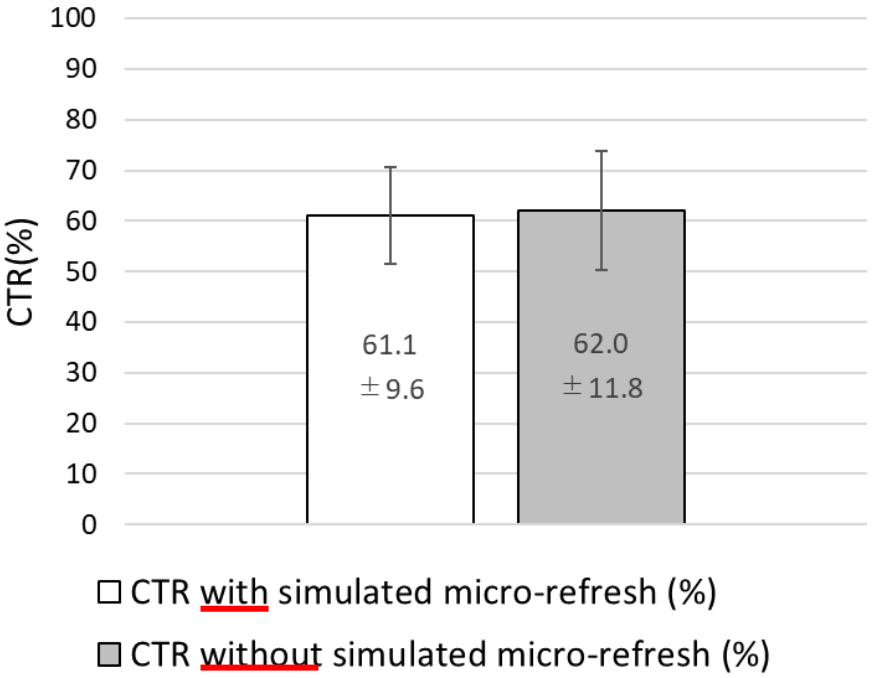
Experiment

- July 23rd and 28th, 2022 from 3:00 to 6:30 p.m.
- An experimental room of Kyoto University
- 8 students from Kyoto University



*QB: Questionnaire before the cognitive task (2min)
*QA: Questionnaire after the cognitive task (4min)

Result



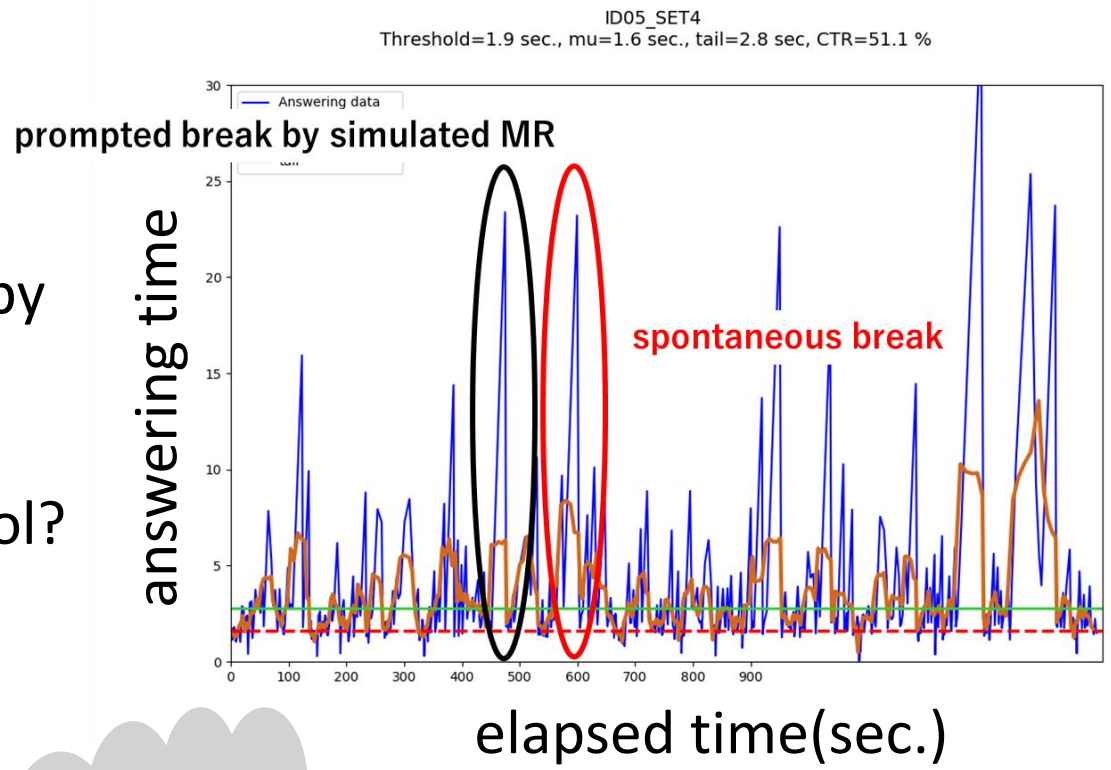
	with simulated MR	without simulated MR
Concentration	0.0±18.7	-10.8±16.6
Fatigue	22.5±20.9	21.7±12.1
Feeling of sleepiness	0.75±3.77	0.25±1.91
Feeling of blurriness	2.00±2.71	1.00±0.92
Feeling of sluggishness	2.50±2.60	3.50±3.60
NASA-TLX	67.6±10.9	69.9±12.4

- The effect of micro-refresh on intellectual concentration could be measured quantitatively.

Discussion

- No consistent trend by MR status

⇒ caused by experimental control?



prompted break by simulated MR

Spontaneous break

?

Changes in concentration, fatigue, …

Conclusion

- The effect of micro-refresh can be measured quantitatively by an experiment.
- There was a possibility that MR may reduce subjective fatigue and feeling of sluggishness.

- As a future prospect…
  - A similar experiment
  - ➢ with instructing not to take a break during the task except when prompted by simulated MR
  - ➢ with a larger number of participants

  should be conducted.