Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Short Communication

A prospective analysis of loss of control over eating, sociodemographics, and mental health during COVID-19 in the United States

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ABSTRACT

Purpose: The study assessed the relationships between sociodemographics, mental health, and prospective changes in loss of control over eating (LOCE).
Methods: Sixty-nine participants (M_{age} = 39.81 years, SD = 12.25; 49.3% female) completed a survey assessing sociodemographics, mental health, and LOCE at three time points.
Results: A one-way repeated-measures ANOVA revealed statistically significant differences between the Wave 1 and Wave 3 LOCE. Mixed between-within subjects ANOVAs revealed a main effects of time, essential worker status, and mental health constructs. Interaction effects were observed for sex, anxiety, and stress with time.
Conclusion: Findings provide insight into eating behaviors during COVID-19.

Introduction

The novel coronavirus (COVID-19) is an acute infectious respiratory disease that has escalated to a global pandemic [1]. Quarantine and mitigation restrictions prevent the spread of COVID-19, however, result in boredom, isolation, mental health challenges, poor eating, and sedentary behaviors [2]. Additionally, food insecurity may exacerbate pandemic-related influences on unhealthy eating [3,4].

Loss of control over eating (LOCE) is the subjective perception of being compelled to eat, unable to resist, or stop eating [5]. LOCE overlaps with binge and emotional eating; binge eating refers to the overconsumption of food, and emotional eating suggests eating in response to negative affect. The constructs, however, similarly lead to distress and subsequent eating [6]. COVID-19 studies have assessed relationships between emotional eating, LOCE, and perceived risk and guideline adherence [7,8]. Studies from Italy suggest psychological distress decreased as restrictions loosened [9], and increases in emotional eating predicted higher depression and anxiety; while stress predicted binge eating [10]. A study from Australia [11] observed greater restricted eating and greater purging during the early stages of the pandemic. Another study observed symptoms of anxiety, depression, and disordered eating behaviors in Greece and Spain [12] and noted these associations with the lockdown. Given the dearth of studies, particularly those of a longitudinal nature, from the U.S., or specifically attending to eating behaviors, this study is warranted.

The aim of the study was to assess changes in LOCE longitudinally across two months and relationships with sociodemographics and psychological distress during the COVID-19 pandemic in the U.S. Positive associations between pandemic-related mental health and eating behaviors were hypothesized; however, sociodemographic relationships and trajectories were exploratory in nature.

Materials and methods

Subjects

Participants (N = 180) were recruited between April and June 2020 for the study through Amazon's Mechanical Turk (MTurk) and completed Wave 1; 21 were eliminated from analyses (16 failed the five attention checks at the 80% level, 5 did not provide recognizable data). From Wave 1, 100 participated in Wave 2, three were eliminated (all failed the attention check items), and 69 participated in wave 3, none of whom were excluded. There was no set recruitment day for each time wave. Instead, participants initially accessed the survey online and were

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invited to participate via email 30 days after they completed each wave to participate for the next wave. A post-hoc power analysis was conducted using G-Power version 3.1. The sample size of 69 was included along with the three time measurements. Alpha level was $p < .05$, and recommended effect sizes for using this assessment included: small ($f_2 = .02$), medium ($f_2 = .15$), and large ($f_2 = .35$). Analysis revealed the statistical power for this study to detect a small, medium, and large effect was equal to .57, .52, and .99, respectfully. The effect size for the current study ($f_2 = .259$; partial eta squared = .063) and the post hoc analyses revealed the statistical power was equal to .95.

Participation was limited to the U.S., and at least a 95% approval rate on MTurk. Given the need to collect data in a timely manner due to the pandemic, MTurk was ideal.

Measures

Sociodemographics

A 21-item demographic questionnaire assessed sociodemographics (e.g., sex, age, ethnicity, essential worker) and information related to the COVID-19 pandemic (e.g., having been diagnosed, unemployment).

Depression, anxiety and stress scale (DASS-21)

This scale assessed levels of depression, anxiety, and stress in the past week. It consists of 21 questions rated on a Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). Scoring is based on summing responses for each of the subscales and multiplying summed subscales scores by two. Higher scores indicate greater levels of depression, anxiety, or stress. Each subscale demonstrated high internal consistency (i.e., depression ($\alpha = .94$), anxiety ($\alpha = .88$), and stress ($\alpha = .93$) [13].

Loss of control over eating scale-brief (LOCES-B)

The LOCES-B consists of 7-items about past month LOCE behaviors scored on a 5-point Likert scale ranging from 1 (never) to 5 (always). A composite was created by calculating the average of the seven items. Higher scores indicate greater severity of LOCE. This scale has demonstrated high internal consistency in past studies ($\alpha = .93$) [5], as well as the present study (α's at three time points ≥.95).

Procedure

The Institutional Review Board approved all procedures. All participants were recruited through Amazon's MTurk mid-April, 2020, where they read a description of the study and the informed consent form. Those who agreed to participate, and confirmed they were at least 18 years old, were directed to the Wave 1 measures. To ensure data quality, attention checks were embedded throughout the study materials. Approximately 30 days after completing Wave 1, participants were invited for Wave 2, where they completed the same measures with minor changes to the sociodemographics. Approximately 30 days after, participants were invited to complete Wave 3. At the conclusion of each survey, participants were provided with suicide prevention resources. Participants remained anonymous and were compensated with $1.00 for Wave 1 and Wave 2, and $2.00 for Wave 3.

Approach to analyses

Descriptive analyses examined sociodemographics, LOCES-B, and DASS subscales. A Repeated Measures ANOVA assessed changes in means over time for LOCE. Five mixed between-within subjects ANOVAs explored trajectories for different subgroups. Mauchly's test of sphericity was performed for all ANOVAs, and the Huynh-Feldt epsilon or Greenhouse-Geisser correction to the degrees of freedom of the F-ratio was reported for each significant effect.

Results

Frequencies of sociodemographics, LOCES-B, and mental health constructs are reported in Table 1. A one-way repeated-measures ANOVA revealed statistically significant differences between the Wave 1 LOCE and Wave 3 LOCE ($p = .045$; see Table 2).

Sociodemographics and mental health constructs' relationships to LOCE were tested using mixed-between subjects ANOVAs (see Table 2). Main effects for time indicated a decrease in LOCE (Model 1). Sex and time interactions suggested males reported decreasing patterns in LOCE, while females' scores did not change over time (Model 2). Main effects of essential worker status indicated higher LOCE scores for essential workers relative to non-essential workers at each time point (Model 3). The main effect of depression indicated for every increase in depression at baseline, there was an increase in LOCE scores at each time point (Model 4). The main effect of anxiety and the anxiety and time interaction indicated anxiety scores affected the pattern of LOCE, such that higher Wave 1 anxiety scores were associated with higher initial LOCE Wave 1 scores and less of a decrease in LOCE over time (Model 5). Similarly, elevated stress scores were associated with heightened LOCE at Wave 1 with a gradual decrease in LOCE over time (Model 6).

Data [14] are available through figshare: https://doi.org/10.6084/m9.figshare.12781256.

Discussion

LOCE declined over time, suggesting that at the height of pandemic restrictions, individuals were more inclined to practice unhealthy eating. This appears consistent with another U.S longitudinal study demonstrating declines in unhealthy eating over time with regard to eating outside of the home [15]. The present finding may be a function

Table 1
Participant characteristics ($n = 69$).

	Frequency	*n*
Sex		
Male	50.7%	35
Female	49.3%	34
Income		
<$29,999	14.5%	10
$30,000–$49,999	14.5%	10
$50,000–$74,999	33.3%	23
$75,000–$99,999	20.3%	14
$100,000+	17.4%	12
Ethnicity		
White	71.0%	49
African American	11.6%	8
Asian American	14.5%	10
Occupation		
Professional, technical, and managerial occupations	39.1%	27
Clerical and sales occupations	10.1%	7
Service occupations (protective service, food service, lodging, domestic service)	11.6%	8
Miscellaneous occupations (transportation, graphic art, radio, television)	20.3%	14
Healthcare occupations (nursing, therapy, doctor)	7.2%	5
Unemployed	11.6%	8
Are you considered an essential worker?		
Yes	36.2%	25
No	63.8%	44

	M	*SD*
Age (Years)	39.81	12.25
DASS scores		
Depression	9.71	11.58
Anxiety	6.81	10.99
LOCES-B scores		
Wave 1	1.68	.87
Wave 2	1.60	.89
Wave 3	1.47	.78

Note: see Supplementary Table 1 for geographical location of participants.

Table 2
Changes in LOCE with sociodemographics and mental health.

	Independent variable(s)	Time main effect	Interaction effect	Independent variable main effect	Parameter estimates
Model 1	LOCE	F (1.70, 115.78) = 4.57, p = .017, partial eta squared = .063	–	–	Baseline: (M = 1.68 SD = .87) 1-month: (M = 1.60, SD = .89) 2-month: (M = 1.47, SD = .78) Bonferroni adjusted pairwise comparison: Baseline and 2-months: p = .045
Model 2	Time by sex[a]	F (1.69, 113.51) = 4.68, p = .015, partial eta squared = .065	F (1.69, 113.51) = 4.62, p = .016, partial eta squared = .065	F (1, 67) = .33, p = .57, partial eta squared = .005	Baseline: (β = .27; p = .20) 1-month: (β = .177; p = .413) 2-month: (β = −.121; p = .525)
Model 3	Time by essential worker[b]	F (1.68, 112.81) = 6.61, p = .003, partial eta squared = .09	F (1.68, 112.81) = 3.19, p = .053, partial eta squared = .045	F (1, 67) = 10.67, p = .002, partial eta squared = .137	Baseline: (β = .736; p < .001) 1-month: (β = .666; p = .002) 2-month: (β = .398; p = .042)
Model 4	Time by depression (DASS)	F (1.76, 118.09) = .31, p = .708, partial eta squared = .005	F (1.76, 118.09) = 2.99, p = .056, partial eta squared = .044	F (1, 67) = 24.19, p < .001, partial eta squared = .265	Baseline: (β = .042; p < .001) 1-month: (β = .035; p < .001) 2-month: (β = .028; p = .001)
Model 5	Time by anxiety (DASS)	F (1.71, 114.34) = .54, p = .555, partial eta squared = .008	F (1.71, 114.34) = 4.50, p = .018, partial eta squared = .063	F (1, 67) = 36.24, p < .001, partial eta squared = .351	Baseline: (β = .051; p < .001) 1-month: (β = .044; p < .001) 2-month: (β = .032; p < .001)
Model 6	Time by stress (DASS)	F (1.70, 112.36) = .04, p = .946, partial eta squared = .001	F (1.70, 112.36) = 4.62, p = .016, partial eta squared = .065	F (1, 66) = 32.26, p < .001, partial eta squared = .328	Baseline: (β = .053; p < .001) 1-month: (β = .045; p < .001) 2-month: (β = .033; p < .001)

Note: Model 1 examined LOCE over time using a within subjects ANOVA, and models 2–6 were performed using mixed between-within subjects ANOVAs.
[a]See Supplementary Table 2 for sex means at each wave.
[b]See Supplementary Table 3 for essential worker status means at each wave.

of desensitization toward restrictions and isolation or result from the reduction in mitigation efforts from April to June 2020. For example, individuals' ability to more readily buy healthy groceries, dine out healthily, or simply be less limited in terms of mobility may have resulted in less loss of control over eating over time.

Prior studies demonstrated greater LOCE in females (e.g., Ref. [16]); however, males in this study reported greater LOCE initially, which declined across waves. Females' LOCE remained seemingly unchanged. While these findings support studies observing reduced sex differences in unhealthy eating, unmeasured variables may need to be considered in future studies, such as parenting and children's food security, as these may closely associate with observed female caretaking and eating patterns [17].

Essential workers reported greater LOCE at each time point relative to non-essential workers. This suggests that the capacity to leave home, heightened professional responsibilities, and limited time for eating may promote unhealthy eating. Indeed, essential worker status was associated with a lesser likelihood to report self-quarantining if testing positive relative to non-essential workers [18]. This suggests essential workers may be sacrificing individual health, intending to benefit public health, yet may be ill-advised.

The observed relationship between higher Wave 1 depression scores and higher LOCE at each Wave is consistent with studies demonstrating associations between depression, less restrained eating, and more emotional eating during COVID-19 [11]. Similarly, cross-sectional studies addressing anxiety and stress with unhealthy eating globally demonstrate co-occurring escalations [11,12]. Present findings show more gradual declines in LOCE over time relative to initial reports of anxiety and stress, suggesting mental health disruptions may impede returns to pre-pandemic eating behaviors.

Strengths and limits

Four limitations are noteworthy. First, retention rates were lower relative to longitudinal studies conducted through MTurk [19]; however, state re-openings, illness, and mental health challenges [7] may have reduced retention. Second, MTurk may limit generalizability to those without internet access, of lower socioeconomic status, and ethnocultural minority groups, although our data suggest a diverse sample. Third, reliance on self-report can be associated with inaccurate reporting and lack of attention; however, this was minimized by excluding individuals who did not accurately complete attention check items. Fourth, some variables that may be pertinent to observed relationships were not measured including parenting, food insecurity, and measures

of body weight and waist circumference. The inclusion of the latter may be particularly relevant as one recent study indicated that overweight and obese hospitalized COVID-19 patients demonstrated significant weight fluctuations relative to the normal weight counterparts [20]. Future studies should begin with large, representative samples, note the likelihood that retention during a pandemic may be challenging, and include variables assessing weight and waist circumference. Strengths include the rapid process undertaken to assess these constructs prospectively within the U.S.

Presently, public health promotes containment and mitigation strategies to reduce COVID-19 spread; however, findings from the present study indicate the need to simultaneously promote individual physical and mental health, especially for essential workers. Public health messaging, perhaps utilizing social media [7,8], as well as the accessibility of cognitive, behavioral, and affective strategies that reduce psychological distress and enhance healthy eating are warranted. Synchronously heightening physical and mental health at individual and community levels will likely reduce morbidity and mortality related to COVID-19 directly and indirectly.

Author statement

Conceived, designed, and performed the study: Theodore V. Cooper, Jennifer Eno Louden, Roberto Sagaribay III, Marcos Lerma, Mariany Gainza; Analyzed and interpreted the data: Gabriel Frietze, Theodore V. Cooper; Writing – original draft: Theodore V. Cooper, Roberto Sagaribay III, Gabriel Frietze; Writing – review & editing: Theodore V. Cooper, Roberto Sagaribay III, Gabriel Frietze.

Ethics statement

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Institutional review board approval was obtained from the University of Texas at El Paso. Informed consent was obtained from all patients for being included in the study.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.orcp.2021.11.005.

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