

What Enhances Food Intake? – Silent Eating or Conversing while Eating with Others

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Abstract The social facilitation of public dining is important for healthy development. Unfortunately, this practice was, for many, temporarily interrupted by COVID-19. In this crossover study, we posit that two conditions—silent eating versus conversing while eating with cafeteria situation affects consumption and taste. In all, 11 students at a university in Japan served 10 g of popcorn each during a 90-s interval under these two conditions. The main outcome measures were consumption, the scores for which were significantly higher when eating with conversation. The results indicated that ambience and friendship affected eating rates are important for food consumption. This paper's result suggested the importance of eating with others. We need to conduct additional experiments in the future. However, this paper is necessary for future developments.

Keywords: silent eating, group eating, university students, popcorn, taste, environment

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1. Introduction

The environment influences the nature of food's palatability. Various factors influence this perception, including sight, sound, smell, and color [1,2,3,4,5]. However, food tasting is complex because it requires both psychological and physiological considerations.

For example, Suzuki et al. found that food color modulates and motivates food intake [3]. Postprandial satiety, thermal sensations, and peripheral temperature also affect intake. Moreover, Genschow et al. suggested that red-colored food acts as a subtle cue to limit incidental ingestion and taste [6]. Indeed, research has shown that food that has a progressively darker shade of red was perceived to be less appetizing, and food with warm hues is perceived as tastier than that with cold ones [2]. In the dining environment, hearing, sound, and music can also affect palatability, as evidenced by the effect of hearing on the senses of taste such as wine tasting [4,5]. Thus, color, and music affect food taste and have a psychological effect. Therefore, color, music type, cultural background, race, and mechanism require detailed consideration.

The factor of visualization is closely related to this area of study. Several studies have highlighted the relationship

between visuals and images people see while eating [1,7,8,9]. Nakata confirmed how eating rates result in palatable changes when participants ate in front of a mirror or a wall-reflecting monitor [7]. This result suggests that the mirroring condition is better than the monitoring condition. One reason for this may be rooted in the relationship with modeling. Cruwys et al. suggested that social modeling can dictate specific food behaviors in familiar situations [8]. Thus, we selected a setting where social modeling is likely to occur, as how, and with whom we eat is also important.

The Japanese government's fourth Shikoku promotion basic plan suggested that people should eat together [10]. However, COVID-19 meant that in Japan, people refrained from eating while talking in public, including school lunches from 2020 to 2022 [11,12]. Although some studies recommended eating together, one study suggested that decreased frequency in commensality was associated with low health-related quality of life [13]. However, few studies, if any, have examined silent eating, or conversing with friends while eating. This study theorizes that eating with a group while talking versus silent eating affects consumption and tastiness. The main outcome is proposed that eating with a group while talking is important because how eating is done affects palatability and rate of consumption.

2. Methods

2.1. Sample and Research Design

Study 1

This crossover study consisted of 11 students (male = 4, female = 7) between the ages of 20 and 21 years. The participants had good health and self-reported no food allergies, history of eating disorders, or special dietary restrictions. In this experiment, the participants experienced two conditions. We confirmed and determined the sample size using G power. Although we aimed for a minimum of 12-15 participants, due to some absences, our final sample size ended up being 11 participants.

The study protocol was reviewed and approved by Tokyo University Ethical Review Board for Medical and Health Research involving Human Subjects (TU-2022-009). The experiment was carefully explained to all participants, who provided their informed consent to participate in the study.

Study 2

A group similar to Study 1 was used, but with only female participants (n=7). Using a crossover design, two rounds of experiments (silent and talk) were conducted with 3 or 4 participants respectively.

2.2. Sampling Procedure

Study 1

The participants were randomly divided into two groups, the group that received the intervention from the silent eating first, consisting of Group 1 (Silent Eating Group, n = 6); and Group 2 (Talking and Eating Group, n = 5). The experiment took place in the school cafeteria at one university in Japan. Due to the continuing COVID-19 pandemic, the researchers installed a transparent screen between the participants.

White bowls of salty buttered soy sauce popcorn (Japan Frito-Lay, Ltd., 10 g per bowl, butter soy source taste, 50 kcal per 10 g), were placed on a desk. An alarm bell signaled the beginning of each tasting period. Four tests were conducted, beginning with Group 1. Each participant took the tests twice.

All participants served 10 g of popcorn that was placed before them for 90 s. We calculated the consumption rate by checking the amount remaining from the initial amount. Participants were not informed they were eating the same popcorn. However, each was required to self-complete a short evaluation questionnaire.

Study 2

We conducted the same experiment as Study 1. The experiments from Study 1 and Study 2 were analyzed together (n=18).

2.3. Data Collection and Measurements

Each questionnaire contained one question about the tastiness of the popcorn and was scored based on a 6-point Likert scale (from “not at all” to “extremely” tasty). The questions reflected participants’ evaluations of the popcorn; an example question was “How tasty is this food?” The higher the score, the more positive participants’ perception of tastiness [1,7,8].

After completing all of the eating tests, six questions were asked about two popcorn preferences, and four questions about their eating habits; “Do you like popcorn?”, “How often do you eat popcorn?” “How often do you eat alone?” “Is your meal time short or long compared to that of your friends?” “Do you eat quickly?” and “Do you watch a screen while eating?” Questions about their eating speed were answered based on a 5-point likert scale. The higher the score, the faster participants’ eating speed.

We also calculated the consumption ratio of each bowl of popcorn by subtracting the ratio of the quantity of the remaining popcorn from the initial quantity.

2.4. Statistical Analysis

Data analysis was conducted with the Statistical Package for the Social Sciences version 25 (Chicago, IL, USA). Data were presented as the mean $\pm$ standard deviations unless otherwise stated.

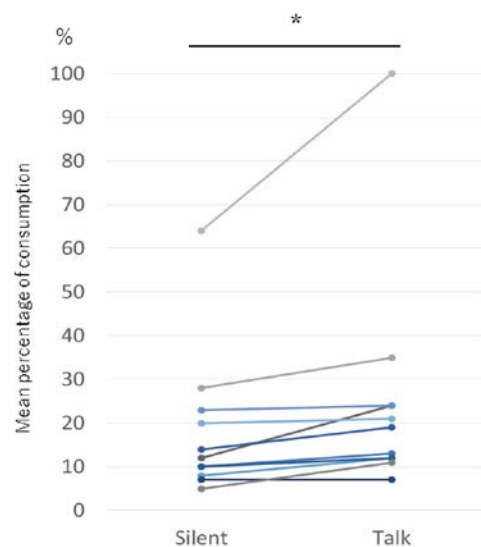


Figure 1. Mean consumption of popcorn (We conducted a paired t-test. The asterisks show p values < 0.05)

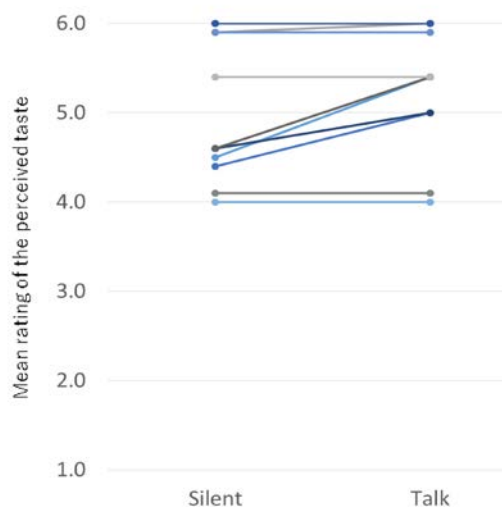


Figure 2. Mean rating of the tastiness of the popcorn (We conducted Wilcoxon singed-rank sum test. The test results were not significant. One question of ask to the deliciousness on a 6-point scale (from “not at all” to “extremely”) reflected participants’ subjective evaluations of the popcorn; an example is “How tasty is this food?” Extremely gets a higher score)

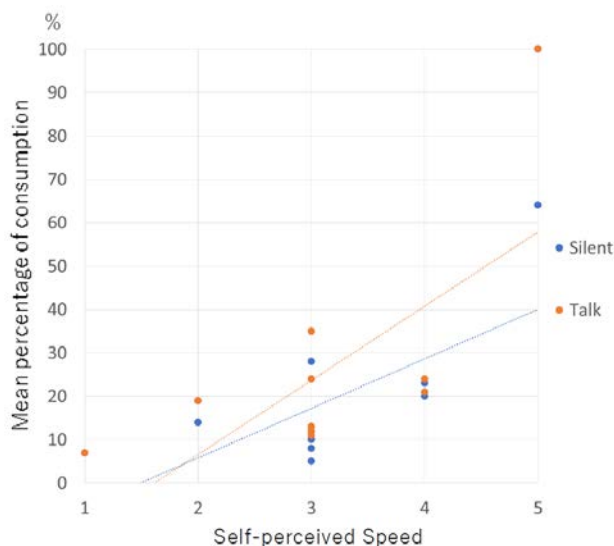


Figure 3. Correlation between consumption and self-perceived speed (Spearman's rank correlation between silent eating and their consumption * $p < 0.05$ and group and their consumption * $p < 0.05$ by each test)

We conducted a paired t-test for popcorn consumption rate and a Wilcoxon signed-rank test for popcorn taste. In addition, we used Spearman's rank correlation coefficient to measure consumption and speed; $p < 0.05$ was considered statistically significant.

3. Results

3.1. The Usual Intake of the Study Participants as Study 1

"Do you like popcorn?", 91% answered that they liked popcorn. The frequency of popcorn consumption was categorized as "almost never" or "less than once a month". "How often do you eat alone?" The participants answered that they do not eat alone so often., "Is your meal time short or long compared to that of your friends?", 63% answered that they spend more "Do you eat quickly?", and "Do you watch a screen while eating?", all participants answered that they watched videos while eating.

3.2. Differences in Eating Rate and Tastiness Under Two Tasting Conditions as Study 1.

Participants' ratings of the popcorn and consumption ratio in each condition were analyzed using a paired t-test with the factors of the presence of silent vs speaking condition (Figure 1). The participants' rating was significantly higher in the talking condition ($M=25.3$, $SD=26.0$) than the silent condition ($M=18.3$, $SD=16.8$, $p < 0.05$).

Participants' deliciousness of the popcorn in each condition was analyzed using Wilcoxon signed-rank sum test with the factors of the presence of silent vs talk condition (Figure 2). The participants' scoring was significantly higher in the talking condition ($M=5.29$, $SD=0.72$,) than the silent condition ($M=5.04$, $SD=0.81$, $p=N.S$).

3.3. Correlation Between the Ratios of Consumption of Popcorn and Eating Speed as Study 1

We confirmed the correlation between the habitual eating speed and the eating rate during the experiment. Self-perceived speed was moderately correlated with speed during experiment ($r=0.56$, $p < 0.01$, data not shown) and consumption of popcorn ($r=0.62$, $p < 0.01$ data not shown) in both two conditions.

In the condition of silent eating, a significant correlation was observed between self-perceived speed and experimental condition speed, as well as consumption ratio, speed during experiment $r=0.62$, $p < 0.05$, data not shown, consumption of popcorn $r=0.62$, $p < 0.05$, Figure 3.

The same correlation was observed even in situations where conversation was possible, speed $r=0.64$, data not shown, $p < 0.05$, consumption $r=0.64$, $p < 0.05$, Figure 3). There were no significant correlation with self-perceived speed and tasty in both two conditions.

3.4. Differences in Eating Rate and Tastiness Under Two Tasting Conditions as Study 1 and Study 2

Participants' ratings of the popcorn and consumption ratio in each condition were analyzed using a paired t-test with the factors of the presence of silent vs speaking condition (Figure 4). The participants' rating was significantly higher in the talking condition ($M=22.1$, $SD=20.7$) than the silent condition ($M=17.2$, $SD=13.3$, $p < 0.05$).

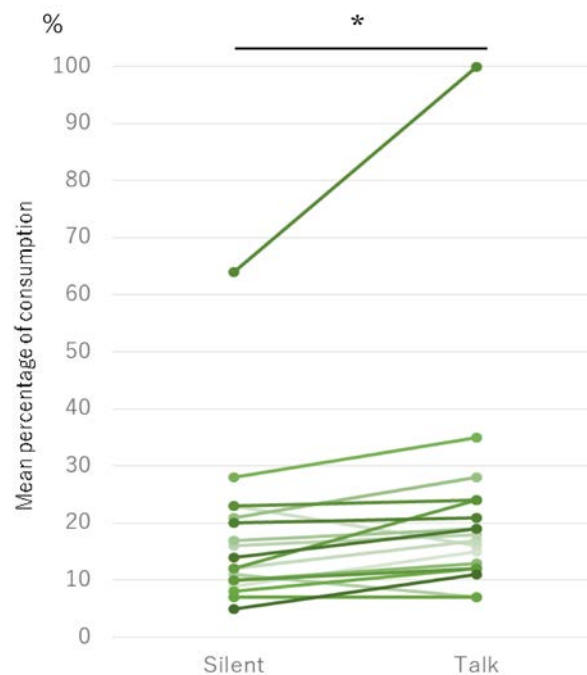


Figure 4. Mean consumption of popcorn (We conducted a paired t-test. The asterisks show p values < 0.05)

Participants' deliciousness of the popcorn in each condition was analyzed using Wilcoxon signed-rank sum test with the factors of the presence of silent vs talk

condition (Figure 5). The participants' scoring was significantly higher in the talking condition ($M=5.28$, $SD=0.73$) than the silent condition ($M=4.96$, $SD=0.81$, $p < 0.05$).

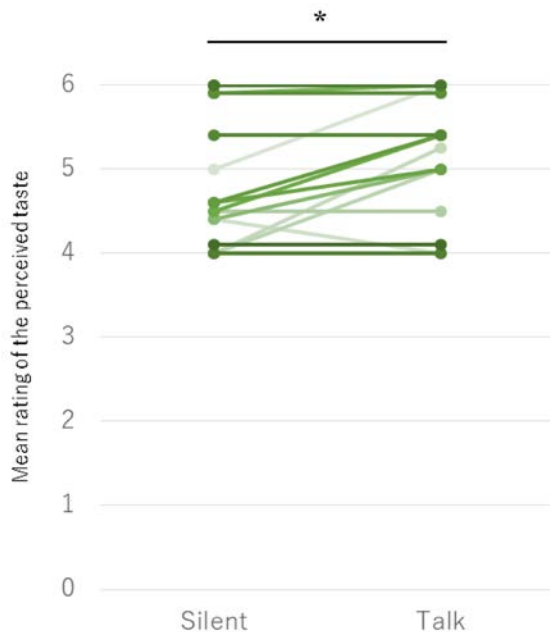


Figure 5. Mean rating of the tastiness of the popcorn (We conducted Wilcoxon singed-rank sum test. The asterisks show p values < 0.05)

4. Discussion

To the best of our knowledge, the effectiveness of eating silently versus eating while talking with cafeteria situation has not been fully investigated. Our results suggested that the group eating while talking with cafeteria situation ate more than the group that ate silently. Both conditions had only 90 s to eat. Despite this, consumption increased for the talking group, even though time was not subtracted from the period they spent talking (Figure 1 and Figure 3). No significant difference was also observed in tastiness (Figure 2). When analyzing Study 1 and Study 2 together, it was found that in the situation where participants ate while talking, both the eating rate and the perceived tastiness were higher (Figure 4 and Figure 5).

Studies have examined how eating rates change palatability when still or mirror images are shown [7], although this finding contradicts that earlier work. Indeed, Cruwys et al.'s study suggested social modeling occurs in a familiar situation [8]. In our study, the participants knew each other, so consumption increased in the conversing group.

A high frequency of solo eating is associated with depression and anorexia [1,13]. Eating and living alone are perceived to be associated with a higher prevalence of unhealthy eating behaviors in men such as adiposity [6]. Many negative effects are attributed to living alone. Although it is dissimilar, it seems better to eat one meal with friends than to eat in silence or alone. This study is important as the results show the importance of commensality [14]. A Korean study highlighted the

association between the frequency of eating together and health-related quality of life [13]. Similarly, a Japanese study highlighted the relationship between self-rated health and morning routines, like home meals [15]. Commensality is a relationship annexed to health, quality of life, dietary intake, and weight status [14,15,16]. The influence of mothers on children must also be considered. For instance, mothers who felt that family commensality was unimportant are more likely to have overweight adolescents than those who perceived otherwise [17]. The home food environment concerning children's dietary quality and weight status is pivotal [18,19,20,21]. Research revealed that happiness while eating is connected more with dinner than breakfast and lunch [22].

While this study does not provide conclusive evidence, it is generally believed that speaking activates the prefrontal cortex, so it is possible that its activity has increased [23].

People's work situation and the number of eating companions may be related to their happiness. Additionally, group size, and gender ratio have also affected feeding [24,25,26]. In this study, the group size was small with only two males in each group. However, other results may vary depending on group size and gender [24,25,26]. We also believe that further examination is necessary regarding the number of male and female participants.

Eating speed was a factor in consumption (Figure 3). We confirmed that there is an effect of social modeling (some had increased eating and faster eating speed), and there were no significant differences between the two groups and gender. Therefore, this research shows the importance of eating while talking with friends.

The experiment occurred in a familiar setting with a group of friends, so it may have been less stressful than in a laboratory setting. The study suggested that there was no social modeling of out-group members' eating but the same group (in-group) had a modeling effect [27]. Participants were friends, and their familiar habit of eating together was more than for the silent group, which may explain the positive modeling effect.

Previous studies used 90-s meals with popcorn [7,27], but it may be necessary to extend the time and consider other foods. However, to implement this scenario in real life, it may be necessary to test for a longer duration with a larger group and experiment with other foods. Further, it should be ascertained whether similar results can be obtained for children, adults, and older people. Our results suggested that eating with others may increase the consumption rate compared to eating alone. This paper's result suggested the importance of eating with others.

Post-COVID-19, friends will be able to resume eating and celebrating. Maternal influence must also be considered regarding children [17], as this is reflected in how offspring consume school lunches; teachers' involvement will be pivotal [28,29]. In the future, we will examine how the situation is affected using remote video confederates. It can be expected to conduct investigations on various situations and foods. However, this result could serve as one of the pieces of evidence for recommending talking while eating in school cafeterias or company cafeterias.

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Conflicts of Interest

Declare conflicts of interest or state “The authors declare no conflict of interest.” Authors must identify and declare any personal circumstances or interest that may be perceived as inappropriately influencing the representation or interpretation of reported research results.

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