## Graduate School of Science and Engineering, Aoyama Gakuin University

Title: Proposal of Feedback Method for Countermeasures against Bad Effects on Health of Eating Alone

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## Abstract

In recent years, the increasing number of people, from children to the elderly, who are eating alone is regarded as a problem. There is a significant correlation between eating alone frequently and obesity. On the other hand, it is clear that people who co-eat more than eating alone can relax better and taste food more deeply. Furthermore, it is clear that the conversation during a meal is preventing obesity while eating quickly, affects obesity. Such, we can assume that co-eating is preferable regarding both physical and mental health.

As research for improving the adverse effects caused by eating alone, various systems proposing remote co-eating using table terminals have been developed. However, they involve other people such their use in a completely isolated environment is difficult. Therefore, in this research, we aim to alleviate the adverse effects on the body and mind caused by eating alone.

In this research, we propose a feedback method to prevent fast eating when alone. First, we introduce conversation to create an environment close to co-eating. As a reference to situations where we eat while watching television at home, we adopted news as a topic to trigger a conversation. The user eats while listening to the news while a bone conduction microphone attached to one ear enables to acquire mastication sound data. The sound data are analyzed on the smartphone, and the system returns some feedback to the user when fast eating is detected, consisting in picking up words from the news stream, and generate automatically voice to cast conversation to the user.

We conducted a user study to verify the effect of the proposed system. Five men aged 21 to 25 years old participated in the following four experimental conditions during a typical lunch: "not streaming news," "streaming news," "streaming news and casting conversation periodically," "streaming news and casting conversation only when detecting fast eating." Based on the speech data collected from the bone conduction microphone and the video data of the situation during the experiment, we calculated and compared the interval between consecutive bites, the bite time, the chewing count, and the chewing interval. Besides, subjects were asked to answer a questionnaire about their psychological situation in each situation.

As a result, there were no correlation among all subjects between the meal condition and the four features calculated. The cause may be that it is difficult to induce conversation spontaneously by just streaming news and automatic speech casting. Furthermore, the number of chewing and chewing interval are different depending on the kind of food and depend on the state of fullness. From now on, it seems necessary to select topics according to the user's taste, very the system with identical meal content.