

Eating Behaviors of American Adults during the COVID-19 Pandemic

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Abstract

The objective was to assess the impact of the coronavirus disease (COVID)-19 pandemic on eating behaviors of a cross section of the US adult population. Participants ($n = 844$) completed a survey through Amazon Mechanical Turk which evaluated frequency of consumption of five food categories – mixed dishes, salty, sweet, creamy foods, and beverages during perceived stress. Physical, emotional, and psychological self-care and demographics were also collected. Males eating behaviors especially mixed dishes, sweet foods, and creamy foods decreased when stressed. However, in females, there was an increase in the consumption of sweet and creamy foods. When compared to their counterpart, there was a reduction in food choices among minorities and Hispanics. Participants with higher body mass index had increased eating behaviors of mixed dishes, salty, and sweet foods. The physical self-care scale revealed that there was limited consumption of sweet foods but the psychological self-care demonstrated that there was an increase in creamy food intake.

Keywords: Coronavirus disease-19, Eating behaviors, Stress, US adults

Introduction

According to the American Institute of Stress, Hans Selye coined stress as the body's non-specific response to demands caused by any stimuli (i.e., pleasant or unpleasant). Stress occurs when internal (e.g., illness) or external (e.g., environmental or social) factors influence physical and mental abilities to perform affecting the body's homeostasis.^[1,2] Perceived stress though multifaceted (e.g., physical, psychological, psychosocial, and medical) is affected by many imaginary and contributing factors which are shaped by societal norms and cultural parameters.^[3] According to researchers Yau and Potenza, Allen *et al.*, and Antonyan and Godlevskii,^[4-6] examples of stress include psychological (e.g., fluctuations of anxiety), biological (e.g., hormonal), and physiological (e.g., health problem) with the magnitude of experiences ranging from mild to severe.^[7] Several methods have been utilized to evaluate stress including assessment of self-reported questionnaires,^[8] biochemical assays such as urine,^[9] behavioral errors

through speech,^[10] psychophysiological evaluation of neural changes,^[11] and neuroendocrine appraisal of cellular transformations.^[12]

Stress has been associated with the selection of less healthy foods^[4,13,14] and poor eating behaviors^[15-17] resulting in higher energy intake,^[13,18] increased consumption of fat/saturated fat,^[19,20] salt,^[21] sugar,^[22] and poor diet quality.^[14,20] Consumption of a well-balanced healthy diet is one of the major contributors in delaying mortality. Poor dietary habits are precursors for chronic diseases (e.g., obesity, heart disease, stroke, hypertension, diabetes, and cancer) consequently leading to soaring health care costs.^[23]

There appears to be gender differences in the types of food choices eaten during stressful and non-stressful conditions. When challenged with a solvable (no-stress) or non-solvable (stress) anagrams to solve, Zeller *et al.* found men ate more significantly unhealthy snacks foods (i.e., potato chips and M&Ms) when under solvable than during non-solvable conditions.^[24] On the contrary,



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women had more healthy snack foods (i.e., grapes and peanuts) when faced with solvable anagram to solve but ate more M&Ms when stressed.^[25,26] Similarly, Hbhab found stressed females preferred sweet and high-fat foods and women who were not stressed ate more low-fat foods.^[27] When Saiki *et al.* examined the relationship between food and stress among female university students, there were statistically significant increases in the selection of mixed dishes, salty/crunchy foods, sweet foods, and beverages during perceived stressful conditions.^[24] Errisuriz *et al.* found among a diverse group of students, consumption of unhealthy foods (e.g., soda, coffee, energy drinks, and fast food) was positively associated with perceived stress.^[28] Among Australian 1st-year university students, though more than 50% in both genders experienced some degree of stress, it was distinctly more prevalent in women, resulting in them selecting less healthy foods when stressed.^[29] Furthermore, earlier research demonstrated that women chose highly palatable or snack foods when under stress using these as a source of comfort.^[30] With the coronavirus disease (COVID-19) pandemic in the United States in March 2020, lockdowns were enforced nationally for all states. With the exception of essential services (e.g., medical, law enforcement, supermarkets, etc.), all other businesses and institutions including restaurants, and fast food facilities were displaced and employees were compelled to work from home. Since COVID-19 had created a sudden transition from people's normal lifestyle, eating habits, and employment practices, the objective of this research was to assess food choices of Americans during the lived pandemic. Although extensive research has been conducted on stress and eating behaviors, to date, no research has examined a larger population to investigate the influence of perceived stress caused by the COVID-19 pandemic and its influence on food choices of males and females. The purpose of this study was to assess the impact of the currently lived COVID-19 pandemic on eating behaviors of a cross section of the US adult population.

Method

A survey was used that included demographic questions (age, sex, race, ethnicity, region of residence, and employment status). To assess eating behaviors, 36 item options were grouped in categories, mixed dishes (e.g., burgers, sandwiches),

salty foods (e.g., potato chips, French fries), sweet foods (e.g., ice cream, cookies), creamy foods (e.g., grilled cheese, pasta), and beverages. After the introduction of the research, participants were asked, "For the following questions, identify how frequently did you eat these foods during the current lived COVID-19 pandemic (or within the past month)?" Participants selected from three potential responses for each food item "more during the pandemic – MT," "same as before – SAB the pandemic," and "less than before – LB the pandemic," which were coded as 1, 0, and -1, respectively. In addition, 27 items grouped in three parts of the National Alliance on Mental Illness' self-care survey were used to assess physical, emotional, and psychological self-care. To assess stress, an item from^[31] 10 item perceived stress scale was used: "In the last month, how often have you felt nervous and "stressed"? Participants selected from 0 = Never to 4 = Very Often with higher score indicating a higher stress level.

Before data collection, the University's Institutional Review Board approved the study as exempt. The survey was made available on Amazon Mechanical Turk during the last week of April 2020. Data were analyzed using SPSS 26. Statistical significance was established at $P < 0.05$.

Results

Of the 1023 surveys completed through Amazon Mechanical Turk, 844 of the participants resided in the United States (US). Mean age for participants was 34.83 (standard deviation [SD] = 11.79) and mean body mass index (BMI) was 25.58 (SD = 5.45), with the majority being female (51.8%) and working fulltime (56.8%). Many were working from home due to the pandemic (62.9%) and few were healthcare workers (14.2%). The plurality of respondents was married (45.6%), and most were living with family members (71.6%). The majority of participants were Caucasian (63.2%), with Asians (22.9%), African Americans (6.6%), and multiracial and other (7.3%). The majority were also non-Hispanic (78.0%).

The internal consistency of the scales was measured by Cronbach's Alpha, with the five eating behavior scales ranging from a low of 0.54 for beverages to a high of 0.80 for sweet foods, with mixed dishes (0.73), creamy foods (0.73), and salty foods scales (0.70) falling in between. The physical self-care scale had an internal consistency coefficient of 0.75, emotional self-care scale was 0.84, and



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psychological self-care scale was also 0.84. Three items concerned with fasting, restricted eating, and skipping meals formed a restrictive eating behavior scale with an internal consistency coefficient of 0.71.

Using a mixed model ANOVA, the five eating behaviors were compared controlling for gender and stress. Interaction effects were found for eating behaviors by gender (Pillai's Trace = 0.01, $F [4837] = 2.33, P = 0.055$) and eating behaviors by stress

(Pillai's Trace = 0.01, $F [4837] = 2.43, P = 0.047$), as well as main effects for eating behaviors (Pillai's Trace = 0.17, $F [4837] = 42.76, P < 0.001$) and gender ($F [1840] = 10.33, P = 0.001$). As shown in Figure 1, with zero indicating no change in the eating behavior, mixed dishes showed the most decline overall, particularly for males. Salty food choices also showed some decline, particularly for males. For sweet foods, females or those who were feeling stressed showed increases while those who

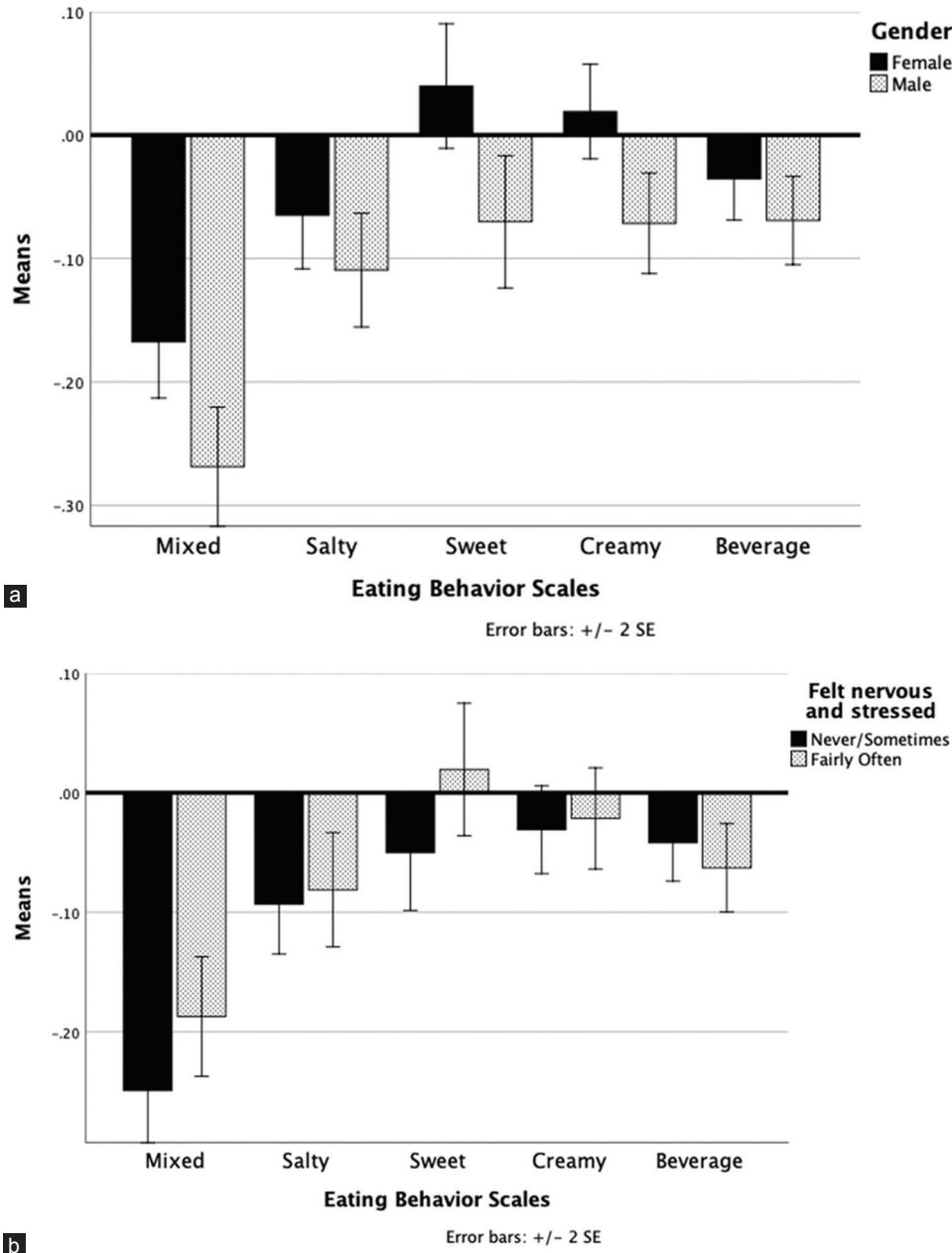


Figure 1: (a and b) Eating behavior changes by stress and gender



were not stressed or male showed declines. Creamy foods had lower means overall except for females, who had an increase. For beverages, all had a small decline with males decreasing the most.

For each eating behavior scale, stress, demographic characteristics, the three self-care scales, and the restrictive eating behavior scale were used as predictors in an ordinary least squares regression analysis. The unstandardized regression coefficients with their standard errors in parentheses are shown in Table 1. All regression models for the eating behavior scales except beverages were found to account for a statistically significant proportion of variance ($P < 0.05$). Excluding beverages, minorities compared to Caucasians reduced their food choices. Hispanics, compared to non-Hispanics, also reduced their choices for mixed dishes, salty foods, and creamy foods. Those with higher BMI values, however, increased on mixed dishes, salty foods, and sweet foods. Males were also found to have decreased their food choices on mixed dishes, sweet foods, and creamy foods. Increased scores on the physical self-care scale were found to be predictive of lower choices for sweet foods, while increased psychological self-care predicted higher levels for creamy foods.

Discussion

Results from the present study revealed in general when compared to females, males eating behaviors in all food categories decreased when stressed. Unlike males, females exhibited increase eating behaviors of sweet and creamy foods. These observations are in congruent with previous researchers.^[24,27] Eating behaviors of females could be explained by the influence of stress on appetite hormones leptin (suppresses hunger) and ghrelin (stimulates appetite). Studies on rats and humans have demonstrated that when stressed females exhibited increase ghrelin production and lower levels of the appetite suppressing hormone leptin resulting in diets with higher consumption of sugars, carbohydrates, fat, and calories. In additional, there is supporting evidence unlike males, women have lower levels of neurotransmitter – serotonin, a regulator of mood and appetite. Due to limited serotonin binding sites in the brain, consumption of sugary foods triggers serotonin activity stimulating the releases of endorphins that produce a calming effect during stressful times.^[32]

Hispanics and minorities reported eating less food. Restrictive eating behaviors could be attributed to

Table 1: Regression coefficients for each eating behavior scale

Predictors	Mixed Dishes	Salty Foods	Sweet Foods	Creamy Foods	Beverages
Intercept	-0.17 (0.14)	0.02(0.14)	0.20(0.16)	0.09(0.12)	0.07(0.10)
Felt nervous and stressed	0.04(0.04)	0.01(0.04)	0.05(0.04)	0.00(0.03)	0.00(0.03)
Age	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)
Employment status	0.04(0.03)	0.02(0.02)	0.01(0.03)	-0.01(0.02)	0.01(0.02)
Caucasian vs. Minority	-0.23*(0.04)	-0.11*(0.04)	-0.13*(0.04)	-0.12*(0.03)	-0.05(0.03)
Hispanic	-0.11*(.04)	-0.13*(0.04)	-0.08(0.05)	-0.11(0.04)	-0.05(0.03)
BMI	0.01*(0.00)	0.00(0.00)	0.01*(0.00)	0.00(0.00)	0.00(0.00)
Marital status	0.02(0.04)	-0.03(0.04)	0.01(0.05)	0.02(0.04)	-0.04(0.03)
Live with others	0.05(0.05)	0.01(0.05)	0.00(0.06)	0.00(0.04)	0.02(0.04)
Healthcare worker	0.03(0.05)	0.04(0.05)	-0.01(0.06)	-0.04(0.05)	0.01(0.04)
Working from home	-0.01(0.04)	0.07(0.04)	0.03(0.05)	0.05(0.04)	0.05(0.03)
Gender	-0.10*(0.04)	-0.06(0.04)	-0.14*(0.04)	-0.09*(0.03)	-0.05(0.03)
Physical SC	-0.05(0.04)	-0.05(0.04)	-0.12*(0.05)	-0.07(0.04)	-0.02(0.03)
Psychological SC	-0.02(0.04)	0.07(0.04)	-0.03(0.05)	0.07*(0.03)	0.01(0.03)
Emotional SC	-0.03(0.04)	-0.06(0.04)	-0.01(0.04)	-0.05(0.03)	0.01(0.03)
Restrictive eating	0.01(0.03)	-0.05(0.03)	-0.07(0.04)	0.02(0.03)	0.02(0.02)
R ²	0.12*	0.06*	0.08*	0.07*	0.03

* $P < 0.05$. Standard error of regression coefficient shown in parentheses



participants' social determinants to health, level of affluence to purchase non-seasonal foods with higher nutrient content, loss of employment or job opportunities, and social distancing during the lockdown of the pandemic.^[33] Furthermore, eating of less foods could be due to participants' fear of getting ill and/or the unavailability or limited insurance coverage for health care services. It has been consistently observed across all ages, when compared to non-Hispanic whites, African Americans, and people of Hispanic origin persistently have lower insurance coverage.^[34]

This research showed that people with higher BMI had increased eating behaviors of mixed dishes, salty, and sweet foods. Overweight and obese individuals have been reported to be most vulnerable to stress-related eating behaviors, often times craving hyperpalatable foods (e.g., snacks, desserts) in the absence of hunger as a mechanism to regulate and suppress stress.^[35,36] A possible speculation for the reduction in beverages across both genders could be their confinement of being in their residence, lack of physical activity, and not being outdoors or limited availability of an assortment of beverages at home. Increased scores on the physical self-care scale were found to be predictive of lower choices for sweet foods, while increased psychological self-care predicted higher levels for creamy foods. Sweet foods choices on this survey are considered unhealthy, therefore, during the pandemic participants who were aware of their physical self-care (eating healthy foods, exercising, take time away from telephones, wear clothing you like, etc.) were aware of limiting sweet foods. Perhaps staying at home allowed these participants to have more control over their food intake and availability by grocery shopping as opposed to eating out. Intake of creamy foods increased with psychological self-care. Creamy foods are associated with comfort. There is evidence that these foods can help soothe patients in distress.^[37] Perhaps eating creamy foods was part of increasing psychological care including such variables as noticing inner thoughts, respecting one's limitations, and coping with stress.

Conclusion

Some of the strengths of this research included assessment of eating behaviors of a cross-section of the US adult population during a unique time frame, that is, occurrence of the COVID-19 pandemic, data were gathered during a rare perceived stressful time, eating behaviors were grouped into five food

categories, and a reliable instrument was used to assess physical, emotional, and psychological self-care. Like any study, some minor limitations included data collection using Amazon Turk. Although the pandemic occurred globally, data collection occurred just in the United States. Recommendations for future research include comparing this data with post-COVID period, investigation of a global population, examining alterations in eating behaviors across demographics (e.g., age, ethnicity, income, employment, etc.), and possibly implication of poor eating behaviors on overall health status. In conclusion, our research suggests stress in males demonstrated decreased eating behaviors in all food categories but influenced increased intake of sweet and creamy foods in females.

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