A proposal of investigating meal similarity effects between an agent and a learner for a food education agent

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Abstract. Eating the same food together is found to improve the closeness and trust of the partner. However, the effects of meal similarity in co-eating where it is via video communication facility and where it is with an interface agent need more exploration. To design effective co-eating agent for food education to the user, we would like to know whether an agent that eats similar food to the user can get the benefit on its impression and/or teaching capability. We planned two experiments for that purpose using co-eating agents, to investigate (1) the effects of meal similarity on impression toward the agent, (2) the effects of meal similarity on learning in food education given by the agent and (3) the mediate effects of impressions.

Keywords: digital food education, co-eating agent, dietary similarity

1 Introduction

In online co-eating, a study suggested that eating the same food made the participant feel the meal taste better and the sense of eating together more [1].

Besides eating with real people, some agents were also used for co-eating, which is called artificial co-eating. Aside from chatting, the co-eating agent is suitable for giving just-in-time food education. For example, some agents were developed to encourage people to eat more varied and balanced, by chatting, telling jokes, or singing while monitoring the weight of food [2,3]. However, these agents didn't eat together and do not have their own food. Some other entertaining co-eating robots have the function of simulating eating food [4,5], but the effects of agents' eating still need more discussion, especially in helping people eat healthier.

In this study, to achieve effective food education by an agent, we aim to improve artificial co-eating and explore the effects of agents' meals. We planned two experiments to investigate the effects of meal similarity on co-eating agents without and with teaching capability respectively. We want to verify if meal similarity's effects on impressions toward co-eating agents are consistent with real people, which improves the closeness, trust [6] and scenes of being together [1]. On the other hand, we also want to explore the effects on food learning. Path analysis showed that liking benefits trust

and trust benefits the compliance of suggestions given by the persuasive robot [7]. Since food education is also a kind of persuasion, we think there is a potential that impression toward agents can positively mediate the relationship between food similarity and the learning experience of digital food education. The research models are as **Fig. 1**. The hypnosis is: Food similarity between the participant and the agent has a significant and positive effect on the impression toward the co-eating agent in digital co-eating (H1-1). Food similarity between participant and the agent has a significant and positive effect on impression toward the agent (H1-2), learning outcome (H2-1), and learning satisfaction (H2-2) in digital food education. Impression toward the agent has a significant and positive effect on learning outcome (H3-1) and learning satisfaction (H3-2) in digital food education.

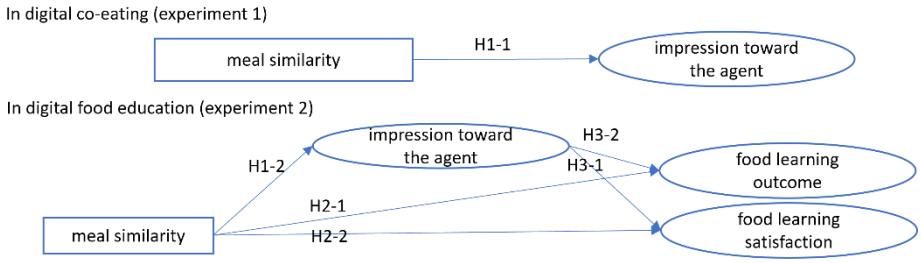

Fig. 1. research models

2 Method

2.1 Meal similarity

To explore the effects of meal similarity, there are "same meal item condition" and "different meal item condition" in both experiments. In the same meal items condition, participants will eat dark chocolate and the agents will also eat it. In different meal item conditions, the participants will still eat dark chocolate, but agents will eat cake, a less healthy snack, or vegetable dip, a healthier snack. Snacks of participants are consistent in both conditions to avoid the effects of taste of food. Dark chocolate was used because it is low in sugar, low in the glycemic index and easy to preserve.

2.2 Experiment 1: Co-eating agent's impression experiment

Experiment 1 is set as a simple co-eating using agents without teaching capability. Twenty students will be recruited, and a within-subjects-design experiment is adopted to avoid the effects of personal differences in acceptance or familiarity with technology. To verify the effects of meal similarity on impression toward an agent in a co-eating scenario, participants will have five-minutes one-on-one co-eating with an agent in each of two conditions. The agent will be different at each time, and the order of the two agents and the two conditions will be balanced. After each condition, the participants

will fill in the questionnaire of co-eating experience and impression of the agent (see **Fig. 2**, Up). At the end of the pilot experiment, an interview will be conducted to ask about their feeling toward the agents.

2.3 Experiment 2: Food education with Co-eating agent experiment

Experiment 2 is set as a food education using an agent with teaching capability. Sixty students will be recruited, and a between-subjects-design experiment is adopted to avoid the learning performance of the two conditions affecting each other. Besides, to avoid the effects on participants' original knowledge or attitude, they will be randomly assigned to each group with a balance of higher/lower scores than median scores in the pre-test. To explore the effects of meal similarity in digital food education, participants will attain to a workshop containing a five-minute co-eating with an agent in an assigned condition and a fifteen-minute lecture given by the agent. Though the co-eating agents usually give just-in-time food education [2,3], we separate eating from teaching to avoid effects of distractions. In the lecture, the agent will persuade participants to follow the guidance on sugar intake [8] and pay attention to the sugar content. Some questions will be asked by the agent and the participants will need to answer them by filling in the blanks or clicking the answer. Whether the participant follows the robot's suggestions will be recorded. After the workshop, the participants will take a post-test and fill in the questionnaire on the co-eating experience, the impression of the agent, and learning satisfaction (see **Fig. 2**, Down). At the end of the pilot experiment, an interview will be conducted to ask about their feeling toward the agent and the lecture.

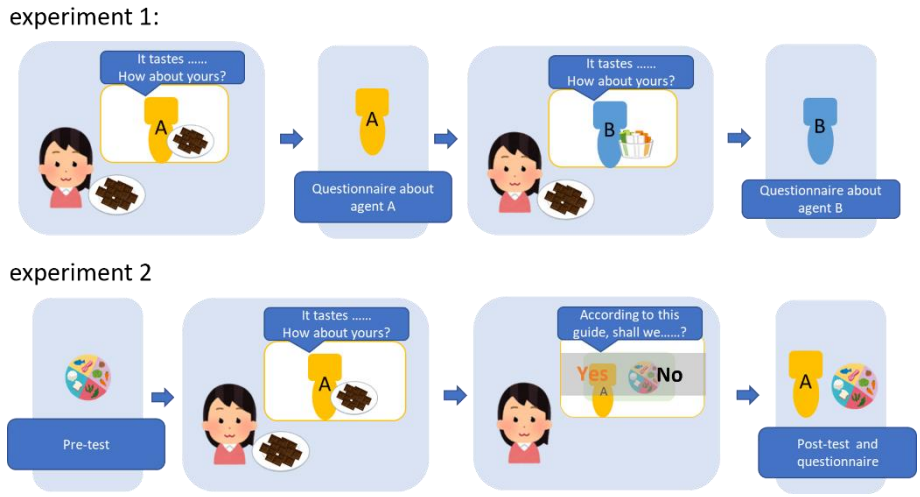

Fig. 2. Up: process of experiment 1. Down: process of experiment 2.

2.4 Data Collection and Analysis

The impression toward the agent is investigated in closeness, trust, and social presence, which are important in human-robot interaction [7,9]. It is measured via a 7-point Likert scale questionnaire (1: strongly disagree, 7: strongly agree), which consists self-made items and items is adapted from the questionnaire in food similarity research [6,1], human-robot interaction research [9], and two social presence research [10, 11]. The learning experience is investigated in learning satisfaction and learning outcome, which represent their change due to the agent's suggestions and teaching in digital food education. Learning satisfaction is measured via the questionnaire in the aspects of knowledge, attitude, skill, and confidence of regulating sugar intake, and satisfaction with the workshop. The learning outcome will be measured via pre and post-test.

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