University of Missouri, St. Louis

IRL @ UMSL

5-13-2022

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

Laura Fewell
University of Missouri-St. Louis, lkfvy7@umsystem.edu

Follow this and additional works at: https://irl.umsl.edu/dissertation

Part of the Clinical Psychology Commons, and the Health Psychology Commons

Recommended Citation

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

Laura K. Fewell

M.A., Psychology, University of Missouri – St. Louis, 2019
B.A., Psychology, Saint Louis University, 2012

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

Advisory Committee

Matthew J. Taylor, Ph.D.
Chair

Ann Steffen, Ph.D., ABPP

Emily Gerstein, Ph.D.

Randall Flanery, Ph.D.

Table of Contents

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 D_4 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 cortexes) 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).

Figure 1

Moderation Model
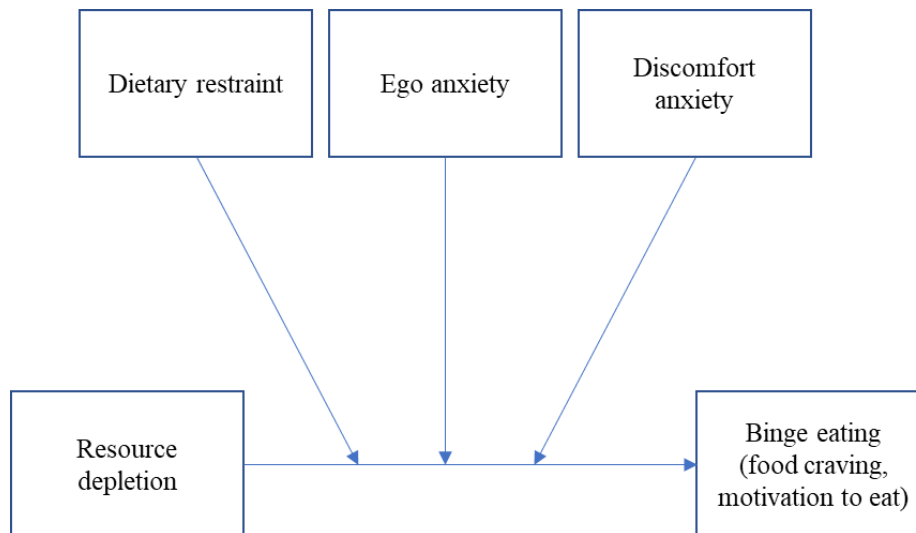
Hypotheses

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).

<div align="center">**Results**</div>

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

	M (*SD*)	Range
Age in Years	28.2 (9.61)	18 to 62 years
	N (%)	
Gender		
Female	165 (96.4)	
Male	0 (0)	
Transgender	3 (1.8)	
Gender Non-Binary	2 (1.2)	
Did not Report	1 (.6)	
Sexuality		
Heterosexual	130 (70.6)	
Gay/Lesbian	7 (4.1)	
Bisexual	26 (15.2)	
Pansexual	5 (2.9)	
Asexual	2 (1.2)	
Ethnicity		
African American	20 (11.7)	
Caucasian, White	116 (67.8)	
Asian/Asian American	11 (6.4)	
Hispanic/Latinx	4 (2.3)	
Caucasian, Middle Eastern	15 (8.8)	
Native American or Alaska Native	3 (1.8)	
Native Hawaiian or Pacific Islander	2 (1.2)	
Religion		
Catholic	79 (46.2)	
Christian	31 (18.1)	
Agnostic	14 (8.2)	
Atheism	14 (8.2)	
None	14 (8.2)	

Islam	8 (4.7)
Buddhist	2 (1.2)
Jewish	2 (1.2)
Hindu	1 (.6)
Tribal Religion	1 (.6)
Coptic Orthodox	1 (.6)
Ethiopian Orthodox	1 (.6)
Spiritual	1 (.6)
New Religion (Wicca/Scientology)	1 (.6)
Not Specified	1 (.6)
Education	
Some High School	2 (1.2)
High School Diploma/ GED	15 (8.8)
Associates Degree	35 (20.5)
Four-Year Degree	37 (21.6)
Master's degree	52 (30.4)
Professional/Doctoral Degree	28 (16.4)
Employment Status	
Full-Time	98 (57.3)
Part-Time	39 (22.8)
Employed Inconsistently	6 (3.5)
Student	14 (8.2)
Unemployed, Student	7 (4.1)
Unemployed, Non-Student	5 (2.9)
Household Income	
Under $20,000	24 (14)
20,000-29,999	12 (7)
30,000-39,999	12 (7)
40,000-49,999	16 (9.4)
50,000-59,999	25 (14.6)
60,000-69,999	12 (7)
70,000-79,999	8 (4.7)
80,000-89,999	11 (6.4)
90,000-99,999	9 (5.3)
100,000-109,999	18 (10.5)
110,000-119,999	4 (2.3)
120,000-129,999	3 (1.8)
130,000-139,999	4 (2.3)
140,000-149,999	3 (1.8)
150,000+	10 (5.8)

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

Independent t-tests Comparing Participants Recruited from Sona Versus MTurk

	SONA Participants		MTurk Participants				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*

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

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, $X^2(5, N = 169) = 98.70$, $p < .001$, 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, $X^2(14, N = 171) = 32.15$, $p =$

.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

	SONA Participants	MTurk Participants
	n (%)	*n* (%)
Full-Time	19 (11.2)	79 (46.7)
Part-Time	34 (20.1)	5 (3.0)
Inconsistent Employment	6 (3.5)	0 (0)
Unemployed	2 (1.1)	3 (1.8)
Unemployed, Student	7 (4.1)	0 (0)
Student	14 (8.3)	0 (0)
Total	82 (48.5)	87 (51.5)

Table 4

Chi-Square Tests of Recruitment Platform by Income

	SONA Participants	MTurk Participants
	n (%)	*n* (%)
Under $20,000	18 (10.5)	6 (3.5)
$20,000-29,999	8 (4.7)	4 (2.3)
$30,000-39,999	8 (4.7)	4 (2.3)
$40,000-49,999	6 (3.5)	10 (5.8)

$50,000-59,999	7 (4.1)	18 (10.5)	
$60,000-69,999	2 (1.2)	10 (5.8)	
$70,000-79,999	4 (2.3)	4 (2.3)	
$80,000-89,999	3 (1.7)	8 (4.7)	
$90,000-99,999	4 (2.3)	5 (2.9)	
$100,000-109,999	8 (4.7)	10 (5.8)	
$110,000-119,999	0 (0)	4 (2.3)	
$120,000-129,999	1 (.6)	2 (1.2)	
$130,000-139,999	3 (1.7)	1 (.6)	
$140,000-149,999	3 (1.7)	0 (0)	
$150,000+	7 (4.1)	3 (1.7)	
Total	82 (48.0)	89 (52.0)	

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

	SONA Participants	MTurk Participants	Total (%)
Cis-Gender	82	83	165 (96.5)
Gender Non-Binary	0 (0)	2	2 (1.2)
Transgender	0 (0)	3	3 (1.8)

Did not State	0 (0)	1	1 (.5)
Total	82	89	171 (100)

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, $X^2(3, N = 169) = 3.582$, $p = .310$; sexuality, $X^2(4, N = 168) = 5.629$, $p = .229$; ethnicity, $X^2(7, N = 169) = 5.833$, $p = .559$; level of education, $X^2(5, N = 167) = 2.864$, $p = .721$; or employment status, $X^2(5, N = 167) = 6.186$, $p = .289$.

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

Measures	$\underline{M}$	$\underline{SD}$	1	2	3	4
1. Binge Eating Symptomatology	16.01	10.04				
2. Resource Depletion	22.23	7.14	.25**			
3. Ego Anxiety	3.43	.97	.34**	.28**		
4. Discomfort Anxiety	3.28	1.00	.47**	.31**	.71**	

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

Hierarchical Multiple Regression Analyses Predicting Food Cravings with Ego Anxiety

as a Moderating Variable

Predictors	β	*t* value	*p*

Step 1			
BES Scores	.54	2.46	.015
Minutes Since Last Food Intake	.009	1.48	.141
Step 2			
BES Scores	.35	1.48	.142
Minutes Since Last Food Intake	.01	1.58	.117
Centered Resource Depletion	-.06	-.18	.855
Centered Ego Anxiety	6.18	2.50	.014
Step 3			
BES Scores	.35	1.46	.145
Minutes Since Last Food Intake	.01	1.56	.120
Centered Resource Depletion	-.06	-1.49	.852
Centered Ego Anxiety	-.44	-.19	.013
Centered Resource Depletion*	.13	.41	.680
Centered Ego Anxiety			

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

Predictors	β	t value	p
Step 1			
BES Scores	.59	2.49	.014
Minutes Since Last Food Intake	.01	1.79	.075
Step 2			
BES Scores	.42	1.65	.102
Minutes Since Last Food Intake	.01	1.88	.062
Centered Resource Depletion	.09	.26	.792
Centered Ego Anxiety	4.61	1.71	.090
Step 3			
BES Scores	.41	1.62	.108
Minutes Since Last Food Intake	.01	1.85	.066
Centered Resource Depletion	.09	.25	.801
Centered Ego Anxiety	5.20	1.91	.058

| Centered Resource Depletion*Centered Ego Anxiety | .45 | 1.36 | .176 |

Note. Standardized beta and t scores are reported.

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

Predictors	*β*	*t* value	*p*

Step 1			
BES Scores	.54	2.46	.015
Minutes Since Last Food Intake	.01	1.48	.141
Step 2			
BES Scores	.10	.41	.686
Minutes Since Last Food Intake	.01	1.81	.072
Centered Resource Depletion	-.18	-.57	.570
Centered Discomfort Anxiety	9.99	3.99	< .001
Step 3			
BES Scores	.06	.24	.809
Minutes Since Last Food Intake	.01	1.83	.070
Centered Resource Depletion	-.14	-.43	.671
Centered Discomfort Anxiety	10.35	4.11	< .001
Centered Resource Depletion*Centered Discomfort Anxiety	.30	1.18	.239

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

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

Predictors	β	t value	p
Step 1			
BES Scores	.59	2.49	.014
Minutes Since Last Food Intake	.01	1.79	.075
Step 2			
BES Scores	.16	.61	.542
Minutes Since Last Food Intake	.01	2.09	.038

Centered Resource Depletion	-.05	-.14	.888
Centered Discomfort Anxiety	9.21	3.36	< .001
Step 3			
BES Scores	.09	.33	.746
Minutes Since Last Food Intake	.01	2.14	.034
Centered Resource Depletion	.04	.11	.913
Centered Discomfort Anxiety	9.92	3.64	< .001
Centered Resource Depletion* Centered Discomfort Anxiety	.59	2.11	.036

Note. Standardized beta and t scores are reported.

Figure 2

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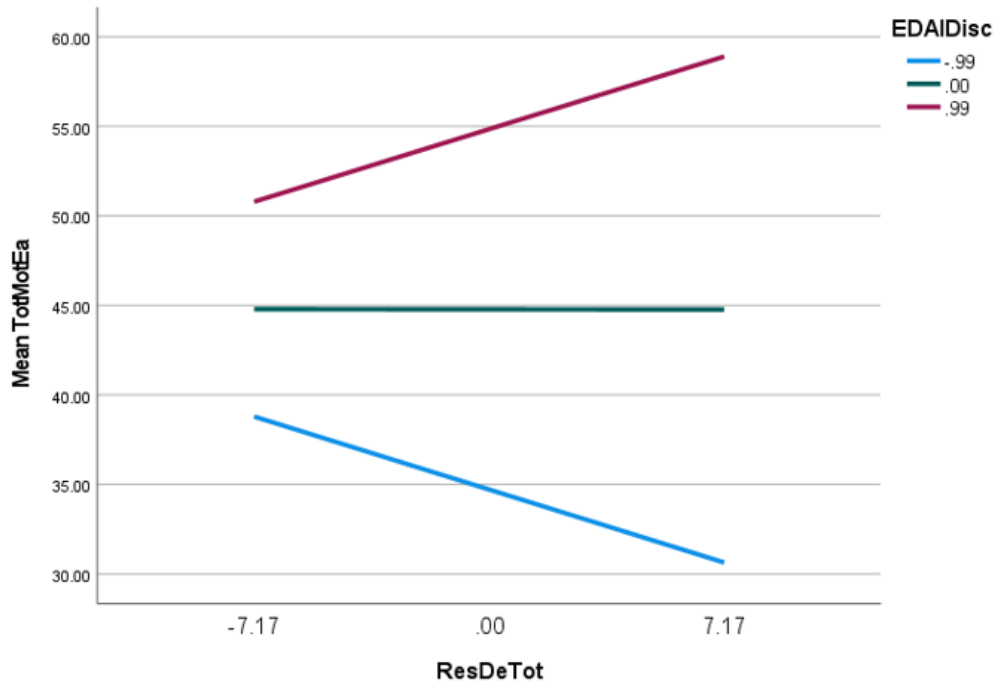
Note. TotMoEa = total motivation to eat; ResDeTot = resource depletion total score.

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

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

Note. Standardized beta and t scores are reported.

Figure 3

Simple Slopes Interaction for Resource Depletion by Dietary Restraint on Food Cravings
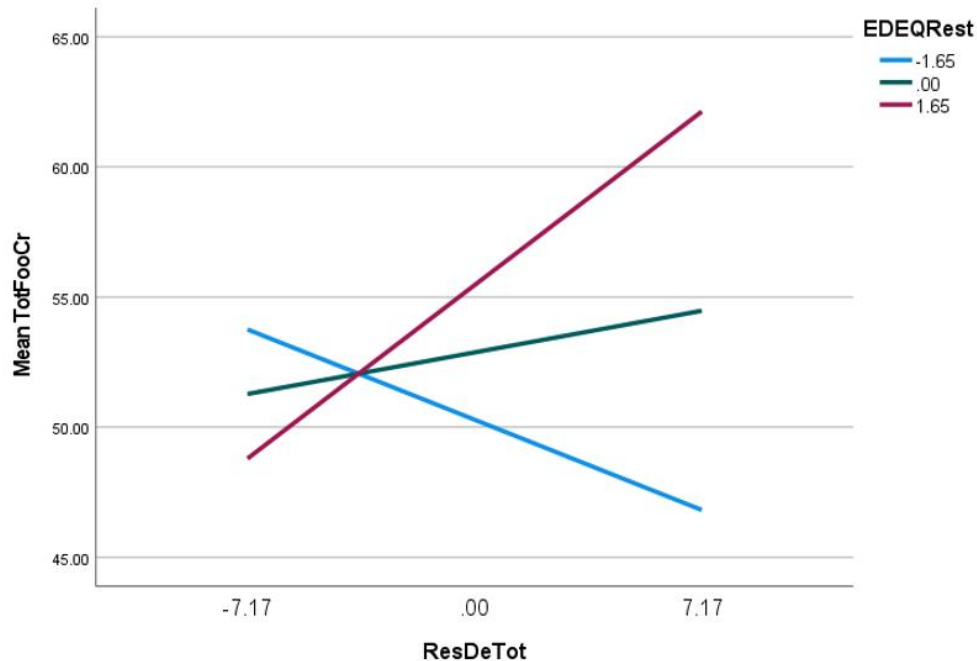
Note. TotFooCr = total food cravings; ResDeTot = resource depletion total score.

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

Predictors	β	t value	p
Step 1			
BES Scores	.59	2.49	.014
Minutes Since Last Food Intake	.01	1.79	.075
Step 2			
BES Scores	.40	1.53	.127
Minutes Since Last Food Intake	.01	1.91	.058

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

Note. Standardized beta and t scores are reported.

Figure 4

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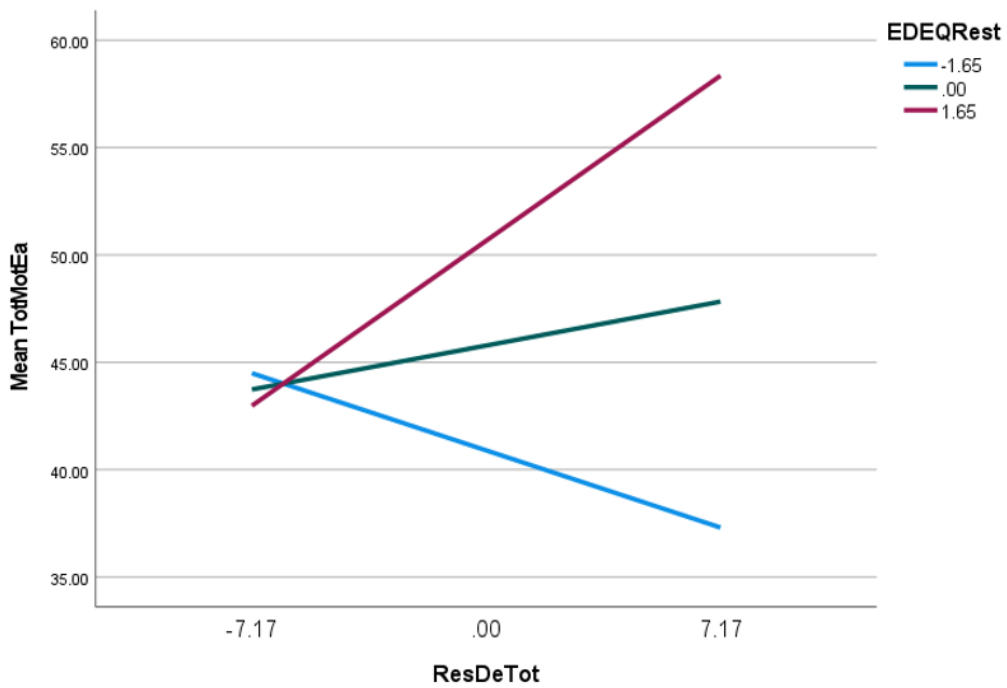
Note. TotMoEa = total motivation to eat; ResDeTot = resource depletion total score.

Table 13

Primary Hypotheses Listed as Supported or Unsupported

	Supported	Unsupported
Hypothesis 1. Increased resource depletion will be related to increased food cravings.		X
Hypothesis 2. Increased resource depletion will be related to increased motivation to eat.		X
Hypothesis 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.		X
Hypothesis 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.		X
Hypothesis 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.		X
Hypothesis 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.	X	
Hypothesis 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.	X	
Hypothesis 8. Dietary restraint will moderate the relationship between resource depletion and motivation to eat, such that higher levels of	X	

dietary restraint will relate to higher levels of
motion 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.

References

Adamus-Leach, H. J., Wilson, P. L., O'Connor, D. P., Rhode, P. C., Mama, S. K., & Lee,

R. E. (2013). Depression, stress and body fat are associated with binge eating in a

community sample of African American and Hispanic women. *Eating and Weight

Disorders-Studies on Anorexia, Bulimia and Obesity*, *18*(2), 221-227.

https://doi.org/10.1007/s40519-013-0021-3

Agh, T., Kovács, G., Supina, D., Pawaskar, M., Herman, B. K., Vokó, Z., & Sheehan, D.

V. (2016). A systematic review of the health-related quality of life and economic

burdens of anorexia nervosa, bulimia nervosa, and binge eating disorder. *Eating

and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 21*(3), 353-364.

https://doi.org/10.1007/s40519-016-0264-x

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental

disorders* (5th ed.). Washington, DC: Author.

American Psychological Association (2021, February 23). *The American workforce faces

compounding pressure: APA's 2021 work and well-being survey results.*

https://www.apa.org/pubs/reports/work-well-being/compounding-pressure-2021

Anson, O., Bernstein, J., & Hobfoll, S. E. (1984). Anxiety and performance in two ego

threatening situations. *Journal of Personality Assessment*, *48*(2), 168-172.

https://doi.org/10.1207/s15327752jpa4802_11

Arnow, B., Kenardy, J., & Agras, W. S. (1992). Binge eating among the obese: A

descriptive study. *Journal of Behavioral Medicine*, *15*(2), 155-170.

https://doi.org/10.1007/BF00848323

Aron, A. R. (2011). From reactive to proactive and selective control: Developing a richer

model for stopping inappropriate responses. *Biological Psychiatry*, *69*(12), e55-

e68.

Balodis, I. M., Molina, N. D., Kober, H., Worhunsky, P. D., White, M. A., Sinha, R., ...

& Potenza, M. N. (2013). Divergent neural substrates of inhibitory control in

binge eating disorder relative to other manifestations of obesity. *Obesity*, *21*(2),

367-377. https://doi.org/10.1002/oby.20068

Barnes, L. L., Harp, D., & Jung, W. S. (2002). Reliability generalization of scores on the

Spielberger state-trait anxiety inventory. *Educational and Psychological*

Measurement, *62*(4), 603-618. https://doi.org/10.1177/0013164402062004005

Baron, R. M. & Kenny, D. A. (1986). The moderator-mediator variable distinction in

social psychological research: Conceptual, strategic, and statistical considerations.

Journal of Personality and Social Psychology, 51(6), 1173-1182.

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview.

Psychological Inquiry, *7*(1), 1-15.

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is

the active self a limited resource?. *Journal of Personality and Social*

Psychology, *74*(5), 1252. https://doi.org/10.1037/0022-3514.74.5.1252

Baumeister, R. F., & Vohs, K. D. (2016). Strength model of self-regulation as limited

resource: Assessment, controversies, update. In *Advances in experimental social*

psychology (Vol. 54, pp. 67-127). Academic Press.

https://doi.org/10.1016/bs.aesp.2016.04.001

Baumeister, R. F., Zell, A. L., & Tice, D. M. (2007). How emotions facilitate and impair

    self-regulation. *Handbook of Emotion Regulation*, 408-426.

Bellows, B. K., DuVall, S. L., Kamauu, A. W., Supina, D., Pawaskar, M., Babcock, T., &

    LaFleur, J. (2016). Characteristics and use of treatment modalities of patients with

    binge-eating disorder in the Department of Veterans Affairs. *Eating*

    behaviors, *21*, 161-167. https://doi.org/10.1016/j.eatbeh.2016.03.013

Berry, W. D., & Feldman, S. (1985). Multiple Regression in Practice. Sage University

    Paper Series on Quantitative Applications in the Social Sciences, series no. 07-

    050). Newbury Park, CA: Sage.

Bodell, L. P., Pearson, C. M., Smith, K. E., Cao, L., Crosby, R. D., Peterson, C. B., ... &

    Berg, K. C. (2019). Longitudinal associations between emotion regulation skills,

    negative affect, and eating disorder symptoms in a clinical sample of individuals

    with binge eating. *Eating Behaviors, 32*, 69-73.

    https://doi.org/10.1016/j.eatbeh.2018.12.005

Bouëtté, G., Esvan, M., Apel, K., & Thibault, R. (2021). A visual analogue scale for food

    intake as a screening test for malnutrition in the primary care setting: Prospective

    non-interventional study. *Clinical Nutrition, 40*(1), 174-180.

    https://doi.org/10.1016/j.clnu.2020.04.042

Cai, W., Ryali, S., Chen, T., Li, C. S. R., & Menon, V. (2014). Dissociable roles of right

    inferior frontal cortex and anterior insula in inhibitory control: Efvidence from

    intrinsic and task-related functional parcellation, connectivity, and response

    profile analyses across multiple datasets. *Journal of Neuroscience*, *34*(44), 14652-

    14667. https://doi.org/10.1523/JNEUROSCI.3048-14.2014

Cardi, V., Leppanen, J., & Treasure, J. (2015). The effects of negative and positive mood

      induction on eating behaviour: A meta-analysis of laboratory studies in the

      healthy population and eating and weight disorders. *Neuroscience &*

      Biobehavioral Reviews, *57*, 299-309.

      https://doi.org/10.1016/j.neubiorev.2015.08.011

Cason, A. M., Smith, R. J., Tahsili-Fahadan, P., Moorman, D. E., Sartor, G. C., & Aston-

      Jones, G. (2010). Role of orexin/hypocretin in reward-seeking and addiction:

      implications for obesity. *Physiology & Behavior*, *100*(5), 419-428.

      https://doi.org/10.1016/j.physbeh.2010.03.009

Cepeda-Benito, A., Gleaves, D. H., Williams, T. L., & Erath, S. A. (2000). The

      development and validation of the state and trait food-cravings questionnaires.

      Behavior Therapy, 31(1), 151-173. https://doi.org/10.1016/S0005-

      7894(00)80009-X

Chao, A. M., Grilo, C. M., & Sinha, R. (2016). Food cravings, binge eating, and eating

      disorder psychopathology: Exploring the moderating roles of gender and race.

      Eating Behaviors, 21, 41-47. https://doi.org/10.1016/j.eatbeh.2015.12.007

Cheng, B. H., & McCarthy, J. M. (2018, January 22). Understanding the Dark and Bright

      Sides of Anxiety: A Theory of Workplace Anxiety. *Journal of Applied*

      Psychology, *103*(5), 537-560. http://dx.doi.org/10.1037/apl0000266

Chua, J. L., Touyz, S., & Hill, A. J. (2004). Negative mood-induced overeating in obese

      binge eaters: an experimental study. *International Journal of Obesity*, *28*(4), 606-

      610.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Craig, A. D. (2002). How do you feel? Interoception: the sense of the physiological

condition of the body. *Nature Reviews Neuroscience*, *3*(8), 655-666.

https://doi.org/10.1038/nrn894

Craven, M. P., & Fekete, E. M. (2019). Weight-related shame and guilt, intuitive eating,

and binge eating in female college students. *Eating Behaviors*, *33*, 44-48.

https://doi.org/10.1016/j.eatbeh.2019.03.002

Crocker, J., Brook, A. T., Niiya, Y., & Villacorta, M. (2006). The pursuit of self-esteem:

Contingencies of self-worth and self-regulation. *Journal of Personality*, *74*(6),

1749-1772. https**://**doi.org/10.1111/j.1467-6494.2006.00427.x

Crocker, J., & Wolfe, C. T. (2001). Contingencies of self-worth. *Psychological Review,*

108(3), 593.

Dang, J. (2016). Commentary: A multilab preregistered replication of the ego-depletion

effect. *Frontiers in Psychology*, *7*, 1155.

https://doi.org/10.3389/fpsyg.2016.01155

Dang, J., Liu, Y., Liu, X., & Mao, L. (2017). The ego could be depleted, providing initial

exertion is depleting. *Social Psychology*. https://doi.org/10.1027/1864-

9335/a000308

Demetriou, Constantina & Özer, Bilge & Essau, Cecilia. (2015). Self-Report

Questionnaires. https://doi.org/10.1002/9781118625392.wbecp507

DeWall, C., Baumeister, R., Stillman, T., & Gailliot, M. (2007). Violence restrained:

Effects of self-regulation and its depletion on aggression. *Journal of Experimental

Social Psychology, 43*, 62–76. http://dx.doi.org/10.1016/j.jesp.2005.12.005

De Young, K.P., Zander, M., & Anderson, D.A. (2014). Beliefs about the emotional

consequences of eating and binge eating frequency. *Eating Behaviors, 15*, 31–36.

https://doi.org/10.1016/j.eatbeh.2013.10.012

Diab-Bahman, R., & Al-Enzi, A. (2020). The impact of COVID-19 pandemic on

conventional work settings. *International Journal of Sociology and Social Policy,
40*(9/9/10), 909-927. https://doi.org/10.1108/IJSSP-07-2020-0262

Didymus, F. F., & Fletcher, D. (2014). Swimmers' experiences of organizational stress:

Exploring the role of cognitive appraisal and coping strategies. *Journal of Clinical
Sport Psychology, 8*(2), 159–183. https://doi.org/10.1123/jcsp.2014-0020.

Dingemans, A., Danner, U., & Parks, M. (2017). Emotion regulation in binge eating

disorder: A review. *Nutrients*, *9*(11), 1274. https://doi.org/10.3390/nu9111274

Dingemans, A. E., Martijn, C., Jansen, A. T. M., & van Furth, E. F. (2009). The effect of

suppressing negative emotions on eating behavior in binge eating disorder,

Appetite, 52(1), 51-57, https://doi.org/10.1016/j.appet.2008.08.004

Dingemans, A. E., Visser, H., Paul, L., & van Furth, E. F. (2015). Set-shifting abilities,

mood and loss of control over eating in binge eating disorder: An experimental

study. *Psychiatry Research*, *230*(2), 242-248.

https://doi.org/10.1016/j.psychres.2015.09.001

Douglas, S. M., & Leidy, H. J. (2019). Novel Methodological Considerations Regarding

the Use of Visual Analog Scale (VAS) Appetite Questionnaires in Tightly

Controlled Feeding Trials. *Current Developments in Nutrition, 3*(6), 1-4.

https://doi.org/10.1093/cdn/nzz061

Drapeau, V., King, N., Hetherington, M., Doucet, E., Blundell, J., & Tremblay, A. (2007). Appetite sensations and satiety quotient: predictors of energy intake and weight loss. *Appetite, 48*(2), 159-166. https://doi.org/10.1016/j.appet.2006.08.002

Duarte, C., Pinto-Gouveia, J., & Ferreira, C. (2015). Expanding binge eating assessment: Validity and screening value of the Binge Eating Scale in women from the general population. *Eating Behaviors*, *18*, 41-47. https://doi.org/10.1016/j.eatbeh.2015.03.007

Duarte, C., Ferreira, C., & Pinto-Gouveia, J. (2016). At the core of eating disorders: Overvaluation, social rank, self-criticism and shame in anorexia, bulimia and binge eating disorder. *Comprehensive Psychiatry*, *66*, 123-131. https://doi.org/10.1016/j.comppsych.2016.01.003

Duarte, C., Pinto-Gouveia, J., & Ferreira, C. (2017). Ashamed and fused with body image And eating: Binge eating as an avoidance strategy. *Clinical Psychology & Psychotherapy*, *24*(1), 195-202. https://doi.org/10.1002/cpp.1996

Ellis, A. (1979). A note on the treatment of agoraphobics with cognitive modification versus prolonged exposure in vivo.. *Behaviour Research and Therapy*. *17*(2), 162-164. https://doi.org/10.1016/0005-7967(79)90027-5

Elran-Barak, R., Fitzsimmons-Craft, E. E., Benyamini, Y., Crow, S. J., Peterson, C. B., Hill, L. L., ... & Le Grange, D. (2015). Anorexia nervosa, bulimia nervosa, and binge eating disorder in midlife and beyond. *The Journal of Nervous and Mental Disease, 203*(8), 583-590. https://doi.org/10.1097/NMD.0000000000000333

Englert, C., & Bertrams, A. (2012). Anxiety, ego depletion, and sports performance. *Journal of Sport and Exercise Psychology*, *34*(5), 580-599.

Englert, C., Zwemmer, K., Bertrams, A., & Oudejans, R. R. (2015). Ego depletion and

attention regulation under pressure: Is a temporary loss of self-control strength

indeed related to impaired attention regulation?. *Journal of Sport and Exercise

Psychology*, *37*(2), 127-137. https://doi.org/10.1123/jsep.2014-0219

Erskine, H. E., & Whiteford, H. A. (2018). Epidemiology of binge eating disorder.

Current Opinion in Psychiatry, *31*(6), 462-470.

https://doi.org/10.1097/YCO.0000000000000449

Evers, C., Dingemans, A., Junghans, A. F., & Boevé, A. (2018). Feeling bad or feeling

good, does emotion affect your consumption of food? A meta-analysis of the

experimental evidence. *Neuroscience fic& Biobehavioral Reviews*, *92*, 195-208.

https://doi.org/10.1016/j.neubiorev.2018.05.028

Fairburn, C. G., & Beglin, S. J. (1994). Assessment of eating disorders: Interview or self-

report questionnaire?. *International Journal of Eating Disorders*, *16*(4), 363-370.

Khatamian-Far, P. (2018). Challenges of recruitment and retention of university students

as research participants: Lessons learned from a pilot study. *Journal of the

Australian Library and Information Association*, *67*(3), 278-292.

https://doi.org/10.1080/24750158.2018.1500436

Fichter, M. M., & Quadflieg, N. (2016). Mortality in eating disorders-results of a large

prospective clinical longitudinal study. *International Journal of Eating

Disorders*, *49*(4), 391-401. https://doi.org/10.1002/eat.22501

Field, A. E., Sonneville, K. R., Micali, N., Crosby, R. D., Swanson, S. A., Laird, N. M.,

... & Horton, N. J. (2012). Prospective association of common eating disorders

and adverse outcomes. *Pediatrics*, *130*(2), e289-e295.

https://doi.org/10.1542/peds.2011-3663

Filipova, A. A., & Stoffel, C. L. (2016). The prevalence of binge eating disorder and its

relationship to work and classroom productivity and activity impairment. *Journal

of American College Health, 64*(5), 349-361.

https://doi.org/10.1080/07448481.2016.1150283

Flint, A., Raben, A., Blundell, J. E., & Astrup, A. (2000). Reproducibility, power and

validity of visual analogue scales in assessment of appetite sensations in single

test meal studies.

International Journal of Obesity, 24, 38-48. https://doi.org/10.1038/sj.ijo.0801083

Friese, M., Messner, C., & Schaffner, Y. (2012). Mindfulness meditation

counteracts self-control depletion. *Consciousness and Cognition*, *21*(2), 1016-

1022. https://doi.org/10.1016/j.concog.2012.01.008

Funahashi, S. (2017). Prefrontal contribution to decision-making under free-choice

conditions. *Frontiers in Neuroscience*, *11*, 431.

https://doi.org/10.3389/fnins.2017.00431

Fuster, J. M. (2015). *The Prefrontal Cortex, 5th Edition.* New York, NY: Academic

Press.

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M.,

... & Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy

source: Willpower is more than a metaphor. *Journal of Personality and Social

Psychology*, *92*(2), 325. https://doi.org/10.1037/0022-3514.92.2.325

Gailliot, M. T., Gitter, S. A., Baker, M. D., & Baumeister, R. F. (2012). Breaking the

    rules: Low trait or state self-control increases social norm violations.

    Psychology, *03*(12), 1074–1083. https://doi.org/10.4236/psych.2012.312159

Garrison, K. E., Finley, A. J., & Schmeichel, B. J. (2019). Ego depletion reduces

    attention control: Evidence from two high-powered preregistered

    experiments. *Personality and Social Psychology Bulletin*, *45*(5), 728-739.

    https://doi.org/10.1177/0146167218796473

Gearhardt, A. N., Yokum, S., Orr, P. T., Stice, E., Corbin, W. R., & Brownell, K. D.

    (2011). Neural correlates of food addiction. *Archives of General*

    Psychiatry, *68*(8), 808-816. https://doi.org/10.1001/archgenpsychiatry.2011.32

Gearhardt, A. N., White, M. A., Masheb, R. M., & Grilo, C. M. (2013). An examination

    of food addiction in a racially diverse sample of obese patients with binge eating

    disorder in primary care settings. *Comprehensive Psychiatry*, *54*(5), 500-505.

    https://doi.org/10.1016/j.comppsych.2012.12.009

Gordon A.R., Moore L.B., Guss C. (2021). Eating Disorders Among Transgender and

    Gender Non-binary People. In: Nagata J.M., Brown T.A., Murray S.B., Lavender

    J.M. (eds). Eating Disorders in Boys and Men. Springer, Cham.

    https://doi.org/10.1007/978-3-030-67127-3_18

Gormally, J., Black, S., Daston, S., & Rardin, D. (1982). The assessment of binge eating

    severity among obese persons. *Addictive Behaviors*, *7*(1), 47-55.

Goss, K., & GilBert, P. (2002). Eating disorders, shame and pride. *Body Shame:*

    Conceptualisation, Research and Treatment, 219-256.

Grilo, C. M., Henderson, K. E., Bell, R. L., & Crosby, R. D. (2013). Eating disorder

examination-questionnaire factor structure and construct validity in bariatric

surgery candidates. *Obesity Surgery*, *23*(5), 657-662.

https://doi.org/10.1007/s11695-012-0840-8

Grilo, C. M., Reas, D. L., Hopwood, C. J., & Crosby, R. D. (2015). Factor structure and

construct validity of the eating disorder examination-questionnaire in college

students: Further support for a modified brief version. *International Journal of

Eating Disorders*, *48*(3), 284-289. https://doi.org/10.1002/eat.22358

Grupski, A. E., Hood, M. M., Hall, B. J., Azarbad, L., Fitzpatrick, S. L., & Corsica, J. A.

(2013). Examining the Binge Eating Scale in screening for binge eating disorder

in bariatric surgery candidates. *Obesity Surgery*, *23*(1), 1-6.

https://doi.org/10.1007/s11695-011-0537-4

Guerdjikova, A. I., O'Melia, A. M., Mori, N., McCoy, J., & McElroy, S. L. (2012). Binge

eating disorder in elderly individuals. *International Journal of Eating

Disorders*, *45*(7), 905-908. https://doi.org/10.1002/eat.22028

Hagger, M. S., Chatzisarantis, N. L. D., Alberts, H., Anggono, C.

O., Batailler, C., Birt, A. R., … Zwienenberg, M. (2016). A multilab preregistered

replication of the ego-depletion effect. *Perspectives on Psychological

Science*, *11*, 546–573. https://doi.org/10.1177/1745691616652873

Hagger, M. S., Panetta, G., Leung, C. M., Wong, G. G., Wang, J. C., Chan, D. K., ... &

Chatzisarantis, N. L. (2013). Chronic inhibition, self-control and eating behavior:

Test of a 'resource depletion' model. *PloS one*, *8*(10), e76888.

https://doi.org/10.1371/journal.pone.0076888

Hardy, S. P. (1985). Analgesia elicited by prefrontal stimulation. *Brain Research*, *339*(2), 281-284. https://doi.org/10.1016/0006-8993(85)90093-9

Harrington, N. (2005). Dimensions of frustration intolerance and their relationship to self-control problems. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, *23*(1), 1-20. https://doi.org/10.1007/s10942-005-0001-2

Hayes, A. F. (2018). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford Publications.

Heatherton, T. F., & Baumeister, R. F. (1991). Binge eating as escape from self-awareness. *Psychological Bulletin, 110*(1), 86-108. https://doi.org/10.1037/0033-2909.110.1.86

Heatherton, T. F., & Wagner, D. D. (2011). Cognitive neuroscience of self-regulation failure. *Trends in cognitive sciences, 15*(3), 132-139. https://doi.org/10.1016/j.tics.2010.12.005

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). Beyond WEIRD: Towards a broad-based behavioral science. *Behavioral and Brain Sciences, 33*(2-3), 111. https://doi.org/10.1017/S0140525X10000725

Herman, C. P., & Polivy, J. (1980). Dietary restraint. *Obesity. WB Saunders: Philadelphia*, 208-225.

Hilbert, A., Petroff, D., Herpertz, S., Pietrowsky, R., Tuschen-Caffier, B., Vocks, S., & Schmidt, R. (2019). Meta-analysis of the efficacy of psychological and medical treatments for binge-eating disorder. *Journal of Consulting and Clinical Psychology, 87*(1), 91–105. https://doi.org/10.1037/ccp0000358

Hilbert, A., Pike, K. M., Goldschmidt, A. B., Wilfley, D. E., Fairburn, C. G., Dohm, F.

      A., ... & Weissman, R. S. (2014). Risk factors across the eating

      disorders. *Psychiatry Research*, *220*(1-2), 500-506.

      https://doi.org/10.1016/j.psychres.2014.05.054

Hobfoll, S. E. (1989). Conservation of resources. A new attempt at conceptualizing

      stress. *American Psychologist, 44*, 513–524. https://doi.org/10.1037/0003-

      066X.44.3.513

Hockey, G. R. J. (2011). A motivational control theory of cognitive fatigue. In P.L.

      Ackerman (Ed.), Cognitive fatigue: multidisciplinary perspectives on current

      research and future applications (pp. 167-188). Washington, DC: American

      Psychological Association.

Holtzer, R., Mahoney, J. R., Izzetoglu, M., Izzetoglu, K., Onaral, B., & Verghese, J.

      (2011). fNIRS study of walking and walking while talking in young and old

      individuals. *Journals of Gerontology Series A: Biomedical Sciences and Medical

      Sciences*, *66*(8), 879-887.

      https://doi.org/10.1093/gerona/glr068

Hood, M. M., Grupski, A. E., Hall, B. J., Ivan, I., & Corsica, J. (2013). Factor structure

      and predictive utility of the Binge Eating Scale in bariatric surgery

      candidates. *Surgery for Obesity and Related Diseases*, *9*(6), 942-948.

      https://doi.org/10.1016/j.soard.2012.06.013

Howell, D. C. (2013). Statistical methods for psychology 8th edition. *Thomson

      Wadsworth*.

Jackson, J. B., Pietrabissa, G., Rossi, A., Manzoni, G. M., & Castelnuovo, G. (2018).

 Brief strategic therapy and cognitive behavioral therapy for women with binge

 eating disorder and comorbid obesity: A randomized clinical trial one-year

 follow-up. *Journal of Consulting and Clinical Psychology, 86*(8), 688-701.

 http://dx.doi.org/10.1037/ccp0000313

Jansen, A. (2016). Eating disorders need more experimental psychopathology. *Behaviour

 Research and Therapy*, *86*, 2-10. https://doi.org/10.1016/j.brat.2016.08.004

Johns, M., Inzlicht, M., & Schmader, T. (2008). Stereotype threat and executive resource

 depletion: examining the influence of emotion regulation. *Journal of

 Experimental Psychology, 137*(4), 691–705. https://doi.org/10.1037/a0013834.

Kessler, R. C., Berglund, P. A., Chiu, W. T., Deitz, A. C., Hudson, J. I., Shahly, V., ... &

 Bruffaerts, R. (2013). The prevalence and correlates of binge eating disorder in

 the World Health Organization World Mental Health Surveys. *Biological

 Psychiatry, 73*(9), 904-914. https://doi.org/10.1016/j.biopsych.2012.11.020

Kessler, R. M., Hutson, P. H., Herman, B. K., & Potenza, M. N. (2016). The

 neurobiological basis of binge-eating disorder. *Neuroscience & Biobehavioral

 Reviews*, *63*, 223-238. https://doi.org/10.1016/j.neubiorev.2016.01.013

Kim, S. I. (2013). Neuroscientific model of motivational process. *Frontiers in

 Psychology*, *4*, 1-12. https://doi.org/10.3389/fpsyg.2013.00098

Koob, G. F., & Volkow, N. D. (2016). Neurobiology of addiction: a neurocircuitry

 analysis. *The Lancet Psychiatry*, *3*(8), 760-773. https://doi.org/10.1016/S2215-
0366(16)00104-8

Kutlucinar, K., Swanson, J. M., & Zametkin, A. (2021). The Effects of Stimulant Treatment of Child and Adolescent Growth: What Every Parent and Clinician Needs to Know. *The ADHD Report*, *29*(4), 1-5.

Lawrence, J. S., & Williams, A. (2013). Anxiety explains why people with domain-contingent self-worth underperform on ability-diagnostic tests. *Journal of Research in Personality*, *47*(3), 227-232. https://doi.org/10.1016/j.jrp.2013.01.004

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

Leehr, E. J., Krohmer, K., Schag, K., Dresler, T., Zipfel, S., & Giel, K. E. (2015). Emotion regulation model in binge eating disorder and obesity-a systematic review. *Neuroscience & Biobehavioral Reviews*, *49*, 125-134. https://doi.org/10.1016/j.neubiorev.2014.12.008

Leentjens, A. F., & Levenson, J. L. (2013). Ethical issues concerning the recruitment of university students as research subjects. *Journal of Psychosomatic Research*, *75*(4), 394-398. https://doi.org/10.1016/j.jpsychores.2013.03.007

Lek, F. Y., Ong, H. H., & Say, Y. H. (2018). Association of dopamine receptor D2 gene (DRD2) Taq1 polymorphisms with eating behaviors and obesity among Chinese and Indian Malaysian university students. *Asia Pacific Journal of Clinical Nutrition, 27*(3), 707.https://doi.org/10.6133/apjcn.092017.09

Lindsay-Hartz, J. (1984). Contrasting experiences of shame and guilt. *American Behavioral Scientist, 27*(6), 689-704.

Loth, K. A., Goldschmidt, A. B., Wonderlich, S. A., Lavender, J. M., Neumark-Sztainer, D., & Vohs, K. D. (2016). Could the resource depletion model of self-control help

the field to better understand momentary processes that lead to binge eating?. *The International Journal of Eating Disorders, 49*(11), 998-1001. https://doi.org/10.1002/eat.22641

Lowe, M. R., van Steenburgh, J., Ochner, C., & Coletta, M. (2009). Neural correlates of individual differences related to appetite. *Physiology & Behavior*, *97*(5), 561-571. https://doi.org/10.1016/j.physbeh.2009.04.001

Luca, A., Luca, M., & Calandra, C. (2015). Eating disorders in late-life. *Aging and Disease*, *6*(1), 48. https://doi.org/10.14336/AD.2014.0124

Lydecker, J. A., & Grilo, C. M. (2016). Different yet similar: Examining race and ethnicity in treatment-seeking adults with binge eating disorder. *Journal of Consulting and Clinical Psychology*, *84*(1), 88. https://doi.org/10.1037/ccp0000048

Lydecker, J. A., & Grilo, C. M. (2018). Comparing men and women with binge-eating disorder and co-morbid obesity. *International Journal of Eating Disorders*, *51*(5), 411-417. https://doi.org/10.1002/eat.22847

Machado, P. P., Grilo, C. M., Rodrigues, T. F., Vaz, A. R., & Crosby, R. D. (2020). Eating Disorder Examination–Questionnaire short forms: A comparison. *International Journal of Eating Disorders, 53*(6), 937-944. https://doi.org/10.1002/eat.23275

Malenfant, R., LaRue, A., & Vézina, M. (2007). Intermittent work and well-being: One foot in the door, one foot out. *Current Sociology*, *55*(6), 814-835. https://doi.org/10.1177/0011392107081987

Mangweth-Matzek, B., Kummer, K. K., & Pope, H. G. (2016). Eating disorder symptoms in middle-aged and older men. *International Journal of Eating Disorders*, *49*(10), 953-957. https://doi.org/10.1002/eat.22550

Marteau, T. M., & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State—Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology*, *31*(3), 301-306.

Marzilli, E., Cerniglia, L., & Cimino, S. (2018). A narrative review of binge eating disorder in adolescence: prevalence, impact, and psychological treatment strategies. *Adolescent Health, Medicine, and Therapeutics, 9*, 17-30. https://doi.org/10.2147/AHMT.S148050

Mason, T. B., Heron, K. E., Braitman, A. L., & Lewis, R. J. (2016). A daily diary study of perceived social isolation, dietary restraint, and negative affect in binge eating. *Appetite, 97*, 94-100. https://doi.org/10.1016/j.appet.2015.11.027

Mason, T. B., & Lewis, R. J. (2015). Assessing the roles of impulsivity, food-related cognitions, BMI, and demographics in the dual pathway model of binge eating among men and women. *Eating Behaviors, 18*, 151-155. https://doi.org/10.1016/j.eatbeh.2015.05.015

Mason, T. B., & Lewis, R. J. (2017). Examining social support, rumination, and optimism in relation to binge eating among Caucasian and African–American college women. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *22*(4), 693-698. https://doi.org/10.1007/s40519-016-0300-x

McManus, F., & Waller, G. (1995). A functional analysis of binge-eating. *Clinical Psychology Review*, *15*(8), 845-863.

Meule, A., & Hormes, J. M. (2015). Chocolate versions of the Food Cravings

Questionnaires. Associations with chocolate exposure-induced salivary flow and

ad libitum chocolate consumption. *Appetite, 91*, 256-265.

https://doi.org/10.1016/j.appet.2015.04.054

Missbach, B., Florack, A., Weissmann, L., & König, J. (2014). Mental imagery

interventions reduce subsequent food intake only when self-regulatory resources

are available. *Frontiers in Psychology*, *5*, 1391.

https://doi.org/10.3389/fpsyg.2014.01391

Mitchison, D., Touyz, S., González-Chica, D. A., Stocks, N., & Hay, P. (2017). How

abnormal is binge eating? 18-year time trends in population prevalence and

burden. *Acta Psychiatrica Scandinavica*, *136*(2), 147-155.

https://doi.org/10.1111/acps.12735

Mulders-Jones, B., Mitchison, D., Girosi, F., & Hay, P. (2017). Socioeconomic correlates

of eating disorder symptoms in an Australian population-based sample. *PLoS

One*, *12*(1), e0170603. https://doi.org/10.1371/journal.pone.0170603

Mustelin, L., Bulik, C. M., Kaprio, J., & Keski-Rahkonen, A. (2017). Prevalence and

correlates of binge eating disorder related features in the community. *Appetite,

109*, 165-171. https://doi.org/10.1016/j.appet.2016.11.032

Nagata, J. M., Compte, E. J., Cattle, C. J., Flentje, A., Capriotti, M. R., Lubensky, M. E.,

... & Lunn, M. R. (2020). Community norms for the Eating Disorder Examination

Questionnaire (EDE-Q) among gender-expansive populations. *Journal of Eating

Disorders*, *8*(1), 1-11. https://doi.org/10.1186/s40337-020-00352-x

National Alliance on Mental Illness (2021). *Eating disorders.*

> https://www.nami.org/About-Mental-Illness/Mental-Health-Conditions/Eating-
>
> Disorders/Support

National Eating Disorders Association (2021). *Help & Support*.

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

Neighbors, C., Larimer, M. E., Markman Geisner, I., & Knee, C. R. (2004). Feeling

> controlled and drinking motives among college students: Contingent self-esteem
>
> as a mediator. *Self and Identity*, *3*(3), 207-224.
>
> https://doi.org/10.1080/13576500444000029

Nijs, I. M., Franken, I. H., & Muris, P. (2007). The modified Trait and State Food-

> Cravings Questionnaires: development and validation of a general index of food
>
> craving. *Appetite, 49*(1), 38-46. https://doi.org/10.1016/j.appet.2006.11.001

Olguin, P., Fuentes, M., Gabler, G. et al. (2017). Medical comorbidity of binge eating

> disorder.

Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity, 22(1), 13–26.

> https://doi.org/10.1007/s40519-016-0313-5

Osborne, J. W., & Waters, E. (2002). Four assumptions of multiple regression that

> researchers should always test. *Practical Assessment, Research, and*
>
> *Evaluation*, *8*(1), 1-5. https://doi.org/10.7275/r222-hv23

Palmwood, E. N. & McBride, C. A. (2019) Challenge vs. threat: The effect of appraisal

> type on resource depletion. *Current Psychology, 38,* 1522–1529.
>
> https://doi.org/10.1007/s12144-017-9713-6

Parker, B., Sturm, K., MacIntosh, C. *et al.* Relation between food intake and visual

    analogue scale ratings of appetite and other sensations in healthy older and young

    subjects (2004). *European Journal of Clinical Nutrition, 58*, 212–218.

    https://doi.org/10.1038/sj.ejcn.1601768

Pelchat, M. L., Johnson, A., Chan, R., Valdez, J., & Ragland, J. D. (2004). Images of

    desire: food-craving activation during fMRI. *Neuroimage*, *23*(4), 1486-1493.

    https://doi.org/10.1016/j.neuroimage.2004.08.023

Phinney, J. S., & Ong, A. D. (2007). Conceptualization and measurement of ethnic

    identity: Current status and future directions. *Journal of Counseling

    Psychology*, *54*(3), 271. https://doi.org/10.1037/0022-0167.54.3.271

Piper, B. J., Ogden, C. L., Simoyan, O. M., Chung, D. Y., Caggiano, J. F., Nichols, S. D.,

    & McCall, K. L. (2018). Trends in use of prescription stimulants in the United

    States and Territories, 2006 to 2016. *PloS One, 13*(11), e0206100.

    https://doi.org/10.1371/journal.pone.0206100

Plaza, A. G., Delarue, J., & Saulais, L. (2019). The pursuit of ecological validity through

    contextual methodologies. *Food Quality and Preference*, *73*, 226-247.

    https://doi.org/10.1016/j.foodqual.2018.11.004

Polivy, J., & Herman, C. P. (1993). Etiology of binge eating: Psychological

    mechanisms. In C. G. Fairburn & G. T. Wilson (Eds.), *Binge eating: Nature,

    assessment, and treatment* (p. 173–205). Guilford Press.

Prem, R., Ohly, S., Kubicek, B., & Korunka, C. (2017). Thriving on challenging

    stressors? Exploring time pressure and learning demands as antecedents of

    thriving at work. *Journal of Organizational Behavior, 38*(1), 108-123.

https://doi.org/10.1002/job.2115.

Richard, A., Meule, A., Reichenberger, J., & Blechert, J. (2017). Food cravings in

everyday life: An EMA study on snack-related thoughts, cravings, and

consumption. *Appetite*, *113*, 215-223. https://doi.org/10.1016/j.appet.2017.02.037

Robinson, E., Bevelander, K. E., Field, M., & Jones, A. (2018). Methodological and

reporting quality in laboratory studies of human eating behavior. *Appetite*, *130*,

321-326. https://doi.org/10.1016/j.appet.2018.02.008

Rodgers, R. F., Watts, A. W., Austin, S. B., Haines, J., & Neumark-Sztainer, D. (2017).

Disordered eating in ethnic minority adolescents with overweight. *International

Journal of Eating Disorders*, *50*(6), 665-671. https://doi.org/10.1002/eat.22652

Rosenthal, L., Carroll-Scott, A., Earnshaw, V. A., Santilli, A., & Ickovics, J. R. (2012).

The importance of full-time work for urban adults' mental and physical

health. *Social Science & Medicine*, *75*(9), 1692-1696.

https://doi.org/10.1016/j.socscimed.2012.07.003

Ruffolo, M., Price, D., Schoultz, M. *et al.* (2021). Employment uncertainty and mental

health during the COVID-19 pandemic initial social distancing implementation: A

cross-national study. *Global Social Welfare, 8,* 141–150.

https://doi.org/10.1007/s40609-020-00201-4

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of

intrinsic motivation, social development, and well-being. *American

Psychologist*, *55*(1), 68.

Ryan, R. M., Deci, E. L., Grolnick, W. S., & La Guardia, J. G. (2006). The significance

of autonomy and autonomy support in psychological development and

psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), Developmental

psychopathology: Theory and method (2nd ed., pp. 795-849). New Jersey: John

Wiley & Sons, Inc.

Sassenberg, K., & Ditrich, L. (2019). Research in social psychology changed between

2011 and 2016: Larger sample sizes, more self-report measures, and more online

studies. *Advances in Methods and Practices in Psychological Science*, *2*(2), 107-

114. https://doi.org/10.1177/2515245919838781

Schmidt, N. B., Richey, J. A., Cromer, K. R., & Buckner, J. D. (2007). Discomfort

intolerance: Evaluation of a potential risk factor for anxiety

psychopathology. *Behavior Therapy*, *38*(3), 247-255.

https://doi.org/10.1016/j.beth.2006.08.004

Schmeichel, B. J., & Baumeister, R. F. (2004). Self-regulatory strength. In R. F.

Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory,

and applications* (pp. 84–98). New York: Guilford Press.

Schulte, E. M., Grilo, C. M., & Gearhardt, A. N. (2016). Shared and unique mechanisms

underlying binge eating disorder and addictive disorders. *Clinical Psychology

Review*, *44*, 125-139. https://doi.org/10.1016/j.cpr.2016.02.001

Serpell, L., Amey, R., & Kamboj, S. K. (2020). The role of self-compassion and self-

criticism in binge eating behaviour. *Appetite*, *144*, 104470.

https://doi.org/10.1016/j.appet.2019.104470

Shewach, O. R., Sackett, P. R., & Quint, S. (2019). Stereotype threat effects in settings

with features likely versus unlikely in operational test settings: A meta-

analysis. *Journal of Applied Psychology*, *104*(12), 1514.

https://doi.org/10.1037/apl0000420

Shingleton, R. M., Thompson-Brenner, H., Thompson, D. R., Pratt, E. M., & Franko, D.

L. (2015). Gender differences in clinical trials of binge eating disorder: An

analysis of aggregated data. *Journal of Consulting and Clinical Psychology,*

83(2), 382–386. https://doi.org/10.1037/a0038849

Shorkey, C. T., & Whiteman, V. L. (1993). Development of the Ego and Discomfort

Anxiety Inventory: Initial validity and reliability. *Psychological Reports*, *73*(1),

83-95.

Sinha, R., Gu, P., Hart, R., & Guarnaccia, J. B. (2019). Food craving, cortisol and ghrelin

responses in modeling highly palatable snack intake in the laboratory. *Physiology*

& Behavior, *208*, 112563. https://doi.org/10.1016/j.physbeh.2019.112563

Smink, F. R., van Hoeken, D., Oldehinkel, A. J., & Hoek, H. W. (2014). Prevalence and

severity of DSM-5 eating disorders in a community cohort of

adolescents. *International Journal of Eating Disorders*, *47*(6), 610-619.

https://doi.org/10.1002/eat.22316

Spencer, S. J., Logel, C., & Davies, P. G. (2016). Stereotype threat. *Annual Review of*

Psychology, 67, 415-437. https://doi.org/10.1146/annurev-psych-073115-103235

Spielberger, C. D. (1989). *State–Trait Anxiety Inventory: a comprehensive bibliography*.

Palo Alto, CA: Consulting Psychologists Press

Spoor, S. T., Stice, E., Bekker, M. H., Van Strien, T., Croon, M. A., & Van Heck, G. L.

(2006). Relations between dietary restraint, depressive symptoms, and binge

eating: A longitudinal study. *International Journal of Eating Disorders*, *39*(8), 700-707.https://doi.org/10.1002/eat.20283

Stice, E., Presnell, K., & Spangler, D. (2002). Risk factors for binge eating onset in adolescent girls: a 2-year prospective investigation. *Health Psychology*, *21*(2), 131.

Stunkard, A. J. (1959). Eating patterns and obesity. *Psychiatric Quarterly*, *33*(2), 284-295.

Stuss, D. T., & Benson, D. F. (1984). Neuropsychological studies of the frontal lobes. *Psychological Bulletin, 95*(1), 3-28.

Suhara, T., Nakayama, K., Inoue, O., Fukuda, H., Shimizu, M., Mori, A., & Tateno, Y. (1992). D1 dopamine receptor binding in mood disorders measured by positron emission tomography. *Psychopharmacology*, *106*(1), 14-18. https://doi.org/10.1007/BF02253582

Svaldi, J., Werle, D., Naumann, E., Eichler, E., & Berking, M. (2019). Prospective associations of negative mood and emotion regulation in the occurrence of binge eating in binge eating disorder. *Journal of Psychiatric Research, 115*, 61-68. https://doi.org/10.1016/j.jpsychires.2019.05.005

Tanaka, M., Ishii, A., & Watanabe, Y. (2014). Neural effects of mental fatigue caused by continuous attention load: a magnetoencephalography study. *Brain Research*, *1561*, 60-66. https://doi.org/10.1016/j.brainres.2014.03.009

Tanofsky-Kraff, M., Shomaker, L. B., Olsen, C., Roza, C. A., Wolkoff, L. E., Columbo, K. M., ... & Yanovski, J. A. (2011). A prospective study of pediatric loss of

control eating and psychological outcomes. *Journal of Abnormal Psychology*, *120*(1), 108. https://doi.org/10.1037/a0021406

Taut, D., Renner, B., & Baban, A. (2012). Reappraise the situation but express your emotions: impact of emotion regulation strategies on ad libitum food intake. *Frontiers in Psychology*, *3*, 359. https://doi.org/10.3389/fpsyg.2012.00359

Taylor, M. A review of food craving measures (2019). *Eating Behaviors, 32*, 101-110.

Toulany, A., Wong, M., Katzman, D. K., Akseer, N., Steinegger, C., Hancock-Howard, R. L., & Coyte, P. C. (2015). Cost analysis of inpatient treatment of anorexia nervosa in adolescents: hospital and caregiver perspectives. *CMAJ Open*, *3*(2), E192. https://doi.org/10.9778/cmajo.20140086

Treasure, J., Leslie, M., Chami, R., & Fernández-Aranda, F. (2018). Are trans diagnostic models of eating disorders fit for purpose? A consideration of the evidence for food addiction. *European Eating Disorders Review*, *26*(2), 83-91. https://doi.org/10.1002/erv.2578

Udo, T., & Grilo, C. M. (2018). Prevalence and correlates of DSM-5–defined eating disorders in a nationally representative sample of US adults. *Biological Psychiatry*, *84*(5), 345-354. https://doi.org/10.1016/j.biopsych.2018.03.014

Udo, T., McKee, S. A., White, M. A., Masheb, R. M., Barnes, R. D., & Grilo, C. M. (2013). Sex differences in biopsychosocial correlates of binge eating disorder: a study of treatment-seeking obese adults in primary care setting. *General Hospital Psychiatry*, *35*(6), 587-591. https://doi.org/10.1016/j.genhosppsych.2013.07.010

Udo, T., White, M. A., Lydecker, J. L., Barnes, R. D., Genao, I., Garcia, R., ... & Grilo, C. M. (2016). Biopsychosocial correlates of binge eating disorder in Caucasian

and African American women with obesity in primary care settings. *European*

Eating Disorders Review, *24*(3), 181-186.

https://doi.org/10.1002/erv.2417https://doi.org/10.1016/j.eatbeh.2019.01.005

United Nations Office on Drugs and Crime (2019). Treatment of stimulant use disorders:

current practices and promising perspectives. Retrieved from

https://www.unodc.org/documents/drug-prevention-and-

treatment/Treatment_of_PSUD_for_website_24.05.19.pdf

Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability:

basic psychological need satisfaction and need frustration as a unifying

principle. *Journal of Psychotherapy Integration, 23*(3), 263.

https://doi.org/10.1037/a0032359

Vansteenkiste, M., Ryan, R.M. & Soenens, B. (2020). Basic psychological need theory:

Advancements, critical themes, and future directions. *Motivation and Emotion,*

44, 1–31. https://doi.org/10.1007/s11031-019-09818-1

Vocks, S., Tuschen-Caffier, B., Pietrowsky, R., Rustenbach, S. J., Kersting, A., &

Herpertz, S. (2010). Meta-analysis of the effectiveness of psychological and

pharmacological treatments for binge eating disorder. *International Journal of*

Eating Disorders, *43*(3), 205-217. https://doi.org/10.1002/eat.20696

Vohs, K. D., & Baumeister, R. F. (Eds.). (2016). *Handbook of self-regulation: Research,*

theory, and applications. Guilford Publications.

Vohs, K. D., & Faber, R. J. (2007). Spent resources: Self-regulatory resource availability

affects impulse buying. *Journal of Consumer Research, 33*(4), 537-547.

https://doi.org/10.1086/510228

Vohs, K. D., Baumeister, R. F., & Ciarocco, N. J. (2005). Self-regulation and self-

    presentation: regulatory resource depletion impairs impression management and

    effortful self-presentation depletes regulatory resources. *Journal of Personality*

    and Social Psychology, *88*(4), 632. https://doi.org/10.1037/0022-3514.88.4.632

Volkow, N. D., Wang, G. J., & Baler, R. D. (2011). Reward, dopamine and the control of

    food intake: implications for obesity. *Trends in Cognitive Sciences*, *15*(1), 37-46.

    https://doi.org/10.1016/j.tics.2010.11.001

Wagner, D. D., & Heatherton, T. F. (2013). Self-regulatory depletion increases emotional

    reactivity in the amygdala. *Social Cognitive and Affective Neuroscience*, *8*(4),

    410-417.https://doi.org/10.1093/scan/nss082

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief

    measures of positive and negative affect: The PANAS scales. *Journal of*

    Personality and Social Psychology, 54(6), 1063–

    1070. https://doi.org/10.1037//0022-3514.54.6.1063

Watts, J., Brennan, B., & S Mehler, P. (2019). Medical Complications of Binge Eating

    Disorder. *Current Women's Health Reviews, 15*(2), 119-122.

    https://doi.org/10.2174/1573404814666180208154012

Whiteman, V. L., & Shorkey, C. T. (1994). Reliability and Validity of the Ego and

    Discomfort Anxiety Inventory. *Psychological Reports*, *75*(1), 384-386.

Whitman, M. V., Halbesleben, J. R., & Holmes, O. (2014). Abusive supervision and

    feedback avoidance: The mediating role of emotional exhaustion. *Journal of*

    Organizational Behavior, 35, 38–53. https://doi.org/10.1002/job.1852

Wilson, D. R., Loxton, N. J., Joynt, T., & O'Donovan, A. (2021). There is no such thing as a mindful binge: How mindfulness disrupts the pathway between anxiety and impulsivity on maladaptive eating behaviours. *Personality and Individual Differences, 168*, 110393. https://doi.org/10.1016/j.paid.2020.110393

Yohn, S. E., Galbraith, J., Calipari, E. S., & Conn, P. J. (2019). Shared Behavioral and Neurocircuitry Disruptions in Drug Addiction, Obesity, and Binge Eating Disorder: Focus on Group I mGluRs in the Mesolimbic Dopamine Pathway. *ACS Chemical Neuroscience*, *10*(5), 2125-2143. https://doi.org/10.1021/acschemneuro.8b00601

Zhou, Y. Gao, X. Chen, H., & Kong, F. (2017). High-disinhibition restrained eaters are disinhibited by self-regulatory depletion in the food-related inhibitory control, *Eating Behaviors, 26*, 70-75, https://doi.org/10.1016/j.eatbeh.2017.01.010

Zsido, A. N., Teleki, S. A., Csokasi, K., Rozsa, S., & Bandi, S. A. (2020). Development of the short version of the Spielberger State—Trait Anxiety Inventory. *Psychiatry Research*, *291*, 113223. https://doi.org/10.1016/j.psychres.2020.113223

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...

	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
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)?	O	O	O	O	O	O	O
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?	O	O	O	O	O	O	O
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)?	O	O	O	O	O	O	O
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)?	O	O	O	O	O	O	O
5. ...have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?	O	O	O	O	O	O	O
6. ...have you had a definite desire to have a totally flat stomach?	O	O	O	O	O	O	O

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	**I feel**
extremely	
feel hungry	**hungry**
(100mm)	
at all (0mm)	

2. How full do you feel?

I feel completely	**I**
do not	
full (0mm)	
feel full	
	at all
(100mm)	

3. How satisfied do you feel?

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

4. How appealing do these foods look?

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

5. Would you like to eat something sweet?

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

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

Not at all
Very much
motivated (0mm)
motivated

                                                                                (100m
                                                                                m)

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

Nothing at all
A lot
(0mm)
(100mm)

8. Would you like to eat something salty?

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

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

Not at all
Very much
motivated (0mm)
motivated

                                                                                (100mm)

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

Nothing at all
A lot
(0mm)
(100mm)

11. Would you like to eat something fatty?

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

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

Not at all
Very much
motivated (0mm)
motivated

(100m
m)

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)**
   o I don't feel self-conscious about my weight or body size when I'm with others.
   o I feel concerned about how I look to others, but it normally does not make me feel disappointed with myself.
   o I do get self-conscious about my appearance and weight which makes me feel disappointed in myself.
   o 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)**
   o I don't have any difficulty eating slowly in the proper manner.
   o Although I seem to "gobble down" foods, I don't end up feeling stuffed because of eating too much.
   o At times, I tend to eat quickly and then, I feel uncomfortably full afterwards.
   o 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)**
   o I feel capable to control my eating urges when I want to.
   o I feel like I have failed to control my eating more than the average person.
   o I feel utterly helpless when it comes to feeling in control of my eating urges.
   o Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control.

4. **(Behavioral)**
   o I don't have the habit of eating when I'm bored.
   o I sometimes eat when I'm bored, but often I'm able to "get busy" and get my mind off food.
   o 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.
   o I have a strong habit of eating when I'm bored. Nothing seems to help me break the habit.

5. **(Behavioral)**
   o I'm usually physically hungry when I eat something.
   o Occasionally, I eat something on impulse even though I really am not hungry.
   o 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.
   o 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)**
o I don't feel any guilt or self-hate after I overeat.
o After I overeat, occasionally I feel guilt or self-hate.
o Almost all the time I experience strong guilt or self-hate after I overeat.

7. **(Emotions/Cognitions)**
o I don't lose total control of my eating when dieting even after periods when I overeat.
o Sometimes when I eat a "forbidden food" on a diet, I feel like I "blew it" and eat even more.
o 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.
o 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)**
o I rarely eat so much food that I feel uncomfortably stuffed afterwards.
o Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed.
o I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks.
o I eat so much food that I regularly feel quite uncomfortable after eating and sometimes a bit nauseous.

9. **(Behavioral)**
o My level of calorie intake does not go up very high or go down very low on a regular basis.
o Sometimes after I overeat, I will try to reduce my caloric intake to almost nothing to compensate for the excess calories I've eaten.
o 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.
o 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)**
o I usually am able to stop eating when I want to. I know when "enough is enough."
o Every so often, I experience a compulsion to eat which I can't seem to control.
o Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.
o I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

11. **(Behavioral)**
o I don't have any problem stopping eating when I feel full.

o I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.
o I have a problem stopping eating once I start and usually I feel uncomfortably stuffed after I eat a meal.
o 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. (Emotions/Cognitions)
o I seem to eat just as much when I'm with others (family, social gatherings) as when I'm by myself.
o 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.
o Frequently, I eat only a small amount of food when others are present, because I'm very embarrassed about my eating.
o 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)
o I eat three meals a day with only an occasional between meal snack.
o I eat 3 meals a day, but I also normally snack between meals.
o When I am snacking heavily, I get in the habit of skipping regular meals.
o There are regular periods when I seem to be continually eating, with no planned meals.

14. (Emotions/Cognitions)
o I don't think much about trying to control unwanted eating urges.
o At least some of the time, I feel my thoughts are pre-occupied with trying to control my eating urges.
o I feel that frequently I spend much time thinking about how much I ate or about trying not to eat anymore.
o 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)
o I don't think about food a great deal.
o I have strong cravings for food but they last only for brief periods of time.
o I have days when I can't seem to think about anything else but food.
o Most of my days seem to be pre-occupied with thoughts about food. I feel like I live to eat.

16. (Behavioral)
o I usually know whether or not I'm physically hungry. I take the right portion of food to satisfy me.
o 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.
o 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.