

Disordered eating in a population-based sample of young adults during the COVID-19 outbreak

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Abstract

Objective: The present study aimed to describe the experience of, and factors associated with, disordered eating in a population-based sample of emerging adults during the COVID-19 outbreak.

Method: Participants in the EAT 2010–2018 (Eating and Activity over Time) study were invited to complete the C-EAT (COVID-19 EAT) survey in April–May 2020. There were 720 respondents to the survey (age: 24.7 ± 2.0 years). Psychological distress, stress, stress management, financial difficulties, and food insecurity during the COVID-19 pandemic were examined as cross-sectional correlates of disordered eating in 2020. Open-ended questions assessed the perceived impact of the pandemic on eating behaviors.

Results: Low stress management was significantly associated with a higher count of extreme unhealthy weight control behaviors (UWCBs). Food insecurity, higher depressive symptoms, and financial difficulties were significantly associated with a higher count of less extreme UWCBs. Higher stress and depressive symptoms were significantly associated with greater odds of binge eating. Six themes pertaining to disordered eating during the pandemic emerged: (a) mindless eating and snacking; (b) increased food consumption; (c) generalized decrease in appetite or dietary intake; (d) eating to cope; (e) pandemic-related reductions in dietary intake; and (f) re-emergence or marked increase in eating disorder symptoms.

Discussion: Psychological distress, stress management, financial difficulties, and abrupt schedule changes may have contributed to disordered eating during the COVID-19 pandemic. Interventions that target stress management, depressive symptoms, and financial strain and provide tools to develop a routine may be particularly effective for emerging adults at risk of developing disordered eating during public health crises.

KEYWORDS

binge eating, COVID-19, financial difficulty, psychological distress, unhealthy weight control, young adults

1 | INTRODUCTION

The novel coronavirus (COVID-19) pandemic is a global public health crisis that has resulted in the rapid adoption and implementation of public health policies to reduce transmission (World Health Organization, 2020). While such policies are necessary to reduce the spread of COVID-19, they have dramatically influenced the daily lives, employment status, and income of many individuals, resulting in psychological consequences in the forms of stress, uncertainty, worry, and hopelessness (Wang et al., 2020). Eating disorders represent one domain wherein the ongoing pandemic, and its associated disruptions to daily life, may have substantial negative consequences (Cooper et al., 2020; Fernández-Aranda et al., 2020; Reger, Stanley, & Joiner, 2020; Rodgers et al., 2020). For instance, public health initiatives and restrictions have evoked feelings of social isolation and loneliness for many people (Touyz, Lacey, & Hay, 2020) and have created barriers to exercise (e.g., fitness center closures), both of which may magnify eating disorder risk (Dalle Grave, Calugi, & Marchesini, 2008; Levine, 2011). Indeed, recent research in clinical eating disorder samples suggests that the global pandemic has influenced individuals' relationships with food, increased rumination about disordered eating behaviors (Branley-Bell & Talbot, 2020), increased anxiety symptoms, and may have resulted in a worsening of eating disorder symptoms (Termorshuizen et al., 2020). Additional efforts have demonstrated that pre-pandemic weight stigma predicted increased maladaptive eating behaviors during the COVID-19 pandemic (Puhl, Lessard, Larson, Eisenberg, & Neumark-Sztainer, 2020). Yet, the effect of COVID-19 prevention policies on disordered eating in the community remains largely unknown. The present study aims to identify factors associated with disordered eating in a population-based sample of emerging adults during the COVID-19 outbreak using quantitative and qualitative survey data.

In addition to ongoing population-level disordered eating risk factors, such as sociocultural pressures to attain an ideal body shape (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999), several factors identified during the COVID-19 pandemic have been regarded as potential disordered eating risk factors (Cooper et al., 2020). For instance, the pandemic and its associated consequences (e.g., job loss, loss of a loved one) have contributed to increased stress and feelings of uncertainty for individuals across the globe (Li et al., 2020; Touyz et al., 2020; Wang et al., 2020). Stress and intolerance of uncertainty have been linked to disordered eating (see Brown et al., 2017 for a review); thus, individuals experiencing such emotional reactions to the pandemic may eat to cope with emotional states or engage in dietary restriction to elicit feelings of control (Brown et al., 2017; Schlegl, Maier, Meule, & Voderholzer, 2020). Additionally, increased economic strain and food insecurity resulting from the ongoing COVID-19 pandemic may further exacerbate eating disorder symptoms (Weissman, Bauer, & Thomas, 2020). Given the potential for additional stay-at-home periods to manage outbreaks and novel strains, there is an urgent need to identify factors associated with disordered eating during the COVID-19 pandemic.

The purpose of this study was threefold: (a) to elucidate associations between stress, psychological distress, financial difficulties, and

disordered eating during the pandemic; (b) to identify associations between stress, psychological distress, financial difficulties, and new-onset disordered eating; and (c) to derive themes from open-ended survey questions related to changes in disordered eating in response to COVID-19. Given the limited research examining risk factors associated with disordered eating during the COVID-19 pandemic in non-clinical samples, the present study was exploratory in nature and thus a priori hypotheses were not developed.

2 | METHOD

2.1 | Study design and sample

Participants in the C-EAT (COVID-19 Eating and Activity over Time) study were members of the EAT 2010–2018 cohort who were invited to complete a follow-up, online survey during the COVID-19 outbreak (Larson, Slaughter-Acey, et al., 2021). The EAT 2010–2018 study is a population-based investigation of weight-related health behaviors and associated factors among young people who were attending secondary school in Minneapolis-St. Paul, Minnesota in 2009–2010 (Neumark-Sztainer et al., 2020a; Neumark-Sztainer et al., 2020b). The C-EAT survey was designed to capture correlates of eating, activity, and weight-related health behaviors during the COVID-19 outbreak and to identify areas in need of immediate attention to avoid adverse health consequences. Email and text message invitations to participate in the online C-EAT survey were sent to the 1,568 cohort members who had completed the most recent follow-up survey in 2017–2018. Invitations and up to five reminders to participate were sent during the months of April to October 2020. All participants were mailed a financial incentive of \$25 following completion of the quantitative and qualitative surveys. Responses were received from 46% of the EAT 2018 sample ($n = 720$). The attrition rate was likely influenced by the shortened recruitment window due to the rapid response nature of the study. The University of Minnesota Institutional Review Board Human Subjects Committee approved all protocols.

The C-EAT survey sample included 447 females, 263 males, and 10 participants of other gender identities. Most survey respondents (90%) were living in Minnesota at the time they completed the survey. The sample had a mean age of 14.3 ± 2.0 years at baseline in 2009–2010, 21.9 ± 2.0 years at follow-up in 2017–2018, and 24.7 ± 2.0 years at follow-up in 2020. The mean timespan between the 2017–2018 and C-EAT surveys was 2.8 ± 0.5 years. C-EAT survey participants were less likely than 2018 survey participants to identify as male, identify their race as African American or Black, or have a parent of lower SES. However, C-EAT participants were of diverse backgrounds and did not differ from non-respondents with regard to the frequency and prevalence of unhealthy weight control behaviors or binge eating in 2018. Comparisons between respondents and non-respondents to the C-EAT survey are included as a Supporting Information. The distribution of ethnic/racial backgrounds reported by C-EAT participants was similar but more diverse than the overall

TABLE 1 Descriptions of measures used in the present study

Measure	Description
<i>Quantitative measures</i>	
Unhealthy weight control behaviors	Two forms of unhealthy weight control behaviors (UWCBs) were assessed during the COVID-19 pandemic: extreme and less extreme. Extreme UWCB items included: diet pill use, self-induced vomiting, laxative use, and diuretic use for weight control in the past month (test–retest $r = 0.90$). Extreme UWCB scores were summed, and ranged from 0 to 4, with a higher score indicating a higher count of extreme UWCBs. Less extreme UWCB items included: fasting, eating very little, using food substitutes, skipping meals, or smoking more cigarettes for weight control in the past month (test–retest $r = .63$; Neumark-Sztainer, Story, Hannan, & Croll, 2002). Less extreme UWCB scores were summed, and ranged from 0 to 5, with a higher score indicating a higher count of less extreme UWCBs. Extreme and less extreme UWCBs at earlier measurement occasions (EAT 2010 and EAT 2018) were assessed using the same set of behaviors; however, participants reported on their engagement in UWCBs over the past year.
Binge eating	Binge eating was assessed with two dichotomous (yes/no) questions adapted from the adult version of the Questionnaire on Eating and Weight Patterns-Revised: “ In the past month, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you (binge-eating)? ” and “ During the times when you ate this way, did you feel you could not stop eating or control what or how much you were eating? ” (Yanovski, 1993). This measure has good psychometric properties in adults (Nangle, Johnson, Carr-Nangle, & Engler, 1994). Binge eating at earlier measurement occasions (EAT 2010 and EAT 2018) was assessed using the same set of behaviors; however, participants reported on their engagement in binge eating over the past year.
Eating to cope	Eating to cope was assessed with the 5-item coping subscale of the Motivations to Eat Scale, which has been shown to have strong construct validity (Jackson et al., 2003) and demonstrated strong internal consistency in the present study ($\alpha = .92$). In response to each item, participants indicated the frequency that they engaged in eating as a coping mechanism (e.g., eating “as a way to help you cope”; Jackson et al., 2003) in the past month. Response options on a scale of 1 (<i>Almost never or Never</i>) to 5 (<i>Almost always or Always</i>) were averaged to create a composite variable.
Stress and stress management	Participants' perceived stress and ability to manage stress was measured using two items. First, participants were asked to indicate their average level of stress in the past month (test–retest $r = 0.69$), with response options ranging from 1 (<i>Not at all stressed</i>) to 10 (<i>Very stressed</i>), as well as their average ability to manage their stress in the past month, with response options ranging from 1 (<i>Ineffective</i>) to 10 (<i>Effective</i>). This measure of stress and stress management was originally developed for a similar population of emerging adults (Nelson, Lust, Story, & Ehlinger, 2008) and has been examined in the EAT 2018 sample in previous manuscripts (Neumark-Sztainer et al., 2020a; Neumark-Sztainer et al., 2020b).
Depressive symptoms	Depressive symptoms were assessed with the six-item Kandel and Davies Depressive Mood Scale (Kandel & Davies, 1982; test–retest $r = .71$), which was modified to assess symptoms within the past month. The scale assesses how often one has been bothered or troubled by six depressive symptoms, including feeling unhappy, sad or depressed; feeling hopeless about the future; feeling nervous or tense; worrying too much about things; having sleep difficulties; and feeling too tired to do things. Item responses on a scale of 1 (<i>not at all</i>) to 3 (<i>very much</i>). The average item value for each participant was multiplied by a factor of 10, resulting in scores that ranged from 10–30 with higher values indicating higher depressive symptoms. This scale demonstrated adequate internal consistency in the present study ($\alpha = .88$).
Food insecurity	Food insecurity within the past month was assessed with two modified items from the short form of the US Household Food Security Survey Module (Blumberg, Bialostosky, & Hamilton, 1999): (a) In the past month, did you ever eat less than you felt you should because there wasn't enough money for food?; and (b) In the past month, were you ever hungry but did not eat because there was not enough money for food?. Participants who responded “yes” to both questions were categorized as having experienced food insecurity.
Financial difficulties	Financial difficulties were assessed by asking the degree of difficulty participants were currently experiencing in living on their total household income (Price et al., 2002). Participants selected from response options ranging from 1 (<i>Not at all difficult</i>) to 4 (<i>Extremely difficult or impossible</i>) (test–retest $r = 0.72$). A score of 1 (not at all) was categorized as “no difficulties”, a score of 2 (somewhat difficult) was categorized as “moderate difficulties” and a score of 3 (very difficult) or 4 (extremely difficult or impossible) was categorized as “extreme difficulties.”
Sociodemographic covariates	Covariates from the original school-based survey collected in 2010 included ethnic/racial identity (African American/Black, Asian, Hispanic/Latino, White, and Mixed/Other) and socioeconomic status (SES), which were included as both have previously demonstrated associations with UWCBs (Mayer-Brown, Lawless, Fedele, Dumont-Driscoll, & Janicke, 2016; Story, French, & Blum, 1994). In the present study, ethnic/racial identity was included as a proxy for exposure to racism, a form of stigma that contributes to a wide range of adverse health and social outcomes, in addition to cultural norms related to eating, body image, and weight. SES was based on parents' education, defined as the highest level of education of either parent, with missing or implausible values imputed or corrected using information on eligibility for public assistance, free or reduced-cost school meals, and parental employment status (Sherwood et al., 2009). Gender identity (male, female, other identity) was based on responses to the EAT 2020 survey.

(Continues)

TABLE 1 (Continued)

Measure	Description
<i>Qualitative measure</i>	
Perceived influence of COVID-19 on eating behaviors	Perceived influence of the COVID-19 outbreak on eating behaviors was assessed with the question: “ Have recent events related to COVID-19 influenced your eating behaviors? ” Response options were “no,” “yes, somewhat,” and “yes, very much.” Participants who reported any influence of the COVID-19 pandemic on their eating behaviors were asked the open-ended question: “ Please comment on how events related to COVID-19 have influenced your eating behaviors, including how you purchase or prepare food and beverages. What event(s) related to COVID-19 have been the most important to your eating? ”

population in Minneapolis-St. Paul, Minnesota. The ethnic/racial identities reported by participants were 29.6% White, 23.9% Asian, 16.5% Latino/Hispanic, 18.2% African American/Black, and 11.8% Mixed or other. The distribution across categories of parental SES based primarily on baseline educational attainment was: 32.7% low, 20.7% low-middle, 17.0% middle, 18.5% upper-middle, and 11.2% high.

2.2 | Survey measures

The C-EAT survey was based on measures used in prior EAT surveys (Larson, Wall, Story, & Neumark-Sztainer, 2013). The measures were adapted from pre-pandemic (i.e., 2010 and 2018) surveys, with the main difference being the time frame provided as reference for the measures of unhealthy weight control behaviors and binge eating (i.e., “past year” in pre-pandemic surveys and “past month” during the pandemic to capture only the period during the pandemic). Text was included to inform participants that the goal of this survey was to learn how their experiences with the COVID-19 outbreak may influence their eating behaviors, physical activity, and well-being. The test–retest reliability of measures included in the EAT 2018 survey was examined using data from a subgroup of 112 emerging adult participants who completed the EAT 2018 survey twice within a period of 3 weeks, at which point all measures were found to have strong (test–retest agreement $\geq 80\%$) or adequate (test–retest agreement $\geq 70\%$) test–retest reliability. All measures used in the present study are described in Table 1.

2.3 | Statistical analysis

Associations between psychological distress (depressive symptoms, stress), stress management, and financial difficulties during the COVID-19 pandemic with any concurrent disordered eating behaviors were examined in generalized linear models (GLM). A Poisson GLM was applied for count dependent variables when the mean and the variance was approximately equal (less extreme unhealthy weight control behaviors [UWCBs]), negative binomial GLM was used for count data with overdispersion (extreme UWCBs), logistic GLM was used for dichotomous dependent variables (binge eating), and GLM with a gamma function was applied for the eating to cope dependent variable. Each model was mutually adjusted for all independent

variables and included gender, racial/ethnic identity, and SES as covariates. For disordered eating variables that had been assessed at prior survey waves (i.e., UWCBs and binge eating), analyses were then repeated in subgroups of the sample to examine associations with new-onset disordered eating, wherein participants who reported the respective dependent variables at earlier measurement occasions (EAT 2010 and/or EAT 2018) were excluded (subsample N range: 234–586).

Responses to open-ended questions pertaining to perceived influences on eating behaviors during the COVID-19 pandemic ($n = 510$) were analyzed using a hybrid inductive-deductive approach to thematic analyses (Fereday & Muir-Cochrane, 2006). All open-ended comments were read by two independent raters (MS and RE), wherein raters identified responses that included a description of disordered eating, any changes to eating behaviors, or eating disorder symptoms. Given the broad scope of the qualitative survey question, additional research using these survey data has focused on qualitative responses pertaining to the impacts of the COVID-19 pandemic on food availability, food preparation, and food insecurity (Larson, Slaughter-Acey, et al., 2021). The deductive component of the qualitative analysis for the present study thus excluded responses pertaining to food access, preparation, and insecurity. All open-ended comments examining changes to eating behaviors and disordered eating in response to the COVID-19 pandemic were assessed using an inductive approach to thematic analysis previously described by Braun and Clarke (2006). All qualitative responses were first read to gain an understanding of the general responses. In a second step, the two raters independently identified preliminary codes for the qualitative data and preliminary codes were compared across raters. Codes between raters were compared and preliminary codes were refined into final organizing themes. The qualitative survey data underwent additional review and the final themes were further refined. Participant codes and responses were organized with Microsoft Excel. Inter-rater reliability coefficients were calculated and any discrepancy between raters was resolved through consensus. To contextualize the derived themes from the qualitative data, a chi-square test compared the proportion of responses for each of the six themes across four subgroups based on current and previous disordered eating behavior history: (a) no current or previous disordered eating ($n = 85$); (b) first incidence of any disordered eating ($n = 57$); (c) previous and current disordered eating ($n = 290$); and (d) previous but not current disordered eating ($n = 64$).

TABLE 2 Prevalence of disordered eating behaviors during the COVID-19 pandemic

Study variables	Descriptive statistics				
	Range	M	SD	N	%
Independent variables					
Stress	1–10	5.59	2.46		
Stress management	1–10	6.29	2.38		
Depressive symptoms	10–30	19.63	5.85		
Food insecurity				92	13.0
Financial difficulty					
Not at all difficult				261	36.8
Somewhat difficult				345	48.7
Very/extremely difficult				103	14.5
Dependent variables					
Extreme UWCBs	0–4	0.11	0.46	58	8.2
Less extreme UWCBs	0–5	1.11	1.31	377	53.1
Binge eating				100	14.1
Eating to cope	1–5	2.21	1.05		

3 | RESULTS

During the COVID-19 outbreak, approximately 8% of participants endorsed past-month extreme UWCBs ($n = 58$), 53% endorsed less extreme UWCBs ($n = 377$), and 14% endorsed binge eating ($n = 100$). A large percentage of individuals who reported extreme UWCBs (82.8%) also reported less extreme UWCBs. In contrast, a much smaller percentage of individuals who reported less extreme UWCBs also endorsed extreme UWCBs (12.7%). The descriptive statistics for each of the independent and dependent variables are presented in Table 2.

3.1 | Cross-sectional correlates of unhealthy weight control behaviors during the COVID-19 pandemic

Mutually adjusted models revealed that stress management was significantly and negatively associated with extreme UWCBs (see Table 3), such that for every 1-unit increase in stress management, the count of extreme UWCBs was 13% lower. Similarly, higher stress management was linked with a lower count of extreme UWCBs among individuals who did not report extreme UWCBs at earlier measurement occasions, such that for every 1-unit increase in stress management, the count of extreme UWCBs was 18% lower.

Mutually adjusted models revealed that depressive symptoms, food insecurity, and moderate financial difficulties were significantly and positively associated with less extreme UWCBs (see Table 4). Specifically, the number of less extreme UWCBs was approximately 6% greater for every 1-unit increase in depressive symptoms. Moreover, the count of less extreme UWCBs was 24% greater among

individuals experiencing food insecurity relative to those who did not report food insecurity and approximately 25% greater among individuals experiencing moderate financial difficulties relative to those who did not report financial difficulties during the COVID-19 pandemic. In contrast, only financial difficulties were significantly associated with less extreme UWCBs among individuals who did not report less extreme UWCBs at prior measurement occasions. The count of less extreme UWCBs was 138% greater among those with moderate financial difficulties and approximately 123% greater among those with extreme financial difficulties relative to those who did not experience financial difficulties.

3.2 | Cross-sectional correlates of binge eating during the COVID-19 pandemic

Odds of endorsing binge eating during the COVID-19 pandemic significantly differed by stress management and depressive symptom scores (see Table 5). Specifically, stress management was significantly and negatively associated with binge eating, wherein each 1-unit increase in stress management was associated with 11% lower odds of binge eating. In contrast, every 1-unit increase in depressive symptoms was associated with 13% greater odds of engaging in binge eating during the COVID-19 pandemic. Among individuals who did not report binge eating at earlier measurement occasions, only depressive symptoms were significantly associated with odds of binge eating during the COVID-19 pandemic. Specifically, every 1-unit increase in depressive symptoms was associated with 10% greater odds of binge eating among individuals who did not report binge eating at earlier measurement occasions.

3.3 | Cross-sectional correlates of eating to cope during the COVID-19 pandemic

Stress, stress management, depressive symptoms, and extreme financial difficulties were significantly associated with eating to cope scores during the COVID-19 pandemic (see Table 6). Specifically, each 1-unit increase in stress and depressive symptom scores was associated with 3% and 4% times higher eating to cope scores, respectively. In contrast, stress management was significantly and negatively associated with eating to cope, such that every 1-unit increase in stress management was associated with 2% lower eating to cope scores. Finally, extreme financial difficulties were significantly associated with 16% higher eating to cope scores relative to those who did not experience financial difficulties.

3.4 | Qualitative themes identified among individuals reporting disordered eating in response to the COVID-19 pandemic

Over 70% of the sample indicated that the recent events related to the COVID-19 pandemic influenced their eating behaviors ($n = 524$),

Predictor	C-EAT full sample N = 675		C-EAT first incidence N = 586	
	Exp(B)	95% CIs	Exp(B)	95% CIs
Stress	0.99	0.86–1.13	0.86	0.71–1.05
Stress management	0.88**	0.80–0.97	0.82**	0.71–0.94
Depressive symptoms	1.01	0.95–1.07	1.02	0.94–1.11
Food insecurity	1.30	0.62–2.69	1.90	0.64–1.10
<i>Financial difficulties</i>				
No difficulties	—	—	—	—
Moderate difficulties	0.62	0.36–1.07	0.52	0.24–1.10
Extreme difficulties	0.46	0.20–1.05	0.27	0.06–1.13
Covariates				
<i>Gender</i>				
Male	—	—	—	—
Female	3.25**	1.66–6.35	2.30*	1.03–5.11
<i>Race/ethnicity</i>				
African American/black	1.09	0.53–2.24	1.13	0.41–3.12
Asian	0.50	0.23–1.11	0.40	0.12–1.34
Hispanic/Latinx	0.58	0.25–1.37	1.22	0.42–3.53
White	—	—	—	—
Mixed or other	1.32	0.60–2.89	0.91	0.25–3.23
Socioeconomic status	0.71**	0.57–0.88	0.80	0.59–1.09

Note: Exp(B) = exponentiated beta values. All models are adjusted for gender, racial/ethnic identity, and socioeconomic status; CIs = 95% confidence intervals.

* $p < .05$; ** $p < .01$.

TABLE 3 Adjusted cross-sectional associations between stress, mood disturbances, financial difficulties, and extreme unhealthy weight control behaviors

each of whom were asked an open-ended question pertaining to changes in their eating behaviors attributed to COVID-19. Among those who were provided the option to respond to this open-ended question, 97.3% ($n = 510$) responded. Changes in eating behaviors of potential relevance to disordered eating or eating behaviors were described by 41% ($n = 210$) of the respondents. Six themes of relevance to disordered eating and/or changes in eating behaviors during COVID-19 were identified: (a) mindless eating and snacking; (b) increased food consumption; (c) generalized decrease in appetite or dietary intake; (d) eating to cope; (e) pandemic-related reductions in dietary intake; and (f) re-emergence or marked increase in eating disorder symptoms. Inter-rater reliability was adequate ($\kappa = 0.84$). Each theme is described in detail below, with illustrative quotes.

3.4.1 | Theme 1: Mindless eating and snacking

The most frequent COVID-19-related eating disturbance was that of marked increases in mindless eating and snacking ($n = 88$; 17.3%). The mindless eating and snacking theme was characterized by comments describing increased eating out of boredom and in the absence of hunger throughout the day. Participants endorsing Theme 1 reported increased boredom due to COVID-19-related schedule disruptions and eating because there was little else to

do. For instance, one participant stated: “I eat when I'm bored now, and have gained a fair bit of weight. My schedule is basically destroyed, so things have gotten pretty bad” [21-year-old Hawaiian/Pacific Islander Male]. In another example, one participant said: “I have been snacking more. Not eating on a schedule, like I did before the pandemic started. Meals are typically once a day, then I tend to snack the rest of the day. This is due to being home all day, out of work” [23-year-old, White Female]. In a third example, one participant said: “Being at home all day makes me just want to be eating every time I go into my kitchen. Although I'm not hungry I'm looking for something to snack on” [26-year-old, Latina Female]. More than half of the participants whose responses were categorized in the mindless eating and snacking theme (55.7%) quantitatively endorsed disordered eating prior to and during the COVID-19 pandemic ($n = 49$; see Table 7).

3.4.2 | Theme 2: Increased food consumption

Another common eating disturbance was related to marked increases in food consumption ($n = 53$; 10.4%). Participants in this group specifically mentioned eating more in general within their responses. Theme 2 differed from Theme 1 as comments more commonly referred to overeating or eating more in general, whereas in Theme 1 comments regarding dietary

TABLE 4 Adjusted cross-sectional associations between stress, mood disturbances, financial difficulties, and less extreme unhealthy weight control behaviors

Predictor	C-EAT full sample N = 676		C-EAT first incidence N = 234	
	Exp(B)	95% CIs	Exp(B)	95% CIs
Stress	0.98	0.94–1.03	1.03	0.91–1.17
Stress management	1.03	1.00–1.06	1.03	0.94–1.13
Depressive symptoms	1.05***	1.04–1.07	1.05	1.00–1.10
Food insecurity	1.24*	1.01–1.53	1.49	0.71–3.12
<i>Financial difficulties</i>				
No difficulties	—	—	—	—
Moderate difficulties	1.25*	1.06–1.49	2.38***	1.53–3.70
Extreme difficulties	1.22	0.96–1.55	2.23*	1.09–4.57
Covariates				
<i>Gender</i>				
Male	—	—	—	—
Female	1.30**	1.10–1.53	0.93	0.61–1.41
<i>Race/ethnicity</i>				
African American/black	1.22	0.97–1.54	0.99	0.55–1.79
Asian	1.43**	1.15–1.77	1.72*	1.03–2.86
Hispanic/Latinx	1.06	0.83–1.37	1.18	0.62–2.23
White	—	—	—	—
Mixed or other	1.69***	1.33–2.13	1.67	0.89–3.14
Socioeconomic status	0.98	0.92	1.04	0.97–1.31

Note: Exp(B) = exponentiated beta values. All models are adjusted for gender, racial/ethnic identity, and socioeconomic status; CIs = 95% confidence intervals.

* $p < .05$; ** $p < .01$; *** $p < .001$.

intake were specific to snacking, mindless eating, or grazing behavior. For example, one participant whose response was coded within Theme 2 said: “Due to covid I just binge eat because there’s nothing else to do. Not being able to go to the gyms really got me lazy as I’m not a work out at home kind of person” [23-year-old, African American/Black Female]. Another stated: “I buy so much more junk food because I just binge eat from boredom. I don’t exercise. I’m always tired” [28-year-old, Asian Female]. More than half of the participants whose responses were categorized in the increased food consumption theme (55.7%) quantitatively endorsed disordered eating both prior to and during the COVID-19 pandemic ($n = 34$).

3.4.3 | Theme 3: Generalized decrease in appetite or dietary intake

Another common theme that emerged pertained to a general decrease in appetite and/or food consumption ($n = 29$; 5.7%). Participants in this group specifically described a general decrease in their appetite and/or a general decrease in their food consumption since the beginning of the COVID-19 pandemic within their responses to qualitative survey questions. For instance, one participant stated: “Eating less, believe it or not. I suppose when I am up and active and engaged, then I burn more energy. But since I’ve been on quarantine I spend more time to loaf around, meaning I use less energy and eat less.” [23-year-old, Mixed or other race Male]. Another participant

indicated: “I have actually been eating less at home than I did when I was working. I don’t order take out all the time. However I have not been cooking much either” [26-year-old, White Female]. In another example, one participant stated: “I’m not feeling hungry so I often miss lunch. I go to the grocery store once every two weeks and stock up on everything I need” [27-year-old, Latina Female]. A large proportion of participants whose responses were categorized in the generalized decrease in appetite or dietary intake theme (62.1%) quantitatively endorsed disordered eating prior to and during the COVID-19 pandemic ($n = 18$).

3.4.4 | Theme 4: Eating to cope

Several participants reported eating to cope ($n = 22$; 4.3%) in response to the stress of the COVID-19 pandemic. The eating to cope theme was characterized by comments pertaining to eating in response to heightened emotional states (e.g., stress, anger, fear) attributed to the COVID-19 pandemic. These comments indicated using food or eating to diminish negative emotional experiences. For instance, one participant said: “I have been eating much more than normal to help cope with the anxiety.” [24-year-old White Female]. For some participants, stress associated with working during the pandemic was a particular concern. For instance, one participant said: “I am an essential worker. By the time I am off of work, most places are closed. I have food in my fridge but every time I can make it to the grocery store most of the items I would normally get are gone. I find

Predictor	C-EAT full sample N = 686		C-EAT first incidence N = 550	
	OR	95% CIs	OR	95% CIs
Stress	1.10	0.95–1.27	1.11	0.91–1.35
Stress management	0.90*	0.80–0.99	0.87	0.76–1.00
Depressive symptoms	1.12***	1.06–1.19	1.10*	1.02–1.19
Food insecurity	1.22	0.64–2.34	1.33	0.54–3.25
<i>Financial difficulties</i>				
No difficulties	—	—	—	—
Moderate difficulties	0.80	0.46–1.39	0.66	0.31–1.38
Extreme difficulties	1.32	0.64–2.73	1.48	0.56–3.91
Covariates				
<i>Gender</i>				
Male	—	—	—	—
Female	1.35	0.79–2.32	1.15	0.58–2.29
<i>Race/ethnicity</i>				
African American/black	0.70	0.32–1.55	1.08	0.39–2.97
Asian	1.36	0.67–2.75	1.36	0.50–3.68
Hispanic/Latinx	1.36	0.64–2.88	2.00	0.77–5.15
White	—	—	—	—
Mixed or other	1.39	0.64–3.02	1.47	0.52–4.17
Socioeconomic status	0.86	0.70–1.04	0.94	0.73–1.20

Note: All models are adjusted for gender, racial/ethnic identity, and socioeconomic status; CIs = 95% confidence intervals.

Abbreviation: OR, odds ratio.

* $p < .05$; *** $p < .001$.

myself having to eat out or order food more often than ever. I also find myself stress eating sometimes at my job since I am watching layoffs and receiving pay cuts from my workplace” [23-year-old, Latino Male]. Another participant who reported working at a retail store stated: “It’s hard to not stress eat when our daily routines change because the world continues to evolve with COVID-19’s impact. I have been [eating] less throughout the day but have done one huge meal a day” [26-year-old Asian Female]. A majority of the participants whose responses were categorized in the eating to cope theme (81.8%) quantitatively endorsed disordered eating prior to and during the COVID-19 pandemic ($n = 13$).

3.4.5 | Theme 5: Pandemic-Related Reductions in dietary intake

A portion of the subsample reported reductions in dietary intake attributed to the specific nuances and stressors associated with the COVID-19 pandemic ($n = 17$; 3.3%). Participants whose comments related to this theme described a marked increase in stress in response to the COVID-19 pandemic, which was associated with a tendency to skip meals, reduced dietary intake, concerns regarding food safety, reduced appetite and/or intake, and reduced food shopping. For instance, one participant noted: “The biggest impact on my diet is the fact that I cannot go to the gym. Since working out

TABLE 5 Adjusted cross-sectional associations between stress, mood disturbances, financial difficulties, and binge eating

is extremely limited, I’ve been restricting more and have tried the Keto diet to be in more control of managing my weight. Not gaining weight during this time is extremely important to me” [27-year-old, Latina Female]. Other participants described the impact anxiety related to the COVID-19 pandemic has had on their dietary intake. For example, one participant stated: “Stress from COVID-19 has caused me to not eat for days due to anxiety” [26-year-old, African American/Black Female]. Another participant noted: “Due to stress levels my appetite has decreased, I also don’t go to the store as often to purchase food” [22-year-old, White Female]. Among participants whose responses were categorized within this theme, an equal proportion (29.4%) quantitatively reported no current or previous disordered eating, a first incidence of disordered eating, or previous and current disordered eating (each $n = 5$). The remaining group (12.8%) reported previous but not current disordered eating ($n = 2$).

3.4.6 | Theme 6: Re-emergence or marked increase in eating disorder symptoms

A small portion of the sample reported experiencing a re-emergence or a worsening of eating disorder symptoms ($n = 5$; 1.0%). Participants whose comments related to this theme described experiencing an

onset or worsening of eating disorder symptoms or habits that they attributed to a past eating disorder diagnosis. Participants whose responses were associated with this theme indicated previous eating disorder diagnoses of avoidant/restrictive food intake disorder (ARFID) and binge eating disorder; however, not all participants

explicitly identified their past or ongoing eating disorder diagnosis. Participants described difficulties maintaining their eating disorder recovery meal plan, skipping meals due to stress, increasing dietary restriction and unhealthy eating habits, and/or a decrease in appetite. For example, one participant noted: “COVID-19 has brought back many of the habits I had when I was struggling with my eating disorder. The spread of the jokes about the ‘corona 15’ were what sparked a lot of the unhealthy habits resurfacing” [22-year-old, White Female]. In a second example, “Due to the gym being closed I do not get as much physical activity as I normally do. This has decreased my appetite and I do not eat much when I am feeling stressed. This is due to an eating disorder of past binge eating due to stress.” [27-year-old, White Male]. Another participant stated: “It has become increasingly hard to get motivation to get groceries, because I’m worried I will contract COVID. This was a hard task for me to start with as I have ARFID that has put me inpatient before. I have also been skipping meals because of the stress of the world. There have been many days where I haven’t had any motivation to eat all day” [25-year-old, White Female]. Among the five participants whose responses were categorized within this theme, 60% quantitatively reported prior and current disordered eating ($n = 3$) and 40% reported previous but not current disordered eating ($n = 2$).

TABLE 6 Adjusted cross-sectional associations between stress, mood disturbances, financial difficulties, and eating to cope ($N = 687$)

Predictor	Exp(B)	95% CIs
Stress	1.03**	1.01–1.05
Stress management	0.99*	0.97–1.00
Depressive symptoms	1.04***	1.03–1.04
Food insecurity	0.99	0.90–1.09
<i>Financial difficulties</i>		
No difficulties	—	—
Moderate difficulties	1.03	0.97–1.10
Extreme difficulties	1.16**	1.05–1.28
Covariates		
<i>Gender</i>		
Male	—	—
Female	1.03	0.96–1.09
<i>Race/ethnicity</i>		
African American/black	1.06	0.97–1.16
Asian	1.04	0.96–1.14
Hispanic/Latinx	0.96	0.87–1.05
White	—	—
Mixed or other	1.10	0.99–1.22
Socioeconomic status	0.99	0.96–1.01

Note: Exp(B) = exponentiated beta values pertinent to GLM models using the gamma function and log link.

* $p < .05$; ** $p < .01$; *** $p < .001$.

3.4.7 | Qualitative themes and disordered eating behavior history

The results from the chi-square test comparing the proportion of responses in each theme across four subgroups based on past and current disordered eating behaviors was statistically insignificant ($\chi^2 [27] = 32.96, p = .20$). Thus, there were no significant differences in current or previous disordered eating behaviors across themes. The percentages for responses in each of the six themes across each group are presented in Table 7.

TABLE 7 Comparisons of derived qualitative themes across four distinct subgroups of the sample according to previous and current endorsement of disordered eating behaviors

Qualitative themes	Subgroup							
	1. No current or previous DEB $N = 85$		2. First incidence $N = 57$		3. Previous and current DEB $N = 290$		4. Previous but not current DEB $N = 64$	
	N	%	N	%	N	%	N	%
No DEB-related theme	50	58.8	32	56.1	171	59.0	37	57.8
Mindless eating/snacking	11	12.9	11	19.3	49	16.9	15	23.5
Increased consumption	9	10.6	4	7.0	34	11.7	5	7.8
Generalized decrease in appetite/intake	8	9.4	1	1.8	18	6.2	2	3.1
Eating to cope	2	2.4	5	8.8	13	4.5	1	1.6
Pandemic-related reductions in intake	5	5.9 ^a	5	8.8 ^a	5	1.7 ^b	2	3.1 ^{a,b}
Re-emerged/increased ED symptoms	0	0.0	0	0.0	3	1.0	2	3.1

Note: Superscripts represent significant differences in prevalence across subgroups, as derived from chi-square comparisons. For example, the previous and current DEB subgroup less commonly represented in the pandemic-related restraint qualitative theme relative to subgroups 1 and 2.

Abbreviations: DEB, disordered eating behaviors; ED, eating disorder.

4 | DISCUSSION

The current study examined associations between stress, mood disturbances, financial difficulties, and disordered eating in a diverse sample of emerging adults, examining any disordered eating during the COVID-19 outbreak in the United States, as well as new-onset disordered eating during this period. Prevalence of disordered eating behaviors during the COVID-19 pandemic was similar to earlier measurement occasions in the cohort. Specifically, over 8% of the present sample endorsed extreme UWCBs *in the past month*, relative to approximately 13% of those who endorsed extreme UWCBs *in the past year* in 2018. Additionally, over 53% of the participants endorsed in less extreme UWCBs *in the past month* during the COVID-19 pandemic, relative to around 52% reporting *past year* less extreme UWCBs in 2018. Finally, over 14% of participants in the present study reported binge eating *in the past month*, whereas over 12% reported *past year* binge eating in 2018.

Quantitative findings from this study revealed that poorer stress management and greater stress, depressive symptoms, and financial difficulties were each significantly and positively associated with concurrent disordered eating, with some differences across disordered eating variables. Qualitative findings from the present study suggest that the most common changes in eating behaviors during the COVID-19 outbreak pertained to mindless eating and snacking as well as both increases and decreases in appetite or food consumption (n range: 29–88). Additional qualitative themes pertained to eating or restricting in response to stressors associated with the COVID-19 pandemic (n range: 17–22), as well as an increase or re-emergence of eating disorder symptoms ($n = 5$). Notably, poor stress management was associated with increased odds of extreme UWCBs in the full sample, as well as the subsample of individuals without a known history of extreme UWCBs. As such, poor stress management may be linked with maintenance or new incidence of extreme UWCBs during the COVID-19 pandemic. Relatedly, qualitative results revealed a theme of pandemic-related reductions in dietary intake, which was characterized by comments indicating a decrease in appetite and/or increased dietary restriction as a maladaptive coping strategy in response to pandemic-specific stress. Together, findings align with previous studies demonstrating a relationship between stress, stress management, and disordered eating (Errisuriz, Pasch, & Perry, 2016). The relationship between stress management and UWCBs may be magnified during the stay-at-home period of the COVID-19 outbreak due to heightened uncertainty and attempts to gain a semblance of control.

Heightened depressive symptoms, food insecurity, and financial difficulties emerged in quantitative results as crucial factors associated with a higher count of less extreme UWCBs in the full sample of emerging adults. However, only heightened financial difficulties emerged as a significant correlate among the subsample of emerging adults without a known history of less extreme UWCBs. This finding suggests that emerging adults experiencing financial difficulties (e.g., unemployment, layoffs or an increase in expenditures) may be at heightened risk of new-onset less extreme UWCBs, whereas

depressive symptoms and food insecurity may be associated with maintenance of less extreme UWCBs. Financial difficulties were also associated with concurrent eating to cope scores and emerged as a pertinent theme in the qualitative portion of the analyses, with several participants referencing pay cuts, being out of work, increases in the cost of food, or similar challenges across themes. These findings provide further support for an established need to develop interventions to reach emerging adults experiencing financial difficulties (Becker, Middlemass, Gomez, & Martinez-Abrego, 2019; Tester, Lang, & Laraia, 2016). Moreover, the present finding is consistent with findings from EAT 2010, wherein adolescents experiencing food insecurity reported a higher rate of UWCBs relative to those who did not experience food insecurity (Hooper, Telke, Larson, Mason, & Neumark-Sztainer, 2020). While the present study did not support an association between food insecurity and binge eating, previous research with the EAT 2010–2018 cohort suggests that food insecurity may be positively associated with binge eating (Larson, Laska, & Neumark-Sztainer, 2020). Differences between the present findings and earlier work in the cohort might be accounted for by differences in the sample size, as well as the differences in the timeframe for binge eating in the present study (past month) relative to earlier measurement occasions (past year).

Quantitative results from the present study revealed that depressive symptoms were associated with increased odds of concurrent binge eating and eating to cope scores. The results from the qualitative analyses further emphasized the relevance of depressive symptoms and psychological distress during the COVID-19 pandemic, wherein emerging adults described eating in response to heightened emotional states (e.g., stress, anger, fear) attributed to the COVID-19 pandemic. Together these findings suggest that psychological distress may play an important role in understanding the factors associated with disordered eating behaviors, and particularly those characterized by increased food consumption, during the ongoing COVID-19 pandemic. These results provide support for past research highlighting the influence of intolerance of uncertainty (Brown et al., 2017), social isolation (Levine, 2011), and stress (Errisuriz et al., 2016) on disordered eating. Taken together, the social and contextual consequences of the COVID-19 pandemic (e.g., psychological distress, schedule disruptions) may contribute to the emergence or maintenance of disordered eating among emerging adults.

The qualitative results from the present study may also provide some insight into the experiences of emerging adults' eating behaviors during the COVID-19 pandemic. A small ($n = 5$) subgroup of the sample described unique challenges with regard to eating disorder recovery maintenance that they attributed to increased stress and uncertainty, as well as the disruptions to day-to-day life, brought on during the COVID-19 pandemic. However, the small number of participants whose responses were categorized in this theme suggests that the results should be interpreted with caution. Yet, the present findings are consistent with other recent qualitative research among adults with a self-reported eating disorder during the COVID-19 lockdown in the United Kingdom (Brown et al., 2021) and thus more research is needed to unpack the effects of the COVID-19 pandemic

on individuals in eating disorder recovery. Several other themes that were consistent with disordered eating in response to the pandemic emerged (n range: 17–88). For instance, some participants commented on the influence of their emotional experiences on their eating behaviors, wherein some described a general decrease in appetite or increased attempts to restrain their intake in response to pandemic-specific stressors. In contrast, a separate group of emerging adults reported increased eating to cope with stress, anger, and other negative emotional experiences that were attributed to the ongoing pandemic. The experiences qualitatively described by emerging adults in the present study are consistent with a large body of research describing the association between psychological distress in disordered eating (Bodell et al., 2019; Kukk & Akkermann, 2019). Together, the quantitative and qualitative survey findings from the present study highlight the importance of psychological distress and emotional experiences (e.g., stress, stress management) during the pandemic.

An additional group of emerging adults described increased snacking, grazing, and mindless eating in response to the dramatic shift in their day-to-day schedule during the ongoing pandemic. Similarly, other participants noted a general increase in food consumption in response to the pandemic and the desire to eat in response to boredom. In contrast, a separate group of emerging adults described a decrease in appetite, a lack of interest in eating, and decreased dietary intake during the COVID-19 pandemic. Together, these findings demonstrate that disruptions to the day-to-day schedule of emerging adults during the COVID-19 pandemic are important to address when considering ways to prevent disordered eating in this group.

This study includes several strengths and limitations. The present study included data from a rapid response study designed to understand the experiences of the COVID-19 pandemic in an existing cohort of emerging adults. However, the need for rapid data collection and the event-specific nature of the survey materials presented several limitations. First, the sample had a high attrition rate, which may be partially explained by the online format of the survey and the shortened recruitment window due to the rapid response nature of the study. Indeed, attrition rates in other longitudinal cohort studies were similarly higher than usual because of rapid response data collection efforts during the pandemic (Daly, Sutin, & Robinson, 2020; Shanahan et al., 2020). Second, there were differences in pertinent demographic variables between the C-EAT sample and earlier measurement occasions, such that respondents in the present sample were less likely to identify as African American or Black and less likely to have a lower SES. This limitation is concerning as the COVID-19 pandemic has had more effects on these groups. Third, the survey included differences in the measurement of disordered eating across waves of data collection (i.e., past year versus past month), which precluded the possibility of meaningful longitudinal analyses within the present study. As the goal of the C-EAT survey was to capture disordered eating specifically during the COVID-19 pandemic, it was not possible to match the past-year measurement timeframe of eating disorder symptoms from past surveys. Similarly, eating to cope was measured for the first time in the C-EAT survey, and thus the associations

between study variables and a first incidence of eating to cope was not possible. Moreover, disordered eating behaviors were based on self-report measures and did not assess the frequency of each behavior. Additionally, the item representing financial difficulties did not assess whether financial difficulties were magnified or influenced as a result of the COVID-19 pandemic and thus the specificity of the difficulties could not be examined. Similarly, the open-ended item that assessed the perceived influence of COVID-19 on eating behaviors included multiple questions, which could have impacted responses due to its complexity. Another limitation is that the present sample was comprised of emerging adults primarily within the state of Minnesota and thus results may not be generalizable to the United States broadly. An additional limitation to the present study was the inability to analyze other potential predictors of disordered eating behaviors that may be particularly salient for emerging adults, such as parenting-related stress. Strengths of the present study include the ethnically/racially and socioeconomically diverse sample of emerging adults and the use of qualitative data to gain a deeper understanding of the influence of the pandemic on young adult eating behaviors.

In sum, the present findings suggest that disordered eating was relatively common during the COVID-19 pandemic. Additionally, the results highlight the influence of stress management, psychological distress, financial difficulties, and schedule disruptions on eating behaviors among emerging adults during the COVID-19 pandemic. Additional outbreaks are expected to continue over the course of several months (Meyer & Madrigal, 2020). Thus, there is an urgent need to develop and evaluate technology-based mental health interventions for emerging adults to decrease eating disorder risk. Our findings suggest that stress management may function as a protective factor against disordered eating, and thus interventions that foster stress management skills (e.g., mindfulness, yoga, distress tolerance) or psychoeducational sessions that focus on the links between stress management and eating behaviors may be particularly useful in reducing disordered eating among emerging adults during the ongoing pandemic. Additionally, national- or state-level stimulus checks may offset the financial impacts of the COVID-19 pandemic and, in turn, reduce disordered eating risk during future outbreaks. The economic effects of the COVID-19 pandemic are expected to persist long after a vaccination has been widely disseminated and thus preventive interventions and treatment efforts should be affordable and easily accessible (e.g., via self-help resources, mobile applications) to those at heightened risk (Weissman et al., 2020). Online or mobile-based interventions that target stress management, depressive symptoms, and financial strain and provide tools to develop a routine during stay-at-home periods may be particularly effective for emerging adults at risk of developing disordered eating during the COVID-19 pandemic.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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