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The associations among psychological distress, stressors of the COVID-19 pandemic, and disinhibited eating of parents of three- to five-year-old children

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A R T I C L E   I N F O

Keywords:
External eating
Emotional eating
COVID-19
Stress
Anxiety
Hostility
Depression

A B S T R A C T

Individuals' psychological distress is associated with disinhibited eating (external and emotional eating). The aim of the current study was to examine the moderating associations of COVID-19-related stress on parents' psychological distress (anxiety, hostility, depression) and external and emotional eating. One hundred and sixty U.S. parents of three- to five-year-old children (Mage = 34.08, SD = 6.76; 89 females) completed an online survey. After accounting for participant characteristics (i.e., age, BMI, sex), regression analyses showed that COVID-19 stress moderated the effects of anxiety, hostility, and depression on external eating. Additionally, findings showed that COVID-19 stress moderated hostility (but not anxiety or depression) on emotional eating. These findings suggest that unexpected stressors from the COVID-19 pandemic may exacerbate disinhibited eating among those individuals who experience psychological distress. This presents support for providing interventions that focus on healthy coping strategies and family well-being, support groups, and community resources (e.g., financial assistance) to alleviate external pressures during unprecedented times.

"Some parents have had job and income losses, creating financial instability—and exacerbating parental stress." -The Wall Street Journal (Peterson, 2021).

In early March 2020, the coronavirus disease 2019 (COVID-19) prompted schools and other businesses (including childcare programs) to close across the country due to enforced public health mandates and stay-at-home (SAH) orders (CDC, 2020a; CDC, 2020b; Review, 2020). The drastic negative outcomes for families of young children were numerous, including changes to family dynamics, childcare, work status, and financial security (e.g., Campbell, 2020; Heggeness & Fields, 2020; Moorman, 2021; Udalova, 2021). This elucidates that families experienced multi-faceted (family dynamics, childcare, work status, financial security) stress unique to the COVID-19 pandemic (henceforth referred to as COVID-19 stress), which may be associated with parents’ psychological distress and disinhibited eating.

Disinhibited eating—a proclivity to lose control of one’s eating either in response to emotional arousal or external circumstances—is an important consideration for health (Provencher et al., 2003; Young et al., 2017). Previous literature supports that psychological distress (anxiety, hostility, depression) is positively associated with disinhibited eating (Konttinen, 2020; Lattimore & Maxwell, 2004; Uğurlu et al., 2021). First, anxiety was found to be a strong predictor of disinhibited eating (Hussenoeder et al., 2021) and may be associated with the unique experiences of the COVID-19 pandemic. For instance, in a Mediterranean sample, Spanish participants who underwent stricter lockdown measures during the COVID-19 pandemic and who experienced greater anxiety also reported lower external eating (but not emotional eating; Papandreou et al., 2020). It is unknown why this is the case. It is likely that participants who underwent stricter public health policies may have experienced less COVID-19-related stress, as these individuals may have perceived that the stricter policies would provide a greater protection from getting the virus (akin to vehicle sanctions on the road leading to more safety behaviors [e.g., wearing seatbelts] and fewer accidents; Nordfjærn et al., 2011). In other words, COVID-19 stress may influence the effect of anxiety on disinhibited eating. Second, hostility (i.e., irritability, uncontrollable temper; Adawi et al., 2019) has been shown to predict disinhibited eating. Prior research indicates this relationship is strongest for participants with obesity and who experience weight fluctuations and dietary helplessness (Carmody et al., 1999). However, the literature regarding hostility and disinhibited eating behaviors is limited, especially among parent-specific samples. Lastly, higher levels of depression are associated with greater disinhibited eating (Konttinen

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https://doi.org/10.1016/j.eatbeh.2022.101654

Received 4 January 2022; Received in revised form 13 July 2022; Accepted 13 July 2022

Available online 19 July 2022

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et al., 2016; Marjaana Lindeman, 2001). Importantly, much of the research on depression and eating behaviors has focused on the association with eating disorders (binge eating) or obesity (Lazarevich et al., 2016; Mason & Lewis, 2014; Pinaquy et al., 2003) and lesser on disinhibited eating. Regardless, the tendency to overeat or lose control of one’s eating in the presence of psychological distress is evident.

Additionally, research has linked psychological distress and general stress with eating behaviors (Groesz et al., 2012; Pellegrini et al., 2021; Şahan et al., 2021). Individuals who experience higher perceived stress are more likely to consume foods high in fat, experience a greater drive to eat, and report greater likelihood for eating under emotional distress and environmental cues (for review see Barrington et al., 2014; Joseph et al., 2018; O’Neill et al., 2020; Shen et al., 2020). Perceived stress and strong emotional states have also been shown to be related to increased emotional eating during the pandemic (Cecchetto et al., 2021; Shen et al., 2020), including among caregivers (Jordan et al., 2021). For instance, prior research has found that people changed their food habits during the SAH orders when confined to their homes (Haddad et al., 2020). Other studies have examined eating disorders (i.e., restricted eating, binge eating, purging) and stress levels during the COVID-19 pandemic (Phillipou et al., 2020; Rodgers et al., 2020) or examined psychological distress as a mediator (Ramalho et al., 2021). However, no studies to our knowledge have directly examined the influence of psychological distress (anxiety, hostility, depression) would demonstrate higher disinhibited eating. Regardless, the tendency to overeat or lose control of external eating, emotional eating) and this relationship may be exacerbated by the degree of COVID-19-related stress that participants experience.

1. Methods

1.1. Participants and procedures

Participants (N = 175) were recruited from Prolific from April 24 through 27, 2020 (Prolific was found to have higher data quality as compared to other crowdsourcing platforms; Prolific, 2020; Palan & Schitter, 2018). Fifteen participants were excluded from the study for either completing the survey twice (i.e., duplicate IP address) or failed attention check questions (‘How many words are in this sentence?’; “How many response options are in this question?”; and an open-ended inquiry regarding the purpose of the study; Oppenheimer et al., 2009). The remaining data (N = 160; 89 females) were used for analyses. The mean age of participants was 34.5 years old (SD = 6.8), identified as 81.3% white, 5.6% Black/African-American, 6.5% Asian, 0.6% Native Hawaiian/Pacific Islander, 3.8% bi- or multi-racial, and 2.5% as “other” or refused to answer, 83.3% non-Hispanic (16.7% Hispanic), lived primarily in California, U.S. (18.8%), and had at least a 4-year college degree (35%). Participants’ self-reported height and weight were used to calculate Body Mass Index (BMI; \( M_{BMI} = 27.1 \text{ kg/m}^2, \ SD = 6.8 \)). A post hoc power analysis using G*Power (Faul et al., 2007) suggested that with \( N = 160 \), we have power = 0.97 to detect effect sizes \( \geq 0.05 \) in multiple linear regression using six predictor variables.

The data collected were part of a larger study examining parenting and stress. Inclusion criteria consisted of the following: Participants must (a) be a parent of a child between the ages of three- and five-years old, (b) currently cohabiting or married with a partner, and (c) reside in the U.S. Additionally, the index child must not have had (d) any developmental delays or (e) any reported major medical problems/allergic reactions following ingestion of food. Eligible participants completed a 30-minute survey and were compensated with $5.00 USD (U.S. minimum hourly wage $7.25/h, Review, 2020). Participants self-recruited and completed the measures in the order described below. This study was approved by the university’s Institutional Review Board.

1.2. Measures

1.2.1. Psychological distress

To measure psychological distress, we used the Brief Symptoms Inventory (BSI; Derogatis & Melisaratos, 1985). Participants rated their extent of feelings during the past 30-days using a 5-point scale (0 = not at all, 4 = extremely). The items correspond to three subscales: 1) Anxiety (six items; e.g., “Nervousness or shakiness inside”; \( \alpha = 0.89 \)), 2) Hostility (five items; e.g., “Temper outbursts that you could not control”; \( \alpha = 0.83 \)), and 3) Depression (five items; e.g., “Feeling hopeless about the future”; \( \alpha = 0.92 \)). Higher scores indicate more distress for the given symptom.

1.2.2. Disinhibited eating

To assess disinhibited eating, participants completed the Dutch Eating Behavior Questionnaire (DEBQ; van Strien et al., 1986). Participants rated their two subscales: 1) emotional eating (13 items; e.g., “Do you have the desire to eat when you are irritated?”; \( \alpha = 0.94 \)), and 2) external eating (10 items; e.g., “If food tastes good to you, do you eat more than usual?”; \( \alpha = 0.76 \)) using a 5-point scale (1 = never, 5 = very often). Higher scores represent engaging more often with the given eating behavior.

1.2.3. COVID-19 stress

To measure the effect of the COVID-19 pandemic on families, a multi-faceted COVID-19 stress measure was created ad hoc and used for the purposes of this research. Participants rated the extent of agreement to four items using a 5-point Likert scale (1 = strongly disagree, 5 =
strongly agree). Participants were asked to what extent the pandemic affected their family dynamic ("My family dynamic is affected by the pandemic of coronavirus"), financial situation ("My financial situation is affected by the pandemic of coronavirus"), childcare ("My childcare arrangement is affected by the pandemic of coronavirus"), and work ("My work is affected by the pandemic of coronavirus"). Items were assessed for reliability and validity and an overall COVID-19 Stress composite was created ($\alpha = 0.68$). Higher scores reflect greater stress from the COVID-19 pandemic.

2. Results

Using SPSS 26, key study variables were checked for normality and missing data. Skewness and kurtosis for all key study variables fell within acceptable levels, $[-2, +2]$ and $[-7, +7]$, respectively. <5 % of data was missing, so it was chosen to leave these cases as missing. Correlational analyses were conducted to examine whether participants' characteristics (age, BMI) were associated with key study variables (anxiety, hostility, depression, COVID-19 stress, external eating, and emotional eating; see Table 1). Independent sample $t$-tests were conducted and found that there were no parent sex differences on key study variables, all $p$s $\geq 0.236$.

2.1. Associations among psychological distress, COVID-19 stress, and disinhibited eating

Six regression analyses controlling for participant characteristics were conducted to examine whether psychological distress (anxiety, hostility, depression) interacted with COVID-19 stress to predict disinhibited eating behaviors (external and emotional eating; see Table 2). All linear regressions met the assumptions of linear regression analyses. The predictor (anxiety, hostility, depression) and moderator variables (COVID-19 stress) were centered by subtracting the variable means. Interaction terms were created by multiplying the centered predictor variable by the centered moderator variable. Interactive (McCabe et al., 2018) was used to probe any significant interactions (moderator variable plotted at values of $-2 SD$, $-1 SD$, mean, $+1 SD$, $+2 SD$).

2.1.1. Anxiety

2.1.1.1. External eating. Findings showed that the interaction of anxiety and COVID-19 stress on external eating, $B = 0.10$, $t(147) = 2.12$, $p = .035$, was significant (see Fig. 1). At COVID-19 stress plotted 1 SD below the mean ($B = 0.19$, 95% CI $=[0.05, 0.33]$, $p = .007$), at the mean ($B = 0.28$, 95% CI $=[0.18, 0.38]$, $p < .001$), 1 SD above the mean ($B = 0.37$, 95% CI $=[0.25, 0.49]$, $p < .001$), and 2 SD above the mean ($B = 0.46$, 95% CI $=[0.28, 0.65]$, $p < .001$), anxiety had a significant positive influence on external eating. At COVID-19 stress plotted at 2 SD below the mean, anxiety did not significantly influence external eating ($B = 0.10$, 95% CI $=[-0.11, 0.30]$, $p = .342$).

2.1.1.2. Emotional eating. Findings showed that the interaction of anxiety and COVID-19 stress on emotional eating was not significant, $B = 0.05$, $t(147) = .71$, $p = .481$.

2.1.2. Hostility

2.1.2.1. External eating. Findings showed that the interaction of hostility and COVID-19 stress on external eating, $B = 0.14$, $t(147) = 2.65$, $p = .009$, was significant (see Fig. 2). At COVID-19 stress plotted at the mean ($B = 0.19$, 95% CI $=[0.08, 0.30]$, $p = .001$), 1 SD above the mean ($B = 0.32$, 95% CI $=[0.17, 0.47]$, $p < .001$), and 2 SD above the mean ($B = 0.44$, 95% CI $=[0.22, 0.67]$, $p < .001$), hostility had a significant positive influence on external eating. At COVID-19 stress plotted 2 SD below the mean ($B = -0.07$, 95% CI $=[-0.29, 0.15]$, $p = .537$) and 1 SD below the mean ($B = -0.06$, 95% CI $=[-0.09, 0.21]$, $p = .423$), hostility did not significantly influence external eating.

2.1.2.2. Emotional eating. Findings showed that the interaction of hostility and COVID-19 stress on emotional eating, $B = 0.24$, $t(147) = 2.84$, $p = .005$, was significant (see Fig. 3). At COVID-19 stress plotted 1 SD below the mean ($B = -0.33$, 95% CI $=[-0.10, 0.56]$, $p = .005$), at the mean ($B = -0.54$, 95% CI $=[-0.37, 0.72]$, $p < .001$), 1 SD above the mean ($B = 0.76$, 95% CI $=[0.53, 0.99]$, $p < .001$), and 2 SD above the mean ($B = 0.97$, 95% CI $=[0.62, 1.32]$, $p < .001$), hostility had a significant positive influence on emotional eating. At COVID-19 stress plotted at 2 SD below the mean ($B = 0.12$, 95% CI $=[-0.23, 0.46]$, $p = .508$), hostility did not significantly influence emotional eating.

2.1.3. Depression

2.1.3.1. External eating. Findings showed that the interaction of depression and COVID-19 stress on external eating, $B = 0.10$, $t(147) = 2.41$, $p = .017$, was significant (see Fig. 4). At COVID-19 stress plotted at the mean ($B = 0.15$, 95% CI $=[0.07, 0.24]$, $p = .001$), 1 SD above the mean ($B = 0.25$, 95% CI $=[0.14, 0.35]$, $p < .001$), and 2 SD above the mean ($B = 0.34$, 95% CI $=[0.18, 0.51]$, $p < .001$), depression had a significant positive influence on external eating. At COVID-19 stress plotted at 2 SD below the mean ($B = -0.04$, 95% CI $=[-0.23, 0.16]$, $p = .716$) and 1 SD below the mean ($B = 0.06$, 95% CI $=[-0.07, 0.19]$, $p = .362$), depression did not significantly influence external eating.

2.1.3.2. Emotional eating. Findings showed that the interaction of depression and COVID-19 stress on emotional eating was not significant, $B = 0.12$, $t(147) = 1.82$, $p = .071$.

3. Discussion

The present study examined the associations among psychological distress (anxiety, hostility, depression), COVID-19 stress, and disinhibited eating (external, emotional eating) of parents of three- to five-year old children. Findings showed that COVID-19 stress moderated the associations between 1) anxiety and external eating, 2) hostility and external eating, and 3) depression and external eating. Additionally, it was found that COVID-19 stress moderated the associations between hostility (but not anxiety and depression) and emotional eating.

First, COVID-19 stress moderated the associations between...
Indeed, we found that among individuals with high psychological distress, lower (vs. higher) levels of COVID-19 stress was associated with lower external eating. However, there was still a significant positive association among high anxiety and external eating under lower levels of COVID-19 stress, suggesting individuals with high anxiety (vs. hostility, depression) may be more prone to external eating while experiencing stressors of the COVID-19 pandemic.

Second, COVID-19 stress moderated the association between hostility (but not anxiety and depression) and emotional eating. The lack of moderating associations between anxiety/depression and emotional eating could be that among individuals who tend to emotionally overeat, COVID-19 stress did not impose a significant amount of additional stress. Indeed, findings from prior work found that among adults who tended to emotionally overeat before the pandemic, COVID-19 health anxiety did not predict increased emotional overeating (Coulthard et al., 2021). In addition, previous studies also found that emotional overeating did not differ between individuals from two Mediterranean countries who experienced differential lockdown measures and pandemic severity (Papandreou et al., 2020). However, it was found that high COVID-19 stress predicted higher emotional eating in individuals that reported high hostility. One possibility, and consistent with the Psychosomatic Theory (Kaplan & Kaplan, 1957; Snoek et al., 2007), is that individuals with hostility are more likely to use escape-avoidance coping, which may include eating to regulate negative affect (Vandervoort, 2006).

### 3.1. Limitations and future directions

Although this study is novel in understanding how psychological distress and COVID-19 stress relate to disinhibited eating, there are some limitations. First, results of this study may have limited generalizability. Respondents were mostly white and upper-class participants. Racial/ethnic minorities and families with lower socioeconomic status may experience the negative effects of the COVID-19 pandemic differently than white or upper-class participants due to higher food insecurity and stress rates (Breslau et al., 2021; Kandiah et al., 2021; Lauren et al., 2021; Lund, 2021). It is possible that the adverse effects of COVID-19 would exacerbate the relationships between psychological distress and disinhibited eating among minority groups and those with low income such that those at risk for food insecurity may decrease their disinhibited eating could be that among individuals who tend to emotionally overeat, COVID-19 stress did not impose a significant amount of additional stress. Indeed, findings from prior work found that among adults who tended to emotionally overeat before the pandemic, COVID-19 health anxiety did not predict increased emotional overeating (Coulthard et al., 2021). In addition, previous studies also found that emotional overeating did not differ between individuals from two Mediterranean countries who experienced differential lockdown measures and pandemic severity (Papandreou et al., 2020). However, it was found that high COVID-19 stress predicted higher emotional eating in individuals that reported high hostility. One possibility, and consistent with the Psychosomatic Theory (Kaplan & Kaplan, 1957; Snoek et al., 2007), is that individuals with hostility are more likely to use escape-avoidance coping, which may include eating to regulate negative affect (Vandervoort, 2006).

| Table 1 | Correlations among key study variables (N = 160). |
|----------|-----------------------------------------------|
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1. Age | – | | | | | | | |
| 2. BMI (kg/m²) | –0.06 | – | | | | | | |
| 3. BSI hostility | –0.04 | 0.08 | 0.68*** | | | | | |
| 4. BSI anxiety | –0.10 | 0.06 | – | | | | | |
| 5. BSI depression | –0.13 | 0.15 | 0.78*** | 0.73*** | – | | | |
| 6. Emotional eating | –0.01 | 0.25*** | 0.56*** | 0.44*** | 0.49*** | – | | |
| 7. External eating | 0.04 | 0.16* | 0.42*** | 0.27*** | 0.32*** | 0.63*** | – | |
| 8. COVID-19 stress | 0.03 | –0.03 | 0.25** | 0.07 | 0.25** | 0.05 | 0.01 | – |

1. p < .05.
2. ** p < .01.
3. *** p < .001.

### Table 2

Regression analyses of the moderating effect of COVID-19 stress on psychological distress and disinhibited eating (N = 160).

| | External eating | Emotional eating |
|----------------|-----------------|-----------------|
| B (SE) | B (SE) | B (SE) | B (SE) |
| R² | 0.23 | 0.43 | 0.22 | 0.43 |
| R² adjusted | 0.23, F (6, 147) = 7.50, p < .001 | 0.43, F (6, 147) = 18.41, p < .001 |
| Constant | 3.28 (0.05) | 2.61 (0.07) |
| Age | 0.01 (0.01) | 0.01 (0.01) |
| Sex | 0.07 (0.09) | −0.03 (0.14) |
| BMI (kg/m²) | 0.01 (0.01) | 0.05 (0.01)*** |
| Anxiety | 0.28 (0.05)*** | 0.66 (0.08)*** |
| COVID-19 Stress | −0.09 (0.05) | −0.12 (0.08) |
| Anxiety × COVID-19 stress | 0.10 (0.05)** | 0.05 (0.07) |

| | External eating | Emotional eating |
|----------------|-----------------|-----------------|
| B (SE) | B (SE) | B (SE) | B (SE) |
| R² | 0.16 | 0.34 | 0.16 | 0.34 |
| R² adjusted | 0.16, F (6, 147) = 4.51, p < .001 | 0.34, F (6, 147) = 12.51, p < .001 |
| Constant | 3.28 (0.05) | 2.60 (0.08) |
| Age | 0.01 (0.01) | 0.01 (0.01) |
| Sex | 0.06 (0.10) | −0.04 (0.14) |
| BMI (kg/m²) | 0.01 (0.01) | 0.05 (0.01)*** |
| Depression | 0.15 (0.04)** | 0.42 (0.07)** |
| COVID-19 stress | −0.07 (0.05) | −0.09 (0.08) |
| Depression × COVID-19 stress | 0.10 (0.04)** | 0.12 (0.07) |

1. p < .05.
2. ** p < .01.
3. *** p < .001.
data collection or that eating behaviors differed for individuals with lower (vs. higher) psychological distress before the COVID-19 pandemic (Breslau et al., 2021). Future studies would benefit from considering pre-pandemic circumstances within their measures. Relatedly, the COVID-19 Stress measure could be evaluating differing COVID-19 psychosocial factors rather than stress levels caused by the pandemic. Even though the measure was assessed for psychometric integrity, it would have been beneficial to evaluate participants on the psychosocial impact of COVID-19 rather than on COVID-19 stress level, specifically.

Third, results are indicative of perceived behaviors and not on actual behavior (e.g., documentation or physiological measurements in real time). Prior research on self-perception indicates people generally are not as accurate about interpersonal perception and behavioral indices (for review see Dunning, 2005; Epley & Dunning, 2006; Vazire & Mehl, 2008; Wilson & Dunn, 2004). Future research should consider taking a more direct approach (e.g., ecological momentary assessment). Lastly, the order of self-report measures was not counterbalanced. Counterbalancing has shown to strengthen internal consistency and validity in numerous domains and research designs (e.g., Luce et al., 2007; Young et al., 2003). Future research should consider counterbalancing self-report measures.

3.2 Implications and conclusions
Our research has theoretical and applied implications. First, our findings are relevant to theoretical perspectives on eating due to external cues and elevated stress or emotional arousal (e.g., Psychosomatic Theory, Schachter’s Externality Theory of Obesity; Kaplan &
Kaplan, 1957; Schachter, 1968; Snoek et al., 2007). Second, this research contributes to our understanding of how the pandemic has affected parents and families (particularly those with young children) and may be key to reducing psychological distress and disinhibited eating. Gaining an in-depth understanding of how external cues and emotional factors affect dietary-relevant behaviors has become increasingly important as dietary health concerns for families continue to rise, particularly during the COVID-19 pandemic (Aksoy et al., 2021; Dunn et al., 2020). Third, our findings that COVID-19 stress moderated factors of psychological distress and disinhibited eating can aid in the creation of interventions, dietary health-relevant advertisements, and communications related to dietary health and stress reduction. For instance, practitioners and mental health professionals can provide interventions that focus on healthy coping strategies and family well-being, support groups, and community resources (e.g., financial assistance) to alleviate external pressures during unprecedented times. As families settle into a “new normal” with new, emerging SARS-CoV-2 variants (CDC, 2020a) and businesses and schools resume to full capacity, parents continue to face multi-faceted COVID-19 stress (changes to family dynamics, childcare, work status, and financial security) including increased psychological distress and disinhibited eating (Canady, 2020; Freisthler et al., 2021).

CRediT authorship contribution statement

Noelle K. Herzog: Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Project administration. Adelyn

![Fig. 3. Two-way linear interaction effects for hostility, COVID-19 stress, and emotional eating (N = 160).](image1)

![Fig. 4. Two-way linear interaction effects for depression, COVID-19 stress, and external eating (N = 160).](image2)
Declaration of competing interest

The authors declare no conflicts of interest in preparing this article.

Acknowledgments

All phases of this study were supported by the Dean's Office of the College of Arts and Letters at the University of Toledo as part of the author, Cin Cin Tan, Ph.D.'s research start-up package.

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