Chang, M. et al. (Eds.) (2019). Proceedings of the 27th International Conference on Computers in Education. Taiwan: Asia-Pacific Society for Computers in Education

An Investigation of a Medical Terminology Learning Environment with a Robot and a Tablet

Yoko SAKAMOTO[a*] & Nobuhiro SAKATA[b]
[a]*Division of Languages and Humanities (English), Dokkyo Medical University, Japan*
[b]*Center for Information & Communication Technology, Dokkyo Medical University, Japan*
*y-saka@dokkyomed.ac.jp

Abstract: In this study, we have examined a medical terminology learning environment with a humanoid communicative robot and a tablet. In the environment with the robot participants can see the whole body of the robot and the tablet. In the tablet only environment the body of the robot was covered with white imitation paper. Total fifteen pairs of English medical terms were selected with the same number of syllables and the same stress pattern with similar sounds. Participants were divided into two groups. One group studied the medical terms with the robot while the other group did with the tablet. In the second learning session conducted after two weeks the participants studied with the another environment. During the session quizzes of the medical terms were given before and after the study. The average scores of the quizzes improved to a similar extent in the both robot and tablet groups. However, in the memory retention test, which was taken two weeks later of the study, showed that the average score was 4.3 in the environment with a robot although 2.4 in the tablet only environment. After the investigation more participants suggested that learning with a robot was fun and could be helpful in memory retention. In fact, we observed that many of participants looked at the face of robot during the study with a robot. We think that the presence of the robot might affect psychological environment. In conclusion, the observation suggested that retention of medical terms might be affected by the learning environment with a robot.

Keywords: Medical terminology, robot, tablet, language learning

1. Introduction

Humanoid communicative robots have been reported to provide effective support in caring for autistic children (Kojima et al. 2008). Ishiguro et al (2016) also showed a new method of using robots for patient education. These previous studies suggest the simplicity of communication with a robot can be helpful to support who have anxiety or need care. When we think of the second language education, language anxiety and social anxiety can be a factor to reduce the learning effect. Thus, we have developed the robot learning environment for medical students. In this study, we aimed to investigate the differences between learning English medical terms with a robot or a tablet.

2. Materials and Methods

2.1 Materials

Fifteen medical terms were presented via a humanoid communicative robot or a tablet.

2.1.1 Medical Terminology

Fifteen pairs of English medical terms were used as stimulus words. Each pair was chosen with the same number of syllables, the same stress pattern, and where possible, similar sounds. For example,

adenoma and trachoma, peritoneal and peritonitis, hypoxia and hypoplasia etc. The left of each pair was presented via a robot and the right was presented via a tablet.

2.1.2 Communicative Robot Environment

A communicative robot ("Pepper") produced by Softbank Robotics (Tokyo, Japan) was used in this investigation (Figure 1). This robot can recognize and speak English and can show pictures and letters on a 10.1-inch touch-panel display (tablet). The height of this robot is about 120 cm. The robot makes gestures such as nodding and moving its arms. A software development kit (Choregraphe) was used to develop the medical term learning materials. The robot asks the Japanese meaning of 15 medical terms orally and students can answer by touching the tablet, which shows four alternative responses. After checking the meaning, the robot asks the students to pronounce the word with a robot.

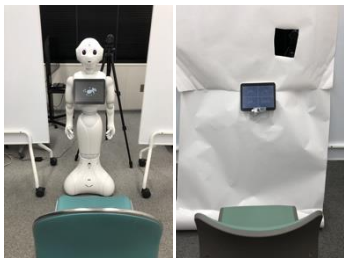

Figure 1. The learning environments with a communicative robot (left) and a tablet only (right)

2.1.3 Tablet only Environment

In order to make similar condition with a robot environment, the body of the robot was covered with white imitation paper (Figure 1). The content of the tablet included the same learning procedure with the robot. The tablet asks the Japanese meaning of 15 medical terms with sounds and students can answer by touching the display, which shows four alternative responses. After checking the meaning of the medical term in Japanese, the tablet asks the students to pronounce the word with a tablet.

2.1.4 Participants

Total 22 first grade medical students participated in this investigation. They were divided into two groups. Half of the participants firstly learned with a robot and then learned with a tablet two weeks later, while the other half of them learned with a tablet first and then with a robot two weeks later.

2.2 Methods

Each student participated in the trial in a separate room. The trial consisted of three steps, including a pre-trial questionnaire and a pre-trial word quiz, robot learning or tablet learning, a post-trial questionnaire and a post-trial word quiz. Two weeks later, the participants were counterbalanced and firstly they took the same word quiz as two weeks before to be checked the memory retention of the medical terms and followed the five steps.

Step 1: In the pre-trial questionnaire, students were asked whether they had learned with a robot or a tablet. The participants did a pre-trial word quiz, which asked the students to write in Japanese the meaning of the medical terms to be learned with a robot or a tablet.

Step 2: The participants learned with the robot or the tablet to check 15 English medical terms presented as a game. First, the robot or the tablet asked a question orally and the students answered by touching a display that showed four alternative answers. When the student answered correctly, the robot or the tablet asked the participant to pronounce the medical word. After the robot or the tablet recognized the word the student pronounced, the next question was presented.

Step 3: In post-trial questionnaire, students were asked whether leaning with a robot or a tablet was helpful to remember English medical terms and whether the learning was fun. The students also did a post-trial word quiz, which asked the students to write in Japanese the meaning of the medical terms which was learned with a robot or a tablet.

3. Results

We checked the word quiz and put one point per one correct answer. Table 1 and 2 are the average score of the word quiz for two subject groups.

Table 1

The Average Score of the Word Quiz of the First Session of the Investigation

	Subject Group 1	Subject Group 2
	Robot trial	Tablet trial
Pre-trial word quiz	2.2	1.1
Post-trial word quiz	6.4	5.1

Table 2

The Average Score of the Word Quiz of the Second Session Conducted Two Weeks Later

	Subject Group 1	Subject Group 2
Memory retention quiz	4.3 (Robot)	2.4 (Tablet)
	Tablet trial	Robot trial
Pre-trial word quiz	1.6	1.8
Post-trial word quiz	5.8	8.2

The results of the word quiz showed that the average score of the robot learning was almost the same with the average score of the tablet learning on the first session, but two weeks later, the result of the memory retention quiz showed that the learning with the robot was slightly higher in the average score by two points than the average score of the tablet learning. Moreover, Subject Group 2 showed better average score after learning with the robot (8.2) compared to the tablet trial group (5.8).

From the post-trial questionnaire more participants mentioned that learning with a robot was fun and could be helpful in memory retention. We also observed that many of participants looked at the face of robot during the study with a robot.

4. Discussion and Conclusion

These results have suggested that a learning environment for medical terms with a robot or with a tablet might have some differences. We think that the presence of the robot might be important in the learning environment. In conclusion, from the point of view of the average scores after each session, we observed that there were similar learning effects when using a robot and tablet. However, retention of vocabulary might be affected by the learning environment with a robot.

Acknowledgements

This work was supported by JSPS KAKENHI Grant Number JP16K02888 and Dokkyo Medical University Grant Number 2017-08. We would like to thank all participants of the trial at Dokkyo Medical University.

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