Evaluation of a VR language learning system

Effect of feedback on learners' flow state

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Introduction

- With globalization, the ability to communicate in English is becoming more important

- Motivation is important in learning

- Therefore, it is necessary to motivate learners to learn English

Introduction

- Suggestions have been made to include flow states into foreign language learning (Sakiyama and Terao 2017)
  - Flow is an intrinsic motivator
  - Flow is a factor in the growth and development of competence

Introduction

- It has been confirmed that VR may amplify flow conditions
  (Kim, et al., 2019)

DaehwanKim,JaeKo, (2019). The impact of virtual reality (VR) technology on sport spectators' flow experience and satisfaction, Computers in Human Behavior ,pp.346-356

Introduction

What is the flow state?

- Proposed by Mihaly Csikszentmihalyi.
- A state of deep immersion in an activity.
- Learners experience high levels of concentration, enjoyment, and satisfaction.

Enjoyment through flow state motivates learning!

Nakamura, J., & Csikszentmihalyi, M. (2014). The concept of flow. In Flow and the foundations of positive psychology (pp. 239–263). Springer, Dordrecht.

Conditions under which flow occurs:

1. The level of activity is balanced by the ability of the actor.
2. The goal (task) of the activity is clear.
3. Clear feedback is immediate.

Nakamura, J., & Csikszentmihalyi, M. (2014). The concept of flow. In Flow and the foundations of positive psychology (pp. 239–263). Springer, Dordrecht.

Research Objectives

To understand if the presence or absence of feedback in VR can facilitate a flow state towards learning English.

Method

We used a modified VR environment developed by Shibata et al. (2021)

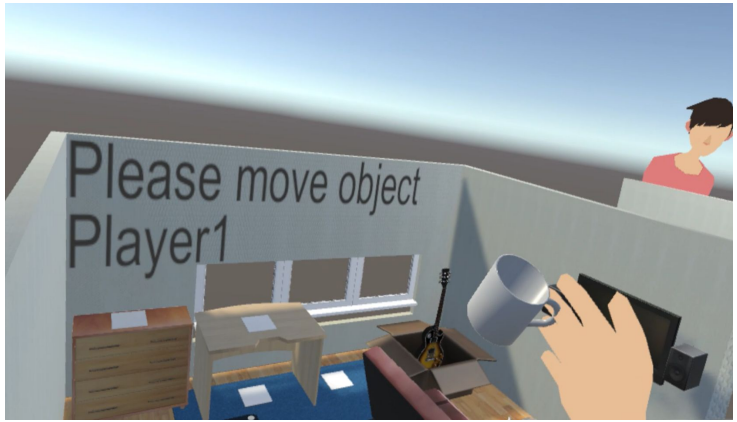
- A spot-the-difference task with objects in each participants rooms. Participants must find the differences.

player 1 screen

player 2 screen

Method

- Communicate using English in VR with your partner.
- Grab things and move them to the correct place.



Method

We added clear, visual and audio feedback, a condition to promote flow to occur in this VR system.

- Display scores on the screen.
- Make a sound when a correct answer is given.

System Overview

This study compares the following two systems:

- VR system with feedback
- VR system without feedback

VR system（with feedback）

There is some feedback on the activity

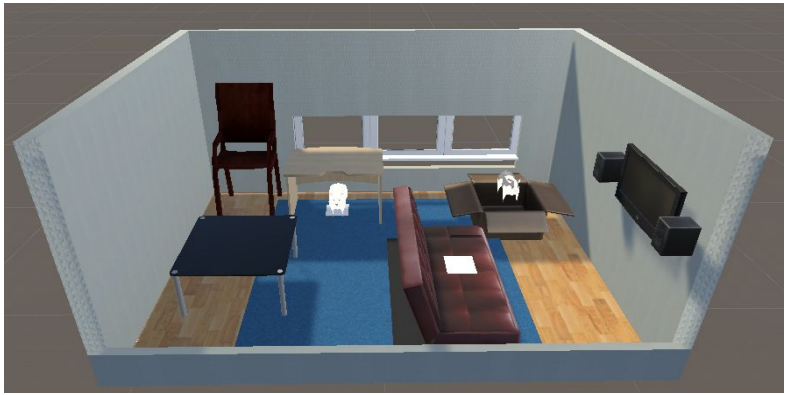
- Scores and time are displayed on the screen
- Sounds play
  - when an item is placed in the same spot (when correct) and
  - when the cleared is cleared

VR system（without feedback）

- System with no feedback on activities.
- Instructions are given only when the task is completed.

VR system

- Perform the spot-the-difference tasks in order of difficulty from level 1 to level 5 in each VR system.
- The number of objects and differences increase with each level.
  - Level 1 : 2 objects / 1 difference
  - Level 5 : 10 objects/5 differences



Level 1 room

Level 5 room

Experiment Summary

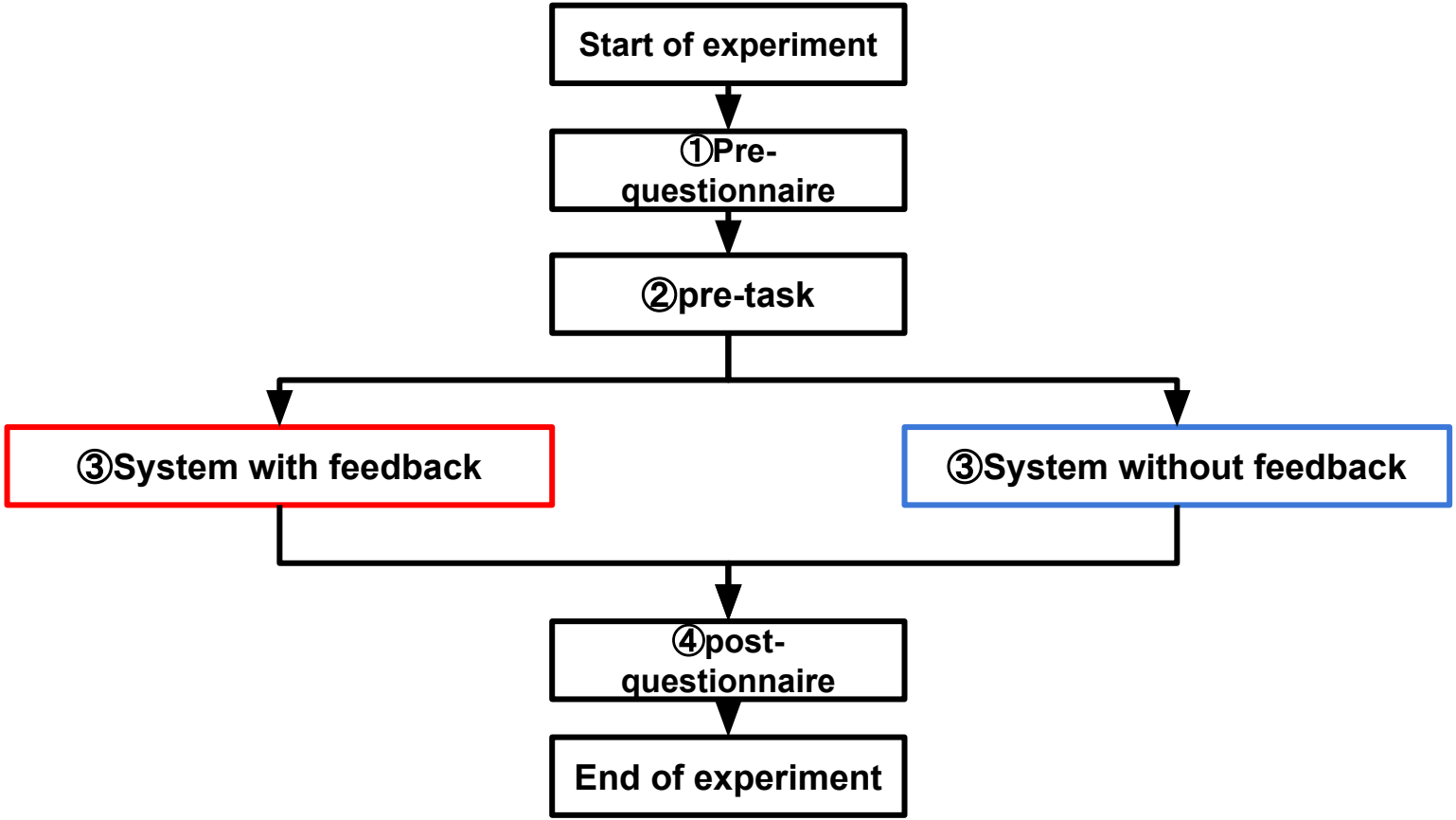
- Focus on feedback and compared systems with and without feedback.

- Comparing systems with and without feedback, we measured which system was more successful in promoting the flow state by means of a post-event questionnaire.

Material

- Venue: Tokyo Denki University
- Subjects: Undergraduate and graduate students of Tokyo Denki University
- Date of experiment: October 4 – November 16, 2021
- Number of subjects: 22 (11 pairs)
  - VR environment with feedback: 12 subjects (6 pairs)
  - VR environment without feedback: 10 subjects (5 pairs)

Experiment Flow



Pre-task

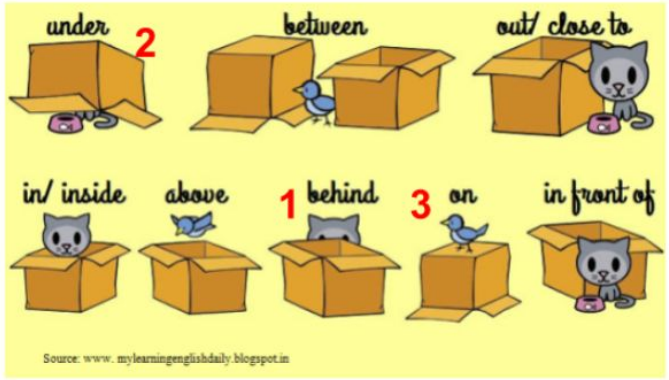
A pre-task was used to help students learn the vocabulary and grammar in the task so that communication is not affected by differences in English ability.

Spot the difference task: Warm-up

In this lesson, you will work with a partner. You will compare items located in the two rooms. The two rooms are divided into five levels. There are objects in each of the two rooms, but some of them are in a different place to your partner. This is a spot-the-difference activity. You will have to decide which of the items are the same and which are different and must be in the right place.

Activity 1: Positions of place

Look at the following picture. The cat and bird are in different positions in relation to the box.

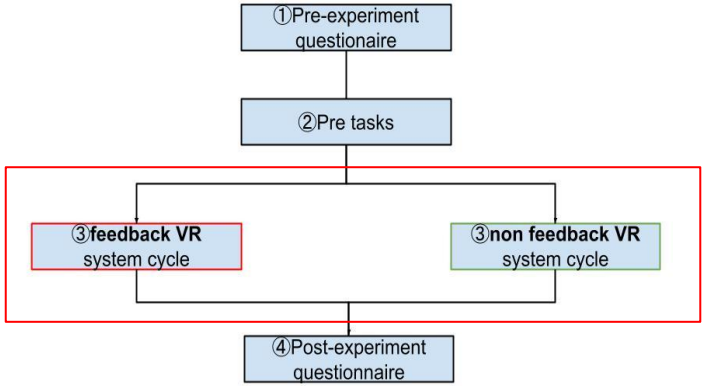


Please write sentences for the three pictures labelled **1**, **2** and **3**. For example; *The cat is in the box.*

1. _____

2. _____

Experiment preparation



1. Operation Explanation
2. Make sure you can hear each other
3. Spot the Differences task

Questionnaire

Conducted the following two questionnaires:

1. Pre-experiment questionnaire
2. Post-experiment questionnaire

pre-experiment questionnaire

Pre-experiment questionnaire was used to determine the subjects' student ID numbers and age.

post-experiment questionnaire

1. A questionnaire to measure the degree of “flow” by each system, using the six-point scale.

2. Investigate subjects’ perception of time while using the system.

3. Collect perceptions of the experience using an open-ended question.


システム後アンケート（2）

該当する番号を選択してください。
6段階評価で、6を非常にそう思う、1を非常にそう思わない、としたときに自分にあてはまる数字の位置に○をつけてください。

1.求められていなくても、このタスクをやりたいと感じた。 *

	1	2	3	4	5	6	
非常にそう思わない	○	○	○	○	○	○	非常にそう思う

2.このタスクは面白かった *

	1	2	3	4	5	6	
非常にそう思わない	○	○	○	○	○	○	非常にそう思う

3.このタスクはやりがいがあり、達成感があった *

	1	2	3	4	5	6	
非常にそう思わない	○	○	○	○	○	○	非常にそう思う

A questionnaire to measure the degree of “flow”

Interest

1. I would do this task even if it were not required.
2. This task was interesting in itself.
3. I found the experience very rewarding and felt good after completing it.
4. This task aroused my imagination.

Attention

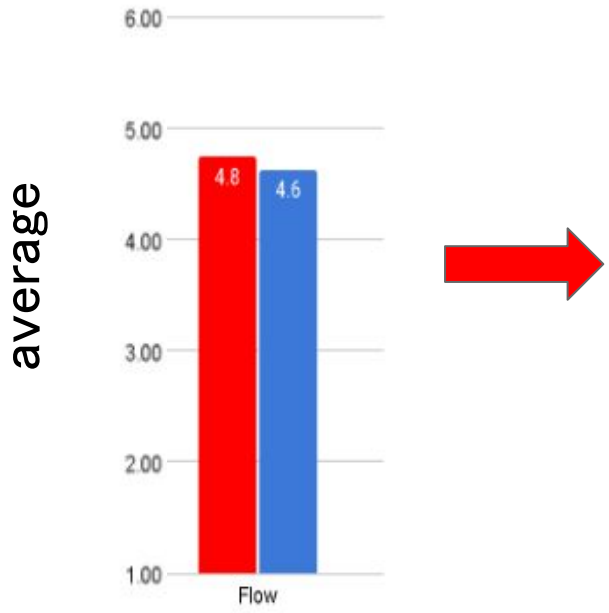
1. It took no effort to keep my mind on the task.
2. When doing this task, I was aware of distractions(revers item)
3. When doing this task, I was totally absorbed in what I was doing.

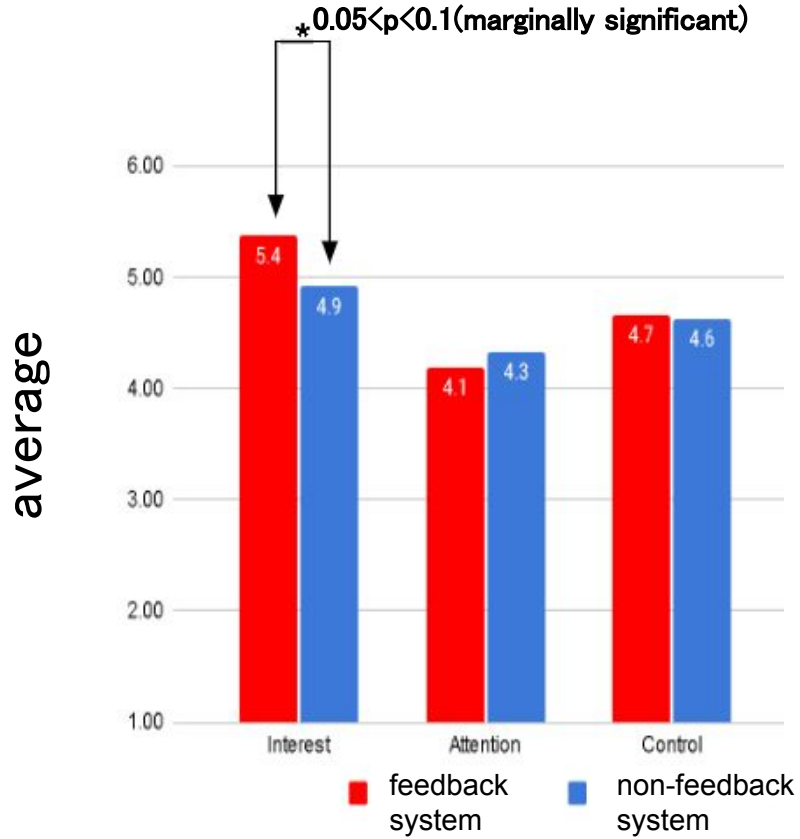
Control

1. When doing this task, I knew clearly what I wanted to do.
2. When doing this task, I had a feeling of control of what and how to write or speak.
3. When doing this task, I had a feeling of total control.

Cho, M. (2018). Task Complexity and Modality: Exploring Learners’ Experience From the Perspective of Flow. *The Modern Language Journal*, *102*(1), 162–180. https://doi.org/10.1111/modl.12460

Results: post-experiment questionnaire(flow questionnaire)





※Use unpaired t-test

Results: post-experiment questionnaire(flow questionnaire)

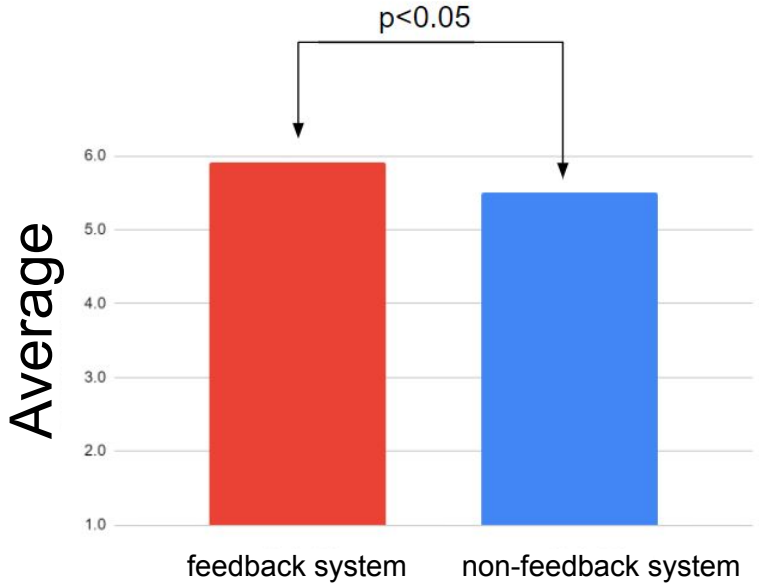
Significant differences were found in two questions on the **Interest** item

Q2. This task was interesting in itself.

Q3. I found the experience very rewarding and felt good after completing it.

Results: post-experiment questionnaire Q2

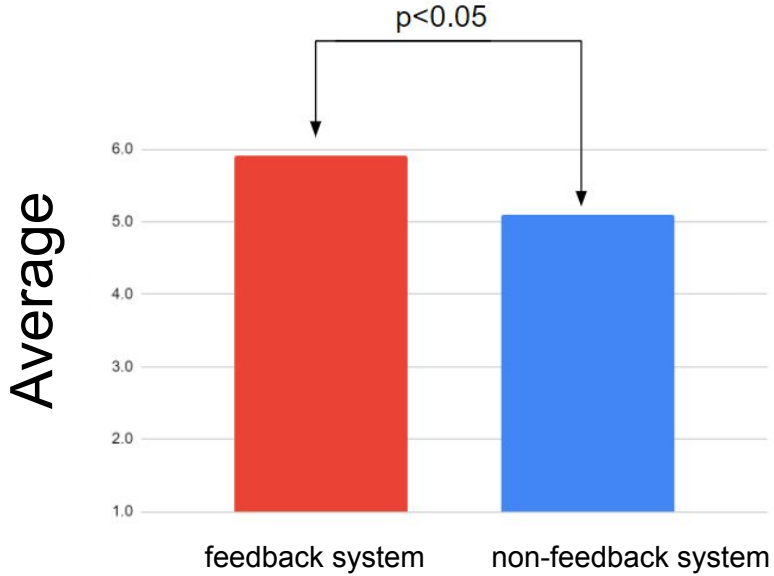
Q2.This task was interesting in itself.



	Average	SD
feedback system	5.9	0.29
non-feedback system	5.5	0.53

Results: post-experiment questionnaire Q3

Q3.I found the experience very rewarding and felt good after completing it.



	Average	SD
feedback system	5.9	0.29
non-feedback system	5.1	0.01

Results: post-experiment questionnaire (time questionnaire)

Flow is characterized by a "Distortion of temporal experience" (Nakamura, J., & Csikszentmihalyi,M.,2014).

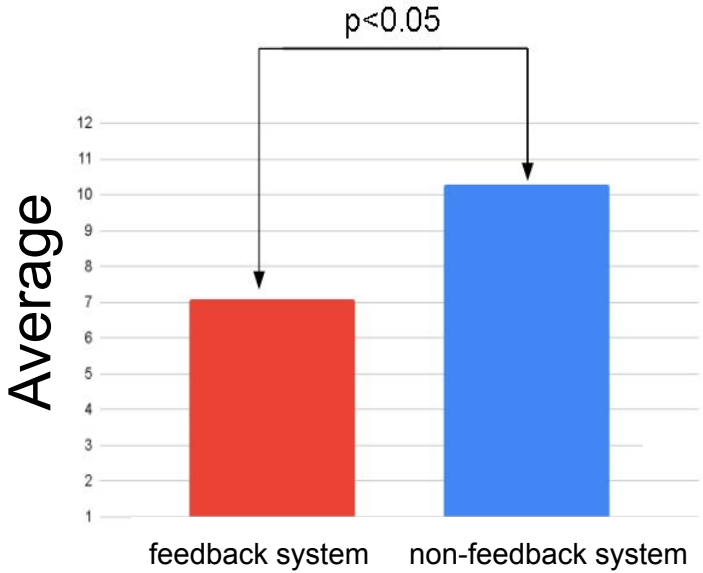
- Participants were asked to respond to the perception of time from the start of the experiment to the end of the experiment.
- Measured actual elapsed time during the experiment.

In both environments with and without feedback subjects' perception of time and actual elapsed time were compared.

Nakamura, J., & Csikszentmihalyi, M. (2014). The concept of flow. In Flow and the foundations of positive psychology (pp. 239–263). Springer, Dordrecht.

Results: post-experiment questionnaire (elapsed time)

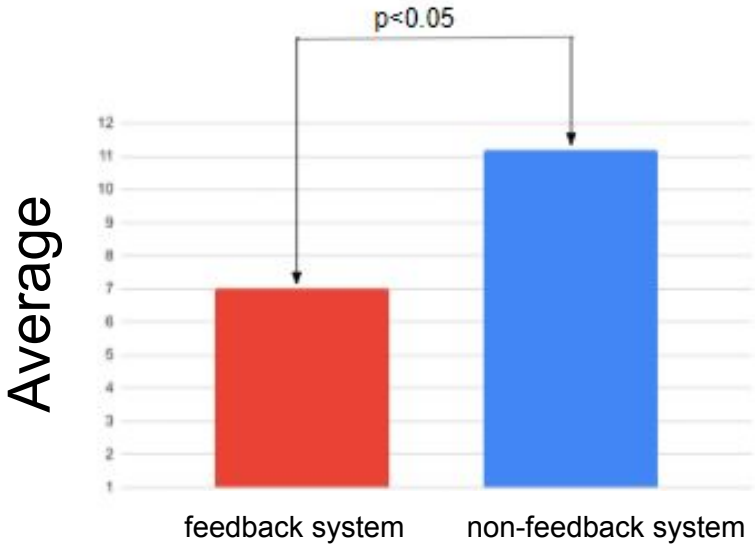
Average elapsed time



	Average elapsed time
feedback system	7.0
non-feedback system	10.0

Results: post-experiment questionnaire (perception of time)

Average perception of time



	Average perception of time
feedback system	7.0
non-feedback system	11.2

Discussion(1)

No significant difference was found between with and without feedback.

- This may be because the subjects experienced only one VR system and compared it to the paper study, making it difficult to find significant differences among the VR systems.
- If subjects were allowed to experience both VR systems, there could be significant difference.

Discussion(2)

The results showed that the results with feedback system were better than non-feedback system on two questions related to **interest**.

It is thought that this is because it is easier to attract people's interest and motivate them to take part in an activity with a system with feedback.

Discussion(3)

Both perception of time and elapsed time were shorter with feedback than without feedback.

This may be because the task was easier to understand with feedback than non-feedback, because the results for the activity were immediately apparent and there was less unnecessary confusion.

Conclusion

Purpose

To identify whether the **presence** or **absence** of feedback in a VR environment can **promote a flow state** for learning English.

Conclusion

- No significant difference in flow state was found between VR environments with and without feedback.
- VR environments with feedback are more likely to be attractive and motivate interest.

Future tasks

- Due to the corona virus, it was not possible to attract a large number of participants, but interest items showed marginally significant.

There is a need to increase the number of participants and conduct additional experiments.