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The COMET study: Examining the effects of COVID-19-related perceived stress on Los Angeles Mothers’ dysregulated eating behaviors, child feeding practices, and body mass index

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ABSTRACT

The COVID-19 pandemic and associated restrictions and mandates have had pronounced implications on the well-being of individuals. This study conducted exploratory analyses of the relationship between COVID-19-related life changes and COVID-19-related perceived stress and associations between COVID-19-related perceived stress and dysregulated maternal eating behaviors, child feeding practices, and body mass index (BMI) in Los Angeles mothers. Mothers (M age = 37.6 ± 6.9) of children aged 5–11 (N = 197, response rate 92.5%) completed an online questionnaire assessing COVID-19-related life changes, COVID-19-related perceived stress, mechanisms used to cope with COVID-19, child feeding practices, their own eating behavior, demographics, and height and weight. The highest proportion of participants reported changes to work, disruptions due to childcare challenges, and increased home responsibilities. Higher COVID-19-related perceived stress was experienced by those who reported loss of work hours (29%), loss of job (15.2%), reduced ability to afford childcare (18.8%), and reduced ability to afford rent/mortgage (19.8%) (ps < 0.05) than those who did not. The most common strategy that mothers indicated using to cope with COVID-19 related stress was eating comfort foods (e.g., candy and chips) (58.7%). COVID-19-related perceived stress was positively associated with mother’s BMI and emotional eating (ps < 0.05). Rewarding their child’s eating and behavior with food were both positively associated with the number of COVID-19 related life changes (ps < 0.05). This study yields new knowledge of the effects of the COVID-19 pandemic on mothers’ dysregulated eating behaviors and child feeding practices. The results highlight the importance of conducting further research to confirm these findings and understand the nature of associations between COVID-19-related perceived stress and health. This is crucial in order to explore ways in which lasting impacts of the pandemic on mental and physical health can be prevented.

1. Introduction

In March 2020, COVID-19, the respiratory disease caused by the SARS-CoV-2 virus, was declared a pandemic by the World Health Organization and a national emergency in the United States of America (U.S.). In the months since the start of the pandemic, the U.S. and California state governments have enforced travel restrictions, testing mandates, and quarantine, or “stay-at-home” orders all in an attempt to ‘flatten the curve’. A state of emergency was declared for Los Angeles County on March 4th (County of Los Angeles Public Health, 2020) and K-12 schools started closing on March 16th with a shelter-in-place order issued March 19th (Executive Department State of California, 2020). This order mandated that all restaurants and bars halt dine-in service, and for gyms, salons, and other recreational indoor activities close temporarily while encouraging, and in some cases requiring, residents to remain at home with the exception of essential activities.

Undeniably, the COVID-19 pandemic and the associated implemented safety measures have had pronounced implications on the U.S. as a nation and its encompassing sectors. Additionally, however, dramatic changes in finances, employment and lifestyle have been
experienced at the individual and family level. In July 2020, nearly 33 million Americans reported that they were receiving unemployment benefits (Department of Labor, 2020). In Los Angeles County, 20.3% of workers have filed for government assistance (Elebee, Lauder, Menezes, & Stiles, 2020). Real-time estimates of the impact of COVID-19 have indicated reductions in employment and average weekly hours of workers (Kurmann, Lale, & Ta, 2020). There have been 3,236,130 total cases and 134,572 deaths in America as recorded by the U.S. Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, 2020). Many have had to self-isolate for extended periods of time or devote time to caring for their loved ones. These changes have the potential to greatly impact mental health, well-being, and behaviors (Batic-Mujanovic et al., 2017). The link between negative changes in employment and lifestyle and resulting mental health consequences has been well-established in research (Balanza-Martinez, Atienza-Carbonell, Kapeczinski, & De Boni, 2020). Greater work-related stress, less job security and transitions from full, paid employment to unpaid or unemployment have all been found to be significantly associated with worsening mental health and increasing perceived stress (Tornam, 2001; Thomas, Benzeval, & Stansfeld, 2005). Furthermore, employees caring for elderly relatives has been associated with an increased risk of depression (Honda, Date, Abe, Aoyagi, & Honda, 2014). A rise in perceived stress does not come without consequences and may be associated with health-related changes.

Elevated stress and negative mental health symptoms have been especially prominent among mothers during the COVID-19 pandemic. A study conducted between April 2020 and May 2020, which surveyed 900 new mothers found that depression was self-identified in 15% of respondents prior to the pandemic and 40.7% of respondents during the pandemic while moderate to high anxiety was self-identified in 29% of the women pre-pandemic and 72% of the women during the pandemic (Davenport, Meyer, Meah, Strynadka, & Khurana, 2020). Another survey implemented between April 2020 and May 2020, which examined the mental health of 183 parents, a majority of which were mothers, with children under the age of 18, found that an exposure to a greater number of COVID-19-related stressors was associated with higher levels of perceived stress (Brown, Doom, Lechuga-Peña, Watamura, & Koppels, 2020, p. 104699). Because mothers typically are the primary caregivers of their children, and existing literature highlights changes specifically in mothers’ mental health during the COVID-19 pandemic, this study sampled mothers only.

Pandemic-related stressors experienced by mothers could compromise health-promoting maternal feeding practices and child’s intake of healthy food (Konttinen, van Strien, Männisto, Jousilahti, & Haukkala, 2019; Lee et al., 2011). From the larger literature, it is widely known that stress is associated with changes in behaviors, including alterations in eating and child feeding practices. Dysregulated eating and feeding practices (e.g., eating or feeding in response to non-hunger related cues and often exceeding one’s homeostatic energy needs) represent forms of uncontrolled eating and are associated with psychological distress, eating disorders, and obesity (Hilbert et al., 2014; Tanoysfly-Kraft et al., 2011; Vainik et al., 2015). Dysregulated eating and unhealthy dietary patterns in children and adults, have all been partially attributed to higher levels of chronic stress (Adam and Epel, 2007; Michelis et al., 2012). Existing research has found that maternal mental health, specifically, may influence both their own and their child’s eating practices (Mason et al., 2019). According to a study of 96 mothers, maternal depression and anxiety symptoms were associated with negative changes in feeding behavior and eating pathology (Blissett, Meyer, & Haycraft, 2007). Moreover, a 2015 meta-analysis found that maternal depression correlated with a greater amount of pressure placed on daughters to consume more food as well as an increase in maternal restrictive feeding, which can contribute to childhood obesity (El-Behadil, Sharp, Hughes, Obasi, & Nicklas, 2015). The analysis also determined that children tend to mimic the eating behaviors of their parents, which could be detrimental if parental response to stress involves unhealthy eating behaviors and patterns.

In addition, maternal stress is associated with emotional child feeding practices (Richardson, Arsenault, Cates, & Muth, 2015; Rodgers et al., 2014). One emotion-based change that may occur is mothers eating in the absence of hunger as a conscious or unconscious effort to suppress or soothe negative emotions. Similarly, due to boredom, frustration being at home, and loneliness, children may request and receive more snacks as a reward. Mothers may be more likely to try to soothe their child with food, given the low effort by the mother.

Excess weight gain prevention in children and mothers is a critical health concern during national emergencies, such as COVID-19, given acute changes in diet and physical activity that may occur in response to stressors. Incidental weight gain can lead to risk of obesity and long-term weight retention (Mozaffarian, Hao, Rimm, Willett, & Hu, 2011; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008; Widen et al., 2015). The situation at hand is particularly unique, as COVID-19 is perhaps the most widespread stressor, in the modern world, that has impacted nearly all people, particularly the normal lives and routines of families. However, outside of anecdotal evidence, there is yet to exist research on the effects of the COVID-19 pandemic on families’ dysregulated eating and child feeding practices. Given previous research on stress compromising intake of healthy food and health-promoting child feeding practices, in this paper we sought to evaluate the strength of these relationships in the context of the COVID-19 pandemic. To explore, we reported partial correlations between COVID-19-related perceived stress and life changes, mothers’ BMI, and mothers’ eating and child feeding practices controlling for mother’s age, ethnicity, and race.

The COMET (Effect of COVID-19 on Maternal Feeding Practices) Study aimed to investigate the effects of the safety measures and restrictions applied as a function of the COVID-19 pandemic on mothers in Los Angeles County during May–June 2020. The effects of the COVID-19 pandemic on mothers were measured by a number of COVID-19 related changes in employment, finances, and lifestyle. The first objective of the study was to examine the effects of COVID-19 related life changes on personal stress levels. The second objective was to explore the associations between COVID-19-related perceived stress, mothers’ dysregulated eating behaviors, body mass index (BMI), and child feeding practices. Given the potential for increased risk of obesity, diabetes, and other chronic diseases in children and adults due to prolonged changes in nutrition, gathering information about the impact of COVID-19 pandemic-related stress on mothers’ eating and child feeding practices is critical to understanding the potential risks at hand and may inform policy efforts during the pandemic.

2. Methods

2.1. Participants and procedure

A cross-sectional study design assessed the effects of the COVID-19 pandemic on the stress and child feeding practices of mothers by using online surveys. A baseline online survey was completed between May 19–June 17, 2020. Due to limitations for in-person recruitment, potential participants were electronically invited through postings in Facebook groups related to mothers in Los Angeles County and online neighborhood forums such as Nextdoor and Craigslist. Recruitment emails were also sent through ResearchMatch and to mothers who had participated in previous University of Southern California studies who had agreed to be contacted for future research. Inclusion criteria included: 1) 18 years of older; 2) speak and read English; 3) live in Los Angeles County due to differing restrictions across counties and states; 4) mother or legal guardian of a child between ages of 5–11; and 5) child resides with participant at least 50% of the time. Although fathers play an increasingly role in children’s health, this study only focused on mothers because previous studies have reported that women in dual-earner couples report take greater responsibility for childcare than their male partners (Bianchi, Sayer, Milkie, & Robinson, 2012; Kamp
We required that at least 50% child custody resided with the mother to enable sufficient time spent together to study. We only included elementary school children (5–11), as mothers have been shown to have greater influence on children’s eating behaviors through feeding practices compared to older children in middle or high school (Alderson & Ogden, 1999; Savage, Fisher, & Birch, 2007; Scaglioni et al., 2018). We suspected that mothers of younger children (0–5) may experience less of a disruption in childcare and stress as their children did not have to transition away from in-person school and childcare settings remained open in LA as an essential business. Children during this age range also show rapid accelerating BMI and increased risk for obesity-related disorders that may continue across the life course (Dietz, 1997; Roll-and-Cachera et al., 1987).

All study procedures took place remotely with participants completing the online screening form, information sheet, and baseline survey in English through an online survey platform Research Electronic Data Capture, which conforms to HIPAA security requirements for the protection of data (Harris et al., 2019). Potential participants were directed an online screening form directly from the recruitment email or posting. Once eligibility was determined, participants were automatically directed to read an anonymous information sheet that described study procedures, risks, and benefits and agreed to participate. Mothers were told the purpose of this study was to investigate the effects of the COVID-19 pandemic on stress, emotion, and maternal feeding practices in the natural environment and their responses would help researchers learn how the COVID-19 pandemic affects how mothers are feeding their children. If mothers decided to participate, they were automatically directed to begin the baseline survey. The baseline survey consisted of questions that covered several constructs including demographics; COVID-19 symptoms, COVID-19-related life changes, and subjective stress; mental health; and eating behaviors and child feeding practices. The survey took 20–30 min to complete. The survey could be saved and completed later at the time and location of their choice and participants had the option to skip any questions they did not wish to answer. The survey was anonymous and did not collect any identifying information, and participants were reminded that their answers would remain de-identified. Participants were not compensated for completing the baseline survey. The Institutional Review Board of the University of Southern California reviewed the study protocol and determined that study procedures presented no more than minimal risk and approved it as exempt from full review (IRB UP-20-00391).

2.2. Baseline measures

Demographics: Mothers reported their age, ethnicity (Hispanic vs. non-Hispanic), race, marital status, education, employment status, income, financial situation, residence type, and household composition. Mothers also self-reported their height (inches) and weight (pounds). Height was converted to meters, and weight was converted to kilograms. Body mass index (BMI; kg/m²) was calculated.

Life Changes due to COVID-19: Recently developed questionnaires on the impacts of the COVID-19 pandemic were consulted for the development of the COVID-19 related questions of the survey. At the time the questionnaires for this study were being developed in March 2020, there were no validated or recommended scales to measure COVID-19 impact. To be able to rapidly begin to collect data, researchers developed their own items to capture the constructs of interest. We reviewed items from two questionnaires used in other COVID-19 studies (Dunton, Do, & Wang, 2020; Morris et al., 2021) assessing COVID-19 impacts on social connection, health care, income, and employment. For this study, we used the same questions and selected all of the response items relevant to our sample of mothers. Mothers were presented with a list of 23 potential events and asked, “Which of the following changes have already occurred due to the COVID-19 outbreak?” and to reduce recall bias were instructed to check all that apply for themselves and then for their partner or other member of household to contributes to family well-being separately. In the analysis, we only included events that mothers indicated had occurred to themselves. Mothers were also asked to indicate behaviors that they are restricting (either required or by choice), what they are doing to cope with COVID-19 related stress, and to identify the single greatest source of stress due to COVID-19. These questions were used to assess the impact of COVID-19 and its associated protective measures on the finances, employment status, and lifestyle of participants. Furthermore, subjective ratings of overall level of stress related to the COVID-19 outbreak and extent of impact on daily life were collected. For the study, we were specifically interested in stress due to or related to the pandemic. We were concerned that participants’ self-reports of stress during the pandemic using general stress measures (e.g., Perceived Stress Scale) would be highly influenced by one’s usual level of stress or stressors not related to changes or uncertainty caused by the pandemic. Thus, we chose to use a survey item that specifically asked about stress related to COVID-19.

Dysregulated child feeding practices: Mothers completed the Feeding Practices and Structure Questionnaire (FPSQ (Jansen, Mallan, Nicholson, & Daniels, 2014); to assess their child feeding practices. Responses were on a 5-point scale ranging from 1 (disagree) to 5 (agree) or 1 (never) to 5 (always). The six items representing the factor of reward for eating (e.g., “When your child refuses food they usually eat, do you encourage to eat by offering a food reward (e.g., dessert),” and the six items representing reward for behavior (e.g., “In order to get my child to behave him/herself I promise him/her something to eat”) were averaged to calculate two scores for each participant. Cronbach’s Alphas for reward for eating and reward for behavior were 0.86 and 0.81 respectively, which indicates high reliability.

Dysregulated eating behavior in mothers: Mothers completed the Three-Factor Eating Questionnaire-R18 (TFEQ-R18 (Angle et al., 2009); to assess their dysregulated eating behaviors. Due to concerns about the factor structure and factor stability of the original Three Factor Eating Questionnaire, a revised version of the questionnaire was constructed by Karlsson, Persson, Sjöstrom, & Sullivan (2000) based on psychometric analyses (Karlsson et al., 2000). The TFEQ-R18 is a shorter version of the original TFEQ and shows good psychometric properties; there are three subscales of the TFEQ-R18: Cognitive Restraint, Uncontrolled Eating, and Emotional Eating (Angle et al., 2009). The current study used the Uncontrolled Eating (i.e., tendency to overeat with the feeling of being out of control) and the Emotional Eating (i.e., tendency to overeat in response to negative emotions) subscales.

Responses were coded on a four-point scale with higher values indicating more of the behaviors. Response option were (1) Definitely false (2) Mostly false (3) Mostly true (4) Definitely true. Average scores for the nine items measuring uncontrolled eating (e.g., “Sometimes when I start eating, I just can’t seem to stop”) and the three items measuring emotional eating (e.g., “When I feel blue, I often overeat”) were calculated for each participant. Cronbach’s Alpha for uncontrolled eating and emotional eating were 0.89 and 0.87 respectively, which indicates high reliability.

2.3. Statistical approach

Prior to analyses, variables were screened for violations of statistical assumptions. Self-reported COVID-19-related perceived stress was highly negatively skewed due to ratings of extreme stress. Non-parametric Mann-Whitney U tests were used instead of transforming the data to compare ratings of stress between groups that did or did not experience a COVID-19 related life change. Partial correlations further examined the relationships between COVID-19-related perceived stress, BMI, reward eating, reward feeding practices, and number of COVID-19 related life changes. Correlations were adjusted for mother’s age, Hispanic ethnicity, white race. We did not covary for employment and financial situation as those were represented by the COVID-19 related life changes measure. Given a sample size of 197 individuals, the study...
had a power to detect small effect sizes greater than $\phi = 0.04$.

3. Results

3.1. Data availability

A total of 391 people expressed interest in the study and completed the screening form. Of this, 23 (5.9%) were deemed ineligible due to living outside Los Angeles County and 14 (3.6%) for not being the parent or legal guardian of a child ages 5–11. A total of 345 (88.2%) participants were eligible after screening and 213 (61.7%) agreed to participate in the study after reading the information sheet. A total of 16 (7.5%) mothers did not begin or complete the baseline questionnaire leaving an analytic sample of 197.

3.2. Demographics and baseline characteristics

Table 1 shows the baseline characteristics of the 197 participants who participated in the study. All of the participants were female, with the majority identifying as non-Hispanic White (38.6%) and 37.9% self-identifying as Hispanic. The mean age was 37.6 (SD = 6.87). Most participants were married (65.7%), lived in a single-family house (64.7%), and consisted of two parents with children < 18 (75.8%). Financially, 29.8% live comfortably, 31.3% meet need with a little left, 30.3% just meet basic expenses and 7.1% do not meet basic expenses. Other important characteristics and indicators are also shown in Table 1. Mean BMI (Shown in Table 3) was 28.34 kg/m^2 (SD = 6.36).

3.3. Effects of COVID-19 related changes on ranking of COVID-Related stress

Descriptive statistics for COVID-19 related life change variables are shown in Table 2. The life change variables with the highest proportion of participants reporting yes were changes to increased home responsibilities (55.3%), disruptions due to childcare challenges (47.7%), remote work (36.5%), loss of work hours (29.4%), and decrease in the value of retirement investments or savings (27.4%).

Also shown in Table 2, there were four life change variables that were significantly associated with rating of COVID-related stress. There was a significant difference in the amount of COVID-related stress experienced in those who reported loss of work hours (p = .04), loss of job (p = .02), reduced ability to afford childcare (p = .04) and reduced ability to afford rent/mortgage (p = .03) as compared to those who did not with the participants that reported “yes” for each of the significant variables experiencing higher COVID-19 related stress.

Participants were asked to indicate the single greatest source of stress due to the COVID-19 outbreak right now. The highest proportions of participants indicated health concerns (13.7%), general well-being due to social distancing and/or quarantine (13.7%), financial concerns (23.8%), and impact on child (31.5%). Participants also identified strategies being used to cope with stress related to the COVID-19 outbreak and the most popular coping mechanism was eating comfort foods (e.g., candy and chips; 58.7%).

3.4. Associations of maternal COVID-Related stress and life changes, BMI, eating behaviors, and child feeding practices

Table 3 displays descriptive statistics for the study variables and partial correlations after controlling for mother’s age, ethnicity, and race. Mean rating of COVID-19 related perceived stress was 75.6 (SD = 20.3) on a scale from 0 to 100. Mothers self-reported an average of 6.5 life changes (SD = 5.4, Range = 0–26). There was a relationship between dysregulated maternal eating and child feeding practices as rewarding child’s behavior with food was positively associated with mother’s uncontrolled eating ($r = 0.25, p < .01$). In the study, mothers who reported more uncontrolled eating also were more likely to report rewarding their child’s behavior with food. BMI of mothers was negatively associated with rewarding eating ($r = -0.19, p = .03$) and positively associated with mother’s emotional eating ($r = 0.30, p < .01$). Mothers with higher BMI were less likely to reward their child’s eating with food and more likely to engage in emotional eating.

Partial correlations of COVID-19 related stress and sum of COVID-19-related life changes with dysregulated eating, child feeding practices,
Correlations controlled for mother’s age, Hispanic ethnicity, white race.

Correlation is significant at the 0.05 level (2-tailed).

Correlation is significant at the 0.01 level (2-tailed).

### Table 2: Independent-Samples Mann-Whitney U Test (n = 197) examining group differences in ratings of COVID-19 related stress.

| Change Variable                      | Proportion reporting yes (%) | Mean Rank Score (Yes) | Mean Rank Score (No) |
|--------------------------------------|------------------------------|-----------------------|----------------------|
| Change to remote work                | 36.5                         | .89                   |                      |
| Loss of work hours                   | 20.4                         | .04                   | 85.84                |
| Decreased work pay                   | 17.8                         | .86                   |                      |
| Loss of job                          | 15.2                         | .02                   | 95.14                |
| New job                              | 3.0                          | 1.00                  |                      |
| Decreased job security               | 16.8                         | .95                   |                      |
| Disruptions due to childcare         | 47.7                         | .85                   |                      |
| Increased work hours                 | 11.2                         | .05                   |                      |
| Increased work responsibilities      | 19.3                         | .60                   |                      |
| Increased home responsibilities      | 55.3                         | .32                   |                      |
| Increased work monitoring and reporting |                   |                      |                      |
| Loss of health insurance             | 5.6                          | .69                   |                      |
| Reduced ability to afford childcare  | 18.8                         | .04                   | 89.13                |
| Reduced ability to afford rent/mortgage | 19.8                         | .01                   | 94.53                |
| Had to move to a different residence | 2.5                          | .31                   |                      |
| Having to move in with parents/friends/relatives | 4.6                          | .61                   |                      |
| Having to fire or furlough employees | 6.1                          | .92                   |                      |
| Increase in value of your retirement, investments or savings | 27.4                         | .23                   |                      |
| Self-quarantined because you returned from a trip | 2.5                          | .14                   |                      |
| Self-quarantined because you had symptoms or tested positive for COVID-19 | 3.6                          | .44                   |                      |
| Self-quarantined because you were exposed to someone testing positive for COVID-19 | 2.5                          | .42                   |                      |
| Cared for someone who is sick        | 9.6                          | .69                   |                      |
| Friend or family member passed away from COVID-19 | 5.6                          | .30                   |                      |

### Table 3: Descriptive statistics and partial correlations between COVID-19-related perceived stress, COVID-19-related life changes, BMI, and mothers’ feeding and eating behaviors.

| Measure                                      | 1   | 2   | 3   | 4   | 5   | 6   | 7   |
|----------------------------------------------|-----|-----|-----|-----|-----|-----|-----|
| 1. COVID-19 Stress                           | .027| .184| -.06| -.01| .18 | .09 |    |
| 2. # of COVID-19                             | .05 | .20 | .24 | .03 | .03 |    |    |
| Changes                                      |     |     |     |     |     |     |    |
| 3. BMI                                       | -.19| -.13| .30 | .13 |    |    |    |
| 4. Reward Eating                             | .54 | .01 | .13 |    |    |    |    |
| 5. Reward Behavior                           | .16 | .25 | .79 |    |    |    |    |
| 6. Emotional                                 |    |    |    |    |    |    |    |
| Eating                                       |    |    |    |    |    |    |    |
| 7. Uncontrolled                              |    |    |    |    |    |    |    |
| Uncontrolled Eating                          |    |    |    |    |    |    |    |
| Mean                                         | 75.57| 6.51| 28.34| 2.32| 2.37| 2.32| 2.22|
| SD                                           | 20.29| 5.43| 6.36 | 0.80| 0.88| 0.89| 0.55|
| Minimum                                      | 0   | 0   | 17.27| 1.00| 1.00| 1.00| 1.33|
| Maximum                                      | 100 | 26  | 53.04| 4.00| 4.00| 4.00| 4.00|

Correlations controlled for mother’s age, Hispanic ethnicity, white race.

Correlation is significant at the 0.05 level (2-tailed).

Correlation is significant at the 0.01 level (2-tailed).

4. Discussion

Pandemic-induced life changes have had a significant impact on the perceived stress and mental health of mothers. This study examined the impact of COVID-19 related life changes on perceived stress, and the associations of COVID-19-related perceived stress on dysregulated eating behaviors and child feeding practices in mothers. Data were collected in Los Angeles County during a period of restrictive policies that included closure of elementary schools and restrictions around dining out.

Findings from this exploratory study provide evidence that life changes due to COVID-19 are positively associated with mothers’ dysregulated eating and child feeding practices. Results from this study indicate that COVID-19 related perceived stress was associated with higher BMI and more emotional eating among mothers; and COVID-19-related life changes were associated with greater use of reward-related child feeding practices, including mothers giving children food rewards for eating and other behavior. These findings are consistent with previous research, which has found associations between stress and dysregulated eating in mothers and reward-related maternal child feeding practices (Mason et al., 2019; Richardson et al., 2015; Rodgers et al., 2014) and suggest that the COVID-19 pandemic may exacerbate these unhealthy behavior patterns in families.

We found that mothers with a higher BMI had higher ratings of COVID-19 related stress, which could be due to the fact that obesity is a high-risk condition associated with greater risk for death from COVID-19 (Dielt & Santos-Burgos, 2020). Also, COVID-19 related stress was associated with greater emotional eating. While it has not been studied specifically in mothers, women’s perceived stress has been significantly correlated with emotional eating in recent COVID-19 literature (Shen, Long, Shih, & Ludy, 2020) and emotional eating in lockdown has been correlated with BMI (Al-Musharaf, 2020; Coulthard, Sharps, Cunliffe, & van den Tol, 2021). Due to disruptions in lifestyle, in a study conducted in Italy under lockdown conditions, half of women reported engaging in emotional eating, increasing their food intake to feel better, or using food to respond to anxiety (Di Renzo et al., 2020).

It has been previously reported that COVID-19 associated lockdowns have led to changes in parental feeding practices. A study of parents of children ages 3–12 in France found that 60% of parents reported at least one change in their feeding practices during lockdown compared to before with a significant increase in mean scores for soothing with food and significant decrease for rules and limits around unhealthy foods (Philippe, Chabanet, Issanchou, & Monney-Patris, 2021). Our findings provide additional evidence for more reward-related child feeding when mothers experienced greater numbers of COVID-19-related changes. It is possible that feeding practices may be an opportunity for mothers to regain a sense of control. Additionally, mothers experiencing greater levels of COVID-19-related life changes such as unemployment may have more opportunities to practice feeding practices due to spending more time with their children at home, relative to mothers experiencing fewer disruptions. Increased time together could lead into more reward-related feeding practices, especially at a time where children may be exhibiting more negative mood, stress, and loneliness and may ask for more unhealthy foods. This is also supported by the significant association between uncontrolled eating of mothers and rewarding their children’s behavior with food.
In our study we found no association with self-reported COVID-19 perceived stress and reward-based child feeding practices. This contrasts a recent study of parents of pre-school children found that overall COVID-19 stress was positively associated with non-nutritive (emotional and instrumental) feeding (Jansen et al., 2021). However, this is likely due to differences in measures assessing COVID-19 related stress as that study used current and pre-COVID financial, general and COVID-19-specific stress averaged to create a mean score. The differences found in the results in associations with COVID-19-related perceived stress compared to COVID-19-related life changes may be attributable to differing perceptions of stress among mothers. As shown in Table 3, COVID-19-related perceived stress was not strongly associated with a number of changes due to COVID-19. As the measure of stress used in the study was a subjective one item self-report, it may not have reflected the amount of COVID-19-related life changes experienced (Kessing, Agerbo, & Mortensen, 2003). Perhaps, despite enduring similar financial hardships, some mothers may have more support being provided by a partner or other household members. Or mothers may have been appreciative of being able to spend more time with their child, which buffered their perceived stress. In our analysis we only included events that occurred directly to the participants. Future studies should look at the contribution of life changes of other family members to the COVID-19-related perceived stress felt by the mothers.

The current study provided important data on the impact of the COVID-19 pandemic on mothers’ dysregulated eating and child feeding practices. However, it is necessary to note the limitations of the study. We do not know the prevalence of dysregulated eating and feeding behaviors of our mothers before the COVID-19 pandemic and lockdown. The cross-sectional design of the study limits our ability to make causal inferences, and it is likely that there may be bi-directional associations among variables. Additionally, we ran multiple tests simultaneously within the same study. While multiplicity adjustments in exploratory analyses may not be required, it is important to acknowledge the overall Type 1 error rate may be increased leading to an increased risk of a false-positive finding and spurious statistical significance. Collecting data online allowed us to quickly survey a sample of mothers about their experiences during this rapidly changing time. Nonetheless, there could be issues with careless responding and self-selection biases. Next, all measures were assessed using unvalidated self-report measures, which are subject to several self-report biases. Finally, results are based on an online convenience sample who reside in Los Angeles county and may not generalize to the larger population. An interesting finding from the study involves the majority of participants using eating comfort food as a strategy to cope with stress related to the COVID-19 outbreak. However, we do not know which foods were the focus of comfort eating. Future studies should include dietary recall surrounding comfort food intake to further study this behavior.

Overall, this study provides supporting evidence for the disruption of a national emergency on mothers’ dysregulated eating and child feeding practices. Indisputably so, the COVID-19 pandemic has affected the livelihood of nearly all people and led to escalating stress levels in many. COVID-19 induced stress effects on eating and child feeding practices, shown in this study, may have lasting implications on mental health, weight changes, and the development of chronic disease (Konttinen et al., 2019). Given that females are more likely than males to self-report higher levels of subjective stress and to engage in stress-induced eating, women are a particularly vulnerable population (Claus & Byrd-Craven, 2013). Our results highlight the importance of developing eating regulation strategies during the COVID-19 and future pandemics. There is a need to confirm the findings, test directionality, and further understand the micro temporal associations between stress and dysregulated eating in mothers and child feeding practices through ecological momentary assessment. Future research will also examine if these associations and potential changes are maintained after the pandemic.

Declaration of competing interest
The authors declare no conflicts of interest.

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Appendix A. Supplementary data
Supplementary data to this article can be found at https://doi.org/10.1016/j.appet.2021.105209.

Author contributions
SW, GD, and TM designed the study. SW collected the data. SW and SD analyzed the data. SW, SD, MC, and TM drafted the manuscript. GD provided critical feedback for revisions. All authors read and approved the final manuscript.

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