

# Effects of background sound on consumers' sensory discriminatory ability among foods



Robert Pellegrino, Curtis R. Luckett, Sara Shinn, Sarah Mayfield, Kelly Gude, Abbey Rhea, Han-Seok Seo

Department of Food Science, University of Arkansas, Fayetteville, AR

## Introduction

- Food perception can be influenced by one or a combination of five senses.
- Sounds elicited by mastication and swallowing process can influence food perception such as crispness and carbonation (Zampini & Spence, 2005).
- Similarly, background noises, sounds that have less particular connection to the food consumed, also modulate food perception.
- Previous studies have demonstrated that background noise unrelated to the food being consumed modulate taste perception (Woods et al. 2011; Stafford et al., 2012).
- Influences of auditory cues should be dependent on not only individual sensory attributes, but also the integration of multiple attributes.
- It is also important to understand the ambient sound conditions that are present during mealtimes in daily life.

## Objectives

- Examine accustomed and preferential levels of background sound in eating atmospheres across different demographics.
- Determine the effect of common background sounds on consumers' overall discriminatory ability during the drinking and mastication process.

## Materials and Methods

### Experiment 1

- A total of 244 (108 men and 138 woman) with mean age of 40 years (standard deviation  $\pm$  13 years) filled out a questionnaire composed of four main questions regarding background sound conditions related to eating.
- Question 1:** Estimate the average background sound level when they consumed four types of meal (i.e., breakfast, lunch, dinner, and snack) during the past week (9-point Likert scale).
- Question 2:** Estimate the frequency of seven eating atmospheres in the past week for the previously asked meal types.
- Question 3:** Select most preferred eating atmosphere among the seven examples.
- Question 4:** Preferred level of background sound while eating (9-point Likert scale).

### Experiment 2

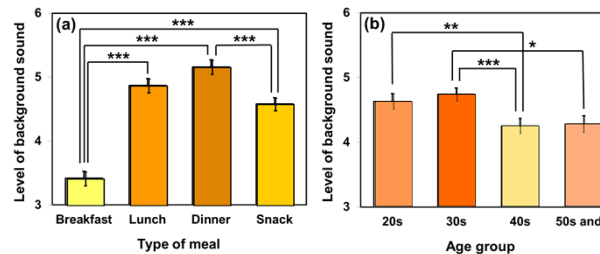
- Fifty-eight volunteers (22 men and 36 women) with an age range from 20 and 69 years [mean age  $\pm$  standard deviation (SD)] = 39  $\pm$  16 years] participated.
- Two types of food, potato chips and carbonated soda, were used:
  - Original Lay and a reduced sodium alternative (Frito-lay, Plano, TX, USA)
  - Sprite and Sprite Zero (The Coca-Cola Company, Atlanta, GA, USA)
- Five background sound conditions were used:
  - Carbonation sound (popping effervescence from a soda being poured)
  - Crisp chewing-sound (initial stages of mastication of a crisp food)
  - Classical music (Mozart's Piano Sonata No. 12 in F Major)
  - Shadowing task (BBC news recording)
  - White noise (fixed width frequency at 1000 Hz)
- To examine participants' discrimination ability, a set of triangle tests were used.
- Each food set was tested against each sound condition for each participant.

## Results and Discussion

### Experiment 1

- As shown in **Figure 1(a)**, background sound level of eating atmosphere in the past week was different among the types of meal ( $p < 0.001$ ) where breakfast was consumed in the most silent condition while dinner was found to be consumed in a louder condition compared to breakfast and snack (for all cases,  $p < 0.001$ ).
- As **Figure 1(b)** demonstrates, the estimated level of background sound in eating atmosphere was significantly different among the four age groups ( $p < 0.001$ ) where participants aged from 20 to 39 years reported that they ate meals and snack in louder condition than those who were aged 40 years and older.
- Based on **Question 4**, participants aged from 19 to 39 years wanted to consume meals and snack in louder condition than those in their 40s and 50s ( $p < 0.001$ ).

Figure 1. Difference in mealtimes (a) and age groups (b) background sound levels experienced in the past week.



- The frequency, shown in **Table 1**, of an eating scenario depends on the type of meal
- For breakfast, individuals most frequently ate either alone in silence or at home with others (e.g., friends, family, or coworkers) in the past week.
- For lunch and dinner individuals were less likely to eat alone in silence and more likely to be in a scenario involving people.
- Based on **Question 3**, more than half (57%) wanted to eat meals while having a conversation.

Table 1. Comparison in the frequency of eating scenarios for mealtimes in the past week

Eating scenarios	Type of meal			
	Breakfast	Lunch	Dinner	Snack
Alone in silence	29.5% a	10.6% d	5.9% d	15.3% b
Alone in front of TV	13.1% b	12.7% d	13.1% c	19.7% b
On computer/at work	16.1% b	23.6% b	3.6% de	28.3% a
While listening to music	5.9% c	5.6% e	3.2% e	7.3% c
At home with others	31.6% a	29.5% a	56.8% a	27.2% a
In a restaurant with others	3.9% c	18.0% c	17.4% b	2.2% d
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Percentages with different letters within a column indicate a significant difference at  $P < 0.05$ .

### Experiment 2

- Participants were able to discriminate sensory differences which were present between the two types of potato chips in all five sound conditions: crisp chewing-sound ( $p < 0.01$ ), carbonation sound ( $p < 0.001$ ), classical music ( $p = 0.02$ ), shadowing task ( $p < 0.01$ ), and white noise ( $p < 0.01$ ).
- As shown in **Figure 2(a)**, the task performance did not significantly differ across the five sound conditions ( $p = 0.81$ ).
- Participants were able to discriminate sensory differences exhibited between the two types of carbonated sodas in the presence of all sound conditions ( $p < 0.001$ ) except the shadow task ( $p = 0.19$ ).
- As shown in **Figure 2(b)**, participants showed significantly better performance in discriminating carbonated sodas while they were listening to carbonation sound ( $p = 0.001$ ) or classical music ( $p = 0.04$ ) compared to while conducting the shadowing task.

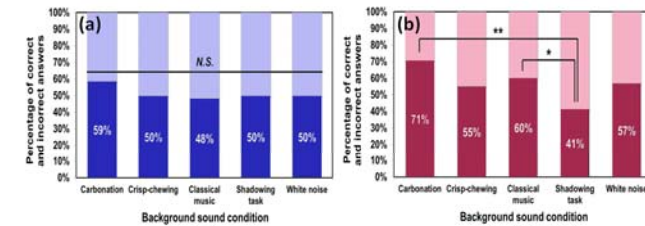


Figure 2. Percentage of correct and incorrect answers in the overall difference task of potato chips (a) and carbonated sodas (b).

## Conclusions

- In our study, we have shown that not only do individuals prefer eating while having a conversation, but that this form of communication increases with certain mealtimes (e.g. lunch and dinner).
- Individuals were unable to distinguish foods that elicited less noise while engaging in a similar cognitive engagement, shadow tasking.
- These findings are important since peoples' preferred eating atmosphere may cover-up differences in certain foods, and this effect may increase as the day progresses and settings become louder. For instance, the food quality of a dinner with friends may be overlooked more than a breakfast eaten alone.
- The frequency at which people may eat in different scenarios, their associated sound levels, and the preferred eating scenario should also be taken into consideration.
- This information may be important to marketers that may want to choose advertisement targets and times for products around certain meals. Furthermore, estimating the volume of background sounds (e.g. background music) may change with age where certain meals may be enjoyed more at lower or higher volume levels.

## References

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