



**6th International Conference on Intelligent Human Systems Integration:
Integrating People and Intelligent systems (IHSI 2023)
February 22-24, 2023 – Venice, Italy**



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The Influence of Worker's Motivation on Intellectual Concentration by ACT-R Cognitive Models

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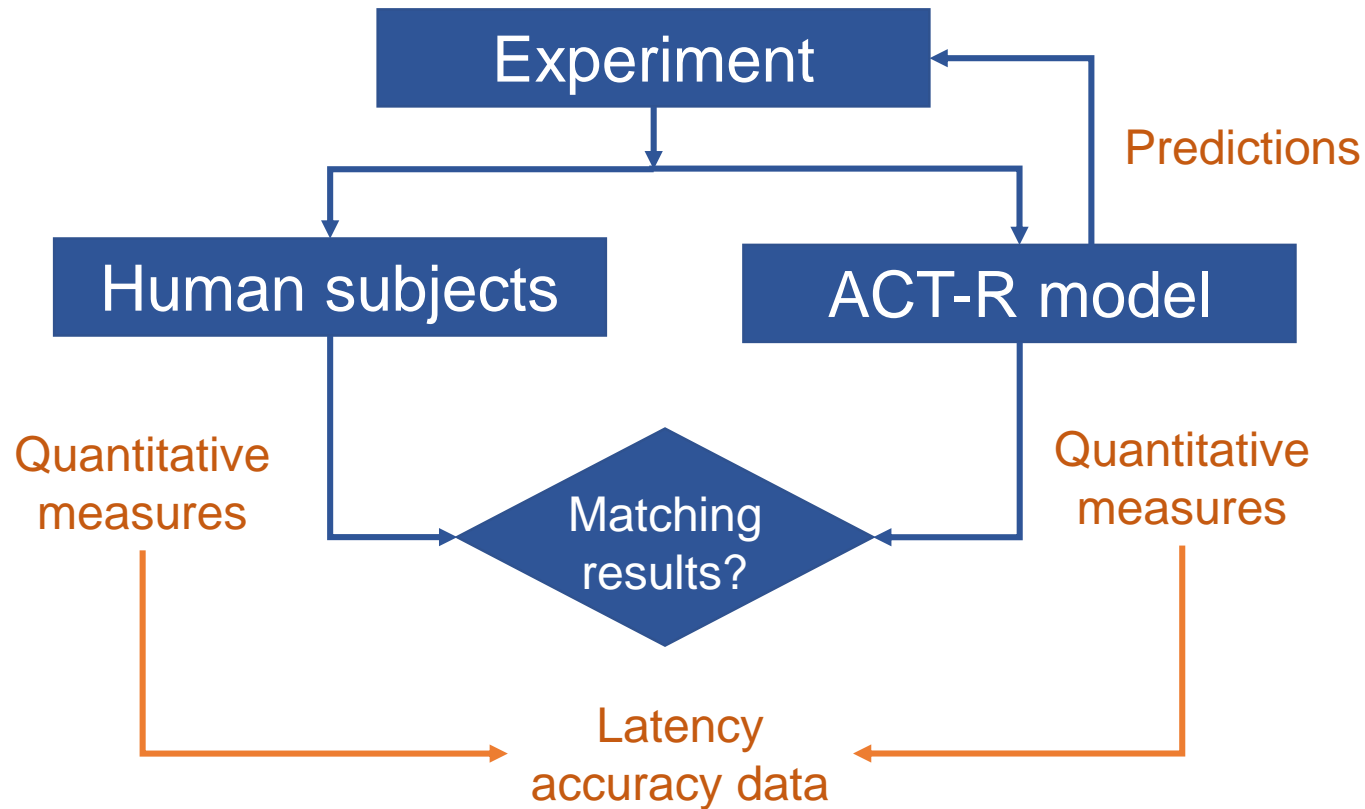
Intellectual Concentration

- Intellectual abilities carried several factors to be considered at their level, stimulation, possibilities of development in the psychology field.
- Intellectual concentration relate to someone **ability to think, understand things and focusing the attention.**

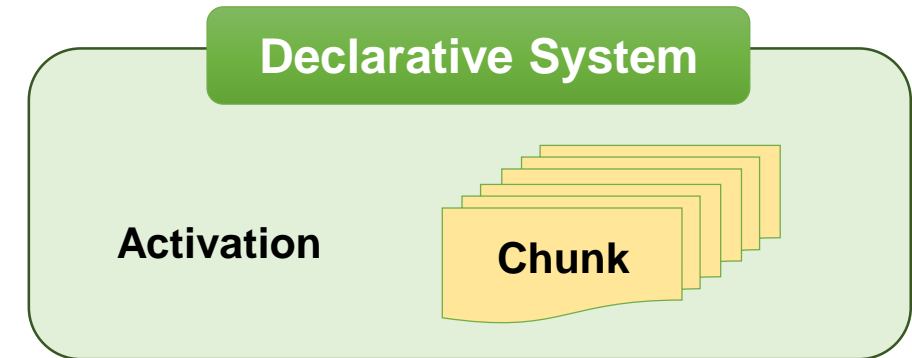
Motivation

- Motivation constitutes the composed of **psychological mechanism performed by individuals or groups to appoint a certain behavior and endure with it.**
- Some paramount aspects of the human's motivation could helps:
 - ✓ describing the demeanor of humans variously
 - ✓ differences on individual characteristics to completing the works
 - ✓ conjecture on the variety of the learning process
- In the study to investigate the intellectual performance, **considering the individual's motivation might be important.**
- **The purpose in this study** : examine the worker's motivation effect on intellectual concentration by an experiment and a cognitive process simulation.

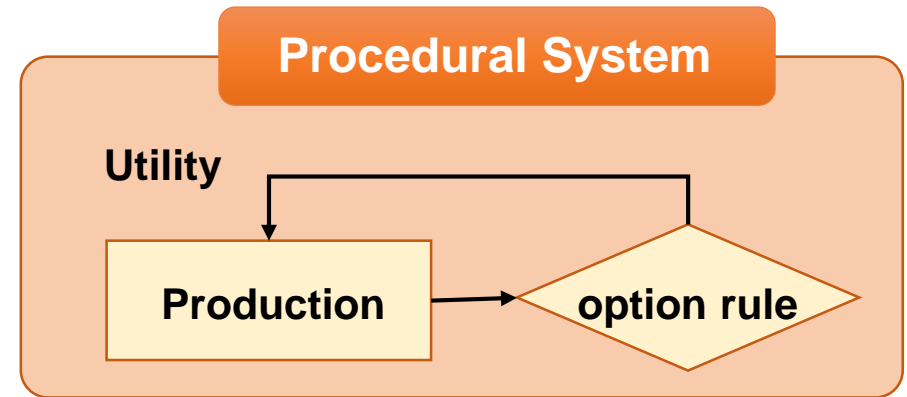
ACT-R Cognitive Architecture



- Declarative Memory Modules



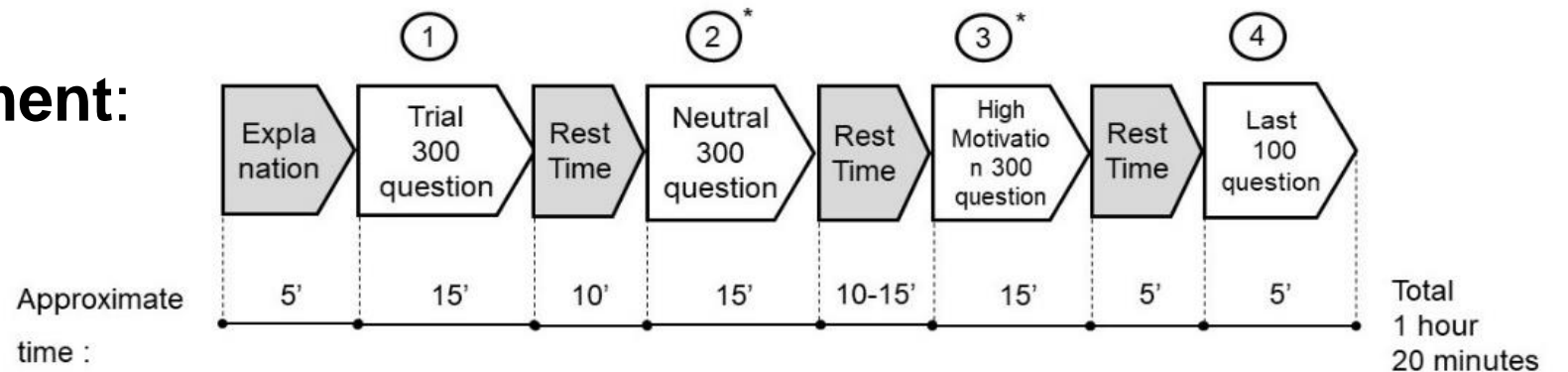
- Procedural Memory Modules



Experiment

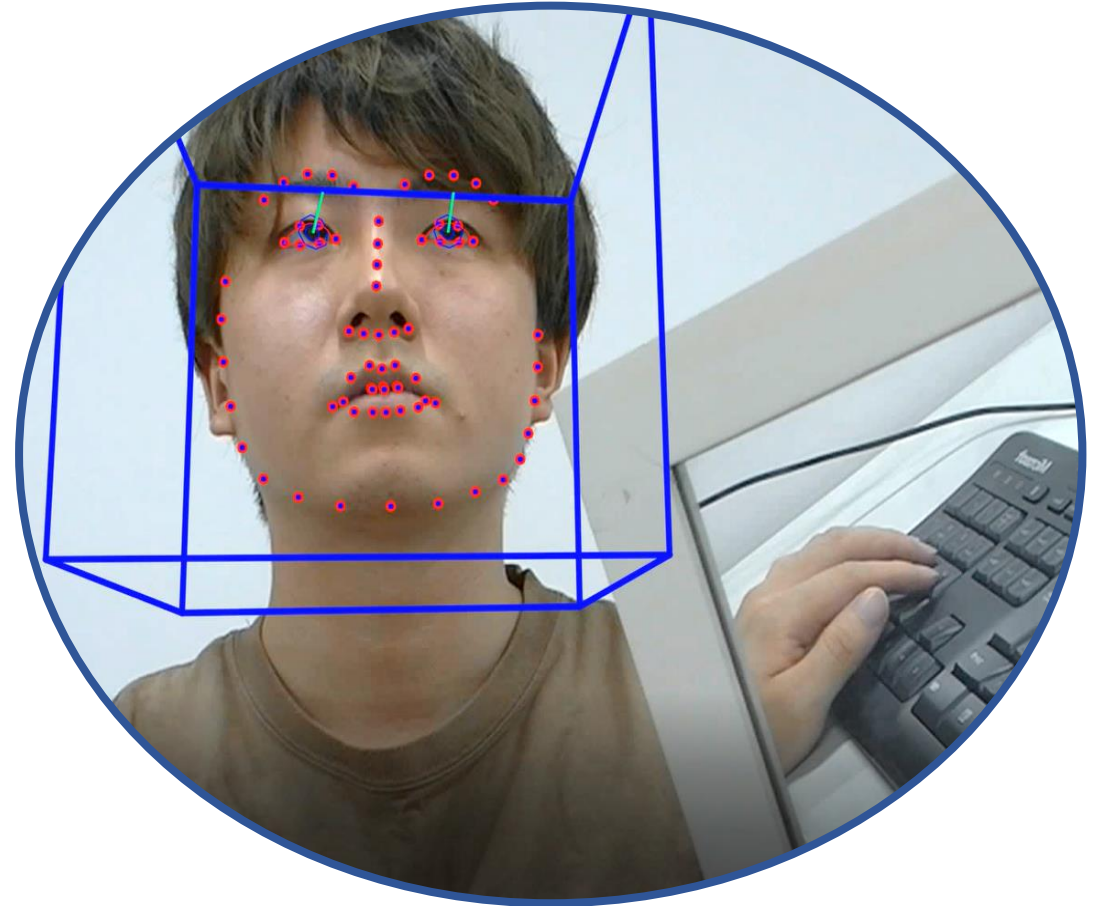
- **Purpose:** Identify Individual different strategies when completing the task.
- **Design the Experiment:** Simple summation mathematical task.
- **Participants:** 5 participants ages 18-22 years old
- **Motivational Condition:** High motivation condition and neutral condition

- **Design of the Experiment:**



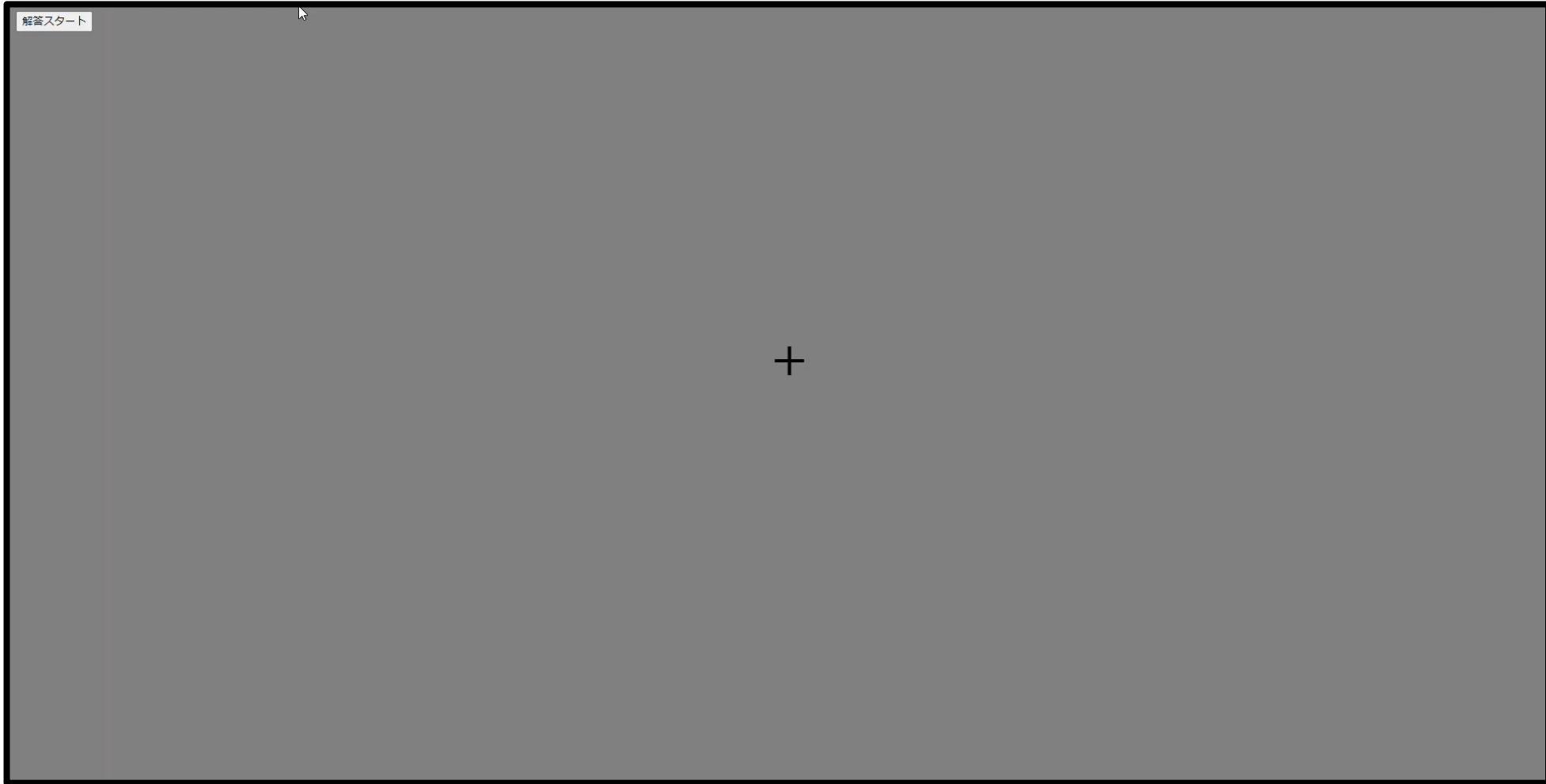
*) The order of step 2 and step 3 are respectively changed for each participant to minimize the ordering task effect's

Experiment

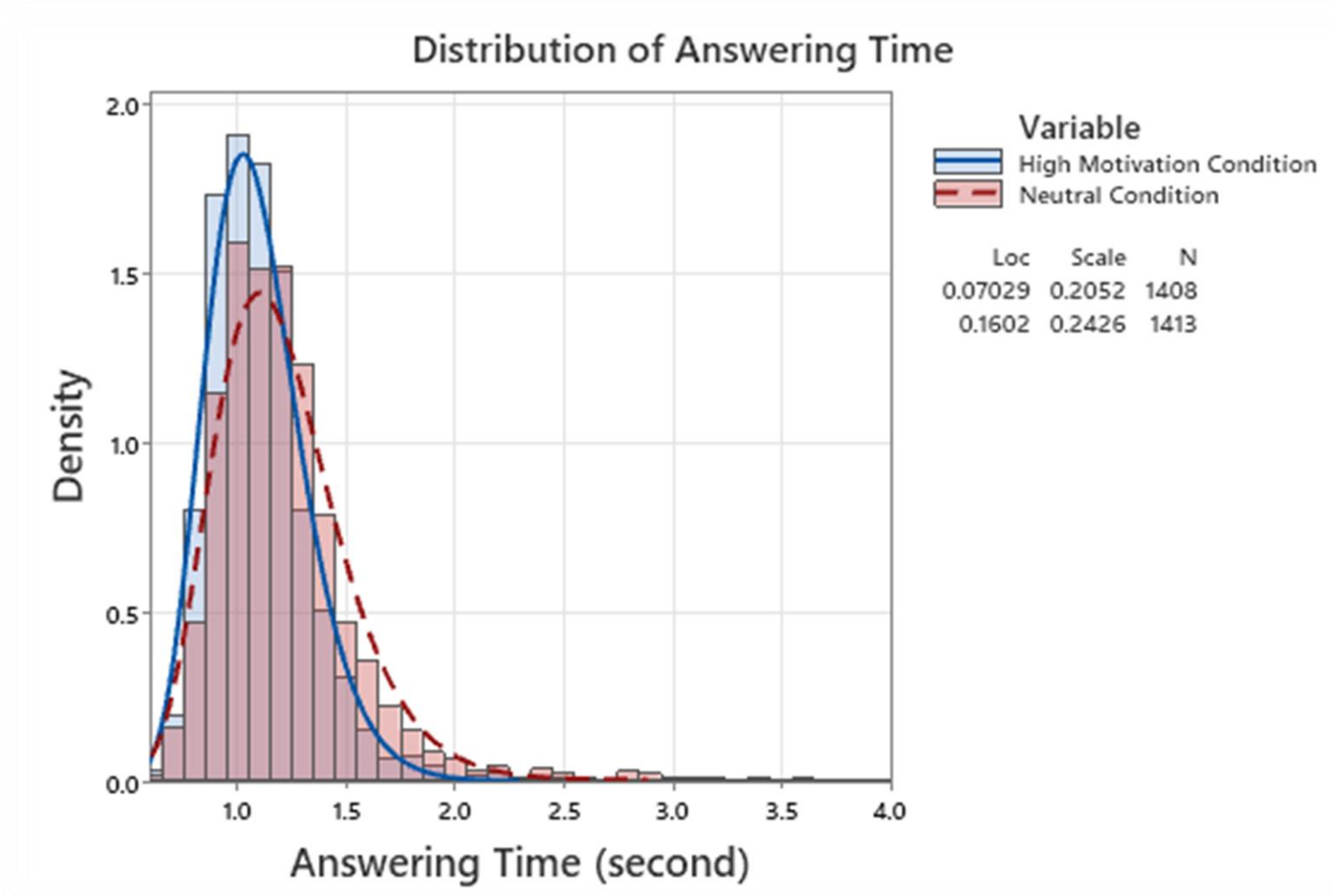


- **Items recorded:** Answering time & eye gaze movement.

Experiment



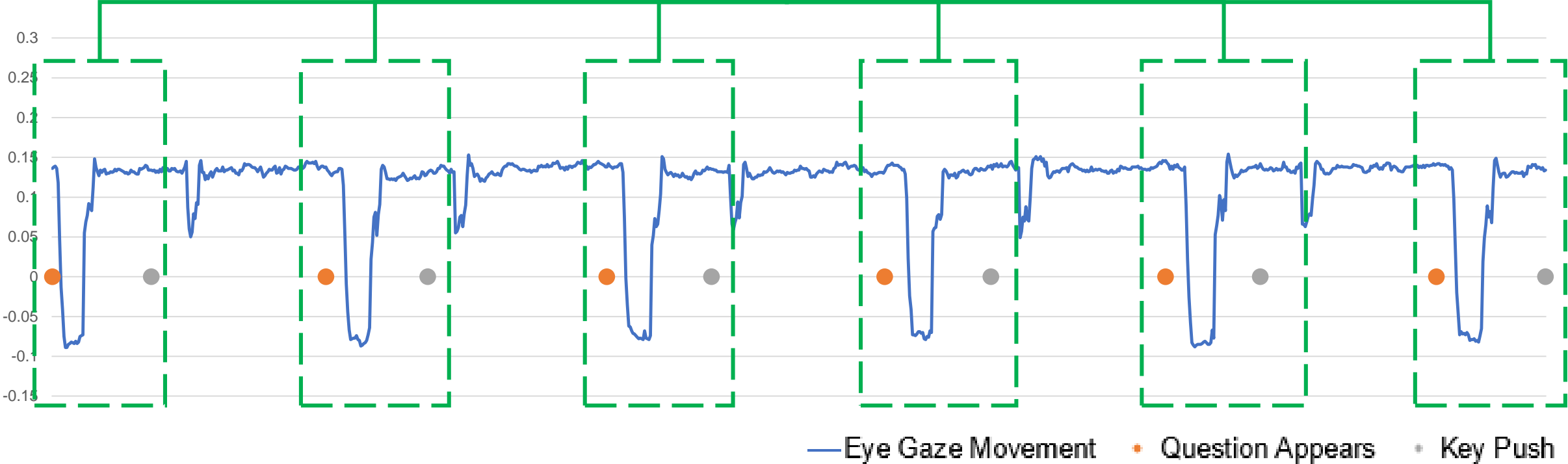
Results



Answering time in two different condition High Motivation Condition and Neutral Condition shows **statistical difference** ($p < 0.01$)

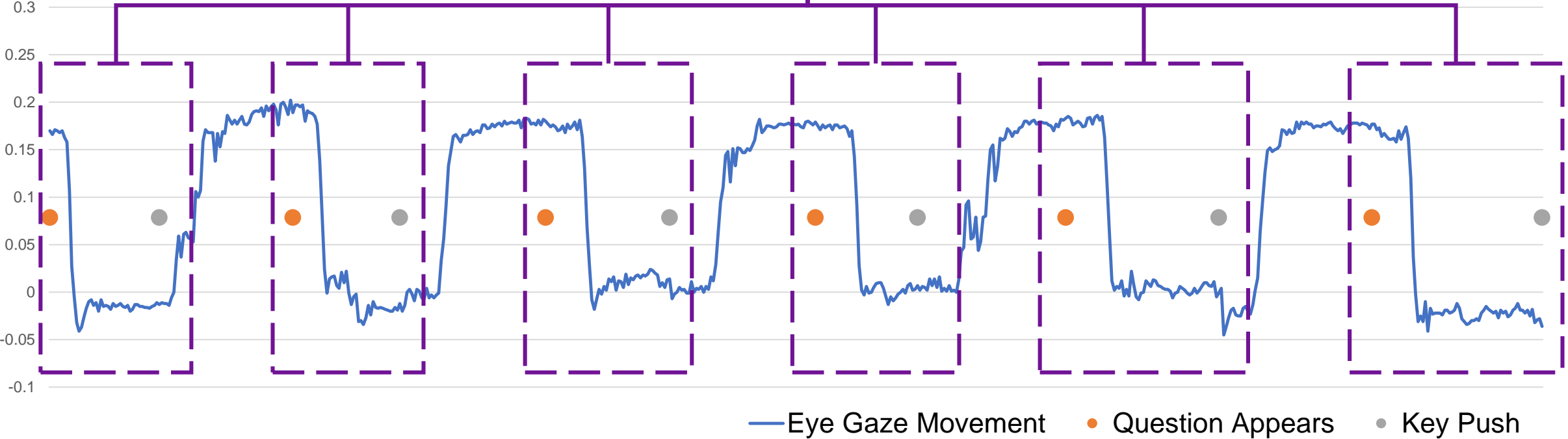
Two gaze pattern movement identified as an individual answering strategies

Pattern 1

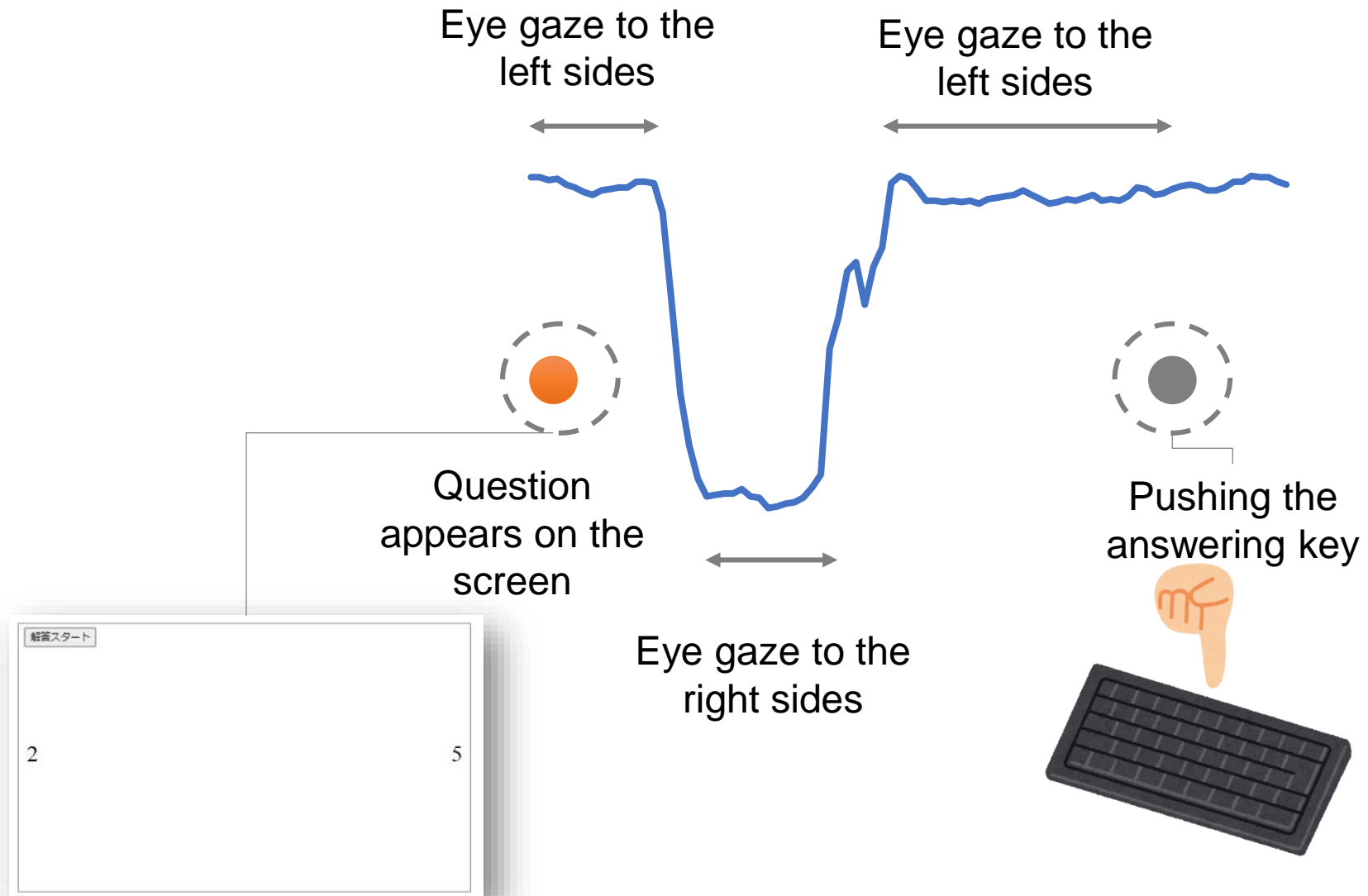


Two gaze pattern movement identified as an individual answering strategies

Pattern 2

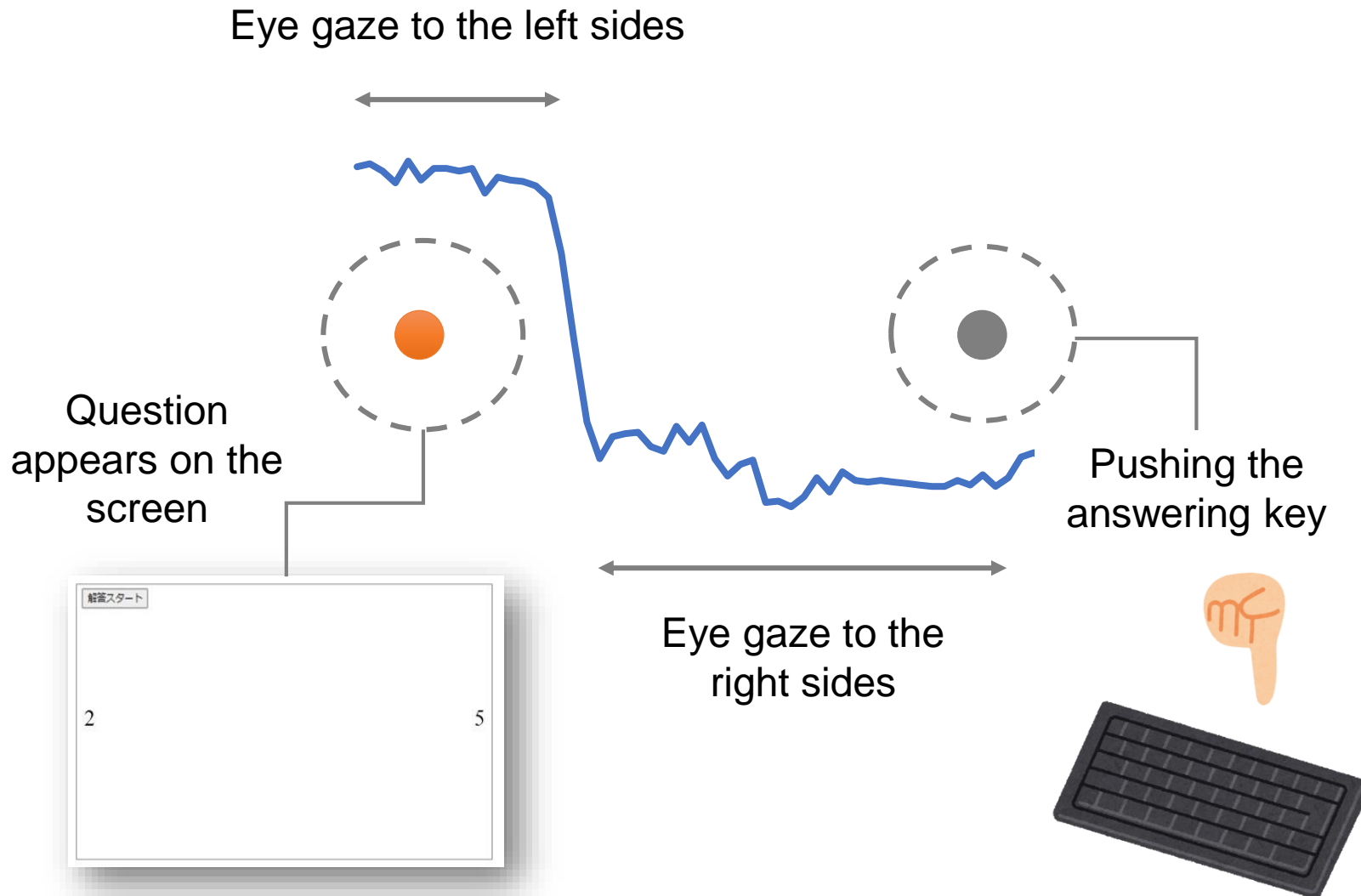


Pattern 1



- ACT-R Production Rule:
 - (1) find-left-number
 - (2) attend-left-number
 - (3) encode-left-number
 - (4) retrieve-left-number
 - (5) find-right-number
 - (6) attend-right-number
 - (7) encode-right-number
 - (8) waiting-for-start-back
 - (9) attend-start-back
 - (10) summation
 - (11) keyboard-click

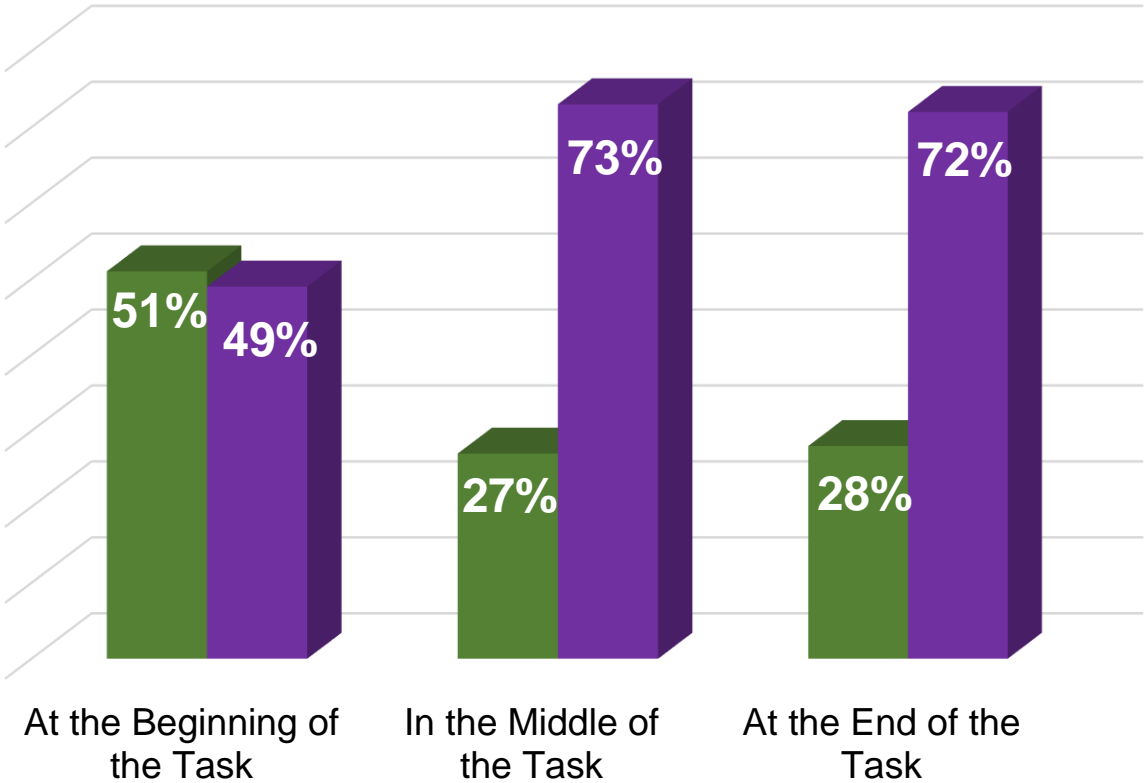
Pattern 2



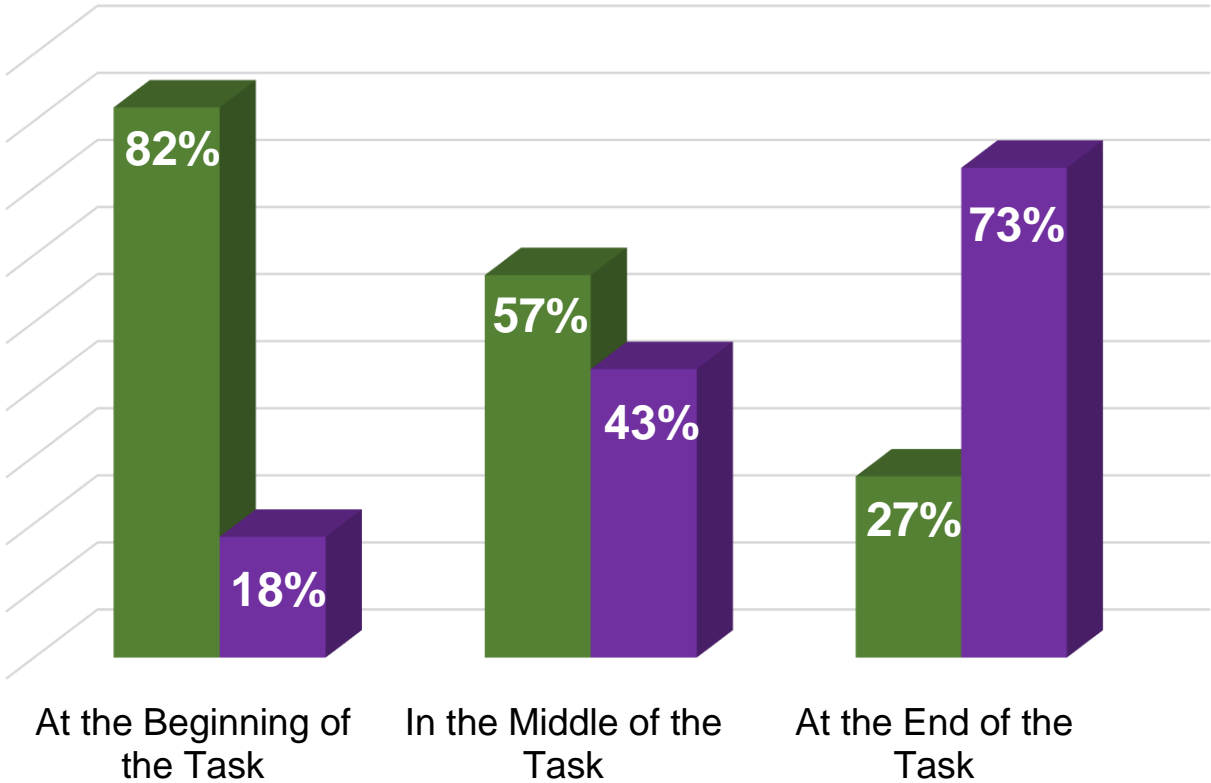
- ACT-R Production Rule:
 - (1) find-left-number
 - (2) attend-left-number
 - (3) encode-left-number
 - (4) retrieve-left-number
 - (5) find-right-number
 - (6) encode-right-number
 - (7) summation
 - (8) keyboard-click
 - (9) waiting-for-start-back
 - (10) attend-start-back

Pattern Distribution during the Experiment in Two Motivational Condition

High Motivation Condition



Neutral Condition



■ Pattern 1
■ Pattern 2

Conclusions

- **The worker's motivation shows an impact on intellectual concentration**
- **Individual different strategies could be investigated under the eye gaze pattern approach**
- **Duration time of the task might influence user to utilize different strategies**
- **Eye gaze pattern identification approach to build the ACT-R cognitive models**



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Thank You

