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Effects of Commensality Condition on Food Perception and Ingestive Behavior †

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Abstract: Commensality can induce social facilitation and subsequently influence an individual's dietary choice and meal intake. Unfortunately, the effect of commensality on food liking or sensory perception has not been studied extensively. While physical commensality is a common occurrence, the recent coronavirus disease 2019 (COVID-19) pandemic has imposed strict social distancing protocols to limit the spread of the virus, making digital commensalism a popular option to virtually gather together via video conference applications. This study showed that, as participants consumed the same meal items three times over the three weeks, their hedonic impression on flavor or texture aspects of the meal items decreased. Notably, overall impression of the meal items was also found to vary with social presence. In conclusion, our findings showed the potential influence of commensality (or the presence of others) on meal evaluations.

Keywords: commensality; social presence; hedonics; video applications; personality; Big-Five Inventory

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1. Introduction

Commensality, or the practice of sharing meals, has been central to various human societies, not only as a means for food intake but also as an intimate interpersonal act [1,2]. Jönsson et al. concluded that commensality, as a trend, has remained stable throughout the years [1]. While commensalism at home (i.e., family dinners) has declined, sharing meals outside of home (e.g., bars or restaurants) has increased in frequency to adapt to the changing societal and cultural norms [1]. The novel coronavirus disease of 2019 (COVID-19), first identified in December 2019 and declared as a global pandemic by the World Health Organization (WHO) in March 2020 [3], has severely constrained the ability of individuals to meet physically, consequently augmenting the use of digital applications to virtually connect in times of isolation. However, incorporating digital platforms in commensal behavior was already an increasingly popular practice, with phenomena such as *skeating* (i.e., individuals virtually interacting with others while eating their meals) [2]. This observed evolution in forms of commensality highlighted the sense of connectedness that food can bring, even via digital applications, and emphasized the need to evaluate the impact this commensality arrangement has on human consumption experience, which is currently quite lacking in the literature.

Research involving commensality has largely focused on how commensality could influence food intake, while little is currently known about its impact on sensory perception and acceptance of the food eaten. Generally, people tend to eat a greater amount of food in the presence of others [4], especially with people they are familiar with, i.e., friends or family [5,6]. These results demonstrated the existence of social facilitation of eating [7],

which was thought to result due to behavioral mimicry from individuals attempting to mirror each other during social interactions to build rapport [7,8]. With regards to how commensality could influence the sensory perception and acceptance of the food eaten, there have been reports of enhanced (un)pleasantness for (un)pleasant foods when eaten in the presence of others eating the same foods [9], or overall increased palatability when foods were eaten in the presence of others [10]. However, there is still relatively little information about how commensality, whether digital or physical, could influence both sensory acceptance and attribute intensities of the meals eaten. The primary objective of this study, thus, was to determine whether commensality (i.e., physical commensality versus digital commensality versus alone) could impact sensory acceptance and attribute perception of foods eaten. We expected that liking ratings of the meals would be higher when eaten in both digital and physical commensality conditions compared to when eaten alone. We also expected that there could be personality dimensions that would influence participants' acceptance and sensory attribute ratings of the meals since previous studies have reported individuals with higher scores of certain personality constructs to be more or less sensitive to odors and trigeminal sensations [11], and more reliant on olfactory cues in their everyday lives [12]. Personality constructs have also been found to contribute to the prediction of the overall acceptance of tasting solutions [13]. For these reasons, a secondary objective of this study was to determine whether there were associations between personality dimensions and commensality condition liking, as well as sensory acceptance and attribute ratings of the meals.

2. Methods

2.1. Participants

Twenty-eight co-habitating pairs, comprising of 56 healthy individuals (29 females and 27 males), with a mean age of 37.3 years (SD = 12.2 years) participated in this study. Participants were recruited as pairs who were already living together to prevent physical contact with strangers as part of COVID-19 safety guidelines. Participants self-reported no diseases or health conditions that could impact their taste or smell performance, and self-reported liking beef teriyaki meals (≥5 on a 9-pt. hedonic categorical scale; 5 = "neither like nor dislike").

2.2. Materials

The meal sample kit included 6 frozen beef teriyaki meals (Healthy Choice, Conagra Brands Inc., Chicago, IL, USA; labels were discarded prior to sample pick-up), napkins, plastic forks, cooking instructions, and 3 envelopes containing the 3 instructions for the 3 test days.

2.3. Procedures

2.3.1. Sample Pick-Up Procedure

Each of the 28 selected pairs was asked to pick up the meal sample kit from the University of Arkansas Sensory Science Center (Fayetteville, AR, USA). Researchers briefed them on the study procedure and instructed them to only read the instructions for the appropriate test day (and not all instructions at once).

2.3.2. Study Procedure

This study was conducted over a period of 3 different days with >72 h between the test days. On each test day, both individuals in the pair logged on to the Zoom call using their electronic devices (Zoom Video Communications Inc., San Jose, CA, USA), where they were virtually met with a researcher. The presence of the researcher was to ensure that the participants followed the test procedures appropriately. Depending on the test

day, each pair would consume each meal under different eating conditions (physical commensality versus digital commensality versus alone; randomized using a Williams Latin Square design). On all three days, participants ate the same meals.

Physical commensality condition: Participants were instructed to sit next to each other and eat the meals as they normally would (i.e., *ad libitum*). To ensure privacy, participants were told that the researcher would not be listening in and watching the video call during their eating period. As such, the only means of communication between the researcher and participants during this time was through the chat feature. Participants typed "start" when they began to eat the meals in the chat and "stop" when they concluded their meals. These times (in seconds) were recorded as the "time taken" to eat the meals. After they finished their meals, they were instructed to answer questions regarding the eating conditions and their impressions of the meals on their separate devices on Compusense® Cloud (Compusense Inc., Guelph, ON, Canada). Questions regarding liking and intensities were rated on 9-pt. hedonic and intensity categorical scales. Participants' willingness to re-eat the meals was rated on 9-pt. categorical scale (1 = "extremely unwilling" and 9 = "extremely willing").

Digital commensality condition: The procedure closely followed the physical commensality condition, except that they were instructed to sit in different rooms, where they were unable to hear or physically see each other in person. Participants were told that they could only communicate with each other while eating through the Zoom videos (i.e., their videos and audio were turned on during the eating period).

Alone condition: The procedure closely followed the digital commensality condition, except that the participants were forbidden to communicate with each other while eating (i.e., their videos and audio were turned off during the eating period).

Demographics: After completing all 3 test days, participants were asked to complete additional demographic questions, including personality dimensions using a 44-item Big-Five Inventory (BFI), comprising of 5 personality dimensions: extraversion, agreeableness, conscientiousness, neuroticism, and openness [14].

2.4. Data Analysis

Results were analyzed using JMP® Pro (version 16.0, SAS Institute Inc., Cary, NC, USA). A three-way mixed model treating "session" and "condition" as fixed effects and "panelist" as a random effect was conducted to determine whether ratings of attribute intensities, hedonic ratings, and time taken to eat the meals differed among the three eating conditions. If a statistically significant difference was found, *post hoc* pairwise comparisons were conducted using Tukey's Honestly Significant Difference (HSD).

To determine whether personality dimensions affected eating condition liking, multivariate correlation analyses were conducted separately for each of the three eating conditions. Additionally, multivariate correlation analysis was also done to examine whether personality types affected ratings of attribute intensities, hedonic ratings, time taken to eat the meals, and condition liking. A difference was defined to be statistically significant at $p < 0.05$.

3. Results and Discussion

3.1. Commensality Enhanced Overall Liking of Meals

There was an effect of eating condition on overall liking of meals ($p < 0.05$), eating condition liking ($p < 0.001$), and time taken to eat the meals ($p = 0.001$) (Table 1). While digital commensality certainly could not replace physical commensality with regards to feelings of connectedness [15], as observed by the significant differences in condition liking ratings in the present study, digital commensalism seemed to display some potential in enhancing the overall hedonic impressions of the meals to a similar degree as to when the meals were consumed under physical commensalism. This observation illustrated a

form of halo effect—high elation had been reported in social eating situations [16], resulting in higher condition liking ratings in this study, which in turn, positively influenced their hedonic impressions of the meals overall. Sharing a meal could be seen as an intrinsically pleasant experience because it creates an opportunity for people to socially bond, especially when the participants in this study were already extremely familiar with their eating companion [9]. Since participants generally liked the meals, their shared experiences of eating the meals together resulted in their positive impressions of the meals being amplified [9].

Table 1. Means (±standard deviation) among the three eating conditions with respect to sensory acceptance and attribute ratings of the meals, as well as time taken for participants to eat their meals and eating condition liking.

	Overall Liking	Appearance Liking	Flavor Liking	Texture Liking	Flavor Intensity	Willingness to Re-Eat	Time Taken	Condition Liking
Alone [1]	6.30 [b] (±1.94)	6.82 (±1.38)	6.55 (±1.75)	6.70 (±1.79)	5.27 (±1.71)	6.63 (±1.93)	310.23 [b] (±122.08)	4.73 [c] (±2.23)
Physical	6.79 [a] (±1.79)	7.23 (±1.21)	6.61 (±1.84)	6.91 (±1.71)	5.63 (±1.71)	7.02 (±1.67)	363.00 [a] (±119.10)	7.32 [a] (±1.45)
Digital	6.73 [ab] (±1.79)	7.11 (±1.53)	6.57 (±1.96)	7.04 (±1.72)	5.41 (±1.57)	6.96 (±1.79)	376.21 [a] (±144.73)	5.77 [b] (±1.76)

[1] Mean values with different superscripts within a column represent a significant difference as determined by *post hoc* multiple pairwise comparisons using Tukey's Honestly Significant Difference (HSD) at $p < 0.05$.

There was also an effect of session day for flavor liking ($p < 0.05$), texture liking ($p < 0.05$), and willingness to re-eat the meals ($p < 0.001$) (Table 2). Participants tended to rate flavor liking, texture liking, and willingness to re-eat the meals the lowest on their third test day regardless of their eating condition. This contrasted with reports that repeated exposure to products could persuade people to like the products more, over more exposure [17,18]. However, since this was not the case here, we attributed this discrepancy to the participants becoming disinterested in the meals and test procedure after time, as they knew what to expect from the study procedures after their first two sessions, as also observed in other previous studies [19,20]. No interactions effects between eating condition and session were observed for any measured attributes.

Table 2. Means (±standard deviation) among the three testing days with respect to sensory acceptance and attribute ratings of the meals, as well as time taken for participants to eat their meals and eating condition liking.

	Overall Liking	Appearance Liking	Flavor Liking	Texture Liking	Flavor Intensity	Willingness to Re-Eat	Time Taken	Condition Liking
Day 1 [1]	6.79 (±1.77)	7.16 (±1.33)	6.80 [a] (±1.71)	7.04 [a] (±1.72)	5.50 (±1.73)	7.13 [a] (±1.54)	340.30 (±141.90)	6.16 (±2.21)
Day 2	6.70 (±1.73)	7.16 (±1.20)	6.61 [ab] (±1.74)	7.04 [a] (±1.61)	5.36 (±1.53)	7.07 [a] (±1.54)	354.77 (±119.83)	6.16 (±2.08)
Day 3	6.34 (±2.03)	6.84 (±1.58)	6.32 [b] (±2.05)	6.57 [b] (±1.86)	5.45 (±1.75)	6.41 [b] (±2.18)	354.38 (±133.73)	5.50 (±2.03)

[1] Mean values with different superscripts within a column represent a significant difference as determined by *post hoc* multiple pairwise comparisons using Tukey's Honestly Significant Difference (HSD) at $p < 0.05$.

3.2. Associations between Personality Traits and Eating Condition Liking

Correlation analyses showed no significant correlations between personality dimensions with eating condition liking. This was unexpected when considering that higher extraversion was associated with a higher liking of eating conditions; for example, extraverts tend to rate pleasant, social situations (like commensalism) more positively [21]. However, this could be attributed to how well-familiar each participant was to their eating companion.

3.3. Associations between Personality Traits and Sensory Perception of Meal Samples

There were significant correlations between extraversion traits with appearance liking or flavor intensity (Table 3). The observed association between extraversion and appearance liking could be related back to the more positive disposition of extraverts, resulting in higher appearance acceptance.

Table 3. Correlation coefficients (*p*-values) showing the relationships between Big-Five personality dimensions and sensory liking and attribute intensity of the meal sample.

	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Appearance Liking [1]	0.21 (0.01)	0.10 (0.20)	−0.07 (0.35)	0.05 (0.48)	−0.06 (0.45)
Flavor Intensity	0.16 (0.03)	0.10 (0.20)	−0.09 (0.26)	−0.08 (0.32)	−0.01 (0.86)

[1] Only significant correlations are shown. There were no other significant correlations between personality dimensions and sensory acceptance and attribute ratings of the meals and condition.

4. Conclusions

This study showed that participants liked physical commensality condition more than digital commensality condition. However, there was the potential for digital platforms to evoke a sense of connectedness and social bonding to create the feeling of a shared eating experience. In addition, this study added to the growing evidence that commensalism, whether digital or presence, could influence sensory acceptance of the meals eaten. The results should open more doors to other research studies regarding digital commensalism, which are currently lacking.

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