The Effect of Chronic Stress on Consumer Sensory Perception

Curtis Luckett, Nicole Nokes, Nathan M. Turner, Marion A. Felix-Faure,

Ji Li, Mallory C. Eggelton, Justin Smock, and Han-Seok Seo

The University of Arkansas Sensory Service Center, Department of Food Science, University of Arkansas, Fayetteville, AR

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

INTRODUCTION

- Popular media has continually drawn the link between obesity and stress, fueled by personal experiences and studies observing stress-related shifts from low-fat foods to high-fat foods (Zellner et al., 2006).
- However, the role of stress on food choice is more complex than often portrayed. For example, research regarding how people's food intake varies in response to stress found that over eating (hyperphagia) was equally as common as under eating (hypophagia) (Willenbring et al., 1986; Weinstein et al., 1997; Oliver & Wardle, 1999).
- Compared to the effect of acute stress, relatively little attention has been paid to the relationship of chronic stress to food choice or eating behavior.
- Around one third of the U.S. adults reported that in the last month, they over-consumed (38%) or skipped their meals (30%) due to their psychological stress (American Psychological Association, 2014).
- Chronic stress to decrease sweet and umami taste perception in rats.
- In randomly selected samples of people it was found that adults under high levels of chronic stress are more likely to consume a diet high in sugar and fat (Ng & Jeffery, 2003)

OBJECTIVE

- This study aimed to ascertain whether the sensory perception and impression of foods can be different under distinctive levels of chronic stress.

MATERIALS AND METHODS

Participants

- A total number of 423 volunteers completed the Perceived Stress Scale (PSS), a self-administrated survey on stress over the previous month (Cohen et al., 1983).
- The highest and lowest quartiles of the PSS score were calculated. One-hundred participants (33 males and 67 females), whose scores were within one of the two ranges were invited to participate in the study.
- The participants who scored in the lowest 25% on the PSS were labeled "low stress group", while the participants who scored in the highest 25% were labeled as "high stress group." Thetwo groups were not significantly different in terms of mean age (P = 0.66), gender ratio (P = 0.08), and body mass index (BMI; P = 0.08).

Food samples

	Sweet foods	Salty foods
High-calorie	Brownie (Artisan Fresh)	Potato Chips (Lay's)
Low-calorie	Grapefruit (Del Monte)	Popcorn (Act II)

- On four consecutive days the participants were asked to evaluate the foods in a traditional consumer sensory test format.
- **Overall liking of the food itself:** on a 9-point hedonic scale.
- **Taste intensity:** on a 15-cm line scale ranging from 0 (not at all sweet; not at all salty) to 15 (extremely sweet; extremely salty).
- **Overall flavor intensity:** on a 15-cm line scale.
- **Food satisfaction:** on a 15-cm line scale ranging from 0 (not at all satisfying) to 15 (extremely satisfying).

RESULTS AND DISCUSSION

- As shown in Fig. 1, low stress group liked grapefruit significantly more than high stress group (P = 0.002). However, there was no significant difference between the low and high stress groups in other foods: popcorn (P = 0.96), brownie (P = 0.17), and potato chips (P = 0.14).

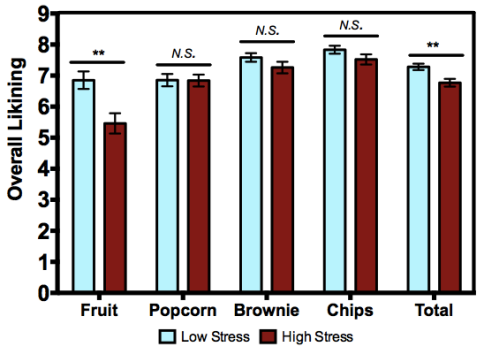

Figure 1. Overall Impression of Different Foods by Stress Level

- As shown in Fig. 2, low stress group satisfied grapefruit significantly more than high stress group (P < 0.001). Food satisfaction ratings did not significantly differ between the low stress and high stress groups in other foods: popcorn (P = 0.42), brownie (P = 0.19), and potato chips (P = 0.21).

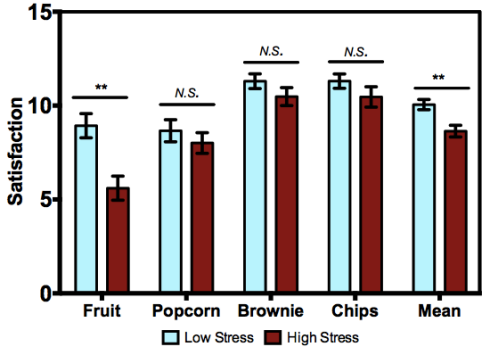

Figure 2. Satisfaction Felt after Eating Different Foods by Stress Level

Table 1. Mean ratings (±standard deviation) of the taste and flavor intensities different food samples in relation to chronic stress levels

	Chronic stress level	
	Low stress group	High stress group
Taste intensity [a]		
Grapefruits (sweetness)	5.5 ± 3.6	4.1 ± 4.3
Brownie (sweetness)	8.6 ± 3.1	8.9 ± 2.4
Popcorn (saltiness)	5.3 ± 3.5	5.8 ± 3.6
Potato chips (saltiness)	9.7 ± 2.9	9.7 ± 3.2
Overall flavor intensity		
Grapefruits	9.6 ± 3.0	9.5 ± 3.8
Brownie	9.1 ± 2.3	8.4 ± 2.6
Popcorn	7.2 ± 2.7	6.7 ± 2.9
Potato chips	9.6 ± 2.3	8.9 ± 2.6

[a] Intensity of the dominant taste quality at each food was rated.

CONCLUSIONS

- The major finding of this study was that **people who reported high chronic stress levels did not perceive the foods the same, like them as much, and feel as satisfied after consuming them**.
- Chronic stress level can modulate individuals' food acceptance and the satisfaction felt after eating
- Chronic stress did not affect the intensity ratings of taste or overall flavor

PRACTICAL APPLICATION

- Income is directly linked to chronic stress levels.
- Many sensory centers recruit panelists who may be higher in higher in chronic stress
  - Part-time jobs
  - Full-time students
  - Low-income
- May be important for sensory centers to take into account panelists with high chronic stress and their ratings.

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