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Publication Date

2015-12-01

DOI

10.1016/j.appet.2015.07.017

Peer reviewed

Comfort eating, psychological stress, and depressive symptoms in young adult women

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A B S T R A C T

Little is known about whether comfort eating actually functions to reduce psychological stress. In addition, the effectiveness of comfort eating may be particularly relevant in the context of depression, but no study has tested whether comfort eating processes might depend on severity of depressive symptomology. This study tested 1) whether greater comfort eating statistically buffers the relationship between adverse life events and perceived psychological stress at age 18–19, and 2) whether potential stress-buffering effects may differ by level of depressive symptoms. These relationships were examined in the NHLBI Growth and Health Study, comprising 2379 young adult women. Participants self-reported experiences with adverse life events, their perceived psychological stress, and whether they tended to eat more while experiencing certain negative emotions. As hypothesized, the relationship between adverse life events and perceived stress depended on comfort eating status ($p = .033$). The effect of adverse events on perceived stress was attenuated among comfort eaters compared to non-comfort eaters ($p = .004$), but this buffering effect was not shown in participants with an elevated level of depressive symptoms. In conclusion, among young adult women without high depressive symptoms, comfort eaters may experience reduced perceived stress compared to those who do not engage in this behavior. Intervention researchers should also consider the possible benefits of comfort eating.

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A majority of Americans report experiencing moderate or high levels of stress (American Psychological Association, 2015), and chronic life stress is associated with greater engagement in "comfort eating," or the consumption of high-fat, high-sugar, or high-calorie "comfort food" with a concurrent emotional state (Torres & Nowson, 2007). Laboratory-induced acute psychological stressors have been shown to increase food intake (Epel, Lapidus, McEwen, & Brownell, 2001; Rutters, Nieuwenhuizen, Lemmens, Born, & Westerterp-Plantenga, 2009), and naturally-occurring stressful events (e.g., academic exams in student populations) have also been associated with comfort eating (Michaud et al., 1990; Weidner, Kohlmann, Dotzauer, & Burns, 1996). Similarly, chronic psychological stress due to interpersonal and work-related daily hassles has been associated with increased consumption of high-fat/high-sugar between-meal snacks (O'Connor, Jones, Conner, McMillan, & Ferguson, 2008). Furthermore, negative mood states such as depression and anxiety have also been shown

to increase craving for palatable foods (Willner et al., 1998). Although the effects of stress and negative mood on eating behavior have been well characterized, there is a dearth of research exploring whether this behavior actually functions to decrease psychological stress perceptions.

Only two known research groups have experimentally tested whether comfort eating might buffer psychological responses to adverse experiences, and these studies have yielded conflicting results. In a sample of healthy men and women, Macht and Mueller (2007) found that after viewing a sad film clip, the consumption of chocolate improved negative mood to a greater extent than drinking water and that palatable food improved mood to a greater extent than non-palatable food. However, a second study in young adults found that after negative mood induction, the consumption of a top-ranked comfort food did not improve mood significantly more than the consumption of a non-comfort food or no food at all (Wagner, Ahlstrom, Vickers, Redden, & Mann, 2014). In sum, previous findings are mixed regarding the capacity of comfort eating to experimentally improve negative psychological mood, and no prior studies have examined whether comfort eating may attenuate psychological stress perceptions.

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Comfort eating may be particularly relevant in the context of depression. Changes in appetite in depression are often observed (Wenzel, Steer, & Beck, 2005), and higher levels of depressive symptoms have been associated with both greater comfort eating (Konttinen, Männistö, Sarlio-Lähteenkorva, Silventoinen, & Haukkala, 2010) and a greater tendency to "self-medicate" by eating chocolate in order to feel better (Schuman, Gitlin, & Fairbanks, 1987). Whether this comfort eating in depressed individuals functions to dampen negative emotion is unknown. Although those with higher levels of depressive symptoms may be more likely to engage in comfort eating, depression is also associated with anhedonia (Sloan, Strauss, & Wisner, 2001), which could plausibly diminish any stress-buffering effects of comfort eating. In one experimental study in young women, Willner and Healy (1994) found that participants rated the pleasantness and desirability of cheese significantly lower after a depressive mood induction compared to baseline. If the presence of depressive mood dampens hedonic capacity related to food consumption, this suggests that perhaps comfort eating may not be an effective coping response to stress in individuals exhibiting higher levels of depressive symptoms. Therefore, an aim of the present study was to test whether potential stress-buffering effects of comfort eating might depend upon level of depressive symptoms.

Using data from the National Heart, Lung, and Blood Institute Growth and Health Study (NGHS), the current study addresses critical gaps in the existing literature by assessing whether comfort eating is a mitigating factor for real-world (rather than laboratory-induced) perceived stress at the population health level. Specifically, we hypothesized that self-reported comfort eating would moderate the effect of adverse life events on the primary outcome of perceived psychological stress at the age of 18–19. Furthermore, we examined whether comfort eating might function differently depending upon individuals' levels of depressive symptomology.

1. Methods

1.1. Participants and procedures

The primary goal of the original NGHS was to evaluate the impact of health behaviors, socioeconomic status, and psychosocial factors on the development of obesity in adolescence and young adulthood. The NGHS methodology and sample characteristics have been described previously in detail (The NHLBI Growth and Health Study Research Group, 1992). For the present study, the University Office of the Human Research Protection Program approved all research activities.

Girls were eligible for enrollment in NGHS if: (1) they identified themselves as being either Black or White; (2) they were within 2 weeks of age 9 or 10 at the time of the first clinical visit; (3) their parents or guardians granted permission and completed a household demographic information form. To reduce the influence of cultural diversity, eligibility was restricted to girls living in racially concordant households and excluded Hispanics of either race and other ethnic groups. If a guardian was not the biological parent, an attempt was made to determine the race of the biological parent.

Participants were recruited from three community sites: Richmond, CA, Cincinnati, OH, and Rockville, MD. Both the Richmond and Cincinnati sites recruited from public and parochial schools, while the Rockville cohort was selected randomly from potentially eligible families enrolled in a large Washington, DC area health maintenance organization. A total of 1213 Black and 1166 White girls were enrolled, and each community site succeeded in enrolling roughly similar percentages of Black and White girls.

From 1987–1997, participants attended 10 annual clinic visits (age 10–19), and the present study focuses on the clinic visits from

ages 18–19 when the key measures were available. Trained and certified NGHS staff obtained data for all measures, and psychosocial measures were taken in alternating years (or less often) to minimize participant burden. The retention rate was very high at 89% at age 19.

1.2. Primary study variables

1.2.1. Adverse life events

Participants' experiences with adverse life events were measured at age 19 using a Life Events Scale. A nearly identical version of this scale collected at an earlier time point of NGHS has been published elsewhere (Franko et al., 2004). The questionnaire asked participants whether or not a list of 46 events had occurred in the past 12 months. The primary domains of adverse life events that were assessed included physical health (e.g., "I had an illness that lasted for more than 3 weeks"), family changes or conflict (e.g., "My parents separated or got divorced"), death (e.g., "A friend of mine died"), drug use or abuse (e.g., "Someone close to me had a drug problem"), safety (e.g., "I didn't feel safe walking on my street"), crime (e.g., "I [or one of my family members] was shot or knifed or something like that"), and academics (e.g., "I failed a class at school").

The scale was developed for use in NGHS based on the Social Readjustment Rating Scale (Holmes & Rahe, 1967) and the Social Environment Inventory (Orr, James, & Charney, 1989), both of which have good psychometric properties (Franko et al., 2004). The latter measure was originally developed and tested as a self-administered questionnaire for use in the pediatric setting to assess maternal exposure to stressors. For the purposes of the present study, two items were removed from analysis due to their confounding with the measure of psychological stress. These items include: "Things in my life seemed out of control," and "I was very worried about my future." A total count of adverse life events was calculated for each participant.

1.2.2. Perceived stress

Perceived stress was measured at age 19 using the 14-item Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). This scale measures the extent to which participants experienced psychological stress in the past month. Sample items include, "In the last month, how often have you felt nervous and stressed?" or "How often have you felt that you were on top of things?" (reverse-coded) with responses on a 5-point Likert scale (1 = *never* and 5 = *very often*). Each participant's responses were summed to create a total score. The PSS is a widely used measure of perceived stress, and it is a valid and reliable measure of experiences of psychological stress in the past month. In nationally representative samples, the inter-item reliability of the PSS ranges from a Cronbach's alpha of .78–.91 (Cohen & Janicki-Deverts, 2012).

1.2.3. Comfort eating

A Nutrition Patterns Form was developed by the Psychosocial Measures Subcommittee of NGHS to assess participants' eating habits. This questionnaire was administered at age 18 and covered several topics, including questions related to comfort eating. Participants were given the prompt, "How well do these statements describe you? Indicate the best description of how often this happens." Following the prompt were statements such as "When I am sad I eat more" or "I eat more when I am mad," on 3-point scale (0 = *never or almost never*, 1 = *sometimes*, 2 = *usually or always*). We developed a 5-item Comfort Eating Scale which included eating while feeling stressed, sad, worried, mad, and bored. Principal components analysis with orthogonal rotation indicated that all items loaded on one factor and inter-item reliability for this scale

was high (Cronbach's alpha = .85). Responses to the 5 items were summed for each participant to generate comfort eating scores, with a higher score indicating a higher level of comfort eating behavior.

1.3. Moderators

1.3.1. Race

As noted above, participants identified their own race as either Black or White at the time of NGHS enrollment.

1.3.2. Depressive symptoms

Depressive symptoms were assessed at age 19 using the Center for Epidemiological Studies Depression Scale (CES-D Scale; Radloff, 1977). This 20-item self-report rating scale was originally developed for use in the general population; however, it has been used in young adult samples as well (Radloff, 1991). Participants were asked to rate how often they had experienced each of the feelings or behaviors listed during the past week. Sample items include: "I had crying spells," "My sleep was restless," and "I felt my life had been a failure." Participants indicated how often they had experienced each feeling or behavior using a 4-point scale (0 = *rarely or none of the time* and 3 = *most or all of the time*). A total CES-D score was calculated by summing each item, with higher scores indicating levels of depressive symptoms. In keeping with published studies using the CES-D in samples of female young adults (Franko et al., 2004; Roberts, Lewinsohn, & Seeley, 1991), we used a conservatively high cut-off score of 24 or higher to classify participants as exhibiting a moderate to severe level of depressive symptoms.

1.4. Covariates

1.4.1. Socioeconomic status

At baseline, parents or guardians were asked to provide information about their highest level of education and household income. Maximum parental education was represented by three categories (high school or less, 1–3 years post-high school, or 4 or more years of college). Household income was represented by four categories (less than $5000; $5000–$19,999; $20,000–$39,999; and $40,000 or more).

1.4.2. Anthropometry

Trained and certified study staff measured weight and height at age 19. Weight was measured using an electronic scale, and height was measured using a stadiometer. Body Mass Index (BMI) was then calculated for each participant using the standard formula, weight (kg)/(height (m))^2.

1.5. Analytic plan

For the study's primary analyses, we used multiple regression to test whether comfort eating moderated the relationship between adverse life events and perceived stress. To examine whether potential stress-buffering effects might depend upon depressive symptoms, we tested for a Depressive Symptoms × Adverse Life Events × Comfort Eating three-way interaction in predicting perceived psychological stress. Adverse life events, comfort eating, perceived stress, and depressive symptoms were all treated as continuous variables to test the full models, and the criterion for statistical significance for all tests was set at p < .05. In the event that interaction analyses were significant, simple slopes analyses used a dichotomized comfort eating variable, characterizing participants as either non-comfort eaters (those who scored 0 on the comfort eating scale) or comfort eaters (those who scored 1–10 on

the comfort eating scale and therefore tended to eat more while feeling at least one of the five measured negative emotions).

Because approximately half the sample was Black and half was White, we also tested for a Race × Adverse Life Events × Comfort Eating three-way interaction in predicting perceived psychological stress. This model showed that the interaction term was not significant in predicting perceived psychological stress (p = .74); nonetheless, we adjusted all subsequent analyses for race, in addition to the potential confounds of parental income and education and participant BMI. Correlations between comfort eating and other relevant constructs (e.g., depressive symptoms) were also calculated.

2. Results

Table 1 presents means, standard deviations, and ranges for the descriptive, predictor, and outcome variables. Of the 2073 participants with data for adverse life events, the three most commonly reported events were, "I moved to a new place to live" (n = 1003; 48.4%), "My boyfriend and I broke up" (n = 821; 39.6%), and "I changed to a new school" (n = 674; 32.5%). Of the 2050 participants with data for the CES-D scale, 270 participants (13.2%) scored at or above the cut-point of 24, suggesting clinically significant depression. These participants with elevated depressive symptoms exhibited significantly greater comfort eating scores (M = 3.09, SD = 2.86) compared to those with scores below 24 (M = 1.97, SD = 2.15), F(1, 1754) = 50.93, p < .001, η^2 = .028. Correlations among continuous study variables are displayed in Table 2. Of note, the number of self-reported adverse events was positively correlated with scores on the perceived stress scale.

The Depressive Symptoms × Adverse Life Events × Comfort Eating three-way interaction term was significant in predicting perceived psychological stress in the 1755 participants with complete data for these variables, F(1, 1740) = 4.46, p = .035, $\eta\rho^2$; = .003. To follow up on the interaction, the full sample was then stratified by the dichotomous variable of participant depressive symptoms. A test of the Adverse Life Events × Comfort Eating simple interaction in each group revealed that comfort eating significantly moderated the relationship between adverse life events and perceived stress in individuals without elevated depressive symptoms, t(1514) = −2.13, b = −.042, SE = .02, p = .033, $\eta\rho^2$; = .003, whereas there was no significant moderation in individuals with elevated depressive symptoms, p = .76.

We next examined simple slopes in participants without

Table 1
Descriptive statistics for study variables.

Variable	N	M (SD) or %	Min–Max
Parental Income[a]	2,244		
Less than $5,000		18.0	
$5,000-$–$19,999		14.4	
$20,000–$39,999		30.9	
$40,000 or more		36.7	
Parental Education[a]	2,376		
Less than High School		26.0	
1–3 years post-High School		38.9	
≥4-year college		35.1	
Comfort Eating[b]	1,992	2.10 (2.27)	0–10
Adverse Life Events Count[c]	2,073	6.55 (4.33)	0–31
Perceived Stress[c]	2,070	22.82 (8.0)	0–55
CES-D[c]	2,050	13.38 (9.14)	0–53
Body Mass Index[c]	2,067	25.57 (6.74)	15.77–55.60

Note. CES-D = Center for Epidemiological Studies Depression Scale.
[a] Age 10.
[b] Age 18.
[c] Age 19.

Table 2
Correlations among continuous study variables.

Variable	1	2	3	4	5
1. Comfort Eating[a]	–				
2. Adverse Life Events Count[b]	.10**	–			
3. Perceived Stress[b]	.23**	.30**	–		
4. CES-D[b]	.22**	.39**	.66**	–	
5. Body Mass Index[b]	.05*	.08**	−.02	.10**	–

Note. CES-D = Center for Epidemiological Studies Depression Scale.
*p < .05, **p < .001.
[a] Age 18.
[b] Age 19.

elevated levels of depressive symptoms by comparing the effect of adverse life events on perceived stress in non-comfort eaters and comfort eaters. Among these participants without elevated depressive symptoms, 506 (31.1%) were non-comfort eaters and the remaining 1122 participants (68.9%) were comfort eaters. For an increase of one additional adverse life event, the predicted corresponding increase in perceived stress was significantly greater for non-comfort eaters than for comfort eaters, $t(1514) = 2.85$, $b = .276$, $SE = .10$, $p = .004$, $\eta\rho^2; = .005$. Fig. 1 displays predicted perceived stress scores as a function of adverse life events count and comfort eating status (non-comfort eater or comfort eater) in participants with and without elevated levels of depressive symptoms.

3. Discussion

Consistent with our hypothesis, in this study comfort eating buffered the association between adverse life events and perceived stress. However, comfort eating appeared to buffer perceived stress only in individuals without an elevated level of depressive symptoms − despite the fact that those with versus without elevated depressive symptoms reported engaging in higher levels of comfort eating. The latter finding replicates previous research showing that

depressive symptoms are positively associated with comfort eating in young women (Konttinen et al., 2010; Ouwens, van Strien, & van Leeuwe, 2009). Thus, the present findings suggest that among Black and White young women experiencing a relatively high number of adverse life events, comfort eaters may experience lower levels of perceived stress compared to those who do not engage in this behavior, but this protective effect of comfort eating may not extend to those with elevated depressive symptoms. Similarly, it is important to note that eating in response to negative emotion may acutely increase, rather than decrease stress for members of other clinical populations; for example, by definition, binge eating disorder and bulimia nervosa are often characterized by feelings of guilt, embarrassment, or distress following a binge eating episode (American Psychological Association, 2013).

Our findings are divergent with a recent study by Wagner et al. (2014), which indicated that comfort food consumption was not more effective than consumption of non-comfort food or no food at all in improving mood. These inconsistent results may reflect methodological differences; for example, the present study operationalized comfort eating as a tendency to eat more in response to naturally occurring negative emotions, and focused specifically on the outcome measure of perceived stress. In contrast, Wagner et al. investigated whether comfort eating following laboratory-induced sadness would improve general negative affect, a construct distinct from psychological stress.

How might comfort eating reduce stress perceptions? Are there plausible physiological mechanisms that might govern this process? Indeed, experimental research in non-human animal models has suggested that the consumption of palatable comfort foods plays a causal role in dampening the stress-responsive hypothalamic-pituitary-adrenal (HPA) axis reactivity to acute and chronic physical stressors (Dallman, Pecoraro, & la Fleur, 2005; Foster et al., 2009; Ulrich-Lai et al., 2007). Furthermore, some studies in humans have reported correlations between high chronic stress, high comfort eating, and decreased HPA responses to acute laboratory
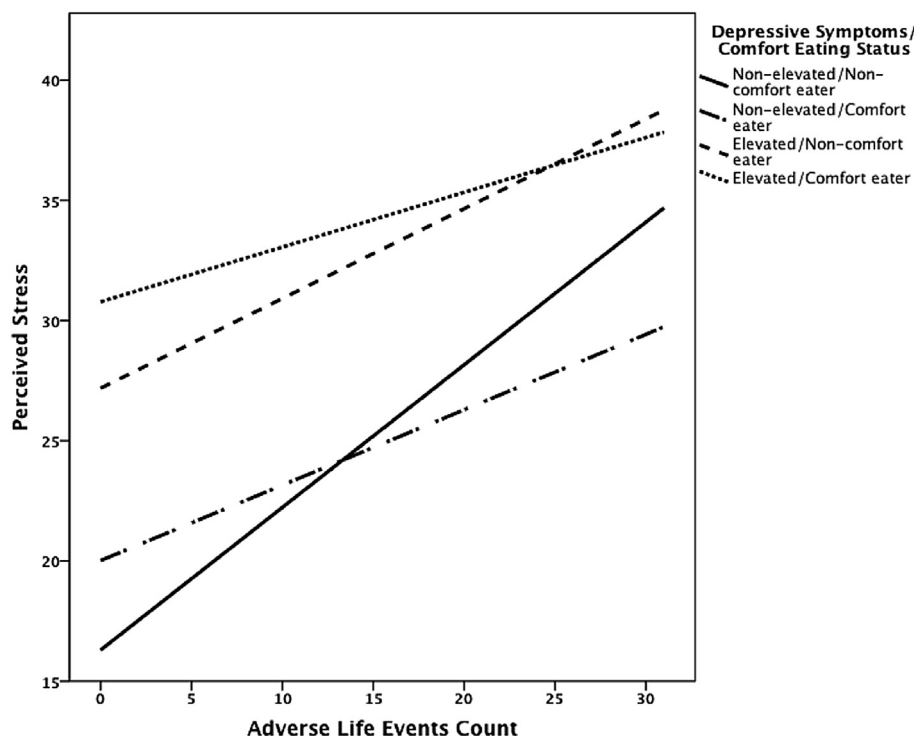

Fig. 1. Perceived stress scores as a function of adverse life events count, comfort eating status, and level of depressive symptoms.

stressors (Tomiyama, Dallman, & Epel, 2011; Tryon, DeCant, & Laugero, 2013; van Strien, Roelofs, & de Weerth, 2013). Future research should examine both psychological and physiological stress responses to naturally occurring stressors to test these putative mechanisms.

One theory that is commonly considered in scholarly discussion of comfort eating behavior is the Psychosomatic Theory of Obesity, which posits that food intake functions as a coping response in the face of negative affect, which can foster overconsumption and consequently lead to obesity (Kaplan & Kaplan, 1957). Consistent with this theory, studies in rodents have found that chronic comfort eating yields visceral fat accumulation (Dallman et al., 2005), which is associated with hypertension, type 2 diabetes, and cardiovascular disease in humans (Björntorp, 1990). Similarly, comfort eating was significantly associated with BMI in the present human sample, although the observed effect was relatively small ($r = .05$). Several other studies in young adult women have found comfort eating to be unrelated to BMI (Wardle et al., 1992) and not prospectively predictive of weight gain (Lowe et al., 2006). Thus, it seems plausible that at least for some, it may be feasible to reduce perceived stress via comfort eating without simultaneously promoting weight gain over time. For example, although the present dataset did not include information about the macronutrient and calorie content of the comfort foods participants were consuming, future research should investigate whether eating fruits and vegetables might provide an avenue for reducing stress without the added fat, sugar, or calorie content of foods traditionally thought of as comfort foods. Indeed, some researchers have already begun to explore interventions for promoting stress-related healthy eating in place of stress-related unhealthy eating, with some success (O'Connor, Armitage, & Ferguson, 2014).

These findings should be considered in light of the following limitations. First, in this study participants self-reported experiences with adverse life events within the past year using a questionnaire format. However, compared to interview methods, survey assessment of life events may be more subject to recall errors and reporting bias (McQuaid, Monroe, Roberts, Kupfer, & Frank, 2000; Simons, Angell, Monroe, & Thase, 1993). Relatedly, it is possible that some participants' current stress perceptions may have colored their reporting of adverse life events, a consideration that may be particularly relevant for the participants with an elevated level of depressive symptoms. Further, the adverse life events measure was limited in that it did not capture the duration of each life event. Distinguishing between acute and chronic adverse events may have been useful, as empirical evidence has suggested that acute versus chronic events may uniquely predict psychological outcomes, such as depressive symptoms (McGonagle & Kessler, 1990). In addition, because the study sample included only Black and White females, it is unclear whether the results would generalize to men or to individuals of other races and ethnicities.

The NGHS data analyzed in this study are about 20 years old in 2015, creating the possibility for cohort effects. However, this potential concern may be ameliorated by more recent data also collected in female young adult samples using the same scales of measurement as the present study, which have demonstrated similar mean levels of demographic variables such as BMI (25.6 vs. 23.6 in Ogden, Carroll, Kit, & Flegal, 2012) and depression scores (13.4 vs. 13.1 in Monahan, Bracken-Minor, McCausland, McDevitt-Murphy, & Murphy, 2012). Furthermore, recent nationally representative survey data have indicated that many young women still engage in comfort eating in present day, as 41% of women aged 18–35 reported eating because of stress in the past month (American Psychological Association, 2015). This, coupled with the fact that a majority of Americans report moderate to high stress levels (American Psychological Association, 2015) suggests that the

data and our findings are relevant today.

To our knowledge, this is the first study to test potential stress-buffering effects of comfort eating at the population health level and in response to naturally occurring stressors. Additionally, this study provides novel insight into the workings of comfort eating behavior in a human, Black and White sample, across a spectrum of depressive symptomatology. In conclusion, the present findings suggest that engagement in comfort eating may protect individuals without elevated depressive symptoms by buffering the effects of adverse life events on perceived psychological stress. Although some researchers have designed interventions to eradicate comfort eating (Meekums, Vaverniece, Majore-Dusele, & Rasnacs, 2012), the possible benefits of comfort eating for psychological stress may need to be considered when attempting to promote health.

4. Conflict of interest statement

The authors have no conflict of interest to disclose.

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