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Associations between parenting stress, parent feeding practices, and perceptions of child eating behaviors during the COVID-19 pandemic

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ABSTRACT

The aim of this study was to explore associations between parenting stress, feeding practices, and perceptions of children's eating behaviors during the COVID-19 pandemic. Parents ($n = 284$) of children ages 4–6 years completed a cross-sectional online survey during the onset of pandemic-related stay-at-home mandates in the U. S. Parents reported current levels of parenting stress, feeding practices, and child eating behaviors. Parents also reported whether parenting stress had increased, stayed the same, or decreased since prior to the onset of pandemic-related stay-at-home mandates. Greater levels of parenting stress were associated with less desirable feeding practices, including greater odds of high use of food for emotional regulation (OR = 1.05, 95% CI = 1.03–1.08), food as a reward (OR = 1.05, 95% CI = 1.02–1.08), and pressure to eat (OR = 1.03, 95% CI = 1.01–1.06), and low use of encouraging a balanced diet (OR = 1.03, 95% CI = 1.01–1.06). Greater levels of parenting stress were also associated with greater perceptions that children exhibited problematic eating behaviors, including greater odds of high food fussiness (OR = 1.05, 95% CI = 1.02–1.08) and low enjoyment of food (OR = 1.05, 95% CI = 1.02–1.07). For parents who reported their parenting stress had increased, greater parenting stress was associated with more frequent use of pressure to eat ($p = .009$) and less frequent monitoring their child's diet ($p = .028$). In conclusion, parenting stress during the pandemic was associated with use of food for emotional and behavioral regulation and perceptions that children exhibited problematic eating behaviors. Further research is needed to understand how to mitigate parenting stress and promote healthy feeding practices during times of crisis.

1. Introduction

The novel coronavirus disease 2019 (COVID-19) spread rapidly in the early months of 2020 and developed into a global pandemic shortly thereafter (Jernigan, 2020). In response to COVID-19, many governments implemented mandates to optimize the health and safety of communities, which included but were not limited to temporary school closures, closures of nonessential businesses, cancellation of recreational activities, travel restrictions, and stay-at-home mandates (Fegert et al., 2020; Jernigan, 2020). Thus, many families were forced to abruptly adjust to the challenges of balancing working from home, caring for their children, and homeschooling with limited support from their social networks and other resources (Di Giorgio et al., 2020; Fegert et al., 2020). These adjustments altered many aspects of families' routines,

affecting parents' emotional and physical well-being (Di Giorgio et al., 2020; Fegert et al., 2020).

One consequence of abrupt and unexpected changes to family routines, especially during times of crisis, is increased parenting stress, which subsequently impacts parent-child dynamics (Caton et al., 2011; Pescud & Pettigrew, 2014). Parenting stress is defined as the perceived stress felt when the demands of caregiving exceed the personal and social resources used to cope with those demands (Abidin, 1995). This type of stress is the result of subjective experiences of distress in relation to a parent's expectations of what is "normal," which is influenced by parents' psychological well-being and the quality of the relationship they have with their child or children (Deater-Deckard, 1998). However, external factors, such as financial stress and food insecurity, may also increase parenting stress (Bauer et al., 2012).

Abbreviations: COVID-19, coronavirus disease 2019.

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The pandemic increased families' risk for many stress-promoting factors, such as job instability, feelings of isolation, difficulties accessing basic needs, food insecurity, and disruptions in families' routines (American Psychological Association, 2020). In particular, studies conducted during the pandemic illustrated these changes in parenting stress affected family mealtimes and parents' feeding practices (Adams et al., 2020; Ammar et al., 2020; Carroll et al., 2020; Jansen et al., 2021; Pietrobelli et al., 2020). For example, parents reported using food as a reward and for emotional regulation to mediate children's problematic behaviors as families spend greater amounts of time together at home (Adams et al., 2020). In addition, parents with high levels of parenting stress reported greater use of food during the pandemic to regulate their child's emotions and to resolve conflict (Jansen et al., 2021). Families experiencing food insecurity due to the pandemic reported even greater use of pressuring practices compared to food secure families, likely due to their concerns about their ability to provide adequate food for their household (Adams et al., 2020). Regular family mealtimes are an important component of a healthy home feeding environment, as they are a conduit for family interactions and are where children develop their eating habits (Satter, 1995). However, as parents faced pandemic-related challenges and changes to family routines, such as job insecurity, financial instability, and loss of childcare and schooling, perceived increases in stress related to these changes likely influenced the types of food available in the home and mealtime interactions (Cluver et al., 2020).

There is a pressing need for more research to inform targeted efforts to reduce the negative impacts of the pandemic and other related crises, with a specific focus on the implications of changes to parenting stress that arise from school and business closures, stay-at-home mandates, and families' loss of normalcy. Previous studies assessed parents' current level of stress, but not whether their level of stress was higher or lower than previous levels of stress (i.e., prior to pandemic-related shutdowns and stay-at-home mandates). Given the rapid onset of pandemic-related mandates and the likelihood that parenting stress also rapidly changed during this time, consideration of parents' levels of parenting stress during the pandemic should be combined with consideration of whether these levels of parenting stress were higher than usual. In addition, pre-pandemic research suggests parenting stress negatively impacts parents' perceptions of children's behavior, with more stressed parents perceiving their children's behaviors to be more challenging or problematic (Miragoli et al., 2018). Given parent feeding practices and parents' perceptions of children's behaviors are both important contributors to the quality of parent-child mealtime interactions, research that considers how both changes in and current levels of parenting stress related to parent feeding practices and perceptions of child eating behaviors during the pandemic would provide novel insights.

To this end, the aim of the present study was to describe parenting stress during the onset of stay-at-home mandates in the U.S. (between March and April 2020) and explore associations between parenting stress, parent feeding practices, and perceptions of child eating behaviors. It was hypothesized that greater levels of parenting stress during the onset of the pandemic would be associated with: (1) greater use of controlling feeding practices; (2) lower use of responsive feeding practices; and (3) greater perceptions that children exhibited problematic eating behaviors during mealtimes. Second, it was hypothesized that associations between levels of parenting stress, parent feeding practices, and child eating behaviors during mealtimes would be modified by the extent to which parenting stress had changed since prior to the onset of stay-at-home mandates. It was hypothesized that the greater increases in parenting stress and greater current levels of parenting stress would be associated with greater use of controlling feeding practices, lower use of responsive feeding practices, and greater perceptions that children exhibited problematic child eating behaviors.

2. Methods

2.1. Design

This study was conducted during the onset of stay-at-home mandates in the U.S. (between March and April 2020). An observational, cross-sectional study design was used to explore associations between parenting stress, parent feeding practices, and perceptions of children's eating behaviors during family mealtimes. The California Polytechnic State University, San Luis Obispo Institutional Review Board approved all study procedures (protocol #: 2020-083-OL).

2.2. Participants

Mothers and fathers with a child between the ages of 4–6 years living in the United States were recruited to complete a survey for this study. We focused on this developmental period because it is a time when parents may struggle with child feeding due to developmental increases in food neophobia and picky eating (Dovey et al., 2008). Participants were recruited through a targeted Facebook ad; those parents who responded to the targeted ad were directed to the survey website, hosted on Qualtrics (<https://qualtrics.com>). To determine eligibility, parents completed a pre-screener at the beginning of the survey. Parents were eligible if they were: (1) a parent (mother or father) with a child between 4 and 6 years of age, (2) their preferred language was English, and (3) the parent (mother or father) was willing to answer questions about their feeding practices and their child's eating behaviors. Parents were ineligible if they: (1) had a preferred language other than English and/or (2) reported their child was diagnosed with developmental delays and/or sensory processing issues. All inclusion and exclusion criteria were self-reported within the pre-screener. If the parent met the inclusion criteria, he or she was then prompted to complete an informed consent form online before beginning the survey. For families with multiple children within the 4–6-year age range, parents were prompted to focus on their youngest child within the age range. Finally, once the survey was completed, parents were prompted to enter their contact information to be entered into a raffle to win a \$100 gift card.

2.3. Measures

2.3.1. Quality control/attention questions

Participants were presented with two quality control/attention questions to ensure they were completing the survey accurately. These questions also facilitated screening of unreliable responses when cleaning data. The first question instructed participants to "Please select 'Yes'." The second question asked participants to provide a qualitative response to the prompt: "Please start by telling us a little bit about your experience as a parent. What do you like best? What do you like least?"

2.3.2. Family demographics and effects of the pandemic on employment and emotions

Demographic data regarding the parent, child, and family was gathered using standard demographic questions. Questions assessed the parent's age, child's age, marital status, parental education, income, employment status, and any recent changes to employment. Parents were also queried about the extent to which their family was emotionally affected by the pandemic.

2.3.3. Food insecurity

The 9-item Household Food Insecurity Access Scale Generic Questionnaire was used to assess the prevalence of household food insecurity (Coates et al., 2007). Questions were structured to assess the severity of food insecurity, including uncertainty about the household's food supply, insufficient food intake, and the consequences faced due to food insecurity. Items were rated on a 5-point Likert scale ranging from 1 = "Never" to 5 = "Always." Items were summed to create a total score,

which was then used to classify families as low, moderate, and high food insecurity. The measure was reported to have excellent reliability ($\alpha = 0.93$) (Hussein et al., 2018). In the present study, this measure demonstrated good reliability ($\alpha = 0.89$).

2.3.4. Parenting stress

The Parental Stress Scale developed by Berry and Jones (1995) was used to measure current levels of parenting stress in relation to their perceptions of being a parent. The Parental Stress Scale is an 18-item self-reported measure (example items: “It is difficult to balance different responsibilities because of my child”; “The major source of stress in my life is my child”); parents rated each item on a 5-point Likert scale ranging from 1 = “Strongly Disagree” to 5 = “Strongly Agree.” Items were summed to create a total score, with possible scores ranging from 18 to 90. Higher scores represented greater levels of parenting stress during the pandemic. The measure was reported to have good reliability ($\alpha = 0.83$) (Berry & Jones, 1995). In the present study, this measure also demonstrated good reliability ($\alpha = 0.88$).

To assess whether parents perceived parenting stress had increased, stayed the same, or decreased since prior to the onset of stay-at-home mandates, the Parental Stress Scale was modified to ask an additional question after each item to assess recent changes in their levels of parenting stress. These additional questions asked whether the parent’s response to each item was “less, the same, or more than 6 weeks ago?” Given the timing of the survey, “6 weeks ago” corresponded with the period prior to the onset of stay-at-home mandates in the United States. Items were rated on a 3-point Likert scale ranging from: 1 (less) to 0 (the same) to 1 (more). Item scores were summed to create an overall change score, with possible scores ranging from -18 to 18 . Negative scores indicated the parent’s level of stress was decreased compared to 6 weeks ago while positive scores indicated the parent’s level of stress was increased compared to 6 weeks ago. In the present study, this subscale demonstrated acceptable reliability ($\alpha = 0.77$).

2.3.5. Parent feeding practices

The Comprehensive Feeding Practices Questionnaire (CFPQ) was developed from the Child Feeding Questionnaire and Preschooler Feeding Questionnaire subscales to adequately measure a range of parent feeding practices (Musher-Eizenman & Holub, 2007). The CFPQ consists of 12 subscales describing parents’ attitudes towards their child’s health and practices used to develop their child’s eating habits (Deater-Deckard, 1998). For the purposes of this study, 6 of the 12 subscales were used. Subscales included: use of food for emotion regulation (example item: “When this child gets fussy, is giving him/her something to eat the first thing you do?”), use of food as a reward (example item: “I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior.”), restricting the child’s diet for weight (example item: “I encourage my child to eat less so he/she won’t get fat.”), pressuring the child to eat (example item: “My child should always eat all of the food on his/her plate.”), monitoring the child’s diet (example item: “How much do you keep track of snack foods (potato chips) that your child eats?”), and encouraging a balanced diet (example item: “Do you encourage this child to eat healthy foods before unhealthy ones?”). Each statement was rated on a 5-point Likert scale ranging from “never” to “always”. Items within each subscale were summed to provide an overall score of each parent feeding practice; higher scores indicated more frequent use of the parent feeding practice. Previous research with parents of 2-8-year-old children demonstrated moderate to good reliability for subscales: use of food for emotion regulation ($\alpha = 0.80$), use food as a reward ($\alpha = 0.77$), restricting child’s diet for weight ($\alpha = 0.79$), pressuring the child to eat ($\alpha = 0.66$), monitoring the child’s diet ($\alpha = 0.77$), and encouraging a balanced diet ($\alpha = 0.71$) (Al-Qerem et al., 2017). In the present study, these subscales also demonstrated moderate to good reliability: use of food for emotion regulation ($\alpha = 0.69$), use food as a reward ($\alpha = 0.77$), restricting child’s diet for weight ($\alpha = 0.76$), pressuring the child to eat ($\alpha = 0.71$), monitoring the child’s

diet ($\alpha = 0.92$), and encouraging a balanced diet ($\alpha = 0.65$).

2.3.6. Child eating behaviors

The Child Eating Behavior Questionnaire (CEBQ) was developed by Wardle et al. (2001) to assess parents’ perceptions of children’s eating behaviors. The 35-item parent-reported questionnaire focuses on the eight different dimensions of children’s eating behaviors. For the purposes of this study, the following subscales were used: food fussiness (example item: “My child refuses new foods at first”), emotional overeating (example item: “My child eats more when worried”), emotional undereating (example item: “My child eats less when she/he is upset”), food responsiveness (example item: “My child is always asking for food”), enjoyment of food (example item: “My child looks forward to mealtimes”), and slowness in eating (example item: “My child eats slowly”). Each statement was rated on a 5-point Likert scale ranging from “never” to “always”. Previous research illustrated good test-retest reliability and internal validity of subscales: responsiveness to food ($\alpha = 0.80$ – 0.82), enjoyment of food ($\alpha = 0.91$), eating slow ($\alpha = 0.74$ – 0.80), fussiness ($\alpha = 0.91$), emotional overeating ($\alpha = 0.72$ – 0.79), and emotional undereating ($\alpha = 0.74$ – 0.75) (Wardle et al., 2001). In the present study, these subscales also demonstrated acceptable to good reliability: responsiveness to food ($\alpha = 0.74$), enjoyment of food ($\alpha = 0.86$), eating slow ($\alpha = 0.79$), fussiness ($\alpha = 0.91$), emotional overeating ($\alpha = 0.77$), and emotional undereating ($\alpha = 0.79$).

2.3.7. Problematic child mealtime behaviors

The Meals in our Household questionnaire was used to assess parents’ perceptions of several aspects of family mealtimes. The questionnaire was developed by Anderson et al. (2012) to study mealtime environments and children’s mealtime behaviors. The Meals in our Household questionnaire is a 60-item parent-reported questionnaire devised of 7 subscales. For the purposes of this study, only the “Problematic Child Mealtime Behaviors” subscale was used. This subscale assessed the extent to which the parent perceived their child exhibited problematic behaviors during mealtimes (e.g., throwing tantrums, complaining about what is served) and the extent to which the parent considered those behaviors a problem. Items within the Problematic Child Mealtime Behaviors subscale were rated on a 5-point Likert scale ranging from “never” to “very often.” Items within this subscale were summed to provide an overall score for the frequency of problematic child mealtime behaviors exhibited; the higher the score, the more problematic behaviors were reported. Previous research illustrated this subscale had excellent reliability ($\alpha = 0.93$) and good validity (Anderson et al., 2012). In the present study, this subscale also demonstrated good reliability ($\alpha = 0.91$).

2.4. Data analysis

A priori power analyses indicated a sample size of at least 147 would provide 80% power to detect significant associations between parenting stress and parent feeding practices at $\alpha < .05$ Type I error level (Cohen, 1992). A total of 737 parents with children between the ages of 4–6 years were eligible for the study based on their responses to the pre-screener questions. During the first pass of data cleaning, respondents were excluded from the sample if they did not answer the quality control questions, provided an incorrect response for the first quality control question, or provided an incoherent response for the second quality control question ($n = 20$). During the second pass of data cleaning, respondents were excluded from the sample if their survey was incomplete (defined as less than 100% of the survey completed; $n = 433$). Thus, the data from the remaining 284 participants were used for analysis. Participants who were included versus excluded did not differ for parent age ($p = .97$), ethnicity ($p = .27$), race ($p = .53$), education level ($p = .14$), income level ($p = .72$), or child age ($p = .47$).

Preliminary analyses revealed violations of assumptions of linear regression (i.e., nonnormality, indicators that linear models were not a

good fit for the data). Therefore, ordinal logistic regression analysis was used to explore whether current levels of parenting stress were associated with use of controlling feeding versus responsive feeding practices and experiences with problematic child eating behaviors. Scores for each outcome variable were categorized into three categories based on interquartile ranges. Measures of parent feeding practices (use of food for emotion regulation, use of food as a reward, restriction, pressure to eat, monitoring the child's diet, encouraging a balanced diet) were divided into the following three categories: low use, moderate use, and high use of feeding practice. Parents' perceptions of child eating behaviors (food fussiness, emotional overeating, emotional undereating, food responsiveness, enjoyment of food, slowness in eating, and problematic mealtime behaviors) were categorized similarly: low frequency of behavior, moderate frequency of behavior, and high frequency of behavior. For all outcomes of interest, the more desirable category (i.e., reflective of lower use of controlling feeding practices, higher use of responsive feeding practices, and less frequent experience with problematic child eating behaviors) was used as the referent category in all models. Separate models were fit to predict each controlling feeding practice (4 separate models), responsive feeding practice (2 separate models), perceptions of child eating behavior (6 separate models), and overall perceived frequency of problematic eating behaviors (1 model). All models were controlled for parent and child characteristics that have been shown by previous research to be associated with parenting stress, parent feeding practices, and parents' perceptions of child eating behaviors: parent gender, ethnicity, child age, child gender, number of children in the household, parent education level, and annual family income level (McPhie et al., 2014).

Interactions between current levels of parenting stress and the extent to which parenting stress had changed were added to the models described above. When significant interactions were identified, predicted probability plots were examined to interpret interaction effects. All statistical analyses were performed using Minitab 15 statistical software (State College, Pennsylvania, USA). A significance level of $p < .05$ was used for all comparisons.

3. Results

3.1. Sample characteristics

Sample characteristics are presented in Table 1. The mean age for children was 4.9 years ($SD = 0.8$, range = 4–6 years). Most respondents (97%) were mothers. The majority of parents identified as Non-Hispanic/Latinx (92%) and of married status (90%). In addition, 82% reported having more than one child in their household. Almost half of parents (46%) reported a family income greater than or equal to \$100,000 and the majority reported completion of some college or an Associates or Bachelor's degree (58%). Approximately 19% reported they were experiencing moderate to high food insecurity.

3.2. Effects of COVID-19 on employment and emotions

Parents' reported effects of the COVID-19 pandemic on their employment and their family's emotional status are presented in Table 2. The majority of participants (75%) indicated no change in employment status from the beginning of the pandemic and 41% indicated they were currently employed full-time. Further, 47% of participants perceived that their family was moderately, emotionally affected by the pandemic (e.g., increased feelings of anxiety, stress, paranoia) and 43% indicated feeling the precautions put in place in response to COVID-19 (i.e., stay-at-home mandates) had been moderately challenging for their family.

Table 1
Sample characteristics (n = 284).

	n	%
Child Gender		
Male	134	47.2
Female	150	52.8
Child Age		
4 years	96	33.8
5 years	112	39.4
6 years	76	26.8
Parent Gender		
Male	9	3.2
Female	275	96.8
Ethnicity		
Non-Hispanic, Latinx	262	92.3
Hispanic, Latinx	22	7.7
Parent Education		
High School Degree	12	4.2
Some College, Associates or Bachelor's Degree	164	57.7
Graduate Degree	108	38.0
Marital Status		
Single	7	2.5
Not married & living with partner	12	4.2
Married	255	89.8
Separated	3	1.1
Divorced	7	2.5
Number of Children in Household		
1	50	17.6
More than 1	234	82.4
Annual Family Income		
< \$49,999	51	18.0
\$50,000 - \$99,999	103	36.3
\$100,000+	130	45.8
Food Insecurity Status		
Low	229	80.6
Moderate	53	18.7
High	2	0.7
Use of Federal Nutrition Assistance Programs		
Food Stamps or SNAP	2	0.7
WIC (Woman, Infants, & Children)	4	1.4
Child participated in free/reduced lunch prior to COVID-19 pandemic		
Yes	45	15.8
No	239	84.2
Child participated in childcare prior to COVID-19 pandemic		
Yes	130	45.8
No	154	54.2

3.3. Current levels of parenting stress and perceived change in parenting stress

Fig. 1, Panel A illustrates the sample distribution of scores for current levels of parenting stress. The sample mean was 40.0 ($SD = 9.4$); scores ranged between 18 and 68 out of a possible score range of 18–90. Fig. 1, Panel B illustrates the sample distribution of scores for parents' perceptions of whether their level of parenting stress had increased, stayed the same, or decreased since prior to the onset of stay-at-home mandates. The mean change score was 2.0 ($SD = 2.7$), illustrating that most parents perceived their levels of parenting stress had stayed the same (change score = 0: 34.2%; $n = 97$) or increased (change score >0: 60.6%, $n = 172$) since prior to the onset of stay-at-home mandates. Scores ranged from -11 to 15 out of a possible score range of -18 to 18.

3.4. Association between current levels of parenting stress, parent feeding practices, and child eating behaviors

Greater levels of parenting stress were associated with significantly greater odds of parents reporting high use of food for emotional regulation ($OR = 1.05$, 95% $CI = 1.03$ – 1.08), food as a reward ($OR = 1.05$, 95% $CI = 1.02$ – 1.08), and pressure to eat ($OR = 1.03$, 95% $CI = 1.01$ – 1.06). In addition, higher levels of parenting stress were associated with greater odds of reporting low use of feeding practices to encourage a balanced diet ($OR = 1.03$, 95% $CI = 1.01$ – 1.06). Associations between

Table 2
Parent-reported effects of COVID-19 pandemic on employment and emotions.

	n	%
Current Employment Status		
Employed working <40 hr/week (part-time)	78	27.5
Employed working >40 hr/week (full-time)	117	41.2
Not employed and looking for work	14	4.9
Not employed and not looking for work	69	24.3
Disabled	6	2.1
Employment Status Changed (within last 6 weeks)		
Yes	70	24.6
No	214	75.4
Laid off within past 6 weeks		
Yes	26	9.2
No	258	90.8
Someone in family has been diagnosed with COVID-19		
Yes	1	0.4
No	283	99.6
Family emotionally affected by the COVID-19 pandemic (increase feelings of anxiety, stress, or paranoia)		
Not affected at all	14	4.9
Slightly affected	89	31.3
Moderately affected	133	46.8
Extremely affected	48	16.9
COVID-19 precautions have been challenging for family		
Not challenging at all	10	3.5
Slightly challenging	113	39.8
Moderately challenging	121	42.6
Extremely challenging	40	14.1

parenting stress and the use of restriction (OR = 1.00, 95% CI = 0.98–1.03) and monitoring child diet (OR = 1.02, 95% CI = 0.99–1.04) were not significant.

Greater levels of parenting stress were also associated with greater perceptions that their child exhibited problematic eating behaviors during mealtimes, including greater odds of high food fussiness (OR = 1.05, 95% CI = 1.02–1.08) and lower odds of enjoyment of food (OR = 1.05, 95% CI = 1.02–1.07). Levels of parenting stress were not associated with perceptions of child food responsiveness (OR = 0.99, 95% CI = 0.97–1.02), emotional overeating (OR = 0.99, 95% CI = 0.97–1.02), emotional undereating (OR = 1.02, 95% CI = 1.0–1.05), or slowness in eating (OR = 1.01, 95% CI = 0.98–1.04) during mealtimes. Additionally, there was no association between levels of parenting stress and overall frequency of perceived problematic eating behaviors (OR = 0.99, 95% CI = 0.97–1.02).

3.5. Perceived change in stress as a moderator of associations between current levels of parenting stress, parent feeding practices, and child eating behaviors

To examine whether associations between levels of parenting stress and parent feeding practices were modified by the extent to which parenting stress had changed since prior to the onset of stay-at-home mandates, interactions between current levels of parenting stress and the extent to which parenting stress had changed were added to models examining associations between current levels of parenting stress and parent feeding practices. Significant interactive effects were noted for models examining associations between current levels of parenting stress and use of pressure to eat ($p = .01$) and monitoring child diet ($p = .03$).

For illustrative purposes, associations between current levels of parenting stress and probability of high frequency of use of pressure to eat (Fig. 2) or low frequency of monitoring (Fig. 3) were estimated for parents whose parenting stress change scores were -1 SD below the mean (-0.7 , representing a slight decrease or no change in parenting stress) versus at the mean (2.0 , representing a smaller increase in parenting stress) versus $+1$ SD above mean (4.7 , representing a larger increase in parenting stress).

As illustrated in Fig. 2, for parents whose parenting stress slightly decreased or did not change, the association between current levels of parenting stress and the use of pressure to eat was not significant ($p = .75$). However, for parents with smaller or larger increases in parenting stress, there was a significant, positive association between current levels of parenting stress and probability of more frequent use of pressure to eat ($p = .02$ and $.0005$, respectively).

As illustrated in Fig. 3, for parents whose parenting stress slightly decreased or did not change or parents who reported smaller increases in parenting stress, the association between current levels of parenting stress and monitoring was not significant ($p = .55$ and $.12$, respectively). However, for parents with larger increases in parenting stress, there was a significant positive association between current levels of parenting stress and the probability of monitoring child diet less frequently ($p = .009$).

To examine whether associations between current levels of parenting stress and perceived child eating behaviors were modified by the extent to which parenting stress had changed since prior to the onset of stay-at-home mandates, interactions between current levels of parenting stress and the extent to which parenting stress had changed were added to the models examining associations between current levels of parenting stress and perceived child eating behaviors. No significant interactive

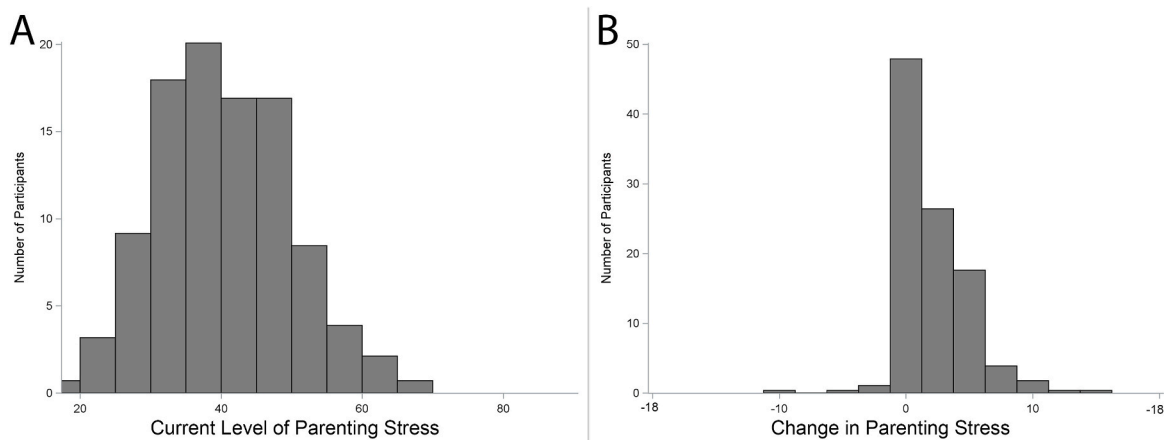


Fig. 1. Sample distributions for current levels of parenting stress (Panel A) and the perceived change in parenting stress since prior to the onset of pandemic-related stay-at-home mandates (Panel B). Possible score range for current levels of parenting stress was 18–90 with higher scores representing greater levels of parenting stress. Possible score range for perceived change in parenting stress was -18 to 18 , with negative scores indicating parenting stress had decreased, 0 indicating parenting stress stayed the same, and positive scores indicating parenting stress had increased.

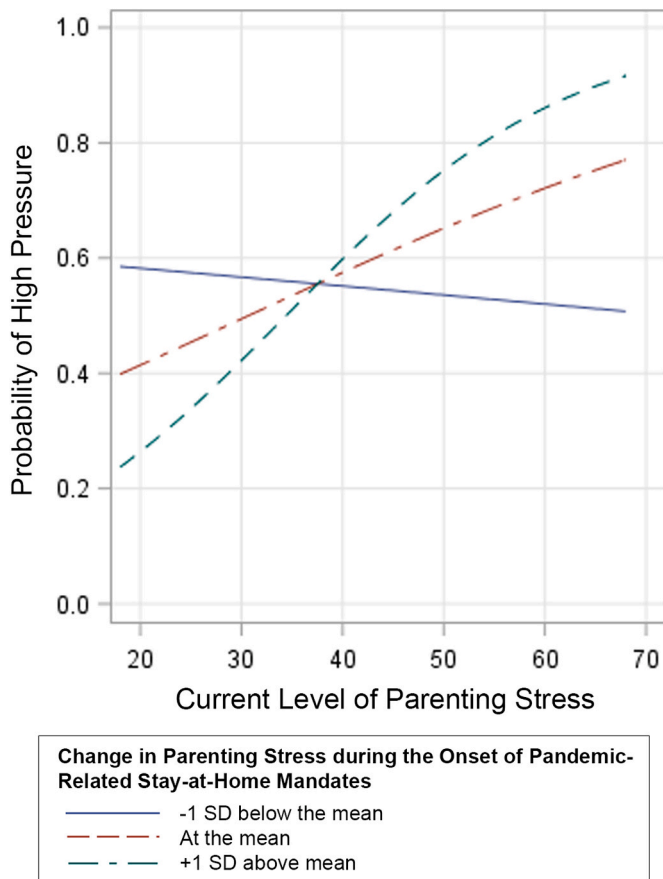


Fig. 2. Predicted Cumulative Probabilities for High Use of Pressure to Eat. Lines represent estimated associations between current levels of parenting stress and odds of high use of pressure to eat for parents whose parenting stress change scores were -1 SD below the mean (-0.7 , representing a slight decrease or no change in parenting stress) versus at the mean (2.0 , representing a smaller increase in parenting stress) versus $+1$ SD above mean (4.7 , representing a larger increase in parenting stress). The x-axis range corresponds to the sample score range for current levels of parenting stress ($18-68$). Fit computed at Parent Gender (female), Ethnicity (Non-Hispanic, Latinx), Number of Children (more than 1), Child's Age (5 years old), Child's Gender (male), Parent Education (Some College, Associates or Bachelor's Degree), Current Income ($\$100,000 \pm$).

effects were noted for any models.

4. Discussion

To date, few studies have examined associations between parenting stress and family mealtimes during times of crisis, such as a pandemic. Thus, the present study aimed to address this research gap by assessing parents' perceived changes in and levels of parenting stress during the COVID-19 pandemic and to explore associations between parenting stress, parent feeding practices, and perceived child eating behaviors. A strength of this study was that it was conducted during the onset of stay-at-home mandates in the U.S. (between March and April 2020). Thus, this study was able to capture parents' early experiences with parenting stress and child feeding during the onset of pandemic-related changes to family life and routines.

During this time, approximately 25% of parents reported a change in employment status, which is comparable to national data on changes to employment during the early months of the pandemic (U.S. Bureau of Labor Statistics, 2020). More than half of parents in the present study indicated their family was moderately or extremely emotionally affected by the pandemic (e.g., increased feelings of anxiety, stress, paranoia)

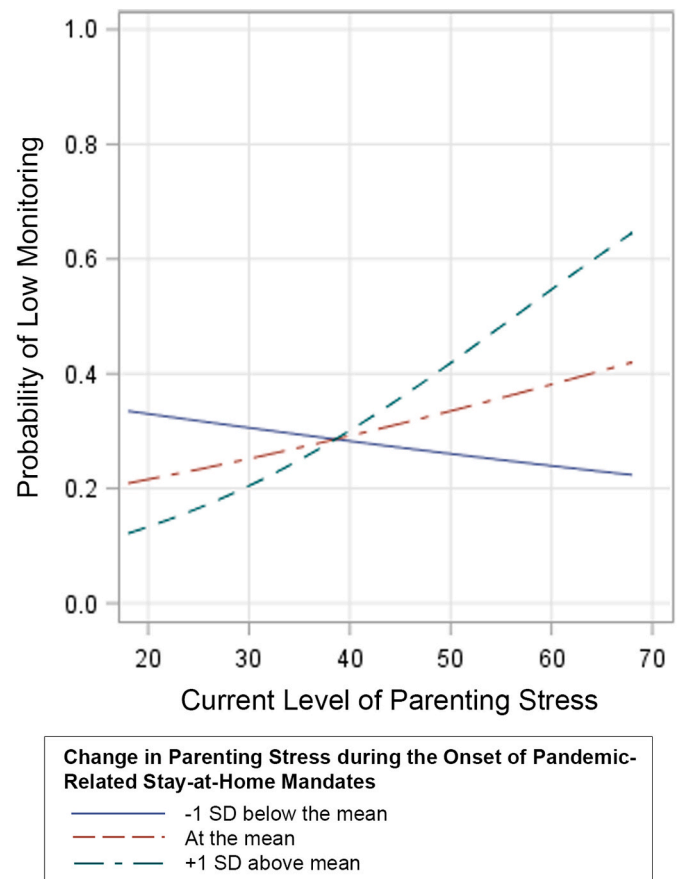


Fig. 3. Predicted Cumulative Probabilities for Low Monitoring Child Diet. Lines represent estimated associations between current levels of parenting stress and odds of low monitoring for parents whose parenting stress change scores were -1 SD below the mean (-0.7 , representing a slight decrease or no change in parenting stress) versus at the mean (2.0 , representing a smaller increase in parenting stress) versus $+1$ SD above mean (4.7 , representing a larger increase in parenting stress). The x-axis range corresponds to the sample score range for current levels of parenting stress ($18-68$). Fit computed at Parent Gender (female), Ethnicity (Non-Hispanic, Latinx), Number of Children (more than 1), Child's Age (5 years old), Child's Gender (male), Parent Education (Some College, Associates or Bachelor's Degree), Current Income ($\$100,000 \pm$).

and felt the precautions put in place in response to COVID-19 (i.e., stay-at-home mandates) had been moderately or extremely challenging for their family. In addition, 94% of parents in the present study reported their level of parenting stress stayed the same (34%) or increased (60%) during the onset of stay-at-home mandates. These findings are consistent with previous research illustrating parents felt higher levels of stress than adults without children during the onset of the pandemic (American Psychological Association, 2020). Thus, this study was able to capture parents' early experiences with parenting stress and child feeding during the onset of pandemic-related changes to family life and routines. It is important to note that this study was conducted during a specific period in the COVID-19 pandemic; these results may or may not be generalizable to periods when stay-at-home mandates and restrictions were lifted or to other stressful situations in the future.

The present study demonstrated that greater levels of parenting stress were associated with greater use of food for emotion regulation and as a reward. There are several possible explanations, not mutually exclusive, for these associations. First, it is possible that stressed parents used these practices to compensate for the lack of control or insecurity they felt about the way they were able to care for their children (Gouveia et al., 2019). Given the unpredictability of the pandemic, it is possible that stressed parents felt a lack of control within their home, thus

resorting to use of food for emotion regulation and as a reward to gain a sense of control over their situation and their children's behaviors. Second, previous research conducted prior to (Wardle et al., 2002) and during the pandemic (Adams et al., 2020) illustrates how use of food for emotional regulation and as a reward may also be a means by which parents respond to challenging child behaviors, especially during times of high stress. Indeed, in the present study, greater current levels of parenting stress were associated with greater perceived child food fussiness and lower perceived child enjoyment of food; both of these perceptions of child eating behaviors may have influenced parents' tendencies to use of food as a reward and for emotion regulation. A third possibility is that parents and children became attuned to each other's emotions and eating habits as they spent more time together during pandemic-related stay-at-home mandates (Sprang & Silman, 2013). Research assessing the effects of home confinement on different lifestyle behaviors during the pandemic illustrated both adults and children consumed more unhealthy foods, with more energy-dense snacks consumed throughout the day and an increase in the amount of food consumed in general (Ammar et al., 2020; Pietrobelli et al., 2020). Given foods can be a significant source of comfort during times of stress (Blass et al., 1989; Oliver & Wardle, 1999; Wardle et al., 2002), thus parents may have fed their children the way they feed themselves, finding comfort in food in the face of increased stress and uncertainty.

It should be noted that greater levels of parenting stress were also associated with less frequent encouragement of a balanced diet. In a recent study of the impact the pandemic had on Canadian families' eating behaviors, families reported eating more snacks and more food in general, while consuming fewer fast food and/or take-out meals (Carroll et al., 2020). These findings suggest the time parents spent with their children during stay-at-home mandates could have served as an opportunity for parents to introduce and incorporate more nutritious foods into their child's diet, as parents reported providing more balanced, home-cooked family meals (Carroll et al., 2020). However, it is possible that parents experiencing more stress were less able to use this opportunity to encourage a balanced diet because they were preoccupied with other responsibilities or stressors. It is also possible that sources of stress, such as having less time due to pandemic-related changes to childcare or schooling, affected parents' desire or ability to encourage a balanced diet. In addition, stay-at-home mandates and concerns about COVID-19 exposure may have decreased the number of trips families made to grocery stores, decreasing families' access to fresh foods, such as fruits and vegetables.

A novel component of this study was the exploration of whether the degree of change in parenting stress experienced during stay-at-home mandates moderated associations between current levels of parenting stress, feeding practices, and perceptions of child eating behaviors. Indeed, additive effects of increases in parenting stress and higher levels of current parenting stress were noted for parents' use of pressuring and monitoring feeding practices – in other words, when parents perceived their stress increased during the onset of stay-at-home mandates and felt high levels of parenting stress currently, their use of pressure to eat was also higher and monitoring their child's diet was lower. In contrast, for parents who reported decreased or similar levels of parenting stress during the onset of the stay-at-home mandates, current levels of parenting stress were not associated with pressure to eat or monitoring their child's diet. Taken together, the consideration of *both* recent changes in and current levels of parenting stress allowed for a deeper understanding of how variability in parents' experiences with the pandemic related to certain feeding practices. While many parents were negatively affected by the pandemic, it is important to note that some parents may have felt decreases in or no changes to their stress because they did not feel directly or negatively affected by the pandemic. For some parents, the opportunity to work from home may have led to a sense of relief related to the break from their normal work routine and the opportunity to be around their family in the safety of their home. Additional research is needed to further understand variability in

parents' experiences, including the risk and protective factors that may augment versus buffer parents' feelings of stress, respectively, as well as bidirectional associations between parenting stress, feeding practices, and perceived child eating behaviors.

5.1. Limitations

Study limitations highlight additional opportunities for future research. It is possible that findings from this study are biased due to the high attrition rate among the final sample included in the study. Although this study was made widely accessible through a targeted social media advertisement, our sample was predominantly Non-Hispanic/Latinx and almost half reported a family income of \$100,000 or more, thus sample demographics differed were not necessarily representative of the U.S. population (U.S. Census Bureau, 2020). In addition, more than half of the sample reported no change in employment status. This limits our ability to generalize study findings to lower income, minority families, and to families who experienced a change in employment status in response to the pandemic. The study did not include a measure of parent or child weight status, which may have been associated with parenting stress, parent feeding practices, and perceived child eating behaviors. Another study limitation is that all data were self-reported by parents, increasing risk for biased reporting. In addition, given the study was based on self-report measures and parents' perceptions, associations between parenting stress and actual feeding practices and child eating behaviors remain unknown. Items assessing changes in parenting stress during the onset of the pandemic were created by the researchers and were not from established, validated scales, nor tested to measure reliability and validity. Given the observational and cross-sectional design of this study, directions of effects cannot be determined. Further research is needed to more thoroughly explore the measure of change in parenting stress used in the present study, as well as to examine longitudinal associations between parenting stress, feeding practices, and perceived child eating behaviors within more diverse samples.

6. Conclusions

In conclusion, the findings of this study revealed that changes in and overall levels of parenting stress were associated with both controlling and responsive feeding practices, as well as perceptions that children exhibited problematic eating behaviors. During the onset of stay-at-home mandates, parenting stress predicted parents' use of food for emotional and behavioral regulation and experiences with problematic child eating behaviors. Future studies should continue to explore the implications of the COVID-19 pandemic on parenting stress, parent feeding practices, child eating behaviors, and other factors that influence the home feeding environment. Future studies can provide parents and families support during pandemics and/or social crises, providing advice on how to navigate changes in stress and living within stay-at-home orders.

Ethics statement

The procedures for studies were approved by the California Polytechnic State University, San Luis Obispo Institutional Review Board (protocol #: 2020-083-OL).

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None.

Author contributions

LMG contributed to the study design, collected the data, conducted analysis and interpretation, drafted and revised the manuscript, and

reviewed the final manuscript. AL and SP contributed to the study design, assisted with manuscript preparation, and reviewed the final manuscript. AKV contributed to the study design, oversaw all aspects of data collection, management, and analysis, and reviewed, revised, and finalized the manuscript.

Data and code availability

The data for this study are available upon request; the lead author has full access to the data reported in the manuscript.

Declaration of competing interest

SP has a grant from WW International. All other authors (LMG, AL, AKV) have no conflicts of interest to declare.

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