Rethinking Binge Eating Disorder: Is Resource Depletion the Missing Link?

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Rethinking Binge Eating Disorder: Is Resource Depletion the Missing Link?

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A Dissertation Submitted to The Graduate School at the University of Missouri-St. Louis in partial fulfillment of the requirements for the degree Doctor of Philosophy in Clinical-Community Psychology

August 2023

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Abstract

Binge eating disorder (BED), the most prevalent of the eating disorders, is associated with significant mental health impairments, high healthcare costs and utilization, and increased mortality. Yet little is known about the mechanisms involved in binge eating, and existing BED theories are incomplete. Scholars have recently suggested that resource depletion, or the state of reduced self-regulation abilities, may apply to BED, but no identified studies have experimentally examined this relationship. The purpose of the current study was to examine the role of resource depletion in binge eating behaviors. Ego anxiety, discomfort anxiety, and dietary restraint were also examined as potential moderators. One hundred seventy-one female-identifying participants (ages 18 to 62) were randomly assigned to a high or low resource depletion writing condition and then asked to rate motivation to eat and food cravings while viewing images of fatty, salty, and sweet foods. Results indicate the manipulation of resource depletion was effective. Participants in the high resource depletion condition reported higher binge eating behaviors, but only under the conditions of high dietary restraint and high discomfort anxiety. Ego anxiety did not moderate the relationship between resource depletion and binge eating behaviors. These results highlight resource depletion as a mechanism of binge eating, specifically as it relates to previous research findings of dietary restraint and discomfort anxiety. Researchers and clinicians should consider the role of resource depletion in BED to inform prevention and treatment efforts for the disorder.
Rethinking binge eating disorder: Is resource depletion the missing link?

Eating disorders are among the most problematic of mental health issues due to their high rates of mortality and medical complications (Fichter & Quadflieg, 2016). The most prevalent among the eating disorders is binge eating disorder (BED; Kessler et al., 2013), with lifetime prevalence estimates ranging from one percent (Udo & Grilo, 2018) to nearly eight percent (Filipova & Stoffel, 2016). BED is associated with numerous physical and mental health issues, including depression, decreased quality of life, obesity, type 2 diabetes, hypertension, metabolic syndrome beyond obesity, disability, role impairment personally and at work, and overall higher mortality (Field et al., 2012; Kessler et al., 2013; Olguin et al., 2016; Watts et al., 2019). Consequently, BED is associated with higher healthcare costs and utilization and has a substantial impact on the public health system (Agh et al., 2016; Bellows et al., 2015; Olguin et al., 2016; Toulany et al., 2015). As a result of the impact of BED, researchers have petitioned to include BED in future Global Burden of Disease studies (Erskine & Whiteford, 2018).

Descriptions of binge eating can be found as early as 1959 (Stunkard, 1959), yet BED was not recognized as a formal disorder until 2013. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), BED is characterized by a real or perceived loss of control during eating episodes in which large quantities of food are consumed in a discrete period of time (American Psychiatric Association, 2013). Individuals with BED also experience distress over bingeing, and feelings of disgust or guilt are typical. Self-criticism and shame are also common; consequently, individuals with the disorder often eat in isolation to avoid embarrassment and shame. Binge eating disorder presents most frequently in early adulthood (Kessler et al., 2013), though reports
of BED have also been described in early childhood (Smink et al., 2014) and middle and late adulthood (Guerdjikova et al., 2012; Mangweth-Matzek et al., 2016). Binge eating disorder prevalence is less apparent in later life, possibly due to higher rates of mortality associated with the disorder. It has sparsely been studied across the lifespan (Elran-Barak et al., 2015; Luca et al., 2015), however, and late-onset BED has been given little empirical or clinical attention. Additionally, though scholars previously believed eating disorders affect primarily affluent and Caucasian women (Mulders-Jones et al., 2017), recent research suggests BED affects all genders and ethnicities (Lydecker & Grilo, 2016; Udo et al., 2013; Udo et al., 2016).

Despite the wide-reaching prevalence of BED, no clear framework currently exists that accounts for the etiology, maintenance, and protective factors of the disorder. Instead, distinct theories of BED have been offered that largely fail to incorporate a broader systems perspective. Specifically, several prominent frameworks guide most BED research and treatments, but no model comprehensively captures the interconnected systems involved in the disorder. Therefore, studies examining the mechanisms of BED are warranted.

**Prominent Binge Eating Theories**

The most prominent BED theories include dietary restraint, craving, addiction, and affect regulation. According to the *Dietary Restraint Model* of BED (Herman & Polivy, 1980; Stice et al., 2002), binge eating is directly caused by periods of restriction, often due to dieting, that disrupts the body’s regulatory system and causes hunger and loss of control eating. Correlational studies have identified food restriction as a precursor to BED (Jansen, 2016), but there are mixed findings regarding whether dieting or
restricting are causally linked to BED (Spoor et al., 2006; Jansen, 2016). Indeed, individuals often do not actually experience extreme calorie deprivation even when dieting (Schulte et al., 2016). Thus, the effects of bingeing after dieting may be cognitive rather than a biological response to starvation, or at least only part of the picture.

The Craving Model of BED (Lowe et al., 2009) suggests binge eating follows intense cravings for specific foods (Chao et al., 2016; McManus & Waller, 1995). Drawing on escape theory, which posits that individuals engage in helpful or unhelpful behaviors to avoid negative experiences (Heatherton & Baumeister, 1991), binge eating is thought to mitigate distress associated with unpleasant food cravings. Foods high in sugar and fat are typically chosen as they activate reward pathways in the brain (Schulte et al., 2016); cravings for additional high-fat and high-sugar foods result, however, thereby creating a cycle of desiring increased food intake. Biological mechanisms are indicated in this model, such that certain genes (e.g., long allele of dopamine D4 receptor) and hormones (e.g., acyl ghrelin) are associated with greater food cravings and hunger cues (Lek et al., 2018; Sinha et al., 2019).

Similarly, the Food Addiction Model of BED (Treasure et al., 2018) assumes individuals are genetically predisposed to high reward sensitivity and increased impulsivity (Kessler et al., 2016) that lead to high quantities of food consumption. Some evidence supports that individuals with BED have higher motivation for reward seeking, and when other sources of rewards are limited, such as in situations of high stress or unpleasant emotions, palatable foods are chosen to produce rewarding effects (e.g., increases in dopamine, serotonin, and opioids; Cason et al., 2010; Yohn et al., 2019). Like with drug addiction, however, repeated exposure to food reward causes decreases in
dopamine and subsequently habituation to the rewarding effects of palatable foods (Gearhardt et al., 2011; Volkow et al., 2011). Consequently, these high fat and high sugar foods can become addicting as these rewarding effects are recurrently sought out and habit formation occurs (Koob & Volkow, 2016; Volkow et al., 2011). Notably, however, much of the neuroimaging research on BED is correlational and in its infancy, therefore limiting the ability to draw conclusions. Additionally, the craving and food addiction models do not sufficiently account for the common shape and weight concerns often experienced by those with BED (American Psychiatric Association, 2013). Research has also demonstrated that between 40 and 60 percent of individuals with BED meet criteria for food addiction (Gearhardt et al., 2013), suggesting that addiction does not fully explain BED. Therefore, the craving and food addiction models fail to account for key components of BED.

Currently, the Affect Regulation Model (Leehr et al., 2015; Polivy & Herman, 1993) is perhaps the most widely used model of BED. Like the craving and food addiction models, the affect regulation model posits that binge eating serves to draw attention away from emotional distress (e.g., depression, anxiety) and towards a narrower focus on the immediate environment (e.g., food) to regulate negative emotions, presumably because one feels they cannot otherwise tolerate these unpleasant experiences (Dingemans et al., 2017; Mason & Lewis, 2015; Naish et al., 2019). In the past several years, researchers have examined shame in the affect regulation model of BED (Duarte et al., 2017). Shame is characterized as a painful emotion that results from believing the self is “bad” and that the “bad” self is negatively evaluated by others (Lindsay-Hartz, 1984). Shame has been postulated as a distinct mechanism of BED, such that binge eating serves
to mitigate feelings of shame and self-criticism (Craven & Fekete, 2019; Leehr et al., 2015). Researchers have also suggested that binge eating may serve as a way to escape feelings of rejection, inferiority, or ostracism (Duarte et al., 2017). Paradoxically, however, binge eating may also create shame (Duarte et al., 2015). For example, binge eating is associated with feelings of guilt and self-criticism following binge episodes (Duarte et al., 2016; Goss & Gilbert, 2002), thereby leading to a possible cycle in which BED serves to both alleviate but also generate self-criticism and shame (Serpell et al., 2020).

Though the affect regulation model has been well-researched, questions remain regarding the mechanisms involved in BED and affect regulation. Specifically, it is poorly understood why some individuals, but not others, ostensibly cope with negative affect via binge eating. It is possible that shame related to one’s identity (i.e., believing the self is “bad” and is negatively evaluated by others) and beliefs that discomfort is intolerable could explain the relationship between negative affect and binge eating, though this has yet to be identified. Further, though some qualitative and cross-sectional studies have found negative mood and emotion regulation deficits to be associated with proximal binge episodes (Arnow et al., 1992; Bodell et al., 2019; Chua et al., 2004; Svaldi et al., 2019), longitudinal designs and studies using ecological momentary assessment have produced mixed results regarding the impact of mood on BED (Cardi et al., 2015; Evers et al., 2018; Mason et al., 2016). Additionally, based on this model, individuals who are able to generate more positive coping responses to negative emotions would theoretically engage in less (or no) binge eating behavior. Yet cognitive behavior therapies (CBTs) for BED have demonstrated limited effectiveness (Vocks et al., 2010),
and more than half of patients receiving CBTs experience binge eating episodes following treatment (Hilbert et al., 2012; Jackson et al., 2018). Therefore, the limited effectiveness of BED treatments suggests other mechanisms are involved in the disorder.

Taken together, existing BED models offer important insights into the disorder but do not fully account for the mechanisms of binge eating. Indeed, why some individuals engage in binge eating following periods of dietary restraint, negative emotions, or food craving is not yet understood. It is likely that additional mechanisms are involved that explain these relationships. Advances in neuroscience methodologies have demonstrated promising insights into possible mechanisms involved in BED, such as the role of resource depletion and its relationship to cognitive and emotional self-regulation efforts (Dang et al., 2017). Therefore, resource depletion may both compliment and extend upon previous BED theories to explain the processes involved in BED.

Resource Depletion

Self-regulation is the ability to control or alter one’s inner processes and behaviors and is indicated in nearly all components of everyday life, from choosing to get out of bed to keeping one’s thoughts to themselves (Vohs & Baumeister, 2016). Self-regulation is also indicated in one’s ability to discontinue eating, specifically in regard to palatable foods. According to the strength model of self-regulation (Baumeister & Heatherton, 1996), self-regulation depends on a controlled, domain-general resource (for example, across decision-making, emotions, etc.) that can become depleted over time. Thus, the more one attempts to self-regulate, the more impairment in subsequent self-
regulatory efforts may occur. This state of reduced self-regulatory abilities is called resource depletion.

In support of the resource depletion model, researchers have found that individuals who engage in cognitive or emotion self-regulation tasks, such as working on complex puzzles, attempting to control automatic responses, and suppressing emotion, demonstrate impaired self-control and perform more poorly on subsequent tasks (Baumeister et al., 2007; Gailliot et al., 2012; Vohs et al., 2005). Extended engagement in self-regulation via emotion or thought suppression also appears to subsequently impair self-regulation when in social settings, such that individuals who have engaged in emotional suppression demonstrate more behavioral aggression, use more curse words, and disobey instructions (DeWall et al., 2007; Gailliot et al., 2012; Vohs & Fabor, 2007). Engagement in self-regulation also appears to influence food intake, such that increased self-regulation efforts lead to resource depletion and higher consumption of foods (Hagger et al., 2013; Missbach et al., 2014).

Importantly, the mechanisms involved in resource depletion remain contended. For example, some research supports that engaging in self-control tasks reduces blood glucose levels (Gailliot et al., 2007a; Hagger & Chatzisarantis, 2013) and that ingesting glucose counteracts resource depletion (Gailliot et al., 2007b). Other researchers, however, have failed to replicate such studies, and some scholars have suggested a minimal relationship between glucose and resource depletion (Dang, 2016). Instead, it has been suggested that specific brain regions are indicated in this phenomenon. Specifically, self-regulation requires executive functioning skills (Baumeister et al., 2007; Hockey, 2011), and extended use of executive functioning can lead to cognitive fatigue...
(e.g., decreased cognitive processing abilities; Holtzer et al., 2011) which is thought to occur when active muscle fibers in the brain become tired with exertion caused by use of cognitive resources. Consequently, the brain’s inhibition system (comprised of the thalamus and frontal, posterior cingulate, and insular cortices) is activated to suppress cognitive performance to aid in rest, thereby causing cognitive tasks to become more effortful (Tanaka et al., 2014). Notably, chronic stress and prolonged overwork may create lasting cognitive fatigue by extending the activation of the inhibition system. Neuroimaging research has supported that self-regulation efforts reduce functional connectivity among the amygdala and ventromedial prefrontal cortex, thereby impairing one’s ability to engage top–down prefrontal regions in the brain involved in decision-making, planning, judgment, and reasoning (Funahashi; 2017; Wagner & Heatherton, 2012), though this research has not yet been connected specifically to the resource depletion model. Taken together, it appears that blood glucose and neurological underpinnings may each be indicated in resource depletion. It is possible that resource depletion may affect physiological states and/or cognitive states, though future research is warranted. Nonetheless, the effects of resource depletion appear significant. Notably, some researchers have questioned the validity of the effects of resource depletion (Hagger et al., 2016); the studies critiqued did not utilize research designs that led participants to find tasks to be effortful, however, and researchers have since found that resource depletion effects hold up when self-regulation tasks are indeed effortful (see Dang et al., 2017). Therefore, ensuring resource depletion has occurred is essential.
Resource Depletion and BED

Scholars have recently suggested the resource depletion model may apply to BED. Loth and colleagues (2016) proposed that individuals with BED may experience resource depletion due to attempting to limit palatable food intake while also attempting to regulate affect. Consequently, they argue, attempting to control one’s affect and/or regulating food intake may lead to binge eating because self-regulatory processes are fatigued. In support of this theory, research has demonstrated that individuals who seek to restrict food intake consume more snack food following self-regulating tasks compared to individuals who do not seek to restrict food intake (Hagger et al., 2013; Zhou et al., 2017). Thus, it is possible that individuals who attempt to engage in dietary restraint, even in the absence of extreme hunger, experience resource depletion that causes binge eating behavior. Interestingly, researchers have also suggested that resource depletion can be restored via eating (Baumeister & Vohs, 2016; Loth et al., 2016), which may suggest that binge eating could both be the consequence of reduced self-regulation abilities and serve to restore resource depletion.

The resource depletion model of BED may also compliment the affect regulation model, which may explain why this model has gained such traction in BED research. Attempting to control or regulate affect may fatigue self-regulatory processes and make self-regulatory tasks, such as limiting palatable food intake, more difficult. Considering that negative mood and beliefs that discomfort is intolerable (e.g., escape theory; Heatherton & Baumeister, 1991) are both common in BED, these mood states and internal beliefs may lead to resource depletion. Notably, scholars have examined the relationship between “negative mood” and resource depletion and found that negative
mood does indeed deplete self-regulation resources (Heatherton & Wagner, 2011), though the distinct features of negative mood were not examined, making it difficult to identify the nature of this relationship.

**Resource Depletion and Anxiety**

More recently, anxiety in particular has been associated with resource depletion. When high levels of anxiety trigger high levels of self-regulatory processes, cognitive processing may be affected (Cheng & McCarthy, 2018). For example, researchers have found that African American individuals who attempt to regulate anxiety following experiencing stereotype threat (i.e., when a person is concerned about judgment or unfair treatment based on a negative stereotype of the group to which they belong; Spencer et al., 2016) demonstrate reduced executive functioning abilities (Johns et al., 2008; Shewach et al., 2019). Attempts to regulate anxiety and its expression have also been found to impair athletic performance (Englert et al., 2015) and job performance (Cheng & McCarthy, 2018). Further, earlier research demonstrated that individuals who attempted to suppress anxiety experienced reduced self-regulatory behaviors and ate more “comfort foods” (Evers et al., 2010; Taut et al., 2012). No recent research has examined the role of anxiety in resource depletion, however, specifically as it relates to BED.

Importantly, it appears that type of anxiety affects performance and depletion. Anxiety can be motivating when it is related to challenge (Lazarus & Folkman, 1984; Prem et al., 2017). Anxiety related to threat, however, requires more emotional resources to cope (Johns et al., 2008; Didymus & Fletcher, 2014) and has been found to cause cognitive and emotional exhaustion (Palmwood & McBride, 2019). Ego anxiety, or the
belief that one’s personal worth is contingent upon personal achievements and successes as viewed by others (Shorkey & Whiteman, 1993), may be particularly indicated in resource depletion, such that contingent self-esteem is related to poorer self-regulation (Neighbors et al., 2004) and decreased task performance (Crocker & Wolfe, 2001).

Interestingly, anxiety and shame are both common in BED (Duarte et al., 2017; Lawrence & Williams, 2013; Wilson et al., 2021), which may lend credence to earlier work demonstrating the role of threatening self-perceptions in resource depletion. The role of ego anxiety has not been examined, however, in relation to resource depletion or BED.

Discomfort anxiety, or anxiety related to beliefs that feelings of pain or unpleasantness is intolerable, has also been associated with reduced self-regulation abilities (Ellis, 1979; Shorkey & Whiteman, 1993). Higher levels of discomfort anxiety have been related to increased avoidance behaviors, such as use of benzodiazepines, even when controlling for negative affect (Harrington, 2005). As discussed, however, discomfort anxiety has not been specifically examined in a model of BED and resource depletion.

**Guiding Theoretical Framework**

Taken together, it appears that resource depletion may be indicated in BED. Specifically, attempts to restrict palatable food consumption may exhaust self-regulation abilities and lead to resource depletion that results in binge eating. Intrapsychic experiences related to self-image may also deplete resources. For example, self-determination theory (Ryan & Deci, 2000) posits that individuals who perceive themselves as being high in autonomy, competence, and interpersonal relatedness experience strong “inner resources” and resilience; those who perceive themselves as low
in these attributes experience depleted energy resources (Ryan et al., 2006; Vansteenkiste & Ryan, 2013; Vansteenkiste et al., 2020). As such, individuals with high levels of ego anxiety or discomfort anxiety may experience more resource depletion that may in turn relate to BED.

**Current Study**

The current study seeks to examine the role of resource depletion in binge eating. In line with previous research, we anticipate that resource depletion will be related to binge eating behavior. Based on existing theoretical models and research on the effects of anxiety and resource depletion, we also anticipate that ego anxiety will moderate the relationship between resource depletion and binge eating. Likewise, we anticipate that discomfort anxiety will moderate the relationship between resource depletion and binge eating. Finally, we postulate that dietary restraint will moderate the relationship between resource depletion and binge eating (see Figure 1). Importantly, due to the current COVID-19 global pandemic, this study was conducted online. Therefore, food cravings and motivation to eat will each be used as proxy or indirect measures for binge eating, as these variables have been found to predict food intake and to precede binge eating episodes (Drapeau et al., 2007; Marzilli et al., 2018; Meule & Hormes, 2015).
Hypotheses

Primary Hypotheses

1. Increased resource depletion will be related to increased food cravings.

2. Increased resource depletion will be related to increased motivation to eat.

3. Ego anxiety will moderate the relationship between resource depletion and food cravings, such that higher levels of ego anxiety will relate to higher levels of food cravings.

4. Ego anxiety will moderate the relationship between resource depletion and motivation to eat, such that higher levels of ego anxiety will relate to higher levels of motivation to eat.

5. Discomfort anxiety will moderate the relationship between resource depletion and food cravings, such that higher levels of discomfort anxiety will relate to higher levels of food cravings.
6. Discomfort anxiety will moderate the relationship between resource depletion and motivation to eat, such that higher levels of discomfort anxiety will relate to higher levels of motivation to eat.

7. Dietary restraint will moderate the relationship between resource depletion and food cravings, such that higher levels of dietary restraint will relate to higher levels of food cravings.

8. Dietary restraint will moderate the relationship between resource depletion and motivation to eat, such that higher levels of dietary restraint will relate to higher levels of motivation to eat.

**Exploratory Questions**

1. Do certain binge eating symptoms relate more to resource depletion than others?
2. Do certain binge eating symptoms relate more to ego anxiety than others?
3. Do certain binge eating symptoms relate more to discomfort anxiety than others?

**Method**

**Participants**

Participants were recruited through the undergraduate research participant pool (SONA) at the University of Missouri – St. Louis. Participants were also recruited through Amazon Mechanical Turk (MTurk; Buhrmester et al., 2011). University students were provided the option of receiving course credit as compensation for their participation. Participants recruited from MTurk received a $3 Amazon gift card for participation in this study. Participants were required to identify as female and to be 18 years of age or older to participate. A total of 198 participants were recruited for participation in the current study. Contact information was collected from participants to
distribute credit or study compensation if either of these options were chosen; information was stored in a separate file from participant responses and was deleted as soon as study credit or compensation was distributed. Study data were kept confidential, and participants’ identities were not linked or stored with their responses.

Measures

Demographics (see Appendix A). Participants were given a questionnaire requesting demographic information such as age, ethnicity, gender, sexual orientation, body mass index, level of education attained, employment status, and income. Ethnicity was coded as follows: 1 = African American; 2 = Caucasian, White; 3 = Asian/Asian American; 4 = Hispanic/Latinx; 5 = Caucasian, Middle Eastern; 6 = Native Hawaiian or Pacific Islander; 7 = Native American or Alaska Native. Gender was coded as: 1 = Female; 2 = Male; 3 = Transgender; 4 = Gender Non-Binary; 5 = Did not Report. Sexuality was coded as: 1 = Gay/Lesbian; 2 = Heterosexual; 3 = Bisexual; 4 = Pansexual; 5 = Asexual/Ace. Level of education was coded as follows: 1 = Some High School; 2 = High School Diploma/General Educational Development (GED); 3 = Associates Degree; 4 = Four-Year Degree; 5 = Master’s Degree; 6 = Professional/Doctoral Degree. Employment status was coded as follows: 1 = Employed full-time; 2 = Employed part-time; 3 = Employed, but inconsistently; 4 = Unemployed, non-student; 5 = Unemployed, student; 6 = Student. Income was coded as: 1 = Under $20,000; 2 = 20,000-29,999; 3 = 30,000-39,999; 4 = 40,000-49,999; 5 = 50,000-59,999; 6 = 60,000-69,999; 7 = 70,000-79,999; 8 = 80,000-89,999; 9 = 90,000-99,999; 10 = 100,000-109,999; 11 = 110,000-119,999; 12 = 120,000-129,999; 13 = 130,000-139,999; 14 = 140,000-149,999; 15 = 150,000+. Participants were also asked to rate how hungry they feel (on a Likert scale
ranging from 0 = “Not at all hungry” to 4 = “Extremely hungry/feeling famished”) and the length of time in minutes and hours since their most recent food intake.

**Eating Disorder Examination Questionnaire (EDE-Q 6.0; Fairburn & Beglin, 1994; see Appendix B).** Participants completed the restraint subscale of the EDE-Q 6.0 to assess for dietary restraint behaviors over the past 28 days. The dietary restraint subscale is comprised of five items (i.e., “Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight [whether or not you have succeeded]?”) with responses ranging from “0 = no days” to “6 = every day.” The total score is calculated by summing the five item scores and dividing by the number of items to measure overall dietary restraint. Higher scores indicate higher levels of dietary restraint. In the present study, the mean centered score was utilized and created by subtracting the mean score of dietary restraint from each value. The EDE-Q has demonstrated good internal consistency (Peterson et al., 2007), excellent test-retest reliability (Luce & Crowther, 1999), and good concurrent validity (Mond et al., 2004). Cronbach’s α was .96 for the present study.

**Binge Eating Scale (BES; Gormally et al., 1982; see Appendix C).** The BES is a 16-item self-report questionnaire designed to assess binge eating symptomatology specific to behaviors, cognitions, and emotions. The BES provides a series of either three or four statements and instructs individuals to select the statement most fitting to them. Example statements include “0 = I rarely eat so much food that I feel uncomfortably stuffed afterwards”; “1 = Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed”; “2 = I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks”; or “3 = I eat so much food that I
regularly feel quite uncomfortable after eating and sometimes a bit nauseous.” Higher scores indicate more binge eating symptomatology. The BES has demonstrated very good reliability and validity (Duarte et al., 2015) and has demonstrated good ability to discriminate against those with and without BED (Grupski et al., 2013). Cronbach’s α was .94 for the present study.

**Ego and Discomfort Anxiety Inventory (EDAI;** Shorkey & Whiteman, 1993; see Appendix D). The EDAI is a 10-item self-report questionnaire comprised of two subscales: the ego anxiety subscale and the discomfort anxiety subscale. Sample items from the ego anxiety and discomfort anxiety subscales include “What other people think of me is very important” and “It is very hard for me to deal with unpleasant feelings,” respectively. Responses are given on a 5-point Likert scale ranging from “strongly disagree” to “strongly agree,” with higher scores indicating higher levels of anxiety. In the present study, the mean centered scores for ego anxiety and discomfort anxiety were utilized. The mean centered score for ego anxiety was created by subtracting the mean ego anxiety subscale score from each value; the mean centered score for discomfort anxiety was created by subtracting the mean discomfort anxiety subscale score from each value. The EDAI has demonstrated good reliability and validity (Shorkey & Whiteman, 1993; Whiteman & Shorkey, 1994). Cronbach’s α was .92 for the present study.

**Visual analogue scales (VAS;** see Appendix E). Participants completed a series of VAS, each 100mm in length with opposite words on each end, to assess hunger, fullness, satiety, palatability of foods, motivation to eat, and food cravings. Example VAS items for hunger include “I do not feel hungry at all,” anchored on the left end of the scale (0mm) to “I feel extremely hungry,” anchored on the right end of the scale
(100mm), with higher scores indicating more hunger. Example VAS items for satiety include “I feel fully satisfied,” anchored on the left end of the scale (0mm) to “I feel very unsatisfied or ravenous,” anchored on the right end of the scale (100mm), with higher scores indicating less satiety. Example VAS items for palatability of foods include “Not at all appealing, looks disgusting,” anchored on the left end of the scale (0mm) to “Very appealing, looks delicious,” anchored on the right end of the scale (100mm), with higher scores indicating more perceived palatability of foods. Example VAS items for motivation to eat include “How motivated are you to eat something sweet right now?” with “Not at all motivated” anchored on the left end of the scale (0mm) and “Very much motivated” anchored on the right end of the scale (100mm), with higher scores indicating more motivation to eat. Example VAS items for food cravings include “Would you like to eat something sweet?” with “No, not at all” anchored on the left end of the scale (0mm) and “Yes, very much” anchored on the right end of the scale (100mm), with higher scores indicating higher food cravings. Visual analogue scales have been used in previous studies and have demonstrated reliability and validity in appetitive research among young and older adults (Bouëtté et al., 2021; Douglas & Leidy, 2019; Flint et al., 2000; Parker et al., 2004).

**Manipulation check** (see Appendix F). Participants completed two questions assessing the extent to which they felt frustrated and fatigued on Likert scales ranging from 1 (Strongly disagree) to 7 (Strongly agree), as utilized elsewhere (Dang et al., 2017; Hagger et al., 2016). Participants also completed three questions assessing a) their level of effort exerted, b) their level of boredom, and c) the extent to which they felt the writing task was difficult on a Likert scale ranging from 1 (Strongly disagree) to 7
(Strongly agree). Higher scores on each item indicate higher levels of frustration, fatigue, effort exerted, boredom, and perception of difficulty, respectively, and a total composite score combining all item responses was used as a measure of resource depletion. The mean centered score of resource depletion was utilized and created by subtracting the mean total composite resource depletion score from each value. Cronbach’s α was .77 for the present study.

**The Spielberger State Trait Anxiety Inventory-State, 5-Item Version**

(STAIS-5; Spielberger, 1983; Zsido et al., 2020; see Appendix G). The STAIS-5 is a 5-item self-report questionnaire assessing state anxiety. Sample items from the STAIS-5 include “I feel upset” and “I am jittery,” with responses given on a 4-point Likert scale ranging from 1 (Not at all) to 4 (Very much so). Higher scores indicate higher levels of state anxiety. Similar to the full version of the Spielberger State Trait Anxiety Inventory, the STAIS-5 has demonstrated strong reliability and validity (Barnes et al., 2002; Zsido et al., 2020). Cronbach’s α was .89 for the present study.

**Procedure**

This study was completed online due to the current COVID-19 pandemic. Participants received an online informed consent document and indicated consent via electronic signatures. Consenting participants were randomly assigned into one of two conditions: high resource depletion (coded as “1”) and low resource depletion (coded as “0”) by Qualtrics Survey Software. All participants were then instructed to refrain from eating or drinking for the duration of the study (approximately 45 minutes). Next, participants completed the demographic questionnaire, followed by the EDE-Q 6.0
Restraint Subscale, the BES, and the EDAI. Reading checks were also implemented throughout the survey.

Participants randomly assigned to the high resource depletion condition were then given the following prompt: “Please spend the next six minutes writing about a stressful experience you have had, either recently or in the past. Please write the entire six minutes, and be sure to use proper spelling, grammar, and punctuation. If you get to a stuck point, do your best to keep writing. Do not stop writing until the six minutes have ended. Very important! Do not use the letters A or N anywhere in your response. If you find yourself writing a word that includes the letters A or N, please stop writing that word and find an alternate way to express your thoughts.” Notably, research has demonstrated that emotional exhaustion is a form of resource depletion and leads to subsequent difficulty regulating impulsive behavior and emotions (Schmeichel & Baumeister, 2004; Whitman et al., 2014). Research has also demonstrated the requirement to control writing by omitting the letters A and N produces resource depletion (Garrison et al., 2019). Therefore, the resource depletion condition captures both emotional and cognitive self-regulation attempts to produce strong resource depletion effects.

Participants in the control condition were given the following prompt: “Please spend the next six minutes writing about a pleasant experience you have had, either recently or in the past. Do not worry about proper spelling, grammar, or punctuation, just enjoy the process! If you get stuck, do not worry, your story can be short.” This prompt is similar to the control condition used by Garrison and colleagues (2019), though writing about a “pleasant experience” was used in place of writing about a “trip” due to possible
negative emotions that could have been evoked when considering traveling due to the current COVID-19 pandemic.

Following the writing task, all participants completed the five questions in the manipulation check followed by the STAIS-5. Next, participants were shown pictures of three specific food types: fatty foods (e.g., pizza, burger, and fried chicken; see Appendix H), salty foods (e.g., French fries, potato chips, and mixed nuts; see Appendix I), and sweet foods (e.g., cake, cookies, and donuts; see Appendix J). While viewing foods in each category, participants were asked to rate via VAS a) how hungry they feel, b) how satisfied they feel, c) how full they feel, d) how much they would like to eat the food, e) how appealing the food looks, and f) how much of the food they would like to eat. After completion of the study, participants recruited through SONA were directed to a separate link where they could provide their email address to receive study credit. Participants recruited through MTurk were directed to a separate link where they were given a code to receive reimbursement through the Amazon MTurk website. Finally, participants were provided with mental health resources and were thanked for their study participation. Mental health resources included the National Alliance on Mental Illness (2021) and National Eating Disorder Association (2021) websites and crisis hotlines (see Appendix K).

Results

Pilot Data

An initial pilot study was conducted to assess the efficacy of the manipulation to improve study design if warranted. A total of 24 participants ($N = 13$ in the control condition; $N = 11$ in the manipulation condition) were recruited for the pilot study via
SONA. Though the initial pilot data lacked adequate power, comparison of mean scores demonstrated that the manipulation was indeed effective. Specifically, participants in the manipulation group reported higher overall resource depletion ($M = 25.73$) than participants in the control group ($M = 18.08$).

**Preliminary Analyses**

All data analyses were conducted via IBM SPSS Statistics 27. To ensure adequate power, a priori power analyses indicated a total minimal sample size of 134 to produce a power value greater than .80 with a moderate effect size of .25, as recommended by Cohen (1992) and demonstrated elsewhere (Hilbert et al., 2019). These requirements were met in the current study, with main analyses including 169 participants (86 participants in the manipulation condition; 83 participants in the control condition).

**Sample Characteristics**

Demographic and sample characteristics are presented in Table 1. A total of 198 participants enrolled in the present study, with 95 participants recruited from SONA and 103 participants recruited from MTurk. One individual (recruited from SONA) did not give consent to participate in the study, and four of the consenting participants did not give permission for their data to be used for research purposes (n$_{SONA} = 3$; n$_{MTurk} = 1$). A total of 11 participants gave consent but did not participate in the study (n$_{SONA} = 9$; n$_{MTurk} = 3$), and 10 participants did not complete the writing task and subsequent questionnaires (n$_{SONA} = 2$; n$_{MTurk} = 8$). Data were retained when no more than two item responses on a questionnaire were omitted; when mean scores were utilized, the score was divided by the total number of items answered. Based on this criteria, two participants (recruited from SONA) completed the full study but omitted several item responses over the
threshold of acceptability that precluded their data from being included in final analyses.

A total of 169 individuals participated in the present study, with 83 participants in the experimental condition and 86 participants in the control condition.

Table 1

Participant Demographic and Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>M (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in Years</td>
<td>28.2 (9.61)</td>
<td>18 to 62 years</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Transgender</td>
<td>3 (1.8)</td>
<td></td>
</tr>
<tr>
<td>Gender Non-Binary</td>
<td>2 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Did not Report</td>
<td>1 (.6)</td>
<td></td>
</tr>
<tr>
<td>Sexuality</td>
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<td></td>
</tr>
<tr>
<td>Heterosexual</td>
<td>130 (70.6)</td>
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<tr>
<td>Gay/Lesbian</td>
<td>7 (4.1)</td>
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<tr>
<td>Bisexual</td>
<td>26 (15.2)</td>
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</tr>
<tr>
<td>Pansexual</td>
<td>5 (2.9)</td>
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<tr>
<td>Asexual</td>
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<tr>
<td>Ethnicity</td>
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<td></td>
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<tr>
<td>African American</td>
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<tr>
<td>Caucasian, White</td>
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<tr>
<td>Asian/Asian American</td>
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<td>Hispanic/Latinx</td>
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<tr>
<td>Native American or</td>
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<td></td>
</tr>
<tr>
<td>Alaska Native</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>2 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Religion</td>
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<td></td>
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<tr>
<td>Catholic</td>
<td>79 (46.2)</td>
<td></td>
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<tr>
<td>Christian</td>
<td>31 (18.1)</td>
<td></td>
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<tr>
<td>Agnostic</td>
<td>14 (8.2)</td>
<td></td>
</tr>
<tr>
<td>Atheism</td>
<td>14 (8.2)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>14 (8.2)</td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td>Count (%)</td>
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</tr>
<tr>
<td>------------------------------</td>
<td>-----------</td>
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<tr>
<td>Islam</td>
<td>8 (4.7)</td>
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<td>Buddhist</td>
<td>2 (1.2)</td>
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<tr>
<td>Jewish</td>
<td>2 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>1 (.6)</td>
<td></td>
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<tr>
<td>Tribal Religion</td>
<td>1 (.6)</td>
<td></td>
</tr>
<tr>
<td>Coptic Orthodox</td>
<td>1 (.6)</td>
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</tr>
<tr>
<td>Ethiopian Orthodox</td>
<td>1 (.6)</td>
<td></td>
</tr>
<tr>
<td>Spiritual</td>
<td>1 (.6)</td>
<td></td>
</tr>
<tr>
<td>New Religion (Wicca/Scientology)</td>
<td>1 (.6)</td>
<td></td>
</tr>
<tr>
<td>Not Specified</td>
<td>1 (.6)</td>
<td></td>
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<table>
<thead>
<tr>
<th>Education</th>
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<td>Some High School</td>
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</tr>
<tr>
<td>High School Diploma/ GED</td>
<td>15 (8.8)</td>
</tr>
<tr>
<td>Associates Degree</td>
<td>35 (20.5)</td>
</tr>
<tr>
<td>Four-Year Degree</td>
<td>37 (21.6)</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>52 (30.4)</td>
</tr>
<tr>
<td>Professional/Doctoral Degree</td>
<td>28 (16.4)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Employment Status</th>
<th>Count (%)</th>
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</thead>
<tbody>
<tr>
<td>Full-Time</td>
<td>98 (57.3)</td>
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<tr>
<td>Part-Time</td>
<td>39 (22.8)</td>
</tr>
<tr>
<td>Employed Inconsistently</td>
<td>6 (3.5)</td>
</tr>
<tr>
<td>Student</td>
<td>14 (8.2)</td>
</tr>
<tr>
<td>Unemployed, Student</td>
<td>7 (4.1)</td>
</tr>
<tr>
<td>Unemployed, Non-Student</td>
<td>5 (2.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household Income</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $20,000</td>
<td>24 (14)</td>
</tr>
<tr>
<td>20,000-29,999</td>
<td>12 (7)</td>
</tr>
<tr>
<td>30,000-39,999</td>
<td>12 (7)</td>
</tr>
<tr>
<td>40,000-49,999</td>
<td>16 (9.4)</td>
</tr>
<tr>
<td>50,000-59,999</td>
<td>25 (14.6)</td>
</tr>
<tr>
<td>60,000-69,999</td>
<td>12 (7)</td>
</tr>
<tr>
<td>70,000-79,999</td>
<td>8 (4.7)</td>
</tr>
<tr>
<td>80,000-89,999</td>
<td>11 (6.4)</td>
</tr>
<tr>
<td>90,000-99,999</td>
<td>9 (5.3)</td>
</tr>
<tr>
<td>100,000-109,999</td>
<td>18 (10.5)</td>
</tr>
<tr>
<td>110,000-119,999</td>
<td>4 (2.3)</td>
</tr>
<tr>
<td>120,000-129,999</td>
<td>3 (1.8)</td>
</tr>
<tr>
<td>130,000-139,999</td>
<td>4 (2.3)</td>
</tr>
<tr>
<td>140,000-149,999</td>
<td>3 (1.8)</td>
</tr>
<tr>
<td>150,000+</td>
<td>10 (5.8)</td>
</tr>
</tbody>
</table>
Relationship Status
- Single, Never Married: 72 (42.1)
- Single, Cohabitating: 17 (9.9)
- Married: 76 (44.4)
- Divorced/Separated: 2 (1.2)
- Not Specified: 4 (2.3)

Community Setting
- Large City: 60 (35.1)
- Suburb Near Large City: 62 (36.3)
- Small City or Town: 35 (20.5)
- Rural Area: 12 (7)
- Not Specified: 2 (1.2)

Independent t-tests and chi-square analyses were conducted to examine any potential differences between participants who completed the study (coded as “1”) compared to participants who did not complete the study (coded as “0”). Results revealed that participants who completed the study did not significantly differ from participants who did not complete the study across total minutes since last food intake, $t(164) = -.104$, $p = .92$; dietary restraint, $t(169) = .23$, $p = .82$, or binge eating symptomatology, $t(168) = .59$, $p = .55$. Independent t-tests demonstrated that participants recruited from MTurk (coded as “2”) compared to participants recruited from SONA (coded as “1”) were significantly older and reported significantly higher scores across dietary restraint, binge eating symptomatology, discomfort anxiety, resource depletion, state anxiety, food cravings, and motivation to eat (see Table 2).

Table 2

<table>
<thead>
<tr>
<th></th>
<th>SONA Participants</th>
<th>MTurk Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>Mean (SD)</th>
<th>Mean (SD)</th>
<th>Mean (SD)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>23.16 (5.60)</td>
<td>32.57 (10.22)</td>
<td>-7.20 &lt; .001</td>
<td>-1.12</td>
<td></td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>293.28 (289.66)</td>
<td>260.59 (417.11)</td>
<td>.58</td>
<td>.560 .09</td>
<td></td>
</tr>
<tr>
<td>Resource Depletion</td>
<td>20.97 (6.29)</td>
<td>23.35 (7.67)</td>
<td>-2.12 .031 .34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binge Eating Symptomatology</td>
<td>12.98 (8.10)</td>
<td>18.84 (10.86)</td>
<td>-3.97 &lt; .001 .61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary Restraint</td>
<td>1.81 (1.73)</td>
<td>2.64 (1.52)</td>
<td>-3.35 &lt; .001 .51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ego Anxiety</td>
<td>3.29 (1.05)</td>
<td>3.54 (.88)</td>
<td>-1.70 .091 .26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discomfort Anxiety</td>
<td>3.04 (.93)</td>
<td>3.49 (1.01)</td>
<td>-3.0 .003 .46</td>
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<td></td>
</tr>
<tr>
<td>State Anxiety</td>
<td>7.38 (2.65)</td>
<td>10.71 (4.61)</td>
<td>-5.68 &lt; .001 .89</td>
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<td></td>
</tr>
<tr>
<td>Food Craving</td>
<td>41.25 (26.41)</td>
<td>63.05 (26.55)</td>
<td>-5.31 &lt; .001 .82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation to Eat</td>
<td>29.35 (25.36)</td>
<td>60.25 (28.03)</td>
<td>-7.48 &lt; .001 1.16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Resource Depletion = total composite score of items in the manipulation check; Binge Eating Symptomatology = total BES scores; Dietary Restraint = total EDE-Q Dietary Restraint subscale scores; Ego Anxiety = total EDAI Ego Anxiety subscale scores; Discomfort Anxiety = total EDAI Discomfort Anxiety subscale scores; State Anxiety = total STAIS-5 scores; Food Craving = total combined VAS food craving scores; Motivation to Eat = total combined VAS motivation to eat scores.

Chi-square analyses demonstrated a significant difference between recruitment platform on level of education, \( \chi^2(5, N = 169) = 98.70, p < .001 \), such that participants recruited from MTurk were more likely to be employed full-time and less likely to be employed part-time, to have inconsistent employment, and to be a student than those recruited from SONA (see Table 3). Chi-square analyses also demonstrated a significant difference between recruitment platform on level of income, \( \chi^2(14, N = 171) = 32.15, p = .004 \), such that participants recruited from MTurk were more likely to report higher
income brackets than those recruited from SONA (see Table 4). There was not a
significant relationship between recruitment platform and gender, $X^2(4, N = 171) = 5.73,$
$p = .13$ (see Table 5).

Table 3

*Chi-Square Tests of Recruitment Platform by Employment Status*

<table>
<thead>
<tr>
<th></th>
<th>SONA Participants</th>
<th>MTurk Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$ (%)</td>
<td>$n$ (%)</td>
</tr>
<tr>
<td>Full-Time</td>
<td>19 (11.2)</td>
<td>79 (46.7)</td>
</tr>
<tr>
<td>Part-Time</td>
<td>34 (20.1)</td>
<td>5 (3.0)</td>
</tr>
<tr>
<td>Inconsistent Employment</td>
<td>6 (3.5)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>2 (1.1)</td>
<td>3 (1.8)</td>
</tr>
<tr>
<td>Unemployed, Student</td>
<td>7 (4.1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Student</td>
<td>14 (8.3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>82 (48.5)</td>
<td>87 (51.5)</td>
</tr>
</tbody>
</table>

Table 4

*Chi-Square Tests of Recruitment Platform by Income*

<table>
<thead>
<tr>
<th></th>
<th>SONA Participants</th>
<th>MTurk Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$ (%)</td>
<td>$n$ (%)</td>
</tr>
<tr>
<td>Under $20,000</td>
<td>18 (10.5)</td>
<td>6 (3.5)</td>
</tr>
<tr>
<td>$20,000-29,999</td>
<td>8 (4.7)</td>
<td>4 (2.3)</td>
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<tr>
<td>$30,000-39,999</td>
<td>8 (4.7)</td>
<td>4 (2.3)</td>
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<tr>
<td>$40,000-49,999</td>
<td>6 (3.5)</td>
<td>10 (5.8)</td>
</tr>
<tr>
<td>Income Range</td>
<td>SONA Participants</td>
<td>MTurk Participants</td>
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<tr>
<td>-------------------</td>
<td>-------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>$50,000-59,999</td>
<td>7 (4.1)</td>
<td>18 (10.5)</td>
</tr>
<tr>
<td>$60,000-69,999</td>
<td>2 (1.2)</td>
<td>10 (5.8)</td>
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<tr>
<td>$70,000-79,999</td>
<td>4 (2.3)</td>
<td>4 (2.3)</td>
</tr>
<tr>
<td>$80,000-89,999</td>
<td>3 (1.7)</td>
<td>8 (4.7)</td>
</tr>
<tr>
<td>$90,000-99,999</td>
<td>4 (2.3)</td>
<td>5 (2.9)</td>
</tr>
<tr>
<td>$100,000-109,999</td>
<td>8 (4.7)</td>
<td>10 (5.8)</td>
</tr>
<tr>
<td>$110,000-119,999</td>
<td>0 (0)</td>
<td>4 (2.3)</td>
</tr>
<tr>
<td>$120,000-129,999</td>
<td>1 (.6)</td>
<td>2 (1.2)</td>
</tr>
<tr>
<td>$130,000-139,999</td>
<td>3 (1.7)</td>
<td>1 (.6)</td>
</tr>
<tr>
<td>$140,000-149,999</td>
<td>3 (1.7)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>$150,000+</td>
<td>7 (4.1)</td>
<td>3 (1.7)</td>
</tr>
<tr>
<td>Total</td>
<td>82 (48.0)</td>
<td>89 (52.0)</td>
</tr>
</tbody>
</table>

*Note: 1 = Under $20,000; 2 = $20,000-29,999; 3 = $30,000-39,999; 4 = $40,000-49,999; 5 = $50,000-59,999; 6 = $60,000-69,999; 7 = $70,000-79,999; 8 = $80,000-89,999; 9 = $90,000-99,999; 10 = $100,000-109,999; 11 = $110,000-119,999; 12 = $120,000-129,999; 13 = $130,000-139,999; 14 = $140,000-149,999; 15 = $150,000+.*

**Table 5**

*Chi-Square Tests of Recruitment Platform by Gender*
Independent t-tests and chi-square analyses were conducted to examine any potential differences between participants in the experimental condition compared to participants in the control condition. Results revealed that participants in the experimental condition did not significantly differ from participants in the control condition across age, \( t(162) = -.90, p = .369 \); income, \( t(167) = -.015, p = .988 \); total minutes since last food intake, \( t(162) = -.729, p = .467 \); dietary restraint, \( t(167) = .813, p = .417 \); binge eating symptomatology, \( t(166) = 1.309, p = .192 \); ego anxiety, \( t(167) = .809, p = .420 \); discomfort anxiety, \( t(167) = .920, p = .359 \); or state anxiety, \( t(167) = -1.270, p = .206 \). Chi-square analyses did not reveal a significant difference between participants in the experimental condition compared to participants in the control condition on gender, \( \chi^2(3, N = 169) = 3.582, p = .310 \); sexuality, \( \chi^2(4, N = 168) = 5.629, p = .229 \); ethnicity, \( \chi^2(7, N = 169) = 5.833, p = .559 \); level of education, \( \chi^2(5, N = 167) = 2.864, p = .721 \); or employment status, \( \chi^2(5, N = 167) = 6.186, p = .289 \).

**Data Normality and Outliers**

Z-scores were generated for each dependent measure’s total score to assist in the detection of univariate outliers. No z-scores greater than, less than, or equal to ±3 were observed for food cravings, motivation to eat, and state anxiety. Data skewness and kurtosis were evaluated via histograms and Shapiro-Wilk statistics to assess for univariate normality for dependent variables. Results suggested the data were not normally distributed across the dependent variables for food cravings, \( W(167) = .870, p < \)
.001, and motivation to eat, $W(167) = .955, p < .001$. Neither Log10 nor square-root transformations improved normality ($ps < .001$). Analysis of homoscedasticity via P-P and scatter plots, however, demonstrated normal and homoscedastic error terms, suggesting that the data were appropriate for regression models (Berry & Feldman, 1985; Osborne & Waters, 2002).

An independent t-test demonstrated a significant difference in group means of resource depletion (as measured via the total composite score of items in the manipulation check) between the experimental and control conditions. Specifically, compared to the control group ($M = 19.45$) participants in the experimental group ($M = 25.15$) demonstrated significantly higher resource depletion, $t(166) = -5.62, p < .001$, and the effect was large ($d = .87$). An independent t-test comparing group means of state anxiety (as measured via the STAIS-5) between the experimental group ($M = 9.54$) and control group ($M = 8.73$) was not significant, $t(167) = -1.27, p = .479$, and the effect was small ($d = .20$).

A multiple regression with dietary restraint, ego anxiety, and discomfort anxiety as the independent variables (IVs) and food cravings as the dependent variable (DV) demonstrated minimal multicollinearity among variables (all VIF scores < 5). Likewise, a multiple regression with dietary restraint, ego anxiety, and discomfort anxiety as the IVs and motivation to eat as the DV demonstrated minimal multicollinearity among variables (all VIF scores < 5). A correlation analysis was conducted to examine if binge eating symptomatology (as measured by the BES) was significantly related to motivation to eat and food cravings. Results indicated BES scores were significantly related to motivation
to eat, \( r(166) = .203, p = .009 \), and to food cravings, \( r(166) = .206, p = .008 \). Therefore, BES scores were used as a control variable in the main analyses.

A correlation matrix was also conducted to examine if binge eating symptomatology (as measured via the BES) relates to resource depletion, ego anxiety, and/or discomfort anxiety. Results from a Pearson correlation demonstrated a positive correlation between binge eating symptomatology and resource depletion, \( r(164) = .25, p < .001 \). Results also demonstrated a positive correlation between binge eating symptomatology and ego anxiety, \( r(166) = .34, p < .001 \), and between binge eating symptomatology and discomfort anxiety, \( r(166) = .47, p < .001 \) (see Table 6).

**Table 6**

*Correlations among Binge Eating Symptomatology, Resource Depletion, Ego Anxiety, and Discomfort Anxiety*

<table>
<thead>
<tr>
<th>Measures</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Binge Eating Symptomatology</td>
<td>16.01</td>
<td>10.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ego Anxiety</td>
<td>3.43</td>
<td>.97</td>
<td>.34**</td>
<td>.28**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Discomfort Anxiety</td>
<td>3.28</td>
<td>1.00</td>
<td>.47**</td>
<td>.31**</td>
<td>.71**</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* **p < 0.001; M = Mean; SD = Standard deviation.*

**Main Analyses**

**Hypotheses 1-4:** It was hypothesized that increased resource depletion (as measured via the total composite score of the manipulation check) would be related to both increased food cravings (as measured via total combined VAS scores; *Hypothesis 1*) and increased motivation to eat (as measured via total combined VAS scores; *Hypothesis*
2). It was also hypothesized that ego anxiety (as measured by the EDAI Ego Anxiety Subscale) would moderate the relationship between resource depletion and food cravings (Hypothesis 3) and resource depletion and motivation to eat (Hypothesis 4). Hierarchical multiple regression analysis with an interaction term was used to examine if ego anxiety moderates the relationship between resource depletion and food cravings while controlling for binge eating symptomatology (as measured via total BES scores) and last time of food intake (as measured via the total number of minutes since last food intake).

Ego anxiety and resource depletion were each centered, as recommended by Howell (2013). Total BES scores and total minutes since last time of food intake were each entered into Block 1 of the regression; centered resource depletion and centered ego anxiety were each entered into Block 2; and a third interaction variable of centered resource depletion*centered ego anxiety was entered into Block 3, as recommended by Baron & Kenny (1986). The hierarchical multiple regression of model 3 was significant, $F(5, 155) = 2.96, p = .014$, though an interaction between resource depletion and ego anxiety was not significant ($p = .680$). Thus, Hypothesis 3 was not supported.

Independently, higher ego anxiety significantly related to higher food cravings, $t(4, 156) = 2.50, p = .013$, $R^2 = .09$, but resource depletion did not significantly relate to food cravings, $t(5, 155) = -.19, p = .852$ (see Table 7). Hypothesis 1 was therefore not supported.

Table 7

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\beta$</th>
<th>$t$ value</th>
<th>$p$</th>
</tr>
</thead>
</table>

**Hierarchical Multiple Regression Analyses Predicting Food Cravings with Ego Anxiety as a Moderating Variable**
Step 1

<table>
<thead>
<tr>
<th>BES Scores</th>
<th>.54</th>
<th>2.46</th>
<th>.015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.009</td>
<td>1.48</td>
<td>.141</td>
</tr>
</tbody>
</table>

Step 2

<table>
<thead>
<tr>
<th>BES Scores</th>
<th>.35</th>
<th>1.48</th>
<th>.142</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.58</td>
<td>.117</td>
</tr>
<tr>
<td>Centered Resource Depletion</td>
<td>-.06</td>
<td>-.18</td>
<td>.855</td>
</tr>
<tr>
<td>Centered Ego Anxiety</td>
<td>6.18</td>
<td>2.50</td>
<td>.014</td>
</tr>
</tbody>
</table>

Step 3

<table>
<thead>
<tr>
<th>BES Scores</th>
<th>.35</th>
<th>1.46</th>
<th>.145</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.56</td>
<td>.120</td>
</tr>
<tr>
<td>Centered Resource Depletion</td>
<td>-.06</td>
<td>-1.49</td>
<td>.852</td>
</tr>
<tr>
<td>Centered Ego Anxiety</td>
<td>-.44</td>
<td>-.19</td>
<td>.013</td>
</tr>
<tr>
<td>Centered Resource Depletion*</td>
<td>.13</td>
<td>.41</td>
<td>.680</td>
</tr>
<tr>
<td>Centered Ego Anxiety</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Standardized beta and t scores are reported. Hierarchical multiple regression analysis with an interaction term was also used to examine if ego anxiety moderates the relationship between resource depletion and motivation to eat while controlling for binge eating symptomatology and last time of food intake. Total BES scores and total minutes since last time of food intake were each entered into Block 1 of the regression; centered resource depletion and centered ego anxiety were each entered into Block 2; and a third interaction variable of centered resource depletion*centered ego anxiety was entered into Block 3. The hierarchical
multiple regression of model 3 was significant, $F(5, 155) = 2.92, p = .015$, though an interaction between resource depletion and ego anxiety was not significant ($p = .176$). Thus, Hypothesis 4 was not supported. Main effects were not significant for resource depletion on motivation to eat, $t(4, 156) = .26, p = .792$, or for resource depletion on ego anxiety, $t(4, 156) = 1.71, p = .090$ (see Table 8). Hypothesis 2 was therefore not supported.

**Table 8**

*Hierarchical Multiple Regression Analyses Predicting Motivation to Eat with Ego Anxiety as a Moderating Variable*

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\beta$</th>
<th>$t$ value</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.59</td>
<td>2.49</td>
<td>.014</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.79</td>
<td>.075</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.42</td>
<td>1.65</td>
<td>.102</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.88</td>
<td>.062</td>
</tr>
<tr>
<td>Centered Resource Depletion</td>
<td>.09</td>
<td>.26</td>
<td>.792</td>
</tr>
<tr>
<td>Centered Ego Anxiety</td>
<td>4.61</td>
<td>1.71</td>
<td>.090</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.41</td>
<td>1.62</td>
<td>.108</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.85</td>
<td>.066</td>
</tr>
<tr>
<td>Centered Resource Depletion</td>
<td>.09</td>
<td>.25</td>
<td>.801</td>
</tr>
<tr>
<td>Centered Ego Anxiety</td>
<td>5.20</td>
<td>1.91</td>
<td>.058</td>
</tr>
</tbody>
</table>
Hypotheses 5-6. It was hypothesized that discomfort anxiety would moderate the relationship between resource depletion and food cravings (Hypothesis 5) and resource depletion and motivation to eat (Hypothesis 6). Hierarchical multiple regression analysis with an interaction term was used to examine if discomfort anxiety (as measured by the EDAI Discomfort Anxiety Subscale) moderates the relationship between resource depletion and food cravings while controlling for binge eating symptomatology and last time of food intake. Total BES scores and total minutes since last time of food intake were each entered into Block 1 of the regression; centered resource depletion and centered discomfort anxiety were each entered into Block 2; and a third interaction variable of centered resource depletion*centered discomfort anxiety was entered into Block 3. The hierarchical multiple regression of model 3 was significant, $F(5, 155) = 5.28, p < .001$, though an interaction between resource depletion and discomfort anxiety was not significant ($p = .239$). Independently, higher discomfort anxiety significantly related to higher food cravings, $t(4, 156) = 3.99, p < .001$, $R^2 = .15$, but resource depletion did not significantly relate to food cravings, $t(4, 156) = -.57, p = .570$ (see Table 9). Therefore, Hypothesis 5 was not supported.

Table 9

Hierarchical Multiple Regression Analyses Predicting Food Cravings with Discomfort Anxiety as a Moderating Variable

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\beta$</th>
<th>$t$ value</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centered Resource Depletion*Centered</td>
<td>.45</td>
<td>1.36</td>
<td>.176</td>
</tr>
</tbody>
</table>

Note. Standardized beta and t scores are reported.
Hierarchical multiple regression analysis with an interaction term was also used to examine if discomfort anxiety moderates the relationship between resource depletion and motivation to eat while controlling for binge eating symptomatology and last time of food intake. Total BES scores and total minutes since last time of food intake were each entered into Block 1 of the regression; centered resource depletion and centered discomfort anxiety were each entered into Block 2; and a third interaction variable of centered resource depletion*centered discomfort anxiety was entered into Block 3. The

<table>
<thead>
<tr>
<th>Step 1</th>
<th>BES Scores</th>
<th>Minutes Since Last Food Intake</th>
<th>Centered Resource Depletion</th>
<th>Centered Discomfort Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.54</td>
<td>2.46</td>
<td>-.18</td>
<td>9.99</td>
</tr>
<tr>
<td></td>
<td>.01</td>
<td>1.48</td>
<td>-.18</td>
<td>3.99</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2</th>
<th>BES Scores</th>
<th>Minutes Since Last Food Intake</th>
<th>Centered Resource Depletion</th>
<th>Centered Discomfort Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.10</td>
<td>.41</td>
<td>-.18</td>
<td>9.99</td>
</tr>
<tr>
<td></td>
<td>.01</td>
<td>1.81</td>
<td>-.18</td>
<td>3.99</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3</th>
<th>BES Scores</th>
<th>Minutes Since Last Food Intake</th>
<th>Centered Resource Depletion</th>
<th>Centered Discomfort Anxiety</th>
<th>Centered Resource Depletion*Centered Discomfort Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.06</td>
<td>.24</td>
<td>-.14</td>
<td>10.35</td>
<td>10.35</td>
</tr>
<tr>
<td></td>
<td>.01</td>
<td>1.83</td>
<td>-.14</td>
<td>4.11</td>
<td>4.11</td>
</tr>
</tbody>
</table>

Note. Standardized beta and t scores are reported.
hierarchical multiple regression revealed a significant interaction between resource
depletion and discomfort anxiety on motivation to eat, $F(5, 155) = 5.31, p < .001$, such
that higher discomfort anxiety strengthened the positive relation between resource
depletion and motivation to eat ($R^2 = .15$; see Table 10). Therefore, Hypothesis 6 was
supported. Simple slopes for the relationship between resource depletion and motivation
to eat were examined for low (-1 standard deviation [SD] below the mean), moderate
(mean), and high (+1 SD above the mean) levels of discomfort anxiety using PROCESS
macro by Hayes (2018). The slope for +1 SD was positive but non-significant, $B = .57,$
$t(166) = 1.25, p = .213$. The slope for the mean was negative and non-significant, $B = -
.01, t(166) = -.01, p = .996$. The slope for -1 SD was negative and non-significant, $B = -
.57, t(166) = -1.39, p = .168$. Examination of differences between slopes revealed that the
slope for +1 SD was significantly different from the slope for -1 SD ($p = .001$; see Figure
2).

Table 10

**Hierarchical Multiple Regression Analyses Predicting Motivation to Eat with Discomfort
Anxiety as a Moderating Variable**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\beta$</th>
<th>$t$ value</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.59</td>
<td>2.49</td>
<td>.014</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.79</td>
<td>.075</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.16</td>
<td>.61</td>
<td>.542</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>2.09</td>
<td>.038</td>
</tr>
</tbody>
</table>
Centered Resource Depletion  
-0.05  -0.14  .888

Centered Discomfort Anxiety  
9.21  3.36  < .001

**Step 3**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BES Scores</td>
<td>0.09</td>
<td>0.33</td>
<td>0.746</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>0.01</td>
<td>2.14</td>
<td>0.034</td>
</tr>
<tr>
<td>Centered Resource Depletion</td>
<td>0.04</td>
<td>0.11</td>
<td>0.913</td>
</tr>
<tr>
<td>Centered Discomfort Anxiety</td>
<td>9.92</td>
<td>3.64</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Centered Resource Depletion * Centered</td>
<td>.59</td>
<td>2.11</td>
<td>0.036</td>
</tr>
</tbody>
</table>

Discomfort Anxiety

*Note.* Standardized beta and t scores are reported.

**Figure 2**

*Simple Slopes Interaction for Resource Depletion by Discomfort Anxiety on Motivation to Eat*
Note. TotMoEa = total motivation to eat; ResDeTot = resource depletion total score.

Hypotheses 7-8. It was hypothesized that dietary restraint (as measured by the EDE-Q 6.0 Restraint Subscale) would moderate the relationship between resource depletion and food cravings (Hypothesis 7) and resource depletion and motivation to eat (Hypothesis 8). Hierarchical multiple regression analysis with an interaction term was used to examine if dietary restraint moderates the relationship between resource depletion and food cravings while controlling for binge eating symptomatology and last time of food intake. Total BES scores and total minutes since last time of food intake were each entered into Block 1 of the regression; centered resource depletion and centered dietary restraint were each entered into Block 2; and a third interaction variable of centered resource depletion*centered dietary restraint was entered into Block 3. The hierarchical multiple regression revealed a significant interaction between resource depletion and dietary restraint on food cravings, $F(5, 155) = 2.77, p = .020$, such that higher dietary restraint strengthened the positive relation between resource depletion and food cravings ($R^2 = .08$; see Table 11). Thus, Hypothesis 7 was supported. Simple slopes for the relationship between resource depletion and food cravings were examined for low (-1 SD below the mean), moderate (mean), and high (+1 SD above the mean) levels of dietary restraint using PROCESS macro by Hayes (2018). The slope for +1 SD was positive and significant, $B = .93, t(166) = 2.26, p = .025$, such that as both resource depletion and dietary restraint increased, food cravings increased. The slope for the mean was positive but non-significant, $B = .22, t(166) = .73, p = .465$. The slope for -1 SD was negative and non-significant, $B = -.48, t(166) = -1.13, p = .260$ (see Figure 3). As both resource depletion and dietary restraint increased, food cravings increased. At high resource
depletion but low dietary restraint, food cravings decreased; at low resource depletion and high dietary restraint, food cravings also decreased. Participants with high resource depletion and high dietary restraint had the highest food cravings (see Figure 3).

**Table 11**

*Hierarchical Multiple Regression Analyses Predicting Food Cravings with Dietary Restraint as a Moderating Variable*

<table>
<thead>
<tr>
<th>Predictors</th>
<th>β</th>
<th>t value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.54</td>
<td>2.46</td>
<td>.015</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.48</td>
<td>.141</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.47</td>
<td>1.92</td>
<td>.056</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.52</td>
<td>.132</td>
</tr>
<tr>
<td>Centered Resource Depletion</td>
<td>.13</td>
<td>.40</td>
<td>.693</td>
</tr>
<tr>
<td>Centered Dietary Restraint</td>
<td>.86</td>
<td>.60</td>
<td>.552</td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.37</td>
<td>1.52</td>
<td>.131</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.63</td>
<td>.106</td>
</tr>
<tr>
<td>Centered Resource Depletion</td>
<td>.14</td>
<td>.45</td>
<td>.651</td>
</tr>
<tr>
<td>Centered Dietary Restraint</td>
<td>.71</td>
<td>.50</td>
<td>.622</td>
</tr>
<tr>
<td>Centered Resource Depletion*Centered Dietary Restraint</td>
<td>.41</td>
<td>2.26</td>
<td>.025</td>
</tr>
</tbody>
</table>

*Note.* Standardized beta and t scores are reported.
Hierarchical multiple regression analysis with an interaction term was also used to examine if dietary restraint moderates the relationship between resource depletion and motivation to eat while controlling for binge eating symptomatology and last time of food intake. Total BES scores and total minutes since last time of food intake were each entered into Block 1 of the regression; centered resource depletion and centered dietary restraint were each entered into Block 2; and a third interaction variable of centered resource depletion*centered dietary restraint was entered into Block 3. The hierarchical multiple regression revealed a significant interaction between resource depletion and dietary restraint on motivation to eat, $F(5, 155) = 3.80, p = .003$, such that higher dietary restraint strengthened the positive relation between resource depletion and motivation to eat ($R^2 = .11$; see Table 12). Therefore, Hypothesis 8 was supported. Simple slopes for
the relationship between resource depletion and motivation to eat were examined for low (-1 SD below the mean), moderate (mean), and high (+1 SD above the mean) levels of dietary restraint using PROCESS macro by Hayes (2018). The slope for +1 SD was positive and significant, $B = 1.07, t(166) = 2.43, p = .016$, such that as both resource depletion and dietary restraint increased, motivation to eat increased. The slope for the mean was positive but non-significant, $B = .29, t(166) = .88, p = .382$. The slope for -1 SD was negative and non-significant, $B = -.51, t(166) = -1.10, p = .275$ (see Figure 4). As both resource depletion and dietary restraint increased, motivation to eat increased. At high resource depletion but low dietary restraint, motivation to eat decreased; at low resource depletion and high dietary restraint, motivation to eat also decreased. Participants with high resource depletion and high dietary restraint had the highest motivation to eat (see Figure 4). In total, Hypotheses 6, 7, and 8 were supported, and Hypotheses 1-5 were not supported (see Table 13).

**Table 12**

*Hierarchical Multiple Regression Analyses Predicting Motivation to Eat with Dietary Restraint as a Moderating Variable*

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\beta$</th>
<th>$t$ value</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.59</td>
<td>2.49</td>
<td>.014</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.79</td>
<td>.075</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES Scores</td>
<td>.40</td>
<td>1.53</td>
<td>.127</td>
</tr>
<tr>
<td>Minutes Since Last Food Intake</td>
<td>.01</td>
<td>1.91</td>
<td>.058</td>
</tr>
</tbody>
</table>
Centered Resource Depletion & .26 & .74 & .460 \\
Centered Dietary Restraint & 2.58 & 1.67 & .098 \\

Step 3

BES Scores & .29 & 1.10 & .273 \\
Minutes Since Last Food Intake & .01 & 2.04 & .043 \\
Centered Resource Depletion & .28 & .81 & .420 \\
Centered Dietary Restraint & 2.40 & 1.57 & .118 \\
Centered Resource Depletion*Centered Dietary Restraint & .47 & 2.46 & .015 \\

Dietary Restraint

Note. Standardized beta and t scores are reported.

Figure 4

Simple Slopes Interaction for Resource Depletion by Dietary Restraint on Motivation to Eat

![Graph showing interaction between Resource Depletion and Dietary Restraint on Motivation to Eat]
Note. TotMoEa = total motivation to eat; ResDeTot = resource depletion total score.

Table 13

*Primary Hypotheses Listed as Supported or Unsupported*

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Supported</th>
<th>Unsupported</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypothesis 1.</strong> Increased resource depletion will be related to increased food cravings.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Hypothesis 2.</strong> Increased resource depletion will be related to increased motivation to eat.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Hypothesis 3.</strong> Ego anxiety will moderate the relationship between resource depletion and food cravings, such that higher levels of ego anxiety will relate to higher levels of food cravings.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Hypothesis 4.</strong> Ego anxiety will moderate the relationship between resource depletion and motivation to eat, such that higher levels of ego anxiety will relate to higher levels of motivation to eat.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Hypothesis 5.</strong> Discomfort anxiety will moderate the relationship between resource depletion and food cravings, such that higher levels of discomfort anxiety will relate to higher levels of food cravings.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Hypothesis 6.</strong> Discomfort anxiety will moderate the relationship between resource depletion and motivation to eat, such that higher levels of discomfort anxiety will relate to higher levels of motivation to eat.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Hypothesis 7.</strong> Dietary restraint will moderate the relationship between resource depletion and food cravings, such that higher levels of dietary restraint will relate to higher levels of food cravings.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Hypothesis 8.</strong> Dietary restraint will moderate the relationship between resource depletion and motivation to eat, such that higher levels of</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
dietary restraint will relate to higher levels of motivation to eat.

**Exploratory Questions**

The initial planned exploratory analyses were not feasible in the present study due to the high risk of Type 1 error. Specifically, correlating each of the 16 BES items to resource depletion, ego anxiety, and discomfort anxiety posed the risk of inflated false positive results. Further, conducting exploratory factor analyses with these variables was beyond the scope of the present study. As such, to further understand the relation between specific binge eating symptoms and resource depletion, ego anxiety, and discomfort anxiety, the BES was divided into two subscales: BES behavioral items and BES emotions/cognitions items, as demonstrated elsewhere (Hood et al., 2013; see Appendix L). Specifically, each item in the BES was coded as related to behaviors (e.g., “At times, I tend to eat quickly and then, I feel uncomfortably full afterwards”) or emotions/cognitions (e.g., “I have days when I can’t seem to think about anything else but food”) to better understand if binge eating behaviors or emotions/cognitions may relate more to resource depletion, ego anxiety, and/or discomfort anxiety. An additional correlation matrix was then conducted with each of the two BES subscales. Results from the Pearson correlation demonstrated a positive correlation between binge eating behaviors and ego anxiety, $r(168) = .33, p < .001$, and between binge eating behaviors and discomfort anxiety, $r(168) = .47, p < .001$. Binge eating behaviors were also positively correlated to resource depletion, $r(167) = .26, p < .001$. Additionally, the Pearson correlation demonstrated a positive correlation between binge eating emotions/cognitions and ego anxiety, $r(168) = .34, p < .001$, and between binge eating
emotions/cognitions and discomfort anxiety, \(r(168) = .44, p < .001\). Binge eating emotions/cognitions were also positively correlated to resource depletion, \(r(167) = .23, p = .003\). The difference in the strength in binge eating behaviors compared to binge eating emotions/cognitions and ego anxiety was non-significant \((z = -1.52, p = .129)\). Likewise, the difference in the strength in binge eating behaviors compared to binge eating emotions/cognitions and discomfort anxiety was non-significant \((z = .34, p = .734)\). The difference in the strength in binge eating behaviors compared to binge eating emotions/cognitions and resource depletion was also non-significant \((z = .29, p = .772)\).

**Discussion**

Binge eating disorder is associated with significant physical and mental health issues, yet the exact etiology and maintaining factors of the disorder remain poorly understood. Elucidating the mechanisms involved in BED is therefore necessary to inform treatments and prevention efforts to mitigate the physical, mental health, and financial burdens that often accompany the disorder. The aim of the present study was to examine if resource depletion may be one such mechanism of binge eating. Ego anxiety, discomfort anxiety, and dietary restraint were also examined to better understand their relation to resource depletion and binge eating behavior.

**Main Analyses**

The current study measured binge eating behaviors (via visual analogue scales) in participants following either high or low resource depletion writing tasks. Participants in the high resource depletion condition experienced significantly higher resource depletion than those in the low resource depletion condition, indicating the manipulation was successful. Although resource depletion did not independently predict binge eating
behaviors (via food cravings and motivation to eat), dietary restraint moderated the relationship between resource depletion and binge eating behaviors. Thus, Hypotheses 7 and 8 were supported, though Hypotheses 1 and 2 were not supported.

Participants who reported higher dietary restraint and higher resource depletion reported higher food cravings compared to those with lower dietary restraint and lower resource depletion. Participants who reported higher dietary restraint and higher resource depletion also reported higher motivation to eat compared to those with lower dietary restraint and lower resource depletion. Notably, resource depletion was associated with food cravings and motivation to eat only for participants who reported high dietary restraint. These results align with previous research that food restriction often precedes binge eating (Jansen, 2016). Results extend upon previous research, however, by elucidating resource depletion as a mechanism by which this relationship exists. Indeed, total time since last food intake was controlled in the current study, such that participants’ time since last food consumption was held constant. Therefore, it appears binge eating behaviors may be indirectly related to exhausted self-regulation abilities from attempting to limit palatable food intake, as scholars have previously suggested but did not directly measure or evidence (Loth et al., 2016; Schulte et al., 2016). The effects of these relationships were small, indicating additional mechanisms are important in binge eating behaviors. Nonetheless, this is the first study to our knowledge to demonstrate that the effects of dietary restraint may be more cognitive in nature than a biological response to hunger.

Discomfort anxiety also moderated the relationship between resource depletion and motivation to eat, supporting Hypothesis 6. Participants with higher discomfort
anxiety who experienced higher resource depletion reported higher motivation to eat than participants who experienced lower resource depletion. Though slopes were not significant at the examined levels (-1 and +1 standard deviations and the mean), high resource depletion had great impact at high levels of discomfort anxiety. Previous studies have postulated that binge eating serves as an escape from discomfort anxiety (Heatherton & Baumeister, 1991), yet the present study specifies a mechanism through which this relation exists. Specifically, it appears that individuals with discomfort anxiety may be continuously attempting to self-regulate this anxiety rather than seeking to escape unpleasant experiences. When additional stressors occur (e.g., a stressful writing task), motivation to eat palatable foods may increase as self-regulatory abilities are further fatigued. Although “negative mood” has been examined in resource depletion (Heatherton & Wagner, 2011), this study specifies discomfort anxiety as an emotional state involved in the disorder. Although the effect of this relationship was small, these results offer promising insights into the potential mechanisms of discomfort anxiety and resource depletion in binge eating.

Discomfort anxiety did not moderate the relationship between resource depletion and food cravings; thus, Hypothesis 5 was not supported. Higher discomfort anxiety predicted higher food cravings independently, however, suggesting that the mechanism through which discomfort anxiety relates to food cravings may not be resource depletion. Though resource depletion may indeed be unrelated to food cravings, it is possible that the measures utilized in the present study did not adequately capture this experience. Specifically, in order to minimize “priming” effects, participants were asked to rate the extent to which they would like to eat the presented foods (e.g., salty, savory, and sweet
foods) rather than to rate their food cravings explicitly. Motivation to eat, on the other hand, was stated directly (i.e., “How motivated are you to eat something [savory]?”) It is possible these indirect and direct statements affected participants’ responses. Though this wording has been utilized in previous studies (Douglas & Leidy, 2019), future research should identify the most appropriate measures of food cravings and motivation to eat as they relate to BED.

It is also possible that motivation to eat and food cravings may be related but separate constructs as they relate to binge eating. One theory of motivation posits that motivation includes decision-making and executive control processing (associated with the anterior cingulate cortex) to determine approach or withdrawal behavior (Kim, 2013). Food craving, in contrast, may engage lower level brain regions involved in emotion and memory, such as the amygdala (Pelchat et al., 2004), though research has not yet elucidated the exact mechanisms involved in food craving. It is possible that motivation to eat reflects a higher-order neural process compared to food craving. Though previous research has demonstrated that motivation to eat (Drapeau et al., 2007) and food cravings (Meule & Hormes, 2015; Richard et al., 2017) each predict food intake, no identified studies have examined how these experiences relate to one another. Future research is therefore warranted to elucidate whether food cravings or motivation to eat may be stronger predictors of binge eating behavior and thus more appropriate as proxies for binge eating. This is particularly important considering the increase in online studies (Sassenberg & Ditrich, 2019) and the need to move beyond the laboratory to understand the contexts and “natural” situations in which BED occurs (Plaza et al., 2019; Robinson et al., 2018). Indeed, participants may be more willing to report BED symptoms rather
than engage in BED behaviors in unfamiliar circumstances and settings such as a research laboratory. A more precise understanding of how motivation to eat and food cravings relate to binge eating behaviors is of paramount importance to aid in prevention and treatment efforts of the disorder.

Contrary to previous research suggesting that threatening self-perceptions are indicated in resource depletion (Neighbors et al., 2004), ego anxiety did not moderate the relationship between resource depletion and motivation to eat or between resource depletion and food cravings. Thus, Hypotheses 3 and 4 were not supported. Independently, higher ego anxiety predicted higher food cravings but not motivation to eat. These results suggest the mechanism through which ego anxiety affects binge eating behaviors may not be depleted self-regulation. In line with previous theories of escape (Duarte et al., 2017; Heatherton & Baumeister, 1991), it is possible that individuals with more threatening self-perceptions may engage in binge eating as a way to escape unpleasant experiences rather than as a result of impaired self-regulation abilities. As discussed, it is also possible that food cravings and motivation to eat are separate constructs of binge eating that may not fully capture binge eating behavior. More research is warranted to clarify if specific threatening self-perceptions are related to binge eating and to delineate the mechanisms though which these relationships exist.

This study adds specificity to previous research examining negative mood and affect in BED (Bodell et al., 2019; Svaldi et al., 2019) and clarifies the processes by which different mood states may relate to BED. Indeed, that discomfort anxiety interacted with resource depletion to cause binge eating behaviors (e.g., motivation to eat), while ego anxiety related to binge eating behaviors (e.g., food cravings) directly,
provides evidence that different mood states uniquely relate to BED. Though more research is necessary to better understand these processes, the results of the present study highlight the importance of delineating different mood states when examining BED.

**Exploratory Questions**

The initial exploratory questions were not able to be analyzed in the present study. The original goal was to examine whether each of the 16 BES items related to resource depletion, ego anxiety, and/or discomfort anxiety, yet analyzing 16 correlations on each variable increased the risk of false positives. Therefore, these analyses were not conducted. Instead, based on previous research demonstrating a two-factor structure of the BES (Hood et al., 2013), items were separated into the two suggested subscales: binge eating behaviors and binge eating emotions/cognitions. Results demonstrated that binge eating behaviors related to discomfort anxiety, which aligns with previous research findings that binge eating serves to mitigate unpleasant experiences of discomfort (Heatherton & Baumeister, 1991). Binge eating behaviors also related to ego anxiety and resource depletion, thus suggesting that these intrapsychic experiences may relate to behavioral manifestations of binge eating. Future research should examine if these intrapsychic experiences relate directly to binge eating behaviors above and beyond binge eating emotions and cognitions to better understand which specific experiences are impacting which specific BED symptoms.

Ego anxiety, discomfort anxiety, and resource depletion also related to binge eating emotions/cognitions, suggesting that these experiences relate to emotional and/or cognitive manifestations of binge eating. These findings provide opportunities for future researchers to examine if distress regarding physical discomfort relates to BED over and
above binge eating behaviors. Previous BED models indicate eating highly palatable foods serves to reduce distress (Dingemans et al., 2017); these results suggest that discomfort anxiety relates to BED beyond physical behaviors and may create or exacerbate BED emotions/cognitions. It is possible that discomfort anxiety leads to food cravings, as previous research has demonstrated (Chao et al., 2016), and that these emotions/cognitions are specifically related to food cravings. It will be important for future researchers to identify how discomfort anxiety, as well as ego anxiety and resource depletion, relate to specific BED symptoms to aid in prevention and treatment efforts of the disorder.

Taken together, these findings suggest that ego anxiety, discomfort anxiety, and resource depletion map on to both behavioral manifestations of BED and to emotional/cognitive symptoms of BED. Logical next steps are to explore a) which symptoms are central to BED and b) if certain symptoms map more strongly onto binge eating behaviors or binge eating emotions/cognitions. Understanding which factors relate more or less to specific BED symptoms can provide specificity to future BED prevention and treatment efforts.

**Limitations**

Several limitations exist in the present study. First, this study was completed online rather than in a controlled laboratory setting, and instead of measuring binge eating directly, self-reported food cravings and motivation to eat were used as proxies for binge eating behaviors. As previously discussed, the use of binge eating proxies may not adequately capture true eating behaviors. Importantly, however, the online nature of the study may have allowed for more realistic experiences of binge eating behaviors than
might be observed in a highly structured and unfamiliar setting. Future research should continue to identify the appropriateness of proxies for binge eating behaviors and seek to identify additional methods of capturing BED in more natural settings. A second study limitation was the lack of a valid and reliable measure of resource depletion, as no such measure has yet been identified. Resource depletion was therefore operationalized as a continuous variable that summed levels of fatigue, frustration, effort, boredom, and difficulty. While these constructs have been conceptualized as components of resource depletion (Dang et al., 2017; Hagger et al., 2016), a standard definition of resource depletion is necessary to allow for appropriate measurement and thus the standardization of research. Physiological and neurological measures (e.g., blood glucose levels, activation of the brain’s inhibition system; Hagger & Chatzisarantis, 2013; Wagner & Heatherton, 2012) may also be implemented to capture objective states of resource depletion, though no standardized physiological or neurological measures of resource depletion currently exist to our knowledge.

Participants were not asked about current medication or substance use in the present study. This is notable as certain medications, such as psychostimulants, suppress appetite (Kutlucinar et al., 2021). Considering both prescribed and illicit psychostimulant use has increased in the United States in recent years (Piper et al., 2018; United Nations Office, 2019), it is possible that results may be obfuscated by psychostimulant effects. For example, participants utilizing appetite-suppressing substances may have experienced reduced food cravings and motivation to eat. Researchers should consider inquiring about and, if necessary, controlling for medication and substance use in future studies to account for any appetite-suppressant effects that may affect study results.
Finally, participants recruited from a university setting differed from those recruited from MTurk on several variables. Participants recruited from the university were younger, less likely to be employed full-time, and were more likely to report lower income brackets than those recruited from MTurk. Participants recruited from the university also reported lower binge eating symptomatology, resource depletion, dietary restraint, discomfort anxiety, state anxiety, food cravings, and motivation to eat than those recruited from MTurk. Though it is unsurprising that individuals in a community setting (i.e., those recruited from MTurk) were older, more likely to be employed, and reported higher income brackets than college students, the differences in self-report measures were unexpected. One explanation for these differences is that individuals recruited from a university setting may have been less invested in study participation and thus less motivated to provide thoughtful responses (Khatamian-Far, 2018). Yet a more likely explanation may be due to employment status. Specifically, individuals recruited from MTurk were more likely to hold full-time employment than their student counterparts. Though full-time employment is often associated with better mental and physical health functioning (Rosenthal et al., 2012), it is possible that the current COVID-19 pandemic has created a heightened sense of stress for those working full-time due to the uncertainty many face with their employment continuity and finances (Ruffolo et al., 2021). The current COVID-19 pandemic has also exacerbated work-related stressors, as many individuals report poorer working conditions due to the pandemic (Diab-Bahman & Al-Enzi, 2020). For those working in manual labor, customer service, or sales, the COVID-19 pandemic likely compounds the already high levels of mental and physical health impairment associated with these industries (American Psychological
Association, 2021). Participants were not asked about their job stressors or working conditions in the present study, so it is unclear if these or other factors are responsible for sample differences. Future research examining if and how specific stressors relate to binge eating symptomatology, resource depletion, dietary restraint, discomfort anxiety, state anxiety, food cravings, and motivation to eat among different populations is therefore warranted.

**Future Directions**

Results in the present study introduce several questions and provide opportunities for future research. For example, does resource depletion relate to binge eating behaviors in individuals with BED? If so, to what extent does resource depletion cause and/or maintain binge eating behaviors in those with BED? What causes resource depletion in a naturalistic setting (i.e., outside of the controlled condition of a stressful writing task)? How does resource depletion relate to binge eating behaviors in a naturalistic setting?

To address these questions, future research should aim to replicate findings in a clinical sample and in real time across settings. Examining resource depletion and binge eating behaviors in individuals with BED will help researchers and clinicians identify if and how these relationships exist for those who are most impacted by the disorder. Identifying natural or ordinary causes of resource depletion is also paramount to understanding how BED functions in a “typical” setting (i.e., beyond a laboratory or online study with a specific manipulation of resource depletion). By identifying specific sources of resource depletion both broadly and at the individual level, researchers and clinicians can target efforts to prevent or mitigate its effects, such as by identifying ways to limit exposure to depleting events and/or by employing strategies to reduce the effects
of depleting events (e.g., mindfulness; Friese et al., 2012). Ecological momentary assessment and longitudinal research designs may be useful to better understand resource depletion and how it relates to binge eating behaviors over time and across settings.

Taken together, future research should aim to replicate and extend upon study findings by examining resource depletion and binge eating in individuals with BED and in natural settings. Examining if and how resource depletion relates to BED in diverse populations is also warranted, as BED may present differently across ethnic (Rodgers et al., 2017) and gender (Gordon & Guss, 2021) minorities and in men (Lydecker & Grilo, 2018). Researchers may also consider additional moderators of resource depletion and binge eating (for example, shame), particularly as the results in the present study accounted for a relatively small amount of variance between these variables. Finally, understanding which BED symptoms are central to developing and maintaining the disorder is crucial to accurately identifying and targeting prevention and treatment efforts to aid in the deleterious effects of BED.

**Conclusion**

This is the first identified study to directly examine resource depletion in binge eating behaviors. We provide novel data demonstrating that resource depletion predicts binge eating behaviors, but only under the specific conditions of high dietary restraint and high discomfort anxiety. These results elucidate resource depletion as an important mechanism in binge eating behavior and extend upon previous research by clarifying the precise mechanisms through which dietary restraint and discomfort anxiety relate to binge eating. This study also extends previous research by demonstrating that dietary restraint may be cognitive in nature rather than a biological response to hunger. Overall,
this research implies that focused attention on resource depletion and, relatedly, dietary restraint and discomfort anxiety, may be effective in reducing binge eating behaviors. Researchers and clinicians should therefore consider including resource depletion, dietary restraint, and discomfort anxiety in BED prevention and treatment efforts to mitigate the detrimental outcomes associated with this disorder.
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Appendix A – Demographics

Demographics Questionnaire

1. What is your age? ______
2. What is your gender?
   A. Cis-gender male
   B. Cis-gender female
   C. Transgender male
   D. Transgender female
   E. Gender non-binary
   F. Gender expansive/gender fluid
   G. Intersex ______________________
   H. Another: ______________________
3. What is your sexual orientation?
   A. Gay/lesbian
   B. Bisexual
   C. Pansexual
   D. Heterosexual (straight)
   E. Asexual/ace
   F. Another: ______________________
4. What is your racial/ethnic group? Please check all that apply to you.
   A. Native American or Alaska Native
   B. Asian, Asian American
   C. Native Hawaiian or Pacific Islander
   D. African American, Black
   E. Caucasian, Middle Eastern
   F. Caucasian, White
   G. Hispanic/Latinx
   H. Another: ______________________
5. What type of community do you currently live in?
   A. Large city
   B. Suburb near a large city
   C. Small city or town
   D. Rural area
6. What is your religion?
   A. Agnostic
   B. Atheist
   C. Buddhist
   D. Catholic
   E. Chinese folk
   F. Hindu
   G. Islamic
   H. Jewish
   I. New Religion (e.g. Hare Krishna, Scientology, Wicca, etc.)
J. Protestant Christian (e.g. Baptist, Lutheran, Methodist, non-denominational, etc.)
K. Tribal Religion
L. None
M. Other: _______________________

7. What is the highest level of education you have completed?
   A. Some High School
   B. High School Graduate/GED
   C. Some College
   D. 2-Year College Degree (e.g. Associates)
   E. 4-Year College Degree
   F. Master’s Degree
   G. Professional or doctoral degree (MD, JD, PhD)
   H. Other: _______________________

8. What is your employment status? (check all that apply)
   A. Employed Full-time
   B. Employed Part-time
   C. Employed, but it is inconsistent (e.g., temporary/seasonal work)
   D. Unemployed
   E. Student
   A. Retired

9. How would you identify your current social class? Please select the one best descriptor:
   A. Lower class
   B. Working class
   C. Middle class
   D. Upper middle class
   E. Upper class
   F. Other (please describe)________

10. How would you identify your family’s social class as you were growing up? Please select the one best descriptor.
    A. Lower class
    B. Working class
    C. Middle class
    D. Upper middle class
    E. Upper class
    F. Other (please describe)________

11. What is your current relationship status?
    A. Single/never married
    B. Single but cohabitating/living with partner
    C. Married
    D. Divorced/Separated
    E. Widowed
    F. Other (please specify)________

12. How many people currently live in your household?
    A. Number of adults _____
B. Number of children ____

13. What is your combined annual household income?
   A. Under $20,000
   B. 20,000-29,999
   C. 30,000-39,999
   D. 40,000-49,999
   E. 50,000-59,999
   F. 60,000-69,999
   G. 70,000-79,999
   H. 80,000-89,999
   I. 90,000-99,999
   J. 100,000-109,999
   K. 110,000-119,999
   L. 120,000-129,999
   M. 130,000-139,999
   N. 140,000-149,999
   O. 150,000+

14. In which state do you currently reside?
15. How hungry do you currently feel? (0 = Not at all hungry, 1 = A little hungry, 2 = Moderately hungry, 3 = Quite hungry, 4 = Extremely hungry/feeling famished
16. How long ago did you last eat something? (in hours and minutes)
17. What is your height? (feet and inches)
18. What is your current weight? (in pounds)
19. Have you ever received treatment for an eating disorder? if yes, describe: _____
Appendix B – EDE-Q Dietary Restraint Subscale

Eating Disorder Examination Questionnaire 6.0 – Dietary Restraint Subscale

**Instructions:** The following questions are concerned with the past four weeks (28 days) only. Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days) only. Please read each question carefully and please answer all the questions. Thank you.

**On how many of the past 28 days...**

<table>
<thead>
<tr>
<th></th>
<th>No days</th>
<th>1-5 days</th>
<th>6-12 days</th>
<th>13-15 days</th>
<th>16-22 days</th>
<th>23-27 days</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ...have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2. ...have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your weight or shape?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>3. ...have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>4. ...have you tried to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5. ...have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6. ...have you had a definite desire to have a totally flat stomach?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</table>
Appendix C – BES

Binge Eating Scale

Instructions: Below are groups of statements about behavior, thoughts, and emotional states. Please indicate which statement in each group best describes how you feel.

1. I don’t feel self-conscious about my weight or body size when I’m with others. I feel concerned about how I look to others, but it normally does not make me feel disappointed with myself. I do get self-conscious about my appearance and weight which makes me feel disappointed in myself. I feel very self-conscious about my weight and frequently, I feel intense shame and disgust for myself. I try to avoid social contacts because of my self-consciousness.

2. I don’t have any difficulty eating slowly in the proper manner. Although I seem to “gobble down” foods, I don’t end up feeling stuffed because of eating too much. At times, I tend to eat quickly and then, I feel uncomfortably full afterwards. I have the habit of bolting down my food, without really chewing it. When this happens I usually feel uncomfortably stuffed because I’ve eaten too much.

3. I feel capable to control my eating urges when I want to. I feel like I have failed to control my eating more than the average person. I feel utterly helpless when it comes to feeling in control of my eating urges. Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control.

4. I don’t have the habit of eating when I’m bored. I sometimes eat when I’m bored, but often I’m able to “get busy” and get my mind off food. I have a regular habit of eating when I’m bored, but occasionally, I can use some other activity to get my mind off eating. I have a strong habit of eating when I’m bored. Nothing seems to help me break the habit.

5. I’m usually physically hungry when I eat something. Occasionally, I eat something on impulse even though I really am not hungry. I have the regular habit of eating foods, that I might not really enjoy, to satisfy a hungry feeling even though physically, I don’t need the food. Although I’m not physically hungry, I get a hungry feeling in my mouth that only seems to be satisfied when I eat a food, like a sandwich, that fills my mouth.
Sometimes, when I eat the food to satisfy my mouth hunger, I then spit the food out so I won’t gain weight.

6. I don’t feel any guilt or self-hate after I overeat. After I overeat, occasionally I feel guilt or self-hate. Almost all the time I experience strong guilt or self-hate after I overeat.

7. I don’t lose total control of my eating when dieting even after periods when I overeat. Sometimes when I eat a “forbidden food” on a diet, I feel like I “blew it” and eat even more. Frequently, I have the habit of saying to myself, “I’ve blown it now, why not go all the way” when I overeat on a diet. When that happens I eat even more. I have a regular habit of starting strict diets for myself, but I break the diets by going on an eating binge. My life seems to be either a “feast” or “famine.”

8. I rarely eat so much food that I feel uncomfortably stuffed afterwards. Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed. I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks. I eat so much food that I regularly feel quite uncomfortable after eating and sometimes a bit nauseous.

9. My level of calorie intake does not go up very high or go down very low on a regular basis. Sometimes after I overeat, I will try to reduce my caloric intake to almost nothing to compensate for the excess calories I’ve eaten. I have a regular habit of overeating during the night. It seems that my routine is not to be hungry in the morning but overeat in the evening. In my adult years, I have had week-long periods where I practically starve myself. This follows periods when I overeat. It seems I live a life of either “feast or famine.”

10. I usually am able to stop eating when I want to. I know when “enough is enough.” Every so often, I experience a compulsion to eat which I can’t seem to control. Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges. I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

11. I don’t have any problem stopping eating when I feel full.
I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.
I have a problem stopping eating once I start and usually I feel uncomfortably stuffed after I eat a meal.
Because I have a problem not being able to stop eating when I want, I sometimes have to induce vomiting to relieve my stuffed feeling.

12. I seem to eat just as much when I’m with others (family, social gatherings) as when I’m by myself.
Sometimes, when I’m with other persons, I don’t eat as much as I want to eat because I’m self-conscious about my eating.
Frequently, I eat only a small amount of food when others are present, because I’m very embarrassed about my eating.
I feel so ashamed about overeating that I pick times to overeat when I know no one will see me. I feel like a “closet eater.”

13. I eat three meals a day with only an occasional between meal snack.
I eat 3 meals a day, but I also normally snack between meals.
When I am snacking heavily, I get in the habit of skipping regular meals.
There are regular periods when I seem to be continually eating, with no planned meals.

14. I don’t think much about trying to control unwanted eating urges.
At least some of the time, I feel my thoughts are pre-occupied with trying to control my eating urges.
I feel that frequently I spend much time thinking about how much I ate or about trying not to eat anymore.
It seems to me that most of my waking hours are pre-occupied by thoughts about eating or not eating. I feel like I’m constantly struggling not to eat.

15. I don’t think about food a great deal.
I have strong cravings for food but they last only for brief periods of time.
I have days when I can’t seem to think about anything else but food.
Most of my days seem to be pre-occupied with thoughts about food. I feel like I live to eat.

16. I usually know whether or not I’m physically hungry. I take the right portion of food to satisfy me.
Occasionally, I feel uncertain about knowing whether or not I’m physically hungry. At these times it’s hard to know how much food I should take to satisfy me.
Even though I might know how many calories I should eat, I don’t have any idea what is a “normal” amount of food for me.
Appendix D – EDAI

Ego and Discomfort Anxiety Inventory

Instructions: Please answer the following questions by using the scale below to indicate how much you agree or disagree with each statement.

(1) Strongly Disagree (2) Disagree (3) Neither Agree nor Disagree (4) Agree (5) Strongly Agree

1. What other people think of me is very important.
2. It is very hard for me to deal with unpleasant feelings.
3. Some things are too painful for me to handle.
4. I feel hurt when a person I respect criticizes me.
5. I can't control myself when things get too upset.
6. I feel that I must have the approval of other people to feel good about myself.
7. I feel upset when people dislike my looks or the way I dress.
8. Some things are too hard for me to deal with.
9. I feel anxious if the people I like don't approve of me.
10. I feel powerless to control myself when I feel anxious.
Appendix E – VAS

Visual Analogue Scales

Instructions: Please move the cursor to indicate how much you agree or disagree with each statement.

1. How hungry do you feel?

| I do not extremely feel hungry (100mm) | I feel hungry at all (0mm) |

2. How full do you feel?

| I feel completely full (0mm) | I do not feel full (100mm) |

3. How satisfied do you feel?

| I feel fully satisfied (0mm) | I am very unsatisfied or ravenous (100mm) |

4. How appealing do these foods look?

| Not at all appealing, looks delicious disgusting (0mm) | Very appealing, looks (100mm) |

5. Would you like to eat something sweet?
6. How motivated are you to eat something sweet right now?

<table>
<thead>
<tr>
<th>Motivation Level</th>
<th>0mm</th>
<th>100mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very much motivated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. How much do you think you could eat right now?

<table>
<thead>
<tr>
<th>Quantity</th>
<th>0mm</th>
<th>100mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Would you like to eat something salty?

<table>
<thead>
<tr>
<th>Preference</th>
<th>0mm</th>
<th>100mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>No, not at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very much</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. How motivated are you to eat something salty right now?

<table>
<thead>
<tr>
<th>Motivation Level</th>
<th>0mm</th>
<th>100mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very much motivated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. How much do you think you could eat right now?

<table>
<thead>
<tr>
<th>Quantity</th>
<th>0mm</th>
<th>100mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. Would you like to eat something fatty?

No, not at all
very much
(0mm)
(100mm)

Yes,

12. How motivated are you to eat something fatty right now?

Not at all
Very much
motivated (0mm)
(100mm)

13. How much do you think you could eat right now?

Nothing at all
A lot
(0mm)
(100mm)
Appendix F – Manipulation Check

Manipulation check.

Instructions: Please use the scale below to indicate how much you agree with the following statements:

(1) Strongly disagree  
(2) Disagree  
(3) Somewhat disagree  
(4) Neither agree nor disagree  
(5) Somewhat agree  
(6) Agree  
(7) Strongly Agree

1. I felt frustrated while completing the writing task.
2. I feel tired after completing the writing task.
3. I put effort into the writing task.
4. I found the writing task boring.
5. I found the writing task difficult.
Appendix G – STAI-State, 5-Item Version

The Spielberger State Trait Anxiety Inventory-State, 5-Item Version

Instructions: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the number at the end of the statement that indicates HOW YOU FEEL RIGHT NOW, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best. Thank you.

(1) Not at all    (2) Somewhat    (3) Moderately so    (4) Very much so

1. I feel upset.
2. I feel frightened.
3. I feel nervous.
4. I feel jittery.
5. I feel confused.
Appendix H – Fatty Foods
Appendix I – Salty Foods
Appendix J – Sweet Foods
Appendix K – Mental Health Resources

National Alliance on Mental Illness (NAMI).

Website for eating disorders: https://www.nami.org/About-Mental-Illness/Mental-Health-Conditions/Eating-Disorders/Support

NAMI Helpline: 800-950-NAMI (800-950-6264)

In a crisis, text "NAMI" (6264) to 741741

National Eating Disorders Association.

Website: https://www.nationaleatingdisorders.org/help-support

NEDA Helpline: 800-931-2237 (Available Monday-Thursday from 11am to 9pm ET, Friday from 11am to 5pm ET)

In a crisis, text “NEDA” (6332) to 741741
Appendix L – Recoding the Binge Eating Scale into Subscales Based on Findings from Hood and Colleagues (2013)

Binge Eating Scale-Recoded

1. (Emotions/Cognitions)
   - I don’t feel self-conscious about my weight or body size when I’m with others.
   - I feel concerned about how I look to others, but it normally does not make me feel disappointed with myself.
   - I do get self-conscious about my appearance and weight which makes me feel disappointed in myself.
   - I feel very self-conscious about my weight and frequently, I feel intense shame and disgust for myself. I try to avoid social contacts because of my self-consciousness.

2. (Behavioral)
   - I don’t have any difficulty eating slowly in the proper manner.
   - Although I seem to “gobble down” foods, I don’t end up feeling stuffed because of eating too much.
   - At times, I tend to eat quickly and then, I feel uncomfortably full afterwards.
   - I have the habit of bolting down my food, without really chewing it. When this happens I usually feel uncomfortably stuffed because I’ve eaten too much.

3. (Emotions/Cognitions)
   - I feel capable to control my eating urges when I want to.
   - I feel like I have failed to control my eating more than the average person.
   - I feel utterly helpless when it comes to feeling in control of my eating urges.
   - Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control.

4. (Behavioral)
   - I don’t have the habit of eating when I’m bored.
   - I sometimes eat when I’m bored, but often I’m able to “get busy” and get my mind off food.
   - I have a regular habit of eating when I’m bored, but occasionally, I can use some other activity to get my mind off eating.
   - I have a strong habit of eating when I’m bored. Nothing seems to help me break the habit.

5. (Behavioral)
   - I’m usually physically hungry when I eat something.
   - Occasionally, I eat something on impulse even though I really am not hungry.
   - I have the regular habit of eating foods, that I might not really enjoy, to satisfy a hungry feeling even though physically, I don’t need the food.
   - Although I’m not physically hungry, I get a hungry feeling in my mouth that only seems to be satisfied when I eat a food, like a sandwich, that fills my mouth.
Sometimes, when I eat the food to satisfy my mouth hunger, I then spit the food out so I won’t gain weight.

6. (Emotions/Cognitions)
   - I don’t feel any guilt or self-hate after I overeat.
   - After I overeat, occasionally I feel guilt or self-hate.
   - Almost all the time I experience strong guilt or self-hate after I overeat.

7. (Emotions/Cognitions)
   - I don’t lose total control of my eating when dieting even after periods when I overeat.
   - Sometimes when I eat a “forbidden food” on a diet, I feel like I “blew it” and eat even more.
   - Frequently, I have the habit of saying to myself, “I’ve blown it now, why not go all the way” when I overeat on a diet. When that happens I eat even more.
   - I have a regular habit of starting strict diets for myself, but I break the diets by going on an eating binge. My life seems to be either a “feast” or “famine.”

8. (Behavioral)
   - I rarely eat so much food that I feel uncomfortably stuffed afterwards.
   - Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed.
   - I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks.
   - I eat so much food that I regularly feel quite uncomfortable after eating and sometimes a bit nauseous.

9. (Behavioral)
   - My level of calorie intake does not go up very high or go down very low on a regular basis.
   - Sometimes after I overeat, I will try to reduce my caloric intake to almost nothing to compensate for the excess calories I’ve eaten.
   - I have a regular habit of overeating during the night. It seems that my routine is not to be hungry in the morning but overeat in the evening.
   - In my adult years, I have had week-long periods where I practically starve myself. This follows periods when I overeat. It seems I live a life of either “feast or famine.”

10. (Behavioral)
    - I usually am able to stop eating when I want to. I know when “enough is enough.”
    - Every so often, I experience a compulsion to eat which I can’t seem to control.
    - Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.
    - I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

11. (Behavioral)
    - I don’t have any problem stopping eating when I feel full.
I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.

I have a problem stopping eating once I start and usually I feel uncomfortably stuffed after I eat a meal.

Because I have a problem not being able to stop eating when I want, I sometimes have to induce vomiting to relieve my stuffed feeling.

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I feel so ashamed about overeating that I pick times to overeat when I know no one will see me. I feel like a “closet eater.”

13. (Behavioral)

I eat three meals a day with only an occasional between meal snack.

I eat 3 meals a day, but I also normally snack between meals.

When I am snacking heavily, I get in the habit of skipping regular meals.

There are regular periods when I seem to be continually eating, with no planned meals.

14. (Emotions/Cognitions)

I don’t think much about trying to control unwanted eating urges.

At least some of the time, I feel my thoughts are pre-occupied with trying to control my eating urges.

I feel that frequently I spend much time thinking about how much I ate or about trying not to eat anymore.

It seems to me that most of my waking hours are pre-occupied by thoughts about eating or not eating. I feel like I’m constantly struggling not to eat.

15. (Emotions/Cognitions)

I don’t think about food a great deal.

I have strong cravings for food but they last only for brief periods of time.

I have days when I can’t seem to think about anything else but food.

Most of my days seem to be pre-occupied with thoughts about food. I feel like I live to eat.

16. (Behavioral)

I usually know whether or not I’m physically hungry. I take the right portion of food to satisfy me.

Occasionally, I feel uncertain about knowing whether or not I’m physically hungry. At these times it’s hard to know how much food I should take to satisfy me.

Even though I might know how many calories I should eat, I don’t have any idea what is a “normal” amount of food for me.